OMRON

Vision Sensor

FH/FHV/FZ5 Series

Vision System

Processing Item Function Reference Manual

FH-1□□□/FH-1□□□-□□
FH-2□□□/FH-2□□□-□□
FH-3□□□/FH-3□□□-□□
FH-5□□□/FH-5□□□-□□
FH-L□□□/FH-L□□□-□□
FHV7□-□□□□
FZ5-6□□/FZ5-6□□-□□
FZ5-8□□/FZ5-8□□-□□
FZ5-11□□/FZ5-11□□-□□
FZ5-12□□/FZ5-12□□-□□
FZ5-L35□/FZ5-L35□-□□

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Z341-E1-13

Introduction

Thank you for purchasing the FH/FHV/FZ5.
This manual provides information regarding functions, performance and operating methods that are required for using the FH/FHV/FZ5.
When using the FH/FHV/FZ5, be sure to observe the following:

- The FH/FHV/FZ5 must be operated by personnel knowledgeable in electrical engineering.
- To ensure correct use, please read this manual thoroughly to deepen your understanding of the product.
- Please keep this manual in a safe place so that it can be referred to whenever necessary.

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The symbols used in this manual have the following meanings.

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Precautions on what to do and what not to do to ensure proper operation and performance.

Additional Information

Additional information to read as required.
This information is provided to increase understanding or make operation easier.

Use of Quotation Marks and Brackets

In this manual, menus and other items are indicated as follows.

[ ]	Menu	Indicates the menu names or processing items shown in the menu bar.
" "	Item name	Indicates the item names displayed on the screen.

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For details on Safety Precautions, refer to *Safety Precautions* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

Precautions for Safe Use

For details on Precautions for Safe Use, refer to *Precautions for Safe Use* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

Precautions for Correct Use

For details on Precautions for Correct Use, refer to *Precautions for Correct Use* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

Regulations and Standards

For details on Regulations and Standards, refer to *Regulations and Standards* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

Related Manuals

The followings are the manuals related to this manual. Use these manuals for reference.

Name of Manual	Man.No.	Model	Proposes	Contents
Vision System FH Instruction Sheet	9607479-9	FH-1□□□ FH-1□□□-□□ FH-3□□□ FH-3□□□-□□	To confirm the safety and usage precautions of the Vision System FH series Sensor Controller.	Describes the definitions of basic terms, meaning of signal words, and precautions for correct use of FH series in the manual.
Vision System FH Instruction Sheet	3102269-4	FH-2□□□ FH-2□□□-□□ FH-5□□□ FH-5□□□-□□		
Vision System FH-L Instruction Sheet	9606631-1	FH-L□□□ FH-L□□□-□□	To confirm the safety and usage precautions of the Vision System FH-Lite series Sensor Controller.	Describes the definitions of basic terms, meaning of signal words, and precautions for correct use of FH-L series in the manual.
Vision System FZ5 Instruction Sheet	9524422-4	FZ5-6□□ FZ5-6□□-□□ FZ5-11□□ FZ5-11□□-□□	To confirm the setup procedures, safety and usage precautions of the Vision System FZ5-600, FZ5-1100 series Sensor Controller, including I/O setup and wiring	Describes the definitions of basic terms, meaning of signal words, and precautions for correct use of FZ5-600, FZ5-1100 series in the manual.
Vision System FZ5 Instruction Sheet	9308317-7	FZ5-8□□ FZ5-8□□-□□ FZ5-12□□ FZ5-12□□-□□	To confirm the setup procedures, safety and usage precautions of the Vision System FZ5-800,FZ5- 1200 series Sensor Controller, including I/O setup and wiring	Describes the definitions of basic terms, meaning of signal words, and precautions for correct use of FZ5-800, FZ5-1200 series in the manual.
Vision System FZ5-L Instruction Sheet	9910002-2	FZ5-L35□ FZ5-L35□-□□	To confirm the setup procedures, safety and usage precautions of the Vision System FZ5-L Series Sensor Controller, including I/O setup and wiring.	Describes the definitions of basic terms, meaning of signal words, and precautions for correct use of FZ5-L series in the manual.
Smart Camera FHV Instruction Sheet	3129404-0	FHV7□-□□□□-C	To confirm the safety and usage precautions of the Smart Camera FHV series.	Describes the definitions of basic terms, the meaning of signal words, and precautions for correct use of FHV series in the manual.
Smart Camera Lighting Module FHV-LTM Instruction Sheet	3129276-4	FHV-LTM□□	To confirm the safety and usage precautions of the Smart camera lighting module FHV-LTM.	Describes the definitions of basic terms, the meaning of signal words, and precautions for correct use of the lighting module FHV-LTM in the manual.

Name of Manual	Man.No.	Model	Proposes	Contents
Smart Camera Lens Module FHV-LEM-S Instruction Sheet	3128622-5	FHV-LEM-S□□	To confirm the safety and usage precautions of the Smart camera lens module FHV-LEM.	Describes the definitions of basic terms, the meaning of signal words, and precautions for correct use of the lens module FHV-LEM.
FHV Series Smart Camera Setup Manual	Z408	FHV7□-□□□□-C FHV7□-□□□□-S-□□ FHV7□-□□□□-S-□□-□□	When User want to know about the hardware specifications or to setup the Smart camera FHV series.	Describes FHV series specifications, dimensions, part names, I/O information, installation information, and wiring information.
Vision System FH/FHV/FZ5 Series User's Manual	Z365	FH-1□□□ FH-1□□□-□□ FH-2□□□ FH-2□□□-□□ FH-3□□□ FH-3□□□-□□ FH-5□□□ FH-5□□□-□□ FH-L□□□ FH-L□□□-□□	When User want to know how to setup the Sensor Controller of the Vision System FH/FZ5 series.	Describes the soft functions, setup, and operations to use Sensor Controller of the Vision System FH/FZ5 series.
Vision System FH/FZ5 series Processing Item Function Reference Manual	Z341		When User confirm the details of each processing items at the create the measurement flow or operate it.	Describes the software functions, settings, and operations for using FH/FHV/FH5-series.
Vision System FH/FZ5 Series User's Manual for Communications Settings	Z342	FHV7□-□□□□-C FHV7□-□□□□-S-□□ FHV7□-□□□□-S-□□-□□ FZ5-L35□	When User confirm the setting of communication functions.	Describes the functions, settings, and communications methods for communicating between FH/FHV/FH5 series. The following communication protocol are described. Parallel, PLC Link, EtherNet/IP, EtherCAT, and Non-procedure
Vision System FH/FZ5 series Macro Customize Functions Programming Manual	Z367	FH-1□□□ FH-1□□□-□□ FH-2□□□ FH-2□□□-□□ FH-3□□□ FH-3□□□-□□ FH-5□□□ FH-5□□□-□□ FH-L□□□ FH-L□□□-□□	When User operate or programming using Macro Customize functions.	Describes the functions, settings, and operations for using Macro Customize function of the FH/FH5-series.
Vision System FH/FZ5 series Hardware Setup Manual	Z366	FZ5-L35□ FZ5-L35□-□□	When User want to know about the Hard-ware specifications or to setup the Sensor Controller of the Vision System FH/FZ5 series.	Describes FH/FZ5 series specifications, dimensions, part names, I/O information, installation information, and wiring information.
Vision System FH Series Operation Manual for Sysmac Studio	Z343	FH-1□□□ FH-1□□□-□□ FH-2□□□ FH-2□□□-□□ FH-3□□□ FH-3□□□-□□ FH-5□□□ FH-5□□□-□□	When User connect to NJ series via EtherCAT communication.	Describes the operating procedures for setting up and operating FH series Vision Sensors from the Sysmac Studio FH Tools.

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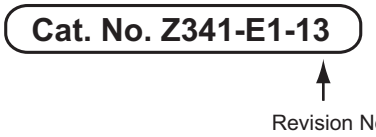
Revision History

A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.



Rev. No.	Reprint symbol	Rev. Date	Revision Contents	Software Version
01	(1)	Jul. 2013	Original production	Ver. 5.00
02	(1)	Aug. 2013	Additions for lighting controllers.	Ver. 5.10
03	(1)	Aug. 2013	Additions for software version upgrade.	Ver. 5.10
04	(1)	Sep. 2013	Additions for software version upgrade.	Ver. 5.12
05	(1)	Jan. 2014	Additions for software version upgrade.	Ver. 5.20
06	(1)	Jun. 2014	Additions for software version upgrade.	Ver. 5.30
07	(1)	Oct. 2015	Additions for software version upgrade.	Ver. 5.50
08	(1)	Apr. 2016	Additions for software version upgrade and description of FH-L series.	Ver. 5.60
09	(1)	Mar. 2017	Additions for software version upgrade.	Ver. 5.71
10	(1)	Mar. 2017	Corrected mistakes.	Ver. 5.71
11	(1)	Jun. 2017	Additions for software version upgrade.	Ver. 5.72
12	(1)	Jul. 2018	Additions for software version upgrade.	Ver. 6.10
13	(1)	Nov. 2018	Additions for software version upgrade.	Ver. 6.20

1

Input image

This chapter describes how to load images from cameras.

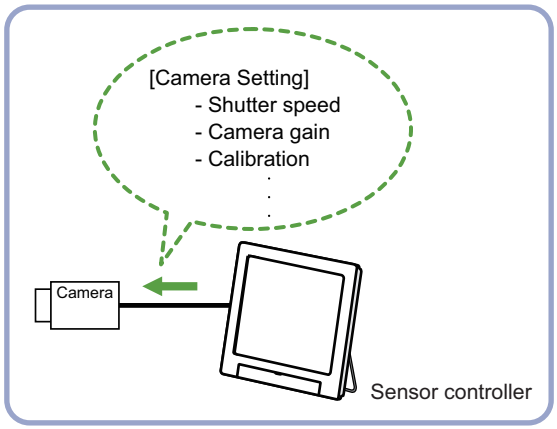
1-1 Camera Image Input

This is a processing item specific to the FZ5 Sensor Controller.

Set the conditions for loading images from the camera and for storing images of the measured objects. This processing item must be used when measuring.

In addition, it is possible to shoot images with different shutter speeds, or lighting by adding multiple Camera Image Input to your flow.

Used in the Following Case



Important

- [Camera Image Input] is preset for Unit 0. Do not set any processing item other than camera image input (camera image input HDR, camera image input HDR Lite) for Unit 0.
- When switching from a color camera to a monochrome or switching to a camera with a different resolution, reconfigure the settings in the following units.
- If a camera is connected other than the one for the previous settings, the camera settings are returned to their initial settings.
- Immediately after starting up the FZ5 Sensor Controller and immediately after changing scenes, there will be no input image. No input image is processed as the same color image as in the factory default state.
- If you open the Properties Dialog Box before inputting an image, click the Cancel button to close the dialog box. Pressing the OK button in the dialog box will change the setting to the same color camera setting as the factory default setting.

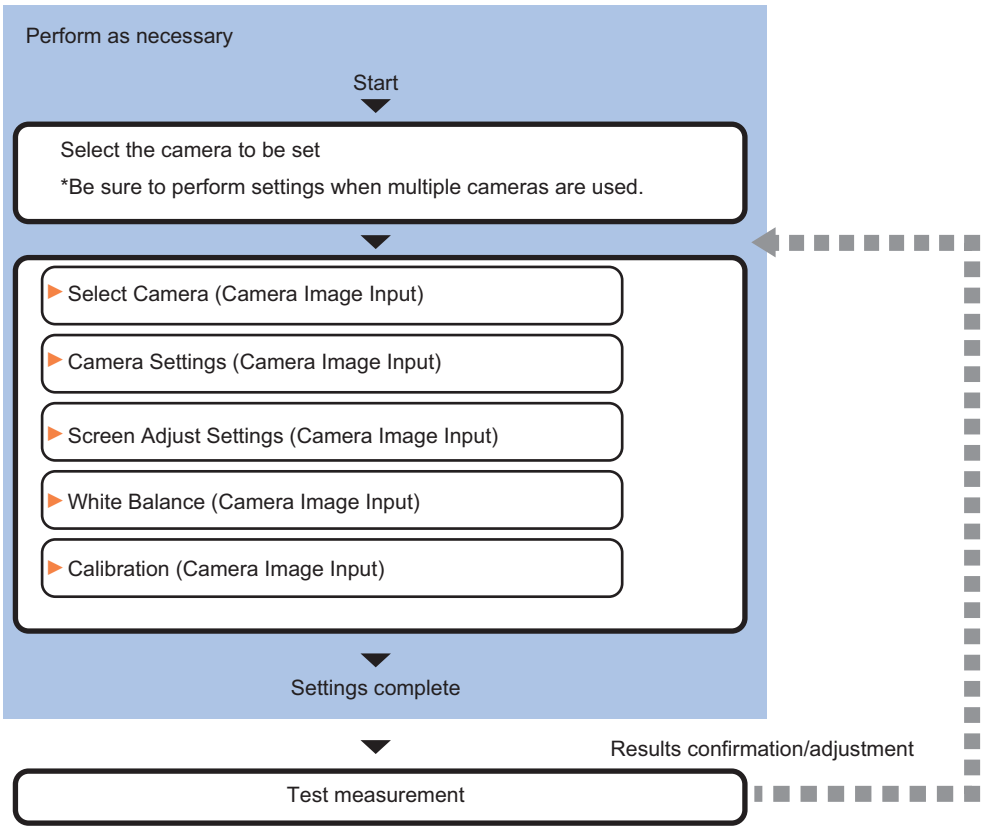
For details, refer to *FAQ For Measurement The measurement NG (image mismatch) error will result when connecting a monochrome camera* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

Important

- When the Scene data created via FZ series Sensor Controller, i.e.. FZ5 series or FZ5-L series, [Camera Image Input] is automatically converted to [Camera Image Input FH].
- The automatically converted contents is the common items between [Camera Image Input] and [Camera Image Input FH]. The other settings is set to the default settings of the connected camera to the FH-1000/2000/3000/5000, or FH-L series Sensor Controller.
- When you load the created data via FH series Sensor Controller, i.e. FH-L series or FH-1000 series. via FZ series Sensor Controller, the automatically conversion is not performed.

1-1-1 Settings Flow (Camera Image Input)

To set camera image input, follow the steps below.



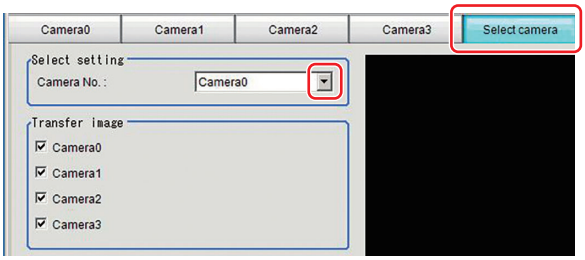
Camera Image Input Item List

Item	Description
Camera 0 to 3	Select the camera to be set.
Select camera	When multiple cameras are connected, select the camera to use for measurement. Refer to *1-1-2 Select Camera (Camera Image Input)* on page 1-5.
Camera setting	Specify the camera settings such as the shutter speed or electronic flash. Refer to *1-1-3 Camera Settings (Camera Image Input)* on page 1-6.
Screen adjust	Adjust the lighting and the lens. Refer to *1-1-4 Screen Adjustment Settings (Camera Image Input)* on page 1-12.
White balance	When using a color camera, adjust the white balance. Refer to *1-1-5 White Balance (Camera Image Input)* on page 1-20.
Calibration	Set when measurements (camera coordinate measurement values) are to be output using actual dimensions. Select the calibration setting method and generate the calibration parameters. Refer to *1-1-6 Calibration (Camera Image Input)* on page 1-21.

1-1-2 Select Camera (Camera Image Input)

When multiple cameras are connected, select the camera to use for measurement.

1 In the Item Tab area, click [Select camera].



2 Click [Camera No.] [▼] and select the camera number.

3 If multiple cameras are connected, the camera to transfer images for can be selected.

Unchecking the camera check box not being used for current Scene or logging, takt time will be shorten because can reduce the transfer processing time after image input for that camera.

Important

Transfer of images for Camera 0 is executed at the same time as image input. Therefore, even if you uncheck the checkbox for Camera 0, the image transfer time is not shortened.

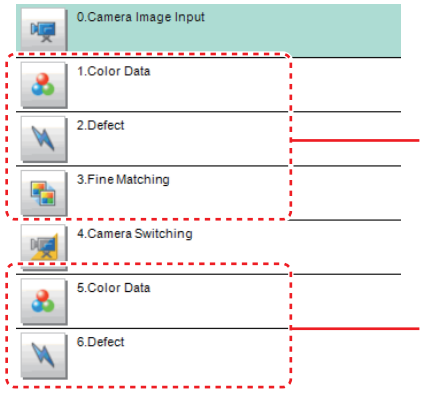
4 A camera model currently connected can be checked in the “Camera model” area.

Additional Information

When using the simulation software, you can select any camera model in the camera model area. Changing the camera model will initialize the correspondence camera settings.

Additional Information

The image from the camera selected in [Select camera] will be the object to be measured in the following units.
If you need to switch the camera during the process, insert a [Camera Switching] unit in the scene and switch the image.
For details, refer to *1-6 Photometric Stereo Image Input* on page 1-114.



1-1-3 Camera Settings (Camera Image Input)

Set the following photographing conditions for each camera.

- Refer to *Camera Settings* on page 1-6.
- Refer to *Frame/Field - for Monochrome Cameras Only* on page 1-9.
- Refer to *Number of lines to be read* on page 1-10.
- Refer to *Electronic Flash Setting* on page 1-11.

Additional Information

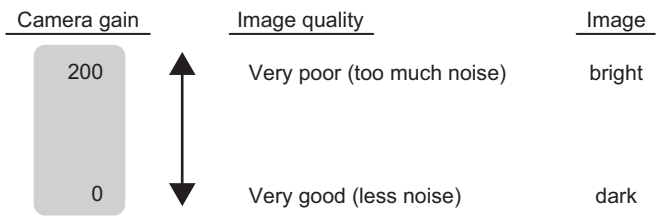
The displayed items differ depending on the camera type and lighting mode. Perform the following procedure as necessary in accordance with the use environment.

Camera Settings

Adjust the settings related to camera shutter speed and camera gain.

Select the shutter speed appropriate to the speed of the measurement object. Choose a faster shutter speed if the measurement object is moving quickly and the image is blurred.

Adjust the camera gain when images cannot be brightened through the shutter speed, lens aperture, or lighting conditions. Usually, the factory default value can be used.

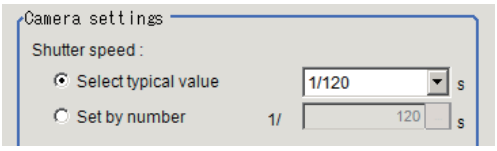


[Factory defaults: 85]

1 In the Item Tab area, click [Camera setting].

2 In the "Camera settings" area, specify the shutter speed.

The setting methods are to select from the options offered or to set the value directly.



Item	Set value [Factory default]	Description
Shutter speed	FZ-SC/S/SHC/SH • [Typical value] 1/200, [1/500], 1/1000, 1/2000, 1/4000, 1/8000, 1/20000 • Set by number 1/10 to 1/50000 FZ-SC2M/S2M/SC5M□/S5M□/SF□/SP□ • [Typical value] 1/200, [1/500], 1/1000, 1/2000, 1/4000, 1/8000, 1/20000 • Set by number 1/10 to 1/50000 FZ-SQ□□□□ • [Typical value] 1/200, 1/500, [1/1000], 1/2000, 1/4000, 1/8000, 1/16000, 1/30000 • Set by number 1/250 to 1/30000 • FH-S□X/S□X05/S□X12 *1 1 to 100000 [µs] [2000] • FH-S□21R *2 50 to 100000 [µs] [2000]	Shutter speed value to set differs by camera type.

*1. Note that the shortest shutter speed for FH-S□X12 is below.
Settable value on the screen: 1 [µs]
Actual shutter speed: 1.5 [µs]

*2. When using FH-S□21R in the reset mode: the rolling shutter, the actual shutter speed for the setting value on the screen is rounded and reflected in the actual operation.

Note that the reflected operation differs as follows by the number of camera cables and communication speed setting.

1 camera cable & standard communication speed: Multiple of 46.9 [µs]

1 camera cable & high communication speed: Multiple of 22.3 [µs]

2 camera cables & standard communication speed: Multiple of 23.5 [µs]

2 camera cables & high communication speed: Multiple of 11.2 [µs]

For example, when the shutter speed is set to 2,000 [µs], the actual shutter speed is as follows.

1 camera cable & standard communication speed: 1969.8 [µs] ?42

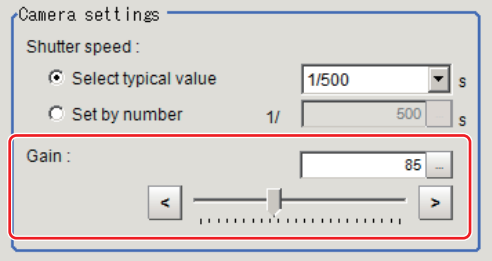
times of 46.9 [µs])

1 camera cable & high communication speed: 1984.7 [µs] (89 times of 22.3 [µs])

2 camera cables & standard communication speed: 1997.5 [µs] (85 times of 23.5 [µs])

2 camera cables & high communication speed: 1993.6 [µs] (178 times of 11.2 [µs])

3 Specify the camera gain while checking the image.



Item	Set value [Factory default]	Description
Gain	• FZ-SC/S/SHC/SH 0 to 230 [85] • FZ-SC2M/S2M/SC5M2/S5M2/SF□/SP□ 0 to 230 [50] • FZ-SC5M3 0 to 230 [65] • FZ-SQ□□□□ 16 to 64 [16]	Adjust the camera gain when the shutter speed, the lens aperture, and lighting conditions cannot be used to brighten the image. Usually, the factory default value can be used.

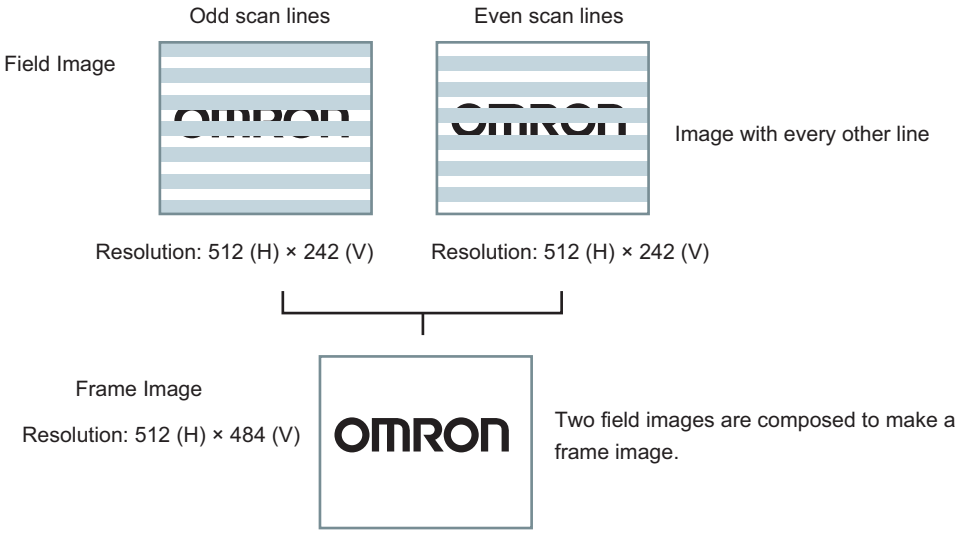
Important

- When an Intelligent Compact Digital camera, FZ-SQ□□□□, is connected, we recommend setting the gain value to 16 for stable operations. Measurement values may be different if the recommended value is exceeded. Be sure to thoroughly check the measurement result and set the gain value.
- When performing defect inspection, keep the gain setting at a low value to suppress the influence of image noise.

Frame/Field - for Monochrome Cameras Only

There are two methods to transfer one image from a camera to the sensor controller: frame read and field read. Frame read is to read all of the scanned lines of the image. The result is called a frame image. Field read is used to read half of the interlaced scanned lines of the image. The result is called the field image.

Here, select the unit to be treated as one image.



1 In the Item Tab area, click [Camera setting].

2 In the "Frame/Field" area, select either "Frame" or "Field".

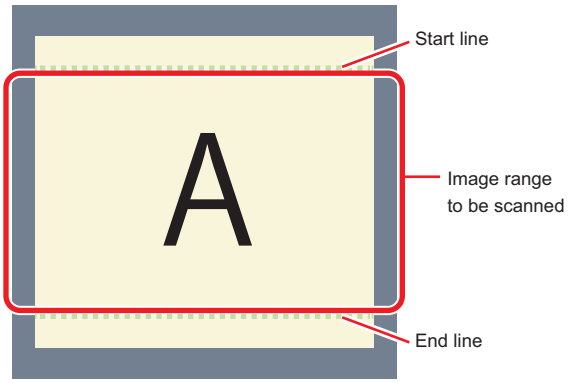
Item	Set value [Factory default]	Description
Frame/Field	[Frame]	Measurements are done in frame units.
	Field	Measurements are done in field units. Select "Field" when you prefer shorter image input time rather than higher accuracy. Processing becomes faster since each image is scanned skipping one scan line per two consecutive lines, but the measurement precision is decreased because the vertical image resolution is lower.

Number of lines to be read

By narrowing the image range to be loaded, the image scan time can be shortened.

Set the range taking the offset of the measurement object into consideration.

The part of the image narrowed down by the start line and the end line will be displayed in the Image Display area of the processing item setting window or the Main screen.



Additional Information

About minimum number of lines

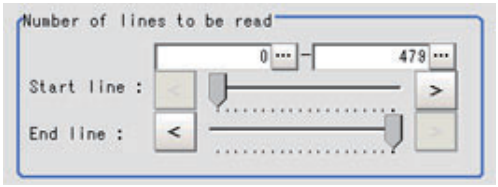
- The minimum number of lines (minimum number of lines between start and end lines) is 12 lines.
- For FZ-S□5M2, the end line is fixed from 1921 to 2043.
- With the FZ-S excluding the FZ-SQ series, the minimum number of lines is 12 lines.
- With the FZ-SQ series, the minimum number of lines is 8 lines.
- With the FZ-S□5M3, the minimum number of lines is 4 lines.
- For FZ-S□5M3, the step width of the Start and End lines is 4 lines. When loading a scene created with the FZ-S□5M2, the number of lines loaded will be a maximum of 4 lines.

About coordinate values

- The coordinate values displayed as the measurement results are the values of the display position on the monitor.
- The coordinate values do not vary according to the settings for "Number of lines to be read".

1 In the Item Tab area, click [Camera setting].

2 Set the start/end line in the "Number of lines to be read" area.



Important

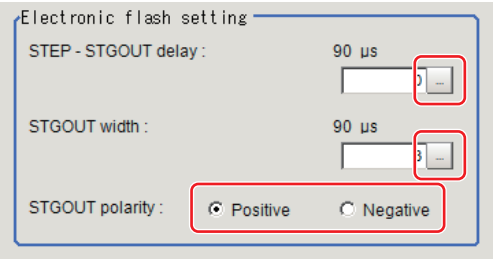
When the built-in lighting of an FZ-SQ□□□□ is used, it may not be possible to shorten the processing time due to restrictions on the light emission time.

Electronic Flash Setting

This function is set when an electronic flash is used. This sets the output conditions for the signal for synchronizing the measurement and the electronic flash timing.

1 In the Item Tab area, click [Camera setting].

2 In the "Electronic flash setting" area, specify each item.



Item	Set value [Factory default]	Description
STEP - STGOUT delay	[0] to 511 (1 count 30 µs)	Set the waiting time from the time the STEP signal is input until the electronic flash trigger output signal comes ON. Delay Time = Count × 30 µs + 90 µs The delay time depends on whether the STGOUT pulse polarity is positive or negative. The displayed time is for the positive polarity. Add 35 µs to the displayed time if the polarity is negative. The delay time can be set in a range of ±10 µs from the setting value.
STGOUT width	1 to 63 [3] (1 count 30 µs)	Set the output time for the electronic flash trigger signal.
STGOUT polarity	• [Positive] • Negative	Select the pulse polarity of the electronic flash trigger. Positive polarity: Flashes synchronized with the timing of the electronic flash trigger output signal changing from OFF to ON. Negative: Flashes when the strobe trigger output signal changes from ON to OFF.

Important

- Do not perform next camera image input processing before STGOUT signal output is completed. STGOUT signal may not be output.
  Perform camera image input processing after STGOUT signal output completion, or set the STEP-camera delay, STEPSTGOUT delay and STGOUT pulse width so that the electronic flash operates synchronizing with the exposure time.
- When you want the electronic flash to lite synchronously with the exposure time, set the delay between STEP and the camera or the delay between STEP and STGOUT, taking into consideration the response time of the external strobe controller.

1-1-4 Screen Adjustment Settings (Camera Image Input)

Set the lighting and lens conditions for each camera.

- Refer to *Lighting Control* on page 1-12.
- Refer to *Line Bright* on page 1-19.

Lighting Control

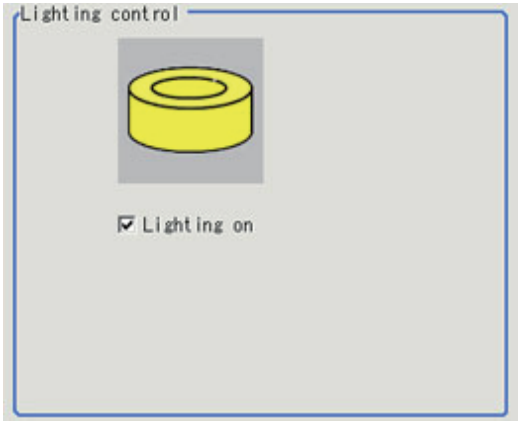
When an Electronic flash controller or Camera-mount Lighting Controller is connected, the light volume of the lighting can be adjusted from the sensor controller. Brightness can be adjusted automatically or one of the preset patterns can be selected.

1 In the item tab area, click [Screen adjust].

2 In the "Lighting control" area, specify the brightness.

Displayed contents differ depending on the connected camera, Electronic flash controller or Camara-mount Lighting Controller.

● Intelligent Compact Digital Camera FZ-SQ□□□□ is connected:



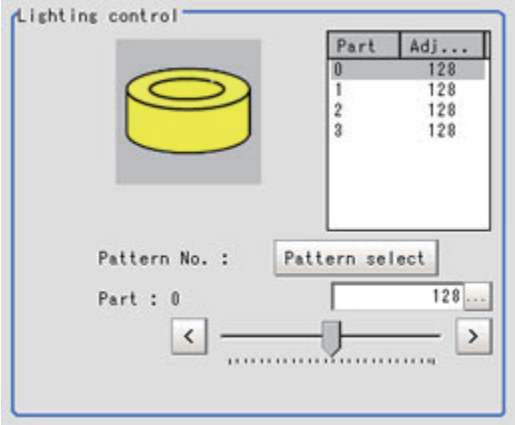
Item	Set value [Factory default]	Description
Lighting on	• [Checked] • Unchecked	Clear the checkbox when no lighting is to be applied.

Important

When the lighting of FZ-SQ□□□□ is used, there are following restrictions.

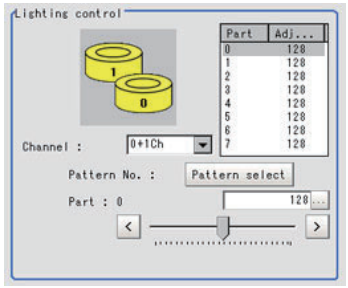
- The measurement can be longer than the measurement with the lighting OFF.
- There are restrictions in the operation of Multi-trigger Imaging.
  Refer to *1-9 Multi-trigger Imaging* on page 1-141.

● Electronic flash controller FZ-LTA100 is connected:

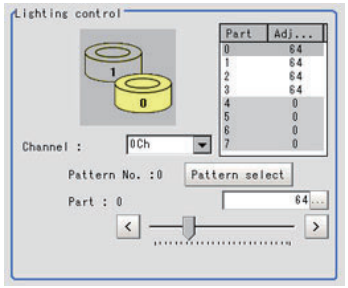


● Electronic flash controller FZ-LTA200 is connected:

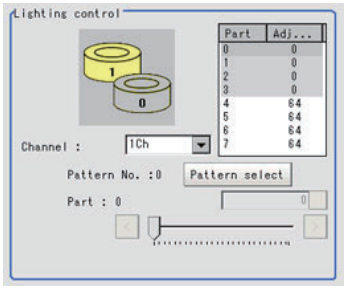
0 +1CH are used:



0CH is used:

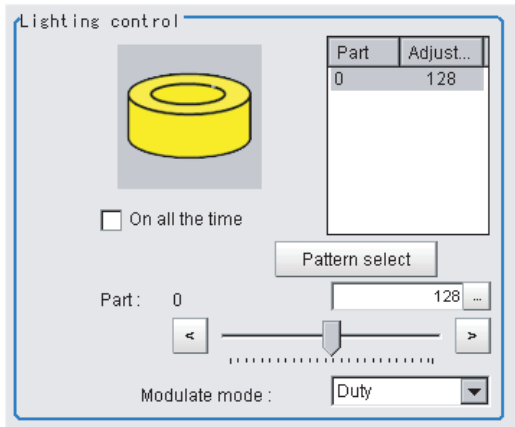


1CH is used:



Item	Set value	Description
Pattern select	Pattern 0 to 16	Can be selected from a preset lighting pattern.
Brightness at each part	0 to 255 [0]	When 1 channel is used, the light volume can be adjusted to one of 256 levels. When 2 channels are used, the light volume can be adjusted to one of 128 levels. 0 indicates the lighting is OFF. The larger the number, the higher the brightness.

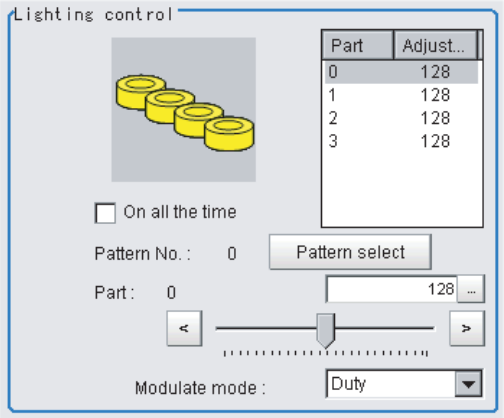
● Camera-mount Lighting Controller FLV-TCC1 is connected:



Item	Set value	Description
Pattern select	---	Select from preset lighting patterns.
On all the time	• Checked • [Unchecked]	Place a check here to keep the light turned ON all of the time regardless of the exposure time.

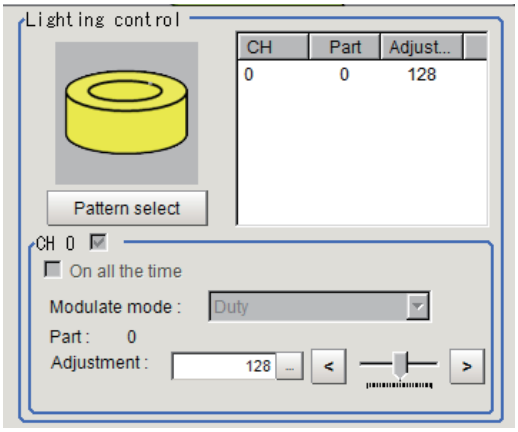
Item	Set value	Description
Modulate mode	• [Duty] • Voltage / Current	Select the lighting adjustment method. • Duty The brightness of the light is adjusted with 255 levels of the pulse width (PWM frequency: 100 kHz). • Voltage / Current The brightness of the light is adjusted with 255 voltage / current levels. Select voltage lighting adjustment if you will use a high-speed shutter speed.
Part	0 to 255 [128]	Set the brightness for the selected parts.

● Camera-mount Lighting Controller FLV-TCC4 is connected:



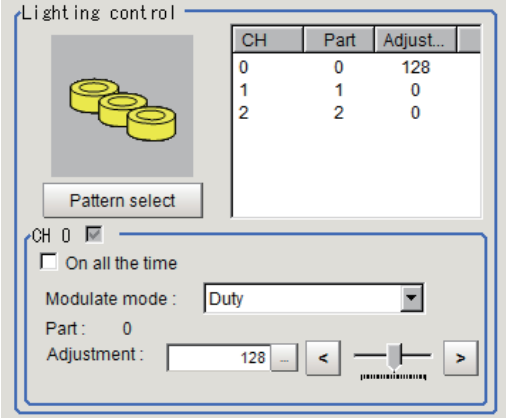
Item	Set value	Description
Pattern select	---	Select from preset lighting patterns.
On all the time	• Checked • [Unchecked]	Place a check here to keep the light turned ON all of the time regardless of the exposure time.
Modulate mode	• [Duty] • Voltage / Current	Select the lighting adjustment method. • Duty The brightness of the light is adjusted with 255 levels of the pulse width (PWM frequency: 100 kHz). • Voltage / Current The brightness of the light is adjusted with 255 voltage / current levels. Select voltage lighting adjustment if you will use a high-speed shutter speed.
Part	0 to 255 [128]	Set the brightness for the selected parts.

● Camera-mount Lighting Controller FLV-TCC1EP is connected:



Item	Set value	Description
On all the time	• Checked • [Unchecked]	Place a check here to keep the light turned ON all of the time regardless of the exposure time.
Modulate mode	• [Duty] • Voltage / Current	Select the lighting adjustment method. • Duty The brightness of the light is adjusted with 255 levels of the pulse width (PWM frequency: 100 kHz). • Voltage / Current The brightness of the light is adjusted with 255 voltage / current levels. Select voltage / current adjustment if you will use a high-speed shutter speed.
Part	0 to 255 [128]	Set the brightness for the selected parts.

● Camera-mount Lighting Controller FLV-TCC3HB is connected:



Item	Set value	Description
On all the time	• Checked • [Unchecked]	Place a check here to keep the light turned ON all of the time regardless of the exposure time.
Modulate mode	• [Duty] • Voltage / Current	Select the lighting adjustment method. 0ch connected: • Duty The brightness of the light is adjusted with 255 levels of the pulse width (PWM frequency: 100 kHz). • Voltage / Current The brightness of the light is adjusted with 255 voltage / current levels. 0ch is the channel for the spot lighting. 1ch / 2ch connected: • Duty The brightness of the light is adjusted with 255 levels of the pulse width (PWM frequency: 100 kHz). • Voltage / Current The brightness of the light is adjusted with 255 voltage / current levels. Select voltage / current adjustment if you will use a high-speed shutter speed.
Part	0 to 255 [128]	Set the brightness for the selected parts.

Important

There is no restriction on power consumption nor on lighting mode when using lightings with lighting controller FLV-TCC1EP. Restrictions on power consumption and lighting mode differ depending on the product series. See the following table for details.

(1) FLV-TCC4/-TCC1

- Without external power supply

Total power consumption	Power consumption per channel	Connectability	Lighting mode □[1]			READY OFF time delay □[2]
			Always-on lighting mode	Simultaneous lighting mode	Single lighting mode	
Greater than 7.5 W	Greater than 7.5 W	Not connectable	---	---	---	---
	7.5 W or less	Connectable	NA	NA	OK	None
7.5 W or less	Less than 7.5 W	Connectable	OK	OK	OK	None

- With external power supply

Total power consumption	Power consumption per channel	Connectability	Lighting mode □[1]			READY OFF time delay □[2]
			Always-on lighting mode	Simultaneous lighting mode	Single lighting mode	
Greater than 15 W	Greater than 15 W	Not connectable	---	---	---	---
	15 W or less	Connectable	NA	NA	OK	Yes
	7.5 W or less	Connectable	NA	NA	OK	None
15 W or less	Less than 15 W	Connectable	NA	OK	OK	Yes
	7.5 W or less	Connectable	NA	OK	OK	Yes
7.5 W or less	Less than 7.5 W	Connectable	OK	OK	OK	None

(2) FLV-TCC3HB

- Without external power supply

  0ch (spot lighting) not connected

Total power consumption	Power consumption per channel	Connectability	Lighting mode □[1]			READY OFF time delay □[2]
			Always-on lighting mode	Simultaneous lighting mode	Single lighting mode	
Greater than 7.5 W	Greater than 7.5 W	Not connectable	---	---	---	---
	7.5 W or less	Connectable	NA	NA	OK	None
7.5 W or less	Less than 7.5 W	Connectable	OK	OK	OK	None

  0ch (spot lighting) connected

Total power consumption	Power consumption per channel	Connectability	Lighting mode □[1]			READY OFF time delay □[2]
			Always-on lighting mode	Simultaneous lighting mode	Single lighting mode	
Greater than 5.5 W	Greater than 7.5 W	Not connectable	---	---	---	---
	7.5 W or less	Connectable	NA	NA	OK	None
5.5 W or less	Less than 5.5 W	Connectable	OK	OK	OK	None

- With external power supply

  0ch (spot lighting) not connected

Total power consumption	Power consumption per channel	Connectability	Lighting mode □[1]			READY OFF time delay □[2]
			Always-on lighting mode	Simultaneous lighting mode	Single lighting mode	
Greater than 15 W	Greater than 15 W	Not connectable	---	---	---	---
	15 W or less	Connectable	NA	NA	OK	Yes
	7.5 W or less	Connectable	NA	NA	OK	None
15 W or less	Less than 15 W	Connectable	NA	OK	OK	Yes
	7.5 W or less	Connectable	NA	OK	OK	Yes
7.5 W or less	Less than 7.5 W	Connectable	OK	OK	OK	None

0ch (spot lighting) connected

Total power consumption	Power consumption per channel	Connectability	Lighting mode *1			READY OFF time delay *2
			Always-on lighting mode	Simultaneous lighting mode	Single lighting mode	
Greater than 14 W	Greater than 15 W	Not connectable	---	---	---	---
	15 W or less	Connectable	NA	NA	OK	Yes
	7.5 W or less	Connectable	NA	NA	OK	None
14 W or less	Less than 14 W	Connectable	NA	OK	OK	Yes
	7.5 W or less	Connectable	NA	OK	OK	Yes
5.5 W or less	Less than 5.5 W	Connectable	OK	OK	OK	None

*1. Lighting modes

Always-on lighting mode	In this mode, the lights are always turned ON for a specific pulse cycle. The always-on lighting mode is used if you place a check in “On all the time” in the “Lighting control” area.
Simultaneous lighting mode	In this mode, all of the connected lights are turned ON in synchronization with the trigger. Set the “Adjustment” set values in the “Lighting control” area for each light to any value other than 0 for all of the parts.
Single lighting mode	In this mode, only one of the connected lights is turned ON in synchronization with the trigger. Set the “Adjustment” set value in the “Lighting control” area to any value other than 0 for the part for only one channel. The lights will not turn ON if you set two or more channels to an adjustment other than 0.

*2. Turning OFF the READY signal is delayed in comparison with not connecting a camera with lighting controller by approximately the exposure time.

Example: Connection example for connecting an external power supply and the lighting modes

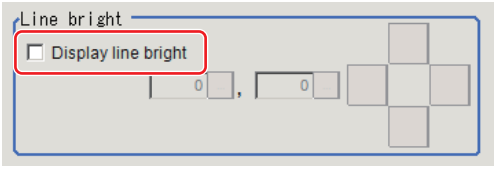
- If four lights with a power consumption of 1 W each are connected to a camera with lighting controller, always-on lighting, simultaneous lighting, and single lighting are all possible.
- If four lights with power consumptions of 2 W, 3 W, 4 W, and 5 W are connected to a camera with lighting controller, simultaneous lighting and single lighting are possible.
- If four lights with power consumptions of 12 W, 1 W, 2 W, and 1 W are connected to a camera with lighting controller, only single lighting is possible.

Line Bright

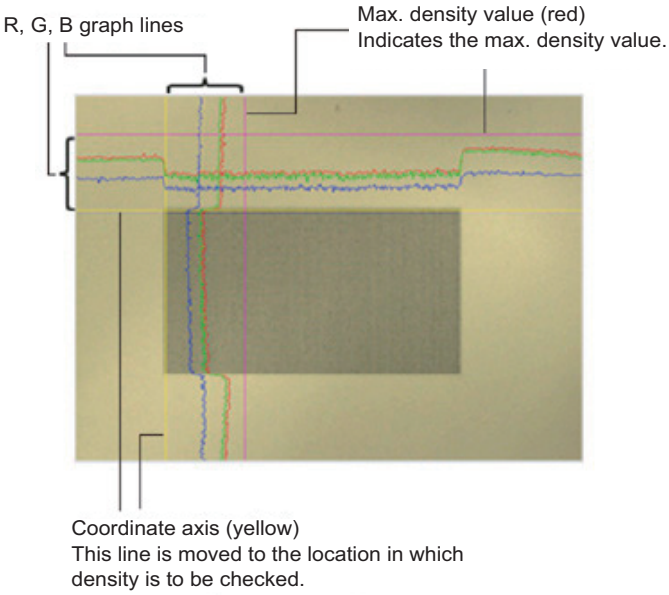
The graph showing the gray distribution for 1 line in the image is called the "Line bright". You can display the line brights for R, G and B for any horizontal or vertical line.

1 In the item tab area, click [Screen adjust].

2 Select the [Display line bright] check box.



3 Move the line to the position whose density distribution you want to see.



1-1-5 White Balance (Camera Image Input)

Set the white balance to make white objects look white by calibrating the color of images loaded from cameras.

By adjusting the white balance, the appropriate white color can be reproduced under any lighting conditions

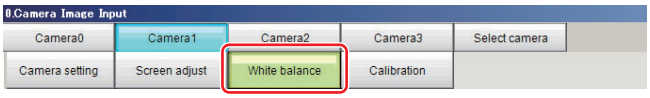
Appropriate values can also be set automatically.

Additional Information

- Perform the white balance setting only when a color camera is used.
- In the following cases, make sure to perform white balance.
  - When a new system is installed
  - When the camera or lighting is changed

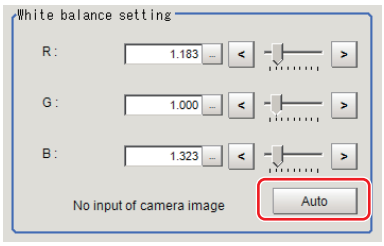
  Since measurement results may vary with changes of the white balance setting, be sure to verify the operation after it has changed.

1 In the Item Tab area, click [White balance].



2 Shoot a white piece of paper or cloth.

3 Click [Auto].



Additional Information

When the "Too bright" or "Too dark" message is displayed, adjust the iris, shutter speed, gain and/or lighting conditions until "Automatic adjustment is possible" is displayed.

4 Adjust the "R", "G" and "B" values as necessary.

Item	Set value [Factory default]	Description
White balance setting • R • G • B	R, G, and B: 0.001 to 7.999 FZ-SQ□□□□: 0.001 to 3.000 • FZ-SC [R=1.183] [G=1.000] [B=1.323] • FZ-SC2M [R=1.394] [G=1.000] [B=1.222] • FZ-SHC [R=1.375] [G=1.000] [B=1.452] • FZ-SFC and FZ-SPC [R=1.145] [G=1.000] [B=1.889] • FZ-SC5M2 [R=1.351] [G=1.000] [B=2.314] • FZ-SC5M3 [R=1.400] [G=1.000] [B=2.150] • FZ-SQ□□□□ [R=1.000] [G=1.040] [B=1.800]	Adjust the white balance. Whiteness increases when the value of "R", "G", and "B" is increased.

1-1-6 Calibration (Camera Image Input)

By setting the calibration, the measurement result can be converted and output as actual dimensions. The calibration method is selected here.

There are three calibration methods, point, sampling, and parameter.

- Refer to *Specifying Points and Setting (Point Specification)* on page 1-22.
- Refer to *Setting Calibration through Sampling Measurement (Sampling)* on page 1-23.
- Refer to *Inputting and Setting Values (Value Setting)* on page 1-24.
- Refer to *View Calibration Parameters* on page 1-26.

Additional Information

In order to output measurement results in actual dimensions, set [Calibration] to "ON" in [Output parameter] for each processing unit. If [Calibration] is "OFF" (factory default), measurement results are output as camera image coordinate values.

Specifying Points and Setting (Point Specification)

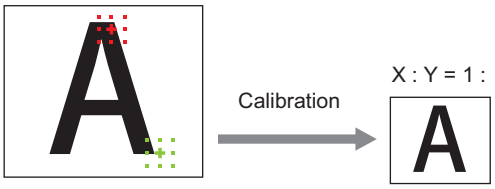
This is a method for performing calibration by specifying arbitrary points (in pixels).

Calibration parameters are calculated automatically when actual coordinates of specified locations are entered. Up to 3 points can be specified.

- When magnification is the same in the X and Y directions

Specify only 2 points.

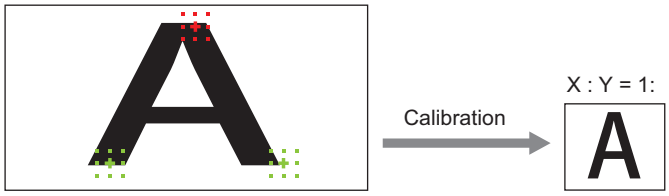
X : Y = 1 : 1



- When magnification is not the same in the X and Y directions

Specify 3 points.

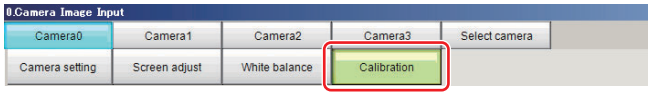
X : Y = 5 : 3



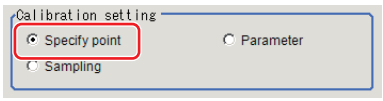
Additional Information

When 2 points are specified, the coordinate system is set to the left-hand system (forward in the clockwise direction). Specify 3 points to perform calibration including the coordinate system.

1 In the Item Tab area, click [Calibration].



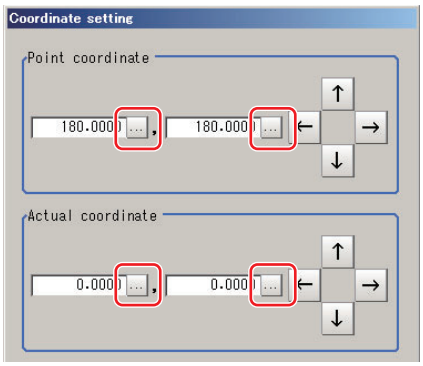
2 In the "Calibration setting" area, select "Specify point".



3 Click the first point on the screen.

4 Input the actual coordinates for the specified point.

The actual coordinate input window is displayed.

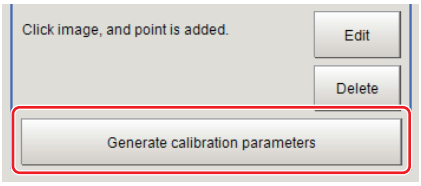


Actual coordinate	Set value [Factory default]
Point coordinate X, Y	0 to 9999.9999 [Point you clicked in the window]
Actual coordinate X, Y	-99999.9999 to 99999.9999 [0]

5 Set the 2nd and 3rd points in the same way.

6 Click [Generate calibration parameters].

The calibration parameters will be generated.

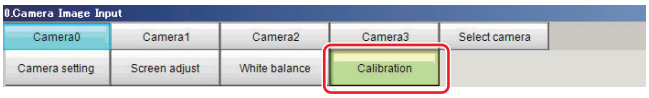


Setting Calibration through Sampling Measurement (Sampling)

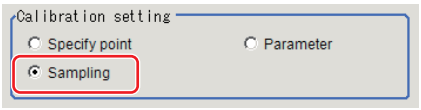
This is a method for setting calibration based on measurement results.

Calibration parameters are calculated automatically when a registered model is searched and the actual coordinates for that position entered.

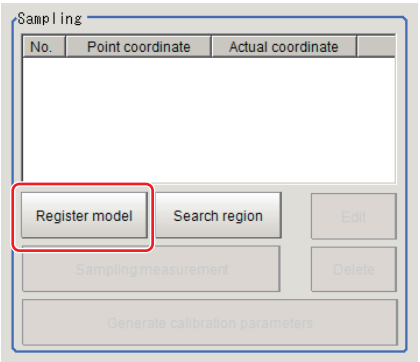
1 In the Item Tab area, click [Calibration].



2 In the "Calibration setting" area, select "Sampling".



3 In the "Sampling" area, click [Regist model].



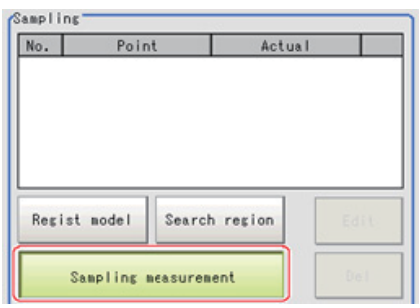
4 Use the Drawing tools to register the model.

5 Adjust the search region as necessary.

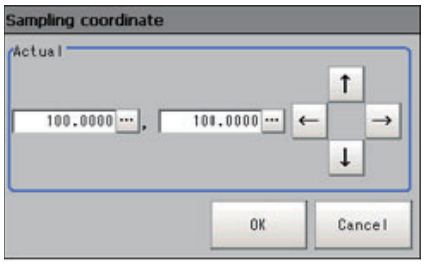
The default value setting is for the entire screen.

6 Click [Sampling measurement].

Measurement is performed.
The search result (cross-shaped cursor) is displayed in the Image Display area, and the Sampling Coordinate window is displayed.

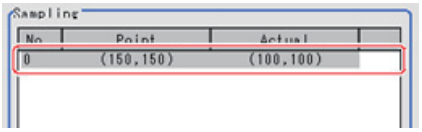


7 In the Sampling Coordinate window, enter the X and Y values.



8 Click [OK].

Point coordinates and actual coordinates are registered in the "Sampling" area.



9 Move the object to be measured and repeat the Steps 3 to 8.

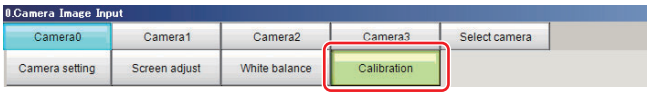
10 Click [Generate calibration parameters].

The calibration parameters will be generated.

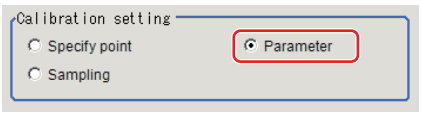
Inputting and Setting Values (Value Setting)

Enter calibration data directly with numerical values.

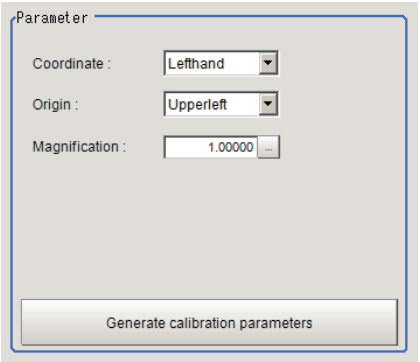
1 In the Item Tab area, click [Calibration].

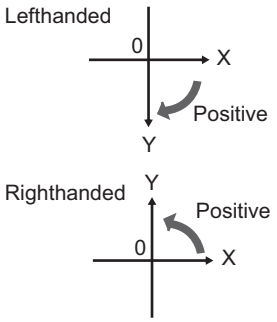
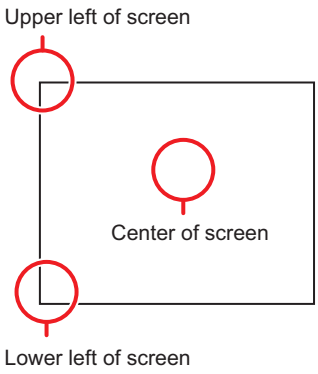


2 In the "Calibration setting" area, select "Parameter".



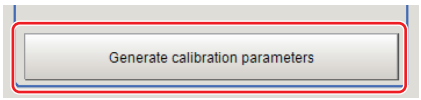
3 In the "Parameter" area, specify values for the "Coordinate", "Origin" and "Magnification".



Item	Set value [Factory default]	Description
Coordinate	• [Lefthand] • Righthand	Left-hand type: Clockwise is forward when specifying the coordinates. Right-hand type: Counter-clockwise is forward when specifying the coordinates. 
Origin	• [Upperleft] • Lowerleft • Center	Select where the origin of the actual coordinates will be. 
Magnification	0.00001 to 9.99999	Specify the ratio of 1 pixel to the actual dimensions.

4 Click [Generate calibration parameters].

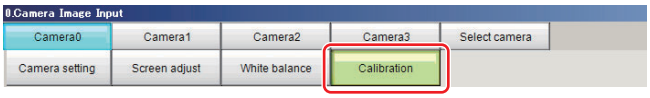
The calibration parameters will be generated.



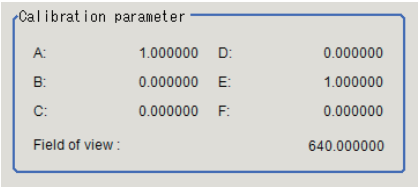
View Calibration Parameters

View the set calibration data.

1 In the Item Tab area, click [Calibration].



2 In the "Calibration parameter" area, confirm the calibration data.

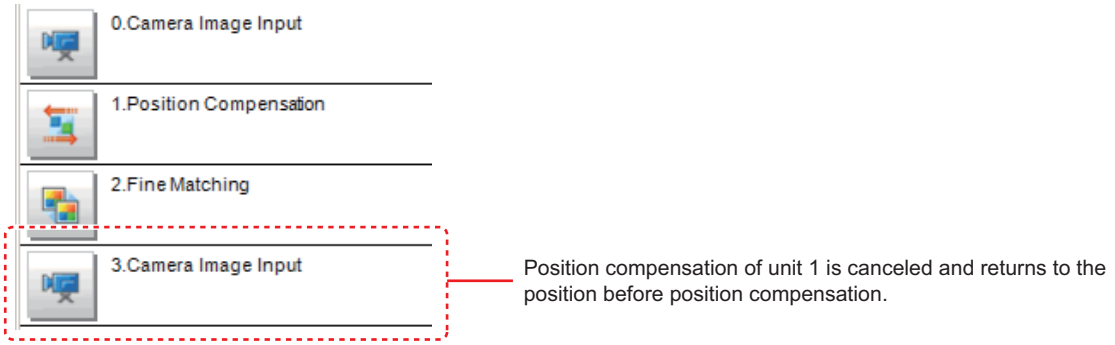


Item	Set value	Description
A	Calculation value	These are calibration conversion values. Camera coordinates are converted to actual coordinates based on these values. The conversion formulas for actual coordinates are as follows: • (X, Y): Measurement point (camera coordinates), Unit: pix • (X', Y'): Conversion point (actual coordinates) $X'=A \times X + B \times Y + C$ $Y'=D \times X + E \times Y + F$
B	Calculation value	
C	Calculation value	
D	Calculation value	
E	Calculation value	
F	Calculation value	
Field of view	Calculation value	This is an actual dimension in the X direction.

1-1-7 Additional Explanation (Camera Image Input)

Position Compensation and Camera Image Input

When creating a scene, if a [Camera Image Input] unit is positioned after a [Position Compensation] processing unit, that [Position Compensation] unit will be cancelled, which will cause a new image to be read.



1-1-8 External Reference Tables (Camera Image Input)

No.	Data Name	Ident	Set/Get	Data range
None	Camera No.	camera No	Set/Get	
None	Transfer image	cameraMask	Set/Get	Bit sum of the camera does not transfer 1: camera0 2: Camera1 4: Camera2 8: Camera3
None	Iris base density	irisDensity	Set/Get	
None	Camera model	cameraModelN (N: 0 to 3)	Set/Get	Connectable camera model name
None	Shutter speed	shutterSpeedN (N: 0 to 3)	Set/Get	
None	Gain	gainN (N: 0 to 3)	Set/Get	
None	Frame/Field	frameModeN (N: 0 to 3)	Set/Get	0: Frame 1: Field
None	Start line	startYN (N: 0 to 3)	Set/Get	
None	End line	endYN (N: 0 to 3)	Set/Get	
None	STEP - STGOUT delay	strobeDelayN (N: 0 to 3)	Set/Get	
None	STGOUT width	pulseWidthN (N: 0 to 3)	Set/Get	
None	STGOUT polarity	pulsePolarityN (N: 0 to 3)	Set/Get	0: Negative 1: Positive
None	Lighting control(Site List)	lightGainN (N: 0 to 3)	Set/Get	A representation of a lighting brightness of each Part in hexadecimal. A value of Part 0 to Part 7 from left to right. Example: If the illumination brightness of Part 0 to Part 3 was in 255 (ff), ffffffff00000000
None	Modulate mode	lightGainModeN (N: 0 to 3)	Set/Get	It expresses the dimming method of each Part by the sum of 4 bit units. 0: Duty 1: Voltage/Current. Example: When Part 0, Part 2, Part 5 are set to Voltage/Current, 1048833
None	CH	lightEnabledChannelN (N: 0 to 3)	Set/Get	0: OFF 1: ON
None	On all the time	alwaysLightN (N: 0 to 3)	Set/Get	0: OFF 1: ON
None	Zoom	zoomN (N: 0 to 3)	Set/Get	
None	Focus	focusN (N: 0 to 3)	Set/Get	
None	Iris	irisN (N: 0 to 3)	Set/Get	
None	White balance	whiteBalanceN (N: 0 to 3)	Set/Get	"," Separated by R G B
None	Calibration parameter	calibParameterN (N: 0 to 3)	Set/Get	"," Separated by a A B C D E F
None	Judge	judge	Get only	0: No judgement(unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)

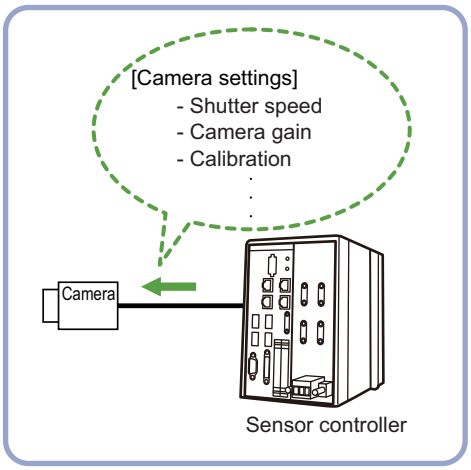
1-2 Camera Image Input FH

This is a processing item specific to the FH Sensor Controller.

Set the conditions for loading images from the camera and for storing images of the measured objects. This processing item must be used when measuring.

In addition, it is possible to shoot images whose shutter speed, or lighting differ by setting multiple Camera Image Input to your flow.

Used in the Following Case



Important

- [Camera Image Input FH] is preset for Unit 0. Do not set any processing item other than camera image input (camera image input FH, camera image input HDR, camera image input HDR Lite) for Unit 0.
- When switching from a color camera to a monochrome or switching to a camera with a different resolution, reconfigure the settings in the following units.
- If a camera is connected other than the one for the previous settings, the camera settings are returned to their initial settings.
- Immediately after starting up the FH Sensor Controller and immediately after changing scenes, there will be no input image. No input image is processed as the same color image as in the factory default state.
- If you open the Properties Dialog Box before inputting an image, click the Cancel button to close the dialog box. Pressing the OK button in the dialog box will change the setting to the same color camera setting as the factory default setting.

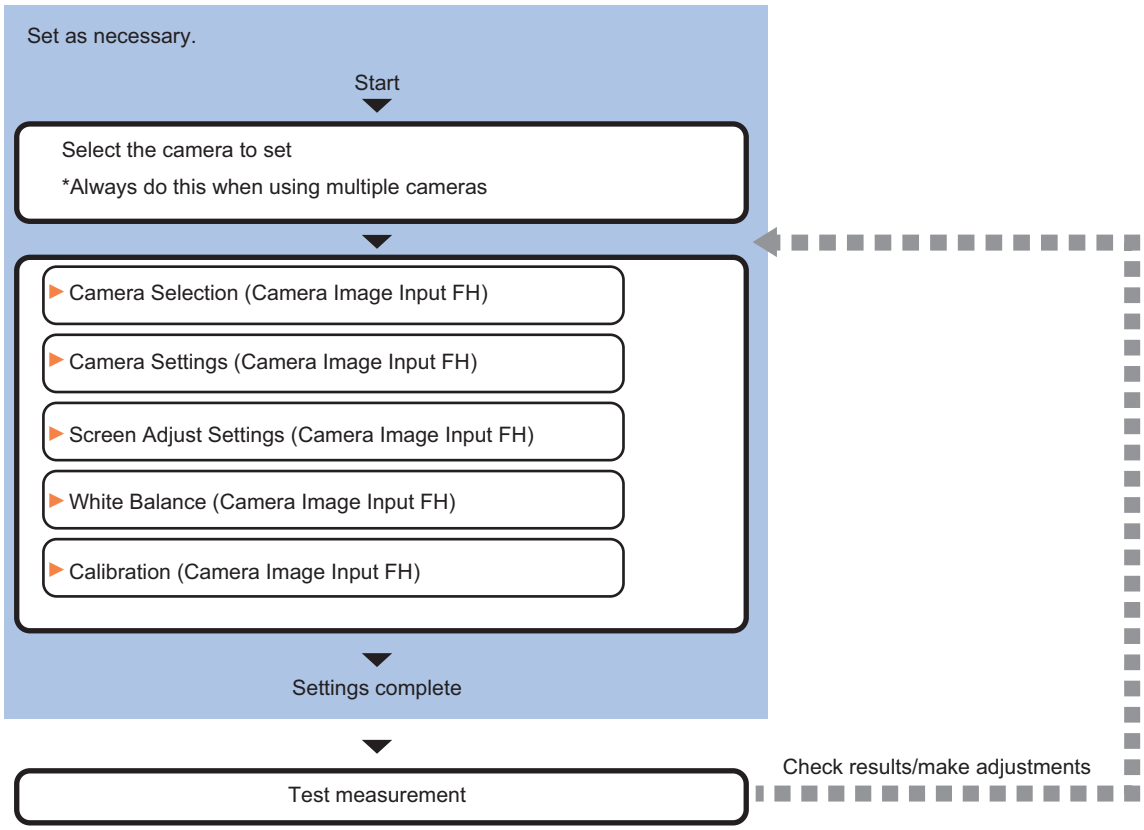
For details, refer to *FAQ For Measurement The measurement NG (image mismatch) error will result when connecting a monochrome camera* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

Important

- When the Scene data created via FZ series Sensor Controller, i.e. FZ5 series or FZ5-L series, [Camera Image Input] is automatically converted to [Camera Image Input FH].
- The automatically converted contents is the common items between [Camera Image Input] and [Camera Image Input FH]. The other settings is set to the default settings of the connected camera to the FH-1000, FH-3000, or FH-L series Sensor Controller.
- When you load the created data via FH series Sensor Controller, i.e. FH-L series or FH-1000 series. via FZ series Sensor Controller, the automatically conversion is not performed.

1-2-1 Settings Flow (Camera Image Input FH)

To set camera image input, follow the steps below.



List of Camera Image Input FH Items

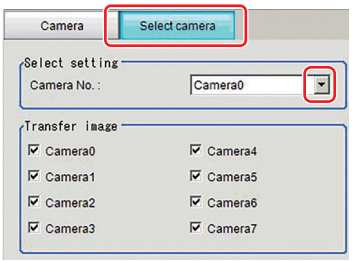
Item name	Description
Camera 0 to 7	Select the camera to be set.
Select camera	When multiple cameras are connected, select the camera to use for measurement.
Camera setting	Specify the camera settings such as the shutter speed or electronic flash. Refer to *1-2-3 Camera Settings (Camera Image Input FH)* on page 1-31.
Screen adjust	Set the adjustment of the lighting and the lens. Refer to *1-2-5 Screen Adjustment Settings (Camera Image Input FH)* on page 1-41.
White balance	When using a color camera, set the white balance. Refer to *1-2-6 White Balance (Camera Image Input FH)* on page 1-55.

Item name	Description
Calibration	Set when measurements (camera coordinate measurement values) are to be output using actual dimensions. Select the calibration setting method and generate the calibration parameters. Refer to *1-2-7 Calibration (Camera Image Input FH)* on page 1-56.

1-2-2 Camera Selection (Camera Image Input FH)

When multiple cameras are connected, select the camera to use for measurement.

1 In the Item Tab area, click [Select camera].



2 Click [Camera No.] [▼] and select the camera number.

3 If multiple cameras are connected, the camera to transfer images for can be selected.

Unchecking the camera check box not being used for current Scene or logging, takt time will be shorten because can reduce the transfer processing time after image input for that camera.

Important

Transfer of images for Camera 0 is executed at the same time as image input. Therefore, even if you uncheck Camera 0, the image transfer time is not shortened.

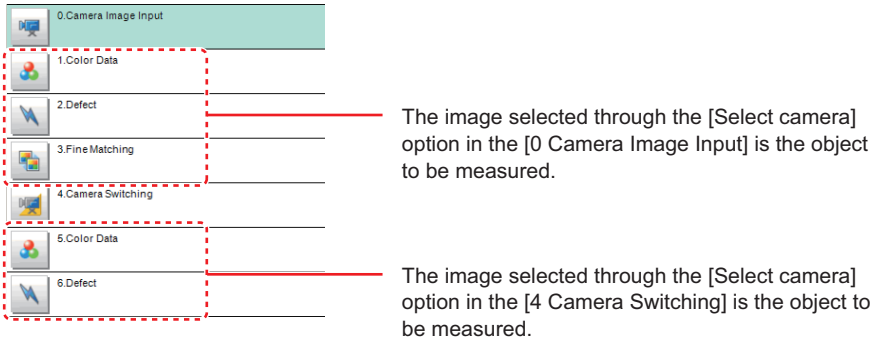
4 A camera model currently connected can be checked in the “Camera model” area.

Additional Information

When using the simulation software, you can select any camera model in the camera model area. Changing the camera model will initialize the correspondence camera settings.

Additional Information

The image from the camera selected in [Select camera] will be the object to be measured in the following units.
If you need to switch the camera during the process, insert a [Camera Switching] unit in the scene and switch the image.
Refer to *1-6 Photometric Stereo Image Input* on page 1-114.



1-2-3 Camera Settings (Camera Image Input FH)

Set the following photographing conditions for each camera.

- Refer to *Camera Settings* on page 1-31.
- Refer to *Binning Settings (for Monochrome Cameras Only)* on page 1-37.
- Refer to *Number of lines to be read* on page 1-38.
- Refer to *Electronic Flash Setting* on page 1-39.

Additional Information

The displayed items differ depending on the camera type and lighting mode. Specify the setting for the following procedure as necessary in accordance with the use environment.

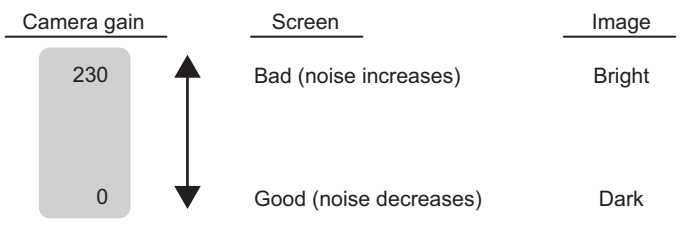
Camera Settings

Adjust the settings related to camera shutter speed and camera gain.

Set the shutter speed appropriate to the speed of the measurement object. Choose a faster shutter speed if the measurement object is moving quickly and the image is blurred.

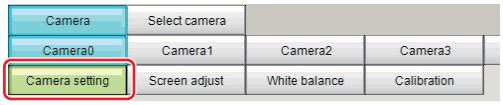
Adjust the camera gain when images cannot be brightened through the shutter speed, lens aperture, or lighting conditions. Usually, the factory default value can be used.

Example Using the FZ-SC



(Factory default: 85)

1 In the Item Tab area, click [Camera setting].



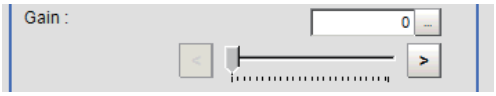
2 In the "Camera settings" area, specify the shutter speed.

Item	Setting value [Factory default]	Description
Shutter speed	• FZ-SC/S/SHC/SH 20 to 100000 [µs] [2000] • FZ-SC2M/S2M/SC5M□/S5M□/SF□/SP□ 20 to 100000 [µs] [8333] • FZ-SQ□□□□ 35 to 4000 [µs] [1000] • FH-SC02/SM02/SC04/SM04 25 to 100000 [µs] [2000] • FH-SC05R/SM05R 500 to 100000 [µs] by 50 µs unit [8000] • FH-SC12/SM12 60 to 100000 [µs] [12000] • FH-S□X/S□X05/S□X12 *1 1 to 100000 [µs] [2000] • FH-S□21R *2 50 to 100000 [µs] [2000]	Shutter speed value to set differs by camera type.

*1. Note that the shortest shutter speed for FH-S□X12 is below.
Settable value on the screen: 1 [µs]
Actual shutter speed: 1.5 [µs]

*2. When using FH-S□21R in the reset mode: the rolling shutter, the actual shutter speed for the setting value on the screen is rounded and reflected in the actual operation.
Note that the reflected operation differs as follows by the number of camera cables and communication speed setting.
1 camera cable & standard communication speed: Multiple of 46.9 [µs]
1 camera cable & high communication speed: Multiple of 22.3 [µs]
2 camera cables & standard communication speed: Multiple of 23.5 [µs]
2 camera cables & high communication speed: Multiple of 11.2 [µs]
For example, when the shutter speed is set to 2,000 [µs], the actual shutter speed is as follows.
1 camera cable & standard communication speed: 1969.8 [µs] (42 times of 46.9 [µs])
1 camera cable & high communication speed: 1984.7 [µs] (89 times of 22.3 [µs])
2 camera cables & standard communication speed: 1997.5 [µs] (85 times of 23.5 [µs])
2 camera cables & high communication speed: 1993.6 [µs] (178 times of 11.2 [µs])

3 Specify the camera gain while checking the image.



Item	Setting value [Factory default]	Description
Gain	• FZ-SC/S/SHC/SH 0 to 230 [85] • FZ-SC2M/S2M/SC5M□/S5M□/SF□/SP□ 0 to 230 [50] • FZ-SC5M3 0 to 230 [65] • FZ-SQ□□□□ 16 to 64 [16] • FH-SC02/SM02/SC04/SM04/SC12/SM12 0 to 255 [0] • FH-SC05R/SM05R 0 to 63 [0] • FH-S□X/S□X05/S□X12 0 to 240 [0] • FH-S□21R 0 to 200 [0]	Adjust the camera gain when the shutter speed, the lens aperture, and lighting conditions cannot be used to brighten the image. Usually, the factory default value can be used.

Important

- When an Intelligent Compact Digital camera, FZ-SQ□□□□, is connected, we recommend setting the gain value to 16 for stable operations. Measurement values may be different if the recommended value is exceeded.
  Be sure to thoroughly check the measurement result and set the gain value.
- Due to the specification of its imaging elements, a CMOS camera generates stripe noises when the gain setting of the camera is raised. You may also find multiple defective pixels, but they do not represent a defect or failure of the product in any way. If stripe noises and defective pixels affect the measurement results, lower the gain setting of the camera or use a CCD camera.
- When performing defect inspection, keep the gain setting at a low value to suppress the influence of image noise.

Reset Mode (FH-SC05R/FH-SM05R/FH-SC21R/FH-SM21R only)

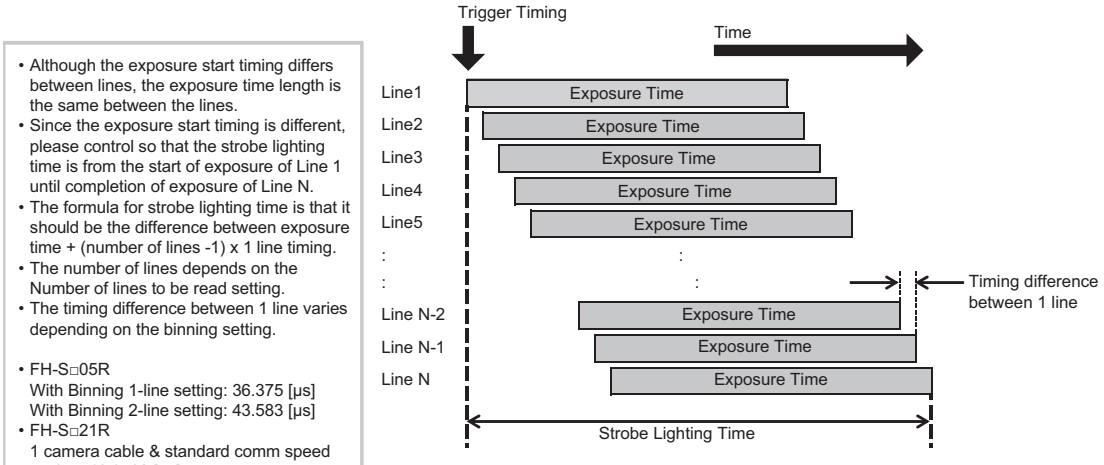
Change the mode when you capture a mobile object.

Item	Setting value [Factory default]	Description
Reset Mode	[Rolling Shutter] Global Reset	Set the Reset Mode of FH-SC05R/FH-SM05R/FH-SC21R/FH-SM21R. • Rolling Shutter: Use this mode when capture static object. Normally, use this mode. • Global Reset: Use this mode when capture a mobile object.

Important

- FH-SC05R/FH-SM05R/FH-SC21R/FH-SM21R are rolling shutter cameras.
- The exposure start timing and exposure time between lines varies depending on the reset mode setting.

About exposure time of Rolling Shutter for Reset Mode

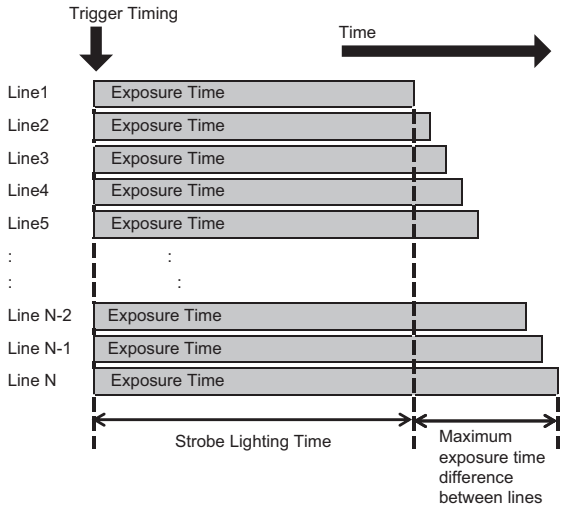


- Although the exposure start timing differs between lines, the exposure time length is the same between the lines.
- Since the exposure start timing is different, please control so that the strobe lighting time is from the start of exposure of Line 1 until completion of exposure of Line N.
- The formula for strobe lighting time is that it should be the difference between exposure time + (number of lines -1) x 1 line timing.
- The number of lines depends on the Number of lines to be read setting.
- The timing difference between 1 line varies depending on the binning setting.

- FH-S□05R
  With Binning 1-line setting: 36.375 [µs]
  With Binning 2-line setting: 43.583 [µs]
- FH-S□21R
  1 camera cable & standard comm speed setting: 46.8562 [µs]
  1 camera cable & high comm speed setting: 22.3399 [µs]
  2 camera cables & standard comm speed setting: 23.4556 [µs]
  2 camera cables & high comm speed setting: 11.1766 [µs]

About exposure time of Global Reset for Reset Mode

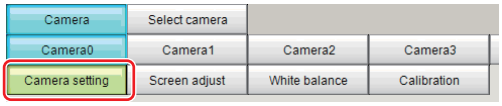
- Exposure for all lines starts at the same time, but the exposure time length differs between lines.
- Since the exposure time is different, please control so that the strobe lighting time is from the start of exposure of Line1 until completion of exposure of Line 1.



Reverse Conversion (supported by FH-SC□□/FH-SM□□/FH-SC21R/FH-SM21R. Not supported by FH-SC05R/FH-SM05R)

Set this option when reversing the camera image vertically or horizontally. The order in which imaging elements are read is changed, so there won't be any delay in image transfer.

1 In the Item Tab area, click [Camera setting].



2 In the "Camera settings" area, specify the reverse conversion settings.

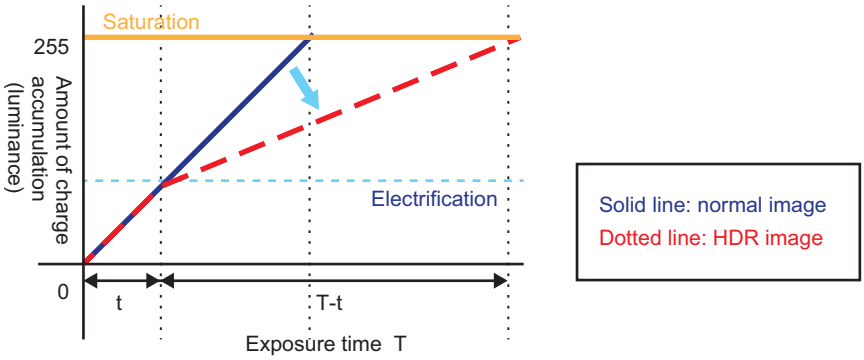
Setting item		Setting value [Factory default]	Description
Mirror an image	↑↓	• Checked • [Unchecked]	Place a check here when reversing the camera image vertically.
	←→	• Checked • [Unchecked]	Place a check here when reversing the camera image horizontally.

Setting Multi-slope Function (for Monochrome Cameras of FH-SM□□ Only)

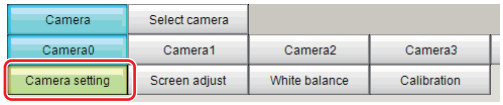
Set this option if you wish to capture a work having a wide dynamic range with a single exposure without causing saturation.

Bright pixels that have reached the charge level specified in the CMOS are clipped and the inclination of stored charge is adjusted, to prevent saturation.

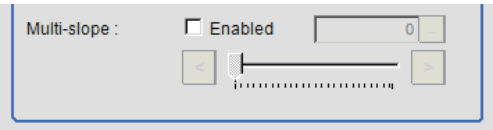
When the multi-slope function is set, pixels that saturate on normal images will no longer saturate. The stored charge amount (inclination of brightness) is changed in the CMOS during a single exposure. This function can also be set for mobile objects because, unlike with Camera Image Input HDR or Camera Image Input HDR Lite, there is no need to change the exposure time and capture and combine multiple images.



1 In the Item Tab area, click [Camera setting].



2 In the "Camera settings" area, specify the Multi-slope settings.



Setting item		Setting value [Factory default]	Description
Multi-slope	Enabled	• Checked • [Unchecked]	Place a check here to use the multi-slope function.
	Slider	-	Set the new level of the inclination of brightness. When the slider is moved to the left, images of wide dynamic ranges can be supported. A desired level can be set on a scale of 1 to 255.

Binning Settings (for Monochrome Cameras Only)

Binning is a function for obtaining a single value by adding multiple lines together.

Some cameras give the effect of a higher frame rate by raising the sensitivity of the brightness virtually by adding together and decreasing the amount of data to be transferred.

Important

The effects that can be obtained with different cameras are as follows.

Camera model	Brightness Sensitivity	Frame rate
FZ-S/-S2M/-S5M3/-SH/-SF/-SP	Effective	Effective
FH-SMX05/-SMX12	Effective	Effective
FH-SM/-SM02/-SM04/-SM12	Effective	No effect
FH-SM05R	No effect	Effective

1 In the Item Tab area, click [Camera setting].

In the "Binning settings" area, select either "1 line" or "2 lines".

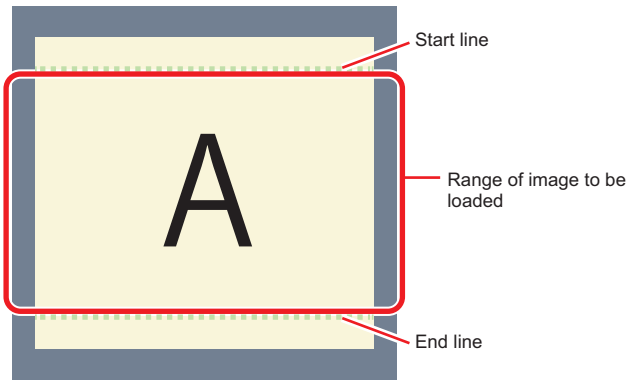
Item	Setting value [Factory default]	Description
Binning setting	[1 line]	Data is transferred line by line.
	2 lines	Data is transferred two lines at a time. Each image is scanned skipping one scan line per two consecutive lines. Measurement precision is decreased because the image resolution in the vertical direction is lower.

Number of lines to be read

By narrowing the image range to be loaded, the image scan time can be shortened.

Set the range taking the offset of the measurement object into consideration.

The part of the image narrowed down by the start line and the end line will be displayed in the Image Display area of the processing item setting window or the Main screen.



Additional Information

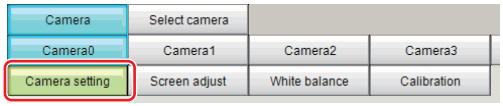
About minimum number of lines

- With the FH-SM□□/FH-SMX□□/FH-SM05R, the minimum number of lines (minimum value between the start and end lines) is 4 line.
- With the FH-SC□□/FH-SCX□□/FH-SC05R, the minimum number of lines is 4 lines.
- With the FH-S□21R, the minimum number of lines is 1,848 lines.
- With the FZ-S□□□ excluding the FZ-SQ series and FZ-S□5M3, the minimum number of lines is 12 lines.
- With the FZ-SQ series, the minimum number of lines is 8 lines.
- With the FZ-S□5M3Q series, the minimum number of lines is 4 lines.
- For FZ-S□5M3, the step width of the Start and End lines is 4 lines. When loading a scene created with the FZ-S□5M2, the number of lines loaded will be a maximum of 4 lines.

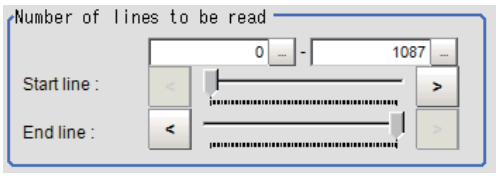
About coordinate values

- The coordinate values displayed as the measurement results are the values of the display position on the monitor.
- The coordinate values do not vary according to the settings for "Number of lines to be read".

1 In the Item Tab area, click [Camera setting].



2 Set the start/end line in the "Number of lines to be read" area.



Important

When the built-in lighting of an FZ-SQ□□□□ is used, it may not be possible to shorten the processing time due to restrictions on the light emission time.

Electronic Flash Setting

This function is set when an electronic flash is used. This sets the output conditions for the signal for synchronizing the measurement and the electronic flash timing. It is possible to assign multiple electronic flashes to a camera and control their flashing.

Important

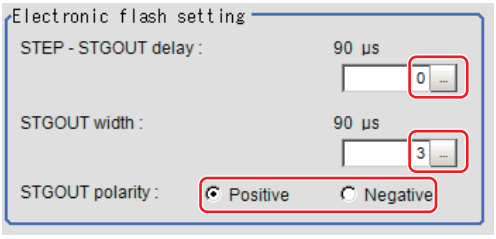
The setting here applies when "STGOUT" is selected for the output signal under [Common settings] on the [Output signal settings] page of the camera accessed by selecting [External Tools] - [System].

If "SHTOUT" is selected, the signal is controlled by each value of SHTOUT set for each line.

For details, refer to *Setting the SHTOUT Signal: [Output Signal Settings]* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

1 In the Item Tab area, click [Camera setting].

2 In the "Electronic flash setting" area, specify each item.



Item	Setting value [Factory default]	Description
STEP - STGOUT delay	[0] to 511 (1 count 30 µs)	Set the waiting time from the time the STEP signal is input until the electronic flash trigger output signal comes ON. Delay Time = Count × 30 µs + 90 µs The displayed time is for the positive polarity. Add 35 µs to the displayed time if the polarity is negative. The delay time can be set in a range of ±10 µs from the setting value.
STGOUT width	0 to 43689 [3] (1 count is 30 µs)	Set the output time for the electronic flash trigger signal. On the FH series Sensor Controller, if 0 is set, the electronic flash will not flash.
STGOUT polarity	• [Positive] • Negative	Select the pulse polarity of the electronic flash trigger. Positive polarity: Flashes synchronized with the timing of the electronic flash trigger output signal changing from OFF to ON. Negative: Flashes when the strobe trigger output signal changes from ON to OFF.

Important

Do not perform next camera image input processing before STGOUT signal output is completed. STGOUT signal may not be output.

Perform camera image input processing after STGOUT signal output completion, or set the STEP-camera delay, STEPSTGOUT delay and STGOUT pulse width so that the electronic flash operates synchronizing with the exposure time.

1-2-4 Assigning Multiple Electronic Flashes to a Camera

It is possible to assign multiple electronic flashes (STGOUT signals) to a camera and select one to use when an image is taken for measurement. This function uses STGOUT signals with which cameras are not connected. This function can be used only with FH series Sensor Controller.

Follow the setting procedure below.

Important

- The STGOUT signals that can be output are as follows.
  - FH-1000/2000/3000/5000 series: SGTOUT 0 to 7
  - FH-L series: STGOUT 0 to 3
- STGOUT0 to STGOUT7 is tied to the camera connector number of the sensor controller, not the camera number. When you use CameraLink Medium Configuration or the Multi-line random-trigger mode, confirm the camera connector number that corresponds to the camera number of Sensor Controller.

1 Click [Tool] - [System settings] - [Camera] - [Output signal setting].

For details, refer to *Setting the SHTOUT Signal: [Output Signal Settings]* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

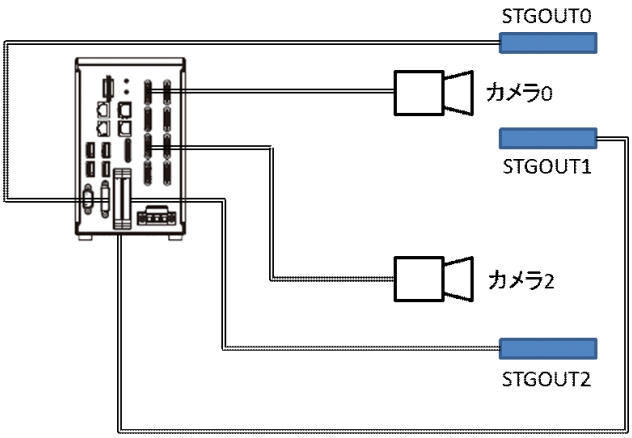
2 Select [STGOUT] for [Output Signal] in "Common setting" area.

3 Place a check to [Output even if camera is not connected] in "STGOUT setting" area.

With this setting, STGOUT signals (STGOUT0 to STGOUT7) which are not connected with cameras can be used. Configure the STGOUT Width of the STGOUT of corresponding Camera Image Input FH Processing Item.
For details, refer to *Electronic Flash Setting of the Vision System FH/FHV/FZ5 Series Processing Item Function Reference Manual* (Cat No. Z341).

Example:

Camera 0 uses STGOUT0 and STGOUT1 and Camera 2 uses STGOUT2.



4 To use STGOUT0 and STGOUT1 for Camera 0, Camera 1 is not connected with a camera.

5 In the [Electronic flash setting] area in the Camera 0 tab of Camera Image Input FH processing item, enter the settings for SGTOUT 0.

6 In the [Electronic flash setting] area in the Camera 1 tab of Camera Image Input FH processing item, enter the settings for SGTOUT 1.

7 In the [Electronic flash setting] area in the Camera 2 tab of Camera Image Input FH processing item, enter the settings for SGTOUT 2.

8 In the [Electronic flash setting] area in the Camera 3 to 7 tab of Camera Image Input FH processing item, set 0 to the STGOUT width.

Additional Information

If an electronic flash is not used or it does not flash, enter 0 to the [STGOUT Width].

1-2-5 Screen Adjustment Settings (Camera Image Input FH)

Set the lighting and lens conditions for each camera.

- Refer to *Lighting Control* on page 1-41.
- Refer to *Line Bright* on page 1-54.

Lighting Control

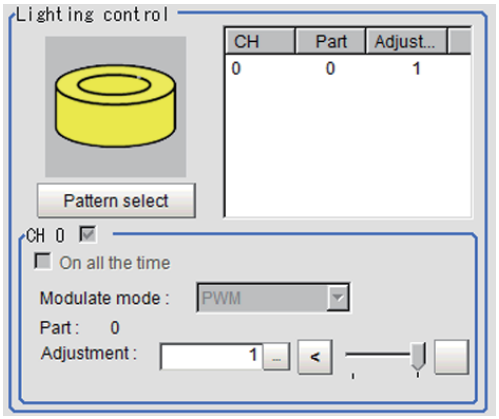
When an Electronic flash controller or Camera-mount Lighting Controller is connected, the light volume of the lighting can be adjusted from the sensor controller. Brightness can be adjusted automatically or one of the preset patterns can be selected.

1 In the Item Tab area, click [Screen adjust].

2 In the "Lighting control" area, specify the brightness.

Displayed contents differ depending on the connected camera, Electronic flash controller or Cmara-mount Lighting Controller.

● Intelligent Compact Digital Camera FZ-SQ□□□□ is connected:



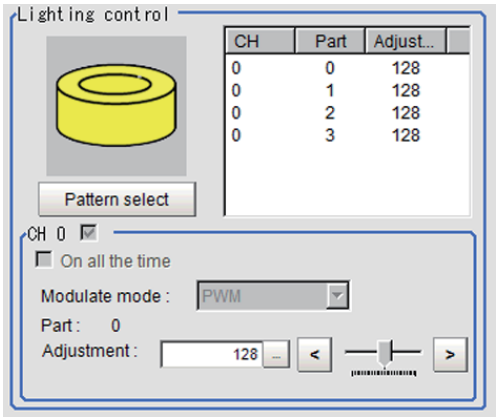
Item	Setting value [Factory default]	Description
Pattern select	Pattern 0 to 1	Select from a preset lighting pattern. Pattern 0: Lit Pattern 1: Unlit
Adjustment	0: Unlit 1: Lit	Adjust the light volume of each part.

Important

When the lighting of FZ-SQ□□□□ is used, there are following restrictions.

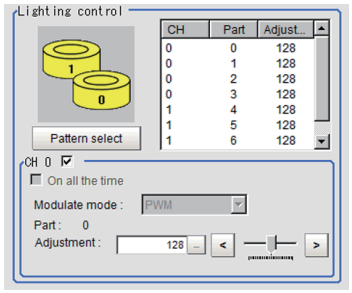
- The measurement can be longer than the measurement with the lighting OFF.
- There are restrictions in the operation of Multi-trigger Imaging.
  Refer to *1-9 Multi-trigger Imaging* on page 1-141.

● Electronic flash controller FZ-LTA100 is connected:

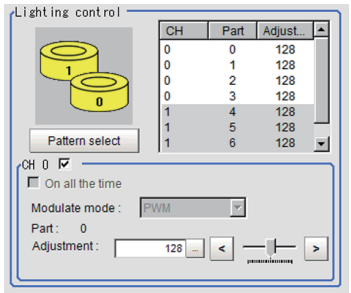


● Electronic flash controller FZ-LTA200 is connected:

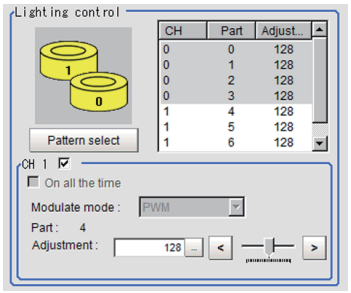
0 + 1CH are used:



0CH is used:

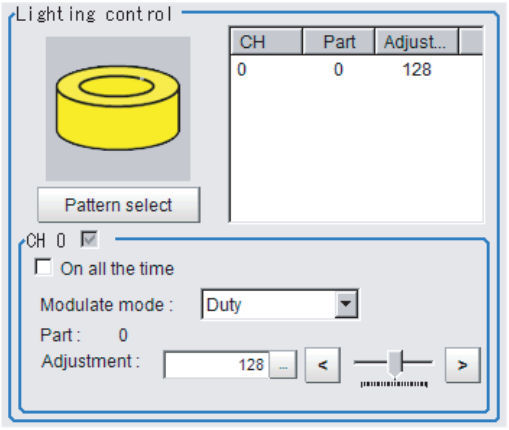


1CH is used:



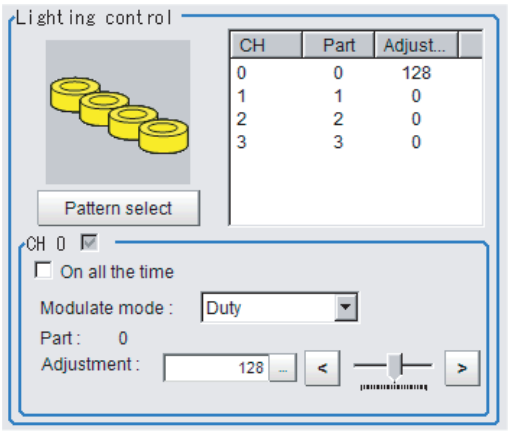
Item	Setting value [Factory default]	Description
Pattern select	Pattern 0 to 16	Select from a preset lighting pattern.
CH	• [Checked] • Unchecked	Place a check here to enable the channel currently selected in the part list.
Adjustment	0 to 255 [128]	When 1 channels are used, the light volume can be adjusted to one of 256 levels. When 2 channels are used, the light volume can be adjusted to one of 128 levels. 0 indicates the lighting is OFF. The larger the number, the higher the brightness.

● Camera-mount Lighting Controller FLV-TCC1 is connected:



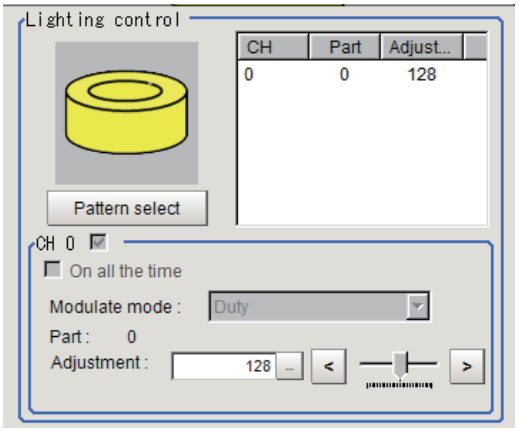
Item	Setting value [Factory default]	Description
Pattern select	---	Select from preset lighting patterns.
On all the time	• Checked • [Unchecked]	Place a check here to keep the light turned ON all of the time regardless of the exposure time.
Modulate mode	• [Duty] • Voltage / Current	Select the lighting adjustment method. • Duty The brightness of the light is adjusted with 255 levels of the pulse width (PWM frequency: 100 kHz). • Voltage / Current The brightness of the light is adjusted with 255 voltage / current levels. Select voltage lighting adjustment if you will use a high-speed shutter speed.
Part	0 to 255 [128]	Set the brightness for the selected parts.

● Camera-mount Lighting Controller FLV-TCC4 is connected:



Item	Setting value [Factory default]	Description
Pattern select	---	Select from preset lighting patterns.
On all the time	• Checked • [Unchecked]	Place a check here to keep the light turned ON all of the time regardless of the exposure time.
Modulate mode	• [Duty] • Voltage / Current	Select the lighting adjustment method. • Duty The brightness of the light is adjusted with 255 levels of the pulse width (PWM frequency: 100 kHz). • Voltage / Current The brightness of the light is adjusted with 255 voltage / current levels. Select voltage lighting adjustment if you will use a high-speed shutter speed.
Part	0 to 255 [128]	Set the brightness for the selected parts.

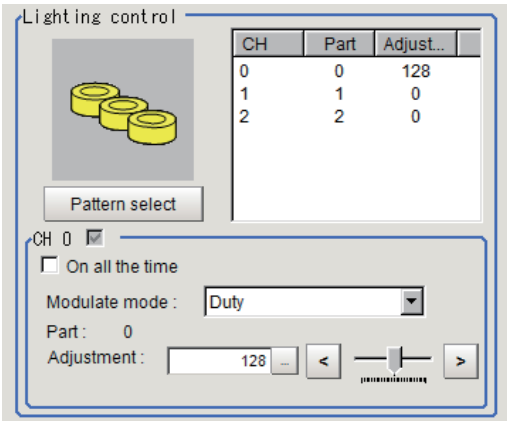
● Camera-mount Lighting Controller FLV-TCC1EP is connected:



Item	Setting value [Factory default]	Description
On all the time	• Checked • [Unchecked]	Place a check here to keep the light turned ON all of the time regardless of the exposure time.

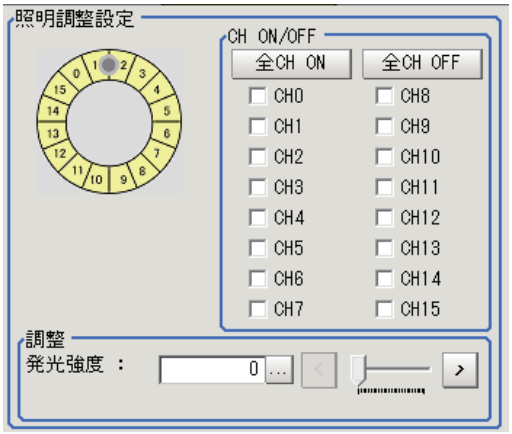
Item	Setting value [Factory default]	Description
Modulate mode	• [Duty] • Voltage / Current	Select the lighting adjustment method. • Duty The brightness of the light is adjusted with 255 levels of the pulse width (PWM frequency: 100 kHz). • Voltage / Current The brightness of the light is adjusted with 255 voltage / current levels. Select voltage / current adjustment if you will use a high-speed shutter speed.
Part	0 to 255 [128]	Set the brightness for the selected parts.

● Camera-mount Lighting Controller FLV-TCC3HB is connected:



Item	Setting value [Factory default]	Description
On all the time	• Checked • [Unchecked]	Place a check here to keep the light turned ON all of the time regardless of the exposure time.
Modulate mode	• [Duty] • Voltage / Current	Select the lighting adjustment method. 0ch connected: • Duty The brightness of the light is adjusted with 255 levels of the pulse width (PWM frequency: 100 kHz). • Voltage / Current The brightness of the light is adjusted with 255 voltage / current levels. 0ch is the channel for the spot lighting. 1ch / 2ch connected: • Duty The brightness of the light is adjusted with 255 levels of the pulse width (PWM frequency: 100 kHz). • Voltage / Current The brightness of the light is adjusted with 255 voltage / current levels. Select voltage / current adjustment if you will use a high-speed shutter speed.
Part	0 to 255 [128]	Set the brightness for the selected parts.

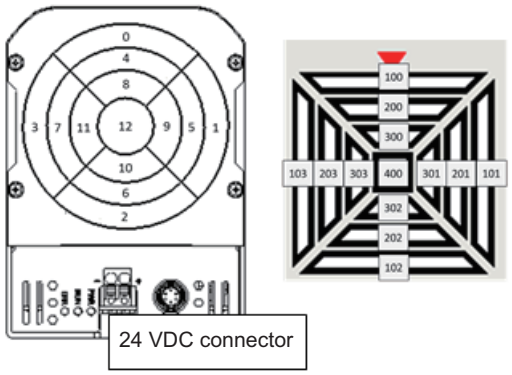
● Camera-mount Lighting Controller FL-TCC1PS is connected:



Setting item	Setting value [Factory default]	Description
CH ON/OFF	• [Unchecked] • Checked	Controls all channels in a batch.
CH0 to CH15	• [Unchecked] • Checked	Specifies a channel to adjust.
Emitting intensity	0 to 255 [128]	Sets the emitting intensity to the selected channel.

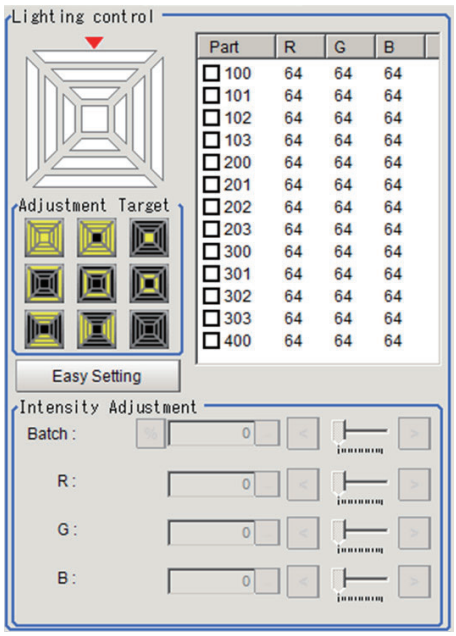
● Camera-mount Lighting Controller FL-MD□MC is connected

Set the lighting direction, lighting colors, and emitting intensity.



Parts of the lighting controller composed of 13 channels (part: 100 to 103, part: 200 to 203, part: 300 to 303, and part: 400), the emitting intensity in each channel can be specified with RGB and 128 gradations.

Screen Configuration



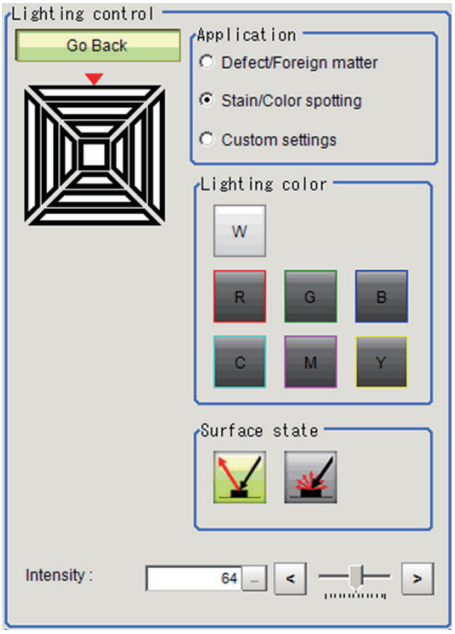
Setting item	Setting value [Factory default]	Description
Schematic diagram	---	Displays the number of a part corresponding to the product. The displayed color differs from the emitting lighting color. Combining ON/OFF of R,G,B LEDs illuminates color of red, green, blue, yellow, magenta, cyan, white, gray (all OFF).
Adjustment target selection	• All • Dome • Coaxial • Upper • Middle • Lower • Vertical • Horizontal • [None]	Selects the adjustment target. All: All parts Dome: Part 100 to 303 Coaxial: Part 400 Upper: Part 300 to 303 Middle: Part 200 to 203 Lower: Part 100 to 103 Vertical: 100, 102, 200, 202, 300, and 302 Horizontal: 101, 103, 201, 203, 301, 303 None: Clear all selection.
Easy setting button	---	Use to set the lighting conditions according to an application, lighting irradiation pattern, condition of a defect object for measurement (defect direction and surface state).
Part selection	• 100 to 103 • 200 to 203 • 300 to 303 • 400 • [Unchecked]	Selects one or more parts to set emitting intensity of each color. Set the selected part in the “Intensity Adjustment” area below.
Intensity adjustment	0 to 127 [64]	Sets the color and intensity of the selected target. Setting in a unit of percent is also possible to a selected part. The time of clicking the [%] button is the reference.

● Setting the Lighting Conditions with “Easy Setting”.

The prepared options make the setting easier.

1 Click the [Easy Setting] on the “lighting control” area.

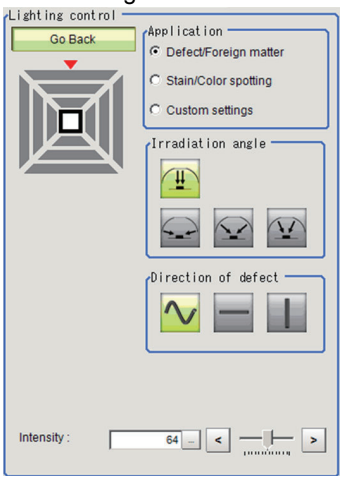
The following screen is displayed.



2 Set application, lighting colors, and surface conditions.

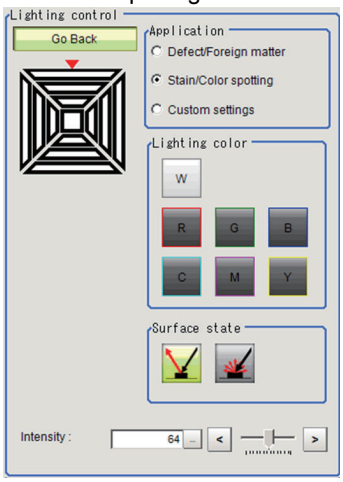
The displayed items depend on applications.

Defect/Foreign matter



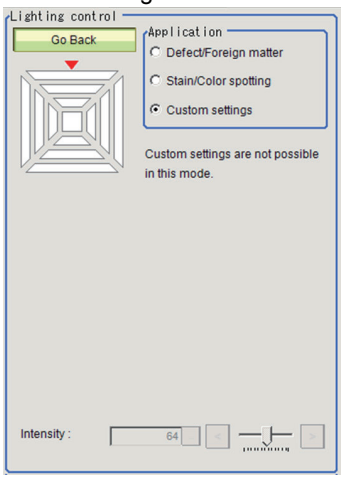
Select the irradiation angle and defect direction. Adjust the emitting intensity as necessity.

Stain/Color spotting



Select the lighting color and surface conditions. Adjust the emitting intensity as necessity.

Custom settings



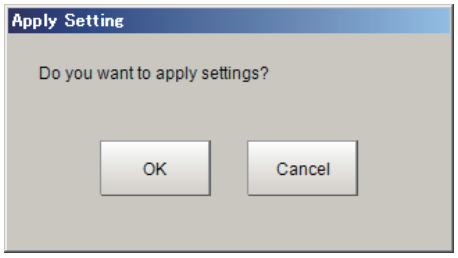
This screen is displayed when clicking “Easy setting” after detailed settings per each part.

Setting item	Setting value [Factory default]	Description
Application	• Defect/Foreign matter • [Stain/Color spotting] • Custom settings	Selects an application. Defect/Foreign matter: Select when detecting surface unevenness. Specify the irradiation angle and defect direction in the following options. Angle: [Coaxial], upper, middle, lower Direction: [Any], horizontal, vertical Stain/Color spotting: Select when detecting color differences. Specify the lighting color and surface state in the following options. Color: [W], R, G, B, Y, M, C Surface state: [Specular reflection], diffuse reflection Custom settings: In this screen, the setting is disabled.
Irradiation angle (For Defect/Foreign matter)	•  [Coaxial] •  Lower •  Middle •  Upper	Selects the irradiation angle to make defects more visible. Coaxial: Select this when displaying defects as black and the background as white. Lower, Middle, Upper: Select this when displaying defects as white and the background as black.
Direction of defect (For Defect/Foreign matter)	•  [Any] •  Horizontal •  Vertical	Selects the direction of defect to detect.
Lighting color (For Stain/Color spotting)	• [W]: White • R: Red • G: Green • B: Blue • Y: Yellow • M: Magenta • C: Cyan	Selects the lighting color.
Surface state (For Stain/Color spotting)	•  [Specular reflection] •  Diffuse reflection	Selects the surface state of an object to detect. Secular reflection: Select this when the surface of an object is glossy. Diffuse reflection: Select this when the surface of an object is not glossy.
intensity	0 to 127 [64]	Adjusts the emitting intensity.

3 Click [Go Back].

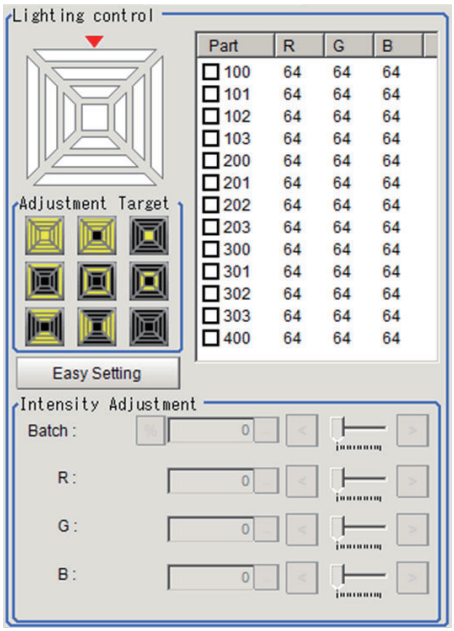
The “Apply Setting” dialog is displayed.

Click [OK] to apply the setting. If clicking [Cancel], then the settings are discarded and return to the Main window.

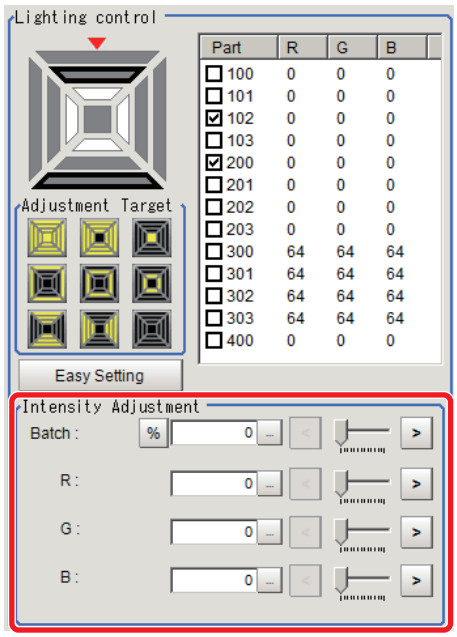


- **Setting the Lighting Conditions in detail per part.**

When you want to set the lighting conditions in detail per part, select parts you want to set and adjust the emitting intensity.

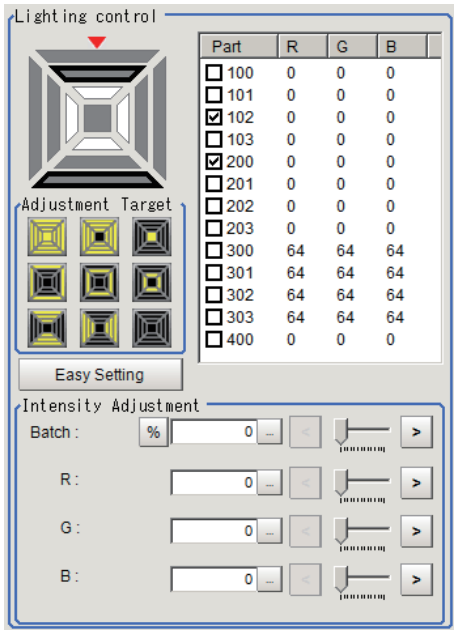


1 Place a check to the target part. When adjusting multiple parts at the same time, place a check to them.



2 Adjust the emitting intensity.

When adjusting all of R, G, B as a batch, use the “Batch”. Setting in the unit of percent is also possible.



Important

There is no restriction on power consumption nor on lighting mode when using lightings with lighting controller FLV-TCC1EP. Restrictions on power consumption and lighting mode differ depending on the product series. See the following table for details.

(1) FLV-TCC4/-TCC1

- Without external power supply

Total power consumption	Power consumption per channel	Connectability	Lighting mode □[1]			READY OFF time delay □[2]
			Always-on lighting mode	Simultaneous lighting mode	Single lighting mode	
Greater than 7.5 W	Greater than 7.5 W	Not connectable	---	---	---	---
	7.5 W or less	Connectable	NA	NA	OK	None
7.5 W or less	Less than 7.5 W	Connectable	OK	OK	OK	None

- With external power supply

Total power consumption	Power consumption per channel	Connectability	Lighting mode □[1]			READY OFF time delay □[2]
			Always-on lighting mode	Simultaneous lighting mode	Single lighting mode	
Greater than 15 W	Greater than 15 W	Not connectable	---	---	---	---
	15 W or less	Connectable	NA	NA	OK	Yes
	7.5 W or less	Connectable	NA	NA	OK	None
15 W or less	Less than 15 W	Connectable	NA	OK	OK	Yes
	7.5 W or less	Connectable	NA	OK	OK	Yes
7.5 W or less	Less than 7.5 W	Connectable	OK	OK	OK	None

(2) FLV-TCC3HB

- Without external power supply

  0ch (spot lighting) not connected

Total power consumption	Power consumption per channel	Connectability	Lighting mode □[1]			READY OFF time delay □[2]
			Always-on lighting mode	Simultaneous lighting mode	Single lighting mode	
Greater than 7.5 W	Greater than 7.5 W	Not connectable	---	---	---	---
	7.5 W or less	Connectable	NA	NA	OK	None
7.5 W or less	Less than 7.5 W	Connectable	OK	OK	OK	None

  0ch (spot lighting) connected

Total power consumption	Power consumption per channel	Connectability	Lighting mode □[1]			READY OFF time delay □[2]
			Always-on lighting mode	Simultaneous lighting mode	Single lighting mode	
Greater than 5.5 W	Greater than 7.5 W	Not connectable	---	---	---	---
	7.5 W or less	Connectable	NA	NA	OK	None
5.5 W or less	Less than 5.5 W	Connectable	OK	OK	OK	None

- With external power supply

  0ch (spot lighting) not connected

Total power consumption	Power consumption per channel	Connectability	Lighting mode □[1]			READY OFF time delay □[2]
			Always-on lighting mode	Simultaneous lighting mode	Single lighting mode	
Greater than 15 W	Greater than 15 W	Not connectable	---	---	---	---
	15 W or less	Connectable	NA	NA	OK	Yes
	7.5 W or less	Connectable	NA	NA	OK	None
15 W or less	Less than 15 W	Connectable	NA	OK	OK	Yes
	7.5 W or less	Connectable	NA	OK	OK	Yes
7.5 W or less	Less than 7.5 W	Connectable	OK	OK	OK	None

0ch (spot lighting) connected

Total power consumption	Power consumption per channel	Connectability	Lighting mode *1			READY OFF time delay *2
			Always-on lighting mode	Simultaneous lighting mode	Single lighting mode	
Greater than 14 W	Greater than 15 W	Not connectable	---	---	---	---
	15 W or less	Connectable	NA	NA	OK	Yes
	7.5 W or less	Connectable	NA	NA	OK	None
14 W or less	Less than 14 W	Connectable	NA	OK	OK	Yes
	7.5 W or less	Connectable	NA	OK	OK	Yes
5.5 W or less	Less than 5.5 W	Connectable	OK	OK	OK	None

*1. Lighting modes

Always-on lighting mode	In this mode, the lights are always turned ON for a specific pulse cycle. The always-on lighting mode is used if you place a check in “On all the time” in the “Lighting control” area.
Simultaneous lighting mode	In this mode, all of the connected lights are turned ON in synchronization with the trigger. Set the “Adjustment” set values in the “Lighting control” area for each light to any value other than 0 for all of the parts.
Single lighting mode	In this mode, only one of the connected lights is turned ON in synchronization with the trigger. Set the “Adjustment” set value in the “Lighting control” area to any value other than 0 for the part for only one channel. The lights will not turn ON if you set two or more channels to an adjustment other than 0.

*2. Turning OFF the READY signal is delayed in comparison with not connecting a camera with lighting controller by approximately the exposure time.

Example: Connection example for connecting an external power supply and the lighting modes

If four lights with a power consumption of 1 W each are connected to a camera with lighting controller, always-on lighting, simultaneous lighting, and single lighting are all possible.

If four lights with power consumptions of 2 W, 3 W, 4 W, and 5 W are connected to a camera with lighting controller, simultaneous lighting and single lighting are possible.

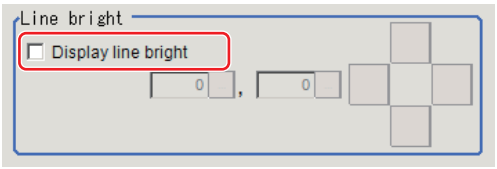
If four lights with power consumptions of 12 W, 1 W, 2 W, and 1 W are connected to a camera with lighting controller, only single lighting is possible.

Line Bright

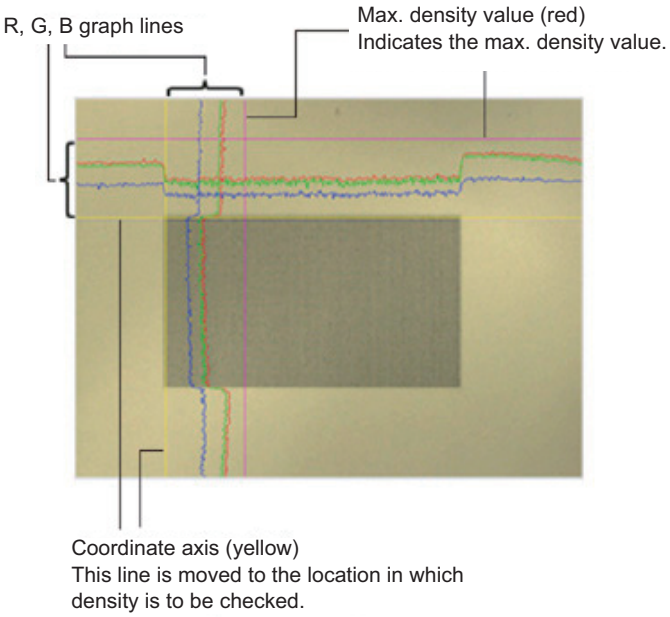
The graph showing the gray distribution for 1 line in the image is called the "Line bright". You can display the line brights for R, G and B for any horizontal or vertical line.

1 In the Item Tab area, click [Screen adjust].

2 Place a check at "Display line bright".



3 Move the line to the position whose density distribution you want to see.



1-2-6 White Balance (Camera Image Input FH)

Set the white balance to make white objects look white by calibrating the color of images loaded from cameras.

By adjusting the white balance, the appropriate white color can be reproduced under any lighting conditions

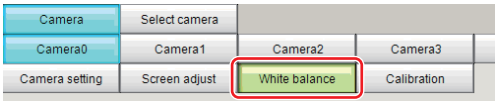
Appropriate values can also be set automatically.

Important

- Perform the white balance setting only when a color camera is used.
- In the following cases, make sure to set white balance.
  - When a new system is installed
  - When a camera or lighting has been changed

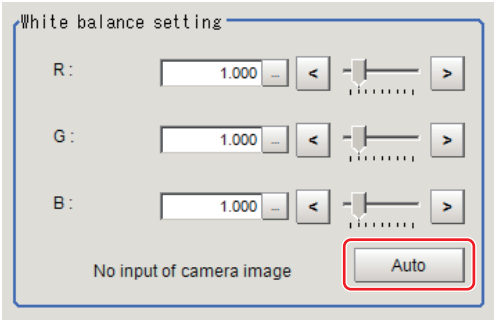
  Since measurement results may vary with changes of the white balance setting, be sure to verify the operation after it has changed.

1 In the Item Tab area, click [White balance].



2 Shoot a white piece of paper or cloth.

3 Click [Auto].



Additional Information

When the "Too bright" or "Too dark" message is displayed, adjust the iris, shutter speed, gain and/or lighting conditions until "Automatic adjustment is possible" is displayed.

4 Set the "R", "G" and "B" values as necessary.

Item	Setting value [Factory default]	Description
White balance setting • R • G • B	• R, G, and B: 0.001 to 7.999 (FZ-SQ□□□□:0.001 to 3.000) • FZ-SC [R=1.183] [G=1.000] [B=1.323] • FZ-SC2M [R=1.394] [G=1.000] [B=1.222] • FZ-SHC [R=1.375] [G=1.000] [B=1.452] • FZ-SFC and FZ-SPC [R=1.145] [G=1.000] [B=1.889] • FZ-SC5M2 [R=1.351] [G=1.000] [B=2.314] • FZ-SC5M3 [R=1.400] [G=1.000] [B=2.150] • FZ-SQ□□□□ [R=1.000] [G=1.040] [B=1.800] • FH-SC□□/FH-SCX□□/FH-SC21R [R=1.000] [G=1.000] [B=1.000]	Set the white balance. Whiteness increases when the value of "R", "G", and "B" is increased.

1-2-7 Calibration (Camera Image Input FH)

By setting the calibration, the measurement result can be converted and output as actual dimensions. The calibration method is selected here.

There are three calibration methods, point, sampling, and parameter.

- Refer to *Specifying Points and Setting (Point Specification)* on page 1-57.
- Refer to *Setting Calibration through Sampling Measurement (Sampling)* on page 1-58.
- Refer to *Inputting and Setting Values (Value Setting)* on page 1-60.
- Refer to *View Calibration Parameters* on page 1-61.

Additional Information

In order to output measurement values in actual dimensions, select [Calibration] to "ON" in [Output parameter] for each processing unit. If [Calibration] is "OFF" (factory default), measurement results are output as camera image coordinate values.

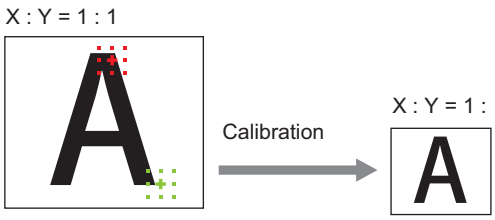
Specifying Points and Setting (Point Specification)

This is a method for performing calibration by selecting arbitrary points (in pixels).

Calibration parameters are calculated automatically when actual coordinates of selected locations are entered. Up to 3 points can be selected.

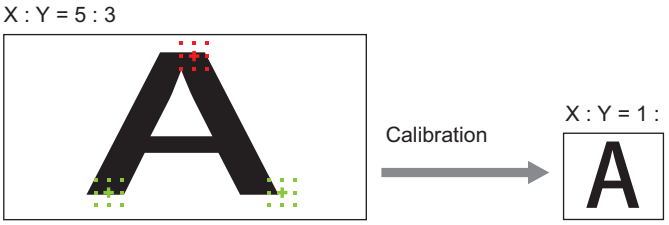
- When magnification is the same in the X and Y directions

Select only 2 points.



- When magnification is not the same in the X and Y directions

Select 3 points.

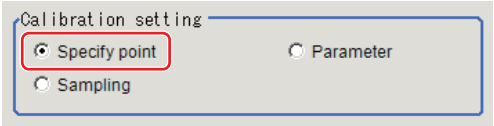


Additional Information

When 2 points are selected, the coordinate system is set to the left-hand system (forward in the clockwise direction). Select 3 points to perform calibration including the coordinate system.

1 In the Item Tab area, click [Calibration].

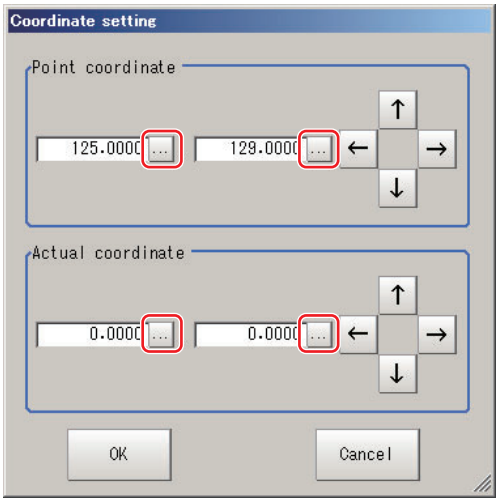
2 In the "Calibration setting" area, select "Specify point".



3 Click the first point on the screen.

4 Set the actual coordinates for the specified point.

The actual coordinate input window is displayed.

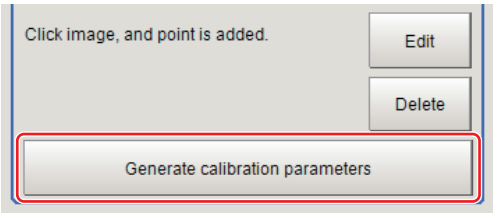


Actual coordinate	Setting value [Factory default]
Point coordinate X, Y	0 to 9999.9999 [Point you clicked in the window]
Actual coordinate X, Y	-99999.9999 to 99999.9999 [0]

5 Set the 2nd and 3rd points in the same way.

6 Click [Generate calibration parameters].

The calibration parameters will be generated.



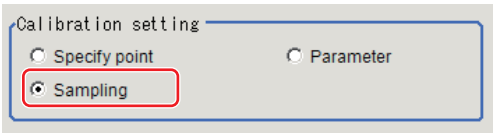
Setting Calibration through Sampling Measurement (Sampling)

This is a method for setting calibration based on measurement results.

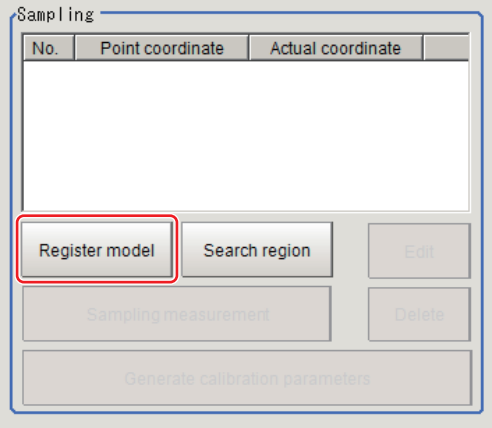
Calibration parameters are calculated automatically when a registered model is searched and the actual coordinates for that position set.

1 In the Item Tab area, click [Calibration].

2 In the "Calibration setting" area, select "Sampling".



3 In the "Sampling" area, click [Register model].



4 Use the Drawing tools to register the model.

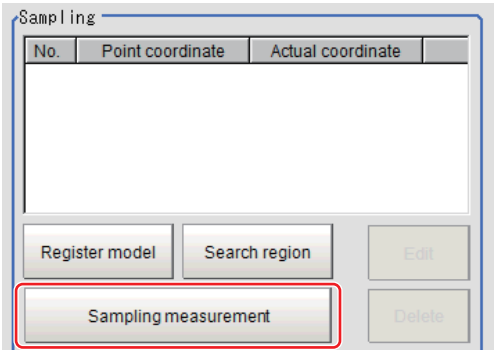
5 Set a search region as necessary.

The default value setting is for the entire screen.

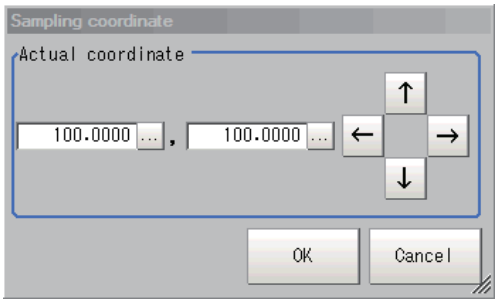
6 Click [Sampling measurement].

Measurement is performed.

The search result (cross-shaped cursor) is displayed in the Image Display area, and the Sampling Coordinate window is displayed.

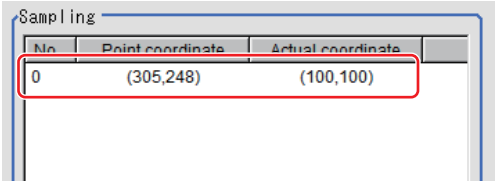


7 In the Sampling Coordinate window, set the X and Y values.



8 Click [OK].

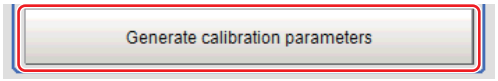
Point coordinates and actual coordinates are registered in the "Sampling" area.



9 Move the object to be measured and repeat the Steps 3 to 8.

10 Click [Generate calibration parameters].

The calibration parameters will be generated.

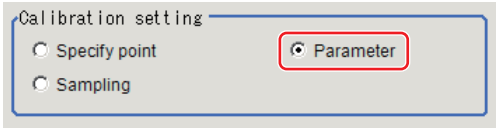


Inputting and Setting Values (Value Setting)

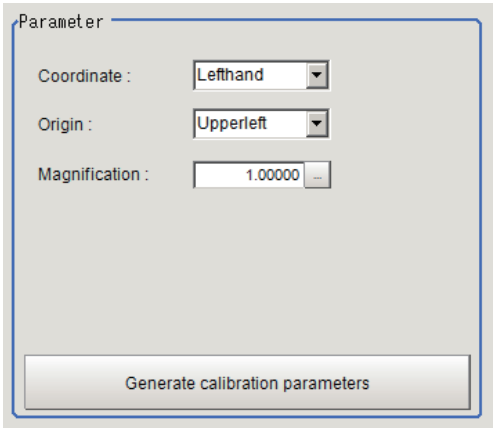
Set calibration data directly with numerical values.

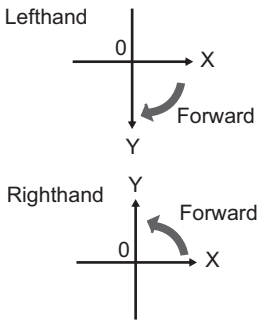
1 In the Item Tab area, click [Calibration].

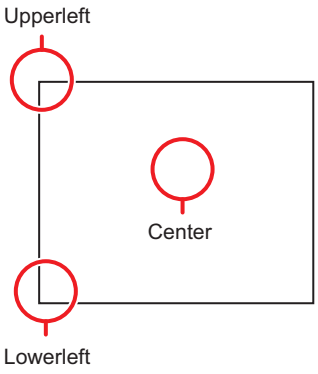
2 In the "Calibration setting" area, select "Parameter".



3 In the "Parameter" area, specify values for the "Coordinate", "Origin" and "Magnification".

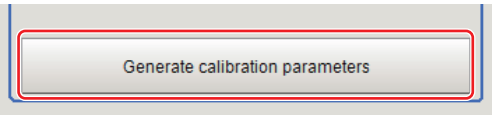


Item	Setting value [Factory default]	Description
Coordinate	• [Lefthand] • Righthand	Lefthand: Clockwise is forward when setting the coordinates. Righthand: Counter-clockwise is forward when setting the coordinates. 

Item	Setting value [Factory default]	Description
Origin	• [Upperleft] • Lowerleft • Center	Set where the origin of the actual coordinates will be. 
Magnification	0.00001 to 9.99999	Specify the ratio of 1 pixel to the actual dimensions.

4 Click [Generate calibration parameters].

The calibration parameters will be generated.

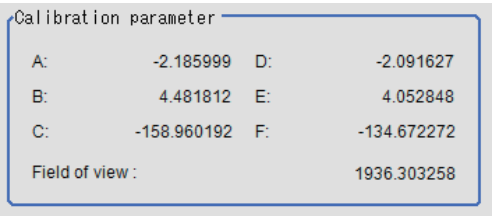


View Calibration Parameters

View the set calibration data.

1 In the Item Tab area, click [Calibration].

2 In the "Calibration parameter" area, confirm the calibration data.



Item	Setting value	Description
A	Calculation value	These are calibration conversion values. Camera coordinates are converted to actual coordinates based on these values. The conversion formulas for actual coordinates are as follows: • (X, Y): Measurement point (camera coordinates), Unit: pix • (X', Y'): Conversion point (actual coordinates) $X'=A \times X + B \times Y + C$ $Y'=D \times X + E \times Y + F$
B	Calculation value	
C	Calculation value	
D	Calculation value	
E	Calculation value	
F	Calculation value	
Field of view	Calculation value	This is an actual dimension in the X direction.

1-2-8 External Reference Tables (Camera Image Input FH)

No.	Data Name	Ident	Set/Get	Data range
None	Camera No.	cameraNo	Set/Get	
None	Transfer image	cameraMask	Set/Get	Bit sum of the camera does not transfer 1: Camera0 2: Camera1 4: Camera2 8: Camera3 16: Camera4 32: Camera5 64: Camera6 128: Camera7
None	Iris base density	irisDensity	Set/Get	
None	Camera model	cameraModelN (N: 0 to 7)	Set/Get	Connectable camera model name
None	Shutter speed	exposureTimeN (N: 0 to 7)	Set/Get	
None	Gain	gainN (N: 0 to 7)	Set/Get	
None	Mirror an image(↑↓)	reverseYN (N: 0 to 7)	Set/Get	0: OFF 1: ON
None	Mirror an image(←→)	reverseXN (N: 0 to 7)	Set/Get	0: OFF 1: ON
None	Multi-slope(Enabled)	multiSlopeModeN (N: 0 to 7)	Set/Get	0: OFF 1: ON
None	Multi-slope(slider)	multiSlopeKnee-PointN (N: 0 to 7)	Set/Get	
None	Reset Mode	shutterResetModeN (N: 0 to 7)	Set/Get	0: Rolling Shutter 1: Global Reset
None	Binning setting	binningYN (N: 0 to 7)	Set/Get	0: One line 1: Two line
None	Start line	startYN (N: 0 to 7)	Set/Get	
None	End line	endYN (N: 0 to 7)	Set/Get	
None	STEP - STGOUT delay	strobeDelayN (N: 0 to 7)	Set/Get	
None	STGOUT width	pulseWidthN (N: 0 to 7)	Set/Get	
None	STGOUT polarity	pulsePolarityN (N: 0 to 7)	Set/Get	0: Negative 1: Positive
None	Lighting con-trol(Site List)	lightGainN (N: 0 to 7)	Set/Get	A representation of a lighting brightness of each Part in hexadeci-mal. A value of Part 0 to Part 7 from left to right. Example: If the illumi-nation brightness of Part 0 to Part 3 was in 255 (ff), ffffffff00000000

No.	Data Name	Ident	Set/Get	Data range
None	Modulate mode	lightGainModeN (N: 0 to 7)	Set/Get	It expresses the dimming method of each Part by the sum of 4 bit units. 0: Duty 1: Voltage/Current. Example: When Part 0, Part 2, Part 5 are set to Voltage/Current, 1048833
None	CH	lightEnabledChannelN (N: 0 to 7)	Set/Get	0: OFF 1: ON
None	On all the time	alwaysLightN (N: 0 to 7)	Set/Get	0: OFF 1: ON
None	Zoom	zoomN (N: 0 to 7)	Set/Get	
None	Focus	focusN (N: 0 to 7)	Set/Get	
None	Iris	irisN (N: 0 to 7)	Set/Get	
None	White balance	whiteBalanceN (N: 0 to 7)	Set/Get	"," Separated by R G B
None	Calibration parameter	calibParameterN (N: 0 to 7)	Set/Get	"," Separated by a A B C D E F
None	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)

1-3 Camera Image Input FHV

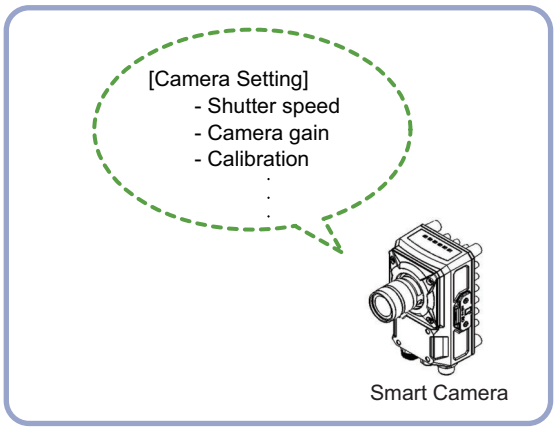
This is a processing item specific to the FHV Sensor Controller.

Set the conditions for loading images from the camera and for storing images of the measured objects.

This processing item must be used when measuring.

It is possible to shoot images whose shutter speed or lighting differ by setting multiple Camera Image input FHV to your measurement flow.

Used in the Following Case



Precautions for Correct Use

- [Camera Image Input FHV] is preset for Unit 0. Do not set any processing item other than Camera Image Input FHV. It does not work correctly, malfunction may result.
- When switching from a color camera to a monochrome camera or switching to a camera with a different resolution, reset the following units.
- If a camera model is different from the previous one, the camera settings are returned to the initial ones. As same as the camera settings, a lighting and/or lens model is different from the previous one, the settings are also returned to the initial ones.

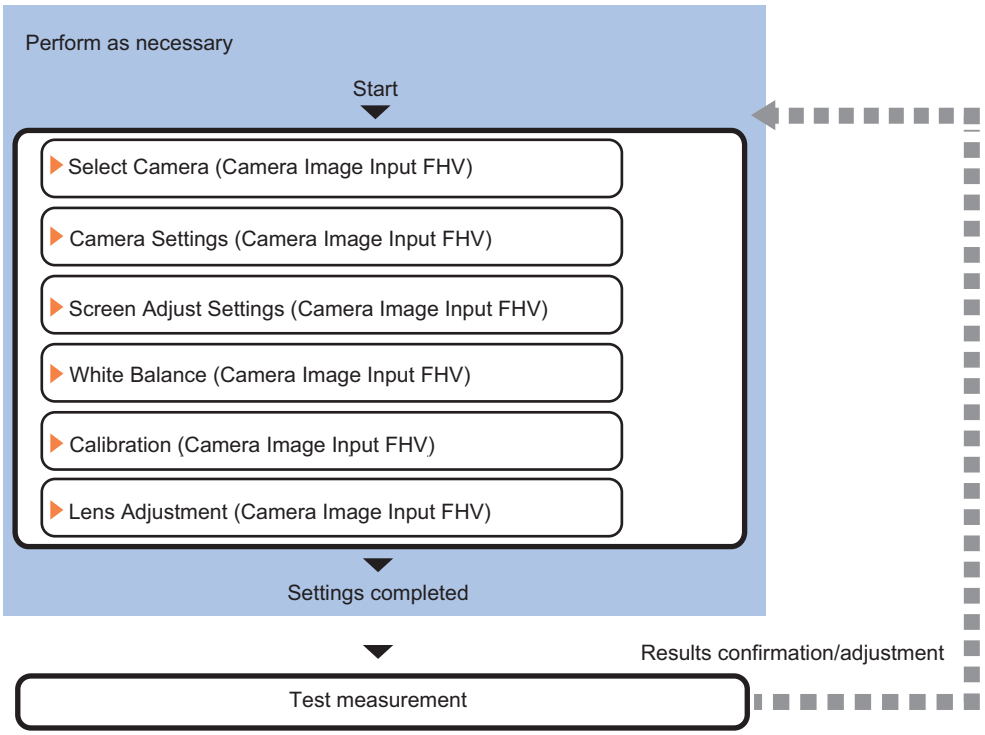
Precautions for Correct Use

- Just after starting up the Sensor Controller or just after changing scenes, it becomes no image input. In this state, it is set to the same color image processing as in the factory default state.
- When the Properties dialog box is opened with no image input, click the [Cancel] button to close the dialog box. Pressing the [OK] button in the dialog box will change the setting to the same color camera setting as the factory default state.

  For details, *FAQ For Measurement The measurement NG (image mismatch) error will result when connecting a monochrome camera in the Vision System FH/FHV/FZ5 Series User's Manual (Z365)*.

1-3-1 Settings Flow (Camera Image Input FHV)

To set Camera Image Input FHV, follow the steps below.

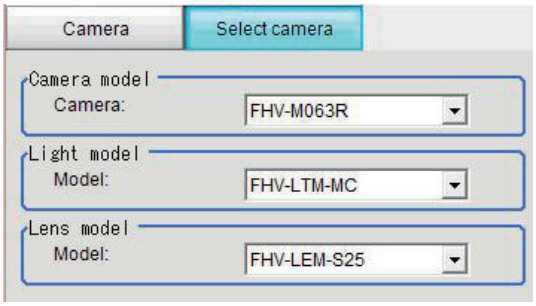


List of Camera Image Input FHV Items

Item	Description
Select camera	Check the type of camera, lighting, and lens that is currently connected.
Camera setting	Specify the camera settings such as the shutter speed or electronic flash.
Screen adjust	Set the lighting conditions.
White balance	When using a color camera, adjust the white balance.
Calibration	Set when measurements (camera coordinate measurement values) are to be output using actual dimensions. Select the calibration setting method and generate the calibration parameters.
Lens adjustment	Adjust the lens focus.

1-3-2 Camera Selection (Camera Image Input FHV)

Check the model of camera, lighting, and lens that are currently connected.



1. In the Item Tab area, Click [Select camera].
2. In the camera area, you can check the camera model that is currently connected.
3. In the lighting model area, you can check the lighting model that is currently connected.
4. In the lens model area, you can check the lens model that is currently connected.

Additional Information

When using the simulation software, you can select any model in the camera model, lighting model, and lens model areas. When the model is changed, the corresponding settings are initialized.

1-3-3 Camera Settings (Camera Image Input FHV)

Set the following photographing conditions to the camera.

- *Camera Settings* on page 1-67
- *Binning Settings (for Monochrome Camera - FHV□□-M0016□□□ Only)* on page 1-70
- *Number of lines to be read* on page 1-71
- *Electronic Flash Settings* on page 1-72

Additional Information

The display items differ depending on the camera model and lighting mode. Specify the setting for the following procedures as necessary in accordance with the use environment.

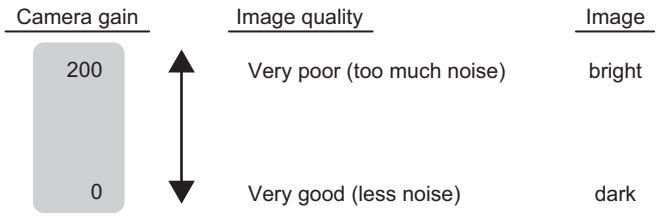
Camera Settings

Adjust the settings related to camera shutter speed and camera gain.

Set the shutter speed appropriate to the speed of the measurement object. Choose a faster shutter speed of the measurement object is moving quickly and the image is blurred.

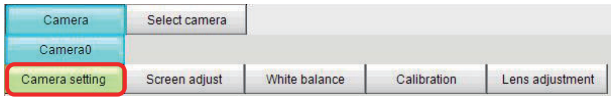
Adjust the camera gain when images cannot be brightened through the shutter speed, lens aperture, or lighting conditions. Usually, the factory default values can be used.

(Example)



[Factory defaults: 85]

1 In the Item Tab area, click [Camera setting].



2 In the "Camera settings" area, specify the shutter speed.

Setting item	Setting value [Factory default]	Description
Shutter speed	FHV7□-M004□/M016□/M032□/M050□/C004□/C016□/C032□/C050□ 1 to 100000 [µs] [2000] FHV7□-M063R□/M120R□/C063R□/C120R□ 500 to 100000 [µs] [2000]*1	The "Shutter speed" option varies depending on the camera model.

*1. Note that the shutter speed for FHV7□-M063R□/M120R□/C063R□/C120R□ is below.
Settable value on the screen: 1 [µs] step
Actual shutter speed: 7.79 [µs] step
The setting value on the screen is converted in the camera to a close value to it and reflected in the actual operation.

3 Specify the camera gain while checking the image.

Setting item	Setting value [Factory default]	Description
Gain	FHV7□-M004□/M016□/M032□/M050□/C004□/C016□/C032□/C050□ 0 to 240 [0] FHV7□-M063R□/M120R□/C063R□/C120R□ 0 to 180 [0]	Adjust the "camera gain" when the shutter speed, the lens aperture, and lighting conditions cannot be used to brighten the image. Usually, the factory default value can be used.

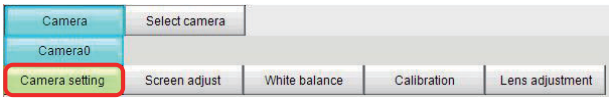
Precautions for Correct Use

- Due to the specifications of its maging elements, a CMOS camera generates stripe noises when the gain setting of the camera is raised. You may also find multiple defective pixels, but they do not represent a defect of failure of the product in any way. If stripe noises and defective pixels affect the measurement results, lower the gain setting of the camera.
- When performing defect inspection, keep the gain setting at a low value to suppress the influence of image noises.

Reverse Conversion

Set this option when reversing the camera image vertically or horizontally. Changing the order to read out from the imaging elements will not cause any delay in image transfer.

1 In the Item Tab area, click [Camera setting].



2 In the "Camera settings" area, specify the reverse conversion settings.

Setting item		Setting value [Factory default]	Description
Mirror an image	↑↓	• Checked • [Unchecked]	Place a check here when reversing the camera image vertically.
	←→	• Checked • [Unchecked]	Place a check here when reversing the camera image horizontally.

Reset Mode (for FHV7□-M063R□/FHV7□-C063R□ /FHV7□-M120R□/ FHV7□-C120R□ only)

This mode is used to capture moving objects.

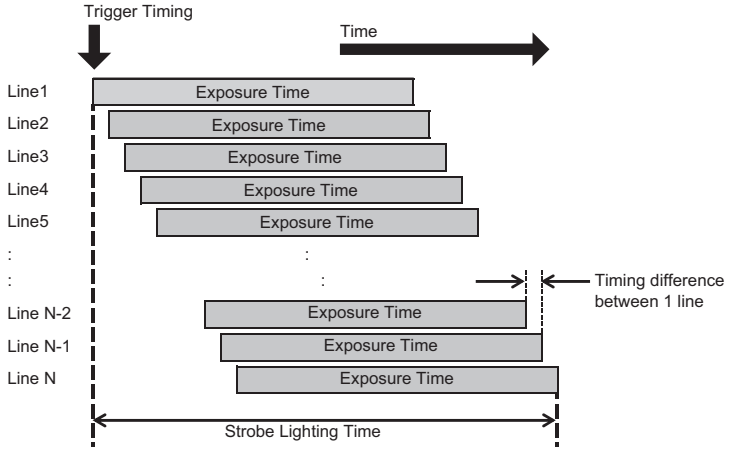
Setting item	Setting value [Factory default]	Description
Reset mode	• [Rolling shutter] • Global reset	Set the reset mode. • Rolling shutter Use this mode when capturing static objects. Usually, use this setting. • Global reset Use this mode when capturing moving objects.

Precautions for Correct Use

- FHV7□-M063R□/FHV7□-C063R□/FHV7□-M120R□/FHV7□-C120R□ are the rolling shutter cameras.
- The exposure timing and exposure time between lines varies depending on the reset mode setting.

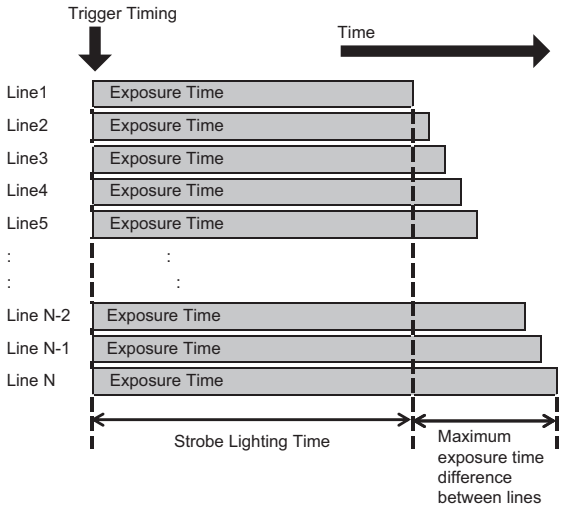
About Exposure Time of Rolling Shutter for Reset Mode

- Although the exposure start timing varies between lines, the exposure time length is the same between lines.
- As the exposure start timing differs, control the strobe lighting time from the start of exposure of Line 1 to the completion of the exposure of Line N.
- The rough estimation for the strobe lighting time is the difference between the exposure time + (the number of lines - 1) x 1 line timing.
- The number of lines depends on the number of lines to be read setting.



About Exposure Time of Global Reset for Reset Mode

- Although exposure for all lines starts at the same time, the exposure time length varies between lines.
- As the exposure time differs, control the strobe lighting time from the start of exposure of Line 1 to the completion of the exposure of Line 1.



Binning Settings (for Monochrome Camera - FHV□□-M016□□□ Only)

Binning is a function for obtaining a single value by adding multiple lines together.

In some case, this gives the effect of virtually raising the sensitivity of the brightness by combining multiple lines and another case the effect of increasing the frame rate by decreasing the amount of data to be transferred.

1 In the Item Tab area, click [Camera setting].

In the "Binning settings" area, select either "1 line" or "2 lines".

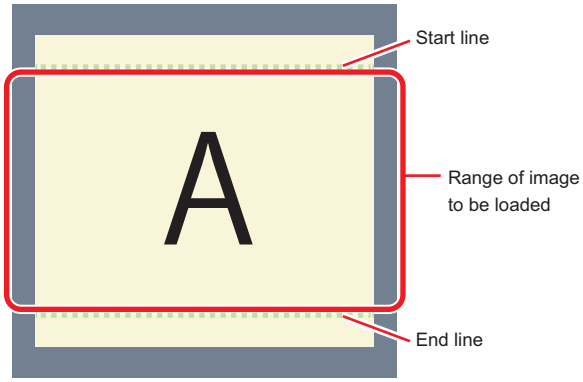
Setting item	Setting value [Factory default]	Description
Binning setting	• [1 line] • 2 lines	• 1 line Data is transferred line by line. • 2 lines Data is transferred two lines at a time. Each image is scanned skipping one scan line per two consecutive lines. Measurement precision is decreased because the image resolution in the vertical direction is lower.

Number of lines to be read

By narrowing the image range to be loaded, the image scan time can be shorted.

Set the range taking the offset of the measurement object into consideration.

The part of the image narrowed down by the start line and the end line will be displayed in the setting screen of the processing item window and the Image Display area of the Main screen.



Additional Information

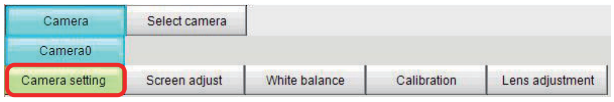
About the minimum number of lines

- For FHV7□-M004□/M016□/M032□/M050□/C004□/C016□/C032□/C050□, the minimum number of lines (minimum value between the start and end lines) is 3 lines.
- For FHV7□-M063R□/M120R□/C063R□/C120R□, the minimum number of lines is 3 lines.
- The step width from the start to end lines is 4 lines.

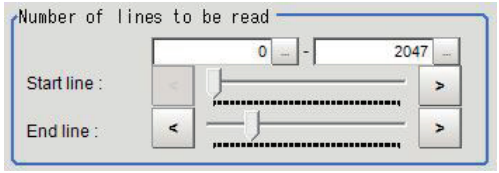
About coordinate values

- The coordinate values of the measurement results are the display position values on the monitor.
- The coordinate values will not vary with this setting.

1 In the Item Tab area, click [Camera setting].



2 Set the start/end lines in the "Number of lines to be read area".



Precautions for Correct Use

When using FHV7□-M063R□/M120R□/C063R□/C120R□, it may not possible to shorten the processing time.

Electronic Flash Settings

This function is set when an electronic flash is used. This sets the output conditions for the signal to synchronize the measurement and the electronic flash timing.

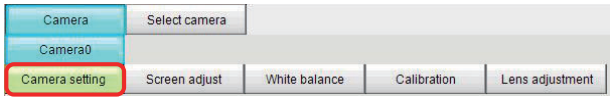
Precautions for Correct Use

The setting here applies when "STGOUT" is selected for the output signal in [Common settings] on the [Output signal settings] page of the camera accessed by selecting [External Tools] - [System].

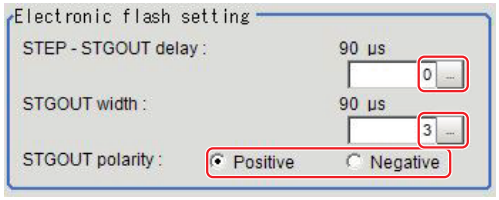
When "STGOUT" is selected, the signal is controlled by each setting value of "SHTOUT" for each line.

For details, refer to *Setting the SHTOUT Signal: [Output Signal Settings]" in the "Vision System FH/FHV/FZ5 Series User's manual (Z365)*.

1 In the Item Tab area, click [Camera setting].



2 In the "Electronic flash setting" area, specify each item.



Setting item	Setting value [Factory default]	Description
STEP-STGOUT delay	0 to 511 [0] (1 count: 30 [µs])	Set the waiting time from the time the STEP signal is input until the electronic flash trigger output signal comes ON. Delay time = Count × 30 µs + 90 µs The delay time varies depending on the polarity of "STGOUT pulse". The displayed time is for the positive polarity. Add 35 [µs] to the displayed time when the polarity is negative. The display time becomes within a range of ±10 [µs] to the setting value.
STGOUT width	0 to 43689 [3] (1 count: 30 [µs])	Set the output time for the electronic flash trigger signal. On the FH/FHV series Sensor Controller, if 0 is set, the electronic flash will not flash.
STGOUT polarity	• [Positive] • Negative	Select the pulse polarity of the electronic flash trigger. • Positive polarity Flashes synchronized with the timing of the electronic flash trigger output signal changing from OFF to ON. • Negative polarity Flashes synchronized with the timing of the electronic flash trigger output signal changing from ON to OFF.

Precautions for Correct Use

Do not perform next camera image input processing before STGOUT signal output is completed. If it were done, STGOUT signal may not be output. Perform camera image input processing after STGOUT signal output is completed or set the STEP-camera delay, STEP-STGOUT delay, and STGOUT pulse width properly so that the electronic flash flashes synchronizing with the exposure time.

1-3-4 Screen Adjustment Settings (Camera Image Input FHV)

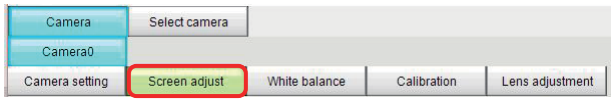
Set the lighting and lens conditions for each camera.

- *Lighting Control* on page 1-73
- *Line Bright* on page 1-85

Lighting Control

When an Electronic flash controller or Camera-mount Lighting controller is connected, the light volume of the lighting can be adjusted from the Sensor Controller. Moreover, selecting one of the preset patterns are also possible.

1 In the Item Tab area, click [Screen adjust].



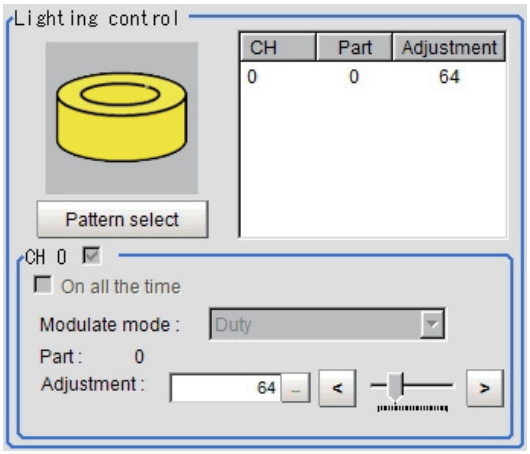
2 In the "Lighting selection" area, select a model of lighting to be used.

Setting item	Setting value [Factory default]	Description
Select	• [Internal lighting] • External lighting	Select a lighting used in the unit.

3 In the "Lighting control" area, specify the brightness.

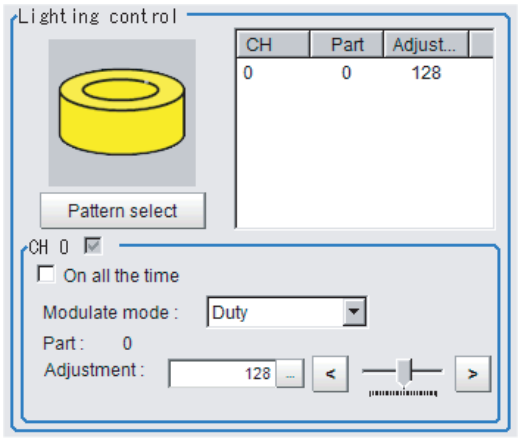
Displayed contents vary depending on the connected camera, electronic flash controller, or camera-mount lighting controller.

● Camera-mount Lighting Controller FL-TCC1 is connected



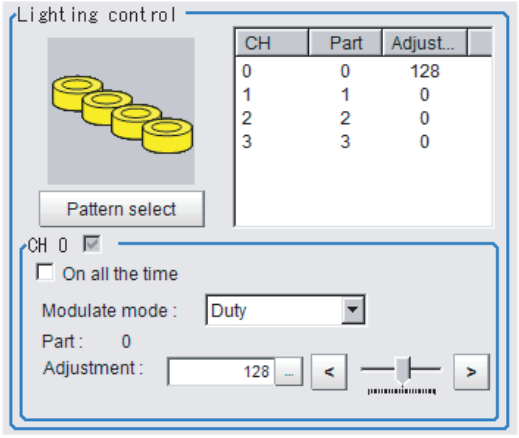
Setting item	Setting value [Factory default]	Description
Pattern select	---	Select one of the preset lighting patterns.
Part	0 to 255 [64]	Set the brightness for the selected parts.

● Camera-mount Lighting Controller FLV-TCC1 is connected



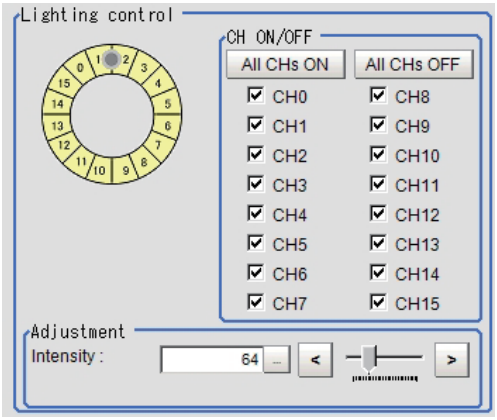
Setting item	Setting value [Factory default]	Description
Pattern select	---	Select one of the preset lighting patterns.
On all the time	• Checked • [Unchecked]	Place a check here to keep the lighting turned ON all of the time regardless of the exposure time.
Modulate mode	• [Duty] • Voltage/Current	Select the lighting adjustment method. • Duty The light emitting volume is adjusted with a pulse width of 255 (PWM frequency: 100 kHz). • Voltage/Current The light emitting volume is adjusted with voltage/current levels of 255. Select voltage/current adjustment when using this with a highspeed shutter speed.
Part	0 to 255 [64]	Set the brightness for the selected parts.

● Camera-mount Lighting Controller FLV-TCC4 is connected



Setting item	Setting value [Factory default]	Description
Pattern select	---	Select one of the preset lighting patterns.
On all the time	• Checked • [Unchecked]	Place a check here to keep the lighting turned ON all of the time regardless of the exposure time.
Modulate mode	• [Duty] • Voltage/Current	Select the lighting adjustment method. • Duty The light emitting volume is adjusted with a pulse width of 255 (PWM frequency: 100 kHz). • Voltage/Current The light emitting volume is adjusted with voltage/current levels of 255. Select voltage/current adjustment when using this with a highspeed shutter speed.
Part	0 to 255 [64]	Set the brightness for the selected parts.

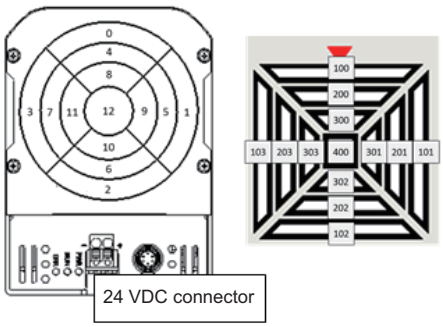
● Camera-mount Lighting Controller FL-TCC1PS is connected



Setting item	Setting value [Factory default]	Description
CH ON/OFF	• Checked • [Unchecked]	Control all channels together.
CH0 to CH15	• Checked • [Unchecked]	Specify a channel to be adjusted.
Intensity	0 to 255 [64]	Set light intensity of the selected channel.

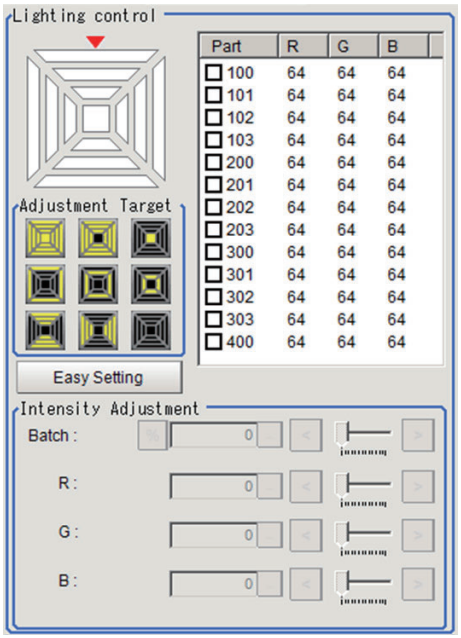
● Camera-mount Lighting Controller FL-MD ☐ MC is connected

Set the lighting direction, lighting color, and emitting intensity.



Pats of the lighting controller are composed of 13 channels (part: 100 to 103, 200 to 203, 300 to 303, and 400), the emitting intensity in each channel can be specified with RGB and 128 gradations.

- Screen Configuration



Setting item	Setting value [Factory default]	Description
Schematic diagram	---	Display a number for the part corresponding to the product. The displayed color differs from the emitting lighting color. Combining ON/OFF of R,G,B LEDs illuminates color of red, green, blue, yellow, magenta, cyan, white, gray (all OFF).
Adjustment target selection	• All • Dome • Coaxial • Upper • Middle • Lower • Vertical • Horizontal • [None]	Select the adjustment target. • All: All parts • Dome: Part 100 to 303 • Coaxial: Part 400 • Upper: Part 300 to 303 • Middle: Part 300 to 203 • Lower: Part 100 to 103 • Vertical: Part 100, 102, 200, 202, 300, 302 • Horizontal: 101, 103, 201, 203, 301, 303 • None: Clear all selection

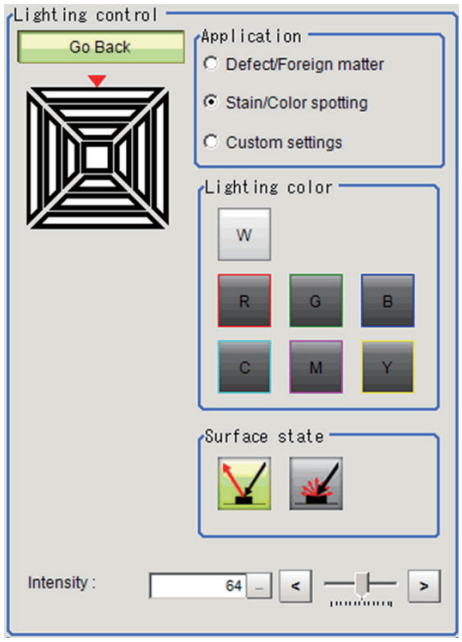
Setting item	Setting value [Factory default]	Description
Easy setting button	---	Use this when performing settings according to an application, lighting irradiation pattern, and a condition of the measurement object (defect direction and surface state).
Part selection	• 100 to 103 • 200 to 203 • 300 to 303 • 400 • [Unchecked]	Select one or more parts to set the emitting intensity of each color. Set the selected parts in the "Intensity Adjustment" area below.
Intensity Adjustment	0 to 127 [64]	Set the color and light intensity of the selected target. For the selected part, % setting is also available. The time of clicking the [%] button is the reference.

● Setting the Lighting Conditions with Easy Setting

The prepared options make the settings easier.

1 Click the [Easy Setting].

The following screen is displayed.

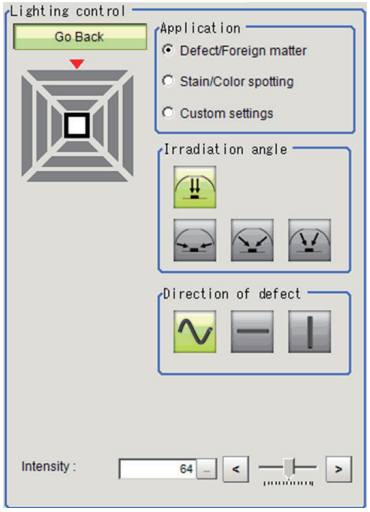


2 Set application, lighting colors, and surface conditions.

The displayed items depend on applications.

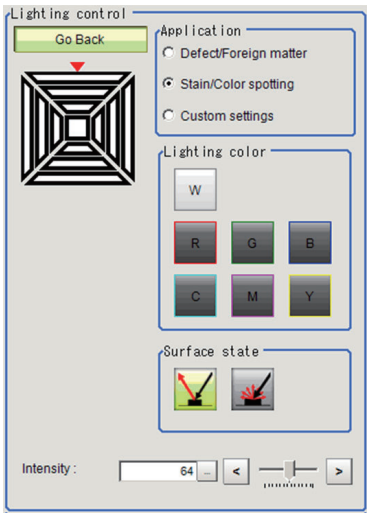
- Defect/Foreign matte

  Select the irradiation angle and defect direction. Adjust the emitting intensity as necessary.



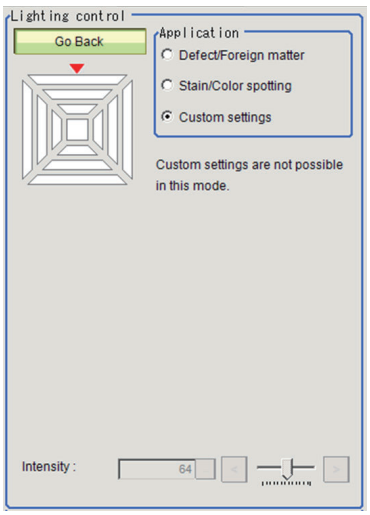
- Stain/Color spotting

  Select the lighting color and surface conditions. Adjust the emitting intensity as necessary.



- Custom settings

  This screen is displayed when clicking [Easy Setting] after detailed settings for each part.

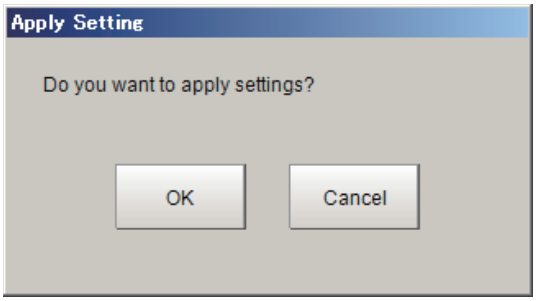


Setting item	Setting value [Factory default]	Description
Application	• Defect/Foreign matter • [Staing/Color spotting] • Cutom settings	Select an application. • Defect/Foreign matter Select this to detect unevenness. Specify the irradiation angle and defect direction with the following options. • Angle: [Coaxial], upper, middle, lower • Direction: [Any], horizontal, vertical • Stain/Color spotting: Select this to detect color differences. Specify the lighting color and surface state with the following options. • Color: [W], R, G, B, Y, M, C • Surface state: [Specular reflection], diffuse reflection • Custom settings: In this screen, the setting is disabled. This becomes a selected state when switched to this screen after detailed settings were done.
Irradiation angle (for Defect/Foreign matter)	• [Coaxial] • Lower • Middle • Upper	Select the irradiation angle for lighting. • Coaxial: Part 400 • Lower: Part 100 to 103 • Middle: Part 200 to 203 • Upper: Part 300 to 303
Direction of defect (for Defect/Foreign matter)	• [Any] • Horizontal • Vertical	Select the direction of a defect to detect.
Lighting color (for Stain/Color spotting)	• [W] • R • G • B • Y • M • C	Select the lighting color.
Surface state (for Stain/color spotting)	• [Specular reflection] • Diffuse reflection	Select the surface state of an object to detect. • Secular reflection: Part 100 to 303, and 400. • Diffuse reflection: Part 100 to 303
Intensity	0 to 127 [64]	Adjust the emitting intensity.

3 Click [Go Back].

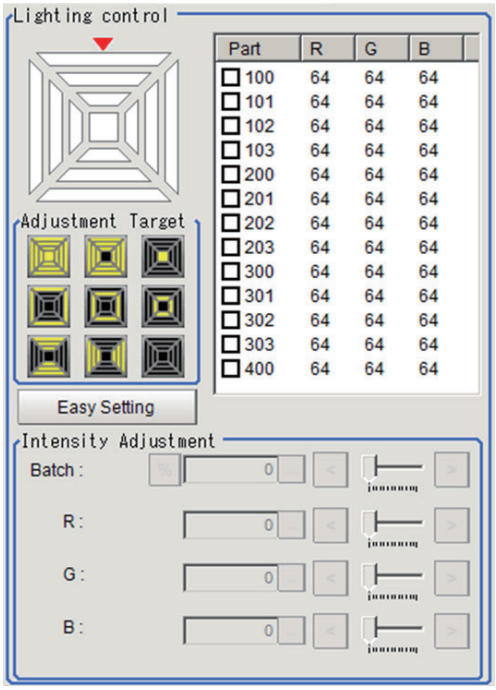
The Apply Setting dialog is displayed.

Clicking the [OK] button is to apply the setting. Clicking the [Cancel] button discards the changes and returns to the Main window.

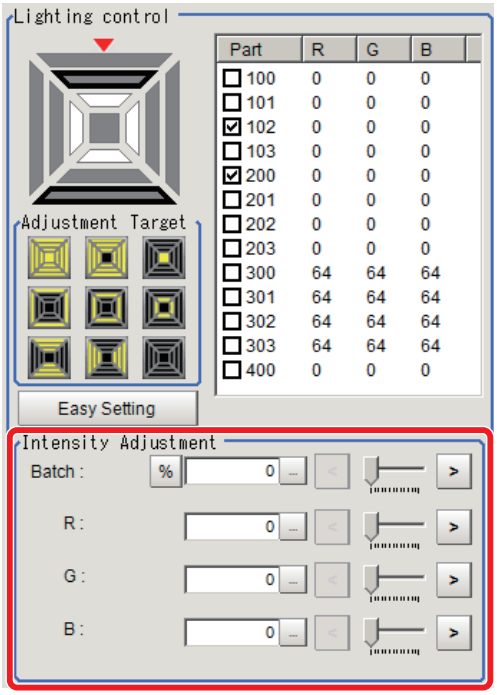


Setting the Lighting Conditions in detail per Part

When setting each part in detail, select a part and adjust the emitting intensity.



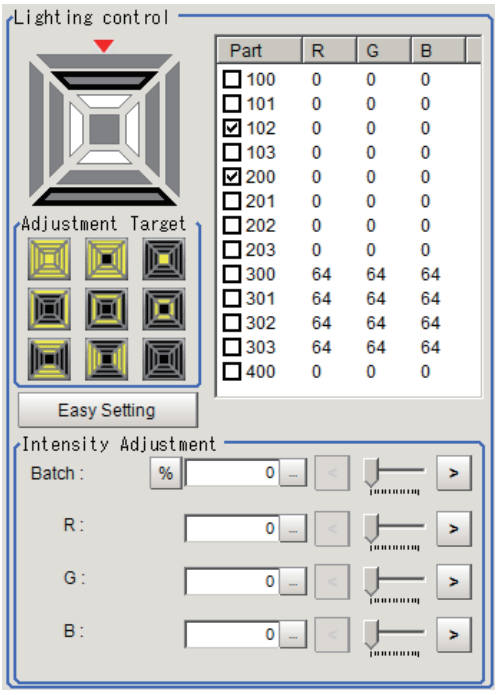
1 Place a check to the target part. When adjusting parts simultaneously, place a check to multiple parts.



2 Adjust the emitting intensity.

When adjusting all of R, G, B simultaneously, use the "Batch".

For the selected part(s), setting with % unit is also available.



Precautions for Correct Use

- There is no restriction on power consumption nor on emitting mode when using lighting with lighting controller FLV-TCC1EP.
- Restictions on power consumption and emitting mode vary depending on your product. See the following table for details.

(1) FLV-TCC4/TCC1

- **Without external power supply**

Total power consumption	Power consumption per channel	Connectability	Lighting mode *1			READY OFF time delay *1
			Always on	simultaneous	Single	
Grater than 7.5 W	Greater than 7.5 W	Not connectable	---	---	---	---
	7.5 W or less	Connectable	NA	NA	OK	None
7.5 W or less	Less than 7.5 W	Connectable	OK	OK	OK	None

- **With external power supply**

Total power consumption	Power consumption per channel	Connectability	Lighting mode *1			READY OFF time delay *1
			Always on	simultaneous	Single	
Greater than 15 W	Greater than 15 W	Not connectable	---	---	---	---
	15 W or less	Connectable	NA	NA	OK	Yes
	7.5 W or less	Connectable	NA	NA	OK	None
15 W or less	Less than 15 W	Connectable	NA	OK	OK	Yes
	7.5 W or less	Connectable	NA	OK	OK	Yes
7.5 W or less	Less than 7.5 W	Connectable	OK	OK	OK	None

(2) FLV-TCC3HB

- **Without external power supply**

0ch (spot lighting) not connected

Total power consumption (1ch/2ch)	Power consumption per channel	Connectability	Lighting mode *1			READY OFF time delay *1
			Always on	simultaneous	Single	
Greater than 7.5 W	Greater than 7.5 W	Not connectable	---	---	---	---
	7.5 W or less	Connectable	NA	NA	OK	None
7.5 W or less	Less than 7.5 W	Connectable	OK	OK	OK	None

0ch (spot lighting) connected

Total power consumption (1ch/2ch)	Power consumption per channel	Connectability	Lighting mode *1			READY OFF time delay *1
			Always on	simultaneous	Single	
Greater than 5.5 W	Greater than 7.5 W	Not connectable	---	---	---	---
	7.5 W or less	Connectable	NA	NA	OK	None
5.5 W or less	Less than 5.5 W	Connectable	OK	OK	OK	None

- **With external power supply**

0ch (spot lighting) not connected

Total power consumption (1ch/2ch)	Power consumption per channel	Connectability	Lighting mode *1			READY OFF time delay *1
			Always on	simultaneous	Single	
Greater than 15 W	Greater than 15 W	Not connectable	---	---	---	---
	15 W or less	Connectable	NA	NA	OK	Yes
	7.5 W or less	Connectable	NA	NA	OK	None
15 W or less	Less than 15 W	Connectable	NA	OK	OK	Yes
	7.5 W or less	Connectable	NA	OK	OK	Yes
7.5 W or less	Less than 7.5 W	Connectable	OK	OK	OK	None

0ch (spot lighting) connected

Total power consumption	Power consumption per channel	Connectability	Lighting mode *1			READY OFF time delay *1
			Always on	simultaneous	Single	
Greater than 14 W	Greater than 15 W	Not connectable	---	---	---	---
	15 W or less	Connectable	NA	NA	OK	Yes
	7.5 W or less	Connectable	NA	NA	OK	None
14 W or less	Less than 14 W	Connectable	NA	OK	OK	Yes
	7.5 W or less	Connectable	NA	OK	OK	Yes
7.5 W or less	Less than 7.5 W	Connectable	OK	OK	OK	None

*1. Lighting mode

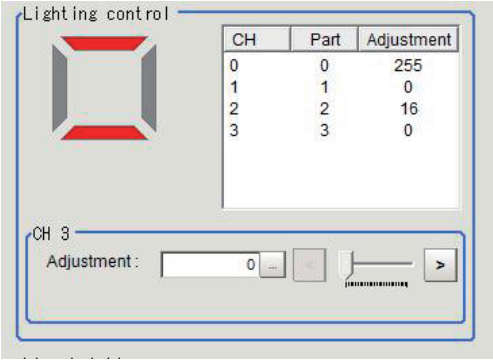
Always-on lighting mode	The lighting is always turned on by a constant pulse cycle. This mode is enabled when placing a check in the "On all the time" in the "Lighting control" area.
Simultaneous lighting mode	All lighting connected is synchronously turned on with the trigger. Set the "Adjustment" in the "Lighting control" area for each lighting to any value other than 0.
Single lighting mode	Only one lighting is synchronously turned on with the trigger. Set the "Adjustment" of one part in the "Lighting control" area to any value other than 0. When two or more channels are set to any value other than 0, the lighting will not be turned on.

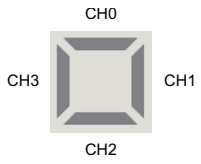
- READY OFF time delay

  The turning OFF time for the READY signal will be delayed for approximately the exposure time compared to no camera-mount lighting controller connected.

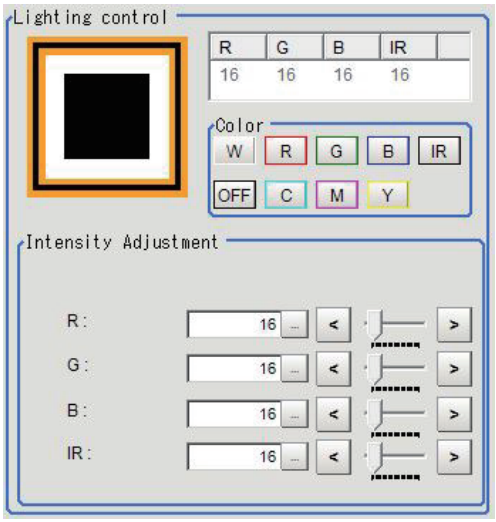
  (Example) Connection example for connecting an external power supply, and the lighting modes.
  - When four lighting with a power consumption of 1 W each are connected to a camera-mount lighting controller, all lighting modes (Always-on, Simultaneous, and Single) are available.
  - When four lighting with power consumptions of 2 W, 3 W, 4 W, and 5 W each are connected to a camera-mount lighting controller, two lighting modes (Simultaneous and Single) are available.
  - When four lighting with power consumptions of 12 W, 1 W, 2 W, and 1W each are connected to a camera mount lighting controller, Single lighting mode is only available.

● Internal Lighting: FHV-LTM-R, FHV-LTM-W, and FHV-LTM-IR are connected



Setting item		Setting value [Factory default]	Description
Schematic diagram		---	Display the lighting state. Channels with 0 setting value are displayed in gray. Channels with 1 or more setting value are displayed in the following color. • FHV-LTM-R: Red • FHV-LTM-W: White • FHV-LTM-IR: Orange
CH0 to CH3	Adjustment	0 to 255 [16]	Adjust setting values of channels selected in the list. 

● Internal Lighting, FHV-LTM-MC is connected



Setting item	Setting value [Factory default]	Description
Schematic diagram	---	Display the light status. Displayed color varies depending on each setting value.
Color		Set the preset value for each button: R (Red), G (Green), B (Blue), IR (IR).
W button (White)	• R: 50 • G: 50 • B: 50 • IR: 0	
R button (Red)	• R: 255 • G: 0 • B: 0 • IR: 0	
G button (Green)	• R: 0 • G: 255 • B: 0 • IR: 0	
B button (Blue)	• R: 0 • G: 0 • B: 255 • IR: 0	
IR button (IR)	• R: 0 • G: 0 • B: 0 • IR: 255	
C button (Cyan)	• R: 0 • G: 100 • B: 100 • IR: 0	
M button (Magenta)	• R: 100 • G: 0 • B: 100 • IR: 0	
Y button (Yellow)	• R: 100 • G: 100 • B: 0 • IR: 0	
OFF button	• R: 0 • G: 0 • B: 0 • IR: 0	

Setting item		Setting value [Factory default]	Description
Intensity		---	Set the emitting intensity individually.*1*2 An error will appear if an improper value is entered to set. In that case, please change the value.
	R	0 to 255 [16]	Set a value for R (red).
	G	0 to 255 [16]	Set a value for G (green).
	B	0 to 255 [16]	Set a value for B (blue).
	IR	0 to 255 [16]	Set a value for IR (IR).

*1. An error will appear if an improper value is entered to set. In that case, please change the value.

*2. As it is hard to fine-tune by the slider, so the maximum setting may not be possible.When an error occurred after moving the slider, use the button to fine-tune.

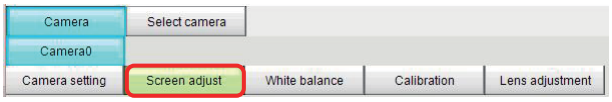
Additional Information

Lighting directions of the internal lighting FHV-LTM-MC cannot be controlled unlike the single color lighting (FHV-LTM-R, FHV-LTM-W, and FHV-LTM-IR). All lighting is only turned on or off.

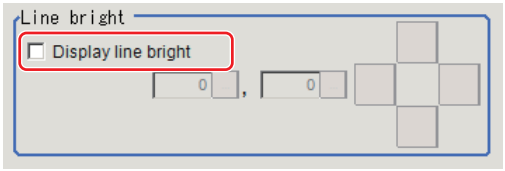
Line Bright

A graph showing gray distribution for one line in the image is called the "Line bright". Each line bright corresponding to R, G, B for any line in horizontal and vertical directions is displayed.

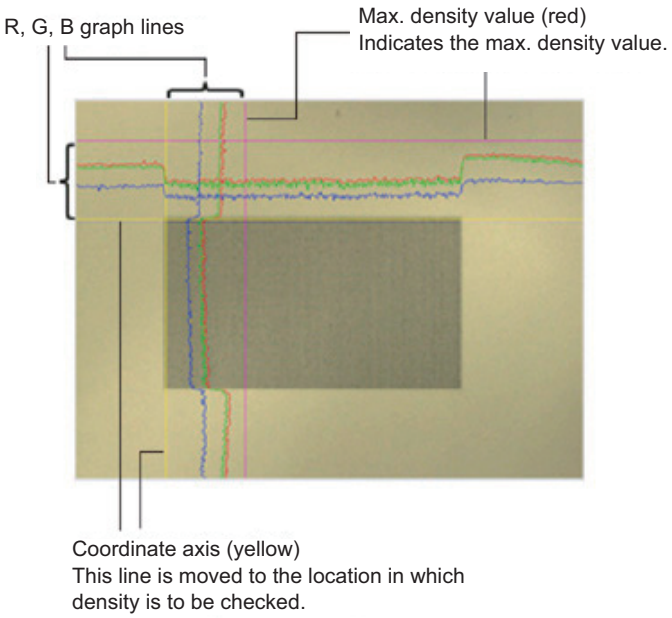
1 In the Item Tab area, click [Screen adjust].



2 Place a check to the "Display line bright".



3 Move the line to a position whose deinsity distribution is desired to see.



1-3-5 White Balance (Camera Image Input FHV)

This feature compensates the color of images loaded from a camera and sets the white balance to make white objects look white.

By adjusting the white balance, proper white color is reproduced with any type of lighting.

Moreover, optimum values can also be set automatically.

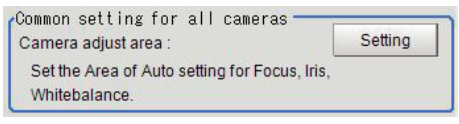
Additional Information

- The white balance setting is only available when a color camera is used.
- In the following cases, make sure to set the white balance.
  - Newly installed
  - A camera or lighting is changed
    Since measurement results may vary with changes in the white balance settings, make sure to verify the operation.

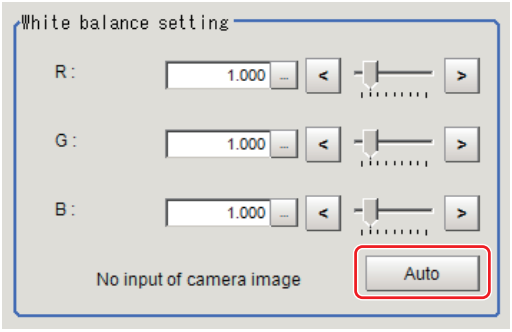
1 In the Item Tab area, click the [White balance].

2 Shoot a white piece of paper or cloth.

3 Set the "Camera adjust" in the "Common setting for all cameras".



4 Click the [Auto].



Additional Information

When the [Too bright] or [Too dark] message is displayed, adjust the iris, shutter speed, gain and/or lighting conditions until [Automatic adjustment is possible]. is displayed.

5 Set the "R", "G", and "B" values as necessary.

Setting item	Setting value [Factory default]	Description
White balance setting • R • G • B	0.001 to 7.999 [1] (R, G, B respectively)	Set the white balance. Increasing the values of "R", "G", and "B" increases whiteness.

1-3-6 Calibration (Camera Image Input FHV)

By setting the calibration, the measurement result can be converted and output as actual dimensions.

The calibration method is selected here.

There are three calibration methods, point, sampling, and parameter.

- *Specifying Points and Setting (Point Specification)* on page 1-88
- *Setting Calibration through Sampling Measurement (Sampling)* on page 1-90
- *Inputting and Setting Vaules (Numerical Value Specification)* on page 1-91
- *View Calibration Parameters* on page 1-93

Additional Information

For outputting measurement values in actual dimensions, select the [Calibration] in the [Output parameter] for each processing unit to "ON". When the [Calibration] is "OFF" (factory default), then measurement values are output as camera image coordinates.

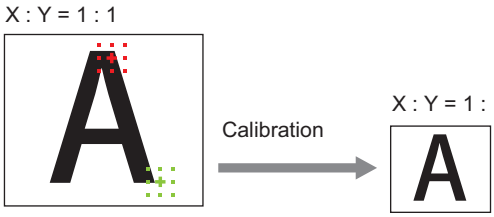
Specifying Points and Setting (Point Specification)

This is a method for performing calibration by selecting arbitrary points (in pixels).

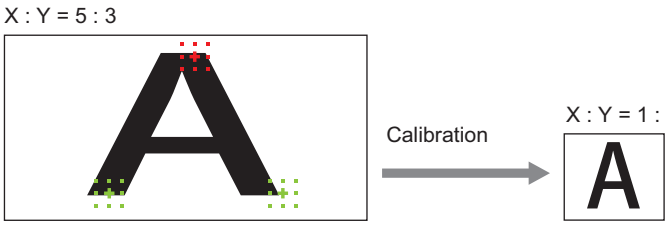
Calibration parameters are automatically calculated by entering actual coordinates of selected positions.

Up to three points are possible to select.

- When the magnification of X and Y directions is the same:
  Select two points.



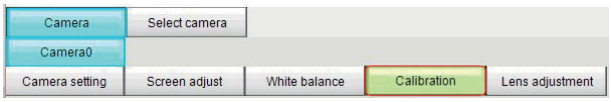
- When the magnification of X and Y directions is not the same:
  Select three points.



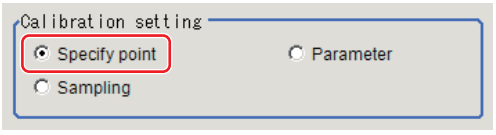
Additional Information

When two points are selected, the coordinate system is set to the left-handed system (clockwise). When performing the calibration including the coordinate system, select three points.

1 In the Item Tab area, click the [Calibration].

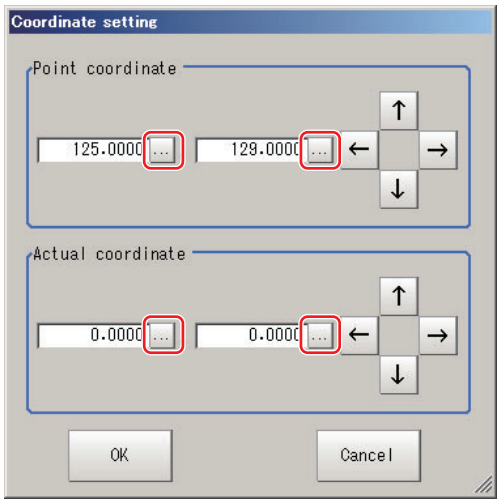


2 In the "Calibration setting" area, select the "Specify point".



3 Click the first point on the screen.

4 Set the actual coordinates for the specified point.

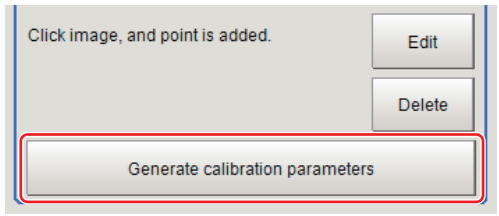


Setting item	Setting value [Factory default]	Description
Point coordinate X, Y	0 to 9999.9999 [Point clicked in the window]	---
Actual coordinate X, Y	-99999.9999 to 99999.9999 [0]	---

5 Set the second and third points in the same way.

6 Click the [Generate calibration parameters].

The calibration parameters will be generated.

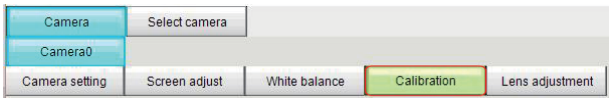


Setting Calibration through Sampling Measurement (Sampling)

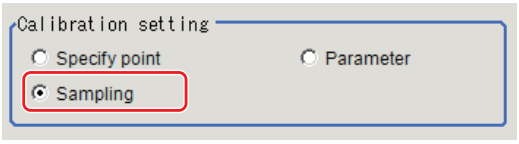
This is a method for setting calibration based on measurement results.

Calibration parameters are automatically calculated by searching a registered model and setting the actual coordinate of the position.

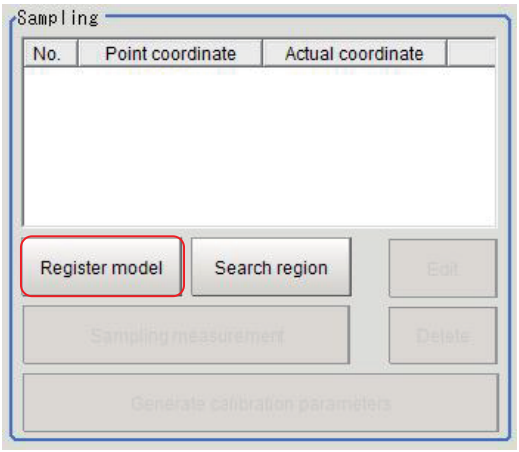
1 In the Item Tab area, click the [Calibration].



2 In the "Calibration setting" area, select the "Sampling".



3 In the "Sampling" area, click the [Register model].



4 Register the model with the Drawing tools.

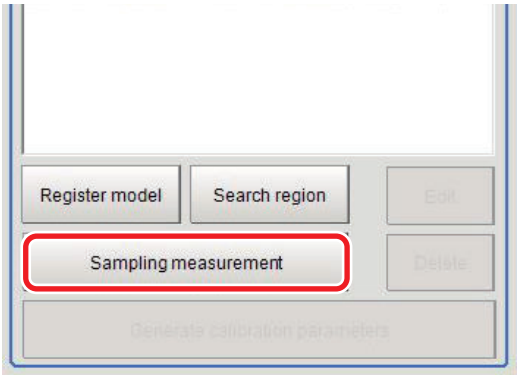
5 Set a search region as necessary.

The initial value is the entire screen.

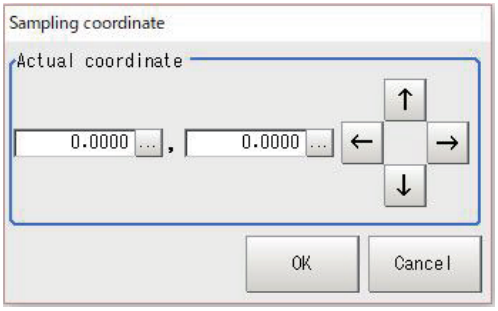
6 Click the [Sampling measurement].

Measurement is performed.

The search result (cross cursor) is displayed in the Image Display area and the Sampling Coordinate window is displayed.

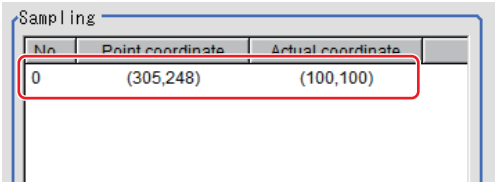


7 In the Sampling Coordinate window, set the X and Y values.



8 Click [OK].

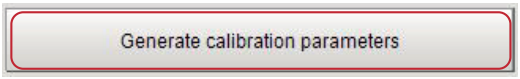
The point coordinates and actual coordinates are registered in the Sampling area.



9 Move the measurement object and repeat the step 3 to 8.

10 Click the [Generate calibration parameters].

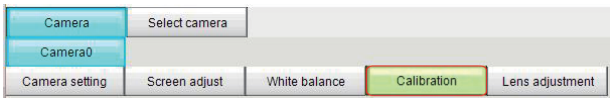
The calibration parameters will be generated.



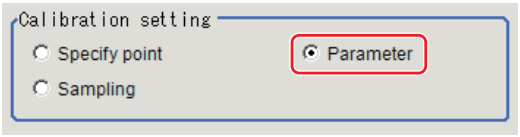
Inputting and Setting Vaules (Numerical Value Specification)

Set calibration data directly with numerical values.

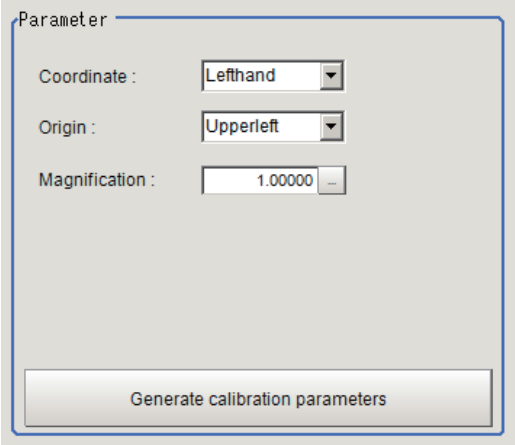
1 In the Item Tab area, click the [Calibration].

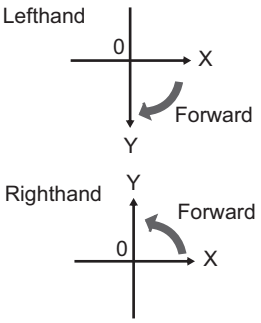
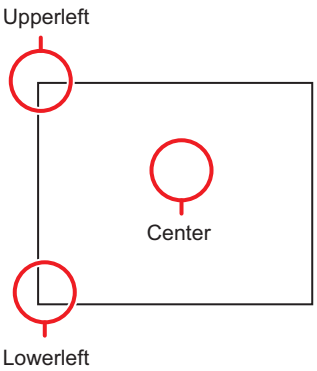


2 In the "Calibration setting" area, select the "Parameter".



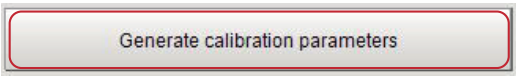
3 In the "Parameter" area, specify values for "Coordinate", "Origin", "Magnification".



Setting item	Setting value [Factory default]	Description
Coordinate	• [Lefthand] • Righthand	• Lefthand The clockwise is forwad when setting the coordinates. • Righthand Counter-clockwise is forward when setting the coordinates. 
Origin	• [Upperleft] • Lowerleft • Center	Set the origin of the actual coordinates. 
Magnification	0.00001 to 9.99999	Specify the ratio of one pixel to the actual dimentions.

4 Click the [Generate calibration parameters].

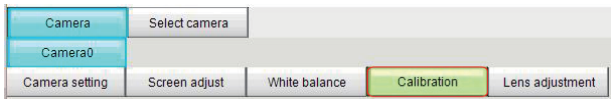
The calibration parameters will be generated.



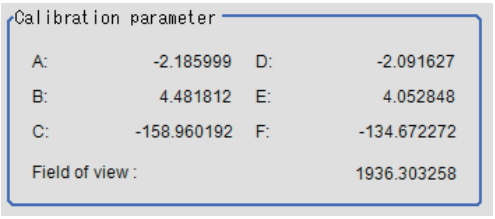
View Calibration Parameters

View the set calibration data.

1 In the Item Tab area, click the [Calibration].



2 In the "Calibration parameter" area, confirm the calibration data.



Setting item	Setting value	Description
A	Calculation value	These are calibration conversion values. Camera coordinates are converted to actual coordinates based on these values. The conversion formulas for actual coordinates are as follows: (X, Y): Measurement point (camera coordinates), Unit: pixel (X', Y'): Conversion point (actual coordinates) X' = A×X + B×Y + C Y' = D×X + E×Y + F
B	Calculation value	
C	Calculation value	
D	Calculation value	
E	Calculation value	
F	Calculation value	
Field of view	Calculation value	An actual dimension in the X direction.

1-3-7 Lens Adjustment (Camera Image Input FHV)

Adjust the focus of a lens module.

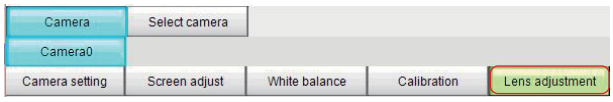
Adjust the lens so that the focus evaluation value is as high as possible.

- *Lens Adjustment Settings* on page 1-94
- *Lens Adjustment* on page 1-95

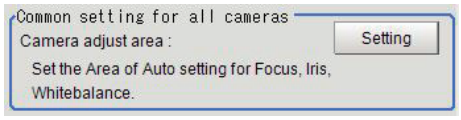
Lens Adjustment Settings

Set the focus of a lens module.

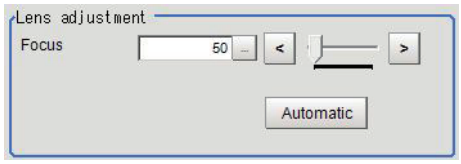
1 In the Item Tab area, click [Lens adjustment].



2 In the "Common setting for all cameras" area, set the "Camera adjust area".



3 In the "Lens adjustment" area, specify a value for the "Focus".



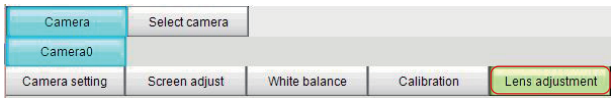
Setting item	Setting value [Factory default]	Description
Focus	FHV-LEM-S06: 26 to 260 [50] FHV-LEM-S09: 18 to 480 [50] FHV-LEM-S12: 47 to 815 [50] FHV-LEM-S16: 10 to 685 [50] FHV-LEM-S25: 37 to 885 [50]	Set the focus value.
Automatic	---	This is used to set the focus value automatically. (Autofocus) *1 Set the "Focus automatically" to the "Camera adjust" area in the "Common setting for all cameras".

*1. As it is hard to fine-tune by the slider, so the maximum setting may not be possible.When an error occurred after moving the slider, use the button to fine-tune.

Lens Adjustment

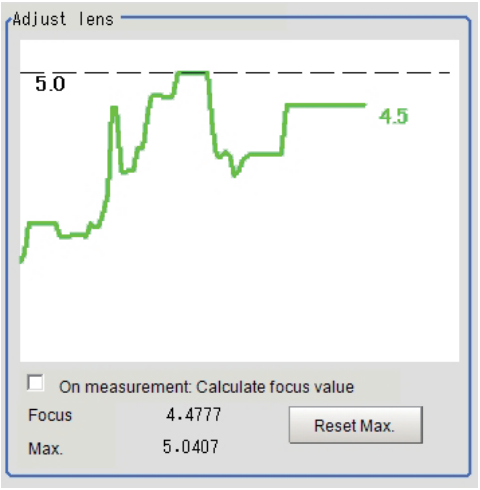
Check the focus adjusting state using a focus evaluation value.

1 In the Item Tab area, click [Lens adjustment].



2 In the "Lens adjustment" area, check the focus evaluation value.

The history of the focus evaluation value for captured images are graphed.



Setting item	Setting value [Factory default]	Description
On measurement: Calculate focus value	• Checked • [Unchecked]	Set Whether or not to calculate the focus evaluation value at measurements. • Checked: Calculate • Unchecked: Not calculate
Focus	---	Display the focus evaluation value for the latest captured image.
Max.	---	Display the maximum focus evaluation value so far.
Max. reset	---	Use this when clearing the history of focus evaluation values so far.

1-3-8 External Reference Tables (Camera Image Input FHV)

No.	Data name	Data ident	Set/Get	Data range
None	Internal light brightness	internalLightGain	Set/Get	The brightness for each part is expressed in hexadecimal. Part 0 to Part 4 values in order from left to right. Example: ffffffff when light brightness for Part 0 to Part 3 is set to 255(ff).
None	Internal light model	internalLightModelInfo	Set/Get	Model and type of Internal light, Serial No., Hardware version
None	Lens model	lensModelInfo	Set/Get	Model and type of Lens module, Serial No., Hardware version
None	Select light	lightMode	Set/Get	Select light 0: External light 1: Internal light
None	Modulate mode	lightGainMode	Set/Get	It expresses the dimming method of each Part by the sum of 4 bit units. 0: Duty 1: Voltage/Current Example: When Part 0, Part 2, Part 5 are set to Voltage/Current, 1048833
None	Lighting control (Site List)	lightGainN	Set/Get	A representation of a lighting brightness of each Part in hexadecimal. A value of Part 0 ~ Part 7 from left to right. Example: If the illumination brightness of Part 0 ~ Part 3 was in 255 (ff), ffffffff00000000
None	On all the time	alwaysLight	Set/Get	0: OFF 1: ON
None	CH	lightEnabledChannel	Set/Get	0: OFF 1: ON
None	Calculate focus at measurement	enableFocusEvaluation	Set/Get	Calculate focus at measurement 0: Disable 1: Enable
None	Calibration parameter	calibParameter	Set/Get	"," Separated by a A B C D E F
None	focus evaluation	focusEvaluation0	Get only	focus evaluation
None	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
None	Focus	focus	Set/Get	
None	Zoom	zoom	Set/Get	
None	White balance	whiteBalance	Set/Get	"," Separated by R G B
None	Iris	iris	Set/Get	
None	STGOUT polarity	pulsePolarity	Set/Get	0: Negative 1: Positive

No.	Data name	Data ident	Set/Get	Data range
None	Gain	gain	Set/Get	
None	Shutter speed	exposureTime	Set/Get	
None	Mirror an image (←→)	reverseX	Set/Get	0: OFF 1: ON
None	Mirror an image (↑↓)	reverseY	Set/Get	0: OFF 1: ON
None	Transfer image	cameraMask	Set/Get	Bit sum of the camera does not transfer 1: camera0 2: camera1 4: camera2 8: camera3 16: camera4 32: camera5 64: camera6 128: camera7
None	Camera No.	cameraNo	Set/Get	
None	Camera model	cameraModel	Set/Get	Connectable camera model name
None	Iris base density	irisDensity	Set/Get	
None	End line	endY	Set/Get	
None	Start line	startY	Set/Get	
None	STGOUT width	pulseWidth	Set/Get	
None	STEP - STGOUT delay	strobeDelay	Set/Get	
None	Multi-slope (slider)	multiSlopeKneePoint	Set/Get	
None	Multi-slope (Enabled)	multiSlopeMode	Set/Get	0: OFF 1: ON
None	Binning setting	binningY	Set/Get	0: One line 1: Two line
None	Reset Mode	shutterResetMode	Set/Get	0: Rolling Shutter 1: Global Reset

1-4 Camera Image Input HDR

This processing item can not be used in the FHV series.

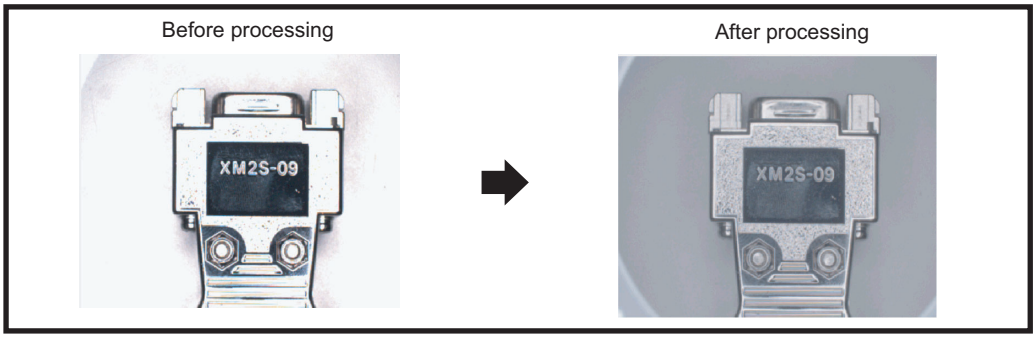
You can acquire a wide dynamic range image by combining images photographed consecutively at different shutter speeds.

With objects that generate halation, images with low-contrast, and environments with fluctuation in the lighting, this processing item is an effective substitute for camera image input.

Used in the Following Case

- To acquire stable images of objects for which halation occurs easily

Used to obtain images with a wide dynamic range in which dark areas are made brighter (text areas) and bright areas are made darker (connector areas).



- To measure images with low-contrast stably
  Use high-contrast mode.

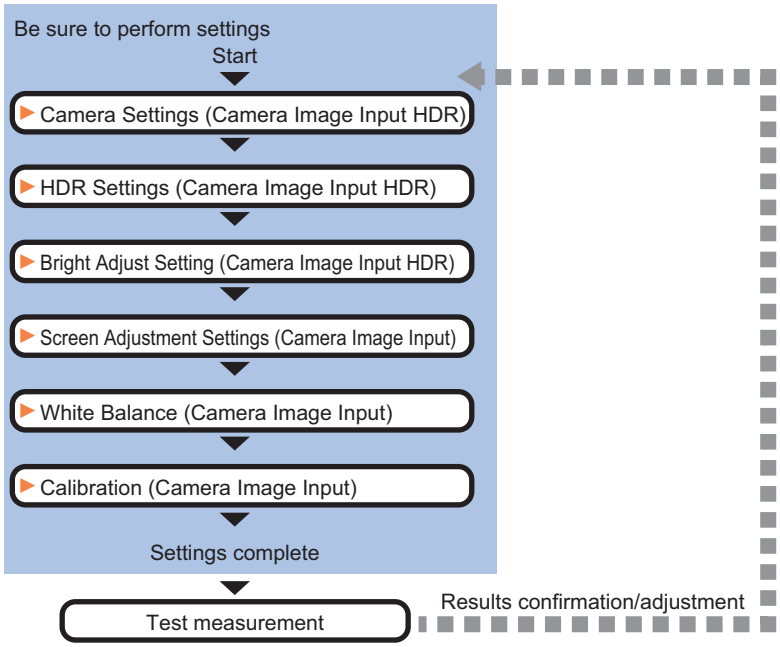
Important

- [Camera Image Input] is preset for Unit 0. Do not set any processing item other than camera image input (camera image input HDR, camera image input HDR Lite, camera image input FH) for Unit 0.
- Immediately after starting up the FH/FHV/FZ5 Sensor Controller and immediately after changing scenes, there will be no input image. No input image is processed as the same color image as in the factory default state.
- If you open the Properties Dialog Box before inputting an image, click the Cancel button to close the dialog box. Pressing the OK button in the dialog box will change the setting to the same color camera setting as the factory default setting.

For details, refer to *FAQ For Measurement The measurement NG (image mismatch) error will result when connecting a monochrome camera* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

1-4-1 Settings Flow (Camera Image Input HDR)

To set camera image input HDR, follow the steps below.



Camera Image Input HDR Item List

Item name	Description
Camera setting	Specify the camera settings such as the electronic flash. The setting method is the same as for [Camera Image Input]. Please check it. Refer to *1-4-2 Camera Settings (Camera Image Input HDR)* on page 1-100.
HDR setting	Carry out the image combination and photography settings. Refer to *1-4-3 HDR Settings (Camera Image Input HDR)* on page 1-104.
Bright adjust	Specify the brightness follow-up adjustment setting. Refer to *1-4-4 Bright Adjust Setting (Camera Image Input HDR)* on page 1-105.
Screen adjust	Adjust the lighting and the lens. The setting method is the same as for [Camera Image Input]. Please check it. However, the iris cannot be adjusted. Refer to *1-1-4 Screen Adjustment Settings (Camera Image Input)* on page 1-12.
White balance	When using a color camera, adjust the white balance. The setting method is the same as for [Camera Image Input]. Please check it. Refer to *1-1-5 White Balance (Camera Image Input)* on page 1-20.
Calibration	Set when measurements (camera coordinate measurement values) are to be output using actual dimensions. Select the calibration setting method and generate the calibration parameters. The setting method is the same as for [Camera Image Input]. Please check it. Refer to *1-1-6 Calibration (Camera Image Input)* on page 1-21.
Camera model	The camera model currently connected can be checked. Refer to *1-4-5 Camera Model(Camera Image Input HDR)* on page 1-106.

1-4-2 Camera Settings (Camera Image Input HDR)

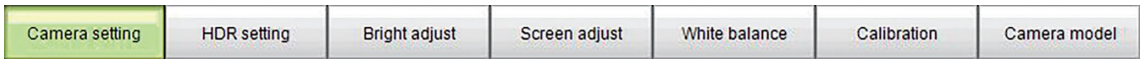
Set the following photographing conditions.

- Refer to *Selection Setting* on page 1-100.
- Refer to *Camera Settings* on page 1-100.
- Refer to *Number of lines to be read* on page 1-10.
- Refer to *Electronic Flash Setting* on page 1-102.

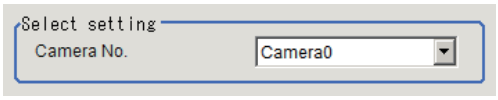
Selection Setting

When multiple cameras are connected, select the camera to use for measurement.

1 In the Item Tab area, click [Camera setting].



2 Click [Camera No.] [▼] and select the camera number.

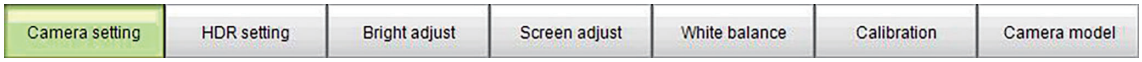


Setting item	Setting value [Factory default]	Description
Camera No.	Cam 0 to 7 [Cam 0]	Select the camera number.

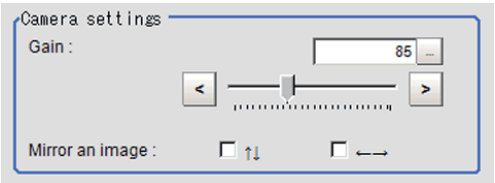
Camera Settings

Specify the camera gain and reverse conversion.

1 In the Item Tab area, click [Camera setting].



2 In the "Camera settings" area, specify the camera gain and reverse conversion settings.



Setting item		Setting value [Factory default]	Description
Gain		• FZ-SC/S/SHC/SH 0 to 230 [85] • FZ-SC2M/S2M/SC5M2/S5M□/SF□/SP□ 0 to 230 [50] • FZ-SC5M3 0 to 230 [65] • FH-SC02/SM02/SC04/SM04/SC12/SM12 0 to 255 [0] • FH-SC05R/SM05R 0 to 63 [0] • FH-S□X/S□X05/S□X12 0 to 240 [85] • FH-S□21R 0 to 200 [85]	Set the camera gain when the shutter speed, the lens aperture, and lighting conditions cannot be used to brighten the image. Usually, the factory default value can be used.
Mirror an image	↑↓	• Checked • [Unchecked]	Place a check here when reversing the camera image vertically.
	←→	• Checked • [Unchecked]	Place a check here when reversing the camera image horizontally.

Important

- With CMOS cameras, striped bands of noise can arise if the camera gain is set too high, a characteristic inherent in the imaging element specifications. A number of pixel defects may also occur; however, such defects should not cause problems with product defects or failure. If having problems with striped bands of noise or pixel defects affecting the measurement results, lower the camera gain setting or use a CCD camera.
- When performing defect inspection, keep the gain setting at a low value to suppress the influence of image noise.

Binning Settings – for Monochrome Cameras only (Not supported by FH-SMX/FH-SM21R)

Binning is a function for obtaining a single value by adding multiple lines together.

Some cameras give the effect of a higher frame rate by raising the sensitivity of the brightness virtually by adding together and decreasing the amount of data to be transferred.

Important

The effects that can be obtained with different cameras are as follows.

Camera model	Brightness sensitivity	Frame rate
FZ-S/-S2M/-S5M3/-SH/-SF/-SP	Effective	Effective
FH-SMX05/-SMX12	Effective	Effective
FH-SM/-SM02/-SM04/-SM12	Effective	No effect
FH-SM05R	No effect	Effective

Electronic Flash Setting

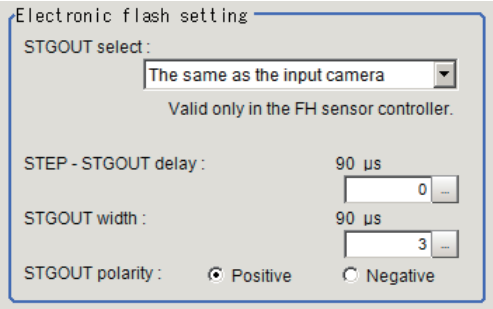
This function is set when an electronic flash is used. This sets the output conditions for the signal for synchronizing the measurement and the electronic flash timing.

Important

- The STGOUT signals that can be output are as follows.
  - FH-1000/2000/3000/5000 series: SGTOUT 0 to 7
  - FH-L series: STGOUT 0 to 3
- STGOUT0 to STGOUT7 is tied to The camera connector number of the sensor controller, not the camera number.
  When you use CameraLink Medium Configuration or the Multi-line random-trigger mode, confirm the camera connector number that corresponds to the camera number of sensor Controller.

1 In the Item Tab area, click [Camera setting].

2 In the Electronic flash setting area, set the items of STGOUT signals.



Item	Setting value [Factory default]	Description
STGOUT select	[The same as the input camera] Camera 0 to 7	Select the STGOUT signal to use for Camera Image Input HDR processing item. The same as the input camera: STGOUT that is tied to the input camera is output. Camera 0 to 7: STGOUT signal that is tied to the selected camera is output.
STEP-STGOUT delay	[0] to 511 (1 count is 30 µs)	Set the time to wait to turn ON the electronic flash trigger signal after STEP signal is input. Delay time = count number ×30 µs+90 µs Delay time changes with the setting of STGOUT polarity. The time displayed is for the polarity of Positive; for Negative, 35µs will be added to the displayed time. Delay time is within the range ±10 µs of set value.
STGOUT width	0 to 43689 [3] (1 count is 30 µs)	Set the time to output the electronic flash trigger signal. For FH series controller, set 0 to disable flashing.
STGOUT polarity	• [Positive] • Negative	Set the pulse polarity of electronic flash trigger. Positive: flashes synchronizing with the electronic flash trigger output changing from OFF→ON. Negative: flashes synchronizing with the electronic flashing trigger output changing from ON→OFF.

Important

Do not perform next camera image input processing before STGOUT signal output is completed. STGOUT signal may not be output.

Perform camera image input processing after STGOUT signal output completion, or set the STEP-camera delay, STEPSTGOUT delay and STGOUT pulse width so that the electronic flash operates synchronizing with the exposure time.

Additional Information

STGOUT signals are output at each imaging. Therefore, it can be duplicated with the next STGOUT signal output, depending on the STEP-STGOUT delay or STGOUT width settings.

If it duplicates with the next, the number of times for imaging and electronic flashing can differ.

1-4-3 HDR Settings (Camera Image Input HDR)

Specify the image combination method etc.

1 In the Item Tab area, click [HDR setting].

2 In the "Mode select" area, specify the mode.

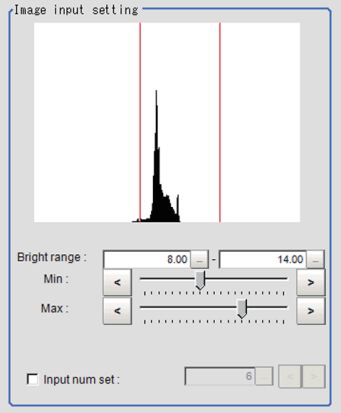
When you select the mode in the "Mode select" area and specify the measurement region on the image, the parameters are set automatically. To finely adjust the parameters, refer to the next items.

Item	Set value [Factory default]	Description
Mode select	[HDR mode]	In halation is likely generated image, select this mode if you want to stabilize the brightness. Generate images with stable brightness by shooting multiple images with different shutter speeds based on the set Bright range.
	High contrast mode	Select this mode if you want to generate image with good contrast. Generate images with good contrast by shooting multiple images with different shutter speeds based on the set Average and Width.

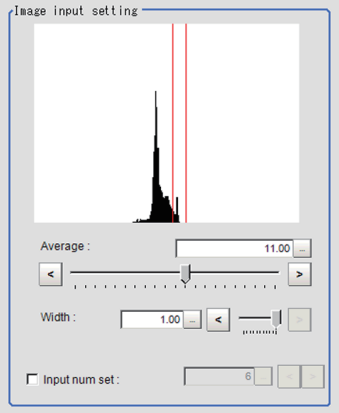
3 In the "Image input setting" area, set the items.

A brightness histogram is displayed as the graph.

- HDR



- High contrast mode



Item	Set value [Factory default]	Description
Min Bright range	0 to 20 [8]	This item sets the minimum brightness for combining images.
Max Bright range	0 to 20 [14]	This item sets the maximum brightness for combining images.
Input num set	• [Unchecked] • Checked 2 to 16 [6]	Place a check to set the number of shots manually. Setting a high shot count provides images with low noise. However, more processing time is required. Setting a low shot count shortens the processing time. However, the image is more easily affected by noise.
Average	0.00 to 20.00 [11.00]	Specify the average brightness for images shot.
Width	0.01 to 1.00 [1.00]	Specify the brightness range for images shot.

Item	Set value [Factory default]	Description
Input num set	• [Unchecked] • Checked 2 to 16 [6]	Place a check to set the number of shots manually. Setting a high shot count provides images with low noise. However, more processing time is required. Setting a low shot count shortens the processing time. However, the image is more easily affected by noise.

4 In the "Output setting" area, set the combination method.

The current shot count and image combination time for the settings are displayed.

Item	Set value [Factory default]	Description
Combine type	[Normal] Color Linear	Select the combination method. Normal: Standard combination method This compensates the brightness so that dark sections on the combination image do not become all black. Color: This is suitable for inspecting labeling and the Gravity and Area. This compensates the saturation when there is little hue information in the combined image. Linear: This is suitable for fine matching and defect inspection. In order to output the actual brightness of the workpiece, no compensation is performed.

1-4-4 Bright Adjust Setting (Camera Image Input HDR)

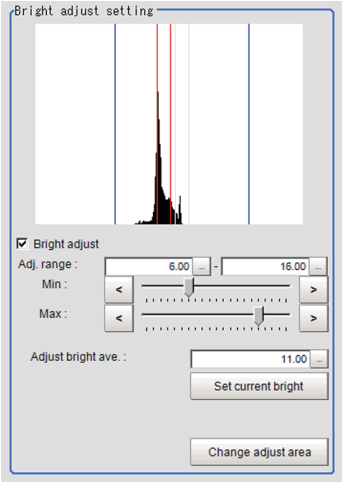
This sets how far to track the brightness of the loaded images.

1 In the Item Tab area, click [Bright adjust].

2 Set each item in the "Bright adjust setting" area.

When a check is placed at the "Bright adjust", the Brightness Adjustment range is displayed with blue lines in the "Histogram" area.

Change the "Adjust bright ave." and brightness adjust area.



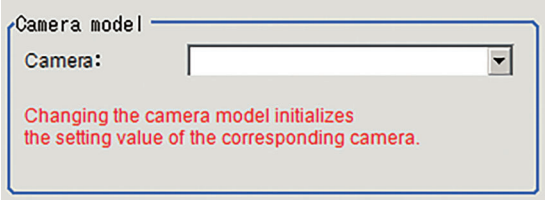
Item	Set value [Factory default]	Description
Bright adjust	• [Unchecked] • Checked	If a check is placed at "Bright adjust", the image is output with its brightness automatically compensated. This makes it possible to obtain images with stable brightness even if the lighting conditions fluctuate, for example due to interfering light.

Item	Set value [Factory default]	Description
Min Adj. range	0.00 to 20.00 [6.00]	Specify the follow-up brightness minimum value.
Max Adj. range	0.00 to 20.00 [16.00]	Specify the follow-up brightness maximum value.
Adjust bright ave.	0.00 to 20.00 [11.00]	Specify the target for brightness follow-up. Clicking the [Set current bright] button updates this value.

1-4-5 Camera Model(Camera Image Input HDR)

You can check the camera model currently connected.

1. In the Item tab area, Click [Camera model].
2. In the “Camera model” area, you can check the camera model currently connected that is assigned to the camera No. you selected in the [Camera setting] tab.



Important

When using the simulation software, you can select any camera model in the camera model area. Changing the camera model will initialize the correspondence camera settings.

1-4-6 External Reference Tables (Camera Image Input HDR)

No.	Data Name	Ident	Set/Get	Data range
10000	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
None	Camera No.	cameraNo	Set/Get	
None	Camera model	cameraModel	Set/Get	Connectable camera model name
None	Gain	gain	Set/Get	
None	Mirror an image(↑↓)	reverseY	Set/Get	0: OFF 1: ON
None	Mirror an image(←→)	reverseX	Set/Get	0: OFF 1: ON

No.	Data Name	Ident	Set/Get	Data range
None	Start line	startY	Set/Get	
None	End line	endY	Set/Get	
None	STGOUT selection	stgoutSelect	Set/Get	0: same as the camera input 100 + N: N is the camera number
None	STEP - STGOUT delay	strobeDelay	Set/Get	
None	STGOUT width	pulseWidth	Set/Get	
None	STGOUT polarity	pulsePolarity	Set/Get	0: Negative 1: Positive
None	Mode select	highContrastMode	Set/Get	0: HDR mode 1: High contrast mode
None	Minimum brightness	minBright	Set/Get	
None	The maximum brightness	maxBright	Set/Get	
None	Average brightness	hcAveBright	Set/Get	
None	Lightness width	hcBrightRange	Set/Get	
None	Input num set(Enabled)	setShutterNum	Set/Get	
None	Input num set(Number of sheets)	shutterNum	Set/Get	
None	Combine type	combineMode	Set/Get	0: Normal 1: Color 2: Linear
None	The presence or absence of brightness follow-up	adjustBright	Set/Get	0: OFF 1: ON
None	The minimum follow-up range	minAdjustBright	Set/Get	
None	The maximum follow-up range	maxAdjustBright	Set/Get	
None	Follow-up brightness average	brightAverage	Set/Get	
None	Lighting control(Site List)	lightGain	Set/Get	A representation of a lighting brightness of each Part in hexadecimal. A value of Part 0 to Part 7 from left to right. Example: If the illumination brightness of Part 0 to Part 3 was in 255 (ff), ffffffff00000000
None	Modulate mode	lightGainMode	Set/Get	It expresses the dimming method of each Part by the sum of 4 bit units. 0: Duty 1: Voltage/Current. Example: When Part 0, Part 2, Part 5 are set to Voltage/Current, 1048833

No.	Data Name	Ident	Set/Get	Data range
None	CH	lightEnabledChannel	Set/Get	0: OFF 1: ON
None	On all the time	alwaysLight	Set/Get	0: OFF 1: ON
None	Zoom	zoom	Set/Get	
None	Focus	focus	Set/Get	
None	Iris	iris	Set/Get	
None	Iris base density	irisDensity	Set/Get	
None	White balance R	whiteBalanceR	Set/Get	
None	White balance G	whiteBalanceG	Set/Get	
None	White balance B	whiteBalanceB	Set/Get	
None	Calibration parameter	calibParameter	Set/Get	"," Separated by a A B C D E F
None	Binning setting	binningY	Set/Get	0: One line 1: Two line

1-5 Camera Image Input HDR Lite

Camera Image Input HDR Lite is for FZ-SQ□□□□.

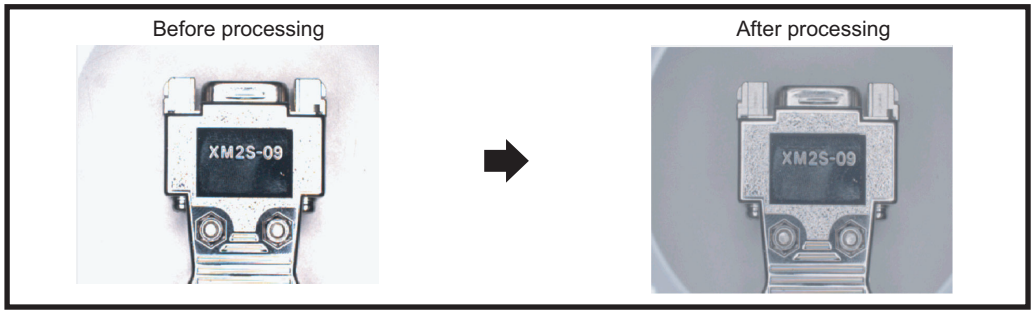
You can acquire a wide dynamic range image by combining images photographed consecutively at different shutter speeds.

With objects that generate halation, images with low-contrast, and environments with fluctuation in the lighting, this processing item is an effective substitute for camera image input.

Used in the Following Case

To acquire stable images of objects for which halation occurs easily

Used to obtain images with a wide dynamic range in which dark areas are made brighter (text areas) and bright areas are made darker (connector areas).



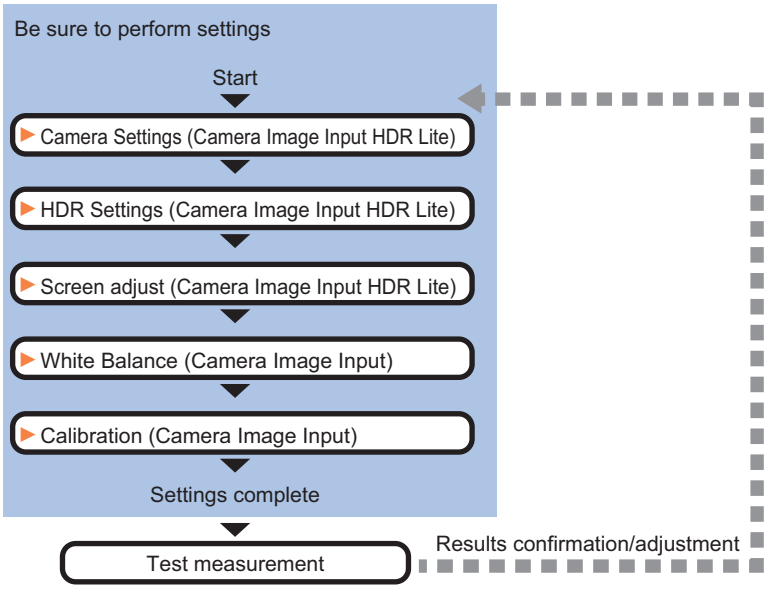
Important

- [Camera Image Input] is preset for Unit 0. Do not set any processing item other than camera image input (camera image input HDR, camera image input HDR Lite and camera image input FH) for Unit 0.
- Immediately after starting up the FH/FHV/FZ5 Sensor Controller and immediately after changing scenes, there will be no input image. No input image is processed as the same color image as in the factory default state.
- If you open the Properties Dialog Box before inputting an image, click the Cancel button to close the dialog box. Pressing the OK button in the dialog box will change the setting to the same color camera setting as the factory default setting.

For details, refer to *FAQ For Measurement The measurement NG (image mismatch) error will result when connecting a monochrome camera* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

1-5-1 Settings Flow (Camera Image Input HDR Lite)

To set Camera Image Input HDR Lite, follow the steps below.



Camera Image Input HDR Lite Item List

Item name	Description
Camera settings	Specify the camera settings such as the electronic flash. Refer to *1-5-2 Camera Settings (Camera Image Input HDRLite)* on page 1-110.
HDR setting	Specify the dynamic range and brightness setting. Specify the HDR automatic setting as necessary. Refer to *1-5-3 HDR settings (Camera Image Input HDR Lite)* on page 1-111.
Screen adjust	Adjust the image with or without the light adjustment or using display line bright. Refer to *1-5-4 Screen adjust (Camera Image Input HDR Lite)* on page 1-112.
White balance	When using a color camera, adjust the white balance. The setting method is the same as for [Camera Image Input]. Please check it. Refer to *1-1-5 White Balance (Camera Image Input)* on page 1-20.
Calibration	Set when measurements (camera coordinate measurement values) are to be output using actual dimensions. Select the calibration setting method and generate the calibration parameters. The setting method is the same as for [Camera Image Input]. Please check it. Refer to *1-1-6 Calibration (Camera Image Input)* on page 1-21.

1-5-2 Camera Settings (Camera Image Input HDRLite)

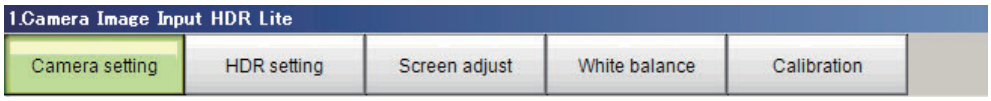
Set the following photographing conditions.

- Refer to *Selection Setting* on page 1-111.
- Refer to *Number of lines to be read* on page 1-10.
- Refer to *Electronic Flash Setting* on page 1-102.

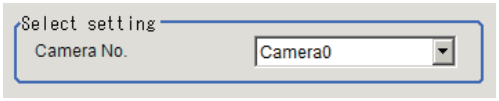
Selection Setting

When multiple cameras are connected, select the camera to use for measurement.

1 In the Item Tab area, click [Camera setting].



2 Click [Camera No.] [▼] and select the camera number.



Setting item	Setting value [Factory default]	Description
Camera No.	Cam 0 to 7 [Cam 0]	Select the camera number.

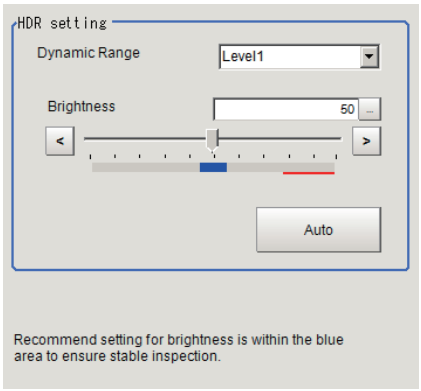
1-5-3 HDR settings (Camera Image Input HDR Lite)

Specify the dynamic range and brightness settings.

1 In the Item Tab area, click [HDR Setting].

2 When automatic is clicked, the dynamic range and the brightness will be automatically set.

If automatic does not produce the desired result, manually adjust the dynamic range and brightness in the HDR settings.



Item	Set value [Factory default]	Description
Dynamic Range	[Level1] to Level4	Specify a dynamic range. The larger the value is, the broader the dynamic range to be combined will be.
Brightness	1 to 100	Specify the brightness settings. The larger the value is in this setting, the longer the exposure time will be. When using a high-speed line, check to make sure that there is no image blur in an actual environment. The degree of image blur can be lowered by decreasing the brightness even when the movement speed of the object is fast.

- Correlation between the level and the dynamic range

The larger the value of the level is, the larger the dynamic range to be combined will be, as illustrated below.

Important

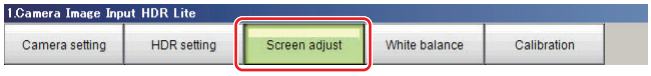
For stable operations, we recommend setting the brightness within the range where the blue bar does not enter the red region. Measurement values may be different if the recommended range is exceeded. Be sure to thoroughly check the measurement result and set the brightness value.

1-5-4 Screen adjust (Camera Image Input HDR Lite)

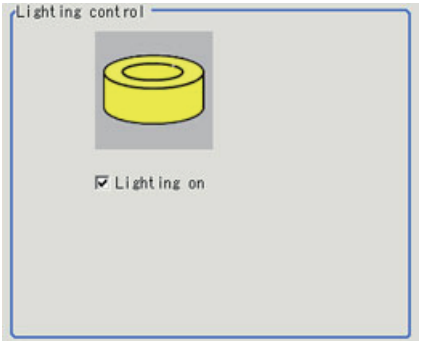
Specify the camera image input HDR Lite lighting and the line bright display settings. Specify whether or not to use the lighting. The setting method for line bright is the same as for [Camera Image Input]. Please check it.

Refer to *Line Bright* on page 1-19.

1 In the Item Tab area, click [Screen adjust].



2 Set [Lighting control] as necessary.



Item	Set value [Factory default]	Description
Lighting on	• [Checked] • Unchecked	Clear the checkbox when no lighting is to be applied.

1-5-5 External Reference Tables (Camera Image Input HDR Lite)

No.	Data Name	Ident	Set/Get	Data range
10000	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
None	Camera No.	cameraNo	Set/Get	
None	Start line	startY	Set/Get	
None	End line	endY	Set/Get	
None	STGOUT selection	stgoutSelect	Set/Get	0: same as the camera input 100 + N: N is the camera number
None	STEP - STGOUT delay	strobeDelay	Set/Get	
None	STGOUT width	pulseWidth	Set/Get	
None	STGOUT polarity	pulsePolarity	Set/Get	0: Negative 1: Positive
None	Dynamic Range	drLevel	Set/Get	0: Level1 1: Level2 2: Level3 3: Level4
None	Brightness	brightValue	Set/Get	
None	Lighting control (Site List)	lightGain	Set/Get	A representation of a lighting brightness of each Part in hexadecimal. A value of Part 0 to Part 7 from left to right. Example: If the illumination brightness of Part 0 to Part 3 was in 255 (ff), ffffffff00000000
None	Modulate mode	lightGainMode	Set/Get	It expresses the dimming method of each Part by the sum of 4 bit units. 0: Duty 1: Voltage/Current. Example: When Part 0, Part 2, Part 5 are set to Voltage/Current, 1048833
None	CH	lightEnabledChannel	Set/Get	0: OFF 1: ON
None	On all the time	alwaysLight	Set/Get	0: OFF 1: ON
None	White balance R	whiteBalanceR	Set/Get	
None	White balance G	whiteBalanceG	Set/Get	
None	White balance B	whiteBalanceB	Set/Get	
None	Calibration parameter	calibParameter	Set/Get	"," Separated by a A B C D E F
None	Binning setting	binningY	Set/Get	0: One line 1: Two line

1-6 Photometric Stereo Image Input

This is a processing item specific to the FH Sensor Controller. This processing item cannot be used correctly unless the Photometric Stereo lighting controller (FL-TCC1PS) is connected.

Set the conditions for loading images from the camera and for storing images of the measured objects. This processing item must be used when measuring.

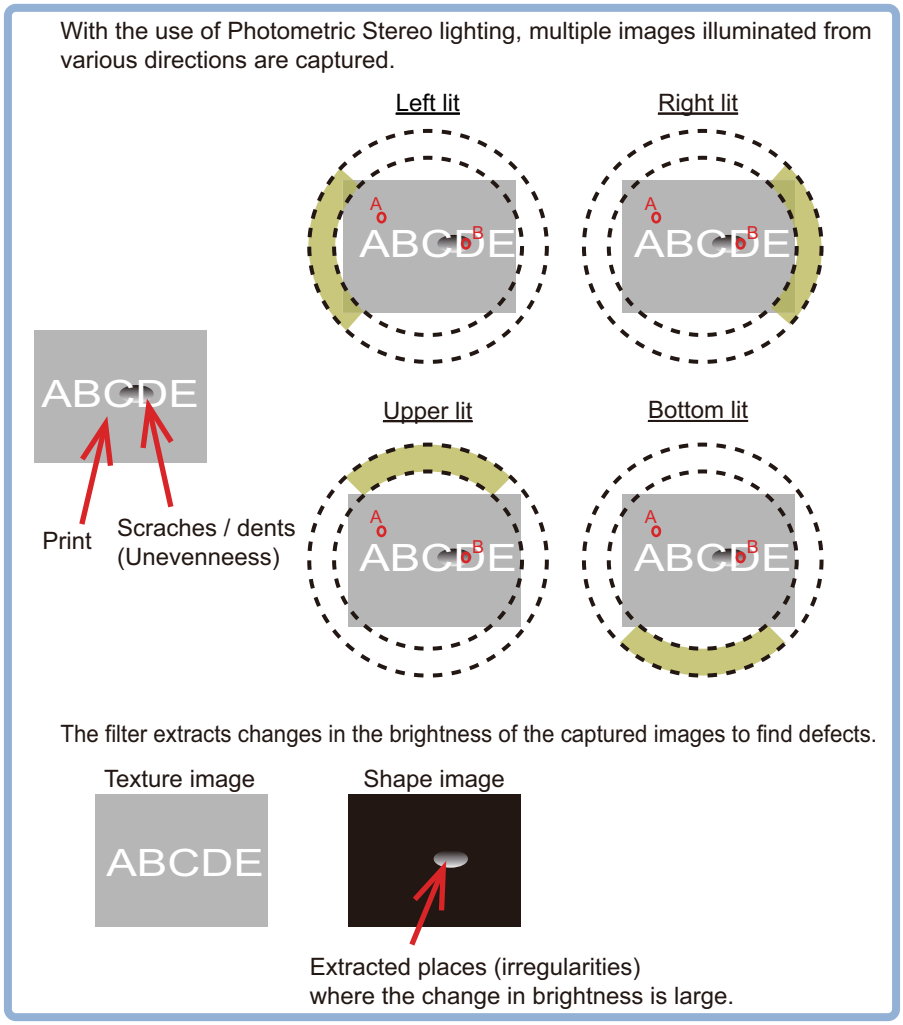
With the use of Photometric Stereo lighting, images lit from different directions can be filtered to extract Shape images (to reveal surface unevenness defects such as dents) and Texture images (for better character and pattern recognition).

Important

- When setting this processing item with logged images, logged images are required in a state that the multiple times captured image logging is set to “Yes” in the image logging. For details, refer to *6-3-1 Logging Measurement Values and Measurement Images [Data Logging/Image Logging] in Vision System FH/FHV/FZ5 Series User’s Manual (Z365)*.
- When using this processing item, install cameras and lightings to observe the following issues.
  - The cameras and lightings should be installed in nearly parallel with the imaging target.
  - Lightings should be installed so that the imaging target is located in the center of a ring type lighting.

Used in the Following Case

When you want to detect defects using the specialty Photometric Stereo lighting.



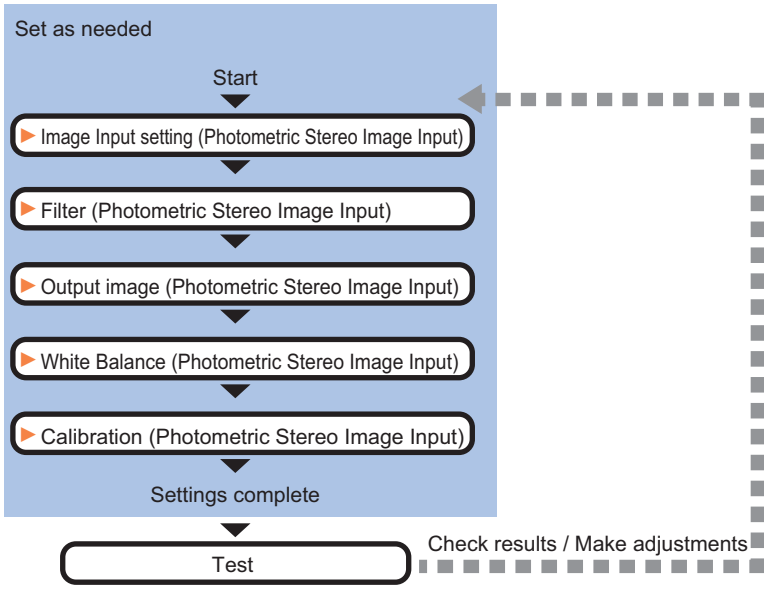
Important

- [Camera Image Input FH] is preset for Unit 0. Do not set any processing item other than camera image input (Camera Image Input FH, Camera Image Input HDR, Camera Image Input HDR Lite, or Photometric Stereo Image Input) for Unit 0.
- When switching from a color camera to a monochrome or switching to a camera with a different resolution, reconfigure the settings in the units that follow it in the flow.
- If a camera is connected other than the one for the previous settings, the camera settings are returned to their initial settings.
- Immediately after starting up the FH Sensor Controller and immediately after changing scenes, there will be no input image. No input image is processed as the same color image as in the factory default state.
- If you open the Properties Dialog Box before inputting an image, click the Cancel button to close the dialog box. Pressing the OK button in the dialog box will change the setting to the same color camera setting as the factory default setting.

  Refer to Appendices – Troubleshooting – FAQ – During operation – “NG (Memory shortage)” is displayed in the “Detail result” area in *Vision System FH/FHV/FZ5 Series User’s Manual* (Cat. No. Z365).

1-6-1 Settings Flow (Photometric Stereo Image Input)

To set Photometric Stereo Image Input, follow the steps below.



Photometric Stereo Image Input Item List

Item		Description
Image input settings		Settings related to cameras and lighting. Refer to *1-6-2 Image input setting (Photometric Stereo Image Input)* on page 1-117.
Filter	Image adjustment setting	Adjust the Photometric Stereo Lighting settings. Refer to *1-6-3 Filter (Photometric Stereo Image Input) Screen adjust* on page 1-124.
	Filter setting	Adjust the Photometric Stereo image filter parameters Refer to *1-6-4 Filter (Photometric Stereo Image Input) Filter setting* on page 1-128.
Output image setting		Set the image to be output to the subsequent stage in the processing flow from among the images created by this filter. Refer to *1-6-5 Output image setting (Photometric Stereo Image Input)* on page 1-132.
White balance		When using a color camera, adjust the white balance. The setting method is the same as for [Camera Image Input FH]. Please refer to that section. Refer to *1-6-6 White balance (Photometric Stereo Image Input)* on page 1-132.
Calibration		Set when measurements (camera coordinate measurement values) are to be output using actual dimensions. Select the calibration setting method and generate the calibration parameters. The setting method is the same as for [Camera Image Input FH]. Please check it. Refer to *1-6-7 Calibration (Photometric Stereo Image Input)* on page 1-132.
Camera model		You can verify the model of the currently connected camera. Refer to *1-6-8 Camera model (Photometric Stereo Image Input)* on page 1-133.

1-6-2 Image input setting (Photometric Stereo Image Input)

Set the following image capture conditions.

- Refer to *Selection Setting* on page 1-100.
- Refer to *Camera Settings* on page 1-6.
- Refer to *Number of lines to be read* on page 1-10.
- Refer to *Electronic Flash Setting* on page 1-11.

Additional Information

The displayed items differ depending on the camera type and lighting mode. Perform the following procedure as necessary in accordance with the use environment.

Display

Switches the display in the Image area.

1 Click one of the tabs in the Item Tab area.

It is possible to set it from any Item tab.

2 Click on [Change display] to select the type of camera image.

What is displayed in the Image display area will change.

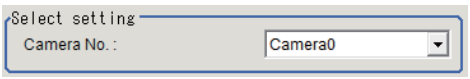
Item	Setting value [Factory default]	Description
Display	Through image	The latest image is always loaded from the Camera and displayed.
	[Freeze Image]	The image that was scanned in the immediately preceding measurement is displayed.

Select settings

When multiple cameras are connected, select the camera to use for measurement.

1 In the Item Tab area, click [Image input setting].

2 Click [Camera No.] [▼] and select the camera number.

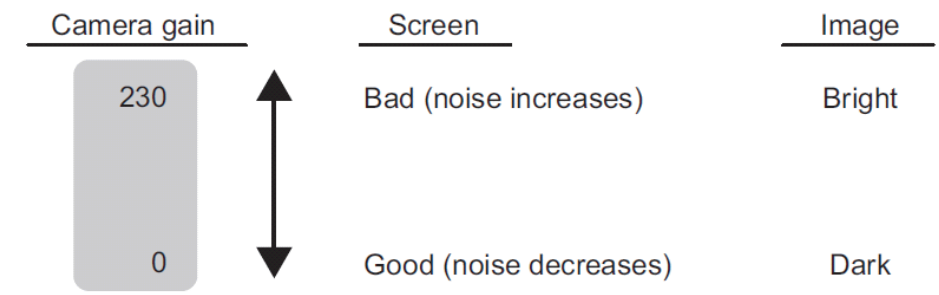


Item	Setting value [Factory default]	Description
Camera No.	Camera 0 to 7 [Camera 0]	Select the camera number.

Camera Settings

Adjust the settings related to camera shutter speed and camera gain. Select the shutter speed appropriate to the speed of the measurement object. Choose a faster shutter speed if the measurement object is moving quickly and the image is blurred. Adjust the camera gain when images cannot be brightened through the shutter speed, lens aperture, or lighting conditions. Usually, the factory default value can be used.

Example Using the FZ-SC



(Factory default: 85)

1 In the Item Tab area, click [Image input setting].

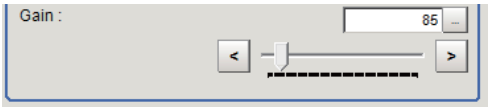
2 In the Camera settings area, specify the shutter speed.

Item	Setting value [Factory default]	Description
Shutter speed	FZ-SC/S/SHC/SH 20 to 100000 [µs] [2000] For FZ-SC2M/S2M/SC5M□/S5M□/SF□/SP□ 20 to 100000[µs] [8333] FH-SC02/SM02/SC04/SM04 25 to 100000 [µs] [2000] FH-SC05R/SM05R 500 to 100000 [µs] [8000] FH-SC12/SM12 60 to 100000 [µs] [12000] FH-S□X/S□X05/S□X12 *1 1 to 100000µs] [2000] FH-S□21R *2 50 to 100000[µs] [2000]	Shutter speed value to set differs by camera type.

*1. Note that the shortest shutter speed for FH-S□X12 is below.
Settable value on the screen: 1 [µs]
Actual shutter speed: 1.5 [µs]

*2. When using FH-S□21R in the reset mode: In the rolling shutter, the actual shutter speed for the setting value on the screen is rounded and reflected in the actual operation.
Note that the reflected operation differs as follows by the number of camera cables and communication speed setting.
1 camera cable & standard communication speed: Multiple of 46.9 [µs]
1 camera cable & high communication speed: Multiple of 22.3 [µs]
2 camera cables & standard communication speed: Multiple of 23.5 [µs]
2 camera cables & high communication speed: Multiple of 11.2 [µs]
For example, when the shutter speed is set to 2,000 [µs], the actual shutter speed is as follows.
1 camera cable & standard communication speed: 1969.8 [µs] (42 times of 46.9 [µs])
1 camera cable & high communication speed: 1984.7 [µs] (89 times of 22.3 [µs])
2 camera cables & standard communication speed: 1997.5 [µs] (85 times of 23.5 [µs])
2 camera cables & high communication speed: 1993.6 [µs] (178 times of 11.2 [µs])

3 Specify the camera gain while checking the image.



Item	Setting value [Factory default]	Description
Gain	FZ-SC/S/SHC/SH 0 to 230 [85] FZ-SC2M/S2M/SC5M2/S5M□/SF□/SP□ 0 to 230 [50] FZ-SC5M3 0 to 230 [65] FH-SC02/SM02/SC04/SM04/SC12/SM12 0 to 255 [0] FH-SC05R/SM05R 0 to 63 [0] FH-S□X/S□X05/S□X12 0 to 240 [0] FH-S□21R 0 to 200 [0]	Adjust the camera gain when the shutter speed, the lens aperture, and lighting conditions cannot be used to brighten the image. Usually, the factory default value can be used.

Important

Due to the specification of its imaging elements, a CMOS camera generates stripe noise when the gain setting of the camera is raised. You may also find multiple defective pixels, but they do not represent a defect or failure of the product in any way. If having problems with striped bands of noise or pixel defects affecting the measurement results, lower the camera gain setting or use a CCD camera.

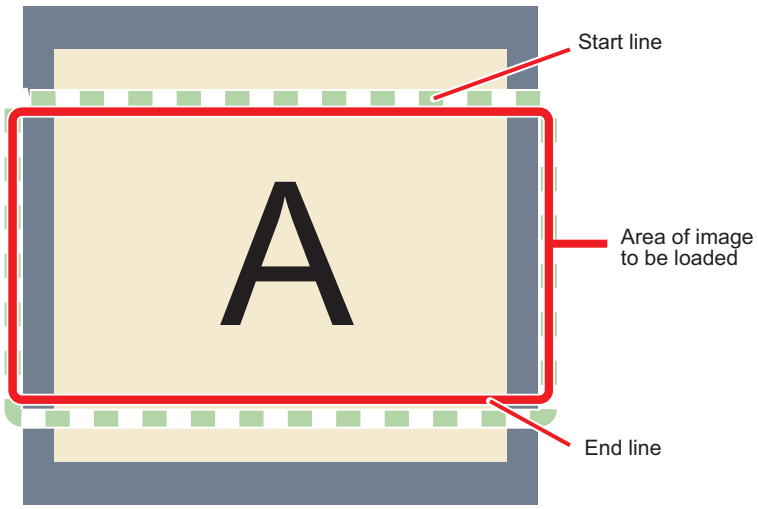
Reset mode (FH-SC05R/FH-SM05R only)

In Photometric Stereo Image Input, the Reset mode for a Rolling shutter camera is Rolling shutter.

- Reset Mode:
  Rolling Shutter: Use this mode when capturing static objects.
  Global Reset: Use this mode when capturing moving objects.
  Refer to *Reset Mode (FH-SC05R/FH-SM05R/FH-SC21R/FH-SM21R only)* on page 1-34.

Number of lines to be read

By narrowing the image range to be loaded, the image scan time can be shortened. Set the range taking the offset of the measurement object into consideration. The part of the image narrowed down by the start line and the end line will be displayed in the Image Display area of the processing item setting window or the Main screen.



Additional Information

About minimum number of lines

- For FH-SM □□/ FH-SM □□R, the minimum number of lines (minimum value between the start and end lines) is 4 lines.
- For FH-SC□□/ FH-SC□□R, the minimum number of lines is 4 lines.
- For FZ-S□5M3, the minimum number of lines is 4 lines.
- For FZ-S□5M3, the step width of the start line and the end line is 4 lines

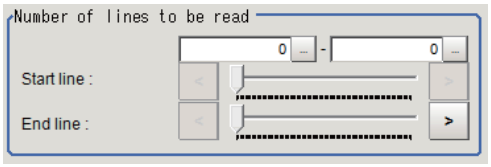
When loading a scene created with FZ-S□5M2, the maximum number of lines that can be supported will increase to 4 lines.

About coordinate values

- The coordinate values displayed as the measurement results are the values of the display position on the monitor.
- The coordinate values do not vary according to the settings for "Number of lines to be read".

1 In the Item Tab area, click [Image Input setting].

2 Set the start/end line in the "Number of lines to be read" area.



Electronic Flash Setting

This function is set when an electronic flash is used. This sets the output conditions for the signal for synchronizing the measurement and the electronic flash timing.

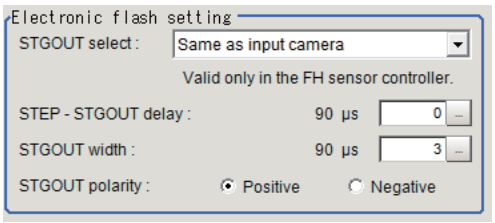
Important

- The STGOUT signals that can be output are as follows.
- For the FH-1000 Series and FH-3000 Series, STGOUT0 to STGOUT7 can be used.
- For the FH-L Series, STGOUT0 to STGOUT3 can be used.
- The STGOUT signal (STGOUT0 to STGOUT7) is tied to the camera connector number of the sensor controller, not the camera number.

  When you use CameraLink Medium Configuration, or the Multi-line random-trigger mode, confirm the camera connector number that corresponds to the camera number of Sensor Controller.

1 In the Item Tab area, click [Image Input setting].

2 In the "Electronic flash setting" area, specify each item.



Item	Setting value [Factory default]	Description
STGOUT select	[The same as the input camera] Camera 0 to 7	Select the STGOUT signal to use for the Photometric Stereo Image Input processing item. The same as the input camera: STGOUT that is tied to the input camera is output. Camera 0 to 7 : STGOUT signal that is tied to the selected camera is output.
STEP - STGOUT delay	[0] to 511 (1 count is 30 µs)	Set the time to wait to turn ON the electronic flash trigger signal after STEP signal is input. Delay time = count number × 30 µs+90 µs Delay time changes with the setting of STGOUT polarity. The time displayed is for Positive polarity. Add 35 µs to the displayed time if the polarity is negative. Delay time is within the range ±10 µs of set value.

Item	Setting value [Factory default]	Description
STGOUT width	0 to 43689 [3] (1 count is 30µs)	Set the output time for the electronic flash trigger signal. For FH series controller, set 0 to disable flashing.
STGOUT polarity	• [Positive] • Negative	Set the pulse polarity of electronic flash trigger. Positive polarity: Flashes synchronized with the timing of the electronic flash trigger output signal changing from OFF to ON. Negative polarity: Flashes when the strobe trigger output signal changes from ON to OFF.

Important

Do not perform next camera image input processing before STGOUT signal output is completed. STGOUT signal may not be output.

Perform camera image input processing after STGOUT signal output completion, or set the STEP-camera delay, STEPSTGOUT delay and STGOUT pulse width so that the electronic flash operates synchronizing with the exposure time.

Input time

You can verify the Input time. The time required for image input and filter processing is displayed.

1 In the Item Tab area, click [Image Input setting].

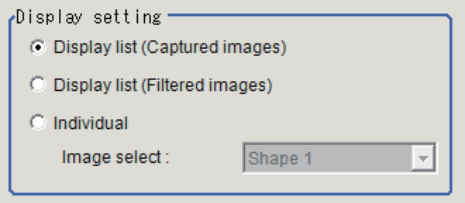
2 The Input time is displayed.

Display setting

You can change how it is displayed.

1 In the Item Tab area, click [Image Input setting].

2 Select the image to display in the Display setting area. The applicable settings are displayed in the Image display area of the processing item. □



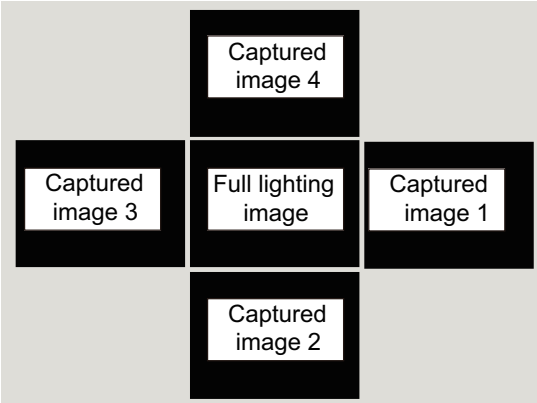
Item	Setting value [Factory default]	Description
Display Settings	• [Display list (Captured images)] • Display list (Filtered images) • Individual	The applicable settings are displayed in the Image display area of the processing item. *
Select image	• [Shape 1] • Shape 2 • Shape 3 • Texture • Full lighting • Captured image 1 • Captured image 2 • Captured image 3 • Captured image 4 • Captured image 5 • Captured image 6 • Captured image 7 • Captured image 8	Select an image to display when Individual is set for the Display Setting.

*

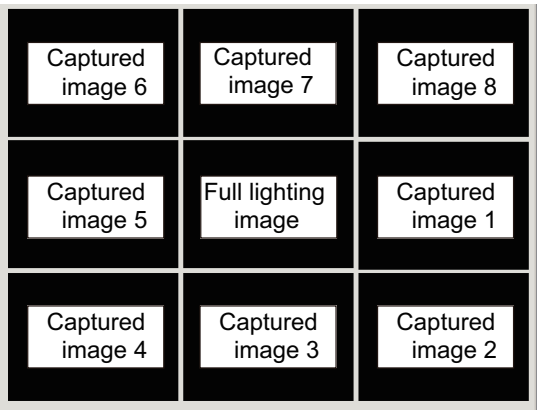
Display list (Captured images)

The captured image and full lighting image is displayed.

• Selected Input pattern is "Four"

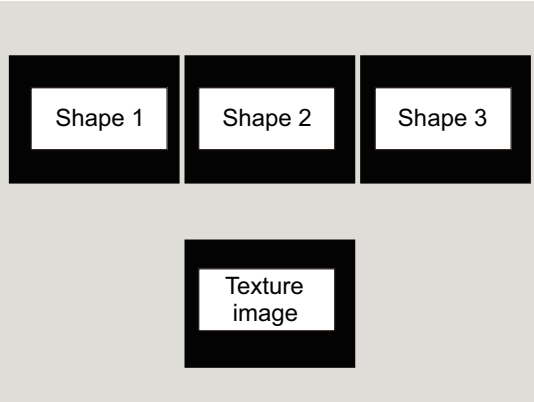


•Selected Input pattern is "Eight"

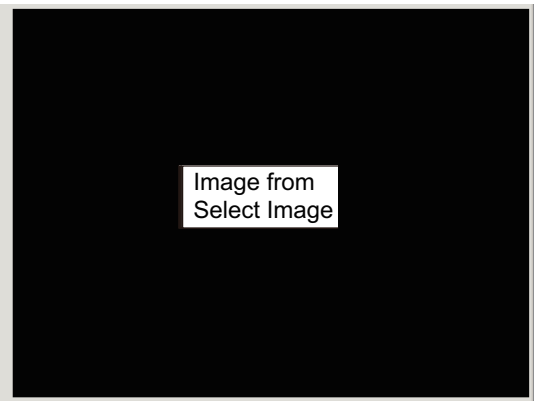


Display list (Filtered images)

Displays the Shape images and Texture images.



Individual



1-6-3 Filter (Photometric Stereo Image Input) Screen adjust

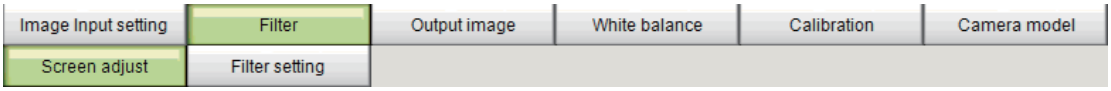
Set the conditions for the Photometric stereo Lighting

- Refer to *Input settings* on page 1-124.
- Refer to *Lighting Control* on page 1-12.

Input settings

You can select the Input pattern for the connected Photometric Stereo lighting.

1 In the Item Tab area, click [Filter] and click [Screen adjust].

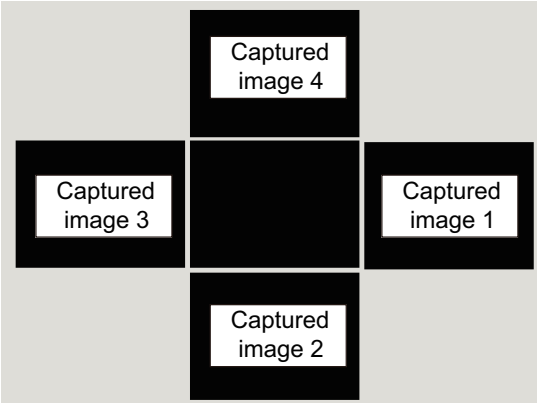


2 In the Input settings area, select the Input pattern to use.

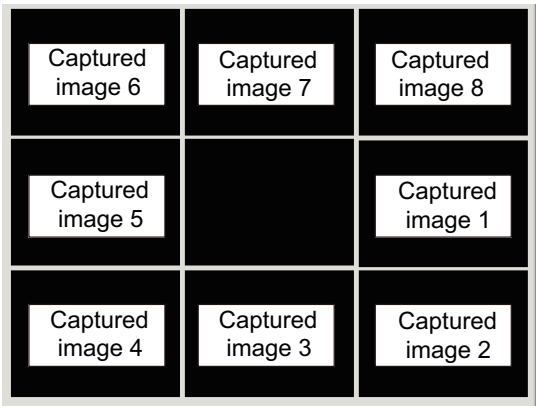
Item	Setting value [Factory default]	Description
Input pattern	• [Four] • Eight	Select the Photometric Stereo Light pattern to use for image capture. Four: Illuminate from 4 directions and capture 4 images. Eight: Illuminate from 8 directions and capture 8 images.

The applicable settings are displayed in the Image display area of the processing item. □

- Input pattern: Four



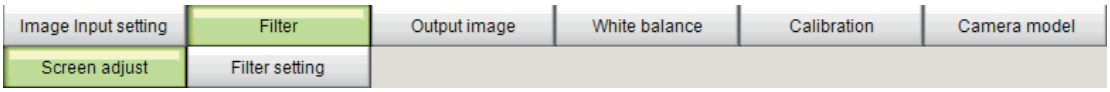
Input pattern: Eight



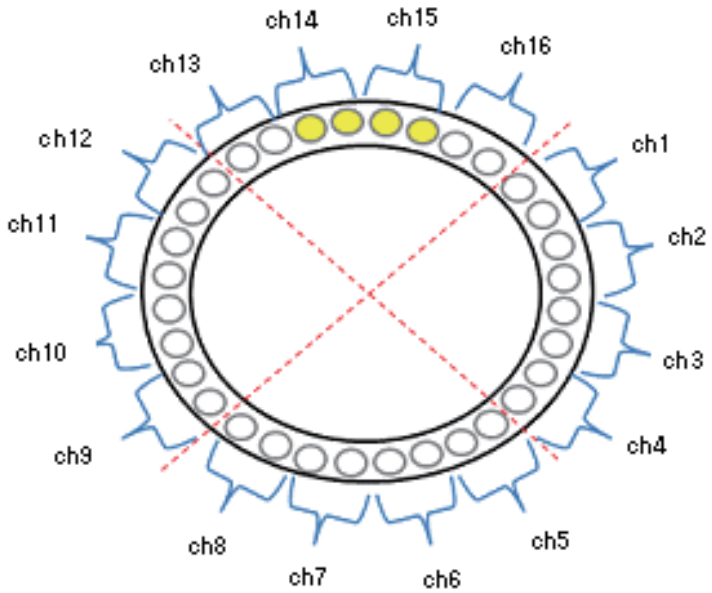
Lighting Control settings

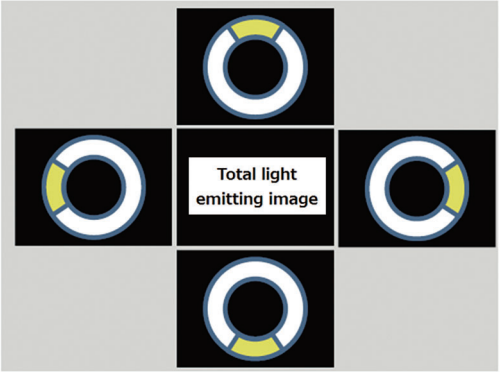
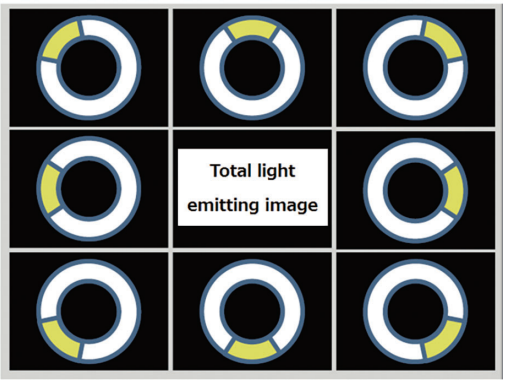
You can adjust the connected Photometric Stereo lighting settings from the FH Controller. You can adjust the width of the light and intensity of the light, and you can adjust the direction of the light.

1 In the Item Tab area, click [Filter] and click [Screen adjust].



2 In the Lighting control area, adjust the settings for the Photometric stereo lighting.

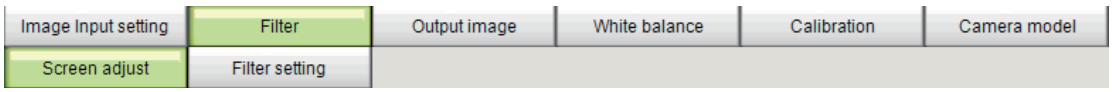
Item	Setting value [Factory default]	Description
Light width	• [Normal] • Tight	Select the width of the area to illuminate. • Normal: For image capture in 1 direction, 4 channels emit light. When the Input pattern is "Four", the lighting position moves clockwise by 4ch at a time. When the Input pattern is "Eight", the light emitting position moves clockwise by 2ch at a time. • Tight: For image capture in 1 direction, 2 channels emit light. Use this setting when there is a high degree of halation. When the Input pattern is "Four", the lighting position moves clockwise by 4ch at a time. When the Input pattern is "Eight", the light emitting position moves clockwise by 2ch at a time. 
Intensity	0 to 255 [128]	Set the intensity of the light.

Item	Setting value [Factory default]	Description
Position adjustment	• CCW 180° • CCW 157.5° • CCW 135° • CCW 112.5° • CCW 90° • CCW 67.5° • CCW 45° • CCW 22.5° • [No adjustment] • CW 22.5° • CW 45° • CW 67.5° • CW 90° • CW 112.5° • CW 135° • CW 157.5° • CW 180°	You can shift the lighting position of the lighting. Example: No adjustment Captured image 1: ch 1,ch 2,ch 3,ch 4 CW 90° Captured image 1: ch 5,ch 6,ch 7,ch 8 CCW 90° Captured image 1: ch13,ch14,ch15,ch16 Adjust so that the display position of the screen and the lighting position of the lighting match. Input pattern is “Four”: Light emitting position  Input pattern is “Eight”: Light emitting position 

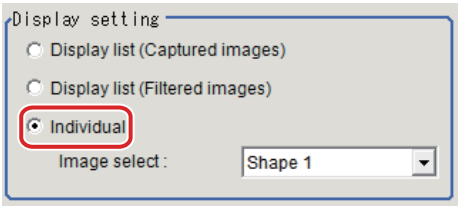
Line Bright

The graph showing the gray distribution for 1 line in the image is called the "Line bright". You can display the line brights for R, G and B for any horizontal or vertical line.

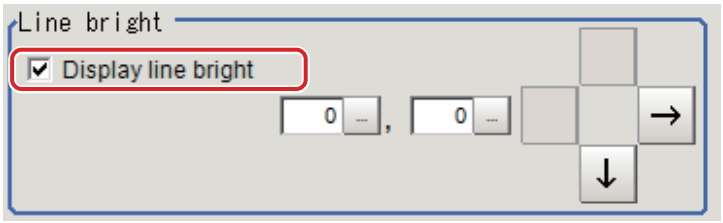
1 In the Item tab area, click [Filter] and then click [Image adjustment setting].



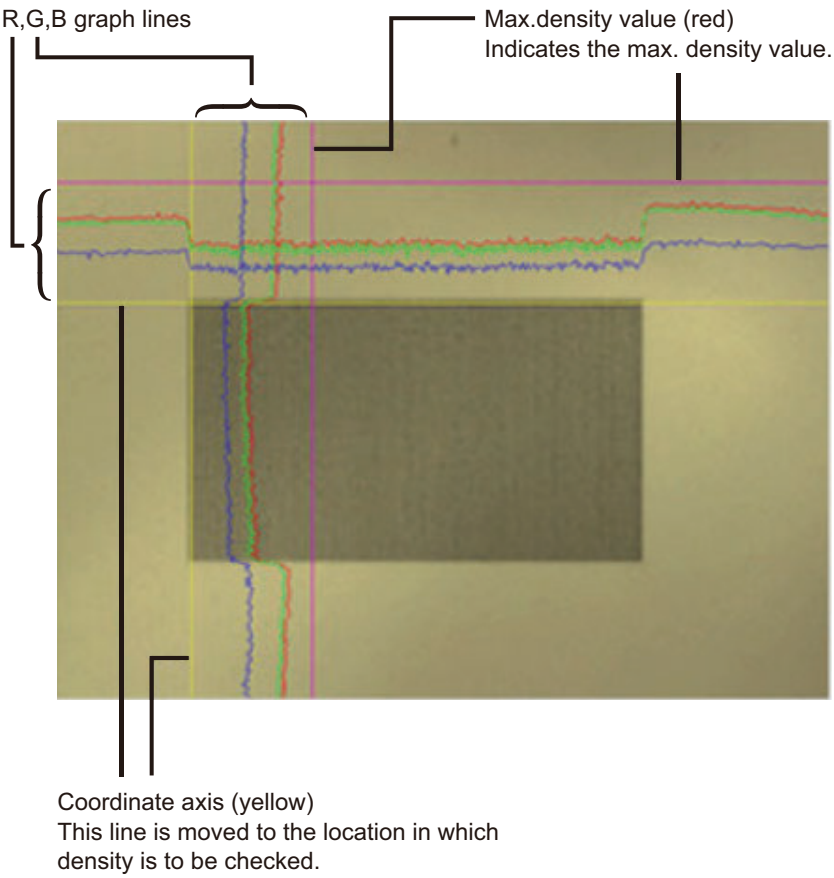
2 In the Display setting area, select Individual.



3 In the Line bright area, put a check in the box for Display line bright.



4 Move the line to the position whose density distribution you want to see.



Input time

- Refer to *1-6-2 Image input setting (Photometric Stereo Image Input)* on page 1-117.

Display setting

- Refer to *1-6-2 Image input setting (Photometric Stereo Image Input)* on page 1-117.

1-6-4 Filter (Photometric Stereo Image Input) Filter setting

Adjust the Photometric Stereo Image filter parameters

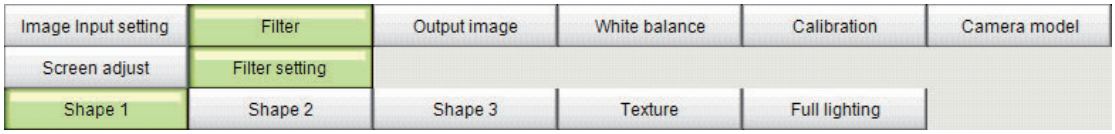
- Refer to *Shape 1, Shape 2, Shape 3* on page 1-128.
- Refer to *Texture* on page 1-130.
- Refer to *Full lighting* on page 1-131.

Shape 1, Shape 2, Shape 3

You can set the filter parameters for a Photometric Stereo image captured as a Shape image.

You can analyze the change in magnitude of brightness from the captured Photometric Stereo image and can extract a defect as a Shape image.

1 In the Item Tab area, click [Filter] and then click [Filter setting].

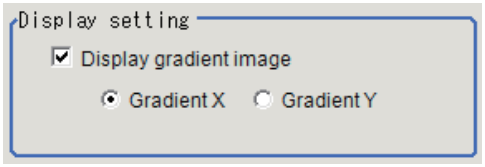


2 In the Item Tab area, select [Shape 1], or [Shape 2], or [Shape 3].

3 In the Display setting area, you can toggle the display between Shape image and Display gradient image. In the Gradient image, you can check whether the defect you want to detect (emphasize) is visible for the captured image.

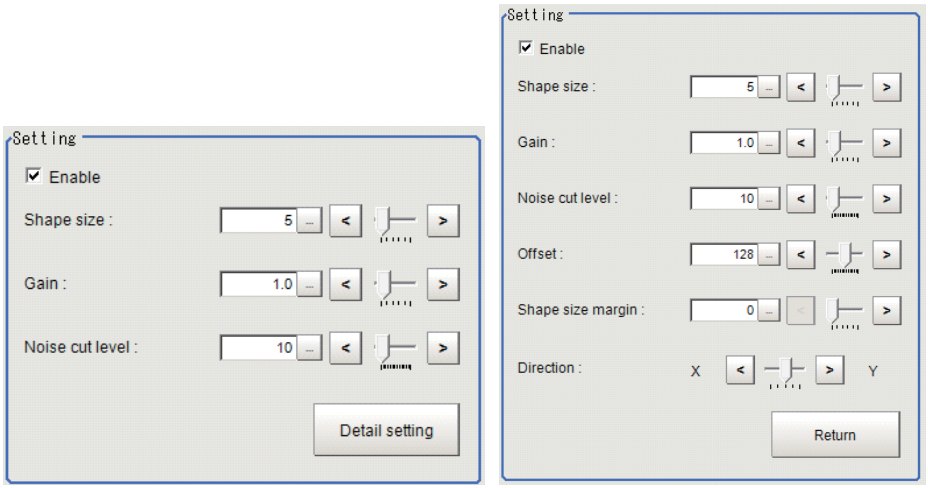
The image is the result of calculating the degree of brightness change on the X slope in the horizontal direction and the Y slope in the vertical direction.

The Gradient image is not linked with the parameters used in the Setting area.



Item	Setting value [Factory default]	Description
Display gradient image	• Checked • [Unchecked]	Checked: A gradient image is displayed. Unchecked: A Shape image is displayed.
Gradient image type	• [Gradient X] • [Gradient Y]	Set when displaying a Gradient image Gradient X: Image obtained as a result of calculating the degree of change in brightness in the horizontal direction Gradient Y: Image obtained as a result of calculating the degree of change in brightness in the vertical direction Display gradient image must be checked for this selection to be enabled.

4 Enter the required parameters for a Shape image in the Settings area.
If necessary, click the Detail setting button to set additional parameters.



Item	Setting value [Factory default]	Description
Enable	• Checked • Unchecked Shape 1: [Checked] Shape 2, Shape 3: [Unchecked]	Select whether or not to create a Shape image. If this is left unchecked, the corresponding Shape image will be invalid and a completely black image will be displayed.
Maximum defect size	1 to 100 Shape 1, Shape 2: [5] Shape 3: [15]	Adjust the size of the defect you want to extract in units of pixels. By increasing this value, larger defects can be extracted.
Gain	0.1 to 10 Shape 1: [1] Shape 2: [2.6] Shape 3: [9]	Adjust the degree of contrast for the Shape image. Increase the value to emphasize the density differences in the image.
Noise cut level	0 to 255 Shape 1, Shape 2: [10] Shape 3: [30]	Adjust the Noise cut level (density value) of the Shape image. Defects smaller than the set value will not be extracted as noise.
Offset	0 to 255 Shape 1: [128] Shape 2: [150] Shape 3: [128]	Adjust the brightness (intensity) of the Shape image. Increase the value to make the image brighter.
Shape size margin	0 to 5 Shape 1: [0] Shape 2: [1] Shape 3: [5]	Set this when you want to extract multiple defects of different sizes. Increasing the value will increase the width of the defect size to be extracted. You can extract small defects. (0: No margin, 1 or higher: split based on the maximum defect size)
Direction	0 to 4 Shape 1, Shape 2, Shape 3: [2]	Adjust the emphasis direction of the shape. By adjusting the degree (ratio) of emphasis between X and Y, it is possible to reduce patterns that appear in a fixed direction like a hairline fracture. 0: Stronger in X direction, 1: A little in X direction 2: In X direction, Equal in both directions 3: A little in Y direction, 4: Stronger in Y direction

Additional Information

If the defect cannot be detected, please check the following.

- The condition of the lighting installation

  Verify that the installation allows for the center of the light to be the same as the center of the camera.

  Verify that the lighting is not tilted
- Is the Start position of the lighting correct?

  Adjust the Position adjusting on the Screen adjust tab
- Other

  In the Input settings area of the Screen adjust tab, change the Input pattern from four to eight.

  Confirm whether a defect is visible in the Gradient image

  Adjust the parameters in the Setting area

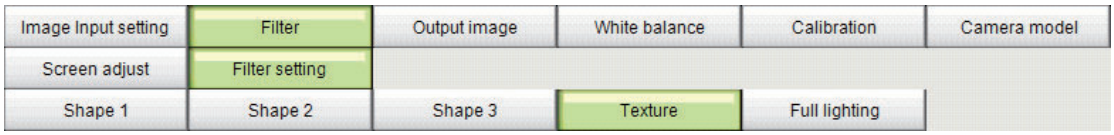
Texture

You can set the parameters for a Photometric Stereo image captured as a Texture image.

You can analyze the change in magnitude of brightness from the Photometric Stereo image and extract a Texture image in which halation is removed from text and patterns.

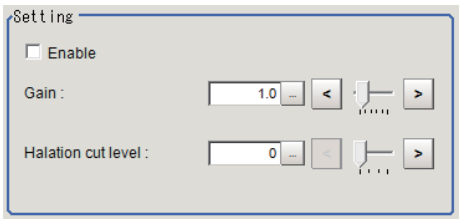
1 In the Item Tab area, click [Filter] and then click [Filter setting].

One row of display is added at the bottom of the tab area.



2 In the Item Tab area, select [Texture].

3 Enter the required parameters in the Setting area.



Item	Setting value [Factory default]	Description
Enable	• Checked • [Unchecked]	Select whether or not to create a Texture image. If this is left unchecked, the corresponding Shape image will be invalid and a completely black image will be displayed.
Gain	0.1 to 10 [1.0]	Sets the contrast for the Texture image. Increase the value to emphasize the density differences in the image.
Halation cut	0 to 3 [0]	Set this when halation occurs in the captured image. Setting this to a higher number can reduce the effect of halation. 0: None 1: Weak 2: Medium 3: Strong

Additional Information

If you cannot remove halation, please check the following.

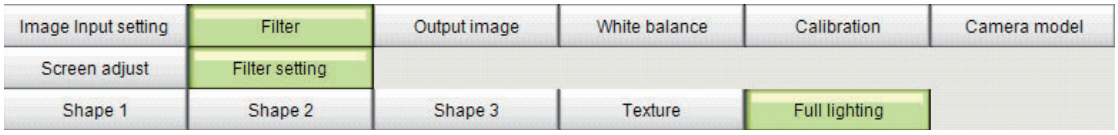
- The condition of the lighting installation
  Change the distance between the light and the workpiece object
- In the Lighting control area of the Screen adjust tab, change the Light width between Normal and Tight.
- Other
  In the Input settings area of the Screen adjust tab, change the Input pattern from four to eight.

Full lighting

Image capture is performed with all lights in the Photometric Stereo Lighting fixture turned ON and illuminating. The image captured with this condition is treated as a Full lighting image.

1 Click [Filter] in the Item tab area, and click [Filter setting].

One row of display is added at the bottom of the tab area.



2 In the Item Tab area, select [Full lighting].

3 Enter the required parameters for settings.

Item	Setting value [Factory default]	Description
Enable	• [Checked] • Unchecked	Select whether or not to do image capture with Full lighting. If this is left unchecked, the corresponding Shape image will be invalid and a completely dark image will be displayed.

1-6-5 Output image setting (Photometric Stereo Image Input)

Set the image to be output to the subsequent stage in the processing flow from among the images created by this filter.

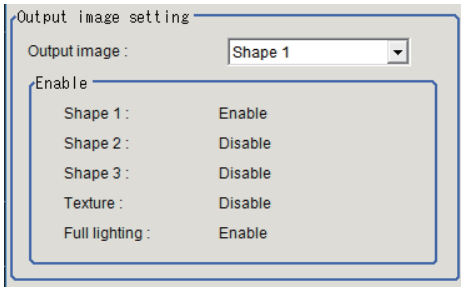
Output image

From among the images created by the filter setting, set the image to be output.

If you set an image that has not been created in Output image, a completely dark image will be output.

1 In the Item Tab area, click [Output image].

2 In the Output image setting area, select the Output image.



Item	Setting value [Factory default]	Description
Output image	• [Shape 1] • Shape 2 • Shape 3 • Texture • Full lighting	Set the Output image. If you select an image not created as an Output image, it will be invalid and a completely dark image will be output.

1-6-6 White balance (Photometric Stereo Image Input)

Refer to *1-2-6 White Balance (Camera Image Input FH)* on page 1-55.

1-6-7 Calibration (Photometric Stereo Image Input)

Refer to *1-2-7 Calibration (Camera Image Input FH)* on page 1-56.

1-6-8 Camera model (Photometric Stereo Image Input)

You can verify the model of the currently connected camera.

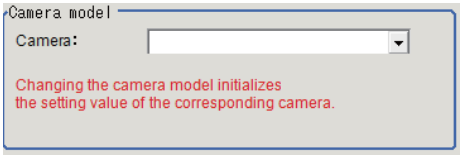
Camera model

Set the image to be output from among the images created by the filter.

If you set an image that has not been created by the Output image function, a completely dark image will be output.

1 In the Item tab area, click on [Camera model].

2 In the Camera model area, you can verify the camera model for the Camera No. currently selected on the [Input image setting] tab.



Additional Information

When using the simulation software, you can select any camera model in the camera model area.

When the camera model is changed, the settings of the corresponding camera are re-initialized.

1-6-9 External Reference Tables (Photometric Stereo Image Input)

No.	Data Name	Ident	Set/Get	Data range
10000	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
None	Camera No.	cameraNo	Set/Get	
None	Camera model	cameraModel	Set/Get	Connectable camera model name
None	Shutter speed	exposureTime	Set/Get	
None	Gain	gain	Set/Get	
None	Start line	startY	Set/Get	
None	End line	endY	Set/Get	
None	STEP - STGOUT delay	strobeDelay	Set/Get	
None	STGOUT width	pulseWidth	Set/Get	

No.	Data Name	Ident	Set/Get	Data range
None	STGOUT polarity	pulsePolarity	Set/Get	0: Negative 1: Positive
None	Input pattern	inputPattern	Set/Get	0: Four 1: Eight
None	Light width	lightWidth	Set/Get	
None	Intensity	lightGain	Set/Get	A representation of a lighting brightness in hexadecimal. Example: If the illumination brightness was in 255 (ff), ff
None	Position adjusting	channelOffset	Set/Get	-8: CCW 180° -7: CCW 157.5° -6: CCW 135° -5: CCW 112.5° -4: CCW 90° -3: CCW 67.5° -2: CCW 45° -1: CCW 22.5° 0: No adjustment 1: CW 22.5° 2: CW 45° 3: CW 67.5° 4: CW 90° 5: CW 112.5° 6: CW 135° 7: CW 157.5° 8: CW 180°
None	Enable	processShape1	Set/Get	0: Disable 1: Enable
None	Shape size	shapeSize1	Set/Get	1 to 100
None	Gain	shapeContrast1	Set/Get	0.1 to 10.0
None	Noise cut level	shapeNoise1	Set/Get	0 to 255
None	Offset	shapeLevel1	Set/Get	0 to 255
None	Shape size margin	shapeSizeMargin1	Set/Get	0 to 5
None	Direction	shapeRateXY1	Set/Get	0 to 4
None	Enable	processShape2	Set/Get	0: Disable 1: Enable
None	Shape size	shapeSize2	Set/Get	1 to 100
None	Gain	shapeContrast2	Set/Get	0.1 to 10.0
None	Noise cut level	shapeNoise2	Set/Get	0 to 255
None	Offset	shapeLevel2	Set/Get	0 to 255
None	Shape size margin	shapeSizeMargin2	Set/Get	0 to 5
None	Direction	shapeRateXY2	Set/Get	0 to 4
None	Enable	processShape3	Set/Get	0: Disable 1: Enable
None	Shape size	shapeSize3	Set/Get	1 to 100
None	Gain	shapeContrast3	Set/Get	0.1 to 10.0
None	Noise cut level	shapeNoise3	Set/Get	0 to 255
None	Offset	shapeLevel3	Set/Get	0 to 255
None	Shape size margin	shapeSizeMargin3	Set/Get	0 to 5
None	Direction	shapeRateXY3	Set/Get	0 to 4

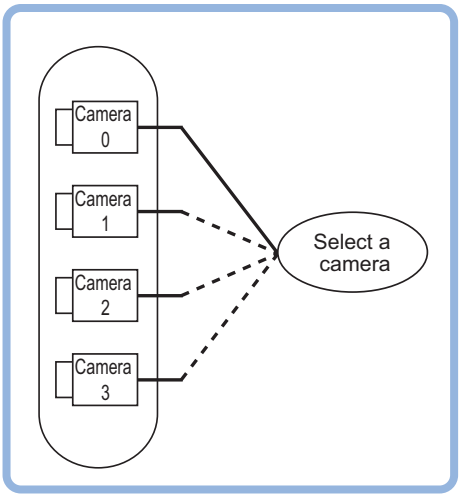
No.	Data Name	Ident	Set/Get	Data range
None	Enable	processTexture	Set/Get	0: Disable 1: Enable
None	Gain	textureContrast	Set/Get	0.1 to 10.0
None	Halation cut level	textureHalationCutLev	Set/Get	0 to 3
None	Enable	fullLighting	Set/Get	0: Disable 1: Enable
None	Output image	outputImage	Set/Get	1: Shape 1 2: Shape 2 3: Shape 3 4: Texture 20: Full lighting (Four) 24: Full lighting (Eight)
None	White balance R	whiteBalanceR	Set/Get	
None	White balance G	whiteBalanceG	Set/Get	
None	White balance B	whiteBalanceB	Set/Get	
None	Calibration parameter	calibParameter	Set/Get	"," Separated by a A B C D E F

1-7 Camera Switching

This processing item can not be used in the FHV series.

Used in the Following Case

When switching to images on cameras other than that has been set to [Camera Image Input] during scene processing

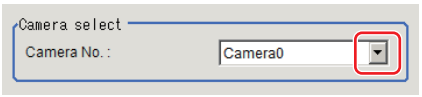


Important

- When switching from a monochrome camera to color camera, reconfigure the settings in the following units.
- Camera switching cannot be used with camera image input HDR.

1-7-1 Camera Selection (Camera Switching)

1 Select the cameras used for measurement.

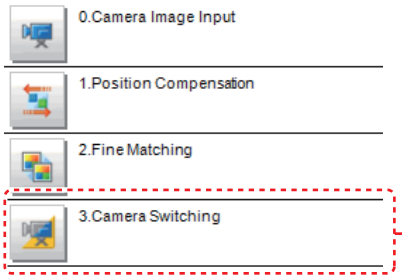


2 Click [OK].

The settings are finalized.

1-7-2 Additional Explanation (Camera Switching)

When creating a scene, [Position Compensation] will be disabled if [Camera Switching] is positioned after a [Position Compensation] unit, and this will restore the image of the measurement object to its former state before the position compensation was applied.



The Position Compensation for Unit 1 is being cancelled, making it restore to its former state before the Position Compensation was applied.

1-7-3 External Reference Tables (Measurement Image Switching)

No.	Data Name	Ident	Set/Get	Data range
10000	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mis-match) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
None	Camera No.	cameraNo	Set/Get	

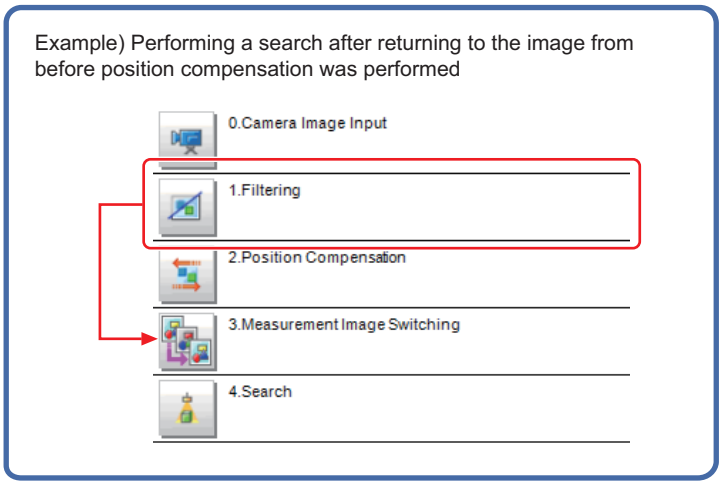
1-8 Measurement Image Switching

This sets the output image for the camera image input processing items and specified image conversion related processing items as the input image for the processing items set in the flow from this processing item onward.

This is primarily used to return converted images back to their originals and to increase the images that can be selected as conversion targets for image conversion related processing items by placing before the image conversion related processing items.

Used in the Following Case

To return a converted image to its original

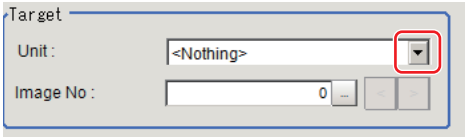


1-8-1 Parameter Settings (Measurement Image Switching)

Specify the processing unit that outputs the images to configure.

Select one that is located in upper position than this processing unit in the flow.

1 Select the target unit in the "Target" area.



Item	Set value [Factory default]	Description
Unit	0 to 9999 processing unit [<Nothing>]	Unit that outputs images subject to reset. Select one that is located in upper position than this processing unit in the flow.
Image No.	0 to 9999 [0]	No. of the image that the target unit holds.

Important

- If <Nothing> is left selected, the measurement image switching measurement result is NG. Be sure to select one other than <Nothing>.
- Selectable Camera Image Input or Compensate Image processing items and their image No. are as follows.
  For details, refer to *Macro Reference - List of Image Numbers* in the *Vision System FH/FZ5 Series Macro Customize Functions Programming Manual* (Z367).

Processing items	Image No.	Image
Camera Image Input	0	Camera image
Camera Image Input FH	0	Camera image
Camera Image Input HDR	0	Camera image
Camera Image Input HDR Lite	0	Camera image
Position Compensation	0	Position compensated image
Filtering	0	Filtered image
Background Suppression	0	Background suppressed image
brightness Correct Filter	0	Brightness corrected image
Color Gray Filter	0	Color gray image
Extract Color Filter	0	Color extracted image
Anti Color Shading	0	Anti color shading image
Stripes Removal Filter II	0	Stripes removed image
Polar Transformation	0	Polar transformed image
Trapezoidal Correction	0	Trapezoidal corrected image
Machine Simulator	0	Axis shifted image
Image Subtraction	0	Subtraction image
Advanced filter	0	Output image 0
	1	Output image 1
	2	Output image 2
	3	Output image 3
Panorama	0	Panorama image

2 Click [OK].

The settings are finalized.

1-8-2 Key Points for Test Measurement and Adjustment (Measurement Image Switching)

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image number	Explanation of image to be displayed
0	Reset image
1	Measurement image

1-8-3 External Reference Tables (Measurement Image Switching)

No.	Data name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
120	Target unit	unitNo	Set/Get	-1 to 9,999: Unit that outputs images subject to reset -1: No setting
121	Image no.	imageNo	Set/Get	0 to 9,999: Image number

1-9 Multi-trigger Imaging

This function can be used only with FH series/FZ5-800 series/FZ5-1100 series/FZ5-1200 series. The Multi-trigger Imaging processing item captures multiple images at user-defined timings and executes parallel measurement for each image. If you append this processing item in the flow, Multi-trigger Imaging, Multi-trigger Imaging Task, Camera Image Input FH and Multi-trigger Imaging End will be added as a group. Insert the Multi-trigger Imaging to the top of the flow. The Multi-trigger Imaging, Multi-trigger Imaging Task, and Multi-trigger Imaging End cannot be used alone. Please use them as a group.

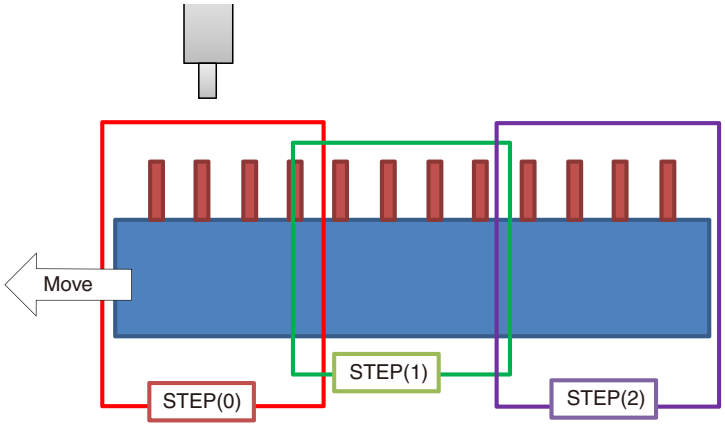
For details, refer to *Changing the System Environment - Multi-trigger Imaging Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

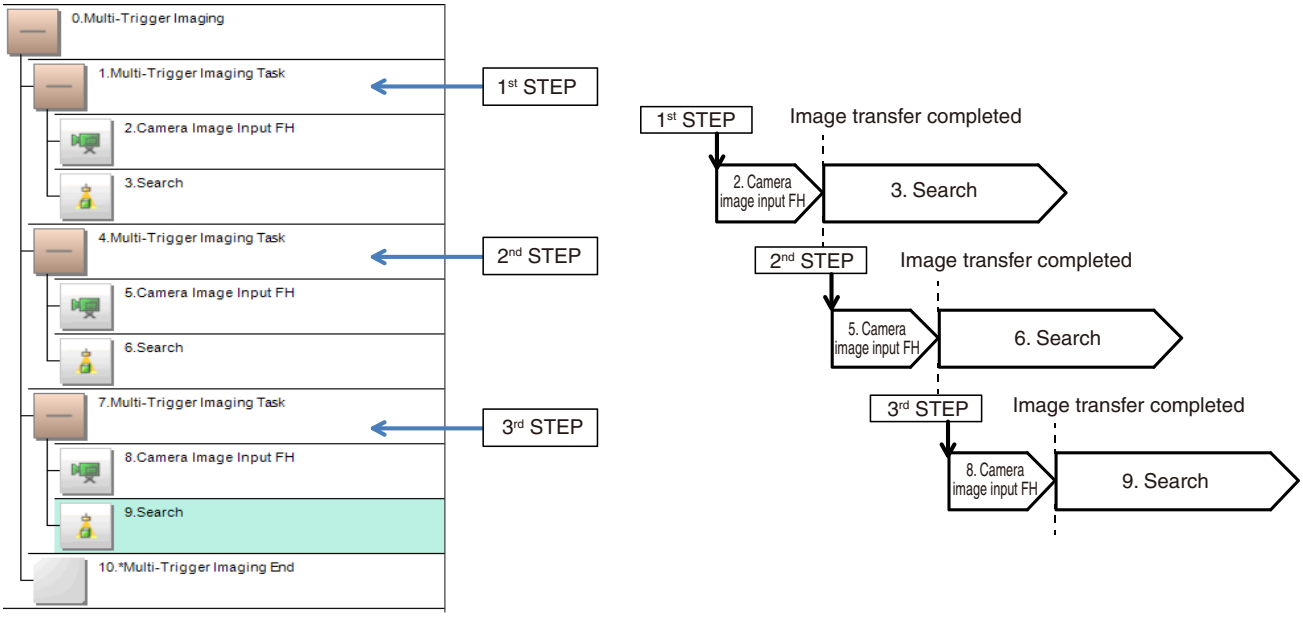
Used in the Following Case

Systems which capture multiple images at user-defined timings and executes parallel measurement for each image.

Example:

This function takes multiple images of a long and thin workpiece at certain timings. While the system takes images for multiple times, it executes measurement for each image in parallel. After that, measurement processing is performed based on the measurement results.





Important

- Multi-trigger Imaging cannot be used when the Operation mode is [Double Speed Multi-input].
- Set the Multi-trigger Imaging processing item to the top (unit 0) of the flow.
- Always set only one Multi-trigger Imaging processing item in one flow.
- The signals that can be used as an image capture trigger are STEP signal of parallel and Trigger signal of EtherCAT. Measurement executed by signals other than these signals or control command does not wait the STEP signal and flow is executed automatically as the controller does in the previous system.
- If the Image mode of the Image Window Setting is set as [Through], flow is executed automatically as the controller does in the previous system.

Mode and timeout (Multi-trigger Imaging)

Configure the Mode and Timeout of Multi-trigger Imaging processing item.

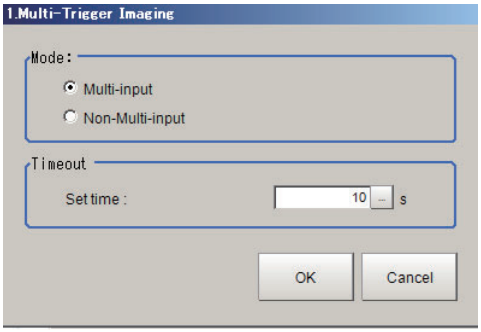
For details, refer to *Multi-trigger Imaging Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No.Z365).

1 On the Main Window (Layout 0), select [Function] - [Edit flow].

2 Select a Multi-trigger Imaging processing item.

3 Click the [Set] button.

4 Configure the Mode and Timeout.



Item	Set value [Factory default]	Description
Mode	• [Multi-input] • Non-Multi-input	Set the processing mode of Multi-trigger Imaging Task. • Multi-input mode: Select this if Multi-input mode is used in the Multi-trigger Imaging Task. The Camera setting for the Input image processing item of the first Multi-trigger Imaging Task is applied to that for other Input image processing items that are executed in Multi-trigger Imaging Tasks. • Non-Multi-input: Cameras operate according to their own settings. The Camera setting for the Input image processing item of the Multi-trigger Imaging Task is applied to each execution of Input image processing items. Because Camera setting is executed at each execution of Input image processing item, the time that READY signal stays OFF becomes longer by several ms to several tens of ms compared with that in Multi-input mode.
Timeout	1 to 60 s [10]	Set the time for timeout of Multi-trigger Imaging Task block. It is a wait time between a Multi-trigger Imaging Task and the next one. When a STEP signal is not input within the timeout time after the READY signal turns ON, the Multi-trigger Imaging unit judgment will be NG.

Important

- In the following cases, the system operates in Multi-input mode, regardless of the settings for Mode.
  - Camera Image Input HDR or Camera Image Input HDR Lite is used.
  - Multiple Input image processing items are used in one Multi-trigger Imaging Task block.
  - FZ-SQ□□□□camera is used with its light ON.
  - Input image processing item is inserted outside of the range between Multi-trigger Imaging and Multi-trigger Imaging End processing items.
- There are restrictions below when FZ-FQ□□□□ camera is used with its light ON.
  - All Camera Image Input processing items operate with the settings for the Camera Image Input of the first Multi-trigger Imaging Task in the flow.
  - The system operates in Multi-input mode disabled. (It takes longer time to turn ON the READY signal).
  - When the light of FZ-FQ□□□□camera is OFF, the camera operates in the same way as other camera does.

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When there is poor image capture results

Parameter to adjust	Description
Edit flow	Verify that there are no additional Camera Image Input units between a Multi-Trigger Imaging block and the first Multi-Trigger Imaging task. If there is a Camera Image Input related unit in this position, image capture results will not be correct. When using Multi-Trigger Imaging, ensure that Camera Image Input related units are contained inside a Multi-Trigger Imaging task.
	The number ofMulti-Trigger Imaging tasks does not match the number ofSTEP signal inputs. Verify that the number of Multi-Trigger Imaging tasks and the number of STEP signal inputs match and try image capture again.

1-9-1 External Reference Tables (Measurement Image Switching)

No.	Data Name	Ident	Set/Get	Data range
None	Mode	multiInput	Set/Get	0: Non-Multi-input 1: Multi-input
None	Timeout	timeout	Set/Get	1,000 to 60,000
None	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)

1-10 Multi-trigger Imaging Task

This function can be used only with FH series/FZ5-800 series/FZ5-1100 series/FZ5-1200 series. The Multi-trigger Imaging processing item captures multiple images at user-defined timings and executes parallel measurement for each image. If you append this processing item in the flow, Multi-trigger Imaging Task and Camera Image Input FH will be added as a group. The Multi-trigger Imaging Task does not require setting. Insert this processing item to the top of the processing which requires imaging for multiple times. The Multi-trigger Imaging, Multi-trigger Imaging Task, and Multi-trigger Imaging End cannot be used alone. Please use them as a group.

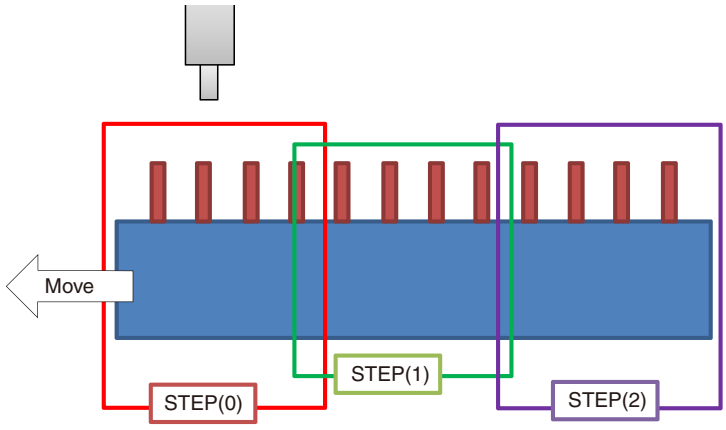
For details, refer to *Changing the System Environment - Multi-trigger imaging Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

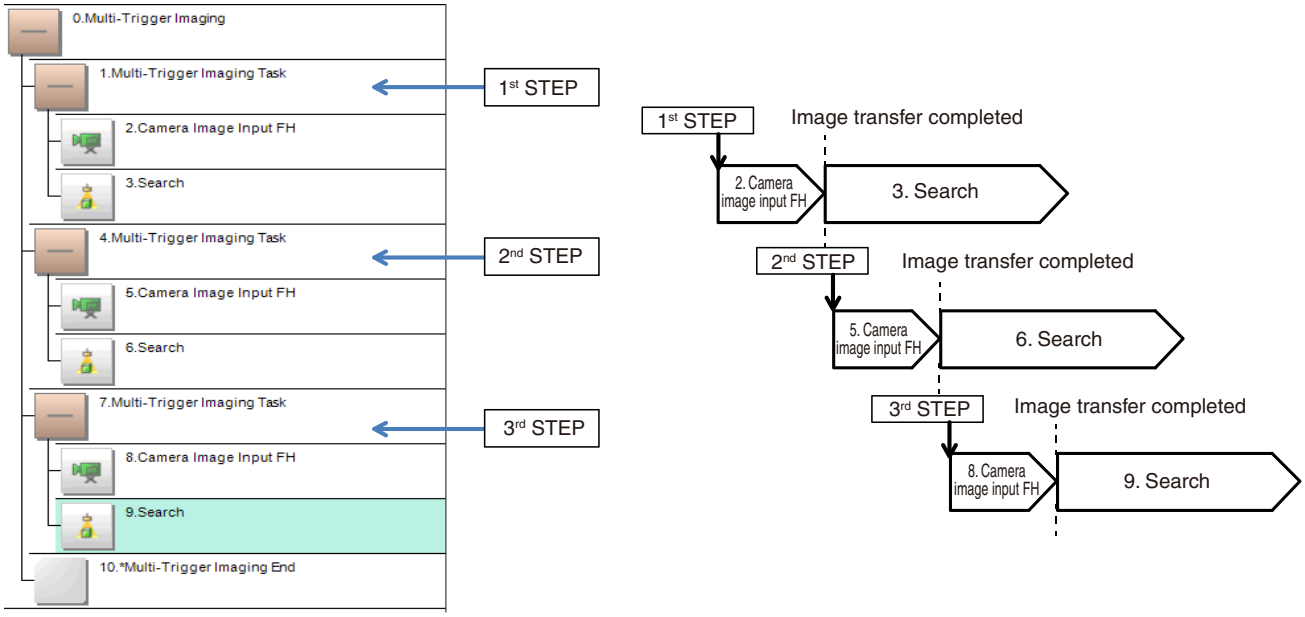
Used in the Following Case

Systems which capture multiple images at user-defined timings and executes parallel measurement for each image.

Example:

This function takes multiple images of a long and thin workpiece at certain timings. While the system takes images for multiple times, it executes measurement for each image in parallel. After that, measurement processing is performed based on the measurement results.





Important

- The signals that can be used as STEP signals are STEP signal of parallel and Trigger input of EtherCAT. Measurement executed by signals other than STEP signal or control command does not wait the STEP signal and flow is executed automatically as the controller does in the previous system.
- If the Image mode of the Image Window Setting is set as [Through], flow is executed automatically as the controller does in the previous system.

2

Inspecting and Measuring

This chapter describes how to set up the processing items that execute measurement. In addition, key points for adjustment addressing unstable measurement results and shortening measurement time will also be introduced.

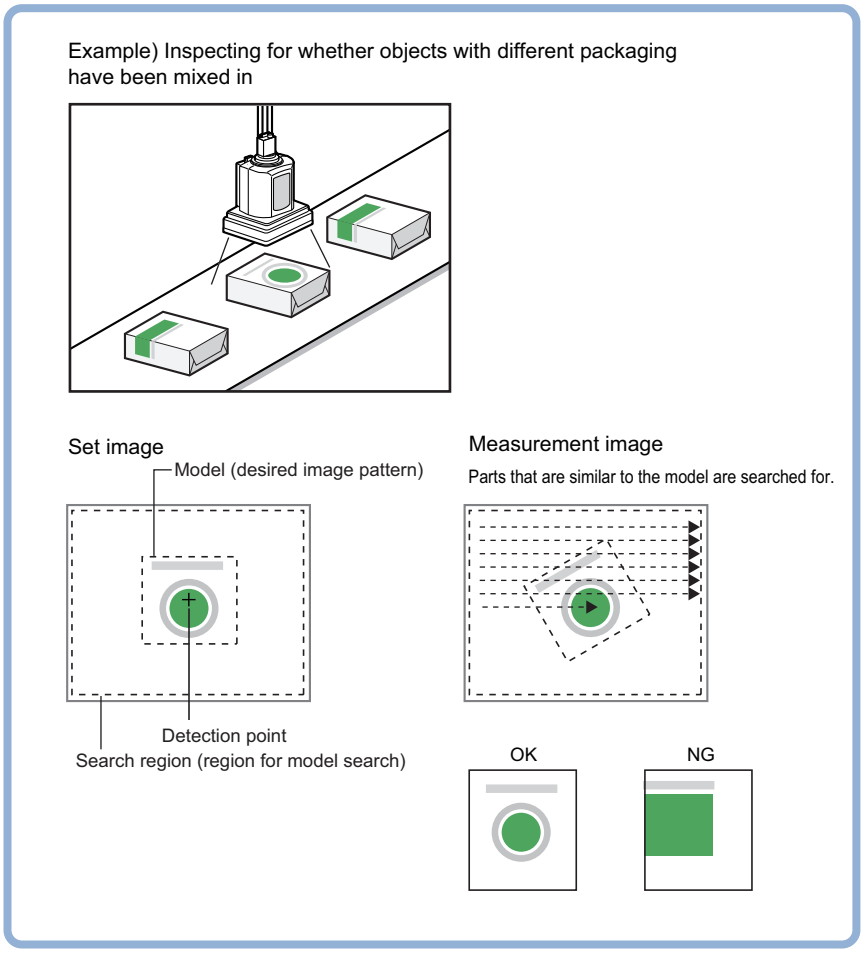
2-1 Search

Register the feature sections of the measurement object as an image pattern (model), then find the most similar part to these models from the input images to detect the position.

The correlation value showing the degree of similarity, measurement object position, and inclination can be output.

Used in the Following Case

When identifying the shape of measurement objects (for detecting defects or foreign matter)



Important

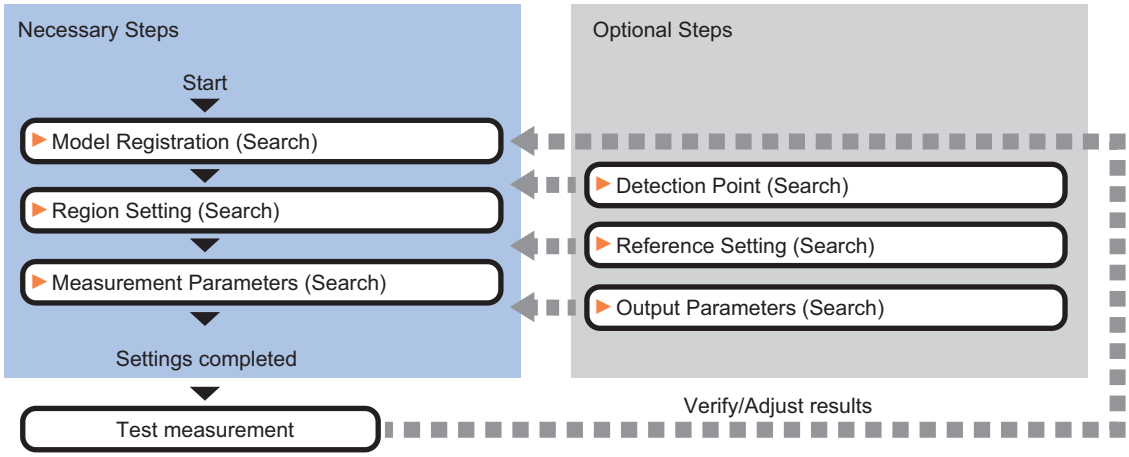
Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

Additional Information

Search processing basic concepts
For details, refer to *Appendixes Measurement Mechanism Search Processing Mechanism* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

2-1-1 Settings Flow (Search)

Set up searches according to the following flow.



List of Search Items

Item name	Description
Model register	This item registers the pattern characteristic of the measurement image as a model. Model parameter values can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used. Refer to *2-1-2 Model Registration (Search)* on page 2-11.
Region setting	This item is used to set up the measurement area. Instead of measuring the entire input image, narrowing the measurement area shortens the processing time. Refer to *2-1-3 Region Setting (Search)* on page 2-13.
Detection point	This item can be changed if necessary. Specify a position in the model that should be used as the detection coordinates during measurement. Usually, the central position of the set model is registered as the detection coordinates. Refer to *2-1-4 Detection Point (Search)* on page 2-14.
Ref. setting	This item can be changed if necessary. Specify the reference position within the camera's field of view. Refer to *2-1-5 Reference Setting (Search)* on page 2-15.
Measurement	This item specifies the judgement condition for measurement results. Specify the criteria to judge the measurement result if the X and Y coordinates and the correlation with the model are OK. Refer to *2-1-6 Measurement Parameters (Search)* on page 2-17.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. Refer to *2-1-7 Output Parameters (Search)* on page 2-18.

2-1-2 Model Registration (Search)

Register the parts to measure as the model.

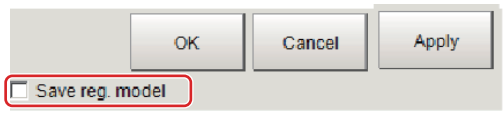
The position at the time of registration is also registered in the model information. Place the measurement object in the correct position when registering a model.

1 In the Item Tab area, click [Model].

When setting a new model, you do not have to click [Model].

2 Use the drawing tools to specify the model registration range.

3 To save the entire image used for model registration, place a check at the "Save reg. model" option.



Important

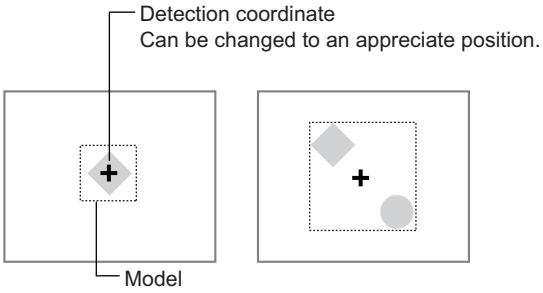
If you save the registered model image, you can re-register the model with the same image after model parameters are adjusted. Note that the scene data size increases when a registered model image is saved.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

Additional Information

When a model is registered, the central coordinates of the model are registered as the detection point. A detection point is a point output as a measurement value. If multiple figures are combined, the central coordinates of the circumscribed rectangle are registered.

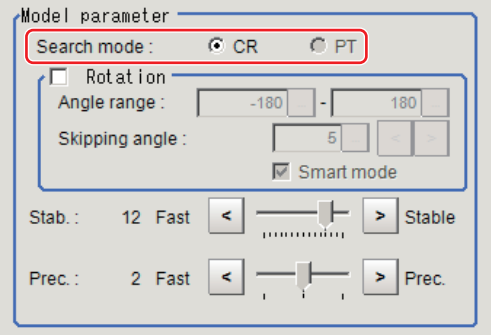


Changing Model Parameters

Model parameter values can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used.

After changing a setting, re-register the model.

1 In the "Model parameter" area, select the search mode, then specify a value for each item for that mode.



Setting item	Set value [Factory default]	Description
Search mode	[CR]	Search for normalizing the brightness. This method can provide stable measurement when there is fluctuation in the overall brightness and when the image has low contrast.
	PT	Measures the degree of matching with the profile. This method can measure at higher speed when the rotation angle has a wide range. It is available only when a 0.3 megapixel color camera is connected.

● When CR is selected

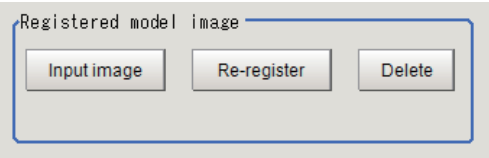
Setting item		Set value [Factory default]	Description
Rotation		• Checked • [Unchecked]	When the measurement object is rotating, place a check at "Rotation" and specify how many degrees the model created rotates each time and through what range of angles. A smaller skipping angle increases stability, but slows down the processing. The forward direction is clock-wise.
	Angle range	[-180 to 180]	
	Skipping angle	1 to 30 [5]	
Smart mode		• [Checked] • Unchecked	Checking the "Smart mode" option enables a high-speed rotation search. However, the stability may be lowered when the model shape aspect ratio is large or when the NOT mask is used.
Stab.		1 to 15 [The default value depend on the connected cam-era. 9 or 12]	Specify which is to have priority, measurement stability or speed. If lowering stability does not speed up processing, it is likely that many candidates have been detected. In this case, specify a larger value for "Candidate LV" or "Stab."
Prec.		1 to 3 [2]	Specify which is to have priority, measurement positional precision or speed.

● When PT is selected

Setting item	Set value [Factory default]	Description
Angle range	[-180 to 180]	This item specifies the rotation angle range for searching. The normal direction is clockwise.
Stability	1 to 5 [3]	If lowering stability does not speed up processing, it is likely that many candidates have been detected. In this case, specify a larger value for "Candidate LV" or "Stab."

Displaying/Re-Registering/Deleting a Model

If you save the model registration image, it is easy to re-register the model after model parameters are changed.



Item	Description
Disp model/Input image	The model image display and input image display are switched.
Re-register	When model parameters are modified, display the original model image and re-register the model.
Delete	Deletes a model.

2-1-3 Region Setting (Search)

Use a rectangle to specify the area where the model is searched.

Instead of measuring the entire input image, narrowing the measurement area shortens the processing time.

1 In the Item Tab area, click [Region setting].

2 Click [Edit].

The figure setting area is displayed.

3 Specify the area in which to search for the model.

The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

2-1-4 Detection Point (Search)

Specify a position in the model that should be used as the detection coordinates during measurement. Usually, the central position of the set model is registered as the detection point. This function is used to change to any desired position.

A detection point can be set either directly or by referencing a unit.

Additional Information

After changing the detection point coordinates to another position, re-registering the model will change it back to the center coordinates of the model.

Specifying directly

Click a position on the image you want to use as a detection point, or input coordinate data for that point.

1 In the Item Tab area, click [Detection point].

In the Display area, the current detection point is displayed with a crosshair cursor.

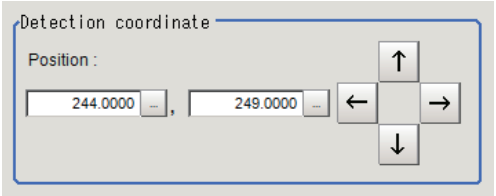
2 In the "Method" area, select "Numerical".

3 Click the position to be set as the detection point.

Additional Information

Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.

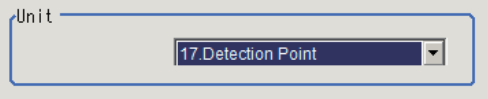


Referencing a unit

Set a detection point by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

1. In the Item Tab area, click [Detection point].
   In the Display area, the current detection point is displayed with a crosshair cursor.
2. In the "Method" area, select "Unit".

3. In the scene in the "Unit" area, select a detection point unit.



4. Perform the next measurement, and the detection point will be displayed.

2-1-5 Reference Setting (Search)

When the model is set, this position is automatically set at the same time as the reference position. This item can be set to change the reference position to any desired position. This is handy for measuring the position deviation from a certain position.

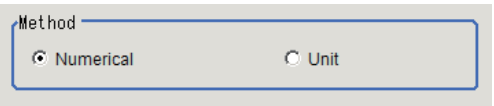
A reference position can be set either directly or by referencing a unit.

Specifying directly

Click a position on the image you want to use as a reference position, or input coordinate data for that point.

1. In the Item Tab area, click [Ref. setting].
   In the display area, the current reference position will be displayed as the crosshair cursor.

2. In the "Method" area, select "Numerical".

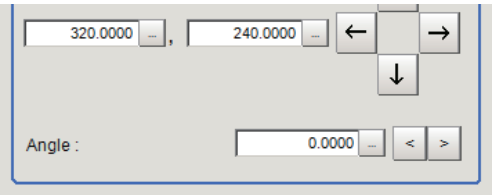


3. Click the position to be set as the reference.

Additional Information

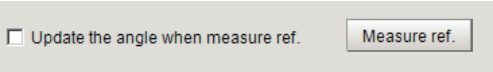
Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.

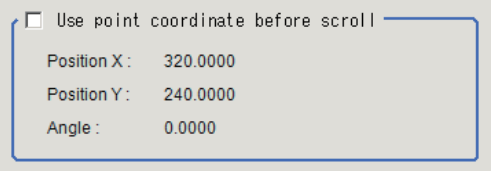


5 Set the reference angle with a numeric value.

6 To remeasure on the displayed image and set the reference, click the [Measure ref.] button. To update the reference angle at the time of reference measurement, place a check at "Update the angle when measure ref.".



7 To use data before position compensation for the reference setting coordinates, place a check at "Use point coordinate before scroll".



Referencing a unit

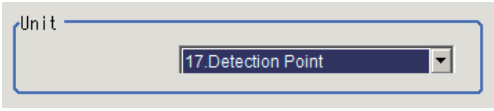
Set a reference by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".

3 In the scene in the "Unit" area, select a detection point unit.



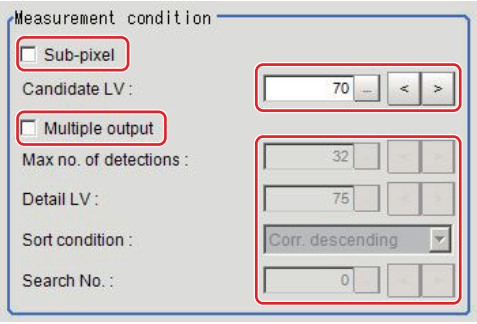
4 Perform the next measurement, and the reference will be displayed.

2-1-6 Measurement Parameters (Search)

Specify the search measurement conditions and the judgement conditions for the measurement results.

1 In the Item Tab area, click [Measurement].

2 In the "Measurement condition" area, specify a value for each item.

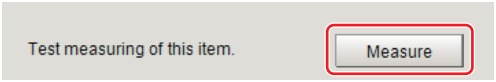


Setting item	Set value [Factory default]	Description
Sub-pixel	• Checked • [Unchecked]	When a check is placed at sub-pixel, the position information can be measured in units of sub-pixels. However, this requires more processing time.
Candidate LV	0 to 100 [70]	Specify the threshold value with which to detect candidate points in a rough search. Specify a smaller value when model search results are unreliable.

- When executing a multi search

Setting item	Set value [Factory default]	Description
Multiple output	• Checked • [Unchecked]	Select to execute a multi searches.
Max. no. of detections	1 to 128 [32]	This executing item is available when Multi search is executed. Specify the maximum number of detections. If it detects more objects than the specified value, these matches are sorted out to output up to the specified value from the top.
Detail LV	0 to 100 [75]	Specify the threshold value with which to detect candidate points in a detail search.
Sort condition	• Corr. ascending • [Corr. descending] • X coordinate ascending • X coordinate descending • Y coordinate ascending • Y coordinate descending	Specify the conditions by which the search number is re-assigned. When sorting referencing the X and Y coordinates, the upper left is the origin.
Search No.	0 to 127 [0]	Specify which of the multiple detection results will be used as measured results.

3 When the setting has been changed, click [Measure] in the Detail area to verify whether measurements can be made correctly.



Additional Information

When the display settings for multiple points are overlapped, magnify the displayed image to check.

4 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

Setting item	Set value	Description
Count	0 to 128	Specify the number of detections that are judged to be OK.
Measure X	-99999.9999 to 99999.9999	Specify the range of X-axis shifting that is judged to be OK.
Measure Y	-99999.9999 to 99999.9999	Specify the range of Y-axis shifting that is judged to be OK.
Search angle	-180 to 180	Specify the range of angles that are judged to be OK.
Correlation	0 to 100	Specify the range of correlation values that are judged to be OK. However, when the correlation value of the measurement result is 0, the judgement result will be NG regardless of the lower limit setting.

2-1-7 Output Parameters (Search)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position deflection correction is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgment.

2-1-8 Key Points for Test Measurement and Adjustment (Search)

The following content is displayed in the "Detail result" area as text.

Important

Executing test measurements will also update the measurement results and the figures in the image.

Displayed item	Description
Judge	Judgement result
Count	Count
Correlation value	Correlation value
Measure X	X coordinate of the position where the model is detected
Measure Y	Y coordinate of the position where the model is detected
Angle θ	Angle of the position where the model is detected

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

- Searching other positions

Parameter to be adjusted	Remedy
Model parameter	Specify a larger value for the "Prec."
	If the measurement results are unstable only when "Rotation" is selected, specify a smaller value for the "Skipping angle".
	When "Rotation" is selected, if the model shape is complex, uncheck the "Smart mode" option.
	If the image has low contrast or blurred edges, set the "Search mode" to "CR".
	If the model image consists of detailed figures, specify a larger value for "Stab."
Measurement parameter	If the precision is low, place a check at "Sub-pixel".
	If images that should be judged OK vary greatly, specify a smaller value for "Candidate LV".

- The judgement is NG (insufficient memory)

Parameter to be adjusted	Remedy
Region setting	Make the search region as small as possible.
Model parameter	Bring "Stab." close to the factory default value.
	Bring the "Skipping angle" close to the factory default value.
	Specify a smaller value for "Prec.".

● When the processing speed is slow

Parameter to be adjusted	Remedy
Region setting	Make the search region as small as possible.
Model registration	Make the area to register as the model as small as possible.
Model parameter	If the model image is a simple figure or a large figure, specify a smaller value for "Stab." If lowering stability does not speed up processing, it is likely that many candidates have been detected. Raise the "Candidate LV" in [Measurement].
	When "Rotation" is selected and the model image is a simple figure, specify a larger value for "Skipping angle".
	When "Rotation" is selected and the model image is a simple figure, place a check at "Smart mode".
	If the position precision is high, specify a smaller value for "Prec.".
	If the rotation angle range is large, set the "Search mode" to "PT".
Measurement parameter	If images that should be judged OK vary little, specify a larger value for "Candidate LV".
	If the position precision is high, uncheck "Sub-pixel".

2-1-9 Measurement Results for Which Output Is Possible (Search)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement result	JG	Judgement result
Count	C	Number of search items detected If none detected, 0
Correlation value	CR	Correlation value with the model
Measurement coordinate X	X	X coordinate of the position where the model is detected
Measurement coordinate Y	Y	Y coordinate of the position where the model is detected
Measurement angle	TH	Angle of the position where the model is detected
Reference position X	SX	X coordinate of the reference position of the registered model
Reference position Y	SY	Y coordinate of the reference position of the registered model
Reference angle	ST	Angle of the registered model
Detection point RX	RX	X coordinate of the registered model
Detection point RY	RY	Y coordinate of the registered model
Correlation value N (N = 00 to 127)	CRN	Detected search N correlation value (N = 00 to 127)
Position N (N = 00 to 127)	XN	Detected search N position X (N = 00 to 127)
Position N (N = 00 to 127)	YN	Detected search N position Y (N = 00 to 127)
Angle N (N = 00 to 127)	THN	Detected search N angle TH (N = 00 to 127)

2-1-10 External Reference Tables (Search)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Correlation value	correlation	Get only	0 to 100
6	Measure X	positionX	Get only	-99,999.9999 to 99,999.9999
7	Measure Y	positionY	Get only	-99,999.9999 to 99,999.9999
8	Measure angel	angle	Get only	-180 to 180
9	Reference X *1	referenceX	Get only	-99,999.9999 to 99,999.9999
10	Reference Y *1	referenceY	Get only	-99,999.9999 to 99,999.9999
11	Reference angle	referenceAngle	Get only	-180 to 180
12	Detected coordinate X	detectionX	Get only	-99,999.9999 to 99,999.9999
13	Detected coordinate Y	detectionY	Get only	-99,999.9999 to 99,999.9999
14	Count	count	Get only	0 to 128
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Search mode	searchMode	Set/Get	0: Correlation 1: Shape
121	With rotation	rotation	Set/Get	0: OFF 1: ON
122	Upper limit of the rotation angle	endAngle	Set/Get	-180 to 180
123	Lower limit of the rotation angle	startAngle	Set/Get	-180 to 180
124	Skipping angle	angleSkip	Set/Get	1 to 30
125	Smart mode	smartMode	Set/Get	0: OFF 1: ON
126	Stab. (CR)	stability	Set/Get	1 to 15
127	Prec.	accuracy	Set/Get	1 to 3
128	Stab. (PT)	searchSpeed	Set/Get	1 to 5
129	Reference X *2	referencePosX	Set/Get	0 to 99,999.9999
130	Reference Y *2	referencePosY	Set/Get	0 to 99,999.9999
132	Detection point X	detectionPosX	Set/Get	0 to 99,999.9999
133	Detection point Y	detectionPosY	Set/Get	0 to 99,999.9999
134	Sub-pixel	subPixel	Set/Get	0: OFF 1: ON
135	Candidate Point Level	candidateLevel	Set/Get	0 to 100
136	Upper limit of measure X	upperX	Set/Get	-99,999.9999 to 99,999.9999
137	Lower limit of measure X	lowerX	Set/Get	-99,999.9999 to 99,999.9999

No.	Data name	Ident	Set/Get	Data range
138	Upper limit of measure Y	upperY	Set/Get	-99,999.9999 to 99,999.9999
139	Lower limit of measure Y	lowerY	Set/Get	-99,999.9999 to 99,999.9999
140	Upper limit of the angle	upperAngle	Set/Get	-180 to 180
141	Lower limit of the angle	lowerAngle	Set/Get	-180 to 180
142	Upper limit of the corr.	upperCorrelation	Set/Get	0 to 100
143	Lower limit of the corr.	lowerCorrelation	Set/Get	0 to 100
144	Save registered model	savemdlimg	Set/Get	0: OFF 1: ON
145	Candidate Point Level	thersDetail	Set/Get	0 to 100
146	Sort condition	sort	Set/Get	0: Corr. ascending 1: Corr. descending 2: X ascending 3: X descending 4: Y ascending 5: Y descending
147	Search No.	searchNo	Set/Get	0 to 127
148	Upper limit of count judgement	upperCount	Set/Get	0 to 128
149	Lower limit of count judgement	lowerCount	Set/Get	0 to 128
150	Multiple output	isMulti	Set/Get	0: OFF 1: ON
151	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
152	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit
153	Update the reference angle	updateAngleFlg	Set/Get	0: Not update 1: Update
154	Reference angle	referencePosAngle	Set/Get	-180 to 180
155	Setting unit of detection coordinate	detUnitNo	Set/Get	-1 to 9,999
156	Setting type of detection coordinate	detSettingType	Set/Get	0: Numerical 1: Unit
157	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
158	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999
159	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999
160	Angle before scroll	beforeScrollRefAngle	Set/Get	-180 to 180
161	Count	extractCount	Set/Get	1 to 128
5100	Re-register	UpdateUnitModel	Set only	1: Execute
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
30000+N (N: 0 to 127)	Correlation value	correlation	Get only	0 to 100
40000+N (N: 0 to 127)	Measure X	positionX	Get only	-99,999.9999 to 99,999.9999

No.	Data name	Ident	Set/Get	Data range
50000+N (N: 0 to 127)	Measure Y	positionY	Get only	-99,999.9999 to 99,999.9999
60000+N (N: 0 to 127)	Measure angle	angle	Get only	-180 to 180
91000	figure0 Count	figArea0_count	Set/Get	1
91001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
91002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
91014	figure0 Rectangle Upper left position X	figArea0_fig0_box-_X0	Set/Get	-99,999 to 99,999
91015	figure0 Rectangle Upper left position Y	figArea0_fig0_box-_Y0	Set/Get	-99,999 to 99,999
91016	figure0 Rectangle Lower right position X	figArea0_fig0_box-_X1	Set/Get	-99,999 to 99,999
91017	figure0 Rectangle Lower right position Y	figArea0_fig0_box-_Y1	Set/Get	-99,999 to 99,999
91099	figure0 Update	figArea0_update	Set only	1: Update

*1. The reference coordinates based on the selection in the Method area of the [Ref.setting] tab can be Get only.

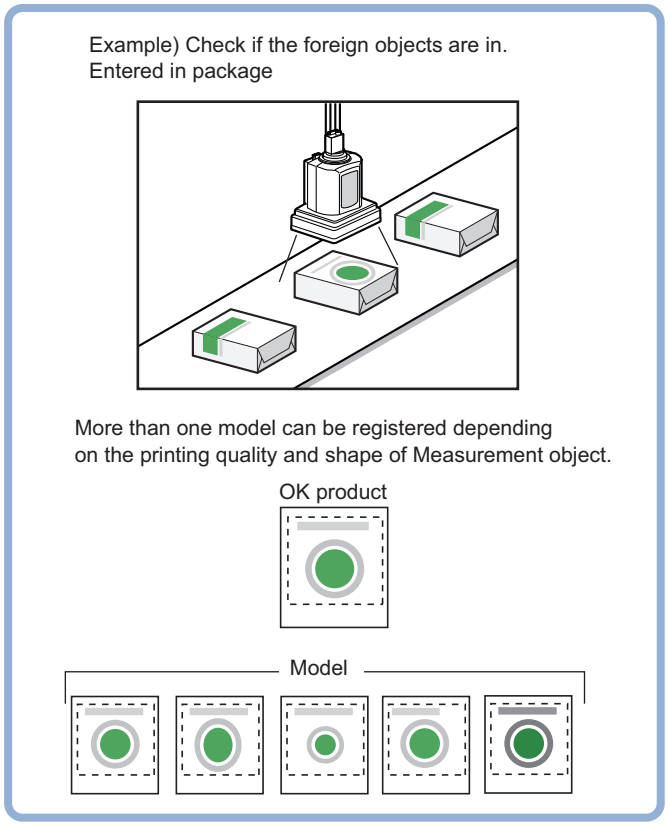
*2. The reference coordinates based on the selection of Numerical in the Method area of the [Ref.setting] tab can be Set/Get.

2-2 Flexible Search

In Flexible Search, multiple measurement object features (models) are registered beforehand. Parts from input images that most resemble the multiple models are searched for, and correlation (similarity) and position are determined.

Used in the Following Case

To treat models with only slight variations as the same and prevent excessive filtering out.



Important

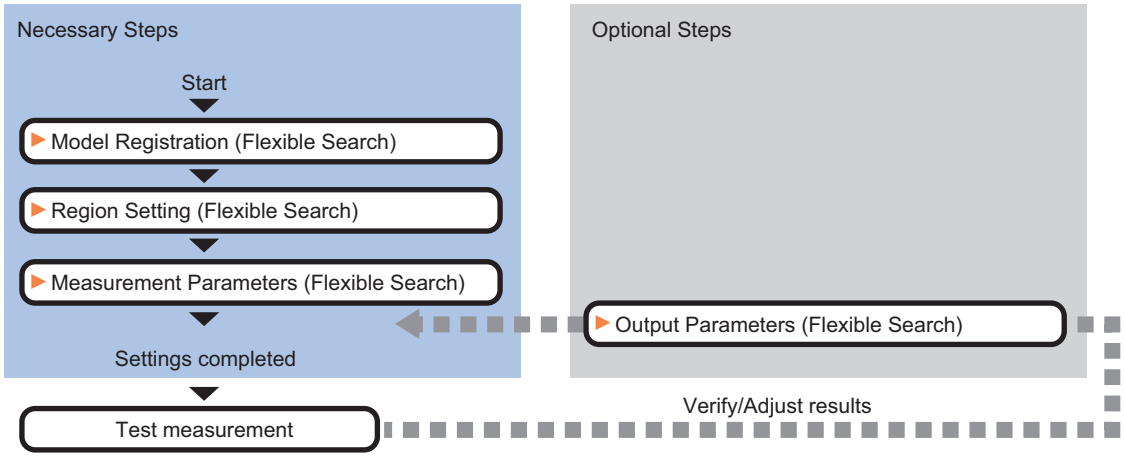
Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

Additional Information

Search processing basic concepts
For details, refer to *Appendixes Measurement Mechanism Search Processing Mechanism* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

2-2-1 Settings Flow (Flexible Search)

Set up flexible search according to the following steps.



List of Flexible Search Items

Item name	Description
Model register	This item registers the pattern characteristic of the measurement image as a model. Model parameter values can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used. Refer to *2-2-2 Model Registration (Flexible Search)* on page 2-26.
Region setting	This item is used to set up the measurement area. Instead of measuring the entire input image, narrowing the measurement area shortens the processing time. Refer to *2-2-3 Region Setting (Flexible Search)* on page 2-28.
Measurement	This item specifies the judgement condition for measurement results. Specify the criteria to judge the measurement result if the X and Y coordinates and the correlation with the model are OK. Refer to *2-2-4 Measurement Parameters (Flexible Search)* on page 2-28.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. Refer to *2-2-5 Output Parameters (Flexible Search)* on page 2-29.

2-2-2 Model Registration (Flexible Search)

Register the parts to measure as the model.

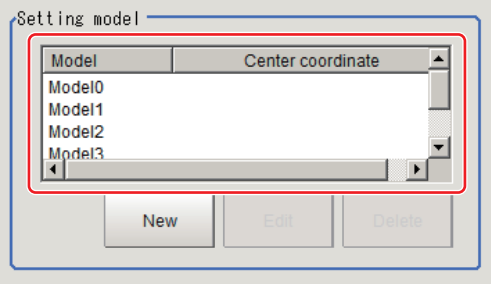
A total of 5 models, 0 through 4, can be registered, with no restriction on the size.

If a model has different printing qualities and shapes, more than one models should be registered.

The position at the time of registration is also registered in the model information. Place the measurement object in the correct position when registering a model.

1 In the Item Tab area, click [Model register].

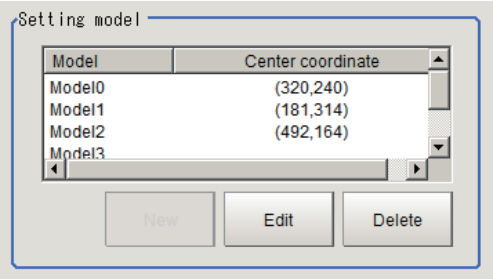
2 In the "Setting model" area, select a model and click [New].



3 Use the drawing tools to specify the model registration range.

4 Click [OK] in the Figure setting area.

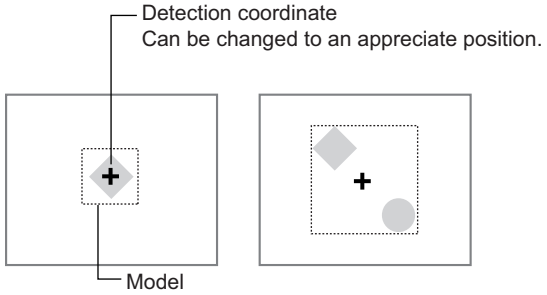
- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.



5 To register two or more models, repeat the Steps 2 to 4.

Important

When a model is registered, the center of the model is registered as the detection point. A detection point is a point output as a measurement value. If multiple figures are combined, the central coordinates of the circumscribed rectangle are registered.

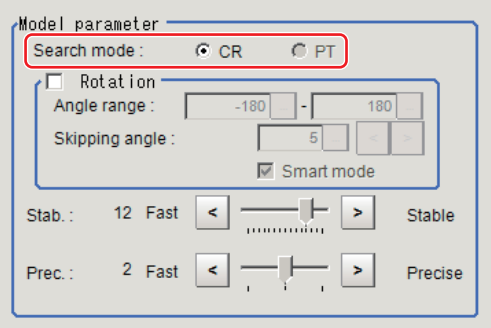


Changing Model Parameters

Model parameter values can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used.

After changing a setting, re-register the model.

1 In the "Model parameter" area, select the search mode, then specify a value for each item for that mode.



Setting item	Set value [Factory default]	Description
Search mode	[CR]	Search for normalizing the brightness. This method can provide stable measurement when there is fluctuation in the overall brightness and when the image has low contrast.
	PT	Measures the degree of matching with the model profile. This method can measure at higher speed when the rotation angle has a wide range. It is available only when a 0.3 megapixel color camera is connected.

● When CR is selected

Setting item	Set value [Factory default]	Description
Rotation	• Checked • [Unchecked]	When the measurement object is rotating, place a check at "Rotation" and specify how many degrees the model created rotates each time and through what range of angles. A smaller skipping angle increases stability, but slows down the processing. The normal direction is clockwise.
Angle range	[-180 to 180]	
Skipping angle	1 to 30 [5]	
Smart mode	• [Checked] • Unchecked	Checking the "Smart mode" option enables a high-speed rotation search. However, the stability may be lowered when the model shape aspect ratio is large or when the NOT mask is used.
Stab.	1 to 15 [The default value depend on the connected camera. 9 or 12]	Specify which is to have priority, measurement stability or speed. If lowering stability does not speed up processing, it is likely that many candidates have been detected. In this case, specify a larger value for "Candidate LV" or "Stab."
Prec.	1 to 3 [2]	Specify which is to have priority, measurement positional precision or speed.

● When PT is selected

Setting item	Set value [Factory default]	Description
Angle range	[-180 to 180]	This item specifies the rotation angle range for searching. The normal direction is clockwise.
Stab.	1 to 5 [3]	If lowering stability does not speed up processing, it is likely that many candidates have been detected. In this case, specify a larger value for "Candidate LV" or "Stab."

2-2-3 Region Setting (Flexible Search)

Use a rectangle to specify the area where the model is searched.

Instead of measuring the entire input image, narrowing the measurement area shortens the processing time.

1. In the Item Tab area, click [Region setting].
2. Click [Edit].

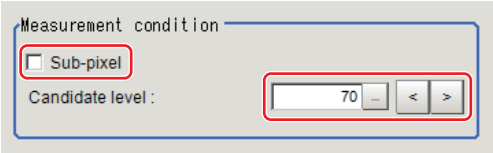
   The figure setting area is displayed.
3. Specify the area in which to search for the model.

   The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.
4. Click [OK] in the Figure setting area.
   - [OK]: Changes the settings and returns to the previous menu.
   - [Cancel]: Changes are discarded. Returns to the previous menu.
   - [Apply]: Updates the settings without leaving edit window.

2-2-4 Measurement Parameters (Flexible Search)

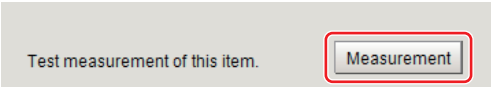
Specify the search measurement conditions and the judgement conditions for the measurement results.

1. In the Item Tab area, click [Measurement].
2. In the "Measurement condition" area, specify a value for each item.



Setting item	Set value [Factory default]	Description
Sub-pixel	• Checked • [Unchecked]	When a check is placed at sub-pixel, the position information can be measured in units of sub-pixels. However, this requires more processing time.
Candidate level	0 to 100 [70]	Specify the threshold value with which to detect candidate points in a rough search. Specify a smaller value when model search results are unreliable.

3 When the setting has been changed, click [Measurement] in the Detail area to verify whether measurements can be made correctly.



4 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

Setting item	Set value	Description
Position X	-99999.9999 to 99999.9999	Specify the range of X-axis shifting that is judged to be OK.
Position Y	-99999.9999 to 99999.9999	Specify the range of Y-axis shifting that is judged to be OK.
Search angle	-180 to 180	Specify the range of angles that are judged to be OK.
Correlation	0 to 100	Specify the range of correlation values that are judged to be OK. However, when the correlation value of the measurement result is 0, the judgement result will be NG regardless of the lower limit setting.

2-2-5 Output Parameters (Flexible Search)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgment.

2-2-6 Key Points for Test Measurement and Adjustment (Flexible Search)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Model number	Model No. of the biggest correlation
Correlation	Correlation value
Position X	X coordinate of the position where the model is detected
Position Y	Y coordinate of the position where the model is detected
Angle θ	Angle of the position where the model is detected

Additional Information

If the model is an ellipse, its circumscribing rectangle is displayed as the search result of the model.

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

- Searching other positions

Parameter to be adjusted	Remedy
Model parameter	Specify a larger value for the "Prec."
	If the measurement results are unstable only when "Rotation" is selected, specify a smaller value for the "Skipping angle".
	When "Rotation" is selected, if the model shape is complex, uncheck the "Smart mode" option.
	If the image has low contrast or blurred edges, set the "Search mode" to "CR".
	If the model image consists of detailed figures, specify a larger value for "Stab."
Measurement	If the precision is low, place a check at "Sub-pixel".
	If images that should be judged OK vary greatly, specify a smaller value for "Candidate LV".
	If the model image is small and unstable, specify a smaller value for the "Reduction".

- The judgement is NG (insufficient memory)

Parameter to be adjusted	Remedy
Region setting	Make the search region as small as possible.
Model parameter	Bring "Stab." close to the factory default value.
	Bring the "Skipping angle" close to the factory default value.
	Specify a smaller value for "Prec.".

● When the processing speed is slow

Parameter to be adjusted	Remedy
Region setting	Make the search region as small as possible.
Model register	Make the area to register as the model as small as possible.
Model parameter	If the model image is a simple figure or a large figure, specify a smaller value for "Stab." If lowering stability does not speed up processing, it is likely that many candidates have been detected. Raise the "Candidate level" in [Measurement].
	When "Rotation" is selected and the model image is a simple figure, specify a larger value for "Skipping angle".
	When "Rotation" is selected and the model image is a simple figure, place a check at "Smart mode".
	If the position precision is high, specify a smaller value for "Prec.".
	If the rotation angle range is large, set the "Search mode" to "PT".
Measurement	If images that should be judged OK vary little, specify a larger value for "Candidate level".
	If the position precision is high, uncheck "Sub-pixel".

2-2-7 Measurement Results for Which Output Is Possible (Flexible Search)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	Judgement result
Model No.	NO	Model No. of the biggest correlation
Correlation value	CR	Correlation value with the model
Measurement coordinate X	X	X coordinate of the position where the model is detected
Measurement coordinate Y	Y	Y coordinate of the position where the model is detected
Measurement angle	TH	Angle of the position where the model is detected
Reference position X	SX	X coordinate of the reference position of the registered model
Reference position Y	SY	Y coordinate of the reference position of the registered model
Reference angle	ST	Angle of the registered model
Detection point RX	RX	X coordinate of the registered model
Detection point RY	RY	Y coordinate of the registered model

2-2-8 External Reference Tables (Flexible Search)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Model No.	modelNo	Get only	0 to 4 -1: No models found
6	Correlation value	correlation	Get only	0 to 100
7	Measure X	x	Get only	-99,999.9999 to 99,999.9999
8	Measure Y	y	Get only	-99,999.9999 to 99,999.9999
9	Measure angle	angle	Get only	-180 to 180
10	Reference X	referenceX	Get only	-99,999.9999 to 99,999.9999
11	Reference Y	referenceY	Get only	-99,999.9999 to 99,999.9999
12	Reference angle	referenceAngle	Get only	-180 to 180
13	Detection point X	detectionX	Get only	-99,999.9999 to 99,999.9999
14	Detection point Y	detectionY	Get only	-99,999.9999 to 99,999.9999
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Search mode	searchMode	Set/Get	0: Correlation 1: Shape
121	With rotation	rotation	Set/Get	0: OFF 1: ON
122	Upper limit of the rotation angle	endAngle	Set/Get	-180 to 180
123	Lower limit of the rotation angle	startAngle	Set/Get	-180 to 180
124	Skipping angle	angleSkip	Set/Get	1 to 30
125	Smart mode	smartMode	Set/Get	0: OFF 1: ON
126	Stab. (CR)	stability	Set/Get	1 to 15
127	Prec.	accuracy	Set/Get	1 to 3
128	Stab. (SH)	searchSpeed	Set/Get	1 to 5
134	Sub-pixel	subPixel	Set/Get	0: OFF 1: ON
135	Candidate Point Level	candidateLevel	Set/Get	0 to 100
136	Upper limit of measure X	upperX	Set/Get	-99,999.9999 to 99,999.9999
137	Lower limit of measure X	lowerX	Set/Get	-99,999.9999 to 99,999.9999
138	Upper limit of measure Y	upperY	Set/Get	-99,999.9999 to 99,999.9999
139	Lower limit of measure Y	lowerY	Set/Get	-99,999.9999 to 99,999.9999
140	Upper limit of the angle	upperAngle	Set/Get	-180 to 180
141	Lower limit of the angle	lowerAngle	Set/Get	-180 to 180
142	Upper limit of the corr.	upperCorrelation	Set/Get	0 to 100

No.	Data name	Ident	Set/Get	Data range
143	Lower limit of the corr.	lowerCorrelation	Set/Get	0 to 100
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
95000	figure0 Count	figArea0_count	Set/Get	1
95001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
95002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
95014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
95015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
95016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
95017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
95099	figure0 Update	figArea0_update	Set only	1: Update

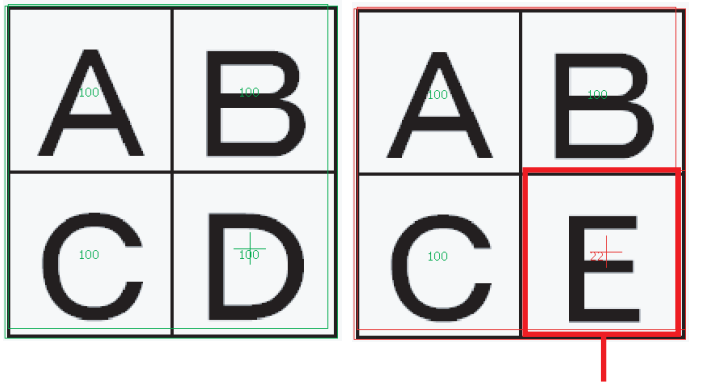
2-3 Sensitive Search

The registered models are automatically finely divided and matched in detail. Of the divided models, the one with the lowest correlation is output. Sensitive search is suitable when the difference between the model image and measurement image is small and regular searches do not produce differences in correlation.

Used in the Following Case

When identifying the shape of the divided area

If an entire object is registered as a model using the search function, identification cannot be done through correlation. However, if a model is registered using the sensitive search function, the correlation value will be lowered if one portion of that model is different, and this portion can be detected as a defect.

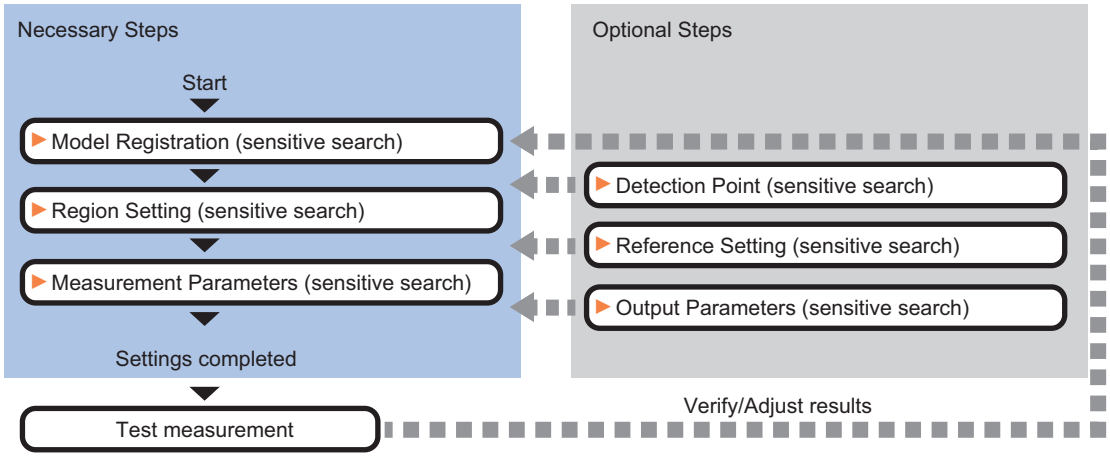


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-3-1 Settings Flow (Sensitive Search)

Set up sensitive search according to the following steps.



List of Sensitive Search Items

Item name	Description
Model	This item registers the pattern characteristic of the measurement image as a model. Model parameter values can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used. Refer to *2-3-2 Model Registration (Sensitive Search)* on page 2-36.
Region setting	This item is used to set up the measurement area. Instead of measuring the entire input image, narrowing the measurement area shortens the processing time. Refer to *2-3-3 Region Setting (Sensitive Search)* on page 2-38.
Detection point	This item can be changed if necessary. Specify a position in the model that should be used as the detection coordinates during measurement. Usually, the central position of the set model is registered as the detection coordinates. Refer to *2-3-4 Detection Point (Sensitive Search)* on page 2-39.
Ref. setting	This item can be changed if necessary. Specify the reference position within the camera's field of view. Refer to *2-3-5 Reference Setting (Sensitive Search)* on page 2-40.
Measurement	This item specifies the judgement condition for measurement results. Specify the criteria to judge the measurement result if the X and Y coordinates and the correlation values with the model are OK. Refer to *2-3-6 Measurement Parameters (Sensitive Search)* on page 2-42.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. Refer to *2-3-7 Output Parameters (Sensitive Search)* on page 2-43.

2-3-2 Model Registration (Sensitive Search)

Register the parts to measure as the model.

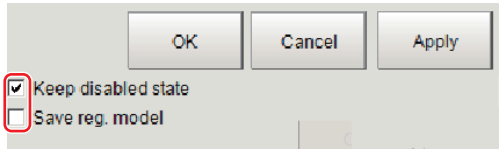
The position at the time of registration is also registered in the model information. Place the measurement object in the correct position when registering a model.

1 In the Item Tab area, click [Model].

When setting a new model, you do not have to click [Model].

2 Use the drawing tools to specify the model registration range.

3 To save the entire image used for model registration, place a check at the "Save reg. model" option. Also, when registering a model but not holding the disable setting for the sub-region set during the last time the model was registered, uncheck the "Keep disabled state" option.



Setting item	Set value [Factory default]	Description
Keep disabled state	• [Checked] • Unchecked	When the model is registered, this holds the disable setting for the sub-region set during the last time the model was registered.
Save reg. model	• Checked • [Unchecked]	To save the entire image used for model registration, place a check at this option.

4 Click [OK] / [Apply] in the Figure setting area.

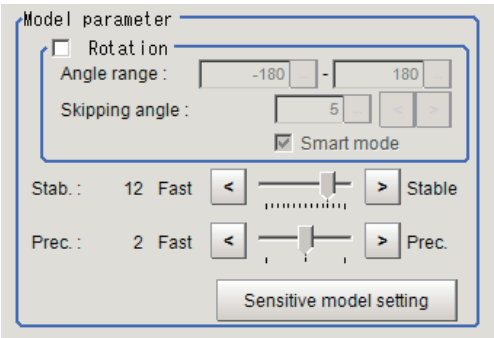
- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.1

Changing Model Parameters

Model parameter values can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used.

After changing a setting, re-register the model.

1 In the "Model parameter" area, set each item.



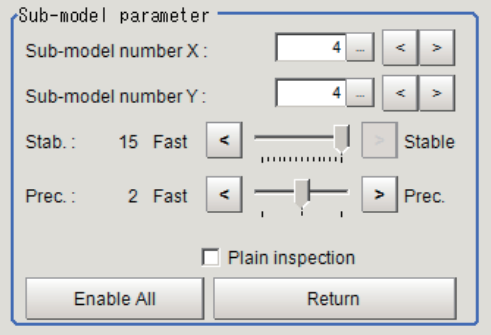
Setting item		Set value [Factory default]	Description
Rotation		• Checked • [Unchecked]	When the measurement object is rotating, place a check at "Rotation" check box and specify how many degrees the model created rotates each time and through what range of angles. A smaller skipping angle increases stability, but slows down the processing. The normal direction is clockwise.
	Angle range	[-180 to 180]	
	Skipping angle	1 to 30 [5]	
Smart mode		• [Checked] • Unchecked	Checking the "Smart mode" option enables a high-speed rotation search. However, the stability may be lowered when the model shape aspect ratio is large or when the NOT mask is used.
Stab.		1 to 15 [The default value depend on the connected camera. 9 or 12]	Specify which is to have priority, measurement stability or speed. If lowering stability does not speed up processing, it is likely that many candidates have been detected. In this case, specify a larger value for "Candidate level" or "Stab."
Prec.		1 to 3 [2]	Specify which is to have priority, measurement positional precision or speed.

Changing Sub-model parameter

Set the "Sensitive model setting" as necessary.

1 Click [Sensitive model setting] in the model parameter.

2 Set up the Sub-model parameter.



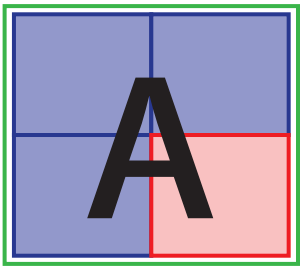
Setting item	Set value [Factory default]	Description
Sub-model number X	0 to 10 [4]	This sets the number of divisions of the registered model in the X direction.
Sub-model number Y	0 to 10 [4]	This sets the number of divisions of the registered model in the Y direction.
Stab.	1 to 15 [The default value depend on the connected camera. 12 or 15]	Specify which is to have priority, measurement stability or speed. If lowering stability does not speed up processing, it is likely that many candidates have been detected. In this case, specify a larger value for "Candidate level" or "Stab."
Prec.	1 to 3 [2]	Specify which is to have priority, measurement positional precision or speed.
Plain inspection	• Checked • [Unchecked]	Specify whether or not to inspect the plain region.

● Disabled setting

You can specify enable/disable of each sub-region.

1 Click the region you wish to disable and select "Disabled".

To release the disabling of a region, click "Enable All".

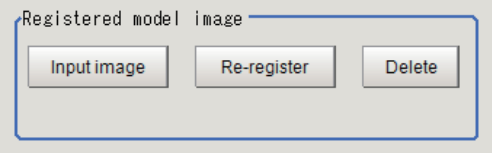


←Set as invalid

Divided model regions

Displaying/Re-Registering/Deleting a Model

If you save the model registration image, it is easy to re-register the model after model parameters are changed.



Item	Description
Disp model/Input image	The model image display and input image display are switched.
Re-register	When model parameters are modified, display the original model image and re-register the model.
Delete	Deletes a model.

2-3-3 Region Setting (Sensitive Search)

Use a rectangle to specify the area where the model is searched.

Instead of measuring the entire input image, narrowing the measurement area shortens the processing time.

1 In the Item Tab area, click [Region setting].

2 Click [Edit].

The figure setting area is displayed.

3 Specify the area in which to search for the model.

The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

2-3-4 Detection Point (Sensitive Search)

Specify a position in the model that should be used as the detection coordinates during measurement. Usually, the center position of the set model is registered as the detection point. This function is used to change to any desired position.

A detection point can be set either directly or by referencing a unit.

Additional Information

After changing the detection point coordinates to another position, re-registering the model will change it back to the center coordinates of the model.

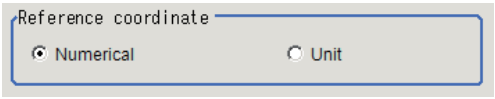
Specifying directly

Click a position on the image you want to use as a detection point, or input coordinate data for that point.

1 In the Item Tab area, click [Detection point].

In the Display area, the current detection point is displayed with a crosshair cursor.

2 In the "Method" area, select "Numerical".

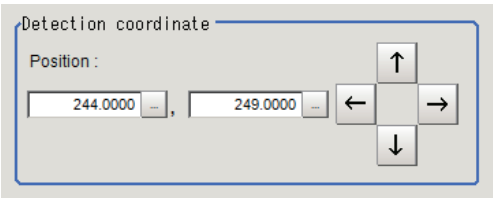


3 Click the position to be set as the detection point.

Additional Information

Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.



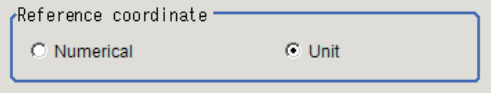
Referencing a unit

Set a detection point by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

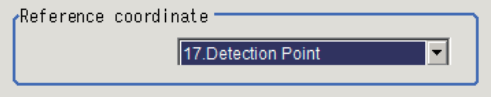
1. In the Item Tab area, click [Detection point].

   In the Display area, the current detection point is displayed with a crosshair cursor.

2. In the "Method" area, select "Unit".



3. In the scene in the "Reference coordinate" area, select a detection point unit.



4. Perform the next measurement, and the detection point will be displayed.

2-3-5 Reference Setting (Sensitive Search)

When the model is set, this position is automatically set at the same time as the reference position. This item can be used to change the reference position to any desired position. This is handy for measuring the position deviation from a certain position.

A reference position can be set either directly or by referencing a unit.

Specifying directly

Click a position on the image you want to use as a reference position, or set coordinate data for that point.

1. In the Item Tab area, click [Ref. setting].

   In the display area, the current reference position will be displayed as the crosshair cursor.

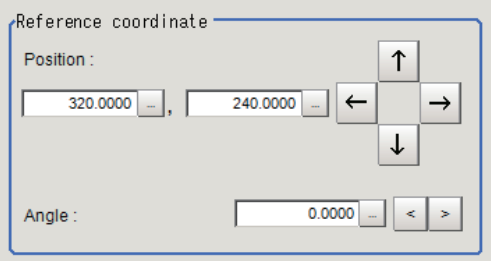
2. In the "Method" area, select "Numerical".

3. Click the position to be set as the reference.

Additional Information

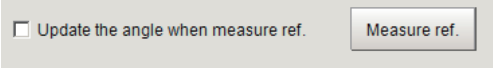
Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.

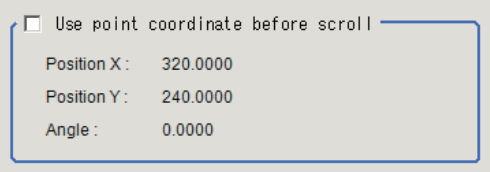


5 Set the reference angle with a numeric value.

6 To remeasure on the displayed image and set the reference, click the [Measure ref.] button. To update the reference angle at the time of reference measurement, place a check at "Update the angle when measure ref.".



7 To use data before position compensation for the reference setting coordinates, place a check at "Use point coordinate before scroll".



Referencing a unit

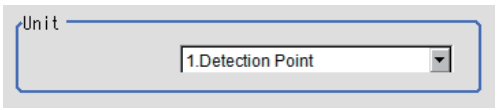
Set a reference by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".

3 In the scene in the "Unit" area, select a detection point unit.



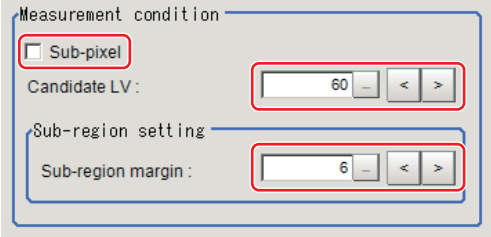
4 Perform the next measurement, and the reference will be displayed.

2-3-6 Measurement Parameters (Sensitive Search)

Specify the sensitive search measurement conditions and the judgement conditions for the measurement results.

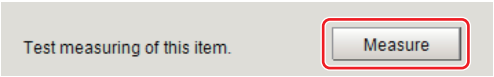
1 In the Item Tab area, click [Measurement].

2 In the "Measurement condition" area, specify a value for each item.



Setting item	Set value [Factory default]	Description
Sub-pixel	• Checked • [Unchecked]	When a check is placed at sub-pixel, the position information can be measured in units of sub-pixels. However, this requires more processing time.
Candidate LV	0 to 100 [60]	Specify the threshold value with which to detect candidate points in a rough search. Specify a smaller value when model search results are unstable.
Sub-region margin	0 to 10 [6]	How large a region to use for the divided model search range for the divided model size is specified in units of pixels. If 6 is set, an area that is the model size expanded by 6 pixels up, down, left, and right is the search range.

3 When the setting has been changed, click [Measure] in the "Detail" area to verify whether measurements can be made correctly.



4 Set up the judgement condition.

Setting item	Set value	Description
Measure X	-99999.9999 to 99999.9999	Specify the range of X-axis shifting that is judged to be OK.
Measure Y	-99999.9999 to 99999.9999	Specify the range of Y-axis shifting that is judged to be OK.
Search angle	-180 to 180	Specify the range of angles that are judged to be OK.
Correlation	0 to 100	Specify the range of correlation values that are judged to be OK. However, when the correlation value of the measurement result is 0, the judgement result will be NG regardless of the lower limit setting.
Deviation	For color cameras: 0 to 221 For monochrome cameras: 0 to 127	Specify the range of density deviations that are judged to be OK. The higher the proportion of plain sections, the higher this value. This is enabled when plain inspection is set in the sensitive model settings.
NG Sub-region	0 to 100	Specify the range of NG sub-region that are judged to be OK.

2-3-7 Output Parameters (Sensitive Search)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item		Set value [Factory default]	Description
Output coordinates		• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position deflection correction is applied.
Calibration		• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement		• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgment.
Display cursor setting			
	Position	• [ON] • OFF	The measurement coordinate position of the detected model is displayed at the cursor.
	Sub-region	• Display • [OFF]	The coordinate position of the region with the lowest correlation value of the sub-regions is displayed at the cursor.

2-3-8 Key Points for Test Measurement and Adjustment (Sensitive Search)

The following content is displayed in the "Detail result" area as text.

Additional Information

Executing test measurements will also update the measurement results and the figures in the image.

Displayed items	Description
Judge	Judgement result
Correlation	Lowest correlation value in the sub-region
Position X	X coordinate of the position where the model is detected
Position Y	Y coordinate of the position where the model is detected
Angle θ	Angle of the position where the model is detected
Deviation	Highest density deviation in the sub-region
NG Sub-region	NG region count

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

- Searching other positions

Parameter to be adjusted	Remedy
Model parameter	Specify a larger value for the "Prec."
	If the measurement results are unstable only when "Rotation" is selected, specify a smaller value for the "Skipping angle".
	When "Rotation" is selected, if the model shape is complex, uncheck the "Smart mode" option.
	If the model image consists of detailed figures, specify a larger value for "Stab."
Sub-model parameter	If images that should be judged OK vary greatly, specify a larger value for "Sub-model number X" and "Sub-model number Y".
Measurement	If the precision is low, place a check at "Sub-pixel".
	If images that should be judged OK vary greatly, specify a smaller value for "Candidate level".
	If images that should be judged OK vary greatly, specify a larger value for "Sub-region margin".

- The judgement is NG (insufficient memory)

Parameter to be adjusted	Remedy
Region setting	Make the search region as small as possible.
Model parameter	Bring "Stab." close to the factory default value.
	Bring the "Skipping angle" close to the factory default value.
	Specify a smaller value for "Prec.".
Sub-model parameter	Specify a larger value for "Sub-model number X" and "Sub-model number Y".

● When the processing speed is slow

Parameter to be adjusted	Remedy
Region setting	Make the search region as small as possible.
Model Registration	Make the area to register as the model as small as possible.
Model parameter	If the model image is a simple figure or a large figure, specify a smaller value for "Stab." If lowering stability does not speed up processing, it is likely that many candidates have been detected. Raise the "Candidate level" in [Measurement].
	When "Rotation" is selected and the model image is a simple figure, specify a larger value for "Skipping angle".
	When "Rotation" is selected and the model image is a simple figure, place a check at "Smart mode".
	If the position precision is high, specify a smaller value for "Prec.".
Sub-model parameter	If images that should be judged OK vary greatly, specify a larger value for "Sub-model number X" and "Sub-model number Y".
Measurement parameter	If images that should be judged OK vary little, specify a larger value for "Candidate LV".
	If the position precision is high, uncheck "Sub-pixel".

2-3-9 Measurement Results for Which Output Is Possible (Sensitive Search)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	Judgement result
Correlation value	CR	Correlation value with the model
Deviation	DV	Deviation
Measurement coordinate X	X	X coordinate of the position where the model is detected
Measurement coordinate Y	Y	Y coordinate of the position where the model is detected
Measurement angle	TH	Angle of the position where the model is detected
Reference position X	SX	X coordinate of the reference position of the registered model
Reference position Y	SY	Y coordinate of the reference position of the registered model
Reference angle	ST	Angle of the registered model
Detection point coordinate X	RX	X coordinate of the registered model
Detection point coordinate Y	RY	Y coordinate of the registered model
NG sub-region	CT	NG region count
Sub-region Number	AN	Region number with the lowest correlation value
Sub-region Number(X)	ANX	X direction column number for the output region
Sub-region Number(Y)	ANY	Y direction line number for the output region
Sub-region Pos. X	DX	X coordinate of the detected sub-region
Sub-region Pos. Y	DY	Y coordinate of the detected sub-region
Correlation (sub-region N) (N = 0 to 99)	CRN	Correlation (sub-region N)
Deviation (sub-region N) (N = 0 to 99)	DVN	Deviation (sub-region N)

2-3-10 External Reference Tables (Sensitive Search)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
1	Correlation value	correlation	Get only	0 to 100
2	Deviation	deviation	Get only	For color cameras: 0.000 to 219.9705 For monochrome cameras: 0.000 to 127.000
3	Measure X	searchPositionX	Get only	-99,999.9999 to 99,999.9999
4	Measure Y	searchPositionY	Get only	-99,999.9999 to 99,999.9999
5	Measure angle	angle	Get only	-180 to 180
6	Detection point X	detectionX	Get only	-99,999.9999 to 99,999.9999
7	Detection point Y	detectionY	Get only	-99,999.9999 to 99,999.9999
8	Reference X *1	referenceX	Get only	-99,999.9999 to 99,999.9999

No.	Data name	Ident	Set/Get	Data range
9	Reference Y *1	referenceY	Get only	-99,999.9999 to 99,999.9999
10	Reference angle	referenceAngle	Get only	-180 to 180
11	NG Sub-region	count	Get only	0 to 100
12	Sub-region No.	areaNum	Get only	0 to 99
13	Sub-region No. (X)	areaNumX	Get only	0 to 9
14	Sub-region No. (Y)	areaNumY	Get only	0 to 9
15	Sub-region Pos. X	positionX	Get only	-99,999.9999 to 99,999.9999
16	Sub-region Pos. Y	positionY	Get only	-99,999.9999 to 99,999.9999
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
121	With rotation	rotation	Set/Get	0: OFF 1: ON
122	Upper limit of the rotation angle	endAngle	Set/Get	-180 to 180
123	Lower limit of the rotation angle	startAngle	Set/Get	-180 to 180
124	Skipping angle	angleSkip	Set/Get	1 to 30
125	Smart mode	smartMode	Set/Get	0: OFF 1: ON
126	Stab.	stability	Set/Get	1 to 15
127	Prec.	accuracy	Set/Get	1 to 3
129	Reference X *2	referencePosX	Set/Get	0 to 99,999.9999
130	Reference Y *2	referencePosY	Set/Get	0 to 99,999.9999
131	Reference angle	referencePosAngle	Set/Get	-180 to 180
132	Detection point X	detectionPosX	Set/Get	0 to 99,999.9999
133	Detection point Y	detectionPosY	Set/Get	0 to 99,999.9999
134	Sub-pixel	subPixel	Set/Get	0: OFF 1: ON
135	Candidate Point Level	candidateLevel	Set/Get	0 to 100
136	Upper limit of measure X	upperX	Set/Get	-99,999.9999 to 99,999.9999
137	Lower limit of measure X	lowerX	Set/Get	-99,999.9999 to 99,999.9999
138	Upper limit of measure Y	upperY	Set/Get	-99,999.9999 to 99,999.9999
139	Lower limit of measure Y	lowerY	Set/Get	-99,999.9999 to 99,999.9999
140	Upper limit of the angle	upperAngle	Set/Get	-180 to 180
141	Lower limit of the angle	lowerAngle	Set/Get	-180 to 180
142	Upper limit of the corr.	upperCorrelation	Set/Get	0 to 100
143	Lower limit of the corr.	lowerCorrelation	Set/Get	0 to 100
144	Save registered model	savemdlimg	Set/Get	0: OFF 1: ON
145	Upper limit of deviation	upperDeviation	Set/Get	For color cameras: 0 to 221 For monochrome cameras: 0 to 127
146	Lower limit of deviation	lowerDeviation	Set/Get	For color cameras: 0 to 221 For monochrome cameras: 0 to 127
147	Upper limit of NG Sub-region	upperCount	Set/Get	0 to 100

No.	Data name	Ident	Set/Get	Data range
148	Lower limit of NG Sub-region	lowerCount	Set/Get	0 to 100
149	Sub-region stab.	innerStability	Set/Get	1 to 15
150	Sub-region prec.	innerAccuracy	Set/Get	1 to 3
151	Sub-model number X	separateX	Set/Get	1 to 10
152	Sub-model number Y	separateY	Set/Get	1 to 10
153	Plain inspection	plainInspection	Set/Get	0: OFF 1: ON
154	NG Sub-region (155,156 setting/acquisition target)	getAreaNo	Set/Get	1 to 100
155	Enabled/disabled of sub-region	areaEnabled	Set/Get	0: OFF 1: ON
156	Type of sub-region	areaItemKind	Set/Get	-1: Not Unit 0: Search 1: Color Data
157	Display cursor (position)	outputMainArea	Set/Get	0: OFF 1: ON
158	Display cursor (Sub-region)	outputSubArea	Set/Get	0: OFF 1: ON
159	Sub-region margin	areaMargin	Set/Get	0 to 10
163	Display Parameter	displayParameter	Set/Get	0: Position 1: Correlation 2: Deviation 3: NG Sub-region
165	Disabled region retention flag	disableKeepFlag	Set/Get	0: Not retained 1: Retained
168	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
169	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit
170	Update the reference angle	updateAngleFlg	Set/Get	0: Not update 1: Update
171	Setting unit of detection coordinate	detUnitNo	Set/Get	-1 to 9,999
172	Setting type of detection coordinate	detSettingType	Set/Get	0: Numerical 1: Unit
173	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
174	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999
175	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999
176	Angle before scroll	beforeScrollRefAngle	Set/Get	-180 to 180
1000+N (N: 0 to 99)	Correlation value of sub-region	CR	Get only	0 to 100
1100+N (N: 0 to 99)	Deviation of sub-region	DV	Get only	For color cameras: 0.000 to 219.9705 For monochrome cameras: 0.000 to 127.000
6002	Format	cameraColor	Set/Get	1: Mmonochrome camera 2: Color camera
91000	figure0 Count	figArea0_count	Set/Get	1
91001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle

No.	Data name	Ident	Set/Get	Data range
91002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
91014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
91015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
91016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
91017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
91099	figure0 Update	figArea0_update	Set only	1: Update

*1. The reference coordinates based on the selection in the Method area of the [Ref.setting] tab can be Get only.

*2. The reference coordinates based on the selection of Numerical in the Method area of the [Ref.setting] tab can be Set/Get.

2-4 ECM Search

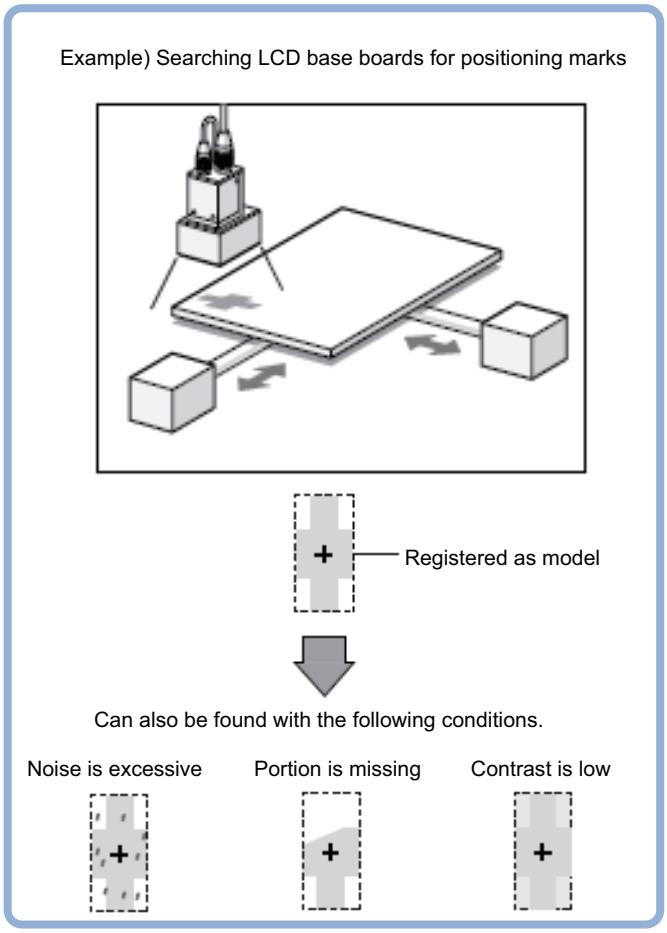
This processing item can not be used in the FHV series.

This processing item searches the input image for parts having a high degree of similarity to the target mark (model), and measures its correlation value (similarity) and position.

In a normal search, image pattern models are used that look at the color and light/dark information, but in an ECM search, models are used that look at the profile information. Therefore, this processing assures a reliable search even for low-contrast or noisy images.

Used in the Following Case

To measure the location of a mark

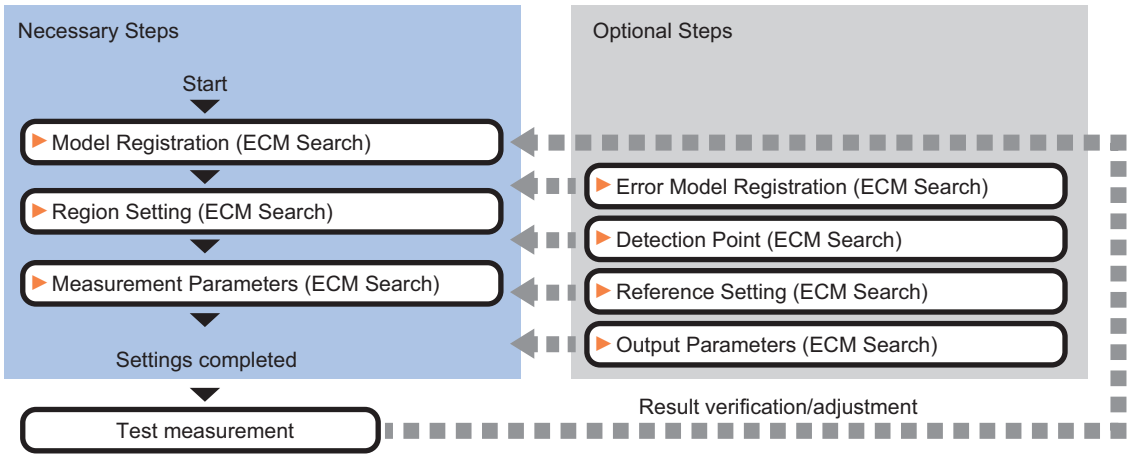


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-4-1 Settings Flow (ECM Search)

Set up ECM search according to the following steps.



List of ECM Search Items

Item name	Description
Model register	This item registers the pattern characteristic of the measurement image as a model. Model parameter values can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used. Refer to *2-4-2 Model Registration (ECM Search)* on page 2-51.
Error model	This item can be changed if necessary. As an error model, register a model with similar characteristics to the registered one, but with its correlation value lowered when measured. Refer to *2-4-3 Error Model Registration (ECM Search)* on page 2-54.
Region setting	This item is used to set up the measurement area. Instead of measuring the entire input image, narrowing the measurement area shortens the processing time. Refer to *2-4-4 Region Setting (ECM Search)* on page 2-54.
Detection point	This item can be changed if necessary. Usually, the central position of the registered model is registered as the search detection point. Refer to *2-4-5 Detection Point (ECM Search)* on page 2-55.
Ref. setting	This item can be changed if necessary. Usually, the central position of the registered region is registered as the reference position. Refer to *2-4-6 Reference Setting (ECM Search)* on page 2-56.
Measurement	This item specifies the judgement condition for measurement results. Specify the criteria to judge the measurement result if the X and Y coordinates and the correlation values with the model are OK. Refer to *2-4-7 Measurement Parameters (ECM Search)* on page 2-58.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. Refer to *2-4-8 Output Parameters (ECM search)* on page 2-59.

2-4-2 Model Registration (ECM Search)

Register the pattern characteristic of the measurement object as a model. In an ECM search, only the image profile information is registered.

Important

- For ECM search, 6 pixels at each end of an image cannot be registered as a part of the model.
- If a model is re-registered, the error model is deleted. Register error models when re-registering a model.

1 In the Item Tab area, click [Model register].

When setting a new model, you do not have to click [Model register].

2 Use the drawing tools to specify the model registration range.

3 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

4 Click [Edge extraction], then confirm the edge extraction image.

If there is a break in the outline of the measurement object, adjust the edge level.

Refer to *Adjusting the Edge Level* on page 2-53.

5 If there is unnecessary profile information in the model, click [Mask register] to set the mask.

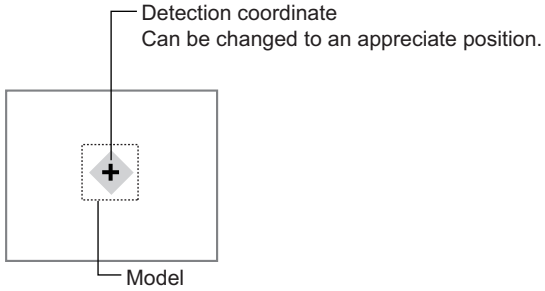
Refer to *Mask any Unnecessary Items.* on page 2-53.

6 To check the model display, click [Display model].

The registered model image is displayed in the image display area.

Important

When a model is registered, the center coordinate of the model is registered as the detection point coordinate. A detection point is a point output as a measurement value.

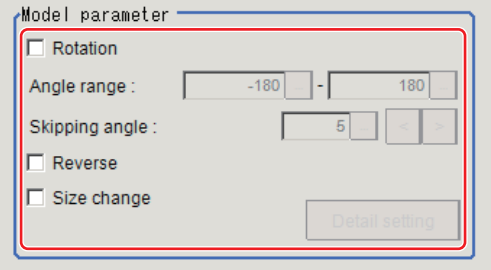


Changing Model Parameters

Model parameter values can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used.

After changing a setting, check whether measurement can be done properly by performing an actual measurement.

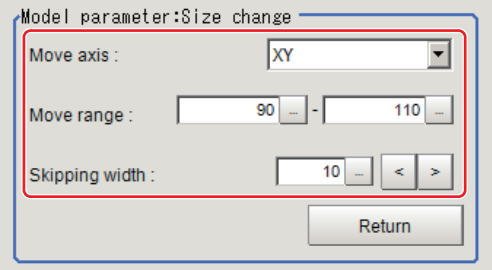
1 In the "Model parameter" area, specify a value for each item.



Setting item			Set value [Factory default]	Description
Rotation			• Checked • [Unchecked]	When the measurement object is rotating, select the "Rotation" check box and specify how many degrees the model created rotates each time and through what range of angles. A smaller skipping angle increases stability, but slows down the processing. The normal direction is clockwise.
	Angle range	Upper limit value	-180 to [180]	
		Lower limit value	[-180] to 180	
	Skipping angle		1 to 30 [5]	Specify how many degrees the model created rotates each time. A smaller angle increases stability, but slows down the processing.
Reverse			• Checked • [Unchecked]	Specify whether to allow the reverse of light and dark for the model.
Size change			• Checked • [Unchecked]	Specify whether to allow size change for the model. When checked, click [Detail setting] and specify a value for each item.

2 When the "Size change" option is checked, click [Detail setting].

The "Model parameter: Size change" area is displayed.



Setting item	Set value [Factory default]	Description
Move axis	• [XY] • X • Y	Specify the model variable direction.
Move range	50 to 150 [90,110]	Specify the range in which to change the model size.

Setting item	Set value [Factory default]	Description
Skipping width	1 to 99 [10]	Specify the skipping percentage within the move range by which to change models being created. A smaller skipping width increases precision, but slows down the processing.

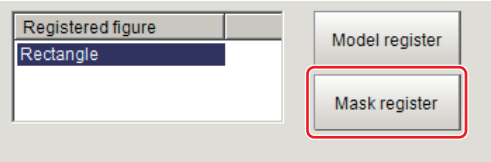
3 Click [Return].

The "Model parameter" area is displayed.

Mask any Unnecessary Items.

By registering a mask, the part you do not want included in the model is excluded.

1 Click [Mask register].



2 Draw the mask figure using the drawing tools.

3 Click [OR/NOT].

The mask figure is displayed in red.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

Adjusting the Edge Level

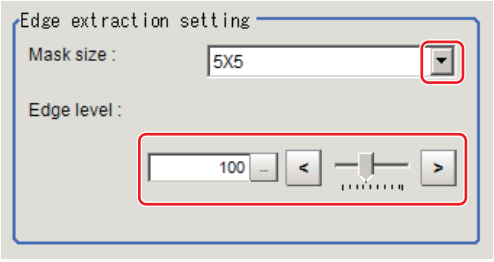
In an ECM search, processing is executed on the edge extraction image. Change this item as necessary when the edge is not extracted or is extracted along with noise.

Important

In model registration, extract as much of the edge as possible, then delete noise etc. in the mask registration to register the entire edge of the model. On the other hand, when measuring, even if the edge has skips, an image with the noise suppressed makes it possible to search the model stably. To set separate edge extraction conditions for model registration and for measuring, after registering the model, change the edge extraction conditions.

1 In the Item Tab area, click [Edge extraction].

2 Set the items in the "Edge extraction setting" area.



Setting item	Set value [Factory default]	Description
Mask size	• 3 × 3 • [5 × 5] • 7 × 7 • 9 × 9	Select the range of pixels which are used to extract the edge. With a larger mask size, search is less affected by variation in pixels.
Edge level	0 to 255 [100]	Change this when the edge is hard to see due to low contrast against the background or when unnecessary background noise must be removed. The smaller the value, the easier it is to find edges. The larger the value, the less noise will affect finding edges.

2-4-3 Error Model Registration (ECM Search)

Even for an image pattern with similar feature sections (for example "P" and "R"), if the model is registered as an error model, the correlation value is lower and measurement mistakes can be prevented. Only one error model can be registered.

1 In the Item Tab area, click [Error model].

2 Display the error model image.

Register the error model with the same procedure as for model registration.

Important

Upon re-registering a model, error models are deleted.Register error models when re-registering a model. Register error models when re-registering a model.

2-4-4 Region Setting (ECM Search)

Use a rectangle to specify the area where the model is searched.

Instead of measuring the entire input image, narrowing the measurement area shortens the processing time.

1 In the Item Tab area, click [Region setting].

2 Click [Edit].

The figure setting area is displayed.

3 Specify the area in which to search for the model.

The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

2-4-5 Detection Point (ECM Search)

Specify a position in the model that should be used as the detection coordinates during measurement. Usually, the center position of the set model is registered as the detection point. This function is used to change to any desired position.

A reference position can be set either directly or by referencing a unit.

Additional Information

After changing the detection point coordinates to another position, re-registering the model will change it back to the center coordinates of the model.

Specifying directly

Click a position on the image you want to use as a reference position, or set coordinate data for that point.

1 In the Item Tab area, click [Detection point].

In the Display area, the current detection point is displayed with a crosshair cursor.

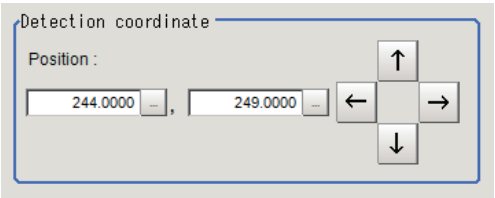
2 In the "Method" area, select "Numerical".

3 Click the position to be set as the detection point.

Additional Information

Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.



Referencing a unit

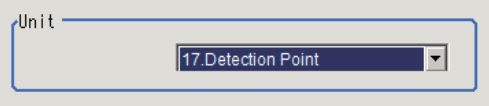
Set a detection point by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

1. In the Item Tab area, click [Detection point].

   In the Display area, the current detection point is displayed with a crosshair cursor.

2. In the "Method" area, select "Unit".

3. In the scene in the "Unit" area, select a detection point unit.



4. Perform the next measurement, and the detection point will be displayed.

2-4-6 Reference Setting (ECM Search)

When the measurement region is set, this position is automatically set at the same time as the reference position. This item can be used to change the reference position to any desired position. This is handy for measuring the position deviation from a certain position.

A reference position can be set either directly or by referencing a unit.

Specifying directly

Click a position on the image you want to use as a reference position, or set coordinate data for that point.

1. In the Item Tab area, click [Ref. setting].

   In the display area, the current reference position will be displayed as the crosshair cursor.

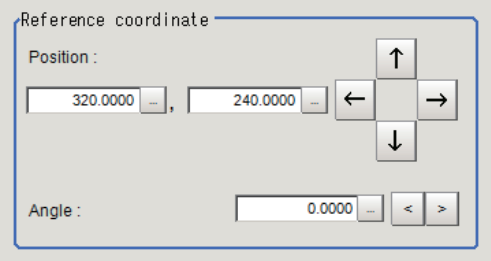
2. In the "Method" area, select "Numerical".

3. Click the position to be set as the reference.

Additional Information

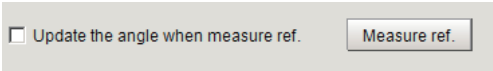
Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.

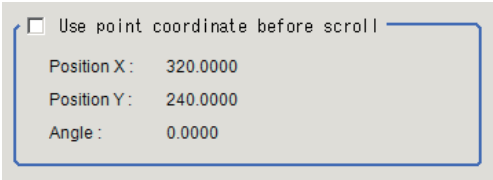


5 Input the reference angle with a numeric value.

6 To remeasure on the displayed image and set the reference, click the [Measure ref.] button. To update the reference angle at the time of reference measurement, place a check at "Update the angle when measure ref.".



7 To use data before position compensation for the reference setting coordinates, place a check at "Use point coordinate before scroll".



Referencing a unit

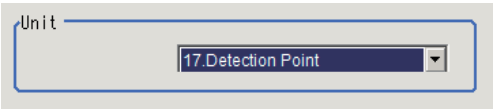
Set a reference by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".

3 In the scene in the "Unit" area, select a detection point unit.



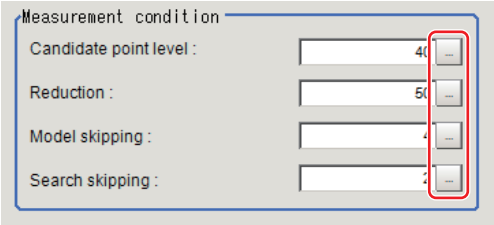
4 Perform the next measurement, and the reference will be displayed.

2-4-7 Measurement Parameters (ECM Search)

This item specifies the judgement condition for measurement results. Specify the criteria to judge the measurement result if the X and Y coordinates and the correlation values with the model are OK.

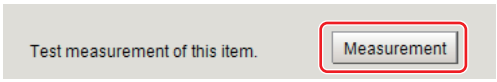
1 In the Item Tab area, click [Measurement].

2 In the "Measurement condition" area, specify a value for each item.



Setting item	Set value [Factory default]	Description
Candidate point level	0 to 99 [40]	Specify the threshold value with which to detect candidate points in a rough search. Specify a smaller value for candidate point level when model search results are unstable.
Reduction	10 to 100 [50]	Specify the percentage to which the input image and the model image are reduced during a rough search. The more the image is reduced, the faster the processing becomes, but search results may be unstable with a smaller image.
Model skipping	1 to 19 [4]	Specify how many pixels should be skipped when performing a rough search.
Search skipping	1 to 9 [2]	Specify how many pixels are skipped when performing a search for the "Search region".

3 When the setting has been changed, click [Measurement] in the "Detail" area to verify whether measurements can be made correctly.



4 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

Setting item	Set value	Description
Measure pos X	-99999.9999 to 99999.9999	Specify the range of X-axis shifting that is judged to be OK.
Measure pos Y	-99999.9999 to 99999.9999	Specify the range of Y-axis shifting that is judged to be OK.
Measure angle	-180 to 180	Specify the range of angles that are judged to be OK.
Correlation *1	0 to 100	Specify the range of correlation values that are judged to be OK.

*1. When the ECM correlation value of the measurement result is 0, the judgement result will be NG regardless of the measurement parameters setting.

2-4-8 Output Parameters (ECM search)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgment.

2-4-9 Key Points for Test Measurement and Adjustment (ECM Search)

The following content is displayed in the "Detail result" area as text.

Displayed item	Description
Judge	Judgement result
Correlation	Correlation value
Position X	X coordinate of the position where the model is detected
Position Y	Y coordinate of the position where the model is detected
Angle θ	Angle of the position where the model is detected

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image number.	Explanation of image to be displayed
0	Measurement image
1	Measurement image displayed with matching models overlaid Green: Matched model points Red: Unmatched model points

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

Parameter to be adjusted	Remedy
Measurement	If images that should be judged OK vary greatly, specify a smaller value for "Candidate level".
	If the model image is small and unstable, specify a smaller value for the "Reduction".
Model register	Mask any unnecessary items.
	Lower the edge level.
	Register the error model.
Model parameter	If the measurement results are unstable only when "Rotation" is selected, specify a smaller value for the "Skipping angle".

● When the processing speed is slow

Parameter to be adjusted	Remedy
Region setting	Make the search region as small as possible.
Model parameter	If images that should be judged OK vary little, specify a larger value for "Candidate level".
	When "Rotation" is selected and the model image is a simple figure, specify a larger value for "Skipping angle".
Measurement	Specify a smaller value of the "Reduction".
	Specify a larger value of the "Model skipping".
	Specify a larger value of the "Search skipping".

2-4-10 When Using Measurement Results Externally (ECM Search)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Correlation value	CR	Correlation value with the model
Measure X	X	X coordinate of the position where the model is detected
Measure Y	Y	Y coordinate of the position where the model is detected
Measurement angle	TH	Angle of the position where the model is detected
Measurement magnification MX	MX	X-axis magnification of the detected model
Measurement magnification MY	MY	Y-axis magnification of the detected model
Reference coordinate X	SX	X coordinate of the reference position of the registered model
Reference coordinate Y	SY	Y coordinate of the reference position of the registered model
Reference angle	ST	Angle of the registered model
Detection point RX	RX	X coordinate of the registered model
Detection point RY	RY	Y coordinate of the registered model

2-4-11 External Reference Tables (ECM Search)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Correlation value	correlation	Get only	0 to 100
6	Measure X	positionX	Get only	-99,999.9999 to 99,999.9999
7	Measure Y	positionY	Get only	-99,999.9999 to 99,999.9999
8	Angle theta	angle	Get only	-180 to 180
9	Magnification X	chgSizeX	Get only	50 to 150
10	Magnification Y	chgSizeY	Get only	50 to 150
11	Reference X *1	referenceX	Get only	-99,999.9999 to 99,999.9999
12	Reference Y *1	referenceY	Get only	-99,999.9999 to 99,999.9999
13	Reference angle	referenceAngle	Get only	-180 to 180
14	Detection point X	searchX	Get only	-99,999.9999 to 99,999.9999
15	Detection point Y	searchY	Get only	-99,999.9999 to 99,999.9999
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Mask size	maskSize	Set/Get	0: 3x3 1: 5x5 2: 7x7 3: 9x9
121	Edge level	edgeLowerLevel	Set/Get	0 to 255
122	Detection point X	searchPosX	Set/Get	0 to 99,999.9999
123	Detection point Y	searchPosY	Set/Get	0 to 99,999.9999
124	Reference X *2	referencePosX	Set/Get	0 to 99,999.9999
125	Reference Y *2	referencePosY	Set/Get	0 to 99,999.9999
126	Upper limit of the corr.	upperCorrelation	Set/Get	0 to 100
127	Lower limit of the corr.	lowerCorrelation	Set/Get	0 to 100
128	Upper limit of measure X	upperX	Set/Get	-99,999.9999 to 99,999.9999
129	Lower limit of measure X	lowerX	Set/Get	-99,999.9999 to 99,999.9999
130	Upper limit of measure Y	upperY	Set/Get	-99,999.9999 to 99,999.9999
131	Lower limit of measure Y	lowerY	Set/Get	-99,999.9999 to 99,999.9999
132	Upper limit of the angle	upperAngle	Set/Get	-180 to 180
133	Lower limit of the angle	lowerAngle	Set/Get	-180 to 180
134	Candidate Point Level	candidateLevel	Set/Get	0 to 99
135	Model skipping	modelSkipping	Set/Get	1 to 19
136	Region skipping	searchSkipping	Set/Get	1 to 9
137	Reduction	reduction	Set/Get	10 to 100
138	With rotation	rotation	Set/Get	0: No rotation 1: With rotation

No.	Data name	Ident	Set/Get	Data range
139	Lower limit of the rotation angle	startAngle	Set/Get	-180 to 180
140	Upper limit of the rotation angle	endAngle	Set/Get	-180 to 180
141	Skipping angle	rotdeg	Set/Get	1 to 30
142	Size change	chgsize	Set/Get	0: No size change 1: XY change 2: X change 3: Y change
143	Upper limit of the size change	upperchgsize	Set/Get	50 to 150
144	Lower limit of the size change	lowerchgsize	Set/Get	50 to 150
145	Size change skipping	chgsizsdeg	Set/Get	1 to 99
146	Reverse	reverse	Set/Get	0: No reverse 1: Reverse
147	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
148	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit
149	Update the reference angle	updateAngleFlg	Set/Get	0: Not update 1: Update
150	Reference angle	referencePosAngle	Set/Get	-180 to 180
151	Setting unit of detection coordinate	detUnitNo	Set/Get	-1 to 9,999
152	Setting type of detection coordinate	detSettingType	Set/Get	0: Numerical 1: Unit
153	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
154	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999
155	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999
156	Angle before scroll	beforeScrollRefAngle	Set/Get	-180 to 180
6002	Format	cameraColor	Set/Get	1: Mmonochrome camera 2: Color camera
91000	figure0 Count	figArea0_count	Set/Get	1
91001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
91002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
91014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
91015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
91016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
91017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
91099	figure0 Update	figArea0_update	Set only	1: Update

*1. The reference coordinates based on the selection in the Method area of the [Ref.setting] tab can be Get only.

*2. The reference coordinates based on the selection of Numerical in the Method area of the [Ref.setting] tab can be Set/Get.

2-5 EC Circle Search

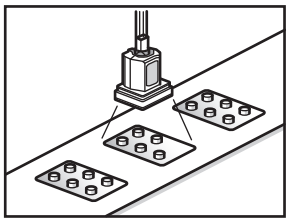
This processing item can not be used in the FHV series.

This processing item searches the input image for parts having a high degree of similarity to the target circle mark (model), and measures its circle evaluated value (similarity) and position. In a normal search, image pattern models are used that look at the color and light/dark information. In EC Circle Search, however, models are used that look at the profile. Therefore, this processing assures a reliable search even for low-contrast or noisy images. It is also possible to measure the number of circles in the input image.

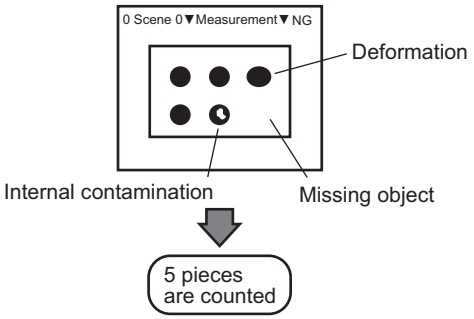
Used in the Following Case

This counts how many circles there are of the specified size. Since circles are extracted with the shape information of "Round", the circles being deformed or dirty does not affect counting.

Example) Quantity count



Circular forms are counted as one piece even if deformation or internal contamination is present.
The range of permissible deformation can be changed.

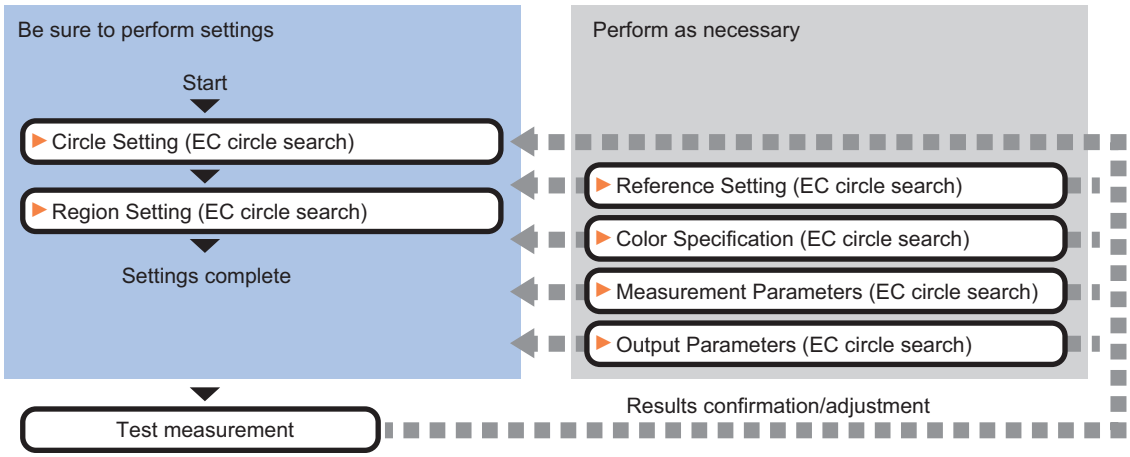


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-5-1 Settings Flow (EC Circle Search)

Set up EC circle search according to the following steps.



List of EC Circle Search Items

EC circle search items are explained below.

Item name	Description
Circle setting	This item sets the size of the circle to search for. Refer to *2-5-2 Circle Setting (EC Circle Search)* on page 2-65.
Region setting	This item is used to set up the measurement area. Narrowing the measurement area instead of measuring the entire input screen shortens the processing time. Refer to *2-5-3 Region Setting (EC Circle Search)* on page 2-66.
Ref. setting	This item can be changed if necessary. Usually, the central position of the registered region is specified as the reference position. Refer to *2-5-4 Reference Setting (EC Circle Search)* on page 2-66.
Color setting	This item can be changed if necessary. Select the color of the circle and the background color. If no check is placed at color setting, the circle (edge) is extracted with the brightness difference. Refer to *2-5-5 Color Specification (EC Circle Search)* on page 2-68.
Measurement parameter	This item changes the measurement parameter as necessary when the measurement result is unstable. Refer to *2-5-6 Measurement Parameters (EC Circle Search)* on page 2-68.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. Refer to *2-5-7 Output Parameters (EC Circle Search)* on page 2-70.

2-5-2 Circle Setting (EC Circle Search)

Registers the size of the circle to search for.

Set the circle size only with the circumference figure.

1. In the Item Tab area, click [Circle register].

   When setting a new circle, you do not need to click [Circle register].

2. Set the search circumference using the drawing tools.

3. Click [OK] in the Figure setting area.
   - [OK]: Changes the settings and returns to the previous menu.
   - [Cancel]: Changes are discarded. Returns to the previous menu.
   - [Apply]: Updates the settings without leaving edit window.

4. Click [Edge extraction] and set values.

   Refer to *Extracting Edges* on page 2-65.

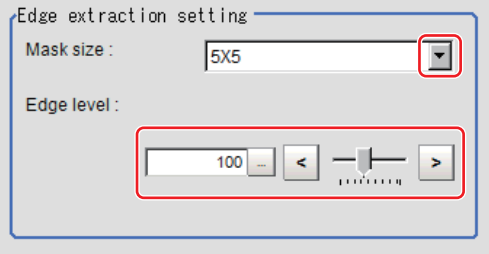
Extracting Edges

In an EC circle search, processing is executed on the edge extraction image. Change this item as necessary when the edge is not extracted or is extracted along with noise.

1. In the Item Tab area, click [Edge extraction].

2. In the "Edge extraction setting" area, click [...] or [▼] and specify a value for each item.

   The "Edge level" value can be specified by dragging the slider or clicking one of the buttons at either end of the slider.



Setting item	Set value [Factory default]	Description
Mask size	• 3 × 3 • [5 × 5] • 7 × 7 • 9 × 9	Select the range of pixels which are used to extract the edge. With a larger mask size, search is less affected by variation in pixels.
Edge level	0 to 255 [100]	Change this when the edge is hard to see due to low contrast against the background or when unnecessary background noise must be removed.The smaller the value, the easier it is to find edges. The larger the value, the less noise will affect finding edges.

2-5-3 Region Setting (EC Circle Search)

Specify the rectangular area in which to search for the circle.

Instead of measuring the entire input image, narrowing the measurement area shortens the processing time.

1. In the Item Tab area, click [Region setting].
2. Click [Edit].

   The figure setting area is displayed.
3. Specify the area in which to search for the model.

   The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.
4. Click [OK] in the Figure setting area.
   - [OK]: Changes the settings and returns to the previous menu.
   - [Cancel]: Changes are discarded. Returns to the previous menu.
   - [Apply]: Updates the settings without leaving edit window.

2-5-4 Reference Setting (EC Circle Search)

When the model is set, this position is automatically set at the same time as the reference position. This item can be used to change the reference position to any desired position. This is handy for measuring the position deviation from a certain position.

A reference position can be set either directly or by referencing a unit.

Specifying directly

Click a position on the image you want to use as a reference position, or set coordinate data for that point.

1. In the Item Tab area, click [Ref. setting].

   In the display area, the current reference position will be displayed as the crosshair cursor.

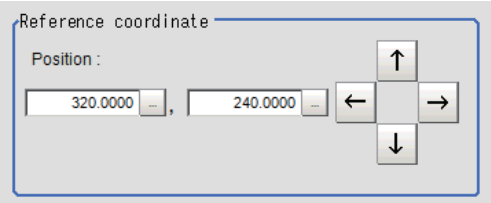
2. In the "Method" area, select "Numerical".

3. Click the position to be set as the reference.

Additional Information

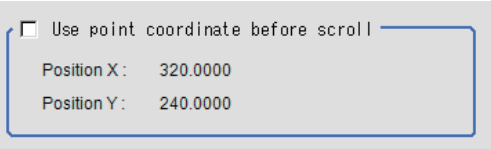
Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the Vision System FH/FHV/FZ5 Series User's Manual (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.



5 To remeasure on the displayed image and set the reference, click the [Measure ref.] button.

6 To use data before position compensation for the reference setting coordinates, place a check at "Use point coordinate before scroll".



Referencing a unit

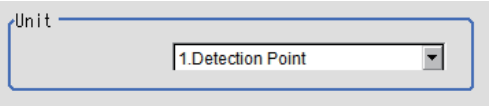
Set a reference by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".

3 In the scene in the "Unit" area, select a detection point unit.



4 Perform the next measurement, and the reference will be displayed.

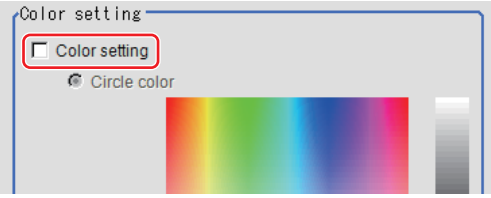
2-5-5 Color Specification (EC Circle Search)

This item can be changed if necessary.

Select the color of the circle and the background color. If no check is placed at color setting, the circle (edge) is extracted with the brightness difference.

1 In the Item Tab area, click [Color setting].

2 If necessary, check "Color setting" in the "Color setting" area.



3 Specify a color.

Enclose the location on the image to be set as the circle and the background color with a rectangle. The average color of the enclosed range is set for R, G, and B.

R, G, and B values can also be set with numbers. To input the values, click [...] for each of "R" (red), "G" (green), and "B" (blue). Specify the circle color and the background color separately.

For value input method, refer to *Appendixes Basic Knowledge about Operations Inputting Values* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

2-5-6 Measurement Parameters (EC Circle Search)

This item specifies the judgement conditions for measurement results. Specify to what degree OK is still judged in relation to measurement result coordinates (X,Y) and the circle evaluation value with the model.

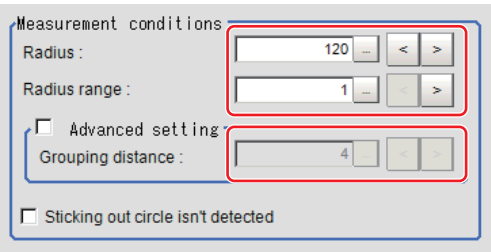
1 In the Item Tab area, click [Measurement].

2 Select the search type.

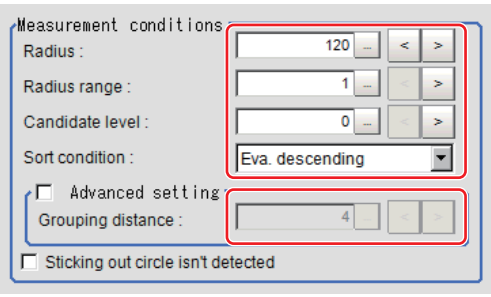
Setting item	Set value [Factory default]	Description
Search type	[Single search]	This is set when there is one circle in the measurement range.
	Multi search	This is set when there are multiple circles in the measurement range.

3 Set the measurement conditions.

- For single search

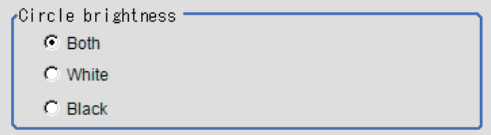


- For multi search



Setting item	Set value [Factory default]	Description
Radius	1 to 9999 [Radius drawn using circle resister]	This item sets the radius of the circle measured. This is displayed on the screen with a solid blue line.
Radius range	[1] to 9999	This measures the measured circle radius ± the permitted radius width. This is displayed on the screen with a broken blue line.
Candidate level (Multi search only)	[0] to 100	Specify the threshold value used when detecting candidate points in an EC circle search. Specify a smaller value when model search results are unstable.
Sort condition (Multi search only)	• X ascending • X descending • Y ascending • Y descending • Eva. ascending • [Eva. descending] • Radius ascending • Radius descending	Specify the conditions by which label number is re-assigned. When sorting referencing the X and Y coordinates, the upper left is the origin.
Advanced setting	• Checked • [Unchecked]	Place a check at setting the grouping distance.
Grouping distance	1 to 10 [4]	When circles measured overlap, this sets the distance for distinguishing circles. The smaller this value, the easier to distinguish circles.
Sticking out circle isn't detected	• Checked • [Unchecked]	Place a check here to include circles within the range only.

- For monochrome cameras:
  For a monochrome camera only, the circle color parameters are displayed.



Setting item	Set value [Factory default]	Description
Circle brightness	• [Both] • White • Black	This sets the circle color with the brightness.

4 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limits.

Setting item	Set value	Description
Measure pos X	-99999.9999 to 99999.9999	Specify the range of X-axis shifting that is judged to be OK.
Measure pos Y	-99999.9999 to 99999.9999	Specify the range of Y-axis shifting that is judged to be OK.
Evaluation	0 to 100	Specify the range of circle evaluated values that are judged to be OK.
Radius	0 to 99999.9999	Set the range of radiuses that is judged to be OK.
Search count	0 to 256	Specify the range of quantities that is judged to be OK.

5 Perform the display setting if required.

Setting item	Set value [Factory default]	Description
Display parameter	• [None] • Radius • Evaluation	Select the type of measurement result to display on the image. The display setting applies only to the settings dialog box.

2-5-7 Output Parameters (EC Circle Search)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify a value for the items.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position deflection correction is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to the overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgment.

Additional Information

For output coordinates and calibration, refer to *Appendixes Measurement Mechanism Handling Coordinates* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

2-5-8 Key Points for Test Measurement and Adjustment (EC Circle Search)

The following content is displayed in the "Detail result" area as text.

Displayed item	Description
Judge	Judgement result
Position X	X coordinate of the position where the model is detected
Position Y	Y coordinate of the position where the model is detected
Evaluation	Circle evaluated value of circles detected
Radius	Radius of circles detected
Search count	Quantity of circles detected

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

Parameter to be adjusted	Processing
Measurement	If images that should be judged OK vary greatly, specify a smaller value for "Evaluation".
Circle setting	Mask any unnecessary items. Lower the edge level.

● When the processing speed is slow

Parameter to be adjusted	Processing
Region setting	Make the search region as small as possible.
Measurement	If images that should be judged OK vary little, specify a larger value for "Evaluation".

2-5-9 Measurement Results for Which Output Is Possible (EC Circle Search)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Measurement coordinate X	X	X coordinate of the position where the circle is detected
Measurement coordinate Y	Y	Y coordinate of the position where the circle is detected
Reference position X	SX	X coordinate of the reference position of the registered circle
Reference position Y	SY	Y coordinate of the reference position of the registered circle
EC correlation value	CR	Evaluated value of circle detected
Radius	RA	Radius of circles detected
Count	CT	Quantity of circles detected
Position N	XN	Detected circle N position X (N = 0 to 255)
Position N	YN	Detected circle N position Y (N = 0 to 255)
Evaluation N	CRN	Detected circle N circle evaluated value (N = 0 to 255)
Radius N	RAN	Detected circle N circle radius (N = 0 to 255)

2-5-10 External Reference Tables (EC Circle Search)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Position X	positionX	Get only	-99,999.9999 to 99,999.9999
6	Position Y	positionY	Get only	-99,999.9999 to 99,999.9999
8	Reference coordinate X *1	referenceX	Get only	-99,999.9999 to 99,999.9999
9	Reference coordinate Y*1	referenceY	Get only	-99,999.9999 to 99,999.9999
15	Evaluation	evoluation	Get only	0 to 100
18	Radius	radius	Get only	0 to 99,999.9999
19	Count	searchCount	Get only	0 to 256
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
140	Reference X*2	referencePosX	Set/Get	-99,999.9999 to 99,999.9999
141	Reference Y*2	referencePosY	Set/Get	-99,999.9999 to 99,999.9999
142	Circle brightness	ObjectVal	Set/Get	0: Black 1: White 2: Black and white

No.	Data name	Ident	Set/Get	Data range
143	Edge color specification	colorSpecification	Set/Get	0: No 1: Yes
144	Circle color R	colorObjR	Set/Get	0 to 255
145	Circle color G	colorObjG	Set/Get	0 to 255
146	Circle color B	colorObjB	Set/Get	0 to 255
147	Background color R	colorBakR	Set/Get	0 to 255
148	Background color G	colorBakG	Set/Get	0 to 255
149	Background color B	colorBakB	Set/Get	0 to 255
150	Mask size	maskSize	Set/Get	0: 3x3 1: 5x5 2: 7x7 3: 9x9
151	Edge extraction level	edgeLowerLevel	Set/Get	0 to 255
153	Upper limit of position X	upperX	Set/Get	-99,999.9999 to 99,999.9999
154	Lower limit of position X	lowerX	Set/Get	-99,999.9999 to 99,999.9999
155	Upper limit of position Y	upperY	Set/Get	-99,999.9999 to 99,999.9999
156	Lower limit of position Y	lowerY	Set/Get	-99,999.9999 to 99,999.9999
159	Upper limit of evaluation	upperEvolution	Set/Get	0 to 100
160	Lower limit of evaluation	lowerEvolution	Set/Get	0 to 100
161	Upper limit of count	upperSearchNum	Set/Get	0 to 256
162	Lower limit of count	lowerSearchNum	Set/Get	0 to 256
165	Upper limit of radius	upperRadius	Set/Get	0 to 99,999.9999
166	Lower limit of radius	lowerRadius	Set/Get	0 to 99,999.9999
171	Search type	searchType	Set/Get	0: Single search 1: Multi search
172	Candidate level	candidateLevel	Set/Get	0 to 100
173	Sort condition	sort	Set/Get	0: X ascending 1: X descending 2: Y ascending 3: Y descending 4: Eva. ascending 5: Eva. descending 6: Radius ascending 7: Radius descending
174	Advanced setting	advancedSetting	Set/Get	0: OFF 1: ON
176	Grouping distance	groupingDistance	Set/Get	1 to 10
177	Radius range	circleWidth	Set/Get	1 to 9,999
178	Radius	setRadius	Set/Get	1 to 9,999
179	Display Parameter	displayParameter	Set/Get	0 to 2
180	Sticking out circle isn't detected	outAreaRemoveMode	Set/Get	0: OFF 1: ON
181	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
182	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit
183	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
184	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999
185	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999

No.	Data name	Ident	Set/Get	Data range
1000+Nx4 (N: 0 to 255)	Position X	X	Get only	-99,999.9999 to 99,999.9999
1001+Nx4 (N: 0 to 255)	Position Y	Y	Get only	-99,999.9999 to 99,999.9999
1002+Nx4 (N: 0 to 255)	Evaluation	CR	Get only	0 to 100
1003+Nx4 (N: 0 to 255)	Radius	RA	Get only	0 to 99,999.9999
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
91000	figure0 Count	figArea0_count	Set/Get	1
91001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
91002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
91014	figure0 Rectangle Upper left position X	figArea0_fig0_box-_X0	Set/Get	-99,999 to 99,999
91015	figure0 Rectangle Upper left position Y	figArea0_fig0_box-_Y0	Set/Get	-99,999 to 99,999
91016	figure0 Rectangle Lower right position X	figArea0_fig0_box-_X1	Set/Get	-99,999 to 99,999
91017	figure0 Rectangle Lower right position Y	figArea0_fig0_box-_Y1	Set/Get	-99,999 to 99,999
91099	figure0 Update	figArea0_update	Set only	1: Update

*1. The reference coordinates based on the selection in the Method area of the [Ref.setting] tab can be Get only.

*2. The reference coordinates based on the selection of Numerical in the Method area of the [Ref.setting] tab can be Set/Get.

2-6 Shape Search II

This processing item can not be used in the FHV series.

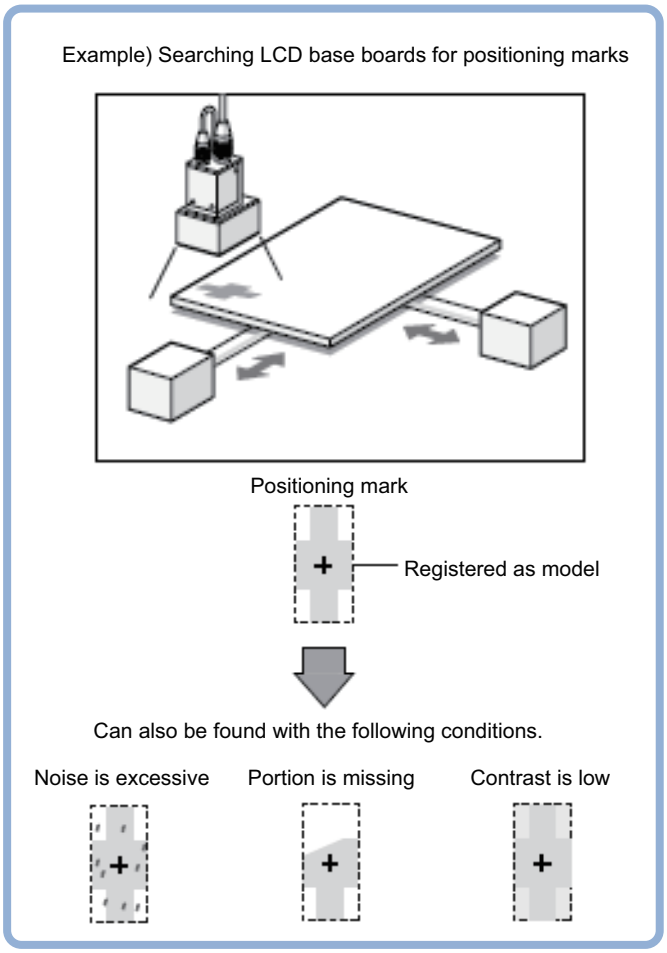
This function is for detecting user-defined target to estimate target position and pose precisely. The correlation value indicating the degree of similarity, measurement target position, and orientation can be output.

In shape search II, edge information is used as features, whereas in a normal search mode, color and texture information are used.

It enables models to be detected fast, precisely, and robustly to environmental variations including shadings, reflections, lightings, shape deformations, pose and noises.

Used in the Following Case

Alignment mark detection and precise position estimation.



Important

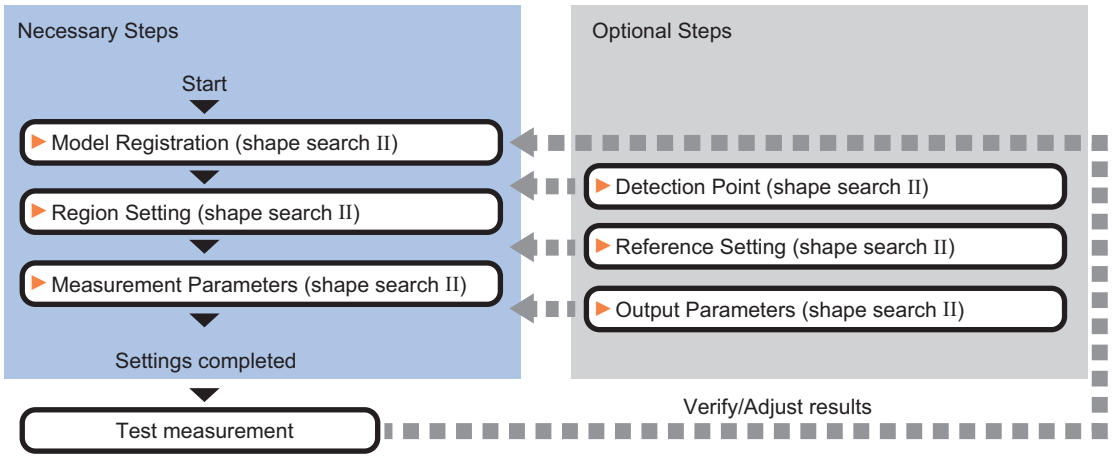
Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

Additional Information

Search processing basic concepts
For details, refer to *Appendixes Measurement Mechanism Search Processing Mechanism* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

2-6-1 Settings Flow (Shape Search II)

Set up shape search II according to the following steps.



List of Shape Search II Items

Item name	Description
Model	This item registers the pattern characteristic of the measurement image as a model. Change the model parameter (black and white reverse) as necessary. Refer to *2-6-2 Model Registration (Shape Search II)* on page 2-77.
Region setting	This item is used to set up the measurement area. Instead of measuring the entire input image, narrowing the measurement area shortens the processing time. Refer to *2-6-3 Region Setting (Shape Search II)* on page 2-78.
Detection point	This item can be changed if necessary. Specify a position in the model that should be used as the detection coordinates during measurement. Usually, the central position of the set model is registered as the detection coordinates. Refer to *2-6-4 Detection Point (Shape Search II)* on page 2-79.
Ref. setting	This item can be changed if necessary. Specify the reference position within the camera's field of view. Refer to *2-6-5 Reference Setting (Shape Search II)* on page 2-80.
Measurement	This item specifies the judgement condition for measurement results. Specify the criteria to judge the measurement result if the X and Y coordinates and the correlation values with the model are OK. Refer to *2-6-6 Measurement Parameters (Shape Search II)* on page 2-82.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. Refer to *2-6-7 Output Parameters (Shape Search II)* on page 2-83.

2-6-2 Model Registration (Shape Search II)

Register the parts to measure as the model.

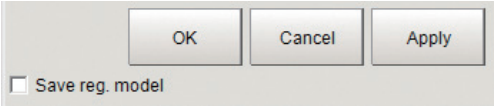
The model information includes the position of the model. So place the target in the correct position in the registration process.

1 Click [Model] tab.

When setting a new model, you do not have to click [Model]. The tab is already being selected.

2 Use the Drawing tools to specify the model registration range.

3 To save the entire image used for model registration, place a check at the "Save reg. model" option.



Additional Information

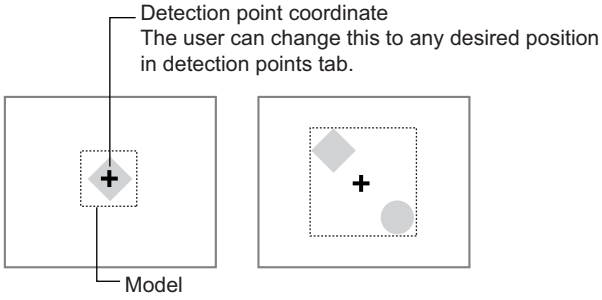
If you save the registered model image, you can re-register the model with the same image after model parameters are adjusted. Note that the scene data size increases when a registered model image is saved.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

Additional Information

When a model is registered, the central coordinates of the model are registered as the detection point. A detection point is a point output as a measurement value. If multiple targets are included in the same model, the detection points become the central coordinate of the bounding box that circumscribing these targets.



Changing model parameters

If the light and dark of the background and the workpiece, such as a shiny workpiece, reverses, specify the "Reverse" setting as necessary.

After changing a setting, re-register the model.

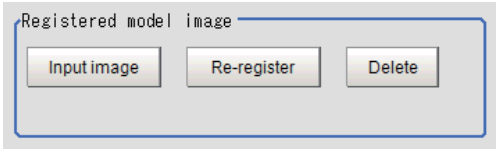
1 Click [Detail setting].

2 In the "Model parameter" area, set "Reverse".

Setting item	Set value [Factory default]	Description
Reverse	• Checked • [Unchecked]	Set whether to allow the reverse of light and dark for the model.

Displaying/Re-Registering/Deleting a Model

If you save the model registration image, it is easy to re-register the model after model parameters are changed.



Item	Description
Disp model/Input image	The model image display and input image display are switched.
Re-register	When model parameters are modified, display the original model image and re-register the model.
Delete	Deletes a model.

2-6-3 Region Setting (Shape Search II)

Use a rectangle to specify the area where the model is searched.

Instead of measuring the entire input image, narrowing the measurement area shortens the processing time.

1 In the Item Tab area, click [Region setting].

2 Click [Edit].

The figure setting area is displayed.

3 Specify the model search range.

The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

2-6-4 Detection Point (Shape Search II)

Specify a position in the model that should be used as the detection coordinates during measurement. Usually, the center position of the set model is registered as the detection point. This function is used to change to any desired position.

A detection point can be set either directly or by referencing a unit.

Additional Information

After changing the detection point coordinates to another position, re-registering the model will change it back to the center coordinates of the model.

Specifying directly

Click a position on the image you want to use as a detection point, or set coordinate data for that point.

1 In the Item Tab area, click [Detection point].

In the Display area, the current detection point is displayed with a crosshair cursor.

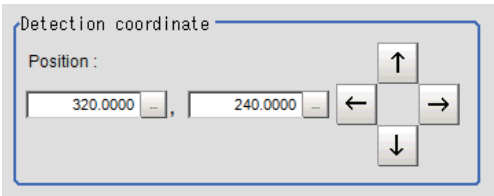
2 In the "Method" area, select "Numerical".

3 Click the position to be set as the detection point.

Additional Information

Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.



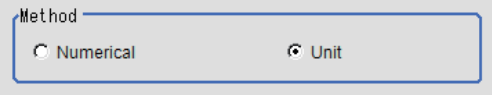
Referencing a unit

Set a detection point by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

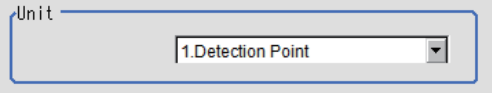
1. In the Item Tab area, click [Detection point].

   In the Display area, the current detection point is displayed with a crosshair cursor.

2. In the "Method" area, select "Unit".



3. In the scene in the "Unit" area, select a detection point unit.



4. Perform the next measurement, and the detection point will be displayed.

2-6-5 Reference Setting (Shape Search II)

When the model is set, this position is automatically set at the same time as the reference position. This item can be set to change the reference position to any desired position. This is handy for measuring the position deviation from a certain position.

A reference position can be set either directly or by referencing a unit.

Specifying directly

Click a position on the image you want to use as a reference position, or set coordinate data for that point.

1. In the Item Tab area, click [Ref. setting].

   In the display area, the current reference position will be displayed as the crosshair cursor.

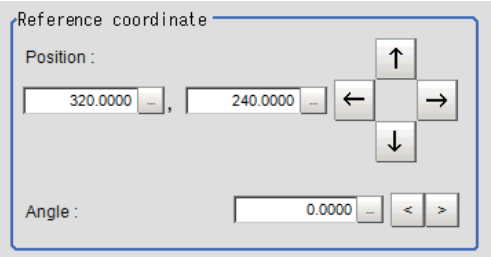
2. In the "Method" area, select "Numerical".

3. Click the position to be set as the reference.

Additional Information

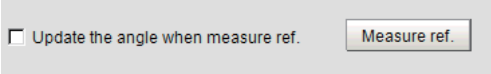
Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.

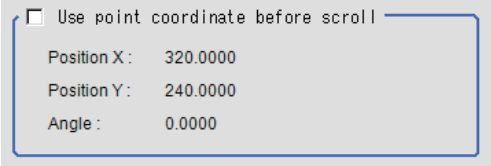


5 Set the reference angle with a numeric value.

6 To remeasure on the displayed image and set the reference, click the [Measure ref.] button. To update the reference angle at the time of reference measurement, place a check at "Update the angle when measure ref.".



7 To use data before position compensation for the reference setting coordinates, place a check at "Use point coordinate before scroll".



Referencing a unit

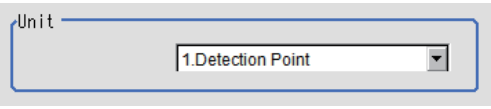
Set a reference by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".

3 In the scene in the "Unit" area, select a detection point unit.



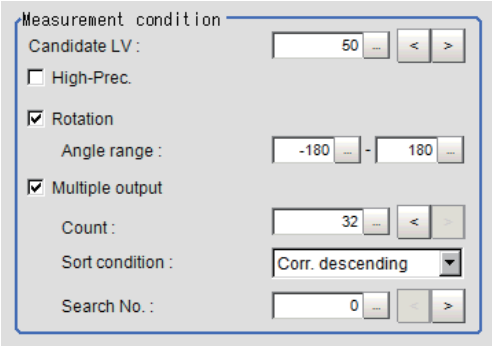
4 Perform the next measurement, and the reference will be displayed.

2-6-6 Measurement Parameters (Shape Search II)

Specify the search measurement conditions and the judgement conditions for the measurement results.

1 In the Item Tab area, click [Measurement].

2 In the "Measurement condition" area, specify a value for each parameter.

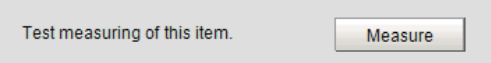


Setting item	Set value [Factory default]	Description
Candidate LV	0 to 100 [50]	Specify the threshold value with which to detect candidate points in a rough search. Specify a smaller value when the detection is unstable.
High-Prec.	• Checked • [Unchecked]	"High-Prec" mode enables sub-pixel and sub-degree order position and pose estimation. There is just a slight increase of processing time.
Rotation	• [Checked] • Unchecked	Select the parameter when the target may be rotated and set appropriate range in "Angle range".
Angle range	-180 to 180 [-180] to [180]	Specify the angle range when "Rotation" is checked.

- When executing a multi search

Setting item	Set value [Factory default]	Description
Multiple output	• [Checked] • Unchecked	Check this parameter enables multiple target detection.
Count	1 to 32 [32]	Specify the maximum number of detections.
Sort condition	• Corr. ascending • [Corr. descending] • X ascending • X descending • Y ascending • Y descending	Specify the method by which the search number is re-assigned. When sorting based on the X and Y coordinates, the upper left is the origin.
Search No.	0 to 31 [0]	Specify which of the multiple detection results will be used as measured results.

3 When the setting has been changed, click [Measure] in the "Detail" area to verify whether measurements can be made correctly.



4 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

Setting item	Set value [Factory default]	Description
Count	0 to 32 [0] to [32]	Specify the number of detections that are judged to be OK.
Measure X	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Specify the range of X-axis shifting that is judged to be OK.
Measure Y	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Specify the range of Y-axis shifting that is judged to be OK.
Search angle θ	-180 to 180 [-180] to [180]	Specify the range of angles that are judged to be OK.
Correlation	0 to 100 [60] to [100]	Specify the range of correlation values that are judged to be OK. However, when the correlation value of the measurement result is 0, the judgement result will be NG regardless of the lower limit setting.

2-6-7 Output Parameters (Shape Search II)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	Select output coordinate for external devices. If "after scroll" is chose here shape search III outputs coordinates after position compensation.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgment.

2-6-8 Key Points for Test Measurement and Adjustment (Shape Search II)

The following content is displayed in the "Detail result" area as text.

Important

Executing test measurements will update the measurement results and the figures in the image.

Displayed items	Description
Judge	Judgement result
Count	Number of detections
Correlation	Correlation value
Position X	X coordinate of the position where the model is detected
Position Y	Y coordinate of the position where the model is detected
Angle	Angle of the position where the model is detected

The image specified in the Sub-image number in image display setting is displayed in the Image Display area.

Sub image number.	Explanation of image to be displayed
0	Measurement image

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

- Searching other positions

Parameter to be adjusted	Remedy
Measurement parameter	If the precision is low, check "High-Prec.".
	If detection or resulting judgement are unstable, set a smaller value for "Candidate LV", specify a smaller value for "Candidate LV".

- The judgement is NG (insufficient memory)

Parameter to be adjusted	Remedy
Region setting	Make the search region as small as possible.

● When the processing speed is slow

Parameter to be adjusted	Remedy
Region setting	Make the search region as small as possible.
Model registration	Make the area to register as the model as small as possible.
Measurement parameter	If images that should be judged OK vary little, specify a larger value for "Candidate LV".
	If the position precision is high, uncheck "High-Prec.".

2-6-9 Measurement Results for Which Output Is Possible (Shape Search II)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Count	C	Number of search items detected If none detected, 0
Correlation	CR	Correlation value with the model
Position X	X	X coordinate of the position where the model is detected
Position Y	Y	Y coordinate of the position where the model is detected
Angle θ	TH	Angle of the position where the model is detected
Ref. position X	SX	X coordinate of the reference position of the registered model
Ref. position Y	SY	Y coordinate of the reference position of the registered model
Ref. angle	ST	Angle of the registered model
Detection point RX	RX	X coordinate of the registered model
Detection point RY	RY	Y coordinate of the registered model
Correlation value N (N = 00 to 31)	CRN	Detected search N correlation value (N = 00 to 31)
Position XN (N = 00 to 31)	XN	Detected search N position X (N = 00 to 31)
Position YN (N = 00 to 31)	YN	Detected search N position Y (N = 00 to 31)
Angle THN (N = 00 to 31)	THN	Detected search N angle TH (N = 00 to 31)

2-6-10 External Reference Tables (Shape Search II)

No.	Data name		Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mis-match) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
9	Reference position X[*1]	referenceX	Get only	-99,999.9999 to 99,999.9999
10	Reference position Y[*1]	referenceY	Get only	-99,999.9999 to 99,999.9999
11	Reference angle	referenceAngle	Get only	-180 to 180
12	Detection point X	detectionX	Get only	-99,999.9999 to 99,999.9999
13	Detection point Y	detectionY	Get only	-99,999.9999 to 99,999.9999
14	Count	count	Get only	0 to 32
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	With rotation	rotation	Set/Get	0: OFF 1: ON
121	Upper limit of the rotation angle	endAngle	Set/Get	-180.0000 to 180.0000

No.	Data name		Set/Get	Data range
122	Lower limit of the rotation angle	startAngle	Set/Get	-180.0000 to 180.0000
124	Reverse	reverse	Set/Get	0: Not detect 1: Detect
126	High-Prec.	subPixelMeas	Set/Get	0: OFF 1: ON
127	Reference X*2	referencePosX	Set/Get	0 to 99,999.9999
128	Reference Y*2	referencePosY	Set/Get	0 to 99,999.9999
129	Reference angle	referencePosAngle	Set/Get	-180.0000 to 180.0000
133	Candidate Point Level	candidateLevel	Set/Get	0 to 100
134	Detected coordinate X	detectionPosX	Set/Get	0 to 99,999.9999
135	Detected coordinate Y	detectionPosY	Set/Get	0 to 99,999.9999
136	Sort condition	sort	Set/Get	0: Corr. ascending 1: Corr. descending 2: X ascending 3: X descending 4: Y ascending 5: Y descending
137	Search No.	searchNo	Set/Get	0 to 31
138	Upper limit of the correlation	upperCorrelation	Set/Get	0.0000 to 100.0000
139	Lower limit of the correlation	lowerCorrelation	Set/Get	0.0000 to 100.0000
140	Upper limit of the detect number	upperCount	Set/Get	0 to 32
141	Lower limit of the detect number	lowerCount	Set/Get	0 to 32
142	Upper limit of the measurement coordinate X	upperX	Set/Get	-99,999.9999 to 99,999.9999
143	Lower limit of the measurement coordinate X	lowerX	Set/Get	-99,999.9999 to 99,999.9999
144	Upper limit of the measurement coordinate Y	upperY	Set/Get	-99,999.9999 to 99,999.9999
145	Lower limit of the measurement coordinate Y	lowerY	Set/Get	-99,999.9999 to 99,999.9999
146	Upper limit of the judge angle	upperAngle	Set/Get	-180.0000 to 180.0000
147	Lower limit of the judge angle	lowerAngle	Set/Get	-180.0000 to 180.0000
161	Max no. of detections	extractCount	Set/Get	1 to 32
168	Multiple output	isMulti	Set/Get	0: OFF 1: ON
171	Save registered model	saveModelimage	Set/Get	0: OFF 1: ON
231	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
232	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit
233	Update the reference angle	updateAngleFlg	Set/Get	0: Not update 1: Update
234	Setting unit of detection coordinate	detUnitNo	Set/Get	-1 to 9,999

No.	Data name		Set/Get	Data range
235	Setting type of detection coordinate	detSettingType	Set/Get	0: Numerical 1: Unit
236	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
237	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999
238	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999
239	Angle before scroll	beforeScrollRefAngle	Set/Get	-180 to 180
1000+N (N: 0 to 31)	Correlation	correlation	Get only	0 to 100
1100+N (N: 0 to 31)	Position X	positionX	Get only	-99,999.9999 to 99,999.9999
1200+N (N: 0 to 31)	Position Y	positionY	Get only	-99,999.9999 to 99,999.9999
1300+N (N: 0 to 31)	Angle	angle	Get only	-180 to 180
5100	Re-register	UpdateUnitModel	Set only	1: Execute
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
91000	figure0 Count	figArea0_count	Set/Get	1
91001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
91002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
91014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
91015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
91016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
91017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
91099	figure0 Update	figArea0_update	Set only	1: Update

*1. The reference coordinates based on the selection in the Method area of the [Ref.setting] tab can be Get only.

*2. The reference coordinates based on the selection of Numerical in the Method area of the [Ref.setting] tab can be Set/Get.

2-7 Shape Search III

This function registers a model of an image pattern based on its contour information and detect parts of inputted images that most closely match the model. The correlation value indicating the degree of similarity, measurement target position, and orientation can be measured.

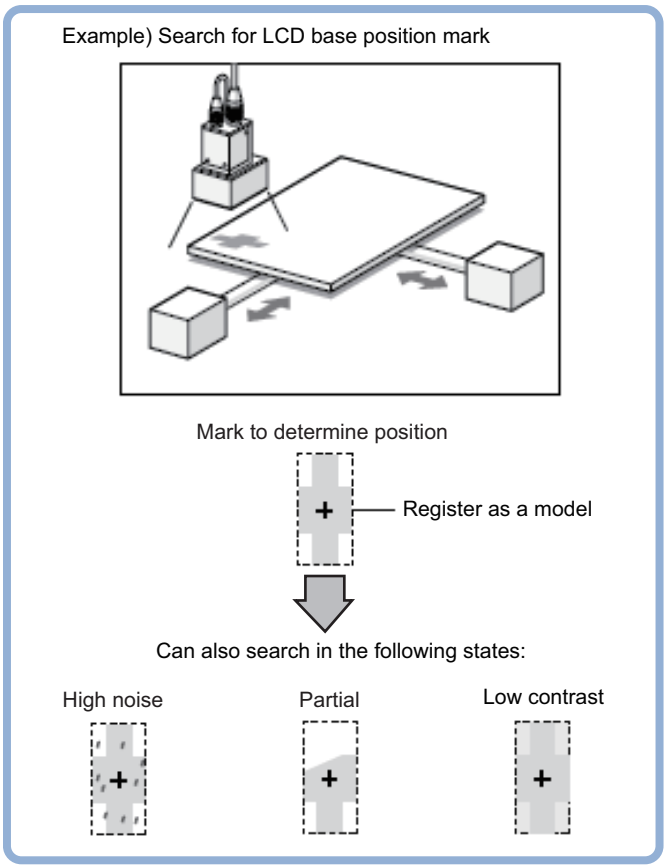
In shape search III, contour information is used as features, whereas in a normal search mode, color and texture information are used.

It enables models to be detected fast, precisely, and robustly to environmental variations including shadings, reflections, lightings, shape deformations, pose and noises.

Since state-of-the-art object detection algorithm is employed in shape search III, it can provide much more reliable position and pose estimation with higher speed compared to shape search II. Furthermore, it has much more parameter to tune to support a wider variety of applications.

Used in the Following Case

Alignment mark detection and precise position estimation.



Important

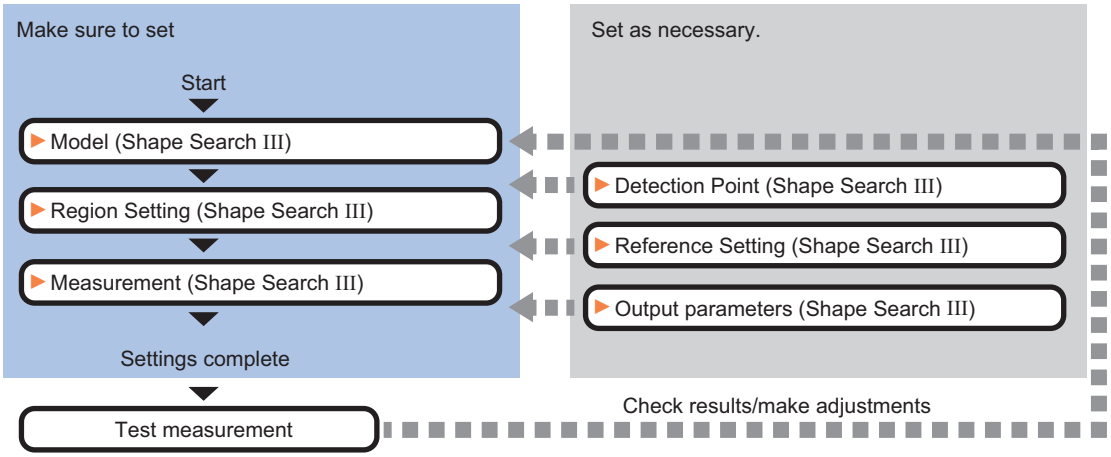
- Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.
- When the measurement region is changed, the Position X and Position Y can differ. Be sure to check functionality thoroughly before starting operation.

Additional Information

Search processing basic concepts
For details, refer to *Appendixes Measurement Mechanism Search Processing Mechanism* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

2-7-1 Settings Flow (Shape Search III)

Set up shape search III according to the following steps.



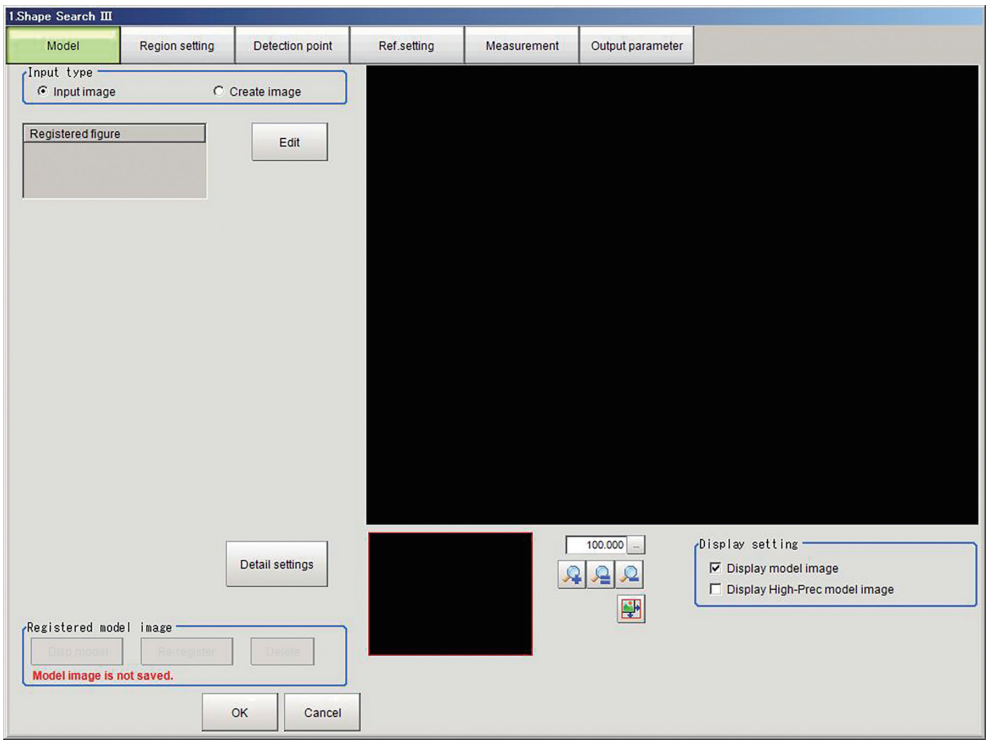
List of Shape Search III Items

Item name	Description
Model	This item registers the characteristic pattern of the measurement image as a model. Change the model parameters as necessary. Refer to *2-7-2 Model (Shape Search III)* on page 2-90.
Region setting	This item is used to set up the measurement area. Instead of measuring the entire input image, narrowing the measurement area shortens the processing time. Refer to *2-7-3 Region Setting (Shape Search III)* on page 2-96.
Detection point	This item is used to change the detection point. It sets a position in the model that should be used as the detection coordinates during measurement. Usually, the central position of the set model is registered as the detection coordinates. Refer to *2-7-4 Detection Point (Shape Search III)* on page 2-97.
Ref. setting	This item is used to change the reference setting. It sets the reference position within the camera's field of view. Refer to *2-7-5 Reference Setting (Shape Search III)* on page 2-98.
Measurement parameter	This item specifies the judgement condition for measurement results. Specify the criteria to judge the measurement result if the X and Y coordinates and the correlation values with the model are OK. Refer to *2-7-6 Measurement parameter (Shape Search III)* on page 2-101.
Output parameter	This item is used to change the output parameters. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. Refer to *2-7-7 Output Parameter (Shape Search III)* on page 2-104.

2-7-2 Model (Shape Search III)

Register the characteristic parts of the image to measure as the Model.

Before registering as a Model, verify the workpiece position to detect. Position information entered at Model registration time is included in the Model information. If the position to detect at measurement time differs from the registered position, it will not be accurately detected.



Model Registration

There are two methods for Model Registration. One is to use the input image. Another is to use an image from a previously provided graphic pattern. In most cases it is recommended to use the input image.

● Register the Model Image (Input Image)

When registering a model image using the Input image.

Verify the position of the workpiece before measuring.

1 Click [Model] tab.

2 Choose [Input image] in the Input type area.

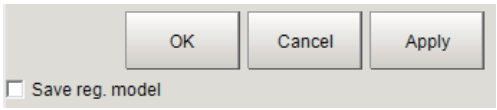
3 Click [Edit].

4 Select the area of the image to register as the Model using the Drawing tool.

5 Check the “Save reg. model” box for later verification of the image used as a Model.

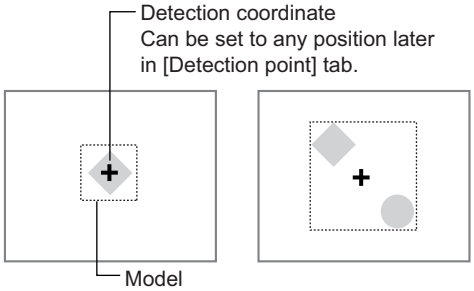
6 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded and returns to the previous menu.
- [Apply]: Updates the settings without leaving current window.



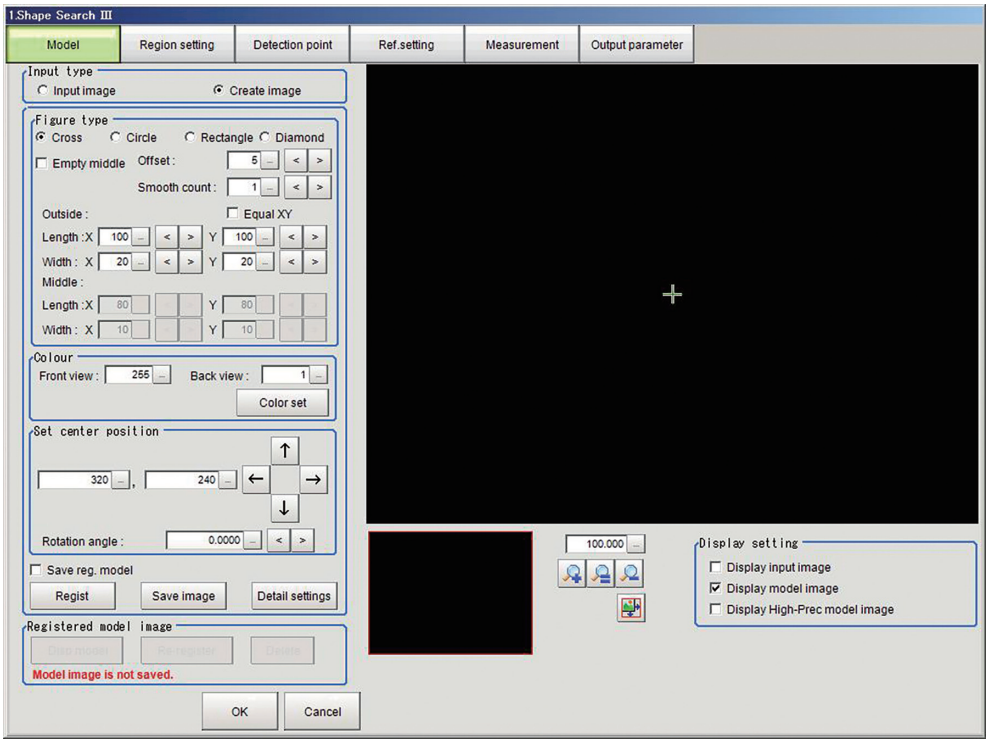
Additional Information

- By saving the Registered model image, the same image can be re-registered as a model after updating any detailed settings.
- Saving the Registered model image will increase the Scene data size.
- When registering the model, the Center point of the registered model is also automatically registered as the Detection point and Reference coordinates. These can be changed later.



● Registering a Model through Image Creating (Create Image)

You can register a model using shapes provided in Shape Search III. Use this function when the captured image has excessive noise, or the shape in the image to register as the model is unclear, or is missing a part.

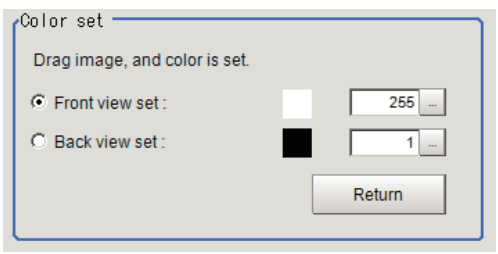


1 In the [Input type] area, select [Create image].

2 Adjust each setting in the [Figure type] area.

Setting item	Setting value [Factory default]	Description
Figure type	• [Cross] • Circle • Rectangle • Diamond	Selects the type of figure to be used for the created image model.
Empty middle	• Checked • [Unchecked]	Selects whether or not to make the created image hollow. Select the setting according to the shape of the detection object.
Offset	0 to 99 [5]	Sets the margins from the outline of the shape used in the created image to the outline of the model registration region. Set a value that is larger than the smooth count. If you set a rotation angle, increase the value even more. Model registration will not be possible if the model region extends beyond the image. If that occurs, reduce the value.
Smooth count	0 to 9 [1]	Set the level of smoothing applied to the created figure according to the condition of the outline of the detection object. If the outline is clear, reduce the value. If the outline is not clear, increase the value.
Equal XY	• Checked • [Unchecked]	If you place a check here, the length and width settings will become the same for X and Y.
Outside (Cross) Length X (Cross) Length Y (Cross) Width X (Cross) Width Y (Circle) Radius (Rectangle) Length X (Rectangle) Length Y (Diamond) Length X (Diamond) Length Y	0 to 9999 [100] [100] [20] [20] [50] [100] [50] [100] [50]	Specify the distance from the center to the outline of the shape to determine the size of the outline. Unit of measure: pixel When you specify the length X to 100, the total X direction of figure is 201 pixels: ±100 pixels from the center of figures.
Middle (Cross) Length X (Cross) Length Y (Cross) Width X (Cross) Width Y (Circle) Radius (Rectangle) Length X (Rectangle) Length Y (Diamond) Length X (Diamond) Length Y	0 to 9999 [80] [80] [10] [10] [25] [50] [25] [50] [25]	Specify the distance from the center to the outline of the hollow to determine the size of the hollow. Unit of measure: pixel When you specify the length X to 100, the total X direction of figure is 201 pixels: ±100 pixels from the center of figures.

3 Click [Color set].



4 In the [Color set] area, specify colors of the created image.

Setting item	Setting value [Factory default]	Description
Color set	• [Front view set] • Back view set	Sets the Front view or the Back view of the Create image. After the setting, drag a color part to be specified on the image. The color information of the dragged area will be set as the Front view or the Back view.
Front view set	1 to 255 [255]	Sets the Front view color of the created image. Set it to match the foreground color of the actual detection object.
Back view set	1 to 255 [1]	Sets the Back view color of the created image. Set it to match the background color of the actual detection object.

5 Click [Return] in the [Color set] area.

6 On the image, click the position you want to use as the center coordinate of the shape.

7 Specify the position in detail by entering values or clicking arrows in the [Set center position] area.

8 Set [Rotation angle] by entering the value in the [Set center position] area.

9 Select the [Save reg. model] check box if you want to keep the image used for model registration for future reference.

10 Click [Save image] to save the created image.

11 Click [Regist].

Model registration is finished successfully.

If the [Save reg. model] check box is selected, the registered model image is also saved besides the model.

Adjusting Settings for Model Registration (Detail settings)

Adjust the settings by [Detail settings] when to stabilize measurements or speed up processing. Otherwise, keep the factory default settings. After adjustments, verify the settings by performing actual measurement.

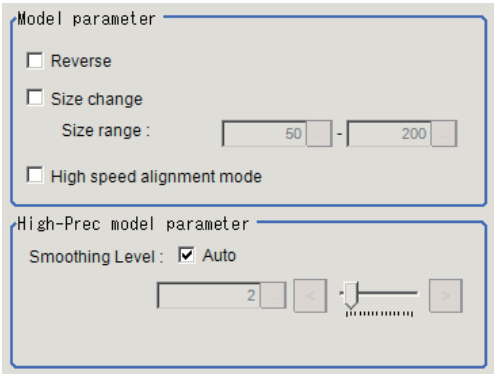
● Changing Model Parameters

Adjusting model parameters when to stabilize measurements or speed up processing.

Re-register the model after the adjustment.

1 Click [Detail setting].

2 Adjust each item in the “Model parameter” area and “High-Prec model parameter” area.



Setting item	Setting value [Factory default]	Description
Model parameter		
Reverse	• Checked • [Unchecked]	Select this check box when detecting objects whose dark areas and bright areas are fluctuating due to glossiness, etc.
Size change	• Checked • [Unchecked]	Select this check box when the size of target objects varies.
Size range	50 to 200 [50] to [200]	This setting is available when the [Size change] check box is selected. Set the upper and lower limit of the size fluctuation.
High speed alignment mode	• Checked • [Unchecked]	Select this check box when detecting simple shapes such as alignment marks. Clear this check box when detecting complex patterns or shapes with only few pixel wide thin lines.
High-Prec model parameter		
Smoothing Level: Auto	• [Checked] • Unchecked	Select this check box to automatically adjust the Smoothing Level. If the result of the auto-adjustment is not as desired, clear this check box and adjust [Smoothing level].
Smoothing Level	1 to 16 [4]	This setting is available when the [Smoothing Level: Auto] check box is cleared. You can adjust the smoothing level of High-Prec model images used when the [High-Prec.] check box is selected in the Measurement Parameter tab page.

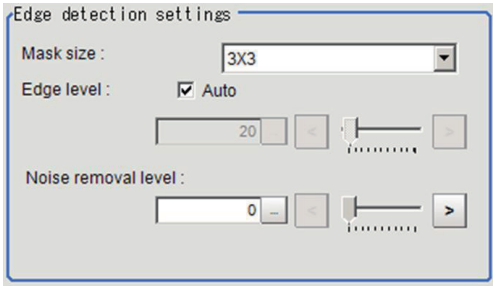
Additional Information

In High speed alignment mode, detection speed is faster, while maintaining accuracy and detection capability by simplifying the model and eliminating its complex feature information. This is effective especially when detecting simple shapes such as alignment marks.

● Changing the Edge Extraction Settings

Adjust the edge extraction settings when you cannot detect edges when registering a model, or when detected edges are broken. Re-register the model after the adjustment.

1 Click [Detail setting].



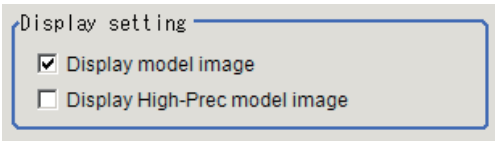
2 Adjust each setting under [Edge setting].

Setting item	Setting value [Factory default]	Description
Mask size	• [3 × 3] • 5 × 5 • 7 × 7	Select the range of pixels to use for edge detection. Select a large size when the brightness varies greatly among pixels.
Edge level: Auto	• [Checked] • Unchecked	Select this check box to adjust [Edge level] automatically. If edges are not detected under the auto settings, clear this check box and adjust value of [Edge level].
Edge level	0 to 1024 [20]	This setting is enabled when the [Auto] check box is cleared in the [Edge detection settings] area. Set the lower limit of edge level to recognize as edge. Edges are recognized when their edge level is above this value. The smaller the value, the easier it is to find edges. The larger the value, the less noise will affect finding edges.
Noise removal level	0 to 100 [0]	Specify the upper limit of noise level to eliminate. Noise whose noise level is below this value will be eliminated. In the noise removal process, edges are connected and divided into a set of groups of line segments, and then these line segments are removed one by one from shorter segments. Setting a larger value removes larger noise.

● Verifying the Model on the Image (Display Settings (Model))

When changing the display settings, the status of the registered model can be checked on the image.

1 In the [Display setting] area, adjust each setting.

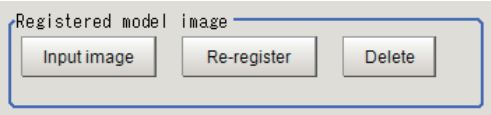


Setting item	Setting value [Factory default]	Description
Display model image	• Checked • [Unchecked]	Select this check box to display and confirm the model image.
Display input image	• [Checked] • Unchecked	This check box is available when the [Create image] check box is selected in the [Input type] area. Select this check box to check the captured image while also the created image is displayed.
Display High-Prec model image	• Checked • [Unchecked]	Select this check box to display the high precision model which is used when the [High-Prec.] check box is selected in the Measurement tab page.

2 Confirm the model image on display, and register as a model.

Displaying, Re-registering, and Deleting a Model (Model Registration Image)

The buttons described in the following table are available when a model registration image is saved. You can use these buttons to reconfirm images used for model registration, or re-registering the model after adjusting detail settings. For more information, refer to *Model Registration (Shape Search III)*.

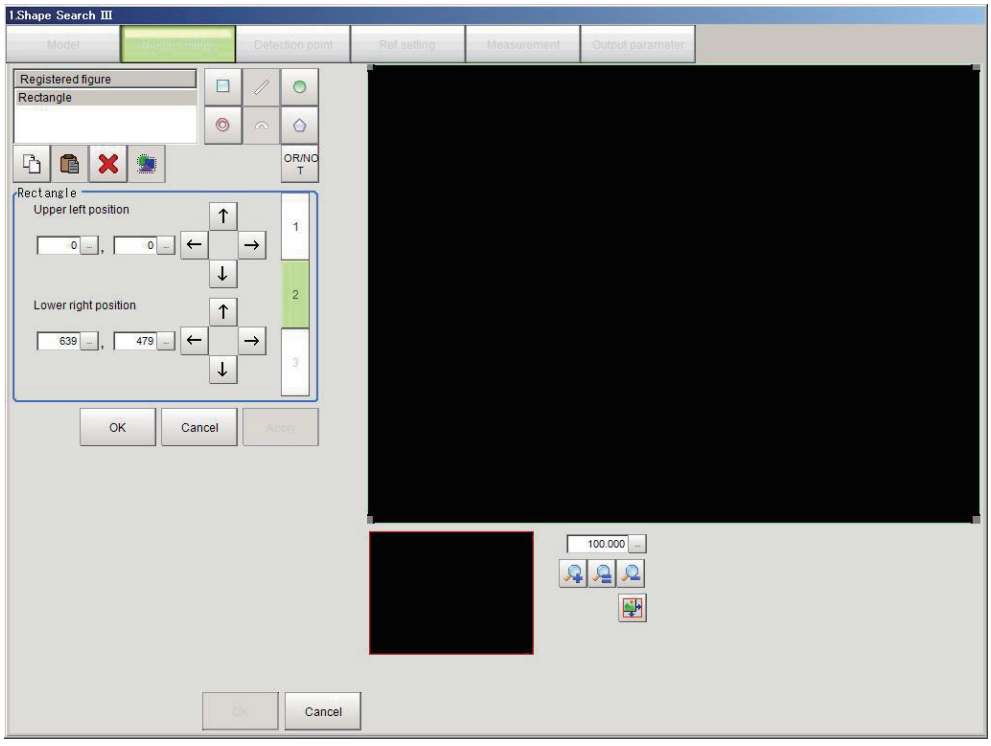


Item	Description
Disp model/Input image	Switches the model image view and input image view.
Re-register	Re-registers a model using the model registration image. When model parameters are changed, you can display the model registration image and re-register. This button is available when the model registration image is displayed.
Delete	Deletes a model.

2-7-3 Region Setting (Shape Search III)

Sets the measurement region of Model.

Measurement entirely Input image is available. To limit the measurement range, you can shorten the processing time.



1. Click [Region setting] tab.
2. Click [Edit].
3. Set the measurement range to detect Model.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving current window.

2-7-4 Detection Point (Shape Search III)

You can change the detection point on the Detection Point tab page.

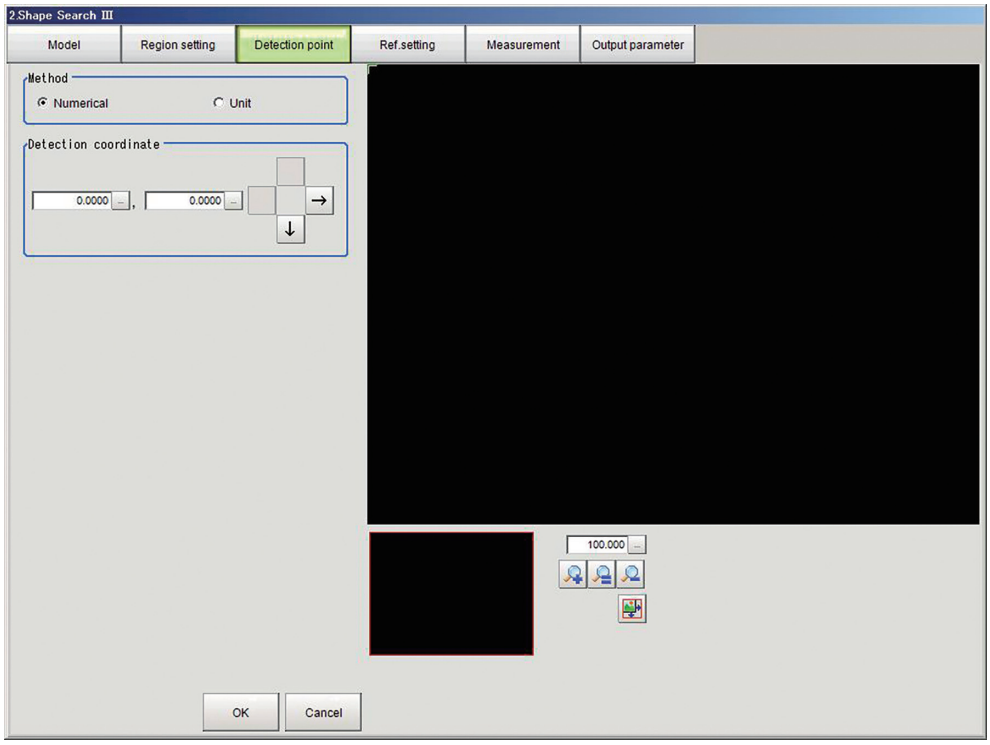
Set the detection point by specifying a point in the detected model to use as a measurement coordinate.

In default setting, the center position of the registered model is set as the detection point.

The detection point can either be set directly, or by referring to a unit.

Important

When you register a model, the center coordinate of the model will automatically be set as a detection point. If you want to use other point, make sure to re-set it after a model registration.



Setting the Detection Point Directly (Numerical)

Click a position on the image you want to use as a detection point, or input coordinate data for that point.

1 Click [Detection point] tab.

The current detection point is displayed on the display area as a cross-cursor.

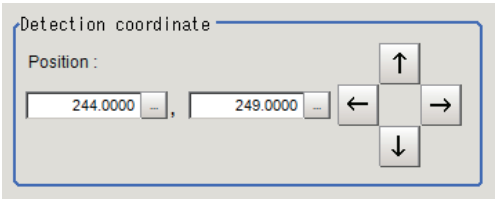
2 In the [Method] area, select [Numerical].

3 Click the position to be set as the detection point.

Additional Information

You can enlarge the image so that it is easier to click.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.



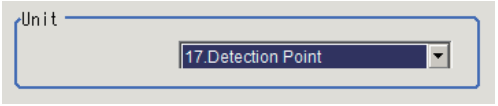
Setting the Detection Point by Referencing Processing Unit (Unit)

Set the detection point by referencing the Detection Point processing unit set in the measurement flow. In this method, the position and angle are set based on measurement results, and thus they are more accurately set than the Numerical setting method.

1 Click [Detection point] tab.

2 In the [Method] area, select [Unit].

3 In the [Unit] area, select [Detection point] processing unit in the current Scene.



4 Perform the next measurement, and then the detection point will be applied.

2-7-5 Reference Setting (Shape Search III)

You can change the reference coordinates on the [Ref. setting] tab page. Set the reference point and angle within the camera FOV as the reference coordinate. When you register a model, the center point of the registered model is automatically set as the reference point. This reference point is used to measure deviation from a certain point.

A reference position can be set either directly or by referencing a unit.

Setting the Reference Point Directly (Numerical)

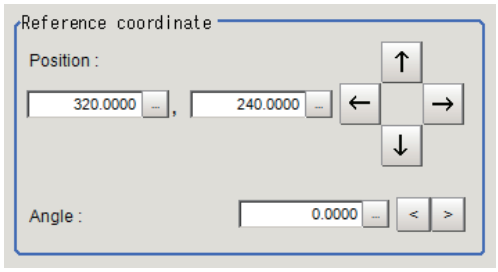
Click a position on the image you want to use as a reference position, or input coordinate data for that point.

1 Click [Ref. setting] tab.

2 In the [Method] area, select [Numerical].

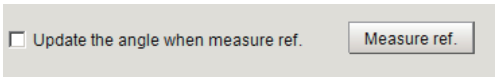
3 Click the position to be set as the reference.

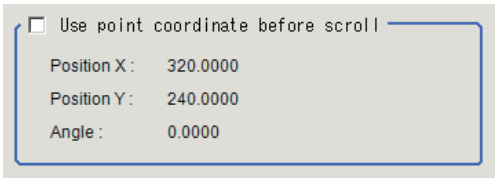
4 Make fine adjustments using numeric value inputs or the arrow buttons as required.



5 Set the reference angle using numeric value inputs in the [Reference coordinate] area.

6 To use the reference coordinate as the coordinate before the position compensation, select the [Use point coordinate before scroll] check box.





Additional Information

- You can enlarge the image so that it is easier to click.
  For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).
- When using the Position Compensation processing item, the coordinates after position compensation will be the reference point. When the coordinates before the position compensation are needed for alignment, etc., select the [Use point coordinate before scroll] check box.

● Updating the Reference Coordinate by Measuring the Displayed Image (Reference Measurement)

Measure the image displayed on the setting window and use the measurement result as the reference coordinate.

1 When you want to update the reference angle besides the reference point, select the [Update the angle when measure ref.] check box.

2 Click [Measure ref.].

The reference coordinate will be updated.

3 If you want to use the reference coordinate as the coordinate before the position compensation, select the [Use point coordinate before scroll] check box.

Additional Information

When using the Position Compensation processing item, the coordinates after position compensation will be the reference point. When the coordinates before the position compensation is needed for alignment, etc., select the [Use point coordinate before scroll] check box.

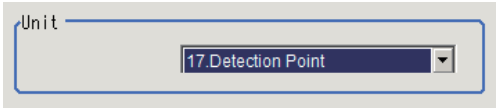
Setting the Reference Point by Referencing Processing Unit (Unit)

Set the reference point by referencing the Detection Point processing unit set in the measurement flow. In this method, the position and angle are set based on measurement results, and thus they are more accurately set than the Numerical setting method.

1 Click [Ref. setting] tab.

2 In the [Method] area, select [Unit].

3 In the [Unit] area, select [Detection point] processing unit in the current Scene.

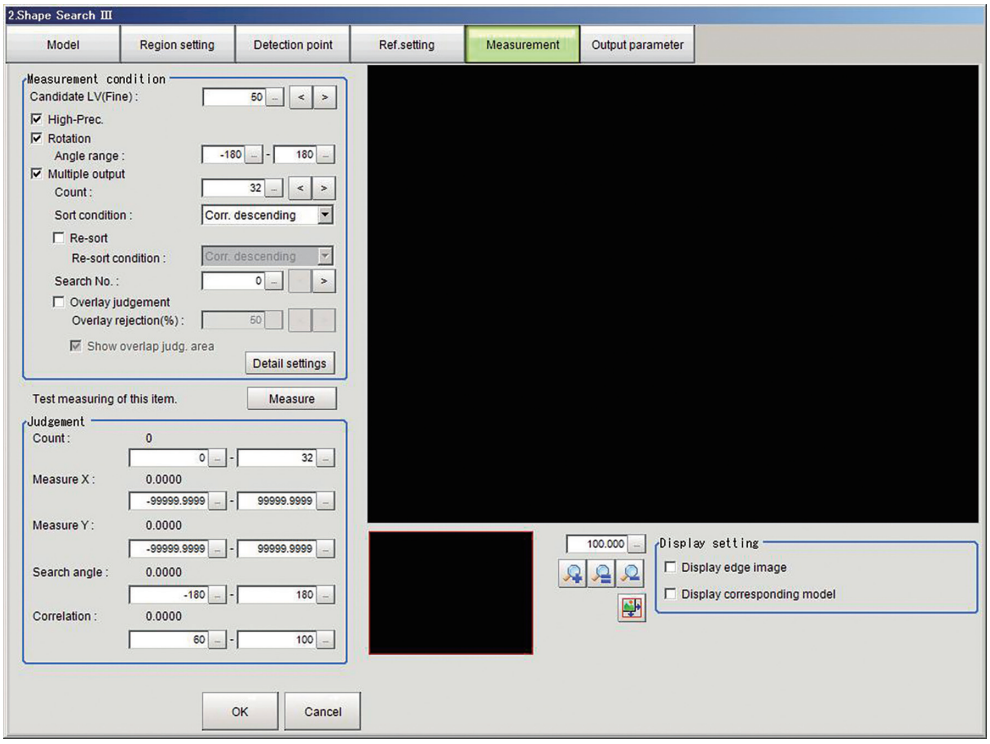


4 Perform the next measurement, and then the reference point will be applied.

The reference coordinate will be updated when performing the next measurement.

2-7-6 Measurement parameter (Shape Search III)

Set the measurement conditions or judgment condition in this Measurement parameter.



Set the Measurement Conditions

Set the necessary parameters and processing conditions for the measurement.

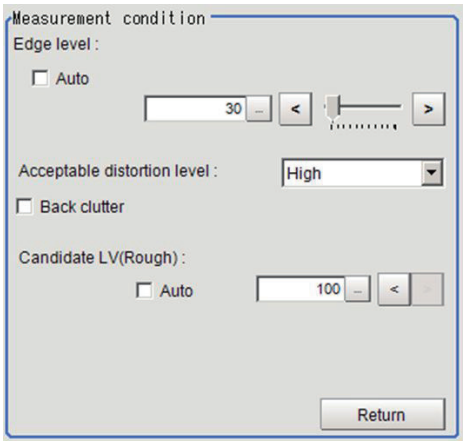
1 Click [Measurement] tab in the Item tab area.

2 Set values for each setting item in the “Measurement condition” area.

Setting item	Setting value [Factory default]	Description
Candidate LV (Fine)	0 to 100 [50]	Set the threshold to detect candidate points in a rough search. Set this Item to a smaller value when the detection is unstable.
High-Prec.	• [Checked] • Unchecked	Check [High-Prec.] to output more accurate position information. Note that the processing time will normally be faster if [High-Prec.] is left un-checked.
Rotation	• [Checked] • Unchecked	Check this item when the direction differs of the inspection object differs from the registered model.
Angle range	-180 to 180 [-180] to [180]	Check this item to be active, then set the measurement angle range.
Multiple output	• [Checked] • Unchecked	Check this item when you want to detect multiple objects in a single measurement.
Count	1 to 128 [32]	Sets the maximum number of detections. If more objects than the set value are detected, all detected candidates are sorted out. Then within Candidates from the top of counted number are outputed as the measurement result.

Setting item	Setting value [Factory default]	Description
Sort condition	• Corr. ascending • [Corr. descending] • X ascending • X descending • Y ascending • Y descending	Select this item to set for the Sort condition when Multiple output is executed. When sorting based on the X and Y coordinates, the upper left is the origin.
Re-sort	• Checked • [Unchecked]	Check this item when you want to re-sort in other conditions. Only the result that selected in [Count] function are output.
Re-sort condition	• Corr. ascending • [Corr. descending] • X ascending • X descending • Y ascending • Y descending	Select the Re-sort condition.
Search No.	0 to 127 [0]	Set the sort order number of output result from the sort or re-sort.
Overlay judgement	• Checked • [Unchecked]	Check this item to distinguish the detected result from the overlap result.
Overlay rejection(%)	1 to 100 [100]	Adjust the overlap rejection percentage. Increase this value when you want to reject a small overlap.
Show overlap judg. area	• [Checked] • Unchecked	This function is applied when you check [Overlay judgement]. When you check [Show overlap judg, area], the area is displayed as dashed line.

3 Click [Detail setting] in the Measurement condition area to set value for each item.



Setting item	Setting value [Factory default]	Description
Edge level: Auto	• [Checked] • Unchecked	In this function, you can set [Edge level] automatically. If edge recognize is not making good progress, un-check this item and set [Edge Level].
Edge level	0 to 1024 [30]	This function will be enable when you un-check [Auto] check box. Set the lower limit to recognize the [Edge level]. Edges is higher than set value are recognized. Decrease the setting value when it is difficult to find edge. Increase the setting value when inspection object takes many noise effects.
Acceptable distortion level	• Low • Medium • [High]	Selects the degree of influence of correlation values when Model edge has small uneven patterns. To avoid reduction of correlation value, set [High] in this item.
Back clutter*1	• Checked • [Unchecked]	Check this item to get stable condition of measurement result when there are many edges in the background of Model.

Setting item	Setting value [Factory default]	Description
Candidate LV Rough: Auto	• Checked • [Unchecked]	Check this when automatically detecting candidate points in a rough search.
Candidate LV	0 to 100 [50]	This function is enabled when unchecking the checkbox for “Candidate LV (Rough): Auto”. Specify a smaller value when model search results are unreliable.

*1. For the FZ5-L35□ or FZ5-6□□, a warning message will be displayed if you place a check here.

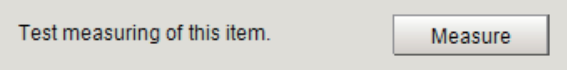
If you place a check for [Back clutter], memory may not be sufficient. If the measurement result is [NG (insufficient memory)], perform the following adjustments to remedy the situation.

Make the measurement region smaller. Refer to *2-7-3 Region Setting (Shape Search III)* on page 2-96.

Increase the candidate level. Refer to *2-7-2 Model (Shape Search III)* on page 2-90.

Decrease the range of the image that varies radically. Refer to *2-7-2 Model (Shape Search III)* on page 2-90.

4 Click [Measure], then check the measurement.



● Confirming the Measurement Result on the Display (Display Settings)

By changing the display setting, you can check the measurement processing status on the image.

1 Set the check box in the [Display setting] area.

2 Confirm the measurement processing condition, then set Measurement condition.

Setting item	Setting value [Factory default]	Description
Display edge image	• Checked • [Unchecked]	Check this item when you confirm extracted edge set in [Edge level] on the display.
Display corresponding mode	• Checked • [Unchecked]	Check this item when you confirm detected Model on the display.

Setting Judgment Condition

Set the upper and lower values to judge the measurement result. When the measurement result value is within the upper and lower value, Judgment is [OK] (pass). When the measurement result value exceeds either the upper, or lower value Judgment is [NG] (failed). About The Judgment result for the Processing Unit is [OK] when the judgment for all measurements is [OK], however it will be [NG] if any measurement result is [NG].

1 Set the value in the [Judgment] area.

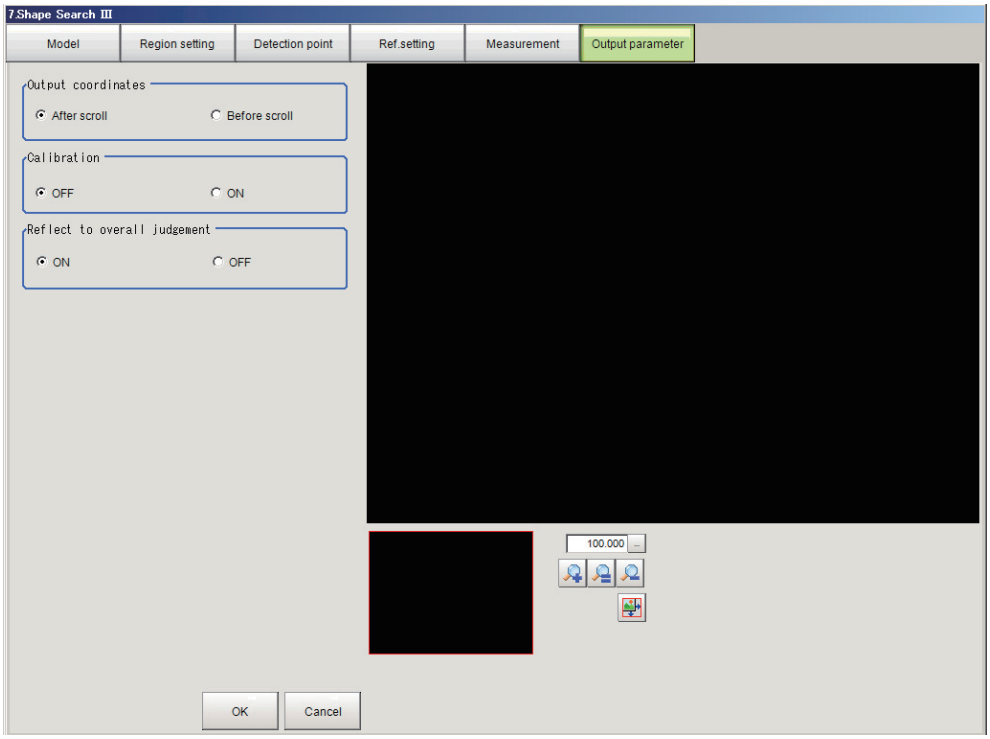
Setting item	Setting value [Factory default]	Description
Count	0 to 128 [0] to [128]	Sets the upper and lower values of number of Model to detect.
Measure X	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Sets the upper and lower limit values on X coordinate for Model to detect.
Measure Y	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Sets the upper and lower limit values on Y coordinate for Model to detect.
Search angle	-180 to 180 [-180] to [180]	Sets the upper and lower limit values for an angle of Model to detect.
Correlation	0 to 100 [60] to [100]	Sets the upper and lower limit values for the correlation to Model to detect. Judgment will be [NG] instead of the lower value when the measurement result correlation is zero.

Additional Information

Measurement result will be displayed on the right of the Judgment items. You can set the Judgment condition refer to this value.

2-7-7 Output Parameter (Shape Search III)

Set how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.



1 Click [Output parameter] tab in Item tab area.

2 Set each item's value.

Setting item	Setting value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	Select the timing for applying Position compensation to the output value.
Calibration	• [OFF] • ON	Select whether, or not the Calibration results affect the output values. ON: Output not the camera's coordinates into actual dimensions based on the Calibraiton result.
Reflect to overall judgement	• [ON] • OFF	Selects whether, or not Shape Search III Judgment results affect the Scene's Overall Judgment.

Additional Information

Measurement result may change if you change the Output parameter after setting the Measurement parameter. So change the Measurement parameter as well when changing the Output parameter.

2-7-8 Key Points for Test Measurement and Adjustment (Shape Search III)

To improve measurement accuracy, or speed adjust the parameter confirming the measurement test result.

Refer to the following points when making adjustments.

For measurement result display or output contents, refer to *2-7-9 Measurement Results for Which Output is Possible (Shape Search III)* on page 2-107.

Additional Information

When performing a test measurement, the detailed information and image displayed will be updated according to the measurement result.

Content displayed in the Detail Result Area

The following measurement results are displayed in the Detail result area as text.

Displayed Items	Description
Judge	Judgement result
Count	Number of detections
Correlation	Correlation value
Position X	X coordinate of the model detected position.
Position Y	Y coordinate of the model detected position.
Angle θ	Angle of the model detected position.

Displayed Contents in the Image Display Area

The following images are displayed with set the Sub image number in the Image display area.

Sub image number	Description
0	Measurement image
1	Measurement image with detection results overlaid.
2	Edge image
3	Edge image with detection results overlaid. Green: Matched model points Yellow: Model points matched but with different directions Red: Unmatched model points

Adjusting Accuracy or Unevenness for Measurement

There are the following methods to adjust the measurement accuracy or uneven.

● When the Measurement Results are Unstable

Parameter to be adjusted	Troubleshooting
Measurement parameter Refer to *Measurement parameter (Shape Search III)* on page 101	• In the case where variation for non-defective workpieces is large. Decrease [Rough-Search detection level]. • In the case where the individual difference among the shape of workpieces is large. Raise [Acceptable distortion level] if the correlation value is greatly decreased when changing workpieces. • In the case where fine edges other than the shape of workpieces are also detected. Raise [Edge Level (Measure)] if dirt or fine patterns of workpieces are also misdetected. • In the case where the measurement accuracy is low. Check [High-Prec.] if a measurement in pixel unit is not performed.

● In the Case of Searching Other Position

Parameter to be adjusted	Troubleshooting
Measurement parameter Refer to *2-7-6 Measurement parameter (Shape Search III)* on page 2-101	• In the case where Detection targets are found excessively by Rough-Search. Raise [Rough-Search detection level] if place where no workpiece exists or features similar to workpiece are misdetected. • In the case where the detection target edges cannot be correctly identified due to lots of edges in the background of workpiece. Uncheck the “Auto” of [Extend detection setting] and set the level manually.

Adjusting of the Measurement Processing Speed

The following methods are useful to improve the processing speed for measurement.

● When the processing speed is late

Parameter to be adjusted	Troubleshooting
Region setting Refer to *2-7-3 Region Setting (Shape Search III)* on page 2-96	• In the case where measurement processing time takes long because the measurement region is broad. Set the measurement region as narrow as possible.
Model Refer to *2-7-2 Model (Shape Search III)* on page 2-90	• In the case where measurement processing time takes long because the model region is broad. Set the model region as narrow as possible. • In the case where a complicated shape is registered as a model. Check [High speed alignment mode] in [Model] tab if the target pattern is not a complex.

Parameter to be adjusted	Troubleshooting
Measurement Refer to *2-7-6 Measurement parameter (Shape Search III)* on page 2-101	• In the case where Detection targets are found excessively by Rough-Search. Raise [Rough-Search detection level] if the variation in non-defective workpieces are small. • In the case where the processing time for the high precision measurement takes longer than that for the sub-pixel one. Uncheck the [High-Prec] when the position accuracy is sufficient. • In the case where needless angle measurement is performed to rotational symmetric workpieces such as circular shapes. Uncheck [Rotation] in this case. • In the case where rotational symmetric workpieces with narrow angle measurement range such as square are measured by large angle range. Narrow the [Angle range] when point symmetric workpieces.

Adjustments except for Accuracy or Speed for Measurement

The following methods are useful to adjust except for accuracy or speed for measurement.

● When the Judgement Result is NG (Insufficient Memory)

Parameter to be adjusted	Troubleshooting
Region setting Refer to *2-7-3 Region Setting (Shape Search III)* on page 2-96	• In the case where memory consumption is too high due to large measurement region. Narrow the measurement region as much as possible.
Model Refer to *2-7-2 Model (Shape Search III)* on page 2-90	• In the case where memory consumption is too high due to large model size. Set the registration area for a model as narrow as possible or narrow the range between upper and lower limit of [Size range (%)] by checking [Size change].
Measurement Refer to *2-7-6 Measurement parameter (Shape Search III)* on page 2-101	• In the case where memory consumption is too high with images having lots of edges due to the [Extended detection candidate] checked. Uncheck the [Extended detection candidate] and filter background edges using processing items in “Compensate image” previously.

2-7-9 Measurement Results for Which Output is Possible (Shape Search III)

The measurement result of Shape Search III is the following. This result is displayed on the measurement result area, and output to extra device is possible by using processing units related on output result.

For a list of referable parameters including output results, refer to *2-7-10 External Reference Tables (Shape Search III)* on page 2-108.

Measurement items	Character string	Description
Judge	JG	Judgement result
Number of detections	C	Number of search items detected If none detected, 0
Correlation value	CR	Correlation value with the model
Position X	X	X coordinate of the position where the model is detected
Position Y	Y	Y coordinate of the position where the model is detected
Angle θ	TH	Angle of the position where the model is detected
Reference X	SX	X coordinate of the reference position of the registered model
Reference Y	SY	Y coordinate of the reference position of the registered model

Measurement items	Character string	Description
Reference angle	ST	Angle of the registered model
Detection point RX	RX	X coordinate of the registered model
Detection point RY	RY	Y coordinate of the registered model
Correlation value N (N = 00 to 127)	CRN	Detected search N correlation value (N = 00 to 127)
Position N (N = 00 to 127)	XN	Detected search N position X (N = 00 to 127)
Position N (N = 00 to 127)	YN	Detected search N position Y (N = 00 to 127)
Angle N (N = 00 to 127)	THN	Detected search N angle TH (N = 00 to 127)

2-7-10 External Reference Tables (Shape Search III)

Setting the number of Processing unit data setting / Control command or acquisition function, you can refer the following data.

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Correlation	correlation	Get only	0.0000 to 100.0000
6	Position X	positionX	Get only	-99,999.9999 to 99,999.9999
7	Position Y	positionY	Get only	-99,999.9999 to 99,999.9999
8	Angle	angle	Get only	-180.0000 to +180.0000
9	Reference position X	referenceX	Get only	-99,999.9999 to 99,999.9999
10	Reference position Y	referenceY	Get only	-99,999.9999 to 99,999.9999
11	Reference angle	referenceAngle	Get only	-180.0000 to +180.0000
12	Detection point X	detectionX	Get only	-99,999.9999 to 99,999.9999
13	Detection point Y	detectionY	Get only	-99,999.9999 to 99,999.9999
14	Count	count	Get only	0 to 1,000
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	With rotation	rotation	Set/Get	0: OFF 1: ON
121	Upper limit of the rotation angle	endAngle	Set/Get	-180 to 180
122	Lower limit of the rotation angle	startAngle	Set/Get	-180 to 180
123	Edge level (Model)	edgeLevelModel	Set/Get	0 to 1,024
124	Reverse	reverse	Set/Get	0: Not detect 1: Detect
126	High-Prec.	subPixelMeas	Set/Get	0: OFF 1: ON
127	Reference X	referencePosX	Set/Get	0 to 99,999.9999

No.	Data Name	Ident	Set/Get	Data range
128	Reference Y	referencePosY	Set/Get	0 to 99,999.9999
129	Reference angle	referencePosAngle	Set/Get	-180.0 to 180.0
130	Size change	changeSize	Set/Get	0: OFF 1: ON
131	Upper limit of the size range	upperChangeSize	Set/Get	50 to 200
132	Lower limit of the size range	lowerChangeSize	Set/Get	50 to 200
133	Fine-Search detection level	candidateLevel	Set/Get	0 to 100
134	Detected coordinate X	detectionPosX	Set/Get	0 to 99,999.9999
135	Detected coordinate Y	detectionPosY	Set/Get	0 to 99,999.9999
136	Sort condition	sort	Set/Get	0: Corr. ascending 1: Corr. descending 2: X ascending 3: X descending 4: Y ascending 5: Y descending
137	Search No.	searchNo	Set/Get	0 to 127
138	Upper limit of the correlation	upperCorrelation	Set/Get	0 to 100
139	Lower limit of the correlation	lowerCorrelation	Set/Get	0 to 100
140	Upper limit of the detect number	upperCount	Set/Get	0 to 128
141	Lower limit of the detect number	lowerCount	Set/Get	0 to 128
142	Upper limit of the measurement coordinate X	upperX	Set/Get	-99,999.9999 to 99,999.9999
143	Lower limit of the measurement coordinate X	lowerX	Set/Get	-99,999.9999 to 99,999.9999
144	Upper limit of the measurement coordinate Y	upperY	Set/Get	-99,999.9999 to 99,999.9999
145	Lower limit of the measurement coordinate Y	lowerY	Set/Get	-99,999.9999 to 99,999.9999
146	Upper limit of the judge angle	upperAngle	Set/Get	-180 to 180
147	Lower limit of the judge angle	lowerAngle	Set/Get	-180 to 180
150	Edge level (Measure)	edgeLevelMeas	Set/Get	0 to 1,024
161	Max no. of detections	extractCount	Set/Get	0 to 128
168	Multiple output	isMulti	Set/Get	0: OFF 1: ON
171	Save registered model	saveModelimage	Set/Get	0: OFF 1: ON
172	Edge level (Measure) auto setting	edgeLevelMeasAuto	Set/Get	0: OFF 1: ON
173	High speed alignment mode	highSpeedMode	Set/Get	0: OFF 1: ON
174	Mask size	maskSize	Set/Get	0: 3×3 1: 5×5 2: 7×7

No.	Data Name	Ident	Set/Get	Data range
177	Image reduction level (Subpixel-Search)	subPixelLevel	Set/Get	1 to 16
178	Edge level (Model) auto setting	edgeLevelModelAuto	Set/Get	0: OFF 1: ON
180	Acceptable distortion level	distLevel	Set/Get	0: Low 1: Middle 2: High
181	Noise removal level	edgeLengthLevel	Set/Get	0 to 100
182	Image reduction level (Subpixel-Search) auto setting	subPixelLevelAuto	Set/Get	0: OFF 1: ON
183	Extend detection candidate limit	complexBackGround	Set/Get	0: OFF 1: ON
184	Rough-Search detection level	candidateLevelRough	Set/Get	0 to 100
185	Rough-Search detection level auto Flag	candidateLevelRoughAuto	Set/Get	0: OFF 1: ON
201	Input type	inputType	Set/Get	0: Input image 1: Create image
202	Figure type	graphicType	Set/Get	0: Cross 1: Circle 2: Rectangle 3: Diamond
203	Empty middle	midEmpty	Set/Get	0: OFF 1: ON
204	Offset	offset	Set/Get	0 to 99
205	Smooth count	smoothCount	Set/Get	0 to 9
206	Equal XY	equalXY	Set/Get	0: OFF 1: ON
207	Front view value	frontViewValue	Set/Get	1 to 255
208	Back view value	backViewValue	Set/Get	1 to 255
209	Display input image	showInputImage	Set/Get	0: OFF 1: ON
210	Cross's outside length X	crossOutLenX	Set/Get	0 to 9,999
211	Cross's outside length Y	crossOutLenY	Set/Get	0 to 9,999
212	Cross's outside width X	crossOutWidX	Set/Get	0 to 9,999
213	Cross's outside width Y	crossOutWidY	Set/Get	0 to 9,999
214	Cross's inside length X	crossMidLenX	Set/Get	0 to 9,999
215	Cross's inside length Y	crossMidLenY	Set/Get	0 to 9,999
216	Cross's inside width X	crossMidWidX	Set/Get	0 to 9,999
217	Cross's inside width Y	crossMidWidY	Set/Get	0 to 9,999
218	Circle's outside radius	circleOutRadius	Set/Get	0 to 9,999
219	Circle's inside radius	circleMidRadius	Set/Get	0 to 9,999
220	Rectangle's outside length X	rectangleOutLenX	Set/Get	0 to 9,999
221	Rectangle's outside length Y	rectangleOutLenY	Set/Get	0 to 9,999
222	Rectangle's inside length X	rectangleMidLenX	Set/Get	0 to 9,999
223	Rectangle's inside length Y	rectangleMidLenY	Set/Get	0 to 9,999
224	Center position X	midPositionX	Set/Get	0 to 99,999

No.	Data Name	Ident	Set/Get	Data range
225	Center position Y	midPositionY	Set/Get	0 to 99,999
227	Additional sort	isReSort	Set/Get	0: OFF 1: ON
228	Additional sort condition	reSortCondition	Set/Get	0: Corr. ascending 1: Corr. descending 2: X ascending 3: X descending 4: Y ascending 5: Y descending
229	Overlay removal	checkOverlayArea	Set/Get	0: OFF 1: ON
230	Overlay permission	overlayAreaPer	Set/Get	1 to 100
231	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
232	Setting type of reference coordinate	refSettingType	Set/Get	0: Numberical 1: Unit
233	Update the reference angle	updateAngleFlg	Set/Get	0: Not update 1: Update
234	Setting unit of detection coordinate	detUnitNo	Set/Get	-1 to 9,999
235	Setting type of detection coordinate	detSettingType	Set/Get	0: Numberical 1: Unit
236	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
237	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999
238	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999
239	Angle before scroll	beforeScrollRefAngle	Set/Get	-180 to 180
240	Rotation angle (Create image)	turnAngle	Set/Get	-180.0000 to 180.0000
241	Diamond's outside length X	diamondOutLenX	Set/Get	0 to 9,999
242	Diamond's outside length Y	diamondOutLenY	Set/Get	0 to 9,999
243	Diamond's inside length X	diamondMidLenX	Set/Get	0 to 9,999
244	Diamond's inside length Y	diamondMidLenY	Set/Get	0 to 9,999
245	Rough-Search model	searchModelImage	Set/Get	0: OFF 1: ON
246	Subpixel-Search model	searchSubModelImage	Set/Get	0: OFF 1: ON
249	Show overlap judg. area	dispOverlayArea	Set/Get	0: OFF 1: ON
2000	Additional correction flag of the position XY	coordinateCorrection-Flag	Set/Get	0: Old algorithm (Ver.5.60 or earlier) 1: New algorithm (Ver.5.70 or later)
5100	Re-register	UpdateUnitModel	Set only	1: Execute
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera

No.	Data Name	Ident	Set/Get	Data range
30000+N (N=0 to 127)	Correlation	correlation	Get only	0.0000 to 100.0000
40000+N (N=0 to 127)	Position X	positionX	Get only	-99,999.9999 to 99,999.9999
50000+N (N=0 to 127)	Position Y	positionY	Get only	-99,999.9999 to 99,999.9999
60000+N (N=0 to 999)	Angle	angle	Get only	-180.0000 to +180.0000
91000	figure0 Count	figArea0_count	Set/Get	1 to 8
91001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
91002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR 1: NOT
91014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
91015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
91016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
91017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
91018	figure0 Ellipse Center Position X	figArea0_fig0_ellipse_CX	Set/Get	-99,999 to 99,999
91019	figure0 Ellipse Center Position Y	figArea0_fig0_ellipse_CY	Set/Get	-99,999 to 99,999
91020	figure0 Ellipse Radius X	figArea0_fig0_ellipse_RX	Set/Get	1 to 99,999
91021	figure0 Ellipse Radius Y	figArea0_fig0_ellipse_RY	Set/Get	1 to 99,999
91025	figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
91026	figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
91027	figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99999
91028	figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99999
91040	figure0 Polygon Point Count	figArea0_fig0_polygon_count	Set/Get	3 to 10
91041	figure0 Polygon Point1 Position X	figArea0_fig0_polygon_x0	Set/Get	-99,999 to 99,999
91042	figure0 Polygon Point1 Position Y	figArea0_fig0_polygon_y0	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
91043	figure0 Polygon Point2 Position X	figArea0_fig0_polygon_x1	Set/Get	-99,999 to 99,999
91044	figure0 Polygon Point2 Position Y	figArea0_fig0_polygon_y1	Set/Get	-99,999 to 99,999
91045	figure0 Polygon Point3 Position X	figArea0_fig0_polygon_x2	Set/Get	-99,999 to 99,999
91046	figure0 Polygon Point3 Position Y	figArea0_fig0_polygon_y2	Set/Get	-99,999 to 99,999
91047	figure0 Polygon Point4 Position X	figArea0_fig0_polygon_x3	Set/Get	-99,999 to 99,999
91048	figure0 Polygon Point4 Position Y	figArea0_fig0_polygon_y3	Set/Get	-99,999 to 99,999
91049	figure0 Polygon Point5 Position X	figArea0_fig0_polygon_x4	Set/Get	-99,999 to 99,999
91050	figure0 Polygon Point5 Position Y	figArea0_fig0_polygon_y4	Set/Get	-99,999 to 99,999
91051	figure0 Polygon Point6 Position X	figArea0_fig0_polygon_x5	Set/Get	-99,999 to 99,999
91052	figure0 Polygon Point6 Position Y	figArea0_fig0_polygon_y5	Set/Get	-99,999 to 99,999
91053	figure0 Polygon Point7 Position X	figArea0_fig0_polygon_x6	Set/Get	-99,999 to 99,999
91054	figure0 Polygon Point7 Position Y	figArea0_fig0_polygon_y6	Set/Get	-99,999 to 99,999
91055	figure0 Polygon Point8 Position X	figArea0_fig0_polygon_x7	Set/Get	-99,999 to 99,999
91056	figure0 Polygon Point8 Position Y	figArea0_fig0_polygon_y7	Set/Get	-99,999 to 99,999
91057	figure0 Polygon Point9 Position X	figArea0_fig0_polygon_x8	Set/Get	-99,999 to 99,999
91058	figure0 Polygon Point9 Position Y	figArea0_fig0_polygon_y8	Set/Get	-99,999 to 99,999
91059	figure0 Polygon Point10 Position X	figArea0_fig0_polygon_x9	Set/Get	-99,999 to 99,999
91060	figure0 Polygon Point10 Position Y	figArea0_fig0_polygon_y9	Set/Get	-99,999 to 99,999
91099	figure0 Update	figArea0_update	Set only	1: Update
91101	figure1 Type	figArea0_fig1_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
91102	figure1 mode	figArea0_fig1_mode	Set/Get	0: OR 1: NOT
91114	figure1 Rectangle Upper left position X	figArea0_fig1_box_X0	Set/Get	-99,999 to 99,999
91115	figure1 Rectangle Upper left position Y	figArea0_fig1_box_Y0	Set/Get	-99,999 to 99,999
91116	figure1 Rectangle Lower right position X	figArea0_fig1_box_X1	Set/Get	-99,999 to 99,999
91117	figure1 Rectangle Lower right position Y	figArea0_fig1_box_Y1	Set/Get	-99,999 to 99,999
91118	figure1 Ellipse Center Position X	figArea0_fig1_ellipse_CX	Set/Get	-99,999 to 99,999
91119	figure1 Ellipse Center Position Y	figArea0_fig1_ellipse_CY	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
91120	figure1 Ellipse Radius X	figArea0_fig1_ellipse_RX	Set/Get	1 to 99,999
91121	figure1 Ellipse Radius Y	figArea0_fig1_ellipse_RY	Set/Get	1 to 99,999
91125	figure1 Circumference Center Position X	figArea0_fig1_circleW_X	Set/Get	-99,999 to 99,999
91126	figure1 Circumference Center Position Y	figArea0_fig1_circleW_Y	Set/Get	-99,999 to 99,999
91127	figure1 Circumference Radius	figArea0_fig1_circleW_R	Set/Get	0 to 99999
91128	figure1 Circumference Width	figArea0_fig1_circleW_W	Set/Get	0 to 99999
91140	figure1 Polygon Point Count	figArea0_fig1_polygon_count	Set/Get	3 to 10
91141	figure1 Polygon Point1 Position X	figArea0_fig1_polygon_x0	Set/Get	-99,999 to 99,999
91142	figure1 Polygon Point1 Position Y	figArea0_fig1_polygon_y0	Set/Get	-99,999 to 99,999
91143	figure1 Polygon Point2 Position X	figArea0_fig1_polygon_x1	Set/Get	-99,999 to 99,999
91144	figure1 Polygon Point2 Position Y	figArea0_fig1_polygon_y1	Set/Get	-99,999 to 99,999
91145	figure1 Polygon Point3 Position X	figArea0_fig1_polygon_x2	Set/Get	-99,999 to 99,999
91146	figure1 Polygon Point3 Position Y	figArea0_fig1_polygon_y2	Set/Get	-99,999 to 99,999
91147	figure1 Polygon Point4 Position X	figArea0_fig1_polygon_x3	Set/Get	-99,999 to 99,999
91148	figure1 Polygon Point4 Position Y	figArea0_fig1_polygon_y3	Set/Get	-99,999 to 99,999
91149	figure1 Polygon Point5 Position X	figArea0_fig1_polygon_x4	Set/Get	-99,999 to 99,999
91150	figure1 Polygon Point5 Position Y	figArea0_fig1_polygon_y4	Set/Get	-99,999 to 99,999
91151	figure1 Polygon Point6 Position X	figArea0_fig1_polygon_x5	Set/Get	-99,999 to 99,999
91152	figure1 Polygon Point6 Position Y	figArea0_fig1_polygon_y5	Set/Get	-99,999 to 99,999
91153	figure1 Polygon Point7 Position X	figArea0_fig1_polygon_x6	Set/Get	-99,999 to 99,999
91154	figure1 Polygon Point7 Position Y	figArea0_fig1_polygon_y6	Set/Get	-99,999 to 99,999
91155	figure1 Polygon Point8 Position X	figArea0_fig1_polygon_x7	Set/Get	-99,999 to 99,999
91156	figure1 Polygon Point8 Position Y	figArea0_fig1_polygon_y7	Set/Get	-99,999 to 99,999
91157	figure1 Polygon Point9 Position X	figArea0_fig1_polygon_x8	Set/Get	-99,999 to 99,999
91158	figure1 Polygon Point9 Position Y	figArea0_fig1_polygon_y8	Set/Get	-99,999 to 99,999
91159	figure1 Polygon Point10 Position X	figArea0_fig1_polygon_x9	Set/Get	-99,999 to 99,999
91160	figure1 Polygon Point10 Position Y	figArea0_fig1_polygon_y9	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
91201	figure2 Type	figArea0_fig2_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
91202	figure2 mode	figArea0_fig2_mode	Set/Get	0: OR 1: NOT
91214	figure2 Rectangle Upper left position X	figArea0_fig2_box_X0	Set/Get	-99,999 to 99,999
91215	figure2 Rectangle Upper left position Y	figArea0_fig2_box_Y0	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
91260	figure2 Polygon Point10 Position Y	figArea0_fig2_poly-gon_y9	Set/Get	-99,999 to 99,999
91301	figure3 Type	figArea0_fig3_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
91302	figure3 mode	figArea0_fig3_mode	Set/Get	0: OR 1: NOT
91314	figure3 Rectangle Upper left position X	figArea0_fig3_box_X0	Set/Get	-99,999 to 99,999
91315	figure3 Rectangle Upper left position Y	figArea0_fig3_box_Y0	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
91360	figure3 Polygon Point10 Position Y	figArea0_fig3_poly-gon_y9	Set/Get	-99,999 to 99,999
91401	figure4 Type	figArea0_fig4_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
91402	figure4 mode	figArea0_fig4_mode	Set/Get	0: OR 1: NOT
91414	figure4 Rectangle Upper left position X	figArea0_fig4_box_X0	Set/Get	-99,999 to 99,999
91415	figure4 Rectangle Upper left position Y	figArea0_fig4_box_Y0	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
91460	figure4 Polygon Point10 Position Y	figArea0_fig4_poly-gon_y9	Set/Get	-99,999 to 99,999
91501	figure5 Type	figArea0_fig5_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
91502	figure5 mode	figArea0_fig5_mode	Set/Get	0: OR 1: NOT

No.	Data Name	Ident	Set/Get	Data range
91514	figure5 Rectangle Upper left position X	figArea0_fig5_box_X0	Set/Get	-99,999 to 99,999
91515	figure5 Rectangle Upper left position Y	figArea0_fig5_box_Y0	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
91560	figure5 Polygon Point10 Position Y	figArea0_fig5_poly-gon_y9	Set/Get	-99,999 to 99,999
91601	figure6 Type	figArea0_fig6_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
91602	figure6 mode	figArea0_fig6_mode	Set/Get	0: OR 1: NOT
91614	figure6 Rectangle Upper left position X	figArea0_fig6_box_X0	Set/Get	-99,999 to 99,999
91615	figure6 Rectangle Upper left position Y	figArea0_fig6_box_Y0	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
91660	figure6 Polygon Point10 Position Y	figArea0_fig6_poly-gon_y9	Set/Get	-99,999 to 99,999
91701	figure7 Type	figArea0_fig7_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
91702	figure7 mode	figArea0_fig7_mode	Set/Get	0: OR 1: NOT
91714	figure7 Rectangle Upper left position X	figArea0_fig7_box_X0	Set/Get	-99,999 to 99,999
91715	figure7 Rectangle Upper left position Y	figArea0_fig7_box_Y0	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
91760	figure7 Polygon Point10 Position Y	figArea0_fig7_poly-gon_y9	Set/Get	-99,999 to 99,999

2-8 Ec Corner

This processing item can not be used in the FHV series.

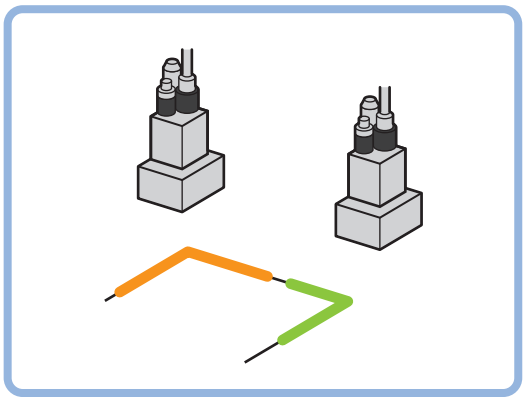
This processing item measures a corner position (corner) of a work.

The intersection of two lines generated from the edge information of two sides of a square work is measured.

A desired corner can be measured by setting the length, direction, edge intensity and other conditions.

Used in the Following Case

When you want to align the work position based on the feature of its corner

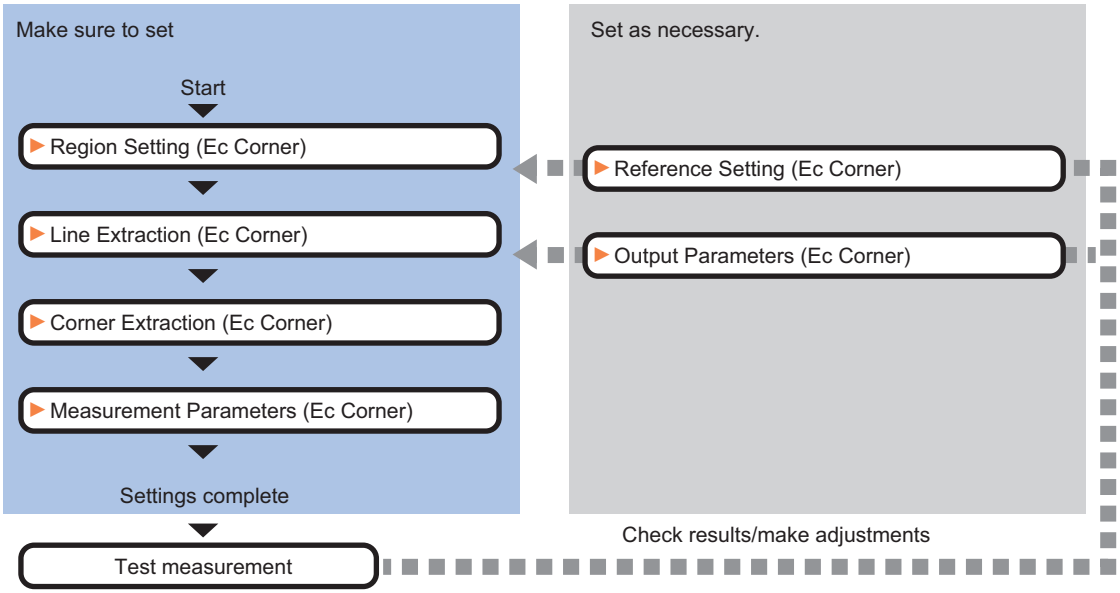


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-8-1 Settings Flow (Ec Corner)

Set up EC corner according to the following steps.



List of Ec Corner Items

Item name	Description
Region setting	This item is used to set up the measurement area. Refer to *2-8-2 Region Setting (Ec Corner)* on page 2-118.
Ref. setting	Change as necessary. This is changed when measuring the position deviation from a certain position. Refer to *2-8-3 Reference Setting (Ec Corner)* on page 2-119.
Line extraction	This item sets the conditions for extracting a line. Refer to *2-8-4 Line Extraction (Ec Corner)* on page 2-120.
Corner extraction	This item sets the conditions for extracting a corner. Refer to *2-8-5 Corner Extraction (Ec Corner)* on page 2-121.
Measurement	Set the sort conditions/judgement conditions of corners. Data of the specified number is output as measurement data. Refer to *2-8-6 Measurement Parameters (Ec Corner)* on page 2-124.
Output parameter	This item can be changed if necessary. Select the measurement result coordinates and set how to handle the coordinates. Refer to *2-8-7 Output Parameters (Ec Corner)* on page 2-125.

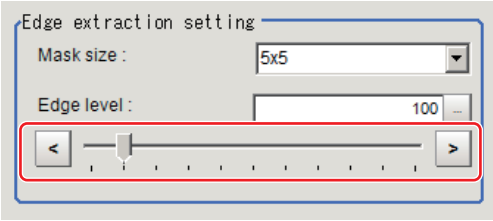
2-8-2 Region Setting (Ec Corner)

This item is used to set up the measurement area.

Use the rectangle to set up the measurement region for [Ec corner].

1. In the Item Tab area, click [Region setting].
2. Use the drawing tools to set the measurement region.
3. Click [OK] in the Figure setting area.
   - [OK]: Changes the settings and returns to the previous menu.
   - [Cancel]: Changes are discarded. Returns to the previous menu.
   - [Apply]: Updates the settings without leaving edit window.
4. Click [Edge extraction], then confirm the edge extraction image.

   If the profile of the measurement object is interrupted or has too many edges, adjust the edge level.



Setting item	Setting value [Factory default]	Description
Mask size	• 3 × 3 • [5 × 5] • 7 × 7 • 9 × 9	Select the range of pixels which are used to extract the edge. With a larger mask size, search is less affected by variation in pixels.

Setting item	Setting value [Factory default]	Description
Edge level	0 to 1000 [100]	Change this when the edge is hard to see due to low contrast against the background or when unnecessary background noise must be removed. The smaller the value, the easier it is to find edges. The larger the value, the less noise will affect finding edges.

2-8-3 Reference Setting (Ec Corner)

When the model is set, this position is automatically set at the same time as the reference position. This item can be set to change the reference position to any desired position. This is handy for measuring the position deviation from a certain position.

A reference position can be set either directly or by referencing a unit.

Specifying directly

Click the position on the image that you want to set as the reference position, or set the coordinates.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

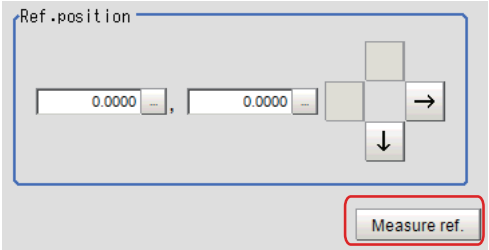
2 In the "Method" area, select "Numerical".

3 Click the position to be set as the reference.

Additional Information

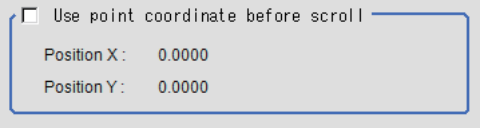
Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.



5 To remeasure on the displayed image and set the reference, click the [Measure ref.] button.

6 To use data before position compensation for the reference setting coordinates, place a check at "Use point coordinate before scroll".



Referencing a unit

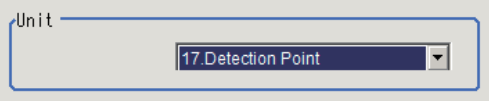
Set a reference by referencing a detection point unit with registered X coordinate and Y coordinate.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".

3 In the scene in the "Unit" area, select a detection point unit.



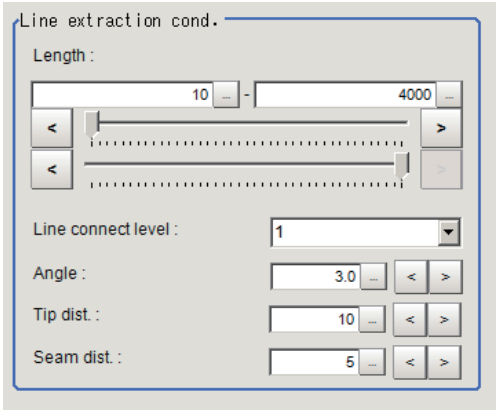
4 Perform the next measurement, and the reference will be displayed.

2-8-4 Line Extraction (Ec Corner)

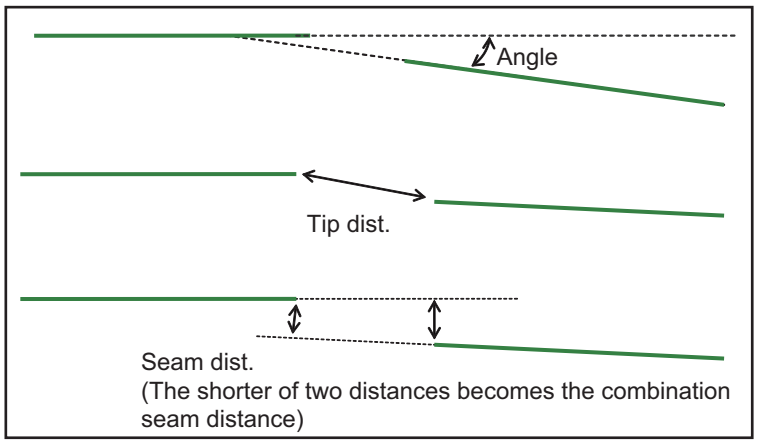
This item sets the conditions for extracting a line.

1 In the Item Tab area, click [Line extraction].

2 In the "Line extraction cond." area, set the conditions for extracting a line.



Setting item	Setting value [Factory default]	Description
Length	5 to 4000 [10] to [4000]	Set the length of edges to be extracted.
Line connect level	• [1] • 2 • 3 • 4 • 5 • Custom	Select the degree to which fragmented lines detected by edge extraction are connected. The higher the level, the more likely the lines are connected.
Angle	0.0 to 30.0 [3.0]	Set the angle range to be used when two lines are connected. Increasing this value allows two lines of different inclinations to be connected.
Tip dist.	0 to 1000 [10]	Set the vertex distance to be used when two lines are connected. Increasing this value allows distant lines to be connected.
Seam dist.	0 to 1000 [5]	Set the distance condition to be used when two lines are connected, where an extension of one line comes closest to the vertex of the other line. Increasing this value allows lines offset vertically to the lines to be connected.

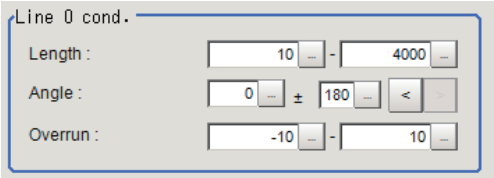


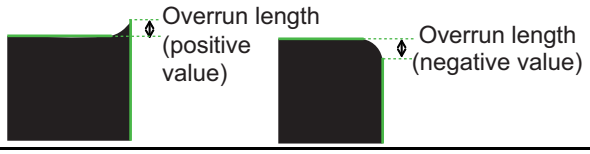
2-8-5 Corner Extraction (Ec Corner)

This item sets the conditions for extracting a corner.

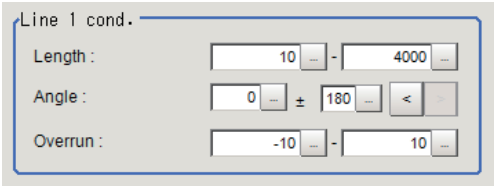
1 In the Item Tab area, click [Corner extraction].

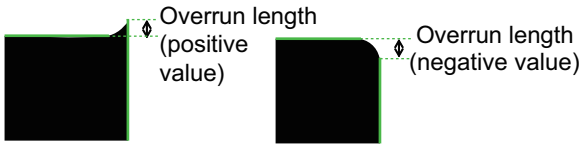
2 In the "Line 0 cond." area, set the conditions for line 0.



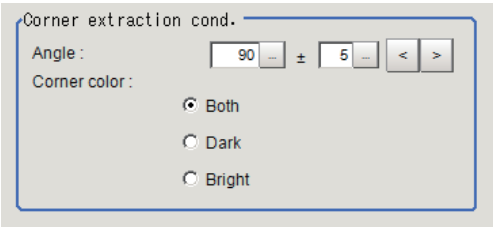
Setting item	Setting value [Factory default]	Description
Length	5 to 4000 [10] to [4000]	Set the length for extracting line 0.
Angle	[0] to 359	Set the angle for extracting line 0.
Overrun	-1000 to 1000 [-10] to [10]	Set the length range to be used when specifying whether the tips of two lines that constitute a corner have penetrated through the corner or are not reaching the corner (unit: pix). If the tips have penetrated through the corner, the overrun length becomes a positive value; whereas, if the tips are not reaching the corner, the overrun length becomes a negative value. 

3 In the "Line 1 cond." area, set the conditions for line 1.



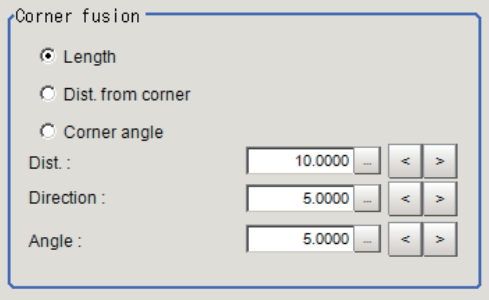
Setting item	Setting value [Factory default]	Description
Length	5 to 4000 [10] to [4000]	Set the length for extracting line 1.
Angle	[0] to 359	Set the angle for extracting line 1.
Overrun	-1000 to 1000 [-10] to [10]	Set the length range to be used when specifying whether the tips of two lines that constitute a corner have penetrated through the corner or are not reaching the corner (unit: pix). If the tips have penetrated through the corner, the overrun length becomes a positive value; whereas, if the tips are not reaching the corner, the overrun length becomes a negative value. 

4 In the "Corner extraction cond." area, set the conditions for corners.



Setting item	Setting value [Factory default]	Description
Angle	10 to 350 [90]	Set the angle range for a corner.
±	0 to 180 [5]	Set the margin of angle error.
Corner color	• [Both] • Dark • Bright	Select the light/dark relationship of the corner and background.

5 If necessary, click [Advanced setting] and set the intersection fusion condition.



Setting item	Setting value [Factory default]	Description
Corner fusion	• Length • Dist. from corner • Corner angle	If all detected corners include two corners that each meet all of the three conditional relationships of "Fusion distance," "Fusion line angle range" and "Fusion corner angle range," fuse the corners into one according to the priorities specified below. Length: Keep the corner with the longer total length of the two lines constituting the corner. Dist. from corner: Keep the corner with the smaller total overrun of the two lines. Corner angle: Keep the corner whose angle formed by the two lines is closer to the "Angle range" set as a corner condition.
Dist.	0 to 1000.0000 [10.0000]	Set the linear distance between the corners.
Direction	0 to 20.0000 [5.0000]	Set the difference between the angles formed by the two sets of lines constituting the corners.
Angle	0 to 20.0000 [5.0000]	Set the angle difference between the corners.

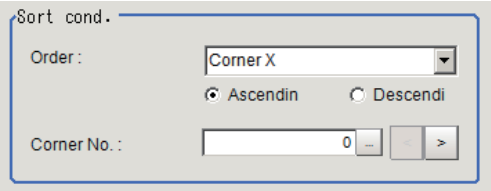
2-8-6 Measurement Parameters (Ec Corner)

Set the sort conditions/judgement conditions of corners.

Data of the specified number is output as measurement data.

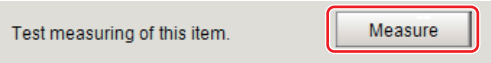
1 In the Item Tab area, click [Measurement].

2 In the "Sort cond." area, set the sorting conditions.



Setting item	Setting value [Factory default]	Description
Order	• [Corner X] • Corner Y • Length	Select the sorting method for the measurement results.
	• [Ascending] • Descending	
Corner No.	[0] to 99	Set the corner number for the data to be output.

3 When the setting has been changed, click [Measure] to verify whether measurements can be made correctly.



4 Set up the judgement condition.

Setting item	Setting value [Factory default]	Description
Corner X	[-99999.9999] to [99999.9999]	Set the range of X coordinates of corner that is judged to be OK.
Corner Y	[-99999.9999] to [99999.9999]	Set the range of Y coordinates of corner that is judged to be OK.
Angle	[0.0000] to [360.0000]	Specify the formed angles that are judged to be OK.
Count	[1] to [100]	Specify the number of detections of corner that is judged to be OK.

2-8-7 Output Parameters (Ec Corner)

Set how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Setting value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Specify whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-8-8 Key Points for Test Measurement and Adjustment (Ec Corner)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Corner X	X Coordinate of measured corner
Corner Y	Y coordinate of measured corner
Angle	Formed angle of measured corner
Number of detections	Number of detections of corner

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image.	Explanation of image to be displayed
0	Measurement image

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

Parameter to be adjusted	Troubleshooting
Measurement	Reduce the distance between the upper and lower limits of line length range for extracting lines, to reduce false detections.
	Raise the line connection level to prevent the lines constituting the corners to be detected from being interrupted.
	Set the narrowest possible conditions for extracting corners, to reduce false detections.

● When the processing speed is slow

Parameter to be adjusted	Troubleshooting
Region setting	Specify as small a value as possible for FigureInfo=Region.
Measurement	Minimize the distance between the upper and lower limits of line length range for extracting lines.
	Minimize the distance between the upper and lower limits of overrun range for extracting corners.
	Minimize the distance between the upper and lower limits of length range for extracting corners.
	Minimize the distance between the upper and lower limits of angle range for extracting corners.

● When judgement is NG

State	Parameter to be adjusted	Troubleshooting
There are lines but they are not detected	Corner extraction	Expand and extend the overrun range in both the positive direction and negative direction so that corners can be formed.

2-8-9 Measurement Results for Which Output Is Possible (Ec Corner)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Corner X	X	Corner coordinate X
Corner Y	Y	Corner coordinate Y
Angle	TH	Formed angle of measured corner
Number of detections	CT	Number of detections
Reference X	SX	Reference X
Reference Y	SY	Reference Y
Corner XN (N = 0 to 99)	XN	Corner coordinate XN
Corner YN (N = 0 to 99)	YN	Corner coordinate YN
Angle N (N = 0 to 99)	THN	Formed angle N of measured corner
Angle N of line 0 (N = 0 to 99)	DIRLN	Inclination N of line 0
Angle N of line 1 (N = 0 to 99)	DIRRN	Inclination N of line 1

2-8-10 External Reference Tables (Ec Corner)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Count	cornerCount	Get only	0 to 100
6	Corner coordinate X	cornerX	Get only	-99,999.9999 to 99,999.9999
7	Corner coordinate Y	cornerY	Get only	-99,999.9999 to 99,999.9999
8	Angle	angle	Get only	0 to 360
9	Reference position X coordinate*1	referenceX	Get only	-99,999.9999 to 99,999.9999
10	Reference position Y coordinate*1	referenceY	Get only	-99,999.9999 to 99,999.9999
11	Reference angle	referenceAngle	Get only	-180 to 180
101	Output coordinate	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Edge extraction level	edgeThresh	Set/Get	0 to 1,000
121	Filter size	maskSize	Set/Get	0: 3x3 1: 5x5 2: 7x7 3: 9x9
122	lower limit of line length	minExtLength	Set/Get	5 to 4,000
123	Upper limit of line length	maxExtLength	Set/Get	5 to 4,000
124	Combination angle	connectDir	Set/Get	0.0 to 30.0
125	Combination tip distance	connectTipDist	Set/Get	0 to 1,000
126	Combination seam distance	connectSeamDist	Set/Get	0 to 1,000
127	Lower limit of line 0 length range	minLineLength0	Set/Get	5 to 4,000
128	Upper limit of line 0 length range	maxLineLength0	Set/Get	5 to 4,000
129	Lower limit of line 1 length range	minLineLength1	Set/Get	5 to 4,000
130	Upper limit of line 1 length range	maxLineLength1	Set/Get	5 to 4,000
131	Line 0 line angle	lineAngle0	Set/Get	0 to 359
132	Line 0 line angle range	lineAngleRange0	Set/Get	0 to 180
133	Line 1 line angle	lineAngle1	Set/Get	0 to 359
134	Line 1 line angle range	lineAngleRange1	Set/Get	0 to 180
135	Formed angle	cornerAngle	Set/Get	10 to 350

No.	Data name	Ident	Set/Get	Data range
136	Formed angle range	cornerAngleRange	Set/Get	0 to 180
137	Lower limit of line 0 overrun range	minOverRun0	Set/Get	-1,000 to 1,000
138	Upper limit of line 0 overrun range	maxOverRun0	Set/Get	-1,000 to 1,000
139	Lower limit of line 1 overrun range	minOverRun1	Set/Get	-1,000 to 1,000
140	Upper limit of line 1 overrun range	maxOverRun1	Set/Get	-1,000 to 1,000
141	Detection object color	colorObjectBright	Set/Get	0: Both 1: Dark 2: Bright
149	Sort condition	sortMode	Set/Get	0: Cross point X 1: Cross point Y 2: Length
150	Sort order	sortOperant	Set/Get	0: Ascending 1: Descending
151	Cross No.	outputNo	Set/Get	0 to 99
155	Corner fusion ON/OFF	cornerMargeFlag	Set/Get	0: OFF 1: ON
156	Fusion distance	margeLength	Set/Get	0 to 1,000
157	Fusion line angle range	margeDirection	Set/Get	0 to 20
158	Fusion corner angle range	margeAngle	Set/Get	0 to 20
159	Corner fusion condition	margeRemainState	Set/Get	0: Length 1: Distance from corner 2: Corner angle
160	Lower limit of corner X	lowerJudgeX	Set/Get	-99,999.9999 to 99,999.9999
161	Upper limit of corner X	upperJudgeX	Set/Get	-99,999.9999 to 99,999.9999
162	Lower limit of corner Y	lowerJudgeY	Set/Get	-99,999.9999 to 99,999.9999
163	Upper limit of corner Y	upperJudgeY	Set/Get	-99,999.9999 to 99,999.9999
164	Lower limit of angle	lowerJudgeAngle	Set/Get	0 to 360
165	Upper limit of angle	upperJudgeAngle	Set/Get	0 to 360
166	Lower limit of count	lowerJudgeCornerCount	Set/Get	0 to 100
167	Upper limit of count	upperJudgeCornerCount	Set/Get	0 to 100
168	Reference position X*2	referencePosX	Set/Get	0 to 99,999.9999
169	Reference position Y*2	referencePosY	Set/Get	0 to 99,999.9999
171	Line connection level	lineConnerctLevel	Set/Get	0: 1 1: 2 2: 3 3: 4 4: 5 5: Custom
173	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
174	Setting type of reference coordinate	refSettingType	Set/Get	0: Numberical 1: Unit
176	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
177	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999

No.	Data name	Ident	Set/Get	Data range
178	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
10000+N (N: 0 to 99)	Corner coordinate X	cornerX	Get only	-99,999.9999 to 99,999.9999
10100+N (N: 0 to 99)	Corner coordinate Y	cornerY	Get only	-99,999.9999 to 99,999.9999
10200+N (N: 0 to 99)	Formed angle	cornerAngle	Get only	10 to 350
90000	figure0 Count	figArea0_count	Set/Get	0 to 1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

*1. The reference coordinates based on the selection in the Method area of the [Ref.setting] tab can be Get only.

*2. The reference coordinates based on the selection of Numerical in the Method area of the [Ref.setting] tab can be Set/Get.

2-9 Ec Cross

This processing item can not be used in the FHV series.

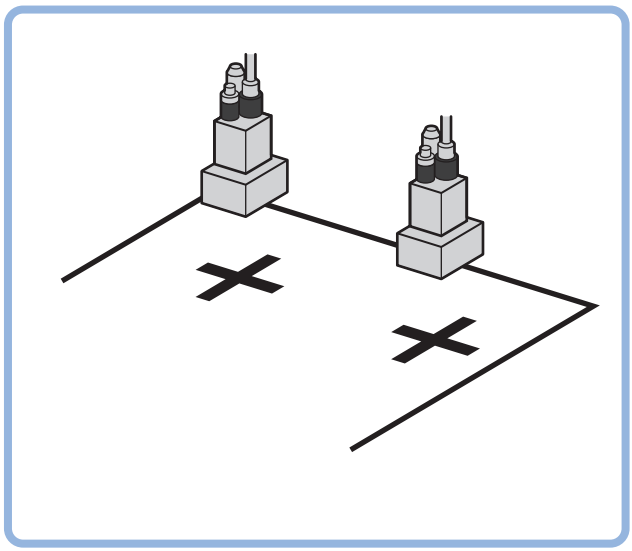
Detect crosshair shapes created by crosshair marks and other edges.

The center position of a crosshair shape is measured using the lines created by the edge information on each side of the crosshair.

A desired crosshair shape can be measured by specifying the length, direction, edge intensity and other conditions.

Used in the Following Case

When you want to align the work position based on a crosshair-shaped mark

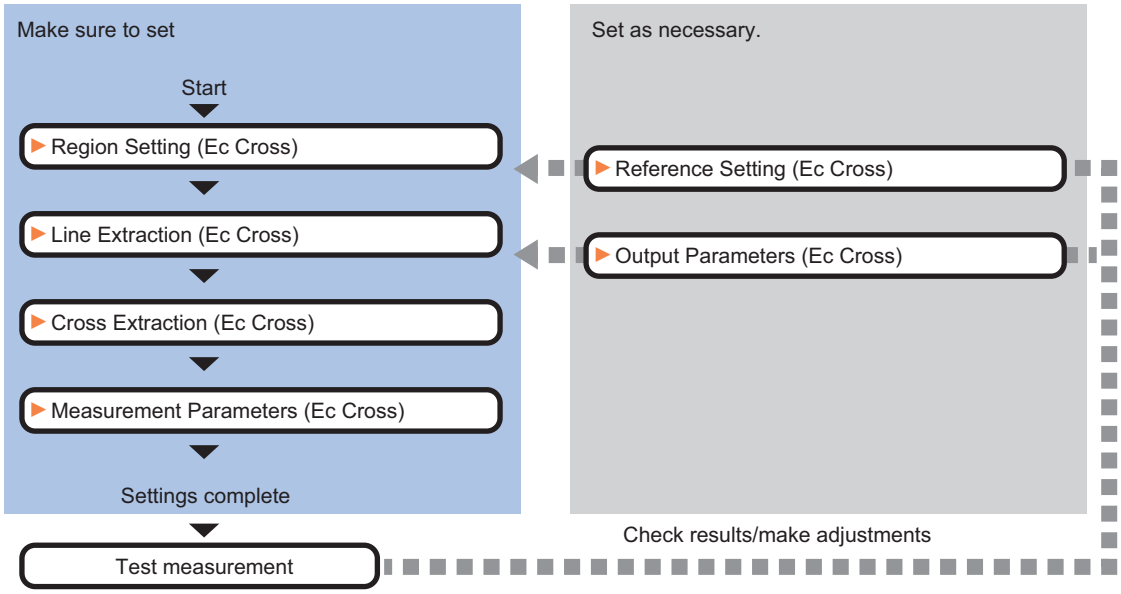


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-9-1 Settings Flow (Ec Cross)

Set up EC cross according to the following steps.



List of Ec Cross Items

Item name	Description
Region setting	This item is used to set up the measurement area. Instead of measuring the entire input image, narrowing the measurement area shortens the processing time. Refer to *2-9-2 Region Setting (Ec Cross)* on page 2-131.
Ref. setting	Change as necessary. This is changed when measuring the position deviation from a certain position. Refer to *2-9-3 Reference Setting (Ec Cross)* on page 2-132.
Line extraction	This item sets the conditions for extracting a line. Refer to *2-9-4 Line Extraction (Ec Cross)* on page 2-134.
Cross extraction	Set the conditions for extraction a crosshair shape. Refer to *2-9-5 Cross Extraction (Ec Cross)* on page 2-135.
Measurement	Set the sort conditions/judgement conditions of crosshair shapes. Data of the specified number is output as measurement data. Refer to *2-9-6 Measurement Parameters (Ec Cross)* on page 2-136.
Output parameter	This item can be changed if necessary. Select the measurement result coordinates and set how to handle the coordinates. Refer to *2-9-7 Output Parameters (Ec Cross)* on page 2-137.

2-9-2 Region Setting (Ec Cross)

This item is used to set up the measurement area.

Use the rectangle to set up the measurement region for [Ec Cross].

1 In the Item Tab area, click [Region setting].

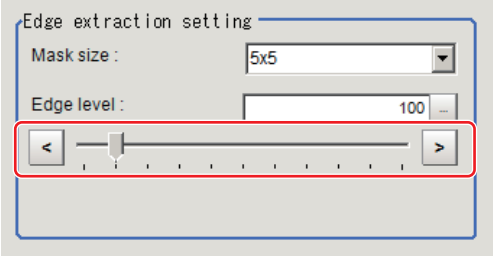
2 Use the Drawing tools to set the measurement region.

3 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

4 Click [Edge extraction], then confirm the edge extraction image.

If the profile of the measurement object is interrupted or has too many edges, adjust the edge level.



Setting item	Setting value [Factory default]	Description
Mask size	• 3 × 3 • [5 × 5] • 7 × 7 • 9 × 9	Select the range of pixels which are used to extract the edge. With a larger mask size, search is less affected by variation in pixels.
Edge level	0 to 1000 [100]	Change this when the edge is hard to see due to low contrast against the background or when unnecessary background noise must be removed. The smaller the value, the easier it is to find edges. The larger the value, the less noise will affect finding edges.

2-9-3 Reference Setting (Ec Cross)

When the model is set, this position is automatically set at the same time as the reference position. This item can be set to change the reference position to any desired position. This is handy for measuring the position deviation from a certain position.

A reference position can be set either directly or by referencing a unit.

Specifying directly

Click the position on the image that you want to set as the reference position, or set the coordinates.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

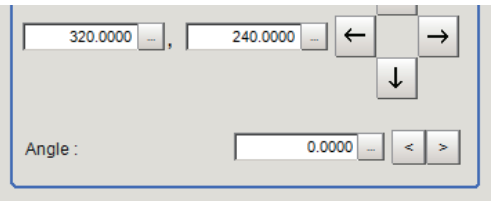
2 In the "Method" area, select "Numerical".

3 Click the position to be set as the reference.

Additional Information

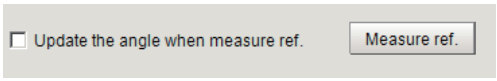
Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.

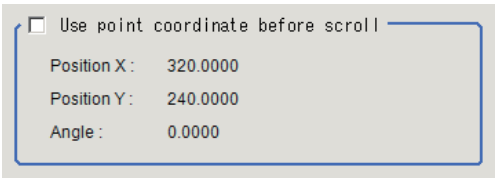


5 Set the reference angle with a numeric value.

6 To remeasure on the displayed image and set the reference, click the [Measure ref.] button. To update the reference angle at the time of reference measurement, place a check at "Update the angle when measure ref.".



7 To use data before position compensation for the reference setting coordinates, place a check at "Use point coordinate before scroll".



Referencing a unit

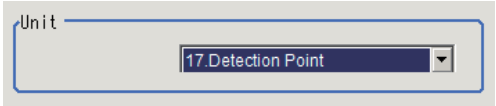
Set a reference by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".

3 In the scene in the "Unit" area, select a detection point unit.



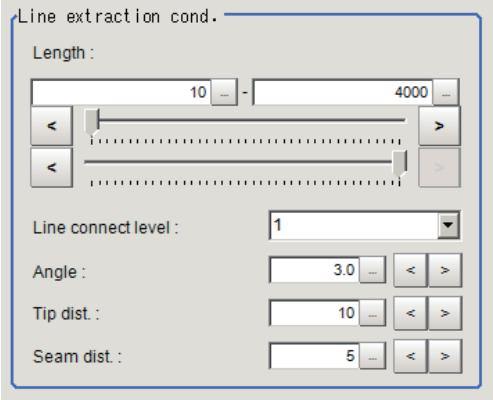
4 Perform the next measurement, and the reference will be displayed.

2-9-4 Line Extraction (Ec Cross)

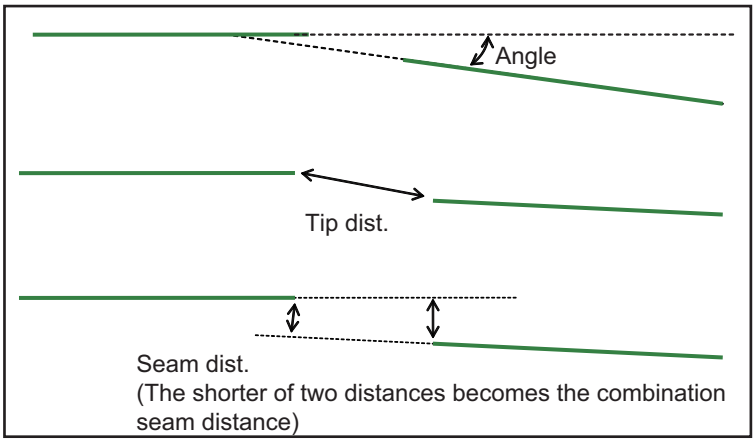
This item sets the conditions for extracting a line.

1 In the Item Tab area, click [Line extraction].

2 In the "Line extraction cond." area, set the conditions for extracting a line.



Setting item	Setting value [Factory default]	Description
Length	5 to 4000 [10] to [4000]	Set the length of edges to be extracted.
Line connect level	• [1] • 2 • 3 • 4 • 5 • Custom	Select the degree to which fragmented lines detected by edge extraction are connected. The higher the level, the more likely the lines are connected.
Angle	0.0 to 30.0 [3.0]	Set the angle range to be used when two lines are connected. Increasing this value allows two lines of different inclinations to be connected.
Tip dist.	0 to 1000 [10]	Set the vertex distance to be used when two lines are connected. Increasing this value allows distant lines to be connected.
Seam dist.	0 to 1000 [5]	Set the distance condition to be used when two lines are connected, where an extension of one line comes closest to the vertex of the other line. Increasing this value allows lines offset vertically to the lines to be connected.

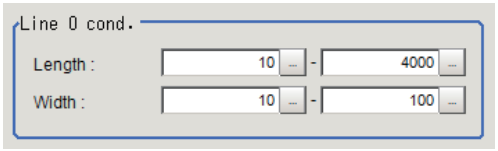


2-9-5 Cross Extraction (Ec Cross)

Set the conditions for intersecting lines.

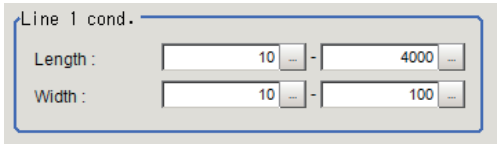
1 In the Item Tab area, click [Cross extraction].

2 In the "Line 0 cond." area, set the conditions for parallel line 0.



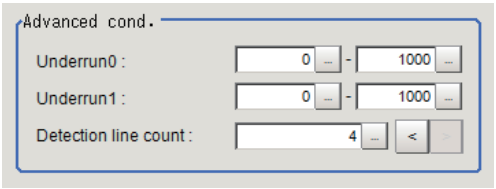
Setting item	Setting value [Factory default]	Description
Length	5 to 4000 [10] to [4000]	Set the length of parallel line 0.
Width	1 to 1000 [10] to [100]	Set the width of parallel line 0.

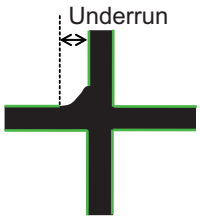
3 In the "Line 1 cond." area, set the conditions for parallel line 1.



Setting item	Setting value [Factory default]	Description
Length	5 to 4000 [10] to [4000]	Set the length of parallel line 1.
Width	1 to 1000 [10] to [100]	Set the width of parallel line 1.

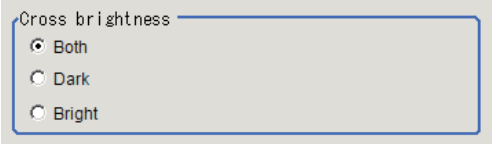
4 In the "Advanced cond." area, set the detection conditions.



Setting item	Setting value [Factory default]	Description
Underrun 0	[0] to [1000]	Set the level to which a cross with a rounded or pointed intersection or intersection concealed due to external disturbance is allowed. Set the range of crosses not reaching the intersection that are still recognized as crosses. 
Underrun 1	[0] to [1000]	

Setting item	Setting value [Factory default]	Description
Detection line count	• 2 • 3 • [4]	Set a number of parallel line sets that are judged forming a cross. If the image does not have external disturbances, a total of four sets of parallel lines, which configure the cross, are detected, and those parallel lines are at the top, bottom, left, and right sides when looked from the center of the cross. When a straight line is not detected by being hidden or broken by an external disturbance, detection of a cross becomes possible by changing a number of detection lines. At least 2 sets must be set. (In case of 2 sets, each set of parallel lines has to be straight.)

5 In the "Cross brightness" area, set the brightness relationship of the crosshair and background.



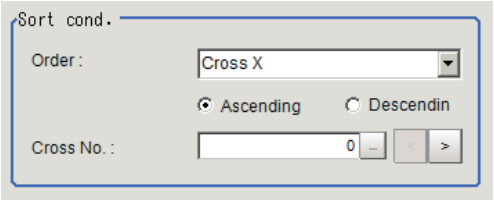
Setting item	Setting value [Factory default]	Description
Cross brightness	• [Both] • Dark • Bright	Select the light/dark relationship of the crosshair and background.

2-9-6 Measurement Parameters (Ec Cross)

Set the sort conditions/judgement conditions of crosshairs.

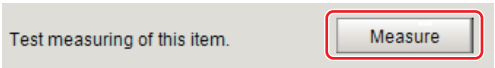
1 In the Item Tab area, click [Measurement].

2 In the "Sort cond." area, set the sorting conditions.



Setting item	Setting value [Factory default]	Description
Order	• [Cross X] • Cross Y • Length	Select the sorting method to be applied to those measurement results where there are multiple intersections.
	• [Ascending] • Descending	
Cross No.	[0] to 9	Set the cross number for the data to be output.

3 When the setting has been changed, click [Measure] to verify whether measurements can be made correctly.



4 Set up the judgement condition.

Setting item	Setting value [Factory default]	Description
Cross X	[-99999.9999] to [99999.9999]	Set the range of X coordinates of crosshair that is judged to be OK.
Cross Y	[-99999.9999] to [99999.9999]	Set the range of Y coordinates of crosshair that is judged to be OK.
Angle	[-45] to [45]	Set the crosshair angles that are judged to be OK.
Count	[1] to [10]	Set the number of detections of crosshair that is judged to be OK.

2-9-7 Output Parameters (Ec Cross)

Set how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Setting value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Specify whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-9-8 Key Points for Test Measurement and Adjustment (Ec Cross)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Cross X	X coordinate of measured crosshair
Cross Y	Y coordinate of measured crosshair
Angle	Angle of measured crosshair
Number of detections	Number of detections of crosshair

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image.	Explanation of image to be displayed
0	Measurement image

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

Parameter to be adjusted	Troubleshooting
Measurement	Reduce the distance between the upper and lower limits of line length range for extracting lines, to reduce false detections.
	Raise the line connection level to prevent the lines constituting the corners to be detected from being interrupted.
	Set the narrowest possible conditions for extracting crosses, to reduce false detections.

● When the processing speed is slow

Parameter to be adjusted	Troubleshooting
Region setting	Specify as small a value as possible for FigureInfo=Region.
Measurement	Minimize the distance between the upper and lower limits of line length range for extracting lines.
	Minimize the range between the upper and lower limits of underrun distance set as part of cross extracting conditions.
	Minimize the range between the upper and lower limits of cross extracting width.
	Minimize the range between the upper and lower limits of cross extracting length.
	Specify as large a value as possible for the number of detection lines for extracting crosses.

● When judgement is NG

State	Parameter to be adjusted	Troubleshooting
There are lines but they are not detected	Cross extraction	Expand and extend the overrun range in both the positive direction and negative direction so that corners can be formed.

2-9-9 Measurement Results for Which Output Is Possible (Ec Cross)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Cross coordinate X	X	Cross coordinate X
Cross coordinate Y	Y	Cross coordinate Y
Angle	TH	Angle
Number of detections	CT	Number of detections
Reference X	SX	Reference X
Reference Y	SY	Reference Y
Reference angle	ST	Reference angle
Cross coordinate XN (N = 0 to 99)	XN	Cross coordinate XN
Cross coordinate YN (N = 0 to 99)	YN	Cross coordinate YN
Angle N (N = 0 to 99)	THN	Angle N

2-9-10 External Reference Tables (Ec Cross)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Count	crossCount	Get only	0 to 10
9	Reference position X coordinate*1	referenceX	Get only	-99,999.9999 to 99,999.9999
10	Reference position Y coordinate*1	referenceY	Get only	-99,999.9999 to 99,999.9999
11	Reference angle	referenceAngle	Get only	-180 to 180
101	Output coordinate	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Edge extraction level	edgeThresh	Set/Get	0 to 1,000
121	Filter size	maskSize	Set/Get	0: 3x3 1: 5x5 2: 7x7 3: 9x9
122	Lower limit of line length	minExtLength	Set/Get	5 to 4,000

No.	Data name	Ident	Set/Get	Data range
123	Upper limit of line length	maxExtLength	Set/Get	5 to 4,000
124	Combination angle	connectDir	Set/Get	0 to 30
125	Combination tip distance	connectTipDist	Set/Get	0 to 1,000
126	Combination seam distance	connectSeamDist	Set/Get	0 to 1,000
127	Lower limit of parallel line 0 length range	minLineLength0	Set/Get	5 to 4,000
128	Upper limit of parallel line 0 length range	maxLineLength0	Set/Get	5 to 4,000
129	Lower limit of parallel line 1 length range	minLineLength1	Set/Get	5 to 4,000
130	Upper limit of parallel line 1 length range	maxLineLength1	Set/Get	5 to 4,000
138	Detection line count	judgeSubline	Set/Get	2 to 4
139	Lower limit of parallel line 0 underrun range	minUnderRun0	Set/Get	0 to 1,000
140	Upper limit of parallel line 0 underrun range	maxUnderRun0	Set/Get	0 to 1,000
141	Lower limit of parallel line 1 underrun range	minUnderRun1	Set/Get	0 to 1,000
142	Upper limit of parallel line 1 underrun range	maxUnderRun1	Set/Get	0 to 1,000
143	Parallel line 0 Min. width	minWidth0	Set/Get	1 to 1,000
144	Parallel line 0 Max. width	maxWidth0	Set/Get	1 to 1,000
145	Parallel line 1 Min. width	minWidth1	Set/Get	1 to 1,000
146	Parallel line 1 Max. width	maxWidth1	Set/Get	1 to 1,000
148	Detection object color	colorObjectBright	Set/Get	0: Both 1: Dark 2: Bright
156	Sort condition	sortMode	Set/Get	0: Cross point X 1: Cross point Y 2: Length
157	Sort order	sortOperant	Set/Get	0: Ascending 1: Descending
158	Cross No.	outputNo	Set/Get	0 to 9
162	Fusion distance	margeLength	Set/Get	0 to 1,000
163	Lower limit of cross X	lowerJudgeX	Set/Get	-99,999.9999 to 99,999.9999
164	Upper limit of cross X	upperJudgeX	Set/Get	-99,999.9999 to 99,999.9999
165	Lower limit of cross Y	lowerJudgeY	Set/Get	-99,999.9999 to 99,999.9999
166	Upper limit of cross Y	upperJudgeY	Set/Get	-99,999.9999 to 99,999.9999
167	Lower limit of angle	lowerJudgeAngle	Set/Get	-45 to 45
168	Upper limit of angle	upperJudgeAngle	Set/Get	-45 to 45
169	Lower limit of count	lowerJudgeCrossCount	Set/Get	0 to 10
170	Upper limit of count	upperJudgeCrossCount	Set/Get	0 to 10
171	Reference position X*2	referencePosX	Set/Get	0 to 99,999.9999
172	Reference position Y*2	referencePosY	Set/Get	0 to 99,999.9999
173	Reference angle	referencePosAngle	Set/Get	-180 to 180

No.	Data name	Ident	Set/Get	Data range
174	Line connection level	lineConnerctLevel	Set/Get	0: 1 1: 2 2: 3 3: 4 4: 5 5: Custom
176	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
177	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit
178	Update the reference angle	updateAngleFlg	Set/Get	0: Not update 1: Update
179	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
180	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999
181	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999
182	Angle before scroll	beforeScrollRefAngle	Set/Get	-180 to 180
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
10000+N (N: 0 to 9)	Cross coordinate X	crossX	Get only	-99,999.9999 to 99,999.9999
10100+N (N: 0 to 9)	Cross coordinate Y	crossY	Get only	-99,999.9999 to 99,999.9999
10200+N (N: 0 to 9)	Formed angle	crossAngle	Get only	-45 to 45
90000	figure0 Count	figArea0_count	Set/Get	0 to 1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

*1. The reference coordinates based on the selection in the Method area of the [Ref.setting] tab can be Get only.

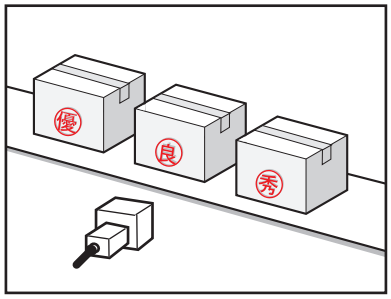
*2. The reference coordinates based on the selection of Numerical in the Method area of the [Ref.setting] tab can be Set/Get.

2-10 Classification

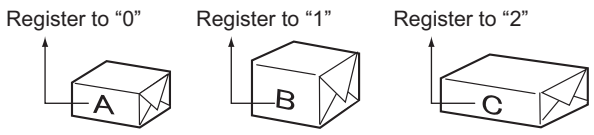
Used in the Following Case

When various kinds of products on a production line need to be classified and identified

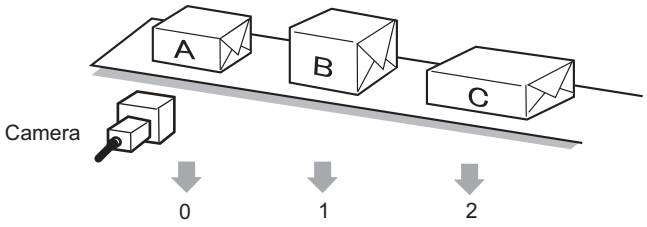
Example) Grade recognition of orange packing box



Register the classification condition as a model first.



Output model No. that is most similar with the input image. Which will be received by the external device and sorted in the following process.
(when there are no similar models, NG (-1) will be output).



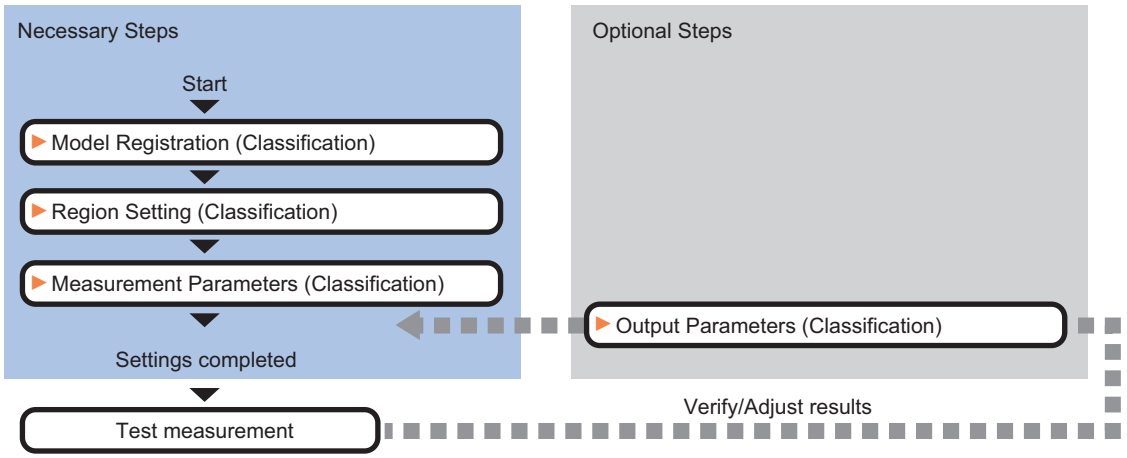
The most similar model No. will be output.

Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-10-1 Settings Flow (Classification)

Classification can be set up as follows.



List of Classification Items

Item name	Description
Model	This item registers the pattern characteristic of the measurement image as a model. Model parameter values can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used. Refer to *2-10-2 Model Registration (Classification)* on page 2-143.
Region setting	This item is used to set up the measurement area. Instead of measuring the entire input image, narrowing the measurement area shortens the processing time. Refer to *2-10-3 Region Setting (Classification)* on page 2-146.
Measurement	This item specifies the judgement condition for measurement results. Specify the criteria to judge the measurement result if the X and Y coordinates and the correlation values with the model are OK. Refer to *2-10-4 Measurement Parameters (Classification)* on page 2-147.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. Refer to *2-10-5 Output Parameters (Classification)* on page 2-148.

2-10-2 Model Registration (Classification)

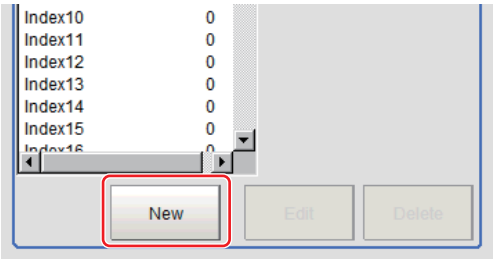
Pre-register as models the sections to be used as reference for classification.

Models can be registered with any of 200 indexes, from 0 to 199, and up to 5 models can be registered for each index.

When there is variation among the model print quality and shapes, pre-register multiple models for the same index.

1 In the Item Tab area, click [Model].

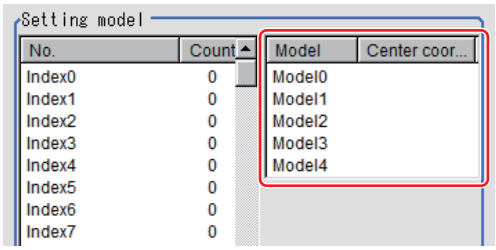
2 In the "Setting model" area, select a model and click [New].



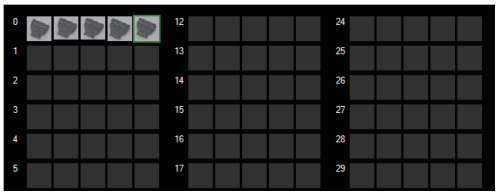
3 Use the Drawing tools to specify the model registration range.

4 Click [OK].

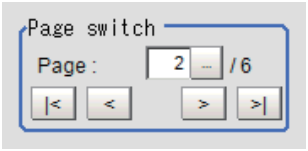
The model is registered and its central X and Y coordinate values are displayed in the "Setting model" area.



The image specified for the model is displayed in the Image Display area.



Set the page in the Switch Page area to display models with index numbers 36 or more.



Additional Information

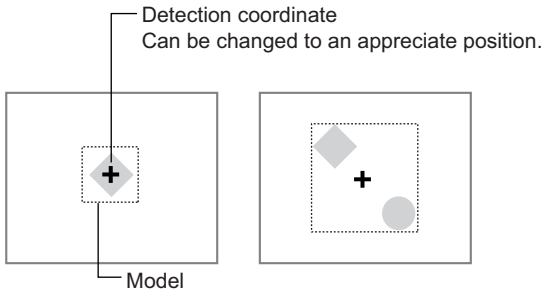
Model Status and Measurement Processing

- Measurement time and accuracy may be affected by the status of model in the following ways. Please select measurement objects that are in good condition (clean) for Model Registration.
  - In the case of large or complicated models, processing time is prolonged.
  - With extremely small models or models without features, search processing is unstable.

5 To register two or more models, repeat the Steps 2 to 4.

Additional Information

When a model is registered, the central coordinates of the model are registered as the detection point. A detection point is a point output as a measurement value. If multiple figures are combined, the central coordinates of the circumscribed rectangle are registered.

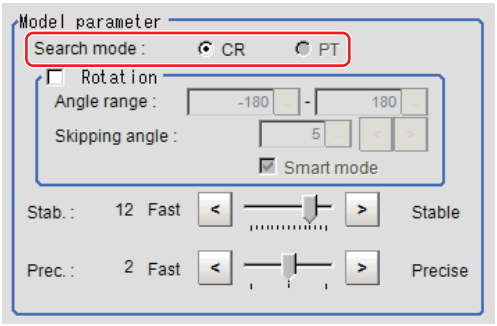


Changing Model Parameters

Model parameter values can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used.

After changing a setting, re-register the model.

1 In the "Model parameter" area, select the search mode, then specify a value for each item for that mode.



Setting item	Set value [Factory default]	Description
Search mode	[CR]	Search normalizing the brightness. This method can provide stable measurement when there is fluctuation in the overall brightness and when the image has low contrast.
	PT	Measures with the degree of matching to the profile of the model. This method can measure at higher speed when the rotation angle has a wide range. It is available only when a 0.3 megapixel color camera is connected.

● When CR is selected

Setting item		Set value [Factory default]	Description
Rotation		• Checked • [Unchecked]	When the measurement object is rotating, select the "Rotation" check box and specify how many degrees the model created rotates each time and through what range of angles. A smaller skipping angle increases stability, but slows down the processing. The normal direction is clockwise.
	Angle range	[-180 to 180]	
	Skipping angle	1 to 30 [5]	

Setting item	Set value [Factory default]	Description
Smart mode	• [Checked] • Unchecked	Checking the "Smart mode" option enables a high-speed rotation search. However, the stability may be lowered when the model shape aspect ratio is large or when the NOT mask is used.
Stab.	1 to 15 [The default value depend on the connected camera. 9 or 12]	Specify which is to have priority, measurement stability or speed. If lowering stability does not speed up processing, it is likely that many candidates have been detected. In this case, specify a larger value for "Candidate level" or "Stab."
Prec.	1 to 3 [2]	Specify which is to have priority, measurement positional precision or speed.

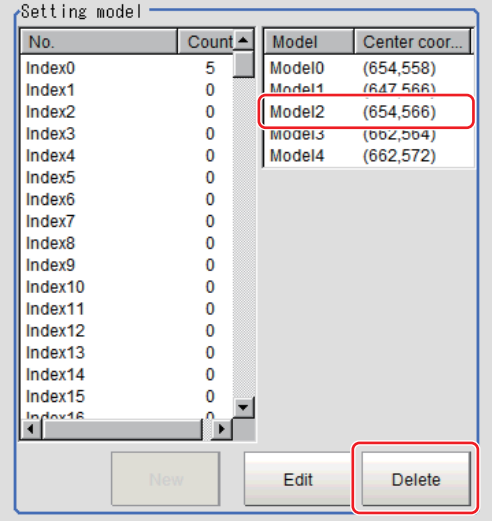
● When PT is selected

Setting item	Set value [Factory default]	Description
Angle range	[-180 to 180]	This item specifies the rotation angle range for searching. The normal direction is clockwise.
Stability	1 to 5 [3]	If lowering stability does not speed up processing, it is likely that many candidates have been detected. In this case, specify a larger value for "Candidate level" or "Stab."

Deleting a Model

Deletes a registered model.

1 Select the model from the list and click [Delete].



2-10-3 Region Setting (Classification)

Use the rectangle to set up the measurement region for [Classification].

1 In the Item Tab area, click [Region setting].

2 Click [Edit].

The figure setting area is displayed.

3 Specify the area in which to search for the model.

The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.

4 Click [OK] in the Figure setting area.

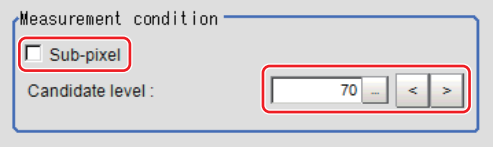
- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

2-10-4 Measurement Parameters (Classification)

Specify the search measurement conditions and the judgement conditions for the measurement results.

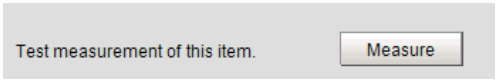
1 In the Item Tab area, click [Measurement].

2 In the "Measurement condition" area, specify a value for each item.



Setting item	Set value [Factory default]	Description
Sub-pixel	• Checked • [Unchecked]	When a check is placed at sub-pixel, the position information can be measured in units of sub-pixels. However, this requires more processing time.
Candidate level	0 to 100 [70]	Specify the threshold value with which to detect candidate points in a rough search. Specify a smaller value when model search results are unreliable.

3 When the setting has been changed, click [Measure] in the "Detail" area to verify whether measurements can be made correctly.



4 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

Setting item	Set value	Description
Position X	-99999.9999 to 99999.9999	Specify the range of X-axis shifting that is judged to be OK.
Position Y	-99999.9999 to 99999.9999	Specify the range of Y-axis shifting that is judged to be OK.
Search angle	-180 to 180	Specify the range of angles that are judged to be OK.
Correlation	0 to 100	Specify the range of correlation values that are judged to be OK. However, when the correlation value of the measurement result is 0, the judgement result will be NG regardless of the lower limit setting.

2-10-5 Output Parameters (Classification)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-10-6 Key Points for Test Measurement and Adjustment (Classification)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Index	Index No. of the biggest correlation
Model number	Model No. of the biggest correlation
Correlation value	Correlation value with the model
Position X	X coordinate of the position where the model is detected
Position Y	Y coordinate of the position where the model is detected
Angle θ	Angle of the position where the model is detected

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

- Searching other positions

Parameter to be adjusted	Remedy
Model parameter	Specify a larger value for the "Prec."
	If the measurement results are unstable only when "Rotation" is selected, specify a smaller value for the "Skipping angle".
	When "Rotation" is selected, if the model shape is complex, uncheck the "Smart mode" option.
	If the image has low contrast or blurred edges, set the "Search mode" to "CR".
	If the model image consists of detailed figures, specify a larger value for "Stab."
Measurement	If the precision is low, place a check at "Sub-pixel".
	If images that should be judged OK vary greatly, specify a smaller value for "Candidate level".
	If the model image is small and unstable, specify a smaller value for the "Reduction".

- The judgement is NG (insufficient memory)

Parameter to be adjusted	Remedy
Region setting	Make the search region as small as possible.
Model parameter	Bring "Stab." close to the factory default value.
	Bring the "Skipping angle" close to the factory default value.
	Specify a smaller value for "Prec.".

● When the processing speed is slow

Parameter to be adjusted	Remedy
Region setting	Make the search region as small as possible.
Model	Make the area to register as the model as small as possible.
Model parameter	If the model image is a simple figure or a large figure, specify a smaller value for "Stab." If lowering stability does not speed up processing, it is likely that many candidates have been detected. Raise the "Candidate level" in [Measurement].
	When "Rotation" is selected and the model image is a simple figure, specify a larger value for "Skipping angle".
	When "Rotation" is selected and the model image is a simple figure, place a check at "Smart mode".
	If the position precision is high, specify a smaller value for "Prec.".
	If the rotation angle range is large, set the "Search mode" to "PT".
Measurement	If images that should be judged OK vary little, specify a larger value for "Candidate level".
	If the position precision is high, uncheck "Sub-pixel".

2-10-7 Measurement Results for Which Output Is Possible (Classification)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Index	IN	Index No. with the highest correlation value
Model No.	NO	Model No. with the highest correlation value
Correlation value	CR	Correlation value with the model
Measurement position X	X	X coordinate of the position where the model is detected
Measurement position Y	Y	Y coordinate of the position where the model is detected
Measurement angle	TH	Angle of the position where the model is detected
Reference position X	SX	Reference coordinate X of the registered model
Reference position Y	SY	Reference coordinate Y of the registered model
Detection point RX	RX	X coordinate of the registered model
Detection point RY	RY	Y coordinate of the registered model

2-10-8 External Reference Tables (Classification)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Index	indexNo	Get only	-1: No models found 0 to 199
6	Model No.	modelNo	Get only	-1: No models found 0 to 4
7	Correlation value	correlation	Get only	0 to 100
8	Measure X	x	Get only	-99,999.9999 to 99,999.9999
9	Measure Y	y	Get only	-99,999.9999 to 99,999.9999
10	Angle theta	angle	Get only	-180 to 180
11	Reference X	referenceX	Get only	-99,999.9999 to 99,999.9999
12	Reference Y	referenceY	Get only	-99,999.9999 to 99,999.9999
13	Reference angle theta	referenceAngle	Get only	-180 to 180
14	Detected coordinate X	detectionX	Get only	-99,999.9999 to 99,999.9999
15	Detected coordinate Y	detectionY	Get only	-99,999.9999 to 99,999.9999
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Search mode	searchMode	Set/Get	0: Correlation 1: Shape
121	With rotation	rotation	Set/Get	0: OFF 1: ON

No.	Data name	Ident	Set/Get	Data range
122	Upper limit of the rotation angle	endAngle	Set/Get	-180 to 180
123	Lower limit of the rotation angle	startAngle	Set/Get	-180 to 180
124	Skipping angle	angleSkip	Set/Get	1 to 30
125	Smart mode	smartMode	Set/Get	0: OFF 1: ON
126	Stab. (CR)	stability	Set/Get	1 to 15
127	Prec.	accuracy	Set/Get	1 to 3
128	Stab. (SH)	searchSpeed	Set/Get	1 to 5
134	Sub-pixel	subPixel	Set/Get	0: OFF 1: ON
135	Candidate Point Level	candidateLevel	Set/Get	0 to 100
136	Upper limit of measure X	upperX	Set/Get	-99,999.9999 to 99,999.9999
137	Lower limit of measure X	lowerX	Set/Get	-99,999.9999 to 99,999.9999
138	Upper limit of measure Y	upperY	Set/Get	-99,999.9999 to 99,999.9999
139	Lower limit of measure Y	lowerY	Set/Get	-99,999.9999 to 99,999.9999
140	Upper limit of the angle	upperAngle	Set/Get	-180 to 180
141	Lower limit of the angle	lowerAngle	Set/Get	-180 to 180
142	Upper limit of the corr.	upperCorrelation	Set/Get	0 to 100
143	Lower limit of the corr.	lowerCorrelation	Set/Get	0 to 100
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

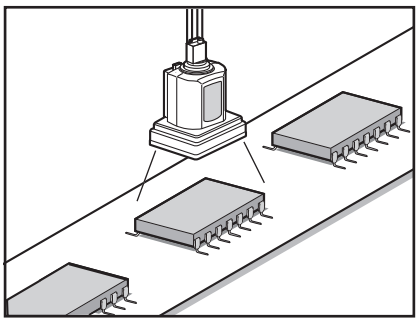
2-11 Edge Position

This processing item detects the position of the measurement object by using the change in color within the measurement region.

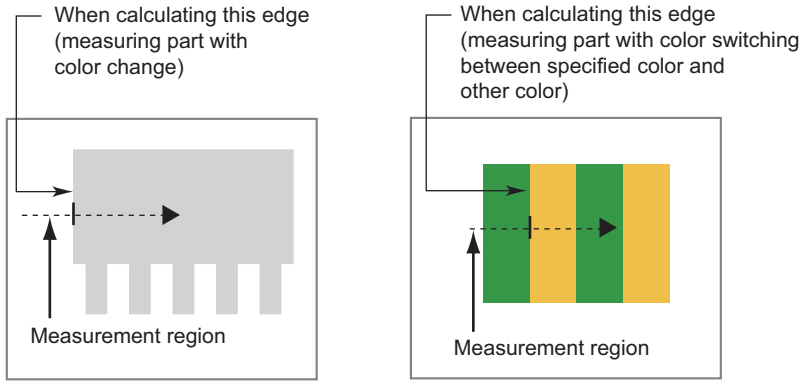
Used in the Following Case

- To calculate edge coordinates of measurement objects

Example) Dimension measurement of finished products



Searches edges by the color change in measurement region.
Edge measurement can be enabled by specifying the color of measurement object.



- To find the width of a measurement object

  Using a Expression, the width of a measurement object can be calculated from the difference between two edge positions.

Important

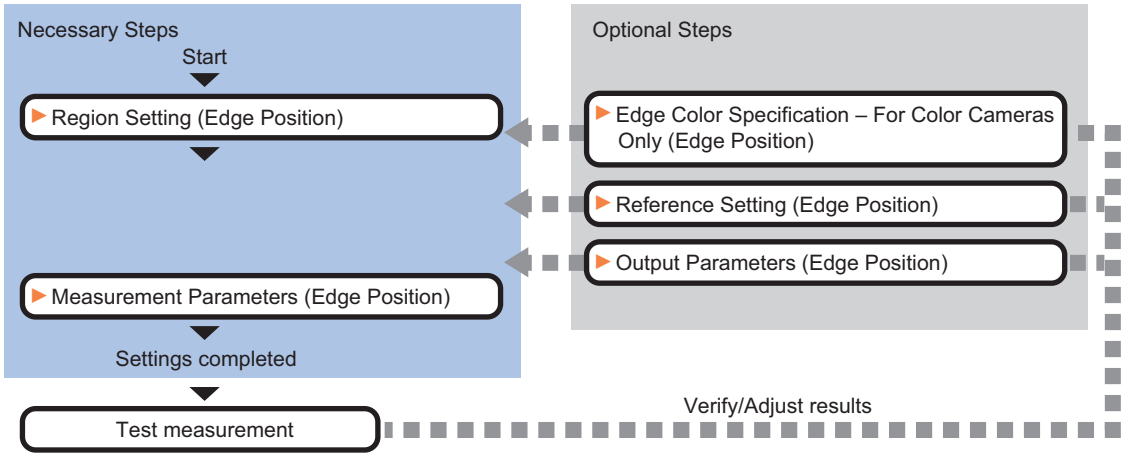
Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

Additional Information

Edge processing basic concepts
For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

2-11-1 Settings Flow (Edge Positions)

Set the edge position with the following steps.



List of Edge Position Items

Item name	Description
Region setting	This item is used to set up the measurement area. Refer to *2-11-2 Region Setting (Edge Position)* on page 2-154.
Edge color (for color cameras only)	If the color of the edges to be detected is decided, specify the color. Refer to *2-11-3 Edge Color Specification - For Color Cameras Only (Edge Position)* on page 2-155.
Ref. setting	The edge position is registered as the reference when the region is set. Change as necessary. Refer to *2-11-4 Reference Setting (Edge Positions)* on page 2-156.
Measurement	This item specifies the judgement condition for measurement results. Measurement parameter can be changed as needed to address unstable measurement results. The displayed items depend on whether your camera is a color or monochrome camera. Normally, the factory default value will be used. Refer to *2-11-5 Measurement Parameters (Edge Positions)* on page 2-158.
Output parameter	This item can be changed if necessary. Normally, the factory default value may be used. Select the measurement result coordinates and set how to handle the coordinates. Refer to *2-11-6 Output Parameters (Edge Position)* on page 2-161.

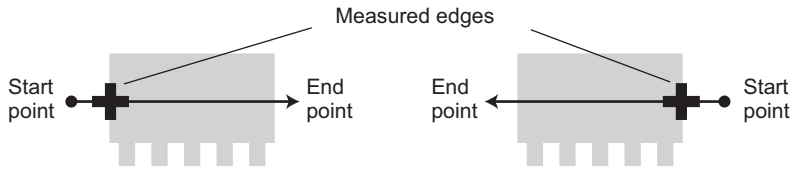
2-11-2 Region Setting (Edge Position)

This item is used to set up the measurement area.

Use a straight line (arrow), circumference, or arc to specify a measurement region for [Edge position].

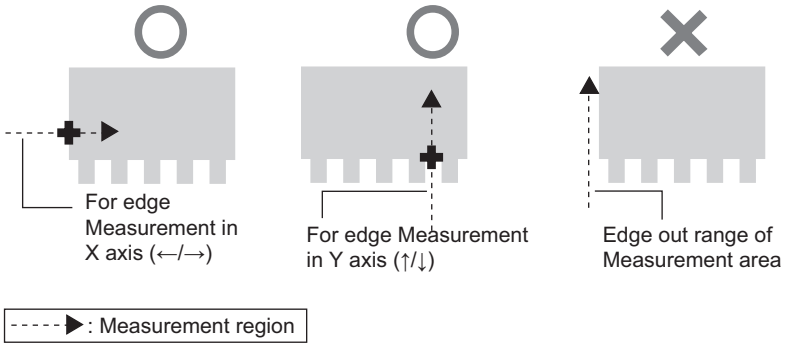
Additional Information

- The edge is scanned from the start point of the area toward the end point.
  When setting up the measurement region, pay attention to the detection direction of the edge.



Drawing the line from left to right and from right to left will lead to different measured edges.

- Measurement cannot be performed if there is no edge within the measurement region. When determining the size and position of the measurement region, take into account the movement range of the measurement object.



1 In the Item Tab area, click [Region setting].

2 Use the Drawing tools to specify the measurement region.

3 Click [OK] in the Figure setting area.

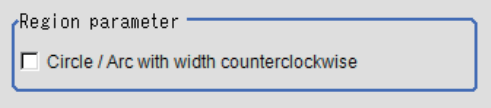
- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

Additional Information

Use the zoom function if the measurement region is too small to identify the direction of the arrow.
For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 When a circumference or arc is selected as the registered figure, select the edge search direction.

If a check is placed at the "Circle/Arc with width counterclockwise" option, the edge is searched counterclockwise. If this option is unchecked, the edge is searched clockwise.



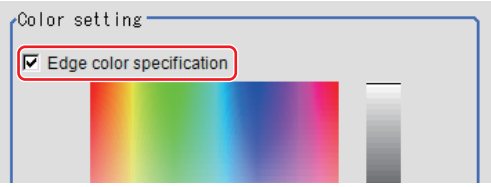
2-11-3 Edge Color Specification - For Color Cameras Only (Edge Position)

This item selects the color of the edges to be detected.

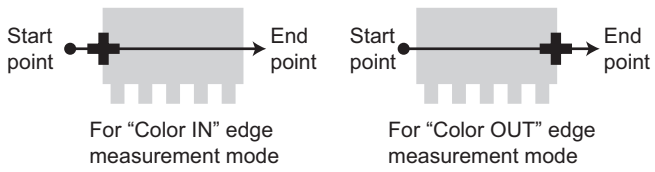
If the target color changes, this setting is not necessary. If the color is not specified, positions in the measurement region where the color changes drastically are detected as an edge.

1 In the Item Tab area, click [Edge color].

2 Place a check at "Edge color specification" in the "Color setting" area.



3 This item selects the color to be detected as edges.

Setting method	Description
Image Display area	Specify a region on the image that includes the target color. The average color of the specified region is registered.
Color chart	Click the reference color on the color chart to specify it. The RGB values for the specified color are displayed at the bottom.
R, G, B	The color to be detected is set with the RGB values.
Difference R, G, B	This sets the allowable color difference for detecting the edge, using the specified color as the reference. The larger the difference values, the larger the color range that is used to detect the edge.
Detection mode	Color IN: The position where a color other than the specified color changes to the specified color is detected as the edge. Color OUT: The position where the specified color changes to a color other than the specified color is detected as the edge.  For “Color IN” edge measurement mode For “Color OUT” edge measurement mode

2-11-4 Reference Setting (Edge Positions)

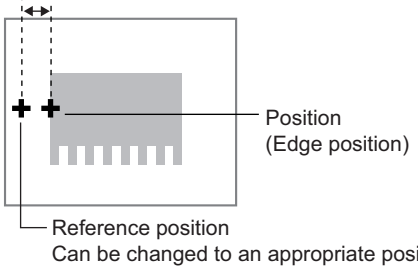
When the measurement region is set, this position is automatically set at the same time as the reference position. This item can be used to change the reference position to any desired position.

A reference position can be set either directly or by referencing a unit.

Additional Information

Reference position usage method: Measuring the distance from a specific position

- Positional deviation can be inspected by calculating the difference between the reference position and the measured position with an expression.



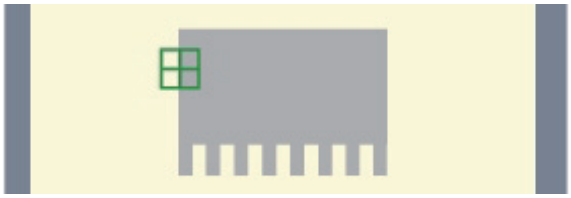
After changing the reference position to any desired position, changing the measurement region will automatically change it back to the default position.

Specifying directly

Click a position on the image you want to use as a reference position, or set coordinate data for that point.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.



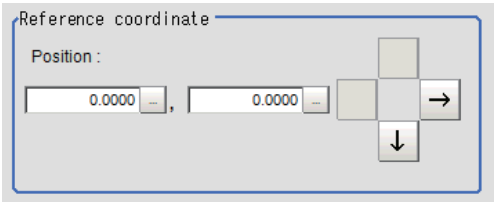
2 In the "Method" area, select "Numerical".

3 Click the position to be set as the reference.

Additional Information

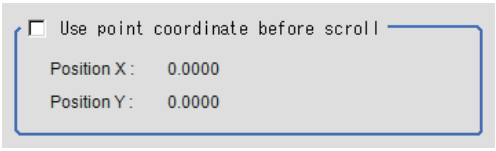
Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.



5 To remeasure on the displayed image and set the reference, click the [Measure ref.] button.

6 To use data before position compensation for the reference setting coordinates, place a check at "Use point coordinate before scroll".



Referencing a unit

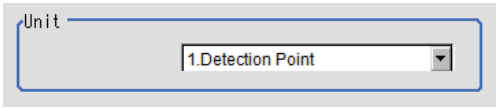
Set a reference by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".

3 In the scene in the "Unit" area, select a detection point unit.



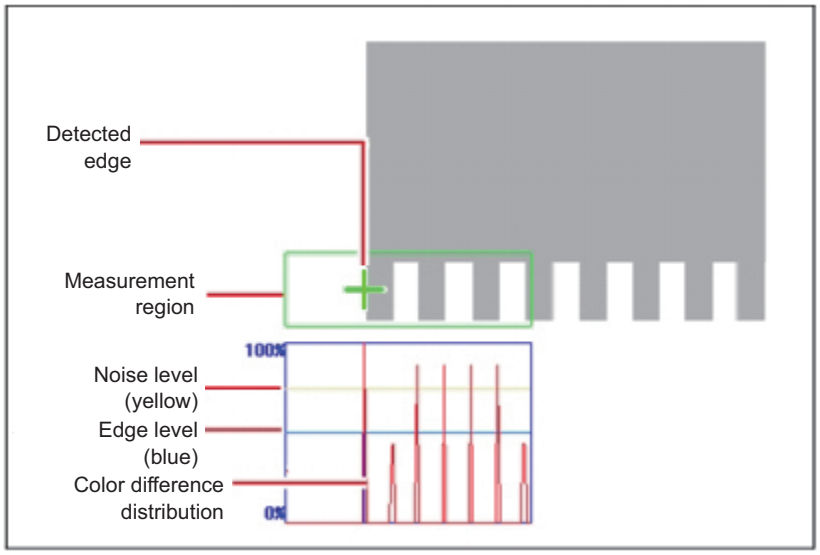
4 Perform the next measurement, and the reference will be displayed.

2-11-5 Measurement Parameters (Edge Positions)

This item specifies the judgement condition for measurement results. Measurement parameter can be changed as needed to address unstable measurement results.

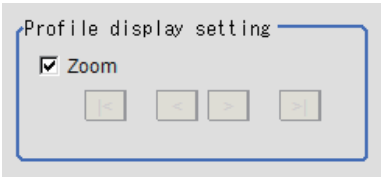
1 In the Item Tab area, click [Measurement].

The edge profile of the measurement region is displayed as a graph in the Image Display area.



Additional Information

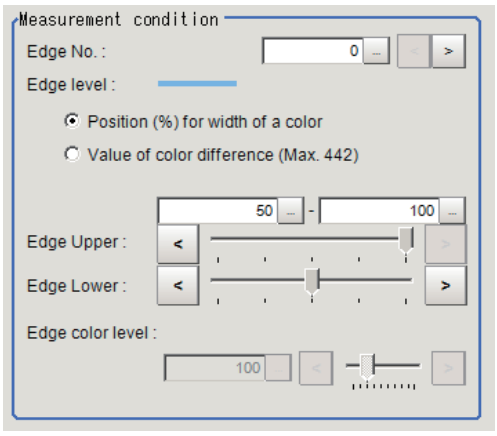
When the region is a circumference or arc, you can display the graph enlarged in the vertical direction. Place a check at "Zoom" and click the button to adjust.



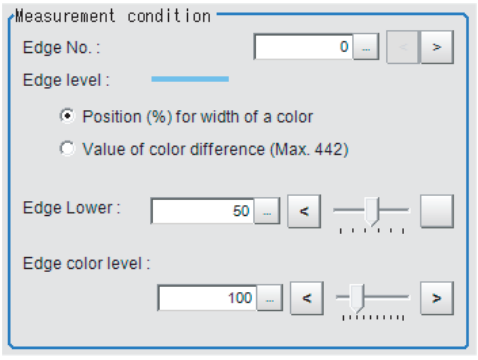
2 If necessary, specify a value for each item in the "Measurement condition" area.

- For color cameras:

Edge Color Not Specified



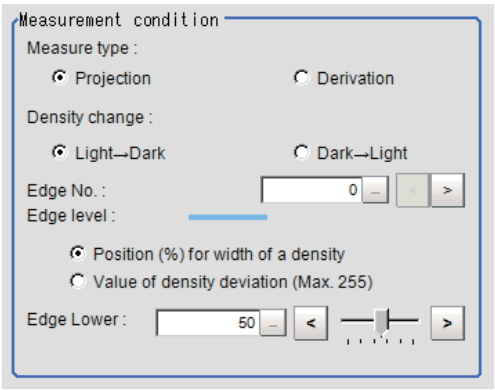
Edge Color Specified



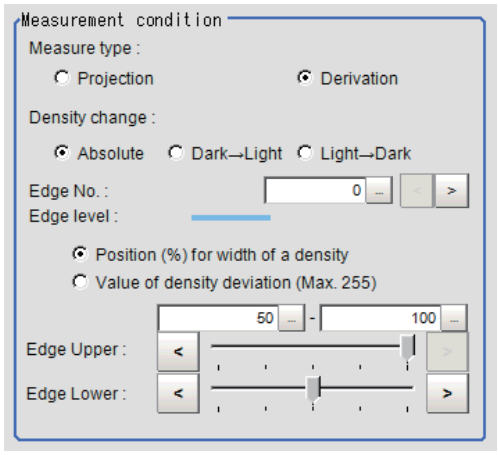
Setting item	Set value [Factory default]	Description
Edge No.	0 to 99 [0]	Specify the edge number used to extract edges. Edge numbers are assigned to detected edges starting from 0 and going on in the direction from the start point (the arrow point) to the end point (the direction of arrow) in the selected area.
Edge Upper (only when edge color is not specified) Edge Lower	• Position (%) for width of a color 0 to 100 [50] to [100] • Value of color 0 to 442 [20] to [442]	Set a range of a color difference level with which the edge is detected. For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Edge color level	0 to 442 [100]	This emphasis level can be specified only if the edge color to detect is specified.

- For monochrome cameras:

When the measurement method is "Projection"



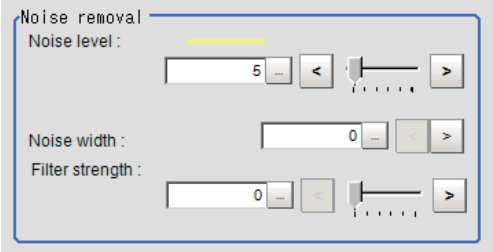
When the measurement method is "Derivation"



Setting item	Set value [Factory default]	Description
Measure type	• [Projection] • Derivation	As the measurement type, specify either projection or derivation. For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Density change	Absolute (only when the measurement method is "Derivation") • [Dark→Light] • Light→Dark	Select whether a black-to-white change or a white-to-black change should be recognized as a density change in the specified region.
Edge No.	0 to 99 [0]	Specify the edge number used to extract edges. Edge numbers are assigned to detected edges starting from 0 and going on in the direction from the start point (the arrow point) to the end point (the direction of arrow) in the selected area.

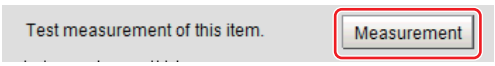
Setting item	Set value [Factory default]	Description
Edge Upper Edge Lower	• Position (%) for width of a density 0 to 100 [50] to [100] • Value of density 0 to 255 [20] to [255]	Select the density change level to be detected as edges. The upper limit of edges can be set only when the measurement method is "Derivation". For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

3 If necessary, set each item in the "Noise removal" area.



Setting item	Set value [Factory default]	Description
Noise level	• For color cameras: 0 to 442 [5] • For monochrome cameras: 0 to 255 [5]	When edges are incorrectly detected due to noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Level* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Noise width	0 to 9999 [0]	Set the width for judging noise. When detection is affected by noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Width* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Filter strength	0 to 100 [0]	If a valley appears in the histogram around the edge threshold value due to noises, smoothen the edge profile using a filter to prevent wrong error detection from being detected. Strengthening the filter smoothen the edge profile further.

4 When the setting has been changed, click [Measurement] in the Detail area to verify whether measurements can be made correctly.



5 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

Setting item	Set value	Description
Edge position X	-99999.9999 to 99999.9999	Specify the range of X-axis shifting that is judged to be OK.
Edge position Y	-99999.9999 to 99999.9999	Specify the range of Y-axis shifting that is judged to be OK.

2-11-6 Output Parameters (Edge Position)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-11-7 Key Points for Test Measurement and Adjustment (Edge Position)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Edge position X	X coordinate of the measured edge position
Edge position Y	Y coordinate of the measured edge position

The image specified in the Sub-image number in image display setting is displayed in the Image Display area.

Sub image number	Explanation of image to be displayed
0	Measurement image
1	Profile display

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

Parameter to be adjusted	Remedy
Measurement	If the color of the edges to be detected is decided, specify the color with [Edge color]. If results are not stable even with the color specified, specify a larger value for the color variance range.
	If noise is detected as an edge, specify larger values for "Noise level" and "Noise width".

2-11-8 Measurement Results for Which Output Is Possible (Edge Position)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Edge position X	X	X coordinate of the measured edge position
Edge position Y	Y	Y coordinate of the measured edge position
Reference coordinate X	SX	Reference X
Reference coordinate Y	SY	Reference Y

2-11-9 External Reference Tables (Edge Position)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Edge position X	positionX	Get only	-99,999.9999 to 99,999.9999
6	Edge position Y	positionY	Get only	-99,999.9999 to 99,999.9999
7	Reference X *1	referenceX	Get only	-99,999.9999 to 99,999.9999
8	Reference Y *1	referenceY	Get only	-99,999.9999 to 99,999.9999
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Edge color specification	colorSpecification	Set/Get	0: OFF 1: ON

No.	Data name	Ident	Set/Get	Data range
121	Edge color R	colorR	Set/Get	0 to 255
122	Edge color G	colorG	Set/Get	0 to 255
123	Edge color B	colorB	Set/Get	0 to 255
124	Difference R	colorDevR	Set/Get	0 to 127
125	Difference G	colorDevG	Set/Get	0 to 127
126	Difference B	colorDevB	Set/Get	0 to 127
127	Edge detection mode	detectionMode	Set/Get	0: Color IN 1: Color OUT
129	Reference X *2	referencePosX	Set/Get	0 to 99,999.9999
130	Reference Y *2	referencePosY	Set/Get	0 to 99,999.9999
131	Edge No.	edgeNo	Set/Get	0 to 99
132	Edge Level Lower limit	edgeLevel	Set/Get	0 to 100
133	Noise level	noiseLevel	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
134	Noise width	noiseWidth	Set/Get	0 to 9,999
135	Edge color level	colorLevel	Set/Get	0 to 442
136	Upper limit of the edge position X	upperX	Set/Get	-99,999.9999 to 99,999.9999
137	Lower limit of the edge position X	lowerX	Set/Get	-99,999.9999 to 99,999.9999
138	Upper limit of the edge position Y	upperY	Set/Get	-99,999.9999 to 99,999.9999
139	Lower limit of the edge position Y	lowerY	Set/Get	-99,999.9999 to 99,999.9999
140	Monochrome Projection edge detection mode	monoDetectMode	Set/Get	0: Light → Dark 1: Dark → Light
141	Edge level Lower limit absolute value	edgeLevelAbs	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
142	Edge level specification method	edgeLevelKind	Set/Get	0: % 1: Absolute value
143	Clockwise/Counterclockwise	counterclockwise	Set/Get	0: Clockwise 1: Counterclockwise
144	Measure type	measureType	Set/Get	0: Projection 1: Derivation
145	Monochrome Derivation edge detection mode	diffDetectMode	Set/Get	0: Absolute 1: Dark → Light 2: Light → Dark
146	Edge Level Upper limit *3	edgeLevelUpper	Set/Get	0 to 100
147	Edge level Upper limit absolute value *4	edgeLevelUpperAbs	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
148	Filter Strength	filterStrength	Set/Get	0 to 100
158	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
159	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit
160	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
161	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999
162	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera

No.	Data name	Ident	Set/Get	Data range
90000	figure0 Count	figArea0_count	Set/Get	0 to 1
90001	figure0 Type	figArea0_fig0_type	Set/Get	4: Wide line 64: Circumference 256: Wide arc
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90009	figure0 Wide line Start point X	figArea0_fig0_lineW_X0	Set/Get	-99,999 to 99,999
90010	figure0 Wide line Start point Y	figArea0_fig0_lineW_Y0	Set/Get	-99,999 to 99,999
90011	figure0 Wide line End point X	figArea0_fig0_lineW_X1	Set/Get	-99,999 to 99,999
90012	figure0 Wide line End point Y	figArea0_fig0_lineW_Y1	Set/Get	-99,999 to 99,999
90013	figure0 Wide line Width	figArea0_fig0_lineW_W	Set/Get	0 to 99,999
90025	figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90034	figure0 Wide arc Center Position X	figArea0_fig0_arcW_X	Set/Get	-99,999 to 99,999
90035	figure0 Wide arc Center Position Y	figArea0_fig0_arcW_Y	Set/Get	-99,999 to 99,999
90036	figure0 Wide arc Radius	figArea0_fig0_arcW_R	Set/Get	0 to 99,999
90037	figure0 Wide arc Start angle	figArea0_fig0_arcW_SA	Set/Get	-180 to 180
90038	figure0 Wide arc End angle	figArea0_fig0_arcW_EA	Set/Get	-180 to 180
90039	figure0 Wide arc Width	figArea0_fig0_arcW_W	Set/Get	0 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

*1. The reference coordinates based on the selection in the Method area of the [Ref.setting] tab can be Get only.

*2. The reference coordinates based on the selection of Numerical in the Method area of the [Ref.setting] tab can be Set/Get.

*3. On the [Measurement] tab of the Properties Dialog Box, this data is displayed as [Edge Upper] when you choose the [Position (%) for width of a color].

*4. On the [Measurement] tab of the Properties Dialog Box, this data is displayed as [Edge Upper] when you choose the [Value (442 at the maximum) of color].

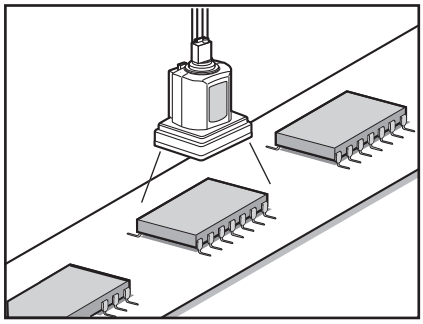
2-12 Edge Pitch

Finds and counts the edges by measuring the color change within the measurement region.

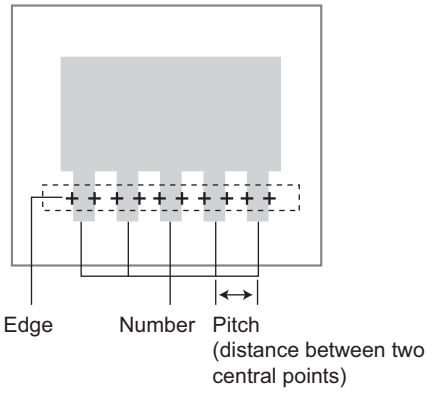
Used in the Following Case

- When calculating number of pins of IC or connectors

Example) Measurement of number of IC pins



- To calculate the pin width and the distance (pitch) between mid-points between two pins



Important

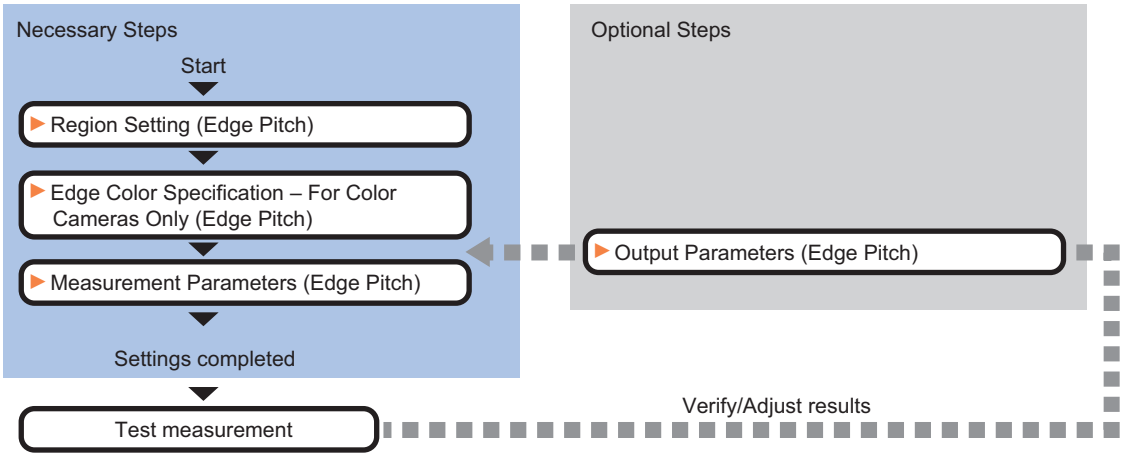
Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

Additional Information

Edge image measurement processing mechanism
For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

2-12-1 Settings Flow (Edge Pitch)

Set the Edge Pitch with the following steps.



Item List for Edge Pitch

Item name	Description
Region setting	This item is used to set up the measurement area. Refer to *2-12-2 Region Setting (Edge Pitch)* on page 2-167.
Edge color (for color cameras only)	This item selects the color information for the edges to be detected. Refer to *2-12-3 Edge Color Specification - For Color Cameras Only (Edge Pitch)* on page 2-167.
Measurement	This item specifies the judgement condition for measurement results. Measurement parameter can be changed as needed to address unstable measurement results. Specify the pitch and width for counting edges. The displayed items depend on whether your camera is a color or monochrome camera. Normally, the factory default value will be used. Refer to *2-12-4 Measurement Parameters (Edge Pitch)* on page 2-168.
Output parameter	This item can be changed if necessary. Normally, the factory default value may be used. Select the measurement result coordinates and set how to handle the coordinates. Refer to *2-12-5 Output Parameters (Edge Pitch)* on page 2-170.

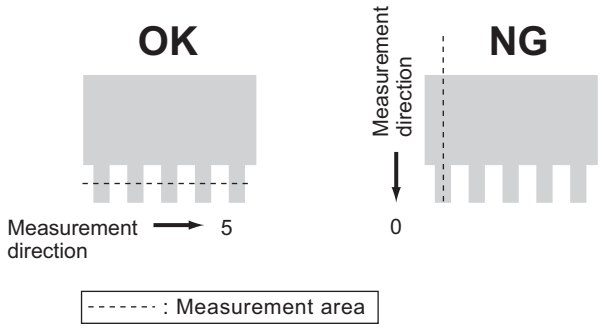
2-12-2 Region Setting (Edge Pitch)

This item is used to set up the measurement area.

Use a straight line, circumference, or arc to specify a measurement region for [Edge Pitch].

Additional Information

When setting up a measurement region, please include all the edges to be detected.



1. In the Item Tab area, click [Region setting].
2. Use the Drawing tools to specify the measurement region.
3. Click [OK] in the Figure setting area.
   - [OK]: Changes the settings and returns to the previous menu.
   - [Cancel]: Changes are discarded. Returns to the previous menu.
   - [Apply]: Updates the settings without leaving edit window.

2-12-3 Edge Color Specification - For Color Cameras Only (Edge Pitch)

Specify the target color to be counted.

1. In the Item Tab area, click [Edge color].
2. Specify the target color for the edges to be counted (used as the reference color for edge detecting).

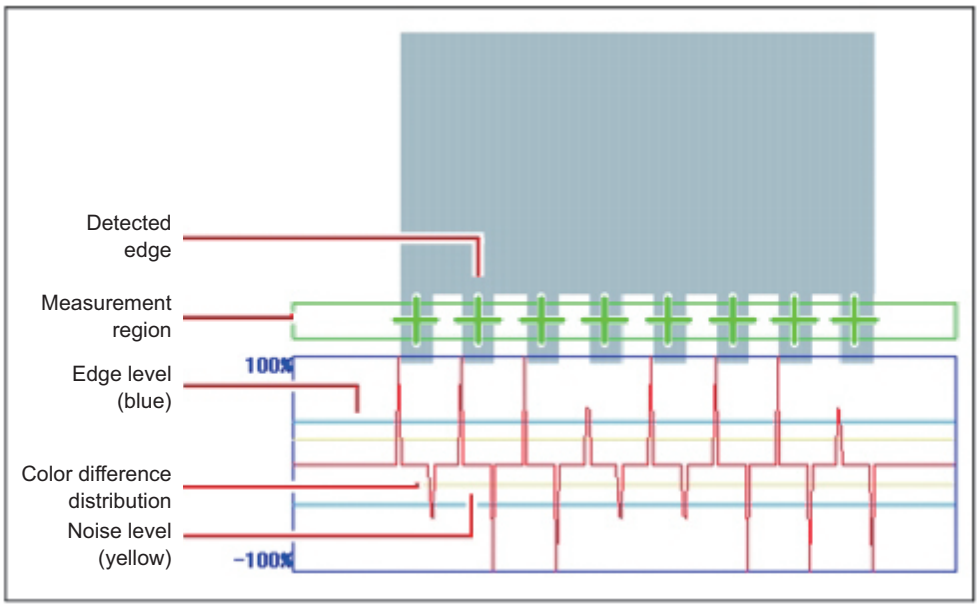
Setting method	Description
Image Display area	Specify a region on the image that includes the target color. The average color of the specified region is registered.
Color chart	Click the color on the color chart to specify it. The RGB values for the specified color are displayed at the bottom.
R, G, B	The color to be detected is set with the RGB values.
Difference R, G, B	This sets the allowable color difference for detecting the edge, using the specified color as the reference. The larger the difference values, the larger the color range that is used to detect the edge.

2-12-4 Measurement Parameters (Edge Pitch)

This item specifies the judgement condition for measurement results. Also specify the range for positions to be judged as OK.

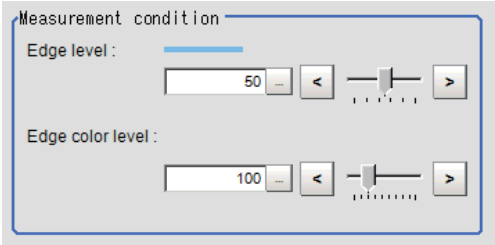
1 In the Item Tab area, click [Measurement].

The edge profile of the measurement region (straight line) is displayed in the Image Display area.



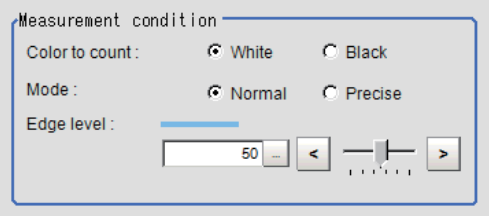
2 If necessary, specify a value for each item in the "Measurement condition" area.

- For color cameras:



Setting item	Set value [Factory default]	Description
Edge level	0 to 100 [50]	Specify a color changing level with which the edge is detected. When the measurement result is lower than the actual number of edges, specify a smaller value for the edge level. On the other hand, when the measurement result is higher than the actual number of edges, specify a larger value for the edge level. For details, refer to *Appendixes Measurement Mechanism Edge Level* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Edge color level	0 to 442 [100]	Set the emphasis level for the edge color specified with [Edge color].

- For monochrome cameras:

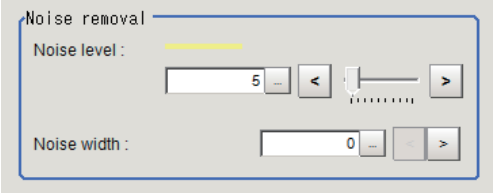


Important

Up to 1000 edges can be measured, but only a maximum of 256 can be displayed on the screen.

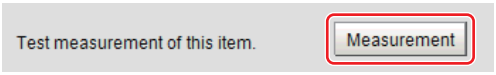
Setting item	Set value [Factory default]	Description
Color to count	• [White] • Black	Select an edge color to be measured.
Mode	• [Normal] • Precise	If the pin width or gap is less than 2 pixels, select precise.
Edge level	0 to 100 [50]	Specify the density change level to be detected as edges. When the measurement result is lower than the actual number, specify a smaller value for the edge level (or the minimum level). On the other hand, when the measurement result is higher than the actual number, specify a larger value for the edge level (or the minimum level). For details, refer to *Appendixes Measurement Mechanism Edge Level* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

3 If necessary, set each item in the "Noise removal" area.



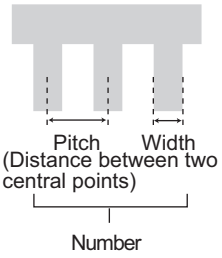
Setting item	Set value [Factory default]	Description
Noise level	0 to 442 [5]	When detection is affected by noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Level* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Noise width	0 to 9999 [0]	Set the width for judging noise. When detection is affected by noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Width* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 When the setting has been changed, click [Measurement] in the "Detail" area to verify whether measurements can be made correctly.



5 Set up the judgement condition.

Setting item	Set value	Description
Edges	0 to 999	Specify a range to be judged as OK.
Pitch	0 to 99999.9999	
Ave pitch	0 to 99999.9999	
Width	0 to 99999.9999	
Ave width	0 to 99999.9999	



6 If a circumference with a width or an arc with a width is set for the region, set the profile display settings as required.

Setting item	Set value [Factory default]	Description
Enlarged display	[Not Visible]	If you place a check here, the profile will be displayed for the length along the circumference of the circumference with a width or arc with a width. Use an enlarged display to check the details of the profile.
	Visible	

2-12-5 Output Parameters (Edge Pitch)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position deflection correction is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-12-6 Key Points for Test Measurement and Adjustment (Edge Pitch)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Number of edges	Number of edges
Average pitch	Average edge pitch
Max. pitch	Edge maximum pitch
Min. pitch	Edge minimum pitch
Average width	Average edge width
Max. width	Edge maximum width
Min. width	Edge minimum width

The image specified in the Sub-image number in image display setting is displayed in the Image Display area.

Sub image number	Explanation of image to be displayed
0	Measurement image
1	Profile display

Key Points for Adjustment

Select the adjustment method referring to the following points.

Parameter to be adjusted	Remedy
Edge color	If edges cannot be detected properly, specify a larger value for the color variance range.
Measurement	If noise is detected as an edge, specify a larger value for "Noise level" and "Noise width".
Edge level	When the measurement result is lower than the actual number of edges, specify a smaller value for the "Edge level". On the other hand, when the measurement result is higher than the actual number of edges, specify a larger value for the "Edge level".

2-12-7 Measurement Results for Which Output Is Possible (Edge Pitch)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	Judgement result
Number of Edge Pins	N	Number of detected edges
Average pitch	P	Average pitch of detected edges
Max. pitch	PH	Maximum pitch of detected edges
Min. pitch	PL	Minimum pitch of detected edges
Average width	W	Average width of detected edges
Max. width	WH	Maximum width of detected edges
Min. width	WL	Minimum width of detected edges

2-12-8 External Reference Tables (Edge Pitch)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Number of Edge Pins	edgePitch	Get only	0 to 999
6	Average pitch	averagePitch	Get only	0 to 99,999.9999
7	Max. pitch	maxPitch	Get only	0 to 99,999.9999
8	Min. pitch	minPitch	Get only	0 to 99,999.9999
9	Average width	averageWidth	Get only	0 to 99,999.9999
10	Max. width	maxWidth	Get only	0 to 99,999.9999
11	Min. width	minWidth	Get only	0 to 99,999.9999
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Edge color R	colorR	Set/Get	0 to 255
121	Edge color G	colorG	Set/Get	0 to 255
122	Edge color B	colorB	Set/Get	0 to 255
123	Edge color difference R	colorDevR	Set/Get	0 to 127
124	Edge color difference G	colorDevG	Set/Get	0 to 127
125	Edge color difference B	colorDevB	Set/Get	0 to 127
127	Edge level	edgeLevel	Set/Get	0 to 100
128	Noise level	noiseLevel	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
129	Noise width	noiseWidth	Set/Get	0 to 9,999
130	Upper limit of edge pitch	upperNumOfPitch	Set/Get	0 to 1,000
131	Lower limit of edge pitch	lowerNumOfPitch	Set/Get	0 to 1,000
132	Upper limit of average pitch	upperAveragePitch	Set/Get	0 to 99,999.9999
133	Lower limit of average pitch	lowerAveragePitch	Set/Get	0 to 99,999.9999
134	Upper limit of the pitch	upperPitch	Set/Get	0 to 99,999.9999
135	Lower limit of the pitch	lowerPitch	Set/Get	0 to 99,999.9999
136	Upper limit of average width	upperAverageWidth	Set/Get	0 to 99,999.9999
137	Lower limit of average width	lowerAverageWidth	Set/Get	0 to 99,999.9999
138	Upper limit of the width	upperWidth	Set/Get	0 to 99,999.9999
139	Lower limit of the width	lowerWidth	Set/Get	0 to 99,999.9999
140	Edge color level	colorLevel	Set/Get	0 to 442
141	Color to count	countColor	Set/Get	0: White 1: Black
142	Mode	mode	Set/Get	0: Normal 1: Precise

No.	Data name	Ident	Set/Get	Data range
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
90000	figure0 Count	figArea0_count	Set/Get	0 to 1
90001	figure0 Type	figArea0_fig0_type	Set/Get	4: Wide line 64: Circumference 256: Wide arc
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90009	figure0 Wide line Start point X	figArea0_fig0_lineW_X0	Set/Get	-99,999 to 99,999
90010	figure0 Wide line Start point Y	figArea0_fig0_lineW_Y0	Set/Get	-99,999 to 99,999
90011	figure0 Wide line End point X	figArea0_fig0_lineW_X1	Set/Get	-99,999 to 99,999
90012	figure0 Wide line End point Y	figArea0_fig0_lineW_Y1	Set/Get	-99,999 to 99,999
90013	figure0 Wide line Width	figArea0_fig0_lineW_W	Set/Get	0 to 99,999
90025	figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90034	figure0 Wide arc Center Position X	figArea0_fig0_arcW_X	Set/Get	-99,999 to 99,999
90035	figure0 Wide arc Center Position Y	figArea0_fig0_arcW_Y	Set/Get	-99,999 to 99,999
90036	figure0 Wide arc Radius	figArea0_fig0_arcW_R	Set/Get	0 to 99,999
90037	figure0 Wide arc Start angle	figArea0_fig0_arcW_SA	Set/Get	-180 to 180
90038	figure0 Wide arc End angle	figArea0_fig0_arcW_EA	Set/Get	-180 to 180
90039	figure0 Wide arc Width	figArea0_fig0_arcW_W	Set/Get	0 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

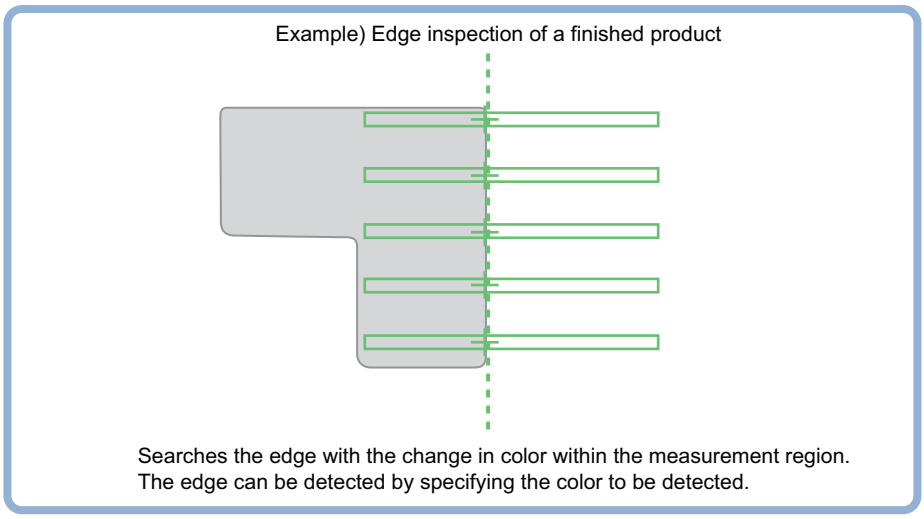
2-13 Scan Edge Position

This processing item detects the position of the measurement object by using the change in color within the measurement region. By dividing the measurement region, the following effects can be expected compared to ordinary edge position measurement.

- Detailed information, such as the closest point or furthest point from the measurement start point, can be calculated.
- The inclination or degree of unevenness of the measured object can be calculated.

Used in the Following Case

To calculate multiple edge positions of the measurement object from statistical data



Important

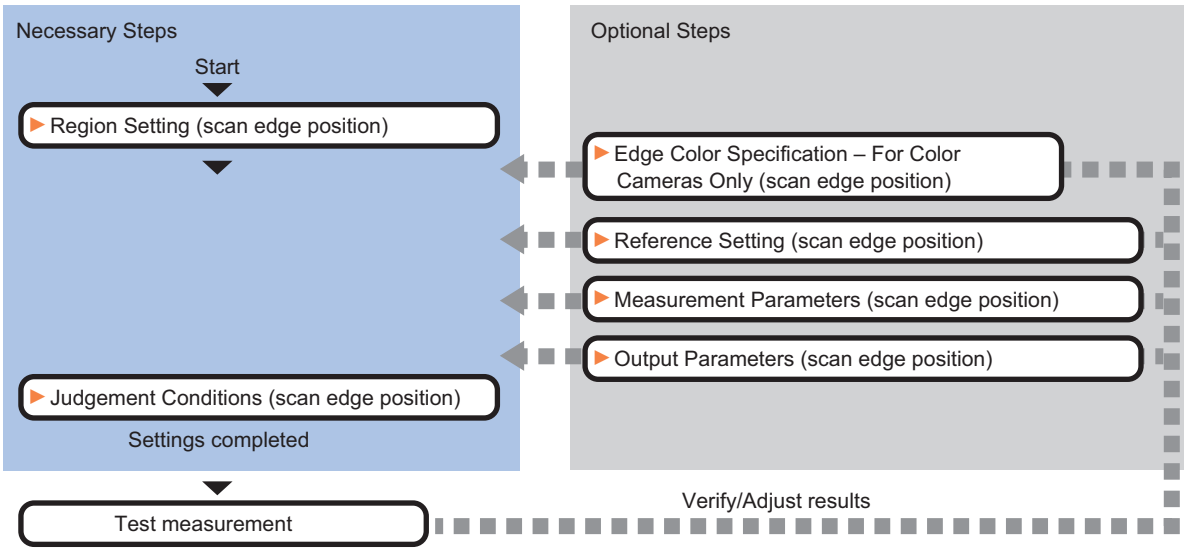
Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

Additional Information

Edge image measurement processing mechanism
For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

2-13-1 Settings Flow (Scan Edge Position)

Set the scan edge position with the following steps.



Item List for Scan Edge Position

Item name	Description
Region setting	This item is used to set up the measurement area. Refer to *2-13-2 Region Setting (Scan Edge Position)* on page 2-176.
Edge color (for color cameras only)	If the color of the edges to be detected is decided, specify the information for the edge color to be detected. Refer to *2-13-3 Edge Color Specification - For Color Cameras Only (Scan Edge Position)* on page 2-177.
Ref. setting	This item can be changed if necessary. The edge position measured once is registered when the region is set. Refer to *2-13-4 Reference Setting (Scan Edge Position)* on page 2-178.
Measurement	This item changes the measurement parameter as necessary when the measurement result is unstable. The displayed items depend on whether your camera is a color or monochrome camera. Normally, the factory default value will be used. Refer to *2-13-5 Measurement Parameters (Scan Edge Positions)* on page 2-180.
Judgement	This item specifies the judgement condition for measurement results. Refer to *2-13-6 Judgement Conditions (Scan Edge Position)* on page 2-183.
Output parameter	This item can be changed if necessary. Normally, the factory default value may be used. Select the measurement result coordinates and set how to handle the coordinates. Refer to *2-13-7 Output Parameters (Scan Edge Position)* on page 2-184.

2-13-2 Region Setting (Scan Edge Position)

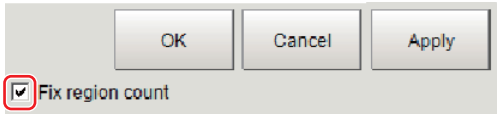
This item is used to set up the measurement area.

Specify the measurement region for [Scan Edge Position] by using wide straight lines.

1 In the Item Tab area, click [Region setting].

2 Use the Drawing tools to specify the measurement region.

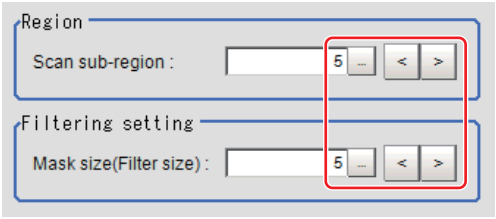
To align with the measurement area and change the number of measurement points, uncheck this. If the width of the measurement region is changed with the checkbox unchecked, the number of measurement points in Scan-sub-region is changed to minimize the amount of change of the scanned region interval.



3 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

4 Set the measurement point and the filter size for the region.

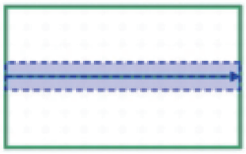


Setting item	Set value [Factory default]	Description
Scan sub-region	1 to 4000 [5]	Set the measurement point for the region.
Mask size	0 to 200 [5]	Set the filter size when smoothing the measurement point vicinity. When 5 is set, smoothing is processed for a total of 11 points: the measurement point and the 5 pixels before and after it.

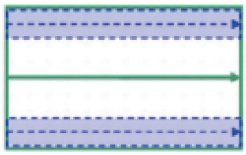
5 The region is divided equally.

Division of Scan Area

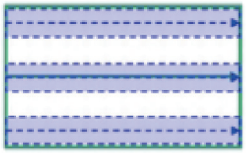
The scan region, when the number of measurement points is 1



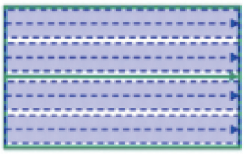
The scan region, when the number of measurement points is 2



The scan region, when the number of measurement points is 3

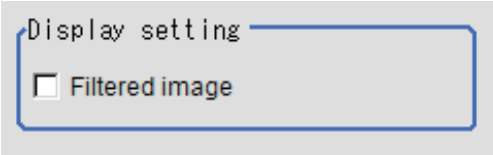


The scan region, when the number of measurement points is 4



6 Perform the display setting if required.

Placing a check at [Filtered image] makes it easier to change the filtering setting.



Setting item	Set value [Factory default]	Description
Filtered image	• [Unchecked] • Checked	If checked, the filtered image of the ranges set with the Scan sub-region and Filter size after smoothing is displayed.

Additional Information

You can specify enable/disable for each edge measurement number. Clicking edge measurement points displays the following screen.

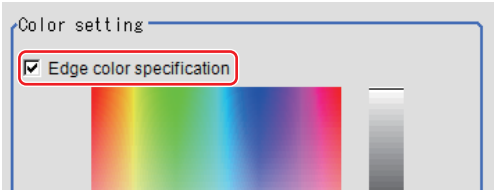
2-13-3 Edge Color Specification - For Color Cameras Only (Scan Edge Position)

This item selects the color of the edges to be detected.

If the target color changes, this setting is not necessary. If the color is not specified, positions in the measurement region where the color changes drastically are detected as an edge.

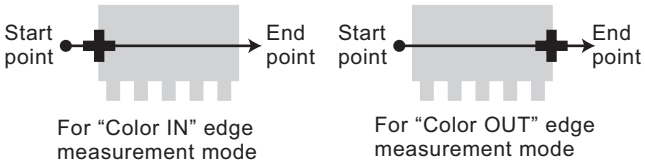
1 In the Item Tab area, click [Edge color].

2 Place a check at "Edge color" in the "Color setting" area.



3 This item selects the color to be detected as edges.

Setting methods	Description
Image Display area	Specify a region on the image that includes the target color. The average color of the specified region is registered.
Color chart	Click the reference color on the color chart to specify it. The RGB values for the specified color are displayed at the bottom.
R, G, B	The color to be detected is set with the RGB values.
Difference R, G, B	This sets the allowable color difference for detecting the edge, using the specified color as the reference. The larger the difference values, the larger the color range that is used to detect the edge.

Setting methods	Description
Detection mode	Color IN: The position where a color other than the specified color changes to the specified color is detected as the edge. Color OUT: The position where the specified color changes to a color other than the specified color is detected as the edge. 

2-13-4 Reference Setting (Scan Edge Position)

When the measurement region is set, this position is automatically set at the same time as the reference position. This item can be used to change the reference position to any desired position.

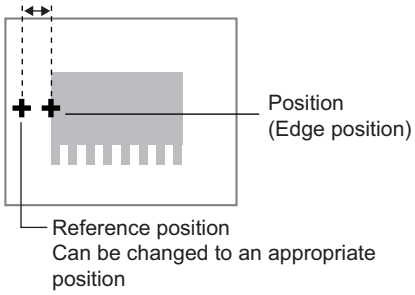
A reference position can be set either directly or by referencing a unit.

Additional Information

Reference position usage method: Measuring the distance from a specific position

Positional deviation can be inspected by calculating the difference between the reference position and the measured position with an expression.

After changing the reference position to any desired position, changing the measurement region will automatically change it back to the default position.

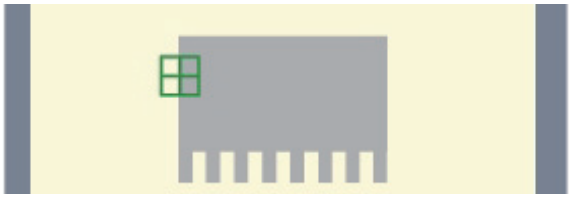


Specifying directly

Click a position on the image you want to use as a reference position, or set coordinate data for that point.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.



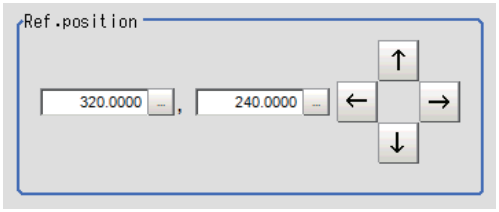
2 In the "Method" area, select "Numerical".

3 Click the position to be set as the reference.

Additional Information

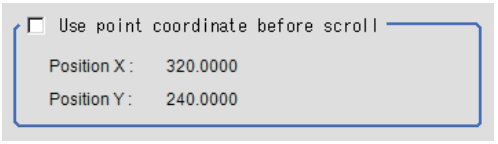
Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.



5 To remeasure on the displayed image and set the reference, click the [Measure ref.] button.

6 To use data before position compensation for the reference setting coordinates, place a check at "Use point coordinate before scroll".



Referencing a unit

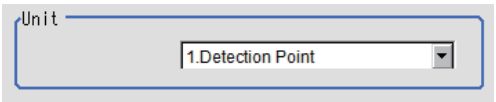
Set a reference by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".

3 In the scene in the "Unit" area, select a detection point unit.



4 Perform the next measurement, and the reference will be displayed.

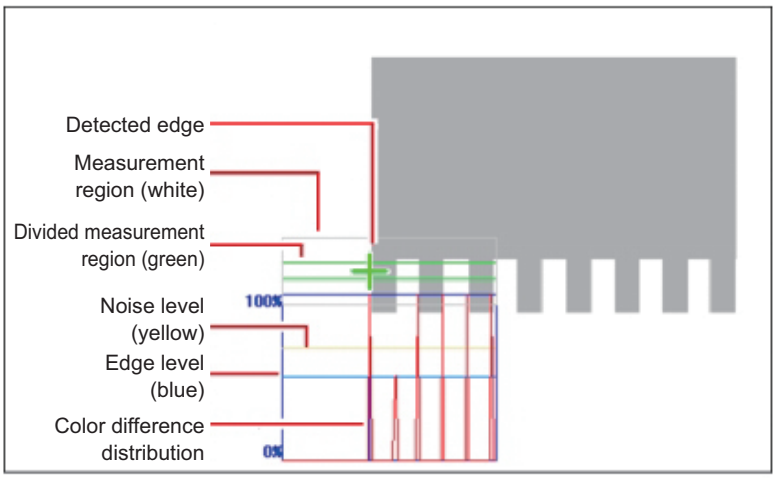
2-13-5 Measurement Parameters (Scan Edge Positions)

Measurement parameters can be changed as needed to address unstable measurement results. Normally, the factory default value will be used.

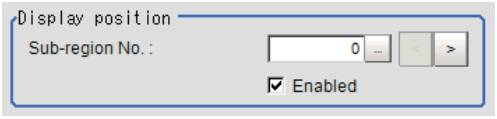
After changing a setting, check whether measurement can be done properly by performing an actual measurement.

1 In the Item Tab area, click [Measurement].

The edge profile of the measurement region is displayed as a graph in the Image Display area.



2 Set the value of each item in the Display position area.

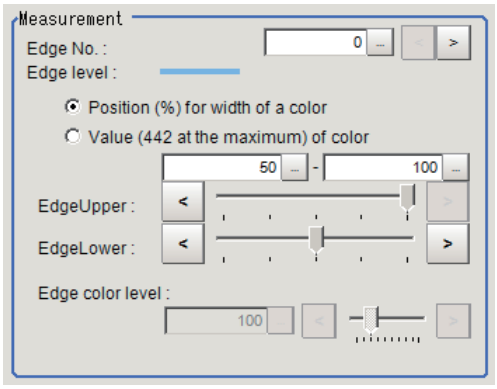


Setting item		Set value [Factory default]	Description
Sub-region No.		[0] to 3999	Specify the edge measurement number for which the edge profile is displayed.
	Enabled	• [Checked] • Unchecked	Specify enable/disable for the displayed edge measurement number. When disabled (unchecked) is specified, that edge measurement number is not measured.

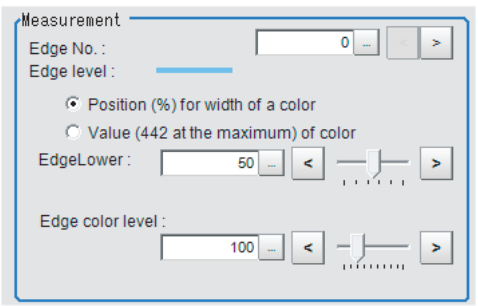
3 Set the value of each item in the "Measurement" area.

- For color cameras:

Edge Color Not Specified



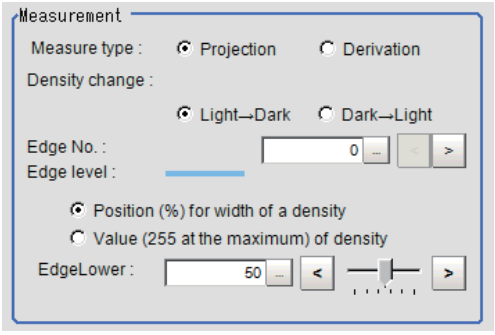
Edge Color Specified



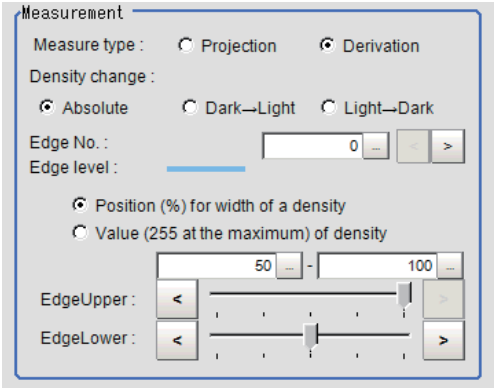
Setting item	Set value [Factory default]	Description
Edge No.	0 to 99 [0]	Specify the edge number used to extract edges. Edge numbers are assigned to detected edges starting from 0 and going on in the direction from the start point (the arrow point) to the end point (the direction of arrow) in the selected area.
Edge Upper (only when edge color is not specified) Edge Lower	• Position (%) for width of a color 0 to 100 [50] to [100] • Value of color 0 to 442 [20] to [442]	Set a range of a color difference level with which the edge is detected. For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Edge color level	0 to 442 [100]	This emphasis level can be specified only if the edge color to detect is specified.

- For monochrome cameras:

When the measurement method is "Projection"

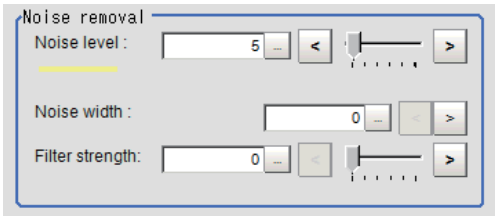


When the measurement method is "Derivation"



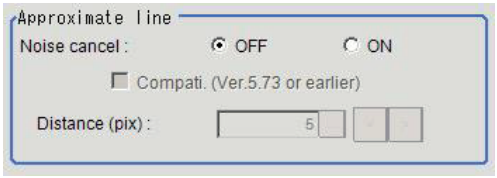
Setting item	Set value [Factory default]	Description
Measure type	• [Projection] • Derivation	As the measurement type, specify either projection or derivation. For details, refer to *Appendixes Measurement Mechanism Edge Detection Method* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Density change	• Absolute (only when the measurement method is "Derivation") • [Light→Dark] • Dark→Light	Select whether a black-to-white change or a white-to-black change should be recognized as a density change in the specified region.
Edge No.	0 to 99 [0]	Specify the edge number used to extract edges. Edge numbers are assigned to detected edges starting from 0 and going on in the direction from the start point (the arrow point) to the end point (the direction of arrow) in the selected area.
Edge Upper Edge Lower	• Position (%) for width of a density 0 to 100 [50] to [100] • Value of density 0 to 255 [20] to [255]	Select the density change level to be detected as edges. The upper limit of edges can be set only when the measurement method is "Derivation". For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 If necessary, set each item in the "Noise removal" area.



Setting item	Set value [Factory default]	Description
Noise level	0 to 442 [5]	When detection is affected by noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Level* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Noise width	0 to 9999 [0]	Set the width for judging noise. When detection is affected by noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Width* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Filter strength	0 to 100 [0]	If a valley appears in the histogram around the edge threshold value due to noises, smoothen the edge profile using a filter to prevent wrong error detection from being detected. Strengthening the filter smoothen the edge profile further.

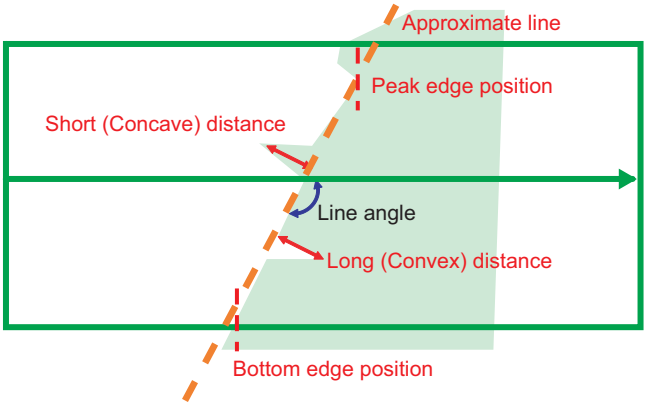
5 In the "Approximate line" area, specify the point to be used for the calculation of approximate lines.



Setting item	Set value [Factory default]	Description
Noise cancel	• ON • [OFF]	When a check is placed at [ON], an approximate line is found by excluding the points with large deviation among the measured points.
Extraction rate	0 to 100 [50]	When ”Noise cancel" is "ON" and "Compati. (Ver. 5.73 or earlier)" is checked, this is displayed. Set the ratio of measurement points used for approximate straight line calculation to all measurement points. When there is considerable noise, reducing this value enables calculation of an approximate straight line with many of the noise points removed. When there is little noise, increasing this value enables calculation of a high-accuracy straight line using many measurement points.
Distance (pix)	0 to 10,000 [5]	When "Noise cancel" is "ON" and "Compati. (Ver. 5.73 or earlier)" is unchecked, this is displayed. Sets the degree of "Noise cancel" with a distance to the approximate line.
Compati. (Ver. 5.73 or earlier)	• Checked • [Unchecked]	Sets the compatible mode for "Noise cancel". Check this when scene data before Ver. 5.73 was loaded.

2-13-6 Judgement Conditions (Scan Edge Position)

Specify the range to be judged as OK.



1 In the Item Tab area, click [Judgement].

2 Set up the judgement condition.

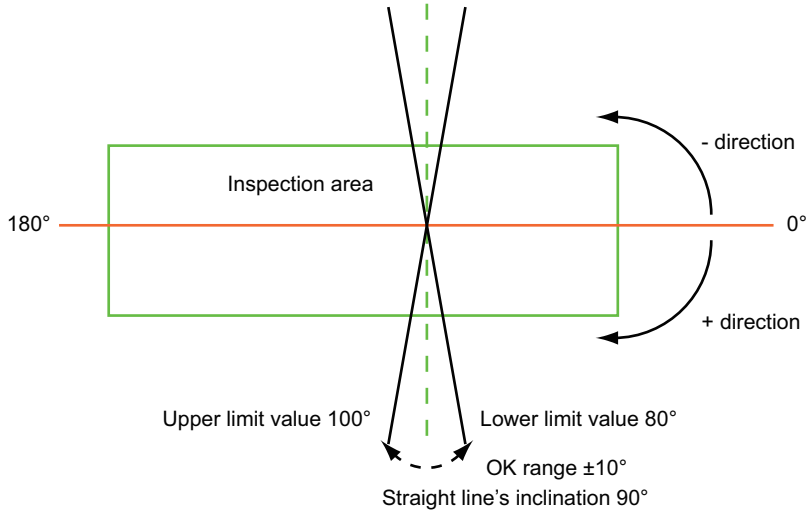
Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limits.

Setting item	Set value	Description
Peak edge position X	-99999.9999 to 99999.9999	Specify the X-axis upper and lower limits of the peak edge position X judged to be OK.
Peak edge position Y	-99999.9999 to 99999.9999	Specify the Y-axis upper and lower limits of the peak edge position Y judged to be OK.
Bottom edge position X	-99999.9999 to 99999.9999	Specify the X-axis upper and lower limits of the bottom edge position X judged to be OK.
Bottom edge position Y	-99999.9999 to 99999.9999	Specify the Y-axis upper and lower limits of the bottom edge position Y judged to be OK.
Edge position X Ave.	-99999.9999 to 99999.9999	Specify the X-axis upper and lower limits of the average edge position judged to be OK.
Edge position Y Ave.	-99999.9999 to 99999.9999	Specify the Y-axis upper and lower limits of the average edge position judged to be OK.
Long distance Max.	0 to 99999.9999	Specify the upper and lower limits of the long distance maximum judged to be OK.
Long distance Min.	0 to 99999.9999	Specify the upper and lower limits of the long distance minimum judged to be OK.
Short distance Max.	0 to 99999.9999	Specify the upper and lower limits of the short distance maximum judged to be OK.
Short distance Min.	0 to 99999.9999	Specify the upper and lower limits of the short distance minimum judged to be OK.
Deviation	0 to 99999.9999	Specify the upper and lower limits of the deviation judged to be OK.
Line angle	-180 to 180	Specify the upper and lower limits of the line angle judged to be OK.
Lost point count	0 to 100	Specify the upper and lower limits of the lost point count judged to be OK.

Additional Information

Judgement condition of the straight line's inclination
To set 90° ±10° (80° to 90°, -80° to -90°) range as OK, set the judgement condition to 80° to 100°.
The range of straight line's inclination is -89.999° to 90° Internally, the angle X of -90° to 0° is the same value as X + 180°, the angle X of 90 to 180° is the same value as X - 180°.



2-13-7 Output Parameters (Scan Edge Position)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

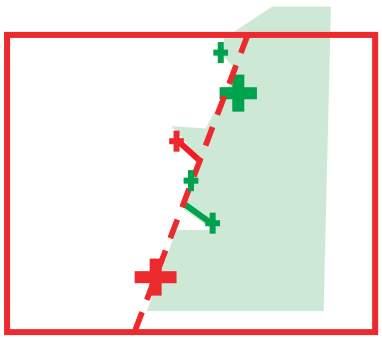
1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

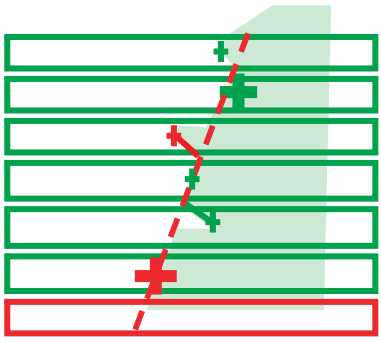
Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgment results of this processing unit is reflected in the scene overall judgment.

2-13-8 Key Points for Test Measurement and Adjustment (Scan Edge Position)

In addition to the camera input image, the measured region, a graphic display of the measured results, and the edge position (the crosshair cursor) are also displayed as results in the Image Display area.



Edge position display (Sub image 0)



Display of edge position in each divided part (Sub image 1)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Peak edge position X	X coordinate of the edge that is the furthest from the start point of the measurement region
Peak edge position Y	Y coordinate of the edge that is the furthest from the start point of the measurement region
Bottom edge position X	X coordinate of the edge that is the closest to the start point of the measurement region
Bottom edge position Y	Y coordinate of the edge that is the closest to the start point of the measurement region
Edge position X Ave.	The average of X coordinates of all the edges
Edge position Y Ave.	The average of Y coordinates of all the edges
Long distance Max.	The maximum distance between the approximate line and edge position (plus direction)
Short distance Max.	The minimum distance between the approximate line and the edge position (minus direction)
Deviation	Deviations in concavity and convexity (Value of the standard deviation for the distance of each edge point from the linear regression)
Line angle	The straight line's inclination against the measurement region
Lost point count	Number of parts for which the detection of edges has failed

The image specified in the Sub-image number in image display setting is displayed in the Image Display area.

Sub image number.	Explanation of image to be displayed
0	Measurement image
1	Scan region

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

Parameter to be adjusted	Remedy
Measurement	If the color of the edges to be detected is decided, specify the color with [Edge color]. If results are not stable even with the color specified, specify a larger value for the color variance range.
	If noise is detected as an edge, specify larger values for "Noise level" and "Noise width".

2-13-9 Measurement Results for Which Output Is Possible (Scan Edge Position)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	Judgement result
Peak edge position X	PEAKX	X coordinate of the edge that is the furthest from the start point of the measurement region
Peak edge position Y	PEAKY	Y coordinate of the edge that is the furthest from the start point of the measurement region
Bottom edge position X	BOTTOMX	X coordinate of the edge that is the closest to the start point of the measurement region
Bottom edge position Y	BOTTOMY	Y coordinate of the edge that is the closest to the start point of the measurement region
Edge position X Ave.	X	The average of X coordinates of all the edges
Edge position Y Ave.	Y	The average of Y coordinates of all the edges
Reference coordinate	SX	X coordinate of the reference coordinates
Reference coordinate	SY	Y coordinate of the reference coordinates
Long distance Max.	PMAXD	The maximum distance between the approximate line and edge position (plus direction)
Long distance Min.	PMIND	The minimum distance between the approximate line and the edge position (plus direction)
Short distance Max.	BMAXD	The maximum distance between the approximate line and the edge position (minus direction)
Short distance Min.	BMIND	The minimum distance between the approximate line and the edge position (minus direction)
Deviation	DEV	Deviations in concavity and convexity
Angle	TH	The straight line's inclination against the measurement region
Lost point count	LOST	Number of parts for which the detection of edges has failed
Line Param. A	A	A in the expression for the approximate line AX + BY + C = 0.
Line Param. B	B	B in the expression for the approximate line AX + BY + C = 0.
Line Param. C	C	C in the expression for the approximate line AX + BY + C = 0.

2-13-10 External Reference Tables (Scan Edge Position)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
1	Peak edge position X	peakEdgePosX	Get only	-99,999.9999 to 99,999.9999
2	Peak edge position Y	peakEdgePosY	Get only	-99,999.9999 to 99,999.9999
3	Bottom edge position X	bottomEdgePosX	Get only	-99,999.9999 to 99,999.9999
4	Bottom edge position Y	bottomEdgePosY	Get only	-99,999.9999 to 99,999.9999
5	Edge position X Ave.	aveEdgePosX	Get only	-99,999.9999 to 99,999.9999
6	Edge position Y Ave.	aveEdgePosY	Get only	-99,999.9999 to 99,999.9999
7	Long distance Max.	maxPeakDist	Get only	-1 to 99,999.9999
8	Long distance Min.	minPeakDist	Get only	-1 to 99,999.9999
9	Short distance Max.	maxBottomDist	Get only	-1 to 99,999.9999
10	Short distance Min.	minBottomDist	Get only	-1 to 99,999.9999
11	Deviation	deviation	Get only	-1 to 99,999.9999
12	Angle	lineAngle	Get only	-180 to 180
13	Lost point	lostPoint	Get only	0 to 4,000
14	Linear coefficient A	coefficientA	Get only	-99,999.9999 to 99,999.9999
15	Linear coefficient B	coefficientB	Get only	-99,999.9999 to 99,999.9999
16	Linear coefficient C	coefficientC	Get only	-99,999.9999 to 99,999.9999
17	Reference X *1	referenceX	Get only	0 to 99,999.9999
18	Reference Y *1	referenceY	Get only	0 to 99,999.9999
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Edge color specification	colorSpecification	Set/Get	0: OFF 1: ON
121	Edge color R	colorR	Set/Get	0 to 255
122	Edge color G	colorG	Set/Get	0 to 255
123	Edge color B	colorB	Set/Get	0 to 255
124	Difference R	colorDevR	Set/Get	0 to 127
125	Difference G	colorDevG	Set/Get	0 to 127
126	Difference B	colorDevB	Set/Get	0 to 127
127	Detection mode	detectionMode	Set/Get	0: Color IN 1: Color OUT
129	Reference X *2	referencePosX	Set/Get	0 to 99,999.9999
130	Reference Y *2	referencePosY	Set/Get	0 to 99,999.9999
131	Edge No.	edgeNo	Set/Get	0 to 99
132	Edge level Lower limit	edgeLevel	Set/Get	0 to 100
133	Noise level	noiseLevel	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255

No.	Data name	Ident	Set/Get	Data range
134	Noise width	noiseWidth	Set/Get	0 to 9,999
135	Edge color level	colorLevel	Set/Get	0 to 442
136	Upper limit of the peak edge position X	upperPeakX	Set/Get	-99,999.9999 to 99,999.9999
137	Lower limit of the peak edge position X	lowerPeakX	Set/Get	-99,999.9999 to 99,999.9999
138	Upper limit of the peak edge position Y	upperPeakY	Set/Get	-99,999.9999 to 99,999.9999
139	Lower limit of the peak edge position Y	lowerPeakY	Set/Get	-99,999.9999 to 99,999.9999
140	Upper limit of the bottom edge position X	upperBottomX	Set/Get	-99,999.9999 to 99,999.9999
141	Lower limit of the bottom edge position X	lowerBottomX	Set/Get	-99,999.9999 to 99,999.9999
142	Upper limit of the bottom edge position Y	upperBottomY	Set/Get	-99,999.9999 to 99,999.9999
143	Lower limit of the bottom edge position Y	lowerBottomY	Set/Get	-99,999.9999 to 99,999.9999
144	Upper limit of the edge position X Ave.	upperAveEdgePosX	Set/Get	-99,999.9999 to 99,999.9999
145	Lower limit of the edge position X Ave.	lowerAveEdgePosX	Set/Get	-99,999.9999 to 99,999.9999
146	Upper limit of the edge position Y Ave.	upperAveEdgePosY	Set/Get	-99,999.9999 to 99,999.9999
147	Lower limit of the edge position Y Ave.	lowerAveEdgePosY	Set/Get	-99,999.9999 to 99,999.9999
148	Upper limit of the long distance Max.	upperMaxPeakDist	Set/Get	0 to 99,999.9999
149	Lower limit of the long distance Max.	lowerMaxPeakDist	Set/Get	0 to 99,999.9999
150	Upper limit of the short distance Max.	upperMaxBottomDist	Set/Get	0 to 99,999.9999
151	Lower limit of the short distance Max.	lowerMaxBottomDist	Set/Get	0 to 99,999.9999
152	Upper limit of the deviation	upperDeviation	Set/Get	0 to 99,999.9999
153	Lower limit of the deviation	lowerDeviation	Set/Get	0 to 99,999.9999
154	Upper limit of the angle	upperAngle	Set/Get	-180 to 180
155	Lower limit of the angle	lowerAngle	Set/Get	-180 to 180
156	Upper limit of the lost point	upperLostPoint	Set/Get	0 to 4,000
157	Lower limit of the lost point	lowerLostPoint	Set/Get	0 to 4,000
158	Monochrome edge detection mode	monoDetectMode	Set/Get	0: Light → Dark 1: Dark → Light
159	Edge level Lower limit absolute value	edgeLevelAbs	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
160	Edge level specification method	edgeLevelKind	Set/Get	0: % 1: Absolute value
162	Scan sub-region	scanLines	Set/Get	1 to 4,000
163	Mask size (Filter size)	scanWidth	Set/Get	0 to 200
164	Display area	displayRegion	Set/Get	0 to 3,999
165	Noise cancel	noisePointCut	Set/Get	0: OFF 1: ON
166	Measure type	measureType	Set/Get	0: Projection 1: Derivation

No.	Data name	Ident	Set/Get	Data range
167	Fix region count	separateType	Set/Get	0: Not fixed 1: Fixed
168	Edge level upper limit *3	edgeLevelUpper	Set/Get	0 to 100
169	Edge level upper limit absolute value *4	edgeLevelUpperAbs	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
170	Monochrome Derivation edge detection mode	diffDetectMode	Set/Get	0: Absolute 1: Dark → Light 2: Light → Dark
171	FNC Rate	fncRate	Set/Get	0 to 100
173	Distance	inlierDist	Set/Get	0 to 10,000
174	Compatibility mode (Ver.5.73 or earlier)	compMode	Set/Get	0: OFF 1: ON
177	Filter Strength	filterStrength	Set/Get	0 to 100
178	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
179	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit
180	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
181	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999
182	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
10100+N (N: 0 to 3,999)	Enable/disable region	area_enabled	Set/Get	0: Disabled 1: Enabled
30000+N (N: 0 to 3,999)	Edge Position X	edgePosX	Get only	-99,999.9999 to 99,999.9999
40000+N (N: 0 to 3,999)	Edge Position Y	edgePosY	Get only	-99,999.9999 to 99,999.9999
90000	figure0 Count	figArea0_count	Set/Get	0 to 1
90001	figure0 Type	figArea0_fig0_type	Set/Get	4: Wide line
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90009	figure0 Wide line Start point X	figArea0_fig0_lineW_X0	Set/Get	-99,999 to 99,999
90010	figure0 Wide line Start point Y	figArea0_fig0_lineW_Y0	Set/Get	-99,999 to 99,999
90011	figure0 Wide line End point X	figArea0_fig0_lineW_X1	Set/Get	-99,999 to 99,999
90012	figure0 Wide line End point Y	figArea0_fig0_lineW_Y1	Set/Get	-99,999 to 99,999
90013	figure0 Wide line Width	figArea0_fig0_lineW_W	Set/Get	0 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

*1. The reference coordinates based on the selection in the Method area of the [Ref.setting] tab can be Get only.

*2. The reference coordinates based on the selection of Numerical in the Method area of the [Ref.setting] tab can be Set/Get.

*3. On the [Measurement] tab of the Properties Dialog Box, this data is displayed as [Edge Upper] when you choose the [Position (%) for width of a color].

*4. On the [Measurement] tab of the Properties Dialog Box, this data is displayed as [Edge Upper] when you choose the [Value (442 at the maximum) of color].

2-14 Scan Edge Width

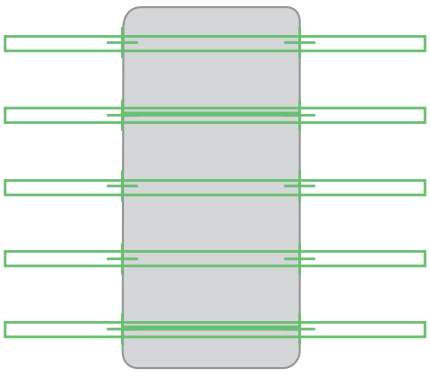
This processing item detects the position of the measurement object by using the change in color within the measurement region. By dividing the measurement region, you can get the following values.

- Local width of the work
- Average width of the work

Used in the Following Case

- When getting several widths of a measurement object

Example) Width inspection of a finished product



Searches the edge by the change in color within the measurement region.
The edge can be detected by specifying the color to be detected.

- To find the width of a measurement object

  Using a Expression, the width of a measurement object can be calculated from the difference between two edge positions.

Important

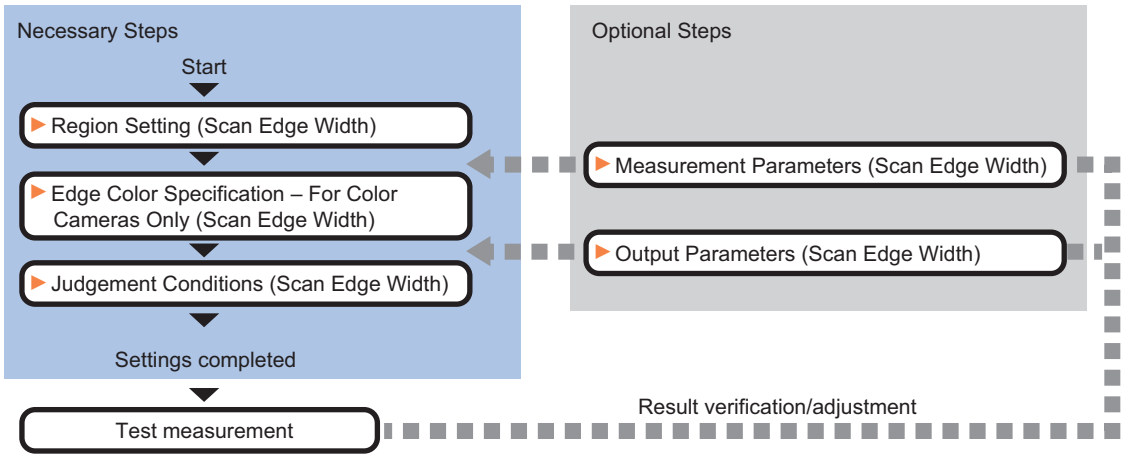
Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

Additional Information

Edge image measurement processing mechanism
For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

2-14-1 Settings Flow (Scan Edge Width)

Set the scan edge width with the following steps.



Item List for Scan Edge Width

Item name	Description
Region setting	This item is used to set up the measurement area. Refer to *2-14-2 Region Setting (Scan Edge Width)* on page 2-191.
Edge color (for color cameras only)	This item selects the color information for the edges to be detected. Refer to *2-14-3 Edge Color Specification - For Color Cameras Only (Scan Edge Width)* on page 2-193.
Measurement	This item changes the measurement parameter as necessary when the measurement result is unstable. The displayed items depend on whether your camera is a color or monochrome camera. Normally, the factory default value will be used. Refer to *2-14-4 Measurement Parameters (Scan Edge Width)* on page 2-194.
Judgement	This item specifies the judgement condition for measurement results. Refer to *2-14-5 Judgement Conditions (Scan Edge Width)* on page 2-196.
Output parameter	This item can be changed if necessary. Normally, the factory default value may be used. Select the measurement result coordinates and set how to handle the coordinates. Refer to *2-14-6 Output Parameters (Scan Edge Width)* on page 2-197.

2-14-2 Region Setting (Scan Edge Width)

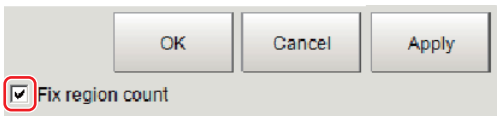
This item is used to set up the measurement area.

Specify the measurement region of [Scan Edge Width] by using a wide line.

1 In the Item Tab area, click [Region setting].

2 Use the Drawing tools to specify the measurement region.

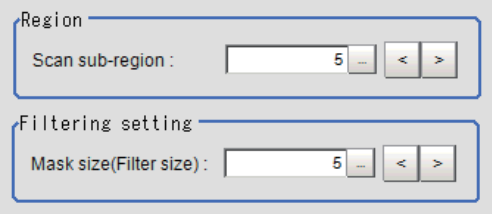
To align with the measurement area and change the number of measurement points, uncheck this.



3 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

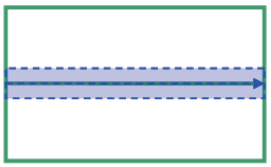
4 Set the measurement point and the filter size for the region.



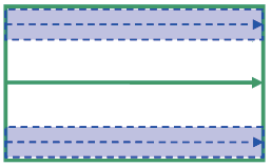
Setting item	Set value [Factory default]	Description
Scan sub-region	1 to 100 [5]	Set the measurement point for the region.
Mask size	1 to 200 0 to 200 [5]	Set the filter size when smoothing the measurement point vicinity. When 5 is set, smoothing is processed for a total of 11 points: the measurement point and the 5 pixels before and after it.

5 The region is divided equally.

The scan region, when the number of measurement points is 1



The scan region, when the number of measurement points is 2

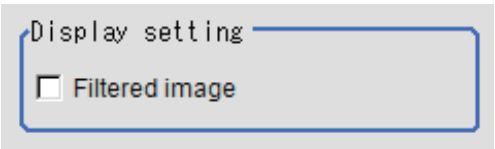


The scan region, when the number of measurement points is 3

The scan region, when the number of measurement points is 4

6 Perform the display setting if required.

Placing a check at [Filtered image] makes it easier to change the filtering setting.



Setting item	Set value [Factory default]	Description
Filtered image	• [Unchecked] • Checked	If checked, the filtered image of the ranges set with the Scan sub-region and Filter size after smoothing is displayed.

Additional Information

You can specify enable/disable for each edge measurement number. Clicking edge measurement points displays the following screen.

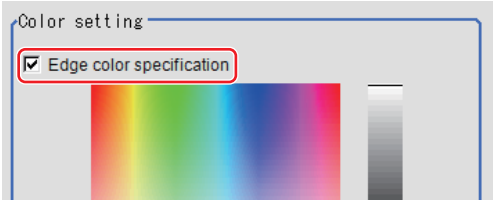
2-14-3 Edge Color Specification - For Color Cameras Only (Scan Edge Width)

This item selects the color of the edges to be detected.

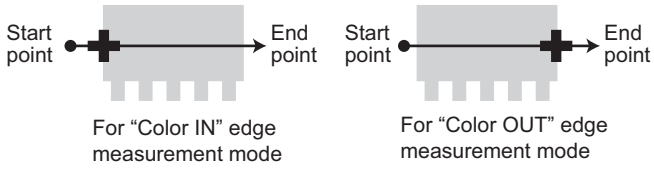
If the target color changes, this setting is not necessary. If the color is not specified, positions in the measurement region where the color changes drastically are detected as an edge.

1 In the Item Tab area, click [Edge color].

2 Place a check at "Edge color specification" in the "Color setting" area.



3 This item selects the color to be detected as edges.

Setting methods	Description
Image Display area	Specify a region on the image that includes the target color. The average color of the specified region is registered.
Color chart	Click the reference color on the color chart to specify it. The RGB values for the specified color are displayed at the bottom.
R, G, B	The color to be detected is set with the RGB values.
Difference R, G, B	This sets the allowable color difference for detecting the edge, using the specified color as the reference. The larger the difference values, the larger the color range that is used to detect the edge.
Detection mode	Color IN: The position where a color other than the specified color changes to the specified color is detected as the edge. Color OUT: The position where the specified color changes to a color other than the specified color is detected as the edge. 

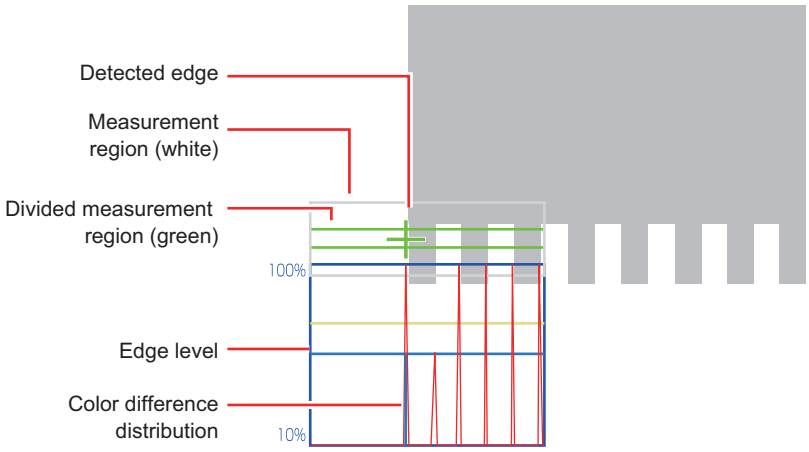
2-14-4 Measurement Parameters (Scan Edge Width)

Measurement parameters can be changed as needed to address unstable measurement results. Normally, the factory default value will be used.

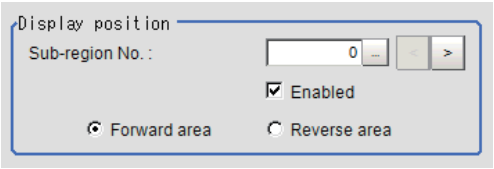
After changing a setting, check whether measurement can be done properly by performing an actual measurement.

1 In the Item Tab area, click [Measurement].

The edge profile of the measurement region is displayed as a graph in the Image Display area.



2 You can specify enable/disable for each edge measurement number.

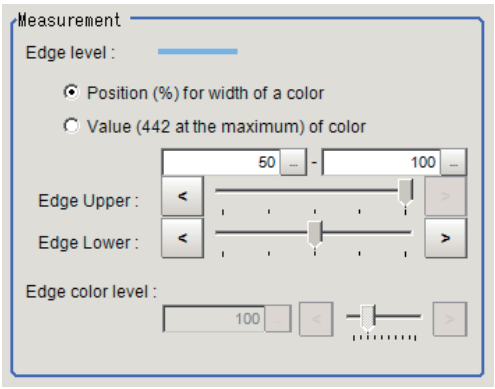


Setting item		Set value [Factory default]	Description
Sub-region No.		[0] to 99	Set the edge measurement number for which the edge profile is displayed.
	Enabled	• [Checked] • Unchecked	Specify enable/disable for the displayed edge measurement number. When disabled (unchecked) is specified, measurement is not performed.
		• [Forward area] • Reverse area	Forward area: The edge is searched for from the start point of the area toward the end point. Reverse area: The edge is searched for from the end point of the area toward the start point.

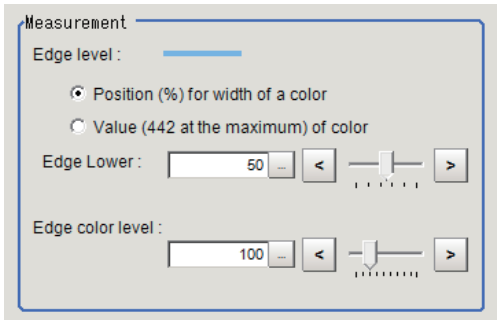
3 Set the value of each item in the "Measurement" area.

- For color cameras:

Edge color specification is OFF.



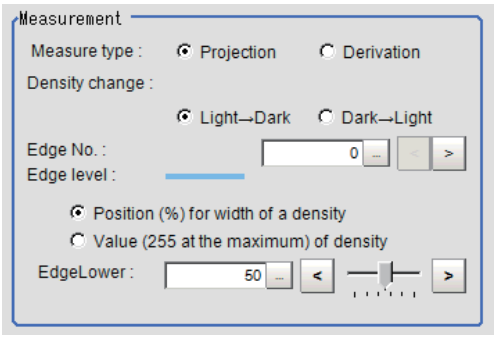
Edge color specification is ON.



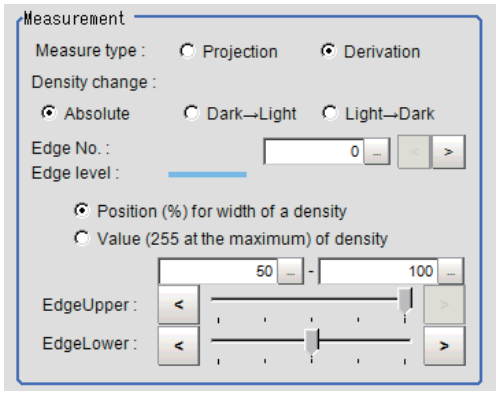
Setting item	Set value [Factory default]	Description
Edge Upper Edge Lower	• Position (%) for width of a color 0 to 100 [50] to [100] • Value of color 0 to 442 [20] to [442]	Set a range of a color difference level with which the edge is detected. For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Edge color level	0 to 442 [100]	This emphasis level can be specified only if the edge color to detect is specified.

- For monochrome cameras:

When the measurement method is "Projection"



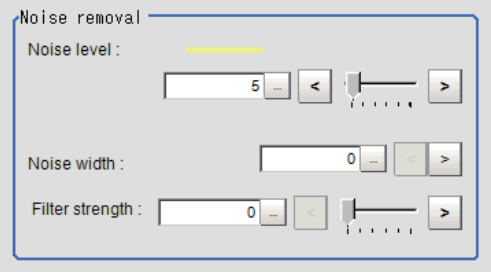
When the measurement method is "Derivation"



Setting item	Set value [Factory default]	Description
Measure type	• [Projection] • Derivation	As the measurement type, specify either projection or derivation. For details, refer to *Appendixes Measurement Mechanism Edge Detection Method* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

Setting item	Set value [Factory default]	Description
Density change	• Absolute (only when the measurement method is "Derivation") • [Light→Dark] • Dark→Light	Select whether a black-to-white change or a white-to-black change should be recognized as a density change in the specified region.
Edge Upper Edge Lower	• Position (%) for width of a density 0 to 100 [50] to [100] • Value of density 0 to 255 [20] to [255]	Select the density change level to be detected as edges. The upper limit of edges can be set only when the measurement method is "Derivation". For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 If necessary, set each item in the "Noise removal" area.



Setting item	Set value [Factory default]	Description
Noise level	0 to 442 [5]	When detection is affected by noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Level* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Noise width	0 to 9999 [0]	Set the width for judging noise. When detection is affected by noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Width* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Filter strength	0 to 100 [0]	If a valley appears in the histogram around the edge threshold value due to noises, smoothen the edge profile using a filter to prevent wrong error detection from being detected. Strengthening the filter smoothen the edge profile further.

2-14-5 Judgement Conditions (Scan Edge Width)

Specify the range to be judged as OK.

1 In the Item Tab area click [Judgement].

2 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

Setting item	Set value	Description
Edge width Max.	0 to 99999.9999	Specify the upper and lower limits of the maximum width judged to be OK.
Edge width Min.	0 to 99999.9999	Specify the upper and lower limits of the minimum width judged to be OK.
Edge width Ave.	0 to 99999.9999	Specify the upper and lower limits of the average width judged to be OK.
Lost width count	0 to 100	Specify the upper and lower limits of the lost width count judged to be OK.

2-14-6 Output Parameters (Scan Edge Width)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position deflection correction is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-14-7 Key Points for Test Measurement and Adjustment (Scan Edge Width)

The following contents can be displayed as text in the "Detail result" area.

Displayed items	Description
Judge	Judgement result
Edge width Max.	The maximum value of edge width
Edge width Min.	The minimum value of edge width
Edge width Ave.	The average value of all the edge width
Lost width count	The number of the scanned areas for which the detection of width failed

The image specified in the Sub-image number in image display setting is displayed in the Image Display area.

Sub image number	Explanation of image to be displayed
0	Measurement image
1	Scan region

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

Parameter to be adjusted	Remedy
Measurement	If the color of the edges to be detected is decided, specify the color with [Edge color]. If results are not stable even with the color specified, specify a larger value for the color variance range.
	If noise is detected as an edge, specify larger values for "Noise level" and "Noise width".

2-14-8 Measurement Results for Which Output Is Possible (Scan Edge Width)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Edge width Max.	MAXW	The maximum value of edge width
Edge width Min.	MINW	The minimum value of edge width
Edge width Ave.	AVEW	The average value of all the edge width
Lost width count	LOST	The number of the scanned areas for which the detection of width failed

2-14-9 External Reference Tables (Scan Edge Width)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
1	Edge width Max.	width_max	Get only	0 to 99,999.9999
2	Edge width Min.	width_min	Get only	0 to 99,999.9999
3	Edge width Ave.	width_ave	Get only	0 to 99,999.9999
4	Lostwidth	lostPoint	Get only	0 to 4,000
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Edge color specification	colorSpecification	Set/Get	0: OFF 1: ON
121	Edge color R	colorR	Set/Get	0 to 255
122	Edge color G	colorG	Set/Get	0 to 255
123	Edge color B	colorB	Set/Get	0 to 255
124	Difference R	colorDevR	Set/Get	0 to 127
125	Difference G	colorDevG	Set/Get	0 to 127
126	Difference B	colorDevB	Set/Get	0 to 127
127	Detection mode	detectionMode	Set/Get	0: Color IN 1: Color OUT
129	Edge Level Lower limit	edgeLevel	Set/Get	0 to 100
130	Noise level	noiseLevel	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
131	Noise width	noiseWidth	Set/Get	0 to 9,999
132	Edge color level	colorLevel	Set/Get	0 to 442
133	Upper limit of the Max. width	upperMaxWidth	Set/Get	0 to 99,999.9999
134	Lower limit of the Max. width	lowerMaxWidth	Set/Get	0 to 99,999.9999
135	Upper limit of the Min.width	upperMinWidth	Set/Get	0 to 99,999.9999
136	Lower limit of the Min.width	lowerMinWidth	Set/Get	0 to 99,999.9999
137	Upper limit of the average width	upperAveWidth	Set/Get	0 to 99,999.9999
138	Lower limit of the average width	lowerAveWidth	Set/Get	0 to 99,999.9999
139	Upper limit of the lostwidth	upperLostPoint	Set/Get	0 to 4,000
140	Lower limit of the lostwidth	lowerLostPoint	Set/Get	0 to 4,000
141	Monochrome edge detection mode	monoDetectMode	Set/Get	0: Light → Dark 1: Dark → Light

No.	Data name	Ident	Set/Get	Data range
142	Edge level Lower limit absolute value	edgeLevelAbs	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
143	Edge level specification method	edgeLevelKind	Set/Get	0: % 1: Absolute value
145	Scan sub-region	scanLines	Set/Get	1 to 4,000
146	Mask size (Filter size)	scanWidth	Set/Get	0 to 200
149	Measure type	measureType	Set/Get	0: Projection 1: Derivation
150	Fix region count	separateType	Set/Get	0: Not fixed 1: Fixed
151	Monochrome Derivation edge detection mode	diffDetectMode	Set/Get	0: Absolute 1: Dark → Light 2: Light → Dark
152	Edge level upper limit *1	edgeLevelUpper	Set/Get	0 to 100
153	Edge level upper limit absolute value *2	edgeLevelUpperAbs	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
154	Filter Strength	filterStrength	Set/Get	0 to 100
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
10100+N (N: 0 to 3,999)	Enable/disable region	area_enabled	Set/Get	0: Disabled 1: Enabled
30000+N (N: 0 to 3,999)	Start Edge Position X	SedgePosX	Get only	-99,999.9999 to 99,999.9999
40000+N (N: 0 to 3,999)	Start Edge Position Y	SedgePosY	Get only	-99,999.9999 to 99,999.9999
50000+N (N: 0 to 3,999)	End Edge Position X	EedgePosX	Get only	-99,999.9999 to 99,999.9999
60000+N (N: 0 to 3,999)	End Edge Position Y	EedgePosY	Get only	-99,999.9999 to 99,999.9999
90000	figure0 Count	figArea0_count	Set/Get	0 to 1
90001	figure0 Type	figArea0_fig0_type	Set/Get	4: Wide line
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90009	figure0 Wide line Start point X	figArea0_- fig0_lineW_X0	Set/Get	-99,999 to 99,999
90010	figure0 Wide line Start point Y	figArea0_- fig0_lineW_Y0	Set/Get	-99,999 to 99,999
90011	figure0 Wide line End point X	figArea0_- fig0_lineW_X1	Set/Get	-99,999 to 99,999
90012	figure0 Wide line End point Y	figArea0_- fig0_lineW_Y1	Set/Get	-99,999 to 99,999
90013	figure0 Wide line Width	figArea0_- fig0_lineW_W	Set/Get	0 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

*1. On the [Measurement] tab of the Properties Dialog Box, this data is displayed as [Edge Upper] when you choose the [Position (%) for width of a color].

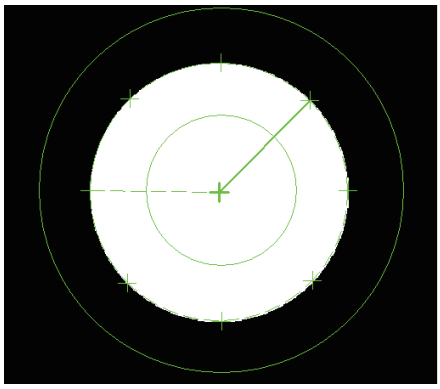
*2. On the [Measurement] tab of the Properties Dialog Box, this data is displayed as [Edge Upper] when you choose the [Value (442 at the maximum) of color].

2-15 Circular Scan Edge Position

This processing item detects the position of the circular measurement object by using the change in color within the measurement region.

Used in the Following Case

To obtain the center of the circle and the radius from multiple edges of a circular measurement object



Searches the edge with the change in color within the measurement region.
The edge can be detected by specifying the color to be detected.

Important

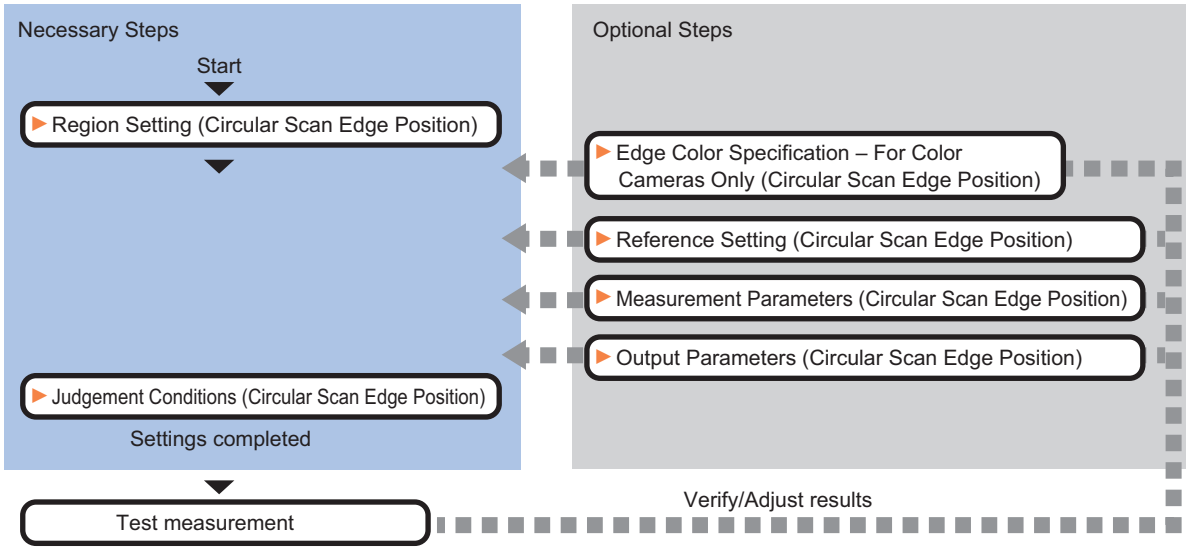
Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

Additional Information

Edge image measurement processing mechanism
For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

2-15-1 Settings Flow (Circular Scan Edge Position)

Set the circular scan edge position with the following steps.



Item List for Circular Scan Edge Position

Item name	Description
Region setting	This item is used to set up the measurement area. Refer to *2-15-2 Region Setting (Circular Scan Edge Position)* on page 2-203.
Edge color (for color cameras only)	If the color of the edges to be detected is decided, specify the information for the edge color to be detected. Refer to *2-15-3 Edge Color Specification - For Color Cameras Only (Circular Scan Edge Position)* on page 2-204.
Ref. setting	This item can be changed if necessary. The edge position measured once is registered when the region is set. Refer to *2-15-4 Reference Setting (Circular Scan Edge Position)* on page 2-205.
Measurement	This item changes the measurement parameter as necessary when the measurement result is unstable. The displayed items depend on whether your camera is a color or monochrome camera. Normally, the factory default value will be used. Refer to *2-15-5 Measurement Parameters (Circular Scan Edge Position)* on page 2-206.
Judgement	This item specifies the judgement condition for measurement results. Refer to *2-15-6 Judgment Conditions (Circular Scan Edge Position)* on page 2-209.
Output parameter	This item can be changed if necessary. Normally, the factory default value may be used. Select the measurement result coordinates and set how to handle the coordinates. Refer to *2-15-7 Output Parameters (Circular Scan Edge Position)* on page 2-211.

2-15-2 Region Setting (Circular Scan Edge Position)

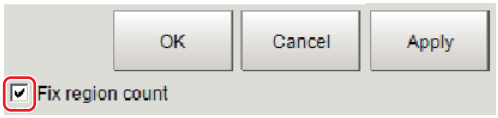
This item is used to set up the measurement area.

Specify the measurement region for [Circular Scan Edge Position] by using circular or wide arc shapes.

1 In the Item Tab area, click [Region setting].

2 Use the Drawing tools to specify the measurement region.

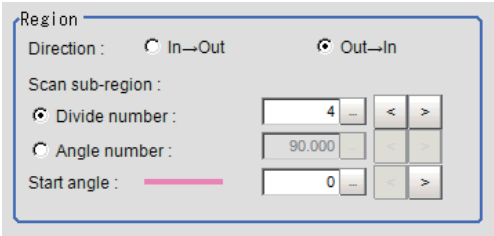
To align with the measurement area and specify the measurement point again, uncheck "Fix region count".



3 Click [OK] in the Figure setting area.

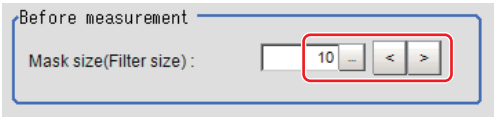
- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

4 Specify the method of measurement, the measurement point, and the start angle for the region.



Setting item		Set value [Factory default]	Description
Direction		• [Out→In] • In→Out	Set the measurement direction.
Scan sub-region			Set the measurement point. Use either the "Divide num" or the "Divide angle" for this setting.
	Divide number	3 to 360 [4]	Set the number of divisions for the circle. The specified value is used as the measurement point.
	Angle number	1.000 to 179.999 [90.000]	Set the skipping angle for the circle. The measurement point is determined based on the specified angle.
Start angle		0 to 359 [0]	Set the start angle to specify a region.

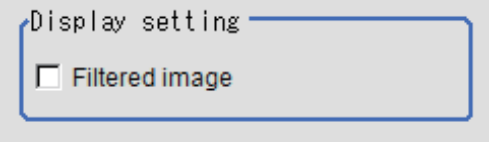
5 Set the mask size for the region.



Setting item	Set value [Factory default]	Description
Mask size	0 to 1000 [10]	Set the filter size when smoothing the measurement point vicinity. When 5 is set, smoothing is processed for a total of 11 points: the measurement point and the 5 pixels before and after it.

6 Perform the display setting if required.

Placing a check at [Filtered image] makes it easier to change the filtering setting.



Setting item	Set value [Factory default]	Description
Filtered image	• [Unchecked] • Checked	If checked, the filtered image of the ranges set with the Scan sub-region and Filter size after smoothing is displayed.

Additional Information

Enable or disable setting can be specified for each edge measurement number. Clicking edge measurement points displays the following screen.

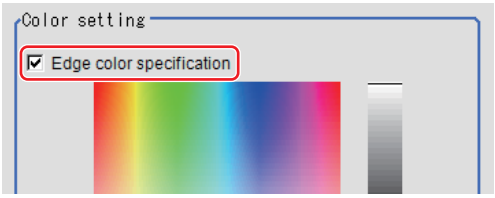
2-15-3 Edge Color Specification - For Color Cameras Only (Circular Scan Edge Position)

This item selects the color of the edges to be detected.

If the target color changes, this setting is not necessary. If the color is not specified, positions in the measurement region where the color changes drastically are detected as an edge.

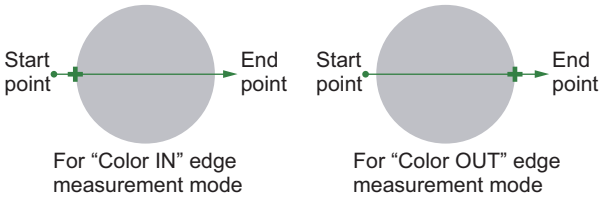
1 In the Item Tab area, click [Edge color].

2 Place a check at "Edge color specification" in the "Color setting" area.



3 This item selects the color to be detected as edges.

Item	Set value [Factory default]	Description
Image Display area	---	Specify a region on the image that includes the target color. The average color of the specified region is registered.
Color chart	---	Click the reference color on the color chart to specify it. The RGB values for the specified color are displayed at the bottom.
R, G, B	0 to 255 [255]	The color to be detected is set with the RGB values.
Difference R, G, B	0 to 127 [5]	This sets the allowable color difference for detecting the edge, using the specified color as the reference. The larger the difference values, the larger the color range that is used to detect the edge.

Item	Set value [Factory default]	Description
Detection mode	• [Color IN] • Color OUT	Color IN: The position where a color other than the specified color changes to the specified color is detected as the edge. Color OUT: The position where the specified color changes to a color other than the specified color is detected as the edge. 

2-15-4 Reference Setting (Circular Scan Edge Position)

When the measurement region is set, this position is automatically set at the same time as the reference position. This item can be used to change the reference position to any desired position. This is handy for measuring the position deviation from a certain position.

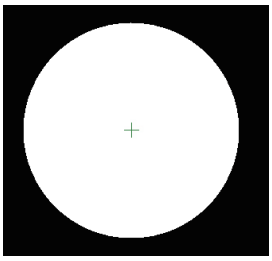
A reference position can be set either directly or by referencing a unit.

Specifying directly

Click a position on the image you want to use as a reference position, or set coordinate data for that point.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.



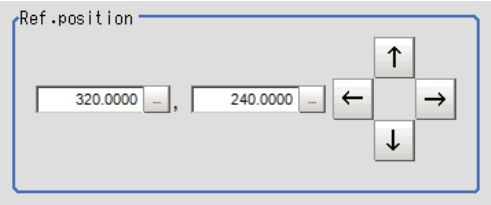
2 In the "Method" area, select "Numerical".

3 Click the position to be set as the reference.

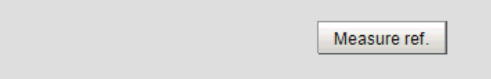
Additional Information

Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

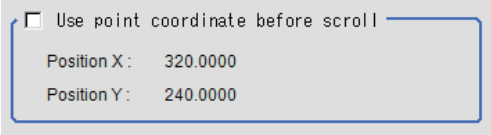
4 Make fine adjustments using numeric value inputs or the arrow buttons as required.



5 To remeasure on the displayed image and set the reference, click the [Measure ref.] button.



6 To use data before position compensation for the reference setting coordinates, place a check at "Use point coordinate before scroll".



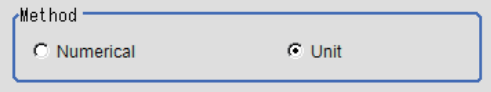
Referencing a unit

Set a reference by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

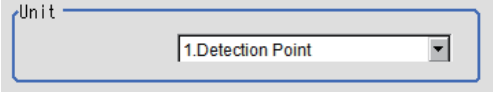
1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".



3 In the scene in the "Unit" area, select a detection point unit.



4 Perform the next measurement, and the reference will be displayed.

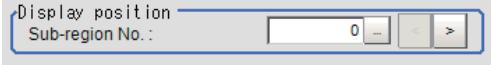
2-15-5 Measurement Parameters (Circular Scan Edge Position)

Measurement parameters can be changed as needed to address unstable measurement results. Normally, the factory default value will be used.

After changing a setting, check whether measurement can be done properly by performing an actual measurement.

1 In the Item Tab area, click [Measurement].

The edge profile of the measurement region is displayed as a graph in the Image Display area.

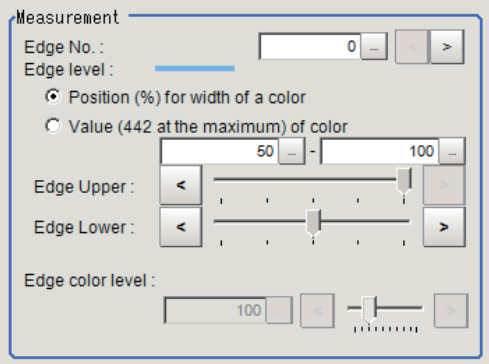


Setting item	Set value [Factory default]	Description
Sub-region No.	0 to 359 [0]	Specify the edge measurement number for which the edge profile is displayed.

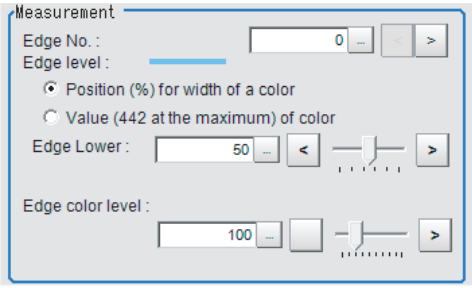
2 Set the value of each item in the "Measurement" area.

- For color cameras:

Edge Color Not Specified



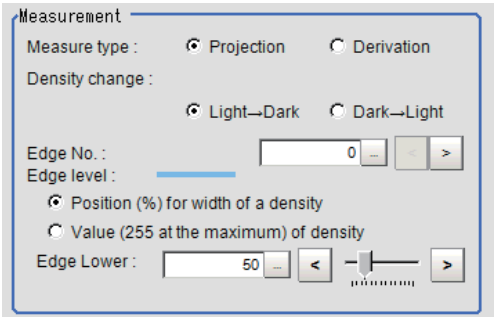
Edge Color Specified



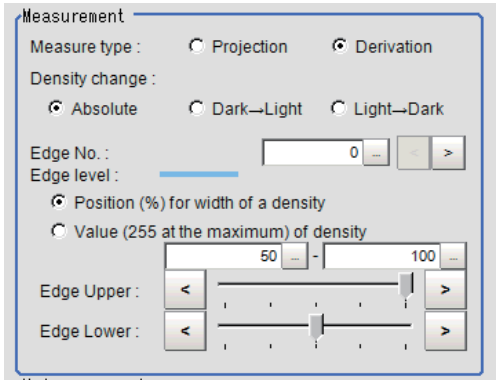
Setting item	Set value [Factory default]	Description
Edge No.	0 to 99 [0]	Specify the edge number used to extract edges. Edge numbers are assigned to detected edges starting from 0 and in the direction from the start point (the arrow) to the end point (the arrow point) in the selected region.
Edge Upper (only when edge color is not specified) Edge Lower	• Position (%) for width of a color 0 to 100 [50] to [100] • Value of color 0 to 442 [20] to [442]	Set a range of a color difference level with which the edge is detected. For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Edge color level	0 to 442 [100]	This emphasis level can be set only if the edge color to detect is specified.

- For monochrome cameras:

When the measurement method is "Projection"

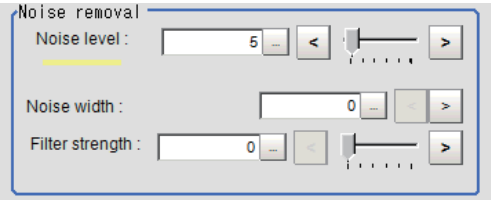


When the measurement method is "Derivation"



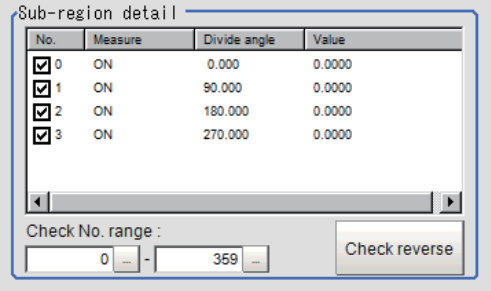
Setting item	Set value [Factory default]	Description
Measure type	• [Projection] • Derivation	As the measurement type, specify either projection or derivation. For details, refer to *Appendixes Measurement Mechanism Edge Detection Method* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Density change	• Absolute (only when the measurement method is "Derivation") • [Light→Dark] • Dark→Light	Set whether a black-to-white change or a white-to-black change should be recognized as a density change in the specified region.
Edge No.	0 to 99 [0]	Specify the edge number used to extract edges. Edge numbers are assigned to detected edges starting from 0 and in the direction from the start point (the arrow) to the end point (the arrow point) in the selected region.
Edge Upper Edge Lower	• Position (%) for width of a density 0 to 100 [50] to [100] • Value of density 0 to 255 [20] to [255]	Set the density change level to be detected as edges. The upper limit of edges can be set only when the measurement method is "Derivation". For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

3 If necessary, set each item in the "Noise removal" area.



Setting item	Set value [Factory default]	Description
Noise level	• For color cameras 3 to 442 [5] • For monochrome cameras 0 to 255 [5]	When detection is affected by noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Level* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Noise width	0 to 9999 [0]	Set the width for judging noise. When detection is affected by noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Width* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Filter strength	0 to 100 [0]	If a valley appears in the histogram around the edge threshold value due to noises, smoothen the edge profile using a filter to prevent wrong error detection from being detected. Strengthening the filter smoothen the edge profile further.

4 In the "Sub-region detail" area, set enable or disable measurement as required.



Setting item	Set value [Factory default]	Description
Check No. range	0 to 359 [0] to [359]	Specify the edge measurement number for which to perform batch reversing of the enable or disable measurement setting. Click [Check reverse] to reverse the check box settings of the edge measurement number within the range.

2-15-6 Judgment Conditions (Circular Scan Edge Position)

Specify the range to be judged as OK.

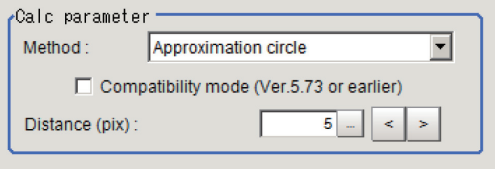
1 In the circle calculation parameter, set the calculation method as required.

Setting item	Set value [Factory default]	Description
Calc parameter	• [Approximation circle] • Smallest enclosing circle • [Fast] • Precision	Specify the circle calculation method. When the calculation from the smallest enclosing circle is selected, specify fast speed or high precision. • Circular Regression: The circle is calculated with the least square method. • Smallest enclosing circle (Fast): A circle that encloses all points is calculated. • Smallest enclosing circle (High precision): A circle that encloses all points and that circumscribes three points is calculated.
Removed area num	0 to 3600 [0]	Set the number of regions to remove. The differences from the circular regression calculated from all measurement points are eliminated in the order of the largest to the smallest. *1
Compatibility mode (Ver. 5.73 or earlier)	• Checked • [Unchecked]	Set compatibility mode. Check this item when Scene data with Ver. 5.73 or earlier was loaded.
Distance (pix)	0 to 10,000 [5]	Specify the degree of “Noise cancel” with a distance to the approximation circle. *2

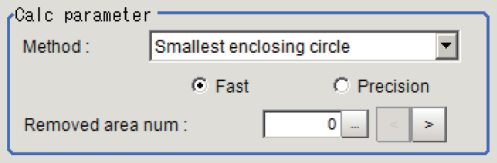
*1. “Compatibility mode (Ver. 5.73 or earlier)” is checked in “Approximation circle” or “Fast” in “Smallest enclosing circle” is selected, this is displayed.

*2. “Compatibility mode (Ver. 5.73 or earlier)” is not checked in “Approximation circle”, this is displayed.

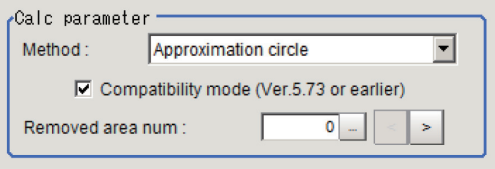
"Approximation circle" is selected in "Method" and "Compatibility mode" is unchecked.



"Smallest enclosing circle" is selected in "Method and "Fast" is selected.



"Approximation circle" is selected in "Method" and "Compatibility mode" is checked.



2 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

Setting item	Set value [Factory default]	Description
Center X	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the range of center coordinate Xs that are judged to be OK.
Center Y	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the range of center coordinate Ys that are judged to be OK.
Radius	0 to 99999.9999 [0] to [99999.9999]	Set the range of radiuses that is judged to be OK.
Radius Max.	0 to 99999.9999 [0] to [99999.9999]	Set the maximum radius that is judged to be OK.
Radius Min.	0 to 99999.9999 [0] to [99999.9999]	Set the minimum radius that is judged to be OK.
Decentration X	-99999.999 to 99999.9999 [-99999.9999] to [99999.9999]	Decentration X is the difference between the X coordinate position of the reference setting and the X coordinate position of the calculated circle center. Set the range of decentration Xs that is judged to be OK.
Decentration Y	-99999.999 to 99999.9999 [-99999.9999] to [99999.9999]	Decentration Y is the difference between the Y coordinate position of the reference setting and the Y coordinate position of the calculated circle center. Set the range of decentration Ys that is judged to be OK.
Lost point count	0 to 3600 [0] to [3600]	Set the range for the number of lost points that is judged to be OK.

2-15-7 Output Parameters (Circular Scan Edge Position)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

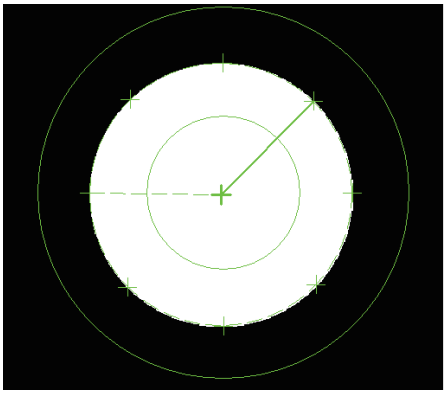
1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

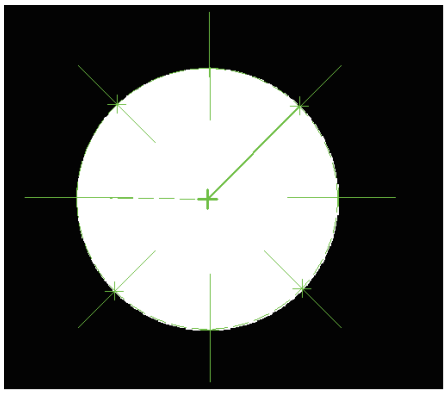
Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgment results of this processing unit is reflected in the scene overall judgment.

2-15-8 Key Points for Test Measurement and Adjustment (Circular Scan Edge Position)

In addition to the camera input image, the measured region, a graphic display of the measured results, and the edge position (the crosshair cursor) are also displayed as results in the Image Display area.



Edge position display (Sub image 0)



Display of edge position in each divided part (Sub image 1)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Center coordinate X	The center X coordinate of the calculation result
Center coordinate Y	The center Y coordinate of the calculation result
Radius	The radius of the calculation result
Maximum radius	The maximum radius of the calculation result

Displayed items	Description
Minimum radius	The minimum radius of the calculation result
Decentration X	The decentration X of the calculation result
Decentration Y	The decentration Y of the calculation result
Number of lost points	Number of parts for which the detection of edges has failed

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

Parameter to be adjusted	Remedy
Measurement	If the color of the edges to be detected is decided, specify the color with [Edge color]. If results are not stable even with the color specified, specify a larger value for the color variance range.
	If noise is detected as an edge, specify larger values for "Noise level" and "Noise width".

2-15-9 Measurement Results for Which Output Is Possible (Circular Scan Edge Position)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	1: OK 0: Not yet measured -1: NG
Center coordinate X	X	The center X coordinate of the calculation result
Center coordinate Y	Y	The center Y coordinate of the calculation result
Radius	R	The radius of the calculation result
Maximum radius	MAXR	The maximum radius of the calculation result
Minimum radius	MINR	The minimum radius of the calculation result
Decentration X	DEX	The decentration X of the calculation result
Decentration Y	DEY	The decentration Y of the calculation result
Number of lost points	LOST	Number of parts for which the detection of edges has failed
Reference coordinate X	SX	X coordinate of the reference coordinates
Reference coordinate Y	SY	Y coordinate of the reference coordinates
Maximum radius region number	MAXNO	The region number for the maximum radius
Minimum radius region number	MINNO	The region number for the minimum radius

2-15-10 External Reference Tables (Circular Scan Edge Position)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mis-match) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Central X	centerX	Get only	-99,999.9999 to 99,999.9999
6	Central Y	centerY	Get only	-99,999.9999 to 99,999.9999
7	Radius	r	Get only	0 to 99,999.9999
8	Max. radius	r_max	Get only	0 to 99,999.9999
9	Min. radius	r_min	Get only	0 to 99,999.9999
10	Deviation X	decentrationX	Get only	-99,999.9999 to 99,999.9999
11	Deviation Y	decentrationY	Get only	-99,999.9999 to 99,999.9999
12	Lost point	void_count	Get only	0 to 3,600
13	Reference X *1	standardX	Get only	0 to 99,999.9999
14	Reference Y *1	standardY	Get only	0 to 99,999.9999
15	Max. radius region No.	max_no	Get only	0 to 3,599
16	Min. radius region No.	min_no	Get only	0 to 3,599
17	Approx. radius	r_apx	Get only	0 to 99,999.9999
101	Output Coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll

No.	Data name	Ident	Set/Get	Data range
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Start angle	start_angle	Set/Get	0 to 359
121	Division method	div_type	Set/Get	0: Divide number 1: Angle number
122	No. of region divisions	scan_num	Set/Get	3 to 3,600
123	Skipping angle	notch_angle	Set/Get	0.01 to 179.999
124	Mask size	region_w	Set/Get	0 to 1,000
125	Display region	displayRegion	Set/Get	0 to 3,599
126	Direction	direction	Set/Get	0 to 1
127	Fix region count	separateType	Set/Get	0: Not fixed 1: Fixed
138	Compatibility mode (Ver.5.73 or earlier)	compMode	Set/Get	0: OFF 1: ON
139	Distance	inlierDist	Set/Get	0 to 10,000
140	Disabled region	notch_ignor	Set/Get	0 to 3,600
141	Reference X *2	referencePosX	Set/Get	0 to 99,999.9999
142	Reference Y *2	referencePosY	Set/Get	0 to 99,999.9999
143	Method	circle_type	Set/Get	0: Approximation circle 1: Smallest enclosing circle
144	Method	calc_type	Set/Get	0: Fast 1: Fine
145	Upper limit of center X	upperCenterx	Set/Get	-99,999.9999 to 99,999.9999
146	Lower limit of center X	lowerCenterx	Set/Get	-99,999.9999 to 99,999.9999
147	Upper limit of center Y	upperCentery	Set/Get	-99,999.9999 to 99,999.9999
148	Lower limit of center Y	lowerCentery	Set/Get	-99,999.9999 to 99,999.9999
149	Upper limit of radius	upperRadius	Set/Get	0 to 99,999.9999
150	Lower limit of radius	lowerRadius	Set/Get	0 to 99,999.9999
151	Upper limit of Max. radius	upperMaxRadius	Set/Get	0 to 99,999.9999
152	Lower limit of Max. radius	lowerMaxRadius	Set/Get	0 to 99,999.9999
153	Upper limit of Min. radius	upperMinRadius	Set/Get	0 to 99,999.9999
154	Lower limit of Min. radius	lowerMinRadius	Set/Get	0 to 99,999.9999
155	Upper limit of deviation X	upperDecentrationX	Set/Get	-99,999.9999 to 99,999.9999
156	Lower limit of deviation X	lowerDecentrationX	Set/Get	-99,999.9999 to 99,999.9999
157	Upper limit of deviation Y	upperDecentrationY	Set/Get	-99,999.9999 to 99,999.9999
158	Lower limit of deviation Y	lowerDecentrationY	Set/Get	-99,999.9999 to 99,999.9999
159	Upper limit of the lostwidth	upperLostPoint	Set/Get	0 to 3,600
160	Lower limit of the lostwidth	lowerLostPoint	Set/Get	0 to 3,600
201	Edge color R	colorR	Set/Get	0 to 255
202	Edge color G	colorG	Set/Get	0 to 255
203	Edge color B	colorB	Set/Get	0 to 255
204	Difference R	colorDevR	Set/Get	0 to 127
205	Difference G	colorDevG	Set/Get	0 to 127
206	Difference B	colorDevB	Set/Get	0 to 127
207	Edge detection mode	detectionMode	Set/Get	0: Color IN 1: Color OUT
208	Edge No.	edgeNo	Set/Get	0 to 99
209	Edge Level Lower limit	edgeLevel	Set/Get	0 to 100
200	Edge color specification	colorSpecification	Set/Get	0: OFF 1: ON

No.	Data name	Ident	Set/Get	Data range
210	Noise level	noiseLevel	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
211	Noise width	noiseWidth	Set/Get	0 to 9,999
212	Edge color level	colorLevel	Set/Get	0 to 442
213	Monochrome edge detection mode	monoDetectMode	Set/Get	0: Light → Dark 1: Dark → Light
214	Edge level Lower limit absolute value	edgeLevelAbs	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
215	Edge level specification method	edgeLevelKind	Set/Get	0: % 1: Absolute value
216	Measure type	measureType	Set/Get	0: Projection 1: Derivation
217	Monochrome Derivation edge detection mode	diffDetectMode	Set/Get	0: Absolute 1: Dark → Light 2: Light → Dark
218	Edge Level Upper limit *3	edgeLevelUpper	Set/Get	0 to 100
219	Edge level Upper limit absolute value *4	edgeLevelUpperAbs	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
220	Filter Strength	filterStrength	Set/Get	0 to 100
221	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
222	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit
223	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
224	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999
225	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
10100+N (N: 0 to 3,599)	Enable/disable region	area_enabled	Set/Get	0 to 1
30000+N (N: 0 to 3,599)	Edge Position (X)	edgePosX	Get only	-99,999.9999 to 99,999.9999
40000+N (N: 0 to 3,599)	Edge Position (Y)	edgePosY	Get only	-99,999.9999 to 99,999.9999
90000	figure0 Count	figArea0_count	Set/Get	0 to 1
90001	figure0 Type	figArea0_fig0_type	Set/Get	64: Circumference 256: Wide arc
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90025	figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90034	figure0 Wide arc Center Position X	figArea0_fig0_arcW_X	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90035	figure0 Wide arc Center Position Y	figArea0_fig0_arcW_Y	Set/Get	-99,999 to 99,999
90036	figure0 Wide arc Radius	figArea0_fig0_arcW_R	Set/Get	0 to 99,999
90037	figure0 Wide arc Start angle	figArea0_fig0_arcW_SA	Set/Get	-180 to 180
90038	figure0 Wide arc End angle	figArea0_fig0_arcW_EA	Set/Get	-180 to 180
90039	figure0 Wide arc Width	figArea0_fig0_arcW_W	Set/Get	0 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

*1. The reference coordinates based on the selection in the Method area of the [Ref.setting] tab can be Get only.

*2. The reference coordinates based on the selection of Numerical in the Method area of the [Ref.setting] tab can be Set/Get.

*3. On the screen, this data is displayed as [Edge Upper] when you choose [Position (%) for width of a color] of [Measurement].

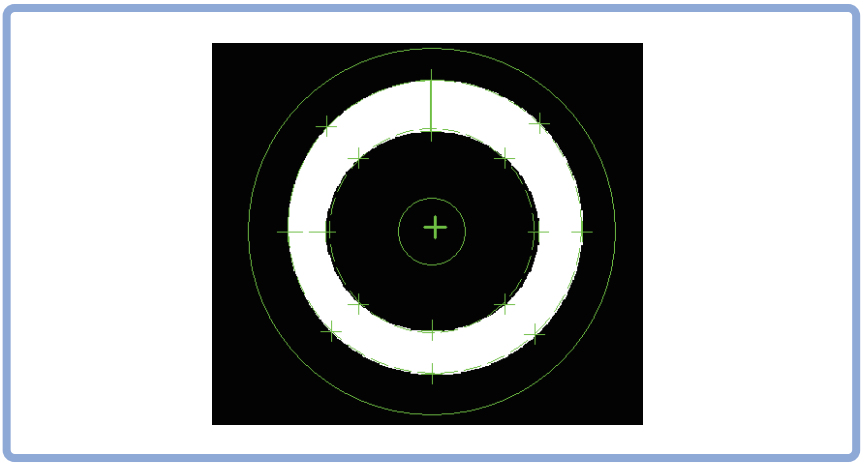
*4. On the screen, this data is displayed as [Edge Upper] when [Value of color difference (Max.442)] of [Measurement].

2-16 Circular Scan Edge Width

This processing item detects the width of the measurement object by using the change in color within the measurement region.

Used in the Following Case

When getting multiple widths of a circular object



Important

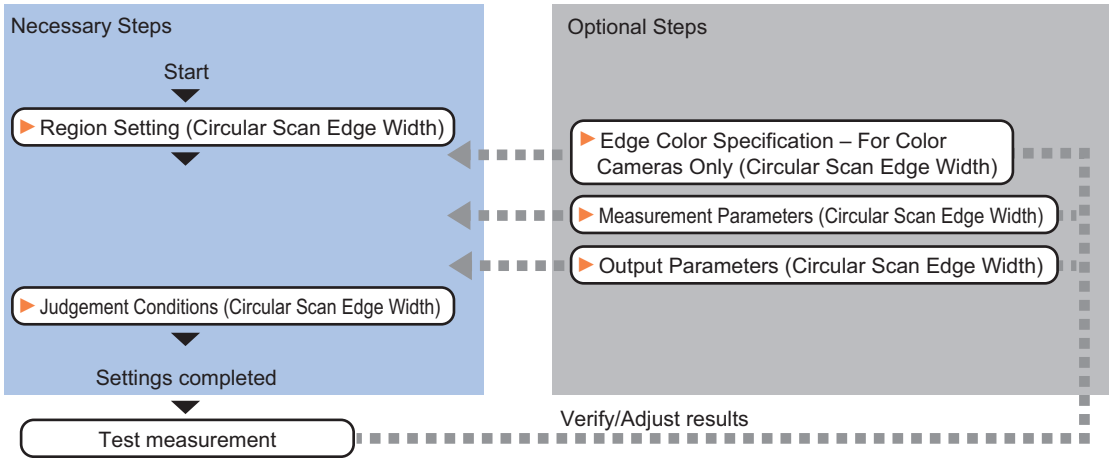
Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

Additional Information

Edge image measurement processing mechanism
For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

2-16-1 Settings Flow (Circular Scan Edge Width)

Set the circular scan edge width with the following steps.



Item List for Circular Scan Edge Width

Item name	Description
Region setting	This item is used to set up the measurement area. Refer to *2-16-2 Region Setting (Circular Scan Edge Width)* on page 2-218.
Edge color (for color cameras only)	This item selects the color information for the edges to be detected. Refer to *2-16-3 Edge Color Specification - For Color Cameras Only (Circular Scan Edge Width)* on page 2-221.
Measurement	This item changes the measurement parameter as necessary when the measurement result is unstable. The displayed items depend on whether your camera is a color or monochrome camera. Normally, the factory default value will be used. Refer to *2-16-4 Measurement Parameters (Circular Scan Edge Width)* on page 2-221.
Judgement	This item specifies the judgement condition for measurement results. Refer to *2-16-5 Judgement Conditions (Circular Scan Edge Width)* on page 2-224.
Output parameter	This item can be changed if necessary. Normally, the factory default value may be used. Select the measurement result coordinates and set how to handle the coordinates. Refer to *2-16-6 Output Parameters (Circular Scan Edge Width)* on page 2-225.

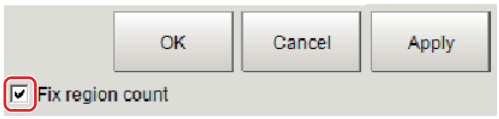
2-16-2 Region Setting (Circular Scan Edge Width)

This item is used to set up the measurement area.

Specify the measurement region of [Circular Scan Edge Width] by using circular shapes.

1. In the Item Tab area, click [Region setting].
2. Use the Drawing tools to specify the measurement region.

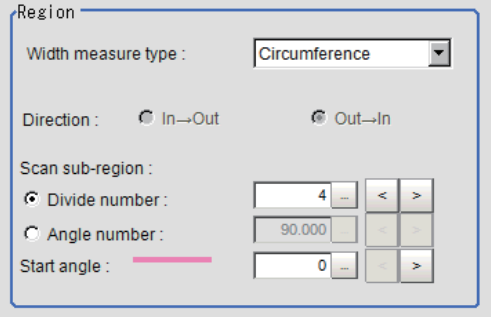
   To align with the measurement area and specify the measurement point again, uncheck "Fix region count".



3 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

4 In the "Region" area, specify a value for each item.



Setting item		Set value [Factory default]	Description
Width measure type		• [Circumference] • Diameter	Select the measurement target for the workpiece.
Direction		• In→Out • [Out→In]	Set the measurement direction when [Diameter] is selected.
Scan sub-region			Set the measurement point. Use either the "Divide num" or the "Divide angle" for this setting.
	Divide number	3 to 360 [4]	Set the number of divisions for the circle. The specified value is used as the measurement point.
	Angle number	When the width measure type is circumference 1.000 to 179.999 When the width measure type is diameter 1.000 to 90.000 [90.000]	Set the skipping angle for the circle. The measurement point is determined based on the specified angle.
Start angle		0 to 359 [0]	Set the start angle to specify a region.

Important

When the width measurement target is set to "Diameter" and the number of divisions and the skipping angle are set to an odd number value, 1 will be added to these settings so that they become even numbers.

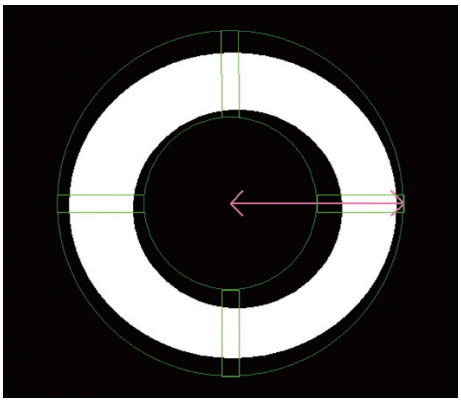
The region is divided by the specified number of points.

- Explanations of the display

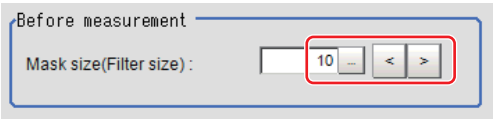
  Green solid line: Represents the circular region.

  Rectangle: Represents the sub-region.

  Pink solid line: Represents the angle and the measurement direction (arrow) to specify the region.



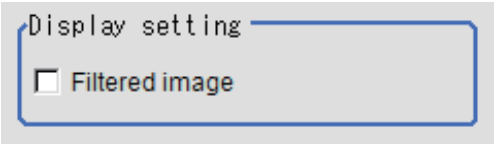
5 Specify the filtering settings as necessary.



Setting item	Set value [Factory default]	Description
Mask size	0 to 1000 [10]	Set the filter size when smoothing the measurement point vicinity. When 5 is set, smoothing is processed for a total of 11 points: the measurement point and the 5 pixels before and after it.

6 Perform the display setting if required.

Placing a check at [Filtered image] makes it easier to change the filtering setting.



Setting item	Set value [Factory default]	Description
Filtered image	• [Unchecked] • Checked	If checked, the filtered image of the ranges set with the Scan subregion and Filter size after smoothing is displayed.

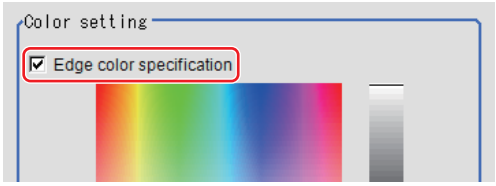
2-16-3 Edge Color Specification - For Color Cameras Only (Circular Scan Edge Width)

This item selects the color of the edges to be detected.

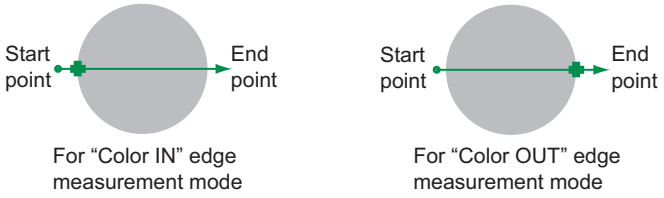
If the target color changes, this setting is not necessary. If the color is not specified, positions in the measurement region where the color changes drastically are detected as an edge.

1 In the Item Tab area, click [Edge color].

2 Place a check at "Edge color specification" in the "Color setting" area.



3 This item selects the color to be detected as edges.

Setting method	Set value [Factory default]	Description
Image Display area	---	Specify a region on the image that includes the target color. The average color of the specified region is registered.
Color chart	---	Click the reference color on the color chart to specify it. The RGB values for the specified color are displayed at the bottom.
R, G, B	0 to 255 [255]	The color to be detected is set with the RGB values.
Difference R, G, B	0 to 127 [5]	This sets the allowable color difference for detecting the edge, using the specified color as the reference. The larger the difference values, the larger the color range that is used to detect the edge.
Detection mode	• [Color IN] • Color OUT	Specified color IN: The position where a color other than the specified color changes to the specified color is detected as the edge. Specified color OUT: The position where the specified color changes to a color other than the specified color is detected as the edge. 

2-16-4 Measurement Parameters (Circular Scan Edge Width)

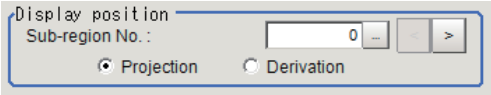
Measurement parameters can be changed as needed to address unstable measurement results. Normally, the factory default value will be used.

After changing a setting, check whether measurement can be done properly by performing an actual measurement.

1 In the Item Tab area, click [Measurement].

The edge profile of the measurement region is displayed as a graph in the Image Display area.

2 In the "Display position" area, specify a value for each item.

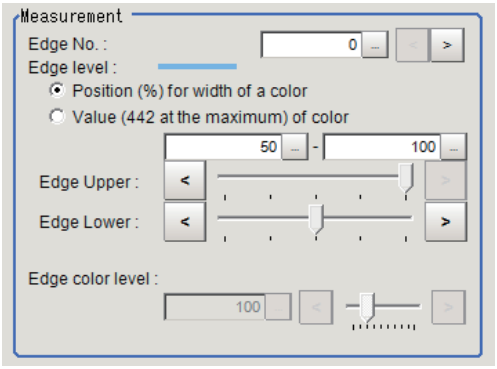


Setting item	Set value [Factory default]	Description
Sub-region No.	0 to 359 [0]	Set the edge measurement number for which the edge profile is displayed.
	• [Projection] • Derivation	Projection: The edge is searched from the center toward the outside direction. Derivation: The edge is searched from the outside of the circle toward the center.

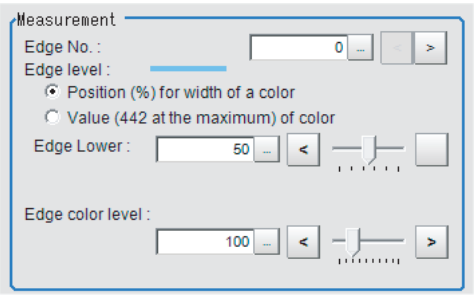
3 Set the value of each item in the "Measurement" area.

- For color cameras:

Edge Color Not Specified



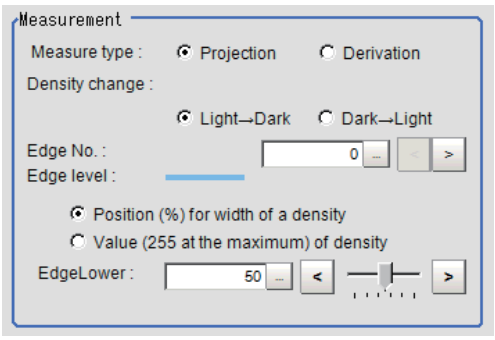
Edge Color Specified



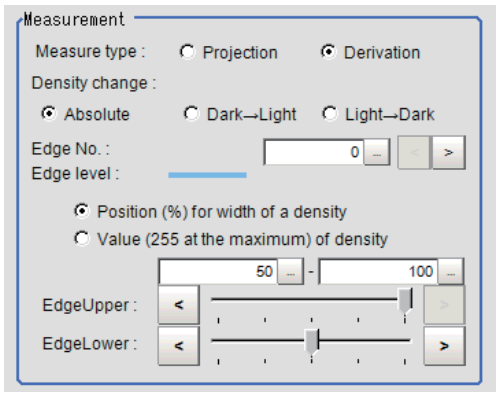
Setting item	Set value [Factory default]	Description
Edge No.	0 to 99 [0]	Specify the edge number used to extract edges. Edge numbers are assigned to detected edges starting from 0 and in the direction from the start point (the arrow) to the end point (the arrow point) in the selected region.
Edge Upper (only when edge color is not specified) Edge Lower	• Position (%) for width of a color 0 to 100 [50] to [100] • Value of color 0 to 442 [20] to [442]	Set a range of a color difference level with which the edge is detected. For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Edge color level	0 to 442 [100]	This emphasis level can be set only if the edge color to detect is specified.

- For monochrome cameras:

When the measurement method is "Projection"

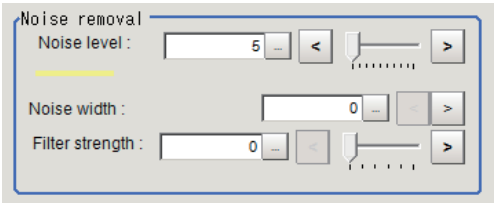


When the measurement method is "Derivation"



Setting item	Set value [Factory default]	Description
Measure type	• [Projection] • Derivation	As the measurement type, specify either projection or derivation. For details, refer to *Appendixes Measurement Mechanism Edge Detection Method* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Density change	• Absolute (only when the measurement method is "Derivation") • [Light→Dark] • Dark→Light	Set whether a black-to-white change or a white-to-black change should be recognized as a density change in the specified region.
Edge No.	0 to 99 [0]	Specify the edge number used to extract edges. Edge numbers are assigned to detected edges starting from 0 and in the direction from the start point (the arrow) to the end point (the arrow point) in the selected region.
Edge Upper Edge Lower	• Position (%) for width of a density 0 to 100 [50] to [100] • Value of density 0 to 255 [20] to [255]	Set the density change level to be detected as edges. The upper limit of edges can be set only when the measurement method is "Derivation". For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

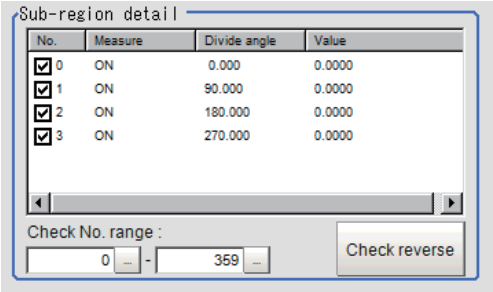
4 If necessary, set each item in the "Noise removal" area.



Setting item	Set value [Factory default]	Description
Noise level	• For color cameras 0 to 442 [5] • For monochrome cameras 0 to 255 [5]	When detection is affected by noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Level* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

Setting item	Set value [Factory default]	Description
Noise width	0 to 9999 [0]	Set the width for judging noise. When detection is affected by noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Width* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Filter strength	0 to 100 [0]	If a valley appears in the histogram around the edge threshold value due to noises, smoothen the edge profile using a filter to prevent wrong error detection from being detected. Strengthening the filter smoothen the edge profile further.

5 In the "Sub-region detail" area, set enable or disable measurement as required.



Setting item	Set value [Factory default]	Description
Check No. range	0 to 359 [0] to [359]	Specify the edge measurement number for which to perform batch reversing of the enable or disable measurement setting. Click [Check reverse] to reverse the check box settings of the edge measurement number within the range.

2-16-5 Judgement Conditions (Circular Scan Edge Width)

Specify the range to be judged as OK.

1 In the Item Tab area click [Judgement].

2 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

Setting item	Set value [Factory default]	Description
Edge width Max.	0 to 99999.9999 [0] to [99999.9999]	Specify the upper and lower limits of the maximum width judged to be OK.
Edge width Min.	0 to 99999.9999 [0] to [99999.9999]	Specify the upper and lower limits of the minimum width judged to be OK.
Edge width Ave.	0 to 99999.9999 [0] to [99999.9999]	Specify the upper and lower limits of the average width judged to be OK.
Lost width count	0 to 360 [0] to [360]	Specify the upper and lower limits of the lost width count judged to be OK.

2-16-6 Output Parameters (Circular Scan Edge Width)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgment results of this processing unit is reflected in the scene overall judgment.

2-16-7 Key Points for Test Measurement and Adjustment (Circular Scan Edge Width)

The following contents can be displayed as text in the "Detail result" area.

Displayed items	Description
Judge	Judgement result
Edge width Max.	The maximum value of edge width
Edge width Min.	The minimum value of edge width
Edge width Ave.	The average value of all the edge width
Lost width count	The number of the scanned areas for which the detection of width failed

The image specified in the Sub-image number in image display setting is displayed in the Image Display area.

Sub image number.	Explanation of image to be displayed
0	Measurement image
1	Scan region

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

Parameter to be adjusted	Remedy
Measurement	If the color of the edges to be detected is decided, specify the color with [Edge color]. If results are not stable even with the color specified, specify a larger value for the color variance range.
	If noise is detected as an edge, specify larger values for "Noise level" and "Noise width".

2-16-8 Measurement Results for Which Output Is Possible (Circular Scan Edge Width)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Edge width Max.	MAXW	The maximum value of edge width
Edge width Min.	MINW	The minimum value of edge width
Edge width Ave.	AVEW	The average value of all the edge width
Lost width count	LOST	The number of the scanned areas for which the detection of width failed
Edge width Max. region No.	MAXNO	Region number of maximum edge width
Edge width Min. region No.	MINNO	Region number of minimum edge width

2-16-9 External Reference Tables (Circular Scan Edge Width)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mis-match) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Edge width Max.	width_max	Get only	0 to 99,999.9999
6	Edge width Min.	width_min	Get only	0 to 99,999.9999
7	Edge width Ave.	width_ave	Get only	0 to 99,999.9999
10	Lost width count	void_count	Get only	0 to 3,600
11	Max. edge width region No.	max_no	Get only	0 to 3,599
12	Min. edge width region No.	min_no	Get only	0 to 3,599
101	Output Coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON

No.	Data name	Ident	Set/Get	Data range
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Start angle	start_angle	Set/Get	0 to 359
121	Division method	div_type	Set/Get	0: Divide number 1: Angle number
122	No. of region divisions	scan_num	Set/Get	3 to 3,600
123	Skipping angle	notch_angle	Set/Get	0.01 to 179.999
124	Mask size	region_w	Set/Get	0 to 1,000
125	Display region	displayRegion	Set/Get	0 to 3,599
126	Direction	direction	Set/Get	0: In → Out 1: Out → In
127	Fix region count	separateType	Set/Get	0: Not fixed 1: Fixed
140	Width measure	kind	Set/Get	0: Edge width 1: Diameter
141	Display direction	displayDirection	Set/Get	0: Forward 1: Reverse
142	Upper limit of Max. edge width	upper_max_width	Set/Get	0 to 99,999.9999
143	Lower limit of Max. edge width	lower_max_width	Set/Get	0 to 99,999.9999
144	Upper limit of Min. edge width	upper_min_width	Set/Get	0 to 99,999.9999
145	Lower limit of Min. edge width	lower_min_width	Set/Get	0 to 99,999.9999
146	Upper limit of Avg. edge width	upper_ave_width	Set/Get	0 to 99,999.9999
147	Lower limit of Avg. edge width	lower_ave_width	Set/Get	0 to 99,999.9999
148	Upper limit of the lostwidth	upperLostPoint	Set/Get	0 to 3,600
149	Lower limit of the lostwidth	lowerLostPoint	Set/Get	0 to 3,600
200	Edge color specification	colorSpecification	Set/Get	0: OFF 1: ON
201	Edge color R	colorR	Set/Get	0 to 255
202	Edge color G	colorG	Set/Get	0 to 255
203	Edge color B	colorB	Set/Get	0 to 255
204	Difference R	colorDevR	Set/Get	0 to 127
205	Difference G	colorDevG	Set/Get	0 to 127
206	Difference B	colorDevB	Set/Get	0 to 127
207	Edge detection mode	detectionMode	Set/Get	0: Color IN 1: Color OUT
208	Edge No.	edgeNo	Set/Get	0 to 99
209	Edge Level Lower limit	edgeLevel	Set/Get	0 to 100
210	Noise level	noiseLevel	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
211	Noise width	noiseWidth	Set/Get	0 to 9,999
212	Edge color level	colorLevel	Set/Get	0 to 442
213	Monochrome edge detection mode	monoDetectMode	Set/Get	0: Light → Dark 1: Dark → Light
214	Edge level Lower limit absolute value	edgeLevelAbs	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255

No.	Data name	Ident	Set/Get	Data range
215	Edge level specification method	edgeLevelKind	Set/Get	0: % 1: Absolute value
216	Measure type	measureType	Set/Get	0: Projection 1: Derivation
217	Monochrome Derivation edge detection mode	diffDetectMode	Set/Get	0: Absolute 1: Dark → Light 2: Light → Dark
218	Edge Level Upper limit *1	edgeLevelUpper	Set/Get	0 to 100
219	Edge level Upper limit absolute value *2	edgeLevelUpperAbs	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
220	Filter Strength	filterStrength	Set/Get	0 to 100
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
10100+N (N: 0 to 3,599)	Enable/disable region	area_enabled	Set/Get	0 to 1
30000+N (N: 0 to 3,599)	Start Edge Position (X)	SedgePosX	Get only	-99,999.9999 to 99,999.9999
40000+N (N: 0 to 3,599)	Start Edge Position (Y)	SedgePosY	Get only	-99,999.9999 to 99,999.9999
50000+N (N: 0 to 3,599)	End Edge Position (X)	EedgePosX	Get only	-99,999.9999 to 99,999.9999
60000+N (N: 0 to 3,599)	End Edge Position (Y)	EedgePosY	Get only	-99,999.9999 to 99,999.9999
90000	figure0 Count	figArea0_count	Set/Get	0 to 1
90001	figure0 Type	figArea0_fig0_type	Set/Get	64: Circumference
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90025	figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

*1. On the [Measurement] tab of the Properties Dialog Box, this data is displayed as [Edge Upper] when you choose the [Position (%) for width of a color].

*2. On the [Measurement] tab of the Properties Dialog Box, this data is displayed as [Edge Upper] when you choose the [Value (442 at the maximum) of color].

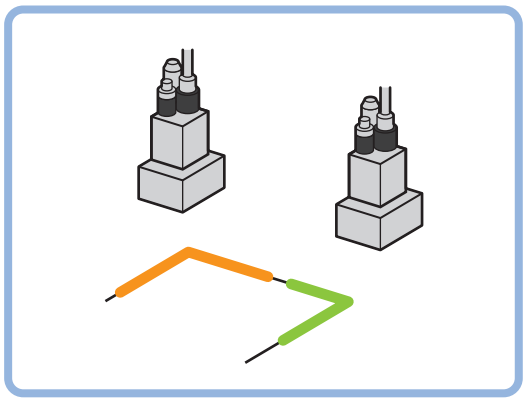
2-17 Intersection

This processing item measures a corner position (corner) of a work.

Calculate approximate lines from the edge information on two sides of a square work to measure the angle formed at the intersection of the two lines.

Used in the Following Case

When you want to align the work position based on the feature of its corner

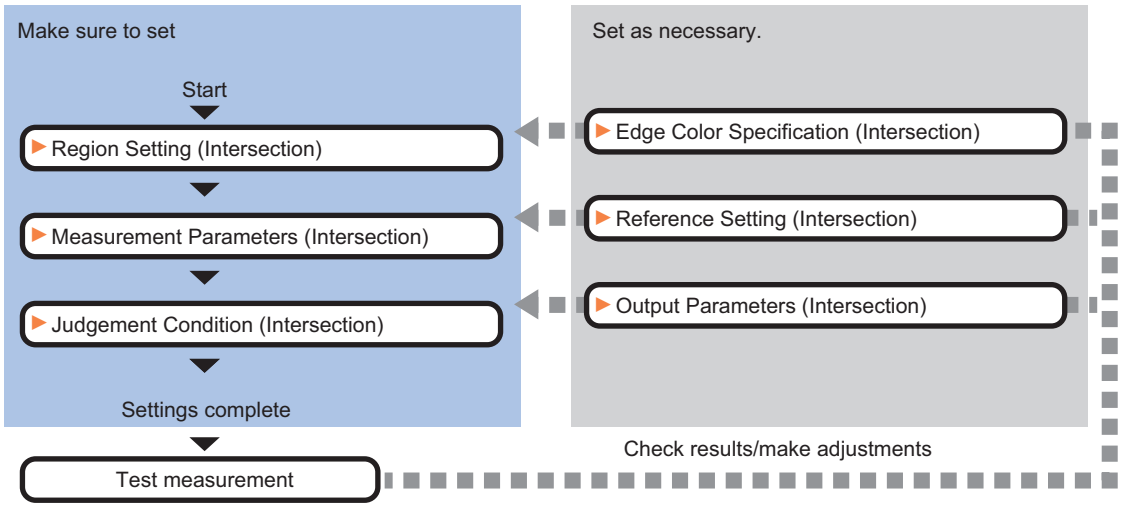


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-17-1 Settings Flow (Intersection)

Follow the steps below to set up intersection coordinates.



List of Intersection Items

Item name	Description
Region setting	This item sets the scan edge area (wide line) for each the two sides to be measured. Refer to *2-17-2 Region Setting (Intersection)* on page 2-230.
Edge color	This item sets the color of the edges to be detected. If the target color changes, this setting is not necessary. If the color is not set, positions in the measurement region where the color changes drastically are detected as an edge. Refer to *2-17-3 Edge Color Specification - For Color Cameras Only (Intersection)* on page 2-232.
Ref. setting	The edge position is registered as the reference when the region is set. Change as necessary. This is changed when measuring the position deviation from a certain position. Refer to *2-17-4 Reference Setting (Intersection)* on page 2-233.
Measurement	This item sets the parameters relating to edge measurement and Line Regression calculation to measure the intersection coordinates. Refer to *2-17-5 Measurement Parameters (Intersection)* on page 2-234.
Judgement	This item specifies the judgement condition for measurement results. Refer to *2-17-6 Judgement Condition (Intersection)* on page 2-237.
Output parameter	This item can be changed if necessary. Select the measurement result coordinates and set how to handle the coordinates. Refer to *2-17-7 Output Parameters (Intersection)* on page 2-238.

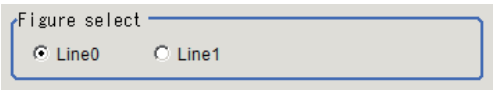
2-17-2 Region Setting (Intersection)

This item is used to set up the measurement area.

Specify the measurement region for [Intersection Coordinates] by using wide lines.

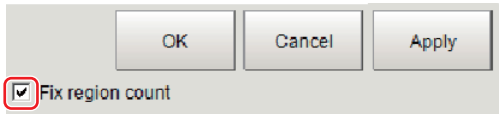
1 In the Item Tab area, click [Region setting].

2 Select the figure to be set.



3 Use the Drawing tools to set the measurement region.

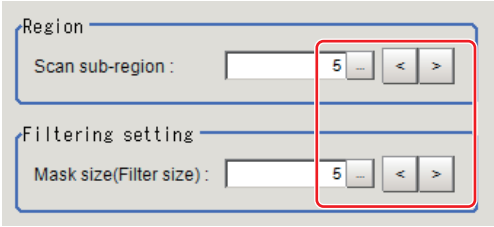
To align with the measurement area and change the number of measurement points, uncheck this.



4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

5 Set the measurement point and the filter size for the region.

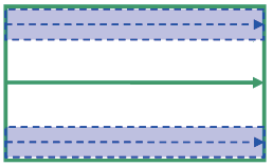


Setting item	Setting value [Factory default]	Description
Scan sub-region	1 to 100 [5]	Set the measurement point for the region.
Mask size (Filter size)	1 to 200 [5]	Set the filter size when smoothing the measurement point vicinity. When 5 is set, smoothing is processed for a total of 11 points: the measurement point and the 5 pixels before and after it.

6 The region is divided equally.

Scan region when scan sub-region is 1

Scan region when scan sub-region is 2



Scan region when scan sub-region is 3

Scan region when scan sub-region is 4

Additional Information

Enable or disable setting can be specified for each edge measurement number. Clicking edge measurement points displays the following screen.

7 Repeat steps 2 to 6, and set the region of line 1.

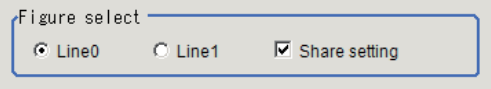
2-17-3 Edge Color Specification - For Color Cameras Only (Intersection)

This item sets the color of the edges to be detected.

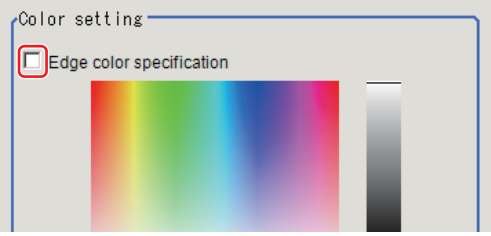
If the target color changes, this setting is not necessary. If the color is not set, positions in the measurement region where the color changes drastically are detected as an edge.

1 In the Item Tab area, click [Edge color].

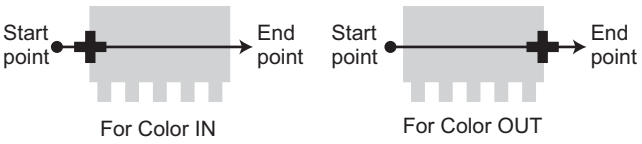
2 Select the figure to be color specified. Uncheck "Share setting" if you want to use different settings for line 0 and line 1.



3 Place a check at [Edge color specification] in the "Color setting" area.



4 Set the color to be detected as edges.

Setting Methods	Description
Image Display area	Set a region on the image that includes the target color. The average color of the set region is registered.
Color chart	Click the reference color on the color chart to set it. The RGB values for the set color are displayed at the bottom.
R, G, B	The color to be detected is set with the RGB values.
Difference R, G, B	Set the allowable color difference for detecting the edge, using the set color as the reference. The larger the difference values, the larger the color range that is used to detect the edge.
Detection mode	Color IN: The position where a color other than the specified color changes to the specified color is detected as the edge. Color OUT: The position where the specified color changes to a color other than the specified color is detected as the edge. 

2-17-4 Reference Setting (Intersection)

When the measurement region is set, this position is automatically set at the same time as the reference position. This item can be used to change the reference position to any desired position.

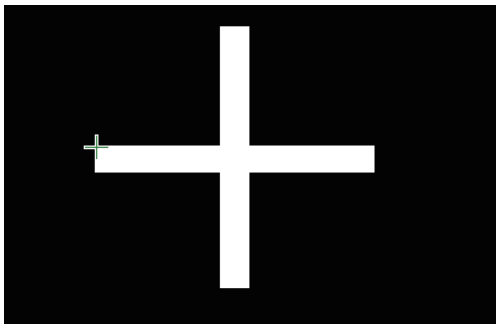
A reference position can be set either directly or by referencing a unit.

Specifying directly

Click a position on the image you want to use as a reference position, or set coordinate data for that point.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.



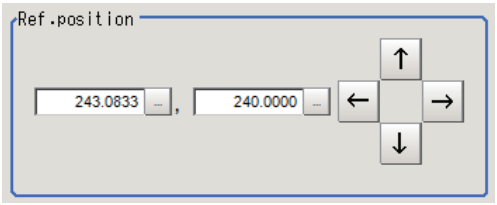
2 In the "Method" area, select "Numerical".

3 Click the position to be set as the reference.

Additional Information

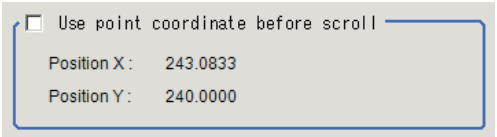
Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 If necessary, finely adjust with numeric input and the arrow buttons.



5 To remeasure on the displayed image and set the reference, click the [Measure ref.] button.

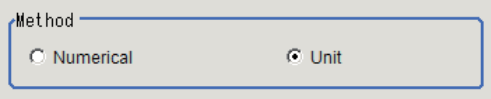
6 To use data before position compensation for the reference setting coordinates, place a check at "Use point coordinate before scroll".



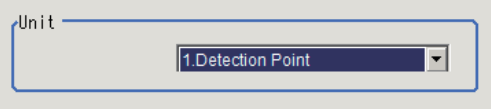
Referencing a unit

Set a reference by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

1. In the Item Tab area, click [Ref. setting].
   In the display area, the current reference position will be displayed as the crosshair cursor.
2. In the "Method" area, select "Unit".



3. In the scene in the "Unit" area, select a detection point unit.

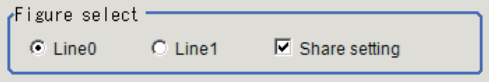


4. Perform the next measurement, and the reference will be displayed.

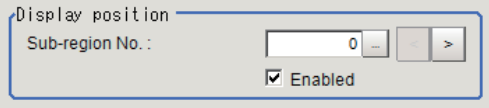
2-17-5 Measurement Parameters (Intersection)

Set the measurement conditions of intersection coordinates.

1. In the Item Tab area, click [Measurement].
2. In the "Figure select" area, select the lines to be set.



3. In the "Display position" area, set the region number if the region is enabled.

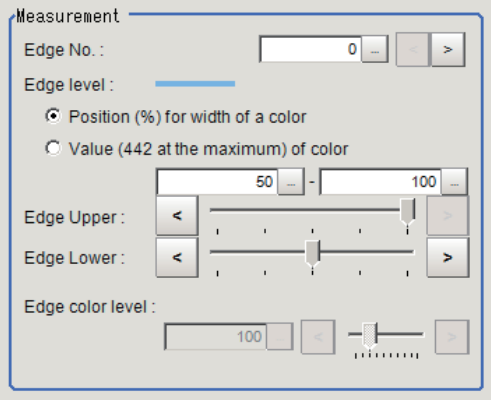


Setting item	Setting value [Factory default]	Description
Sub-region No.	[0] to 3999	Set the edge measurement number for which the edge profile is displayed.
Enabled	• [Checked] • Unchecked	Select enable/disable for the displayed edge measurement number. When disabled (unchecked) is selected, that edge measurement number is not measured.

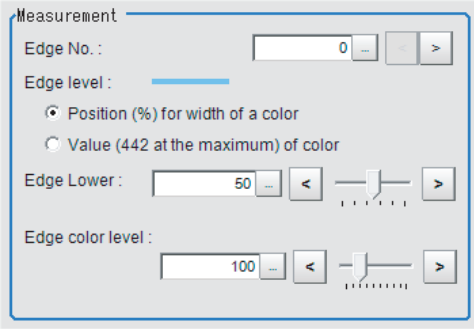
4 Set the value of each item in the "Measurement" area.

- For color cameras:

Edge Color Not Specified



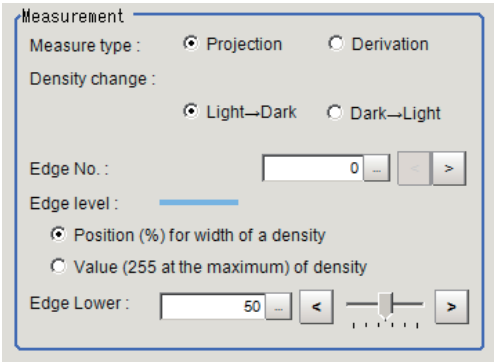
Edge Color Specified



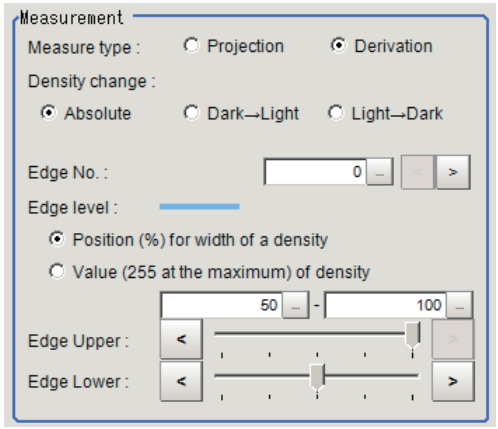
Setting item	Setting value [Factory default]	Description
Edge No.	0 to 99 [0]	Set the edge number used to extract edges. Edge numbers are assigned to detected edges starting from 0 and in the direction from the start point (the arrow) to the end point (the arrow point) in the selected region.
Edge Upper (only when edge color is not specified) Edge Lower	• Position (%) for width of a color 0 to 100 [50] to [100] • Value (442 at the maximum) of color [20] to [442]	Set a range of a color difference level with which the edge is detected. For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Edge color level	0 to 442 [100]	This emphasis level can be set only if the edge color to detect is set.

- For monochrome cameras:

When the measurement method is "Projection"

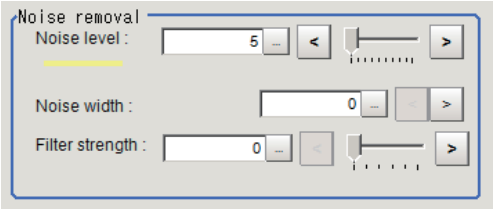


When the measurement method is "Derivation"



Setting item	Setting value [Factory default]	Description
Measure type	• [Projection] • Derivation	As the measurement type, select either projection or derivation. For details, refer to *Appendixes Measurement Mechanism Edge Detection Method* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Density change	• Absolute value (only when the measurement method is "Derivation") • [Light → Dark] • Dark → Light	Select whether a black-to-white change or a white-to-black change should be recognized as a density change in the specified region.
Edge No.	0 to 99 [0]	Set the edge number used to extract edges. Edge numbers are assigned to detected edges starting from 0 and in the direction from the start point (the arrow) to the end point (the arrow point) in the selected region.
Edge Upper Edge Lower	• Position (%) for width of a density 0 to 100 [50] to [100] • Value (255 at the maximum) of density [20] to [255]	Set the density change level to be detected as edges. The upper limit of edges can be set only when the measurement method is "Derivation". For details, refer to *Appendixes Measurement Mechanism Edge Detection Measurement* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

5 If necessary, set each item in the "Noise removal" area.



Setting item	Setting value [Factory default]	Description
Noise level	0 to 442 [5]	When detection is affected by noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Level* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Noise width	0 to 9999 [0]	Set the width for judging noise. When detection is affected by noise, increase this value. For details, refer to *Appendixes Measurement Mechanism Noise Width* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
Filter strength	0 to 100 [0]	Set the filter strength. Specifying a larger value here makes the change in color difference (density) distribution more gradual.

6 In the "Approximate line" area, select the point to be used for the calculation of approximate lines.

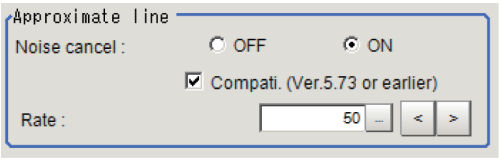
Setting item	Setting value [Factory default]	Description
Noise cancel	• ON • [OFF]	When a check is placed at [ON], an approximate line is found by excluding the points with large deviation among the measured points.

Setting item	Setting value [Factory default]	Description
Rate	0 to 100 [50]	Set the rate for all of the measurement points used to calculate the approximate line. If there is a lot of noise, set a smaller value to eliminate a lot of noise points when calculating the approximate line. If there is little noise, set a larger value to use more measurement points to increase the accuracy when calculating the approximate line. *1
Compati. mode (Ver. 5.73 or earlier)	• Checked • [Unchecked]	Set compatibility mode. Check this item when Scene data with Ver. 5.73 or earlier was loaded.
Distance (pix)	0 to 10,000 [5]	Setting parameter. Specify the degree of “Noise cancel” with a distance to the approximation circle. *2

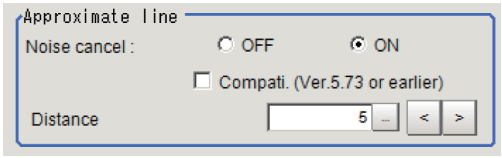
*1. “Compati. mode (Ver. 5.73 or earlier)” is checked in “Approximation circle”, this is displayed.

*2. “Compati. mode (Ver. 5.73 or earlier)” is unchecked in “Approximation circle”, this is displayed.

- “Noise cancel” is “ON” and “Compati.” is checked.



- “Noise cancel” is “ON” and “Compati.” is unchecked.



2-17-6 Judgement Condition (Intersection)

Specify the range to be judged as OK.

1 In the Item Tab area, click [Judgement].

2 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

Setting item	Setting value	Description
Intersection X	-99999.9999 to 99999.9999	Set the range of X coordinates of intersection that is judged to be OK.
Intersection Y	-99999.9999 to 99999.9999	Set the range of Y coordinates of intersection that is judged to be OK.
Angle	0.0000 to 180.0000	Set the angle formed by two lines that are judged to be OK.
Lost point count (Line 0)	0 to 4000	Set the lost point count to be judged as OK.
Lost point count (Line 1)		

2-17-7 Output Parameters (Intersection)

Set how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Setting value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Specify whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-17-8 Key Points for Test Measurement and Adjustment (Intersection)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Intersection coordinate X	X coordinate of measured intersection
Intersection coordinate Y	Y coordinate of measured intersection
Angle	Angle of measured 2 lines
Lost point count (line 0)	Lost point count of measured line 0
Lost point count (line 1)	Lost point count of measured line 1

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

State	Parameter to be adjusted	Troubleshooting
Approximate lines are not stable due to noise.	Measurement	Use the noise removal function to make sure approximate lines are measured stably.

● When judgement is NG

Parameter to be adjusted	Troubleshooting
Region setting	Confirm that the approximate line calculated for line 0 intersects with the approximate line calculated for line 1. If the approximate lines are parallel, a judgement will be NG.

2-17-9 Measurement Results for Which Output Is Possible (Intersection)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Intersection coordinate X	X	X coordinate of intersection
Intersection coordinate Y	Y	Y coordinate of intersection
Angle	TH	Angle between two lines
Reference X	SX	X coordinate of the reference coordinates
Reference Y	SY	Y coordinate of the reference coordinates
Peak edge position X of line 0	PEEKX0	X coordinate of the edge of line 0 that is the furthest from the start point of the measurement region
Peak edge position Y of line 0	PEEKY0	Y coordinate of the edge of line 0 that is the furthest from the start point of the measurement region
Bottom edge position X of line 0	BOTTOMX0	X coordinate of the edge of line 0 that is the closest from the start point of the measurement region
Bottom edge position Y of line 0	BOTTOMY0	Y coordinate of the edge of line 0 that is the closest from the start point of the measurement region
Edge position X Ave. of line 0	AVEX0	The average of X coordinates of all the edges of line 0
Edge position Y Ave. of line 0	AVEY0	The average of Y coordinates of all the edges of line 0
Long distance Max. of line 0	PMAXD0	The maximum distance between the approximate line and edge position of line 0 (plus direction)
Long distance Min. of line 0	PMIND0	The minimum distance between the approximate line and edge position of line 0 (plus direction)
Short distance Max. of line 0	BMAXD0	The maximum distance between the approximate line and edge position of line 0 (minus direction)
Short distance Min. of line 0	BMIND0	The minimum distance between the approximate line and edge position of line 0 (minus direction)
Deviation of line 0	DEV0	Concave and convex deviation of line 0
Angle of line 0	LINETH0	The line 0's inclination against the measurement region
Lost point count of line 0	LOST0	Number of parts for which the detection of edges of line 0 has failed
Line parameter A of line 0	A0	A in the expression for the approximate line of line 0 AX + BY + C = 0.
Line parameter B of line 0	B0	B in the expression for the approximate line of line 0 AX + BY + C = 0.
Line parameter C of line 0	C0	C in the expression for the approximate line of line 0 AX + BY + C = 0.
Peak edge position X of line 1	PEEKX1	X coordinate of the edge of line 1 that is the furthest from the start point of the measurement region
Peak edge position Y of line 1	PEEKY1	Y coordinate of the edge of line 1 that is the furthest from the start point of the measurement region
Bottom edge position X of line 1	BOTTOMX1	X coordinate of the edge of line 1 that is the closest from the start point of the measurement region
Bottom edge position Y of line 1	BOTTOMY1	Y coordinate of the edge of line 1 that is the closest from the start point of the measurement region
Edge position X Ave. of line 1	AVEX1	The average of X coordinates of all the edges of line 1
Edge position Y Ave. of line 1	AVEY1	The average of Y coordinates of all the edges of line 1
Long distance Max. of line 1	PMAXD1	The maximum distance between the approximate line and edge position of line 1 (plus direction)
Long distance Min. of line 1	PMIND1	The minimum distance between the approximate line and edge position of line 1 (plus direction)

Measurement items	Character string	Description
Short distance Max. of line 1	BMAXD1	The maximum distance between the approximate line and edge position of line 1 (minus direction)
Short distance Min. of line 1	BMIND1	The minimum distance between the approximate line and edge position of line 1 (minus direction)
Deviation of line 1	DEV1	Concave and convex deviation of line 1
Angle of line 1	LINETH1	The line 1's inclination against the measurement region
Lost point count of line 1	LOST1	Number of parts for which the detection of edges of line 1 has failed
Line parameter A of line 1	A1	A in the expression for the approximate line of line 1 AX + BY + C = 0.
Line parameter B of line 1	B1	B in the expression for the approximate line of line 1 AX + BY + C = 0.
Line parameter C of line 1	C1	C in the expression for the approximate line of line 1 AX + BY + C = 0.

2-17-10 External Reference Tables (Intersection)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
1	Intersection coordinate X	crossPosX	Get only	-99,999.9999 to 99,999.9999
2	Intersection coordinate Y	crossPosY	Get only	-99,999.9999 to 99,999.9999
3	Angle	angle	Get only	0 to 180
4	Reference coordinate X *1	referenceX	Get only	0 to 9,999
5	Reference coordinate Y *1	referenceY	Get only	0 to 9,999
10	Line 0 peak edge position X	peekEdgePosX0	Get only	0 to 99,999.9999
11	Line 0 peak edge position Y	peekEdgePosY0	Get only	0 to 99,999.9999
12	Line 0 bottom edge position X	bottomEdgePosX0	Get only	0 to 99,999.9999
13	Line 0 bottom edge position Y	bottomEdgePosY0	Get only	0 to 99,999.9999
14	Line 0 average edge position X	aveEdgePosX0	Get only	-1 to 99,999.9999
15	Line 0 average edge position Y	aveEdgePosY0	Get only	-1 to 99,999.9999
16	Line 0 maximum long distance	maxPeakDist0	Get only	-1 to 99,999.9999
17	Line 0 minimum long distance	minPeakDist0	Get only	-1 to 99,999.9999
18	Line 0 maximum short distance	maxBottomDist0	Get only	-1 to 99,999.9999
19	Line 0 minimum short distance	minBottomDist0	Get only	-1 to 99,999.9999

No.	Data name	Ident	Set/Get	Data range
20	Line 0 deviation	deviation0	Get only	-1 to 99,999.9999
21	Line 0 line angle	lineAngle0	Get only	-180 to 180
22	Line 0 lost point	lostPoint0	Get only	0 to 4,000
23	Line 0 line component A	coefficientA0	Get only	-99,999.9999 to 99,999.9999
24	Line 0 line component B	coefficientB0	Get only	-99,999.9999 to 99,999.9999
25	Line 0 line component C	coefficientC0	Get only	-99,999.9999 to 99,999.9999
30	Line 1 peak edge position X	peekEdgePosX1	Get only	0 to 99,999.9999
31	Line 1 peak edge position Y	peekEdgePosY1	Get only	0 to 99,999.9999
32	Line 1 bottom edge position X	bottomEdgePosX1	Get only	0 to 99,999.9999
33	Line 1 bottom edge position Y	bottomEdgePosY1	Get only	0 to 99,999.9999
34	Line 1 average edge position X	aveEdgePosX1	Get only	-1 to 99,999.9999
35	Line 1 average edge position Y	aveEdgePosY1	Get only	-1 to 99,999.9999
36	Line 1 maximum long distance	maxPeakDist1	Get only	-1 to 99,999.9999
37	Line 1 minimum long distance	minPeakDist1	Get only	-1 to 99,999.9999
38	Line 1 maximum short distance	maxBottomDist1	Get only	-1 to 99,999.9999
39	Line 1 minimum short distance	minBottomDist1	Get only	-1 to 99,999.9999
40	Line 1 deviation	deviation1	Get only	-1 to 99,999.9999
41	Line 1 line angle	lineAngle1	Get only	-180 to 180
42	Line 1 lost point	lostPoint1	Get only	0 to 4,000
43	Line 1 linear coefficient A	coefficientA1	Get only	-99,999.9999 to 99,999.9999
44	Line 1 linear coefficient B	coefficientB1	Get only	-99,999.9999 to 99,999.9999
45	Line 1 linear coefficient C	coefficientC1	Get only	-99,999.9999 to 99,999.9999
101	Output coordinate	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Reference coordinate X *2	referencePosX	Set/Get	0 to 99,999.9999
121	Reference coordinate Y *2	referencePosY	Set/Get	0 to 99,999.9999
122	Share setting (edge color specification)	shareSettingColor	Set/Get	0: Not shared 1: Shared
123	Share setting (measurement parameters)	shareSetting	Set/Get	0: Not shared 1: Shared
124	Selected line number	lineNo	Set/Get	0: Line0 1: Line1
130	Intersection X coordinate upper limit	upperCrossPointX	Set/Get	-99,999.9999 to 99,999.9999
131	Intersection X coordinate lower limit	lowerCrossPointX	Set/Get	-99,999.9999 to 99,999.9999
132	Intersection Y coordinate upper limit	upperCrossPointY	Set/Get	-99,999.9999 to 99,999.9999

No.	Data name	Ident	Set/Get	Data range
133	Intersection Y coordinate lower limit	lowerCrossPointY	Set/Get	-99,999.9999 to 99,999.9999
134	Angle upper limit	upperCrossAngle	Set/Get	0 to 180
135	Angle lower limit	lowerCrossAngle	Set/Get	0 to 180
136	Lost point (line 0) upper limit	upperLostPoint0	Set/Get	0 to 4,000
137	Lost point (line 0) lower limit	lowerLostPoint0	Set/Get	0 to 4,000
138	Lost point (line 1) upper limit	upperLostPoint1	Set/Get	0 to 4,000
139	Lost point (line 1) lower limit	lowerLostPoint1	Set/Get	0 to 4,000
200	Edge color specification (line 0)	colorSpecification0	Set/Get	0: No color specification 1: With color specification
201	Edge color R (line 0)	colorR0	Set/Get	0 to 255
202	Edge color G (line 0)	colorG0	Set/Get	0 to 255
203	Edge color B (line 0)	colorB0	Set/Get	0 to 255
204	Difference R (line 0)	colorDevR0	Set/Get	0 to 127
205	Difference G (line 0)	colorDevG0	Set/Get	0 to 127
206	Difference B (line 0)	colorDevB0	Set/Get	0 to 127
207	Edge detection mode (line 0)	detectionMode0	Set/Get	0: Specified color IN 1: Specified color OUT
208	Edge No. (line 0)	edgeNo0	Set/Get	0 to 99
209	Edge level (line 0)	edgeLevel0	Set/Get	0 to 100
210	Noise level (line 0)	noiseLevel0	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
211	Noise width (line 0)	noiseWidth0	Set/Get	0 to 9,999
212	Edge color enhancement level (line 0)	colorLevel0	Set/Get	0 to 442
213	Monochrome edge detection mode (line 0)	monoDetectMode0	Set/Get	0: Light → Dark 1: Dark → light
214	Edge level absolute value (line 0)	edgeLevelAbs0	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
215	Edge level specification method (line 0)	edgeLevelKind0	Set/Get	0: % 1: Absolute value
216	Scan sub-region (line 0)	scanLines0	Set/Get	1 to 4,000
217	Mask size (Filter size) (line 0)	scanWidth0	Set/Get	0 to 200
218	Display area (line 0)	displayRegion0	Set/Get	0 to 3,999
219	Noise cancel (line 0)	noisePointCut0	Set/Get	0: OFF 1: ON
220	Measure type (line 0)	measureType0	Set/Get	0: Projection 1: Differential
221	Fix region count (line 0)	separateType0	Set/Get	0: Not fixed 1: Fixed
222	Monochrome Derivation edge detection mode (line 0)	diffDetectMode0	Set/Get	0: Absolute 1: Dark → Light 2: Light → Dark
223	Edge Level Upper limit (line 0) *3	edgeLevelUpper0	Set/Get	0 to 100
224	Edge level Upper limit absolute value (line 0) *4	edgeLevelUpperAbs0	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255

No.	Data name	Ident	Set/Get	Data range
225	Filter Strength (line 0)	filterStrength0	Set/Get	0 to 100
226	Rate (line 0)	fncRate0	Set/Get	0 to 100
250	Edge color specification (line 1)	colorSpecification1	Set/Get	0: No color specification 1: With color specification
251	Edge color R (line 1)	colorR1	Set/Get	0 to 255
252	Edge color G (line 1)	colorG1	Set/Get	0 to 255
253	Edge color B (line 1)	colorB1	Set/Get	0 to 255
254	Difference R (line 1)	colorDevR1	Set/Get	0 to 127
255	Difference G (line 1)	colorDevG1	Set/Get	0 to 127
256	Difference B (line 1)	colorDevB1	Set/Get	0 to 127
257	Edge detection mode (line 1)	detectionMode1	Set/Get	0: Specified color IN 1: Specified color OUT
258	Edge No. (line 1)	edgeNo1	Set/Get	0 to 99
259	Edge level (line 1)	edgeLevel1	Set/Get	0 to 100
260	Noise level (line 1)	noiseLevel1	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
261	Noise width (line 1)	noiseWidth1	Set/Get	0 to 9,999
262	Edge color enhancement level (line 1)	colorLevel1	Set/Get	0 to 442
263	Monochrome edge detection mode (line 1)	monoDetectMode1	Set/Get	0: Light → Dark 1: Dark → light
264	Edge level absolute value (line 1)	edgeLevelAbs1	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
265	Edge level specification method (line 1)	edgeLevelKind1	Set/Get	0: % 1: Absolute value
266	Scan sub-region (line 1)	scanLines1	Set/Get	1 to 4,000
267	Mask size (Filter size) (line 1)	scanWidth1	Set/Get	0 to 200
268	Display area (line 1)	displayRegion1	Set/Get	0 to 3,999
269	Noise cancel (line 1)	noisePointCut1	Set/Get	0: OFF 1: ON
270	Measure type (line 1)	measureType1	Set/Get	0: Projection 1: Differential
271	Fix region count (line 1)	separateType1	Set/Get	0: Not fixed 1: Fixed
272	Monochrome Derivation edge detection mode (line 1)	diffDetectMode1	Set/Get	0: Absolute 1: Dark → Light 2: Light → Dark
273	Edge Level Upper limit (line 1) *3	edgeLevelUpper1	Set/Get	0 to 100
274	Edge level Upper limit absolute value (line 1) *4	edgeLevelUpperAbs1	Set/Get	Color camera: 0 to 442 Monochrome camera: 0 to 255
275	Filter Strength (line 1)	filterStrength1	Set/Get	0 to 100
276	Rate (line 1)	fncRate1	Set/Get	0 to 100
278	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
279	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit
280	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
281	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999

No.	Data name	Ident	Set/Get	Data range
282	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999
288	Distance (line 0)	inlierDist0	Set/Get	0 to 10,000
290	Distance (line 1)	inlierDist1	Set/Get	0 to 10,000
291	Compatibility mode (Ver.5.73 or earlier) (line0)	compMode0	Set/Get	0: OFF 1: ON
292	Compatibility mode (Ver.5.73 or earlier) (line1)	compMode1	Set/Get	0: OFF 1: ON
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
11000+N (N: 0 to 3,999)	Enabled (line 0)	lineA_area_enabled	Set/Get	0: Disable 1: Enable
15000+N (N: 0 to 3,999)	Enabled (line 1)	lineB_area_enabled	Set/Get	0: Disable 1: Enable
30000+N (N: 0 to 3,999)	Edge Position X (line 0)	lineA_edgePosX	Get only	-99,999.9999 to 99,999.9999
40000+N (N: 0 to 3,999)	Edge Position Y (line 0)	lineA_edgePosY	Get only	-99,999.9999 to 99,999.9999
50000+N (N: 0 to 3,999)	Edge Position X (line 1)	lineB_edgePosX	Get only	-99,999.9999 to 99,999.9999
60000+N (N: 0 to 3,999)	Edge Position Y (line 1)	lineB_edgePosY	Get only	-99,999.9999 to 99,999.9999
90000	Region0 figure Count	figArea0_count	Set/Get	0 to 1
90001	Region0 figure0 Type	figArea0_fig0_type	Set/Get	4: Wide line
90002	Region0 figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90009	Region0 figure0 Wide line Start point X	figArea0_fig0_lineW_X0	Set/Get	-99,999 to 99,999
90010	Region0 figure0 Wide line Start point Y	figArea0_fig0_lineW_Y0	Set/Get	-99,999 to 99,999
90011	Region0 figure0 Wide line End point X	figArea0_fig0_lineW_X1	Set/Get	-99,999 to 99,999
90012	Region0 figure0 Wide line End point Y	figArea0_fig0_lineW_Y1	Set/Get	-99,999 to 99,999
90013	Region0 figure0 Wide line Width	figArea0_fig0_lineW_W	Set/Get	0 to 99,999
90099	Region0 figure Update	figArea0_update	Set only	1: Update
92000	Region1 figure Count	figArea1_count	Set/Get	0 to 1
92001	Region1 figure0 Type	figArea1_fig0_type	Set/Get	4: Wide line
92002	Region1 figure0 mode	figArea1_fig0_mode	Set/Get	0: OR
92009	Region1 figure0 Wide line Start point X	figArea1_fig0_lineW_X0	Set/Get	-99,999 to 99,999
92010	Region1 figure0 Wide line Start point Y	figArea1_fig0_lineW_Y0	Set/Get	-99,999 to 99,999
92011	Region1 figure0 Wide line End point X	figArea1_fig0_lineW_X1	Set/Get	-99,999 to 99,999
92012	Region1 figure0 Wide line End point Y	figArea1_fig0_lineW_Y1	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
92013	Region1 figure0 Wide line Width	figArea1_fig0_lineW_W	Set/Get	0 to 99,999
92099	Region1 figure Update	figArea1_update	Set only	1: Update

*1. The reference coordinates based on the selection in the Method area of the [Ref.setting] tab can be Get only.

*2. The reference coordinates based on the selection of Numerical in the Method area of the [Ref.setting] tab can be Set/Get.

*3. On the [Measurement] tab of the Properties Dialog Box, this data is displayed as [Edge Upper] when you choose the [Position (%) for width of a color].

*4. On the [Measurement] tab of the Properties Dialog Box, this data is displayed as [Edge Upper] when you choose the [Value (442 at the maximum) of color].

2-18 Color Data

Inspect by finding the average color of the measurement region and using its difference from the registered reference color and the color variation in the measurement area. Alternatively, you can only detect the color tone while neglect the effect of image brightness.

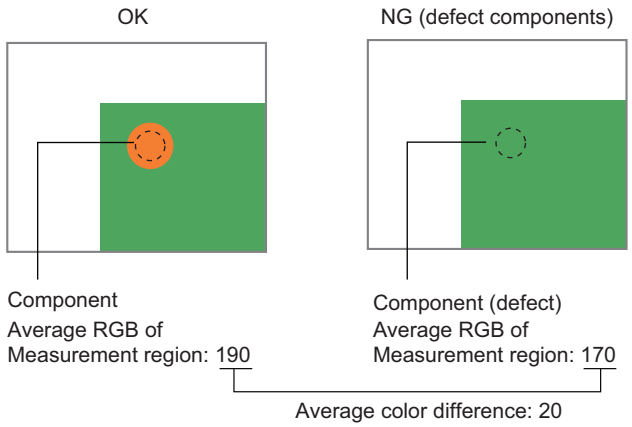
For monochrome cameras, examination is performed by measuring the difference between the average density of the measurement region and the registered reference density (density average), and the density deviation in the measurement region (density deviation).

Used in the Following Case

When measuring the presence of measurement objects

Example) When re-measuring the presence of electronics components

Measure the presence with the color difference by averaging RGB values of the Measurement region.



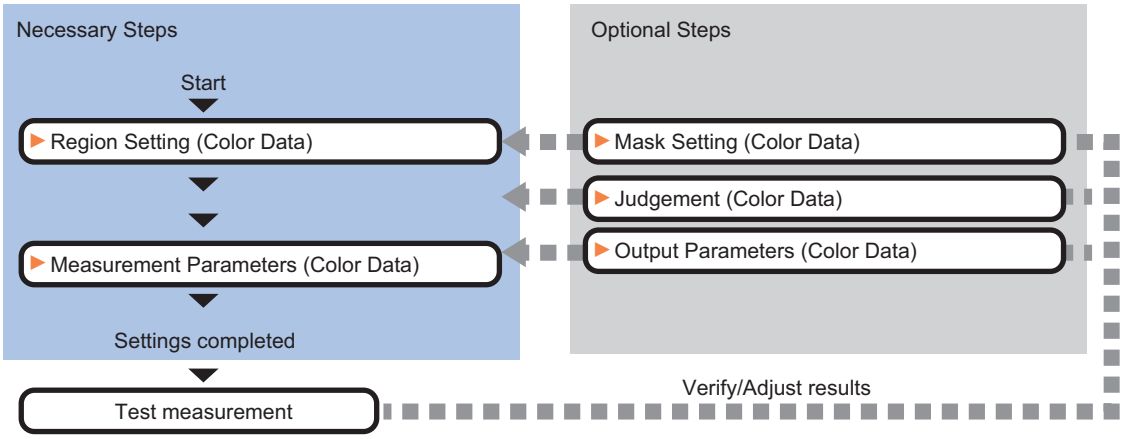
For monochrome cameras, the presence of electronics components is examined by measuring the difference between the average density of the measurement region and the registered reference density.

Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-18-1 Settings Flow (Color Data)

Set the color data with the following steps.



List of Color Data Items

Item name	Description
Region setting	This item is used to set up the measurement area. While the input image can be measured as a whole, a quick and reliable measurement can be performed by set up the measured range. Refer to *2-18-2 Region Setting (Color Data)* on page 2-249.
Mask setting	Set it when masking a region. The measurement result of another processing item can also be used for masking. Refer to *2-18-3 Mask Setting (Color Data)* on page 2-250.
Measurement	Measurement parameters can be changed as needed to address unstable measurement results or for faster processing. Refer to *2-18-4 Measurement Parameters (Color Data)* on page 2-253.
Judgement	This item can be changed if necessary. Normally, the factory default value will be used. This item specifies the judgement condition for measurement results. • For color cameras Set the average color (RGB) value and deviation and set what the maximum difference is for judging the object to be OK. The measurement result of HSV can be judged to be OK. • For monochrome cameras Specify the average density value and deviation and set what the maximum difference is for judging the object to be OK.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Specify whether to reflect the judgement result to the overall judgement of the scene. Refer to *2-18-6 Output Parameters (Color Data)* on page 2-255.

2-18-2 Region Setting (Color Data)

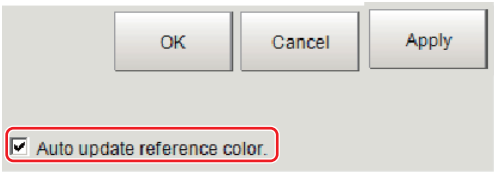
This item is used to set up the measurement area. It is possible to measure the entire input image, but restricting the range enables accurate measurement in a short period of time.

A measurement region for [Color Data] can be specified as a rectangle, circle (ellipse), circumference, or polygon.

Additional Information

Up to 8 graphs can be used together to draw the measured region. Complex areas can be drawn through image integration or by removing unnecessary sections from the measurement region.

1. In the Item Tab area, click [Region setting].
2. Select a button in the Drawing tools.
3. In the figure setting area, specify a region to be measured.
4. Click [OK] in the Figure setting area.
   - [OK]: Changes the settings and returns to the previous menu.
   - [Cancel]: Changes are discarded. Returns to the previous menu.
   - [Apply]: Updates the settings without leaving edit window.
5. To register a color in the region as a reference color, place a check at "Auto update reference color.".



Additional Information

When a check is placed at "Auto update reference color.", the average color within the region is automatically registered as the reference color when the region is registered. Each time the region is updated, the reference color is updated.
To hold the reference color constant, uncheck this option and register the reference color with the measurement parameters.
Refer to *2-18-4 Measurement Parameters (Color Data)* on page 2-253.

2-18-3 Mask Setting (Color Data)

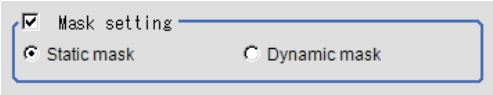
Mask the measurement region when measuring it.

There are two types of masks, namely, a static mask that sets the mask region independent of measurement and a dynamic mask that uses images generated in another unit for each measurement.

Creating a static mask

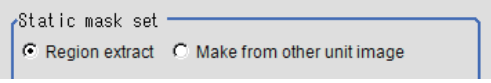
A static mask can be created manually or from an image of another unit.

1 In the Mask setting area, select "Static mask".



● Generating a mask manually

1 In the Static mask set area, select "Region extract".



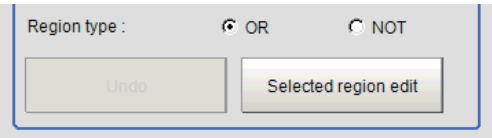
2 Select the selection region type OR or NOT and drag an image directly.

A region is created along successive similar colors from the selected place. It is not masked if the selection region type is OR.

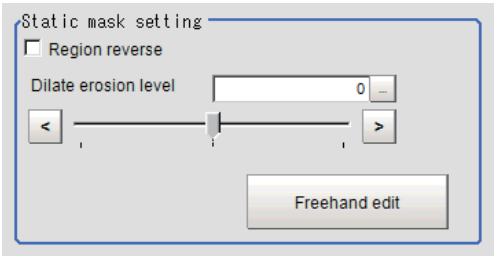
It is masked if the selection region type is NOT.

To deselect a selected region, click [Undo].

To edit a region selected with OR/NOT, click [Selected region edit].



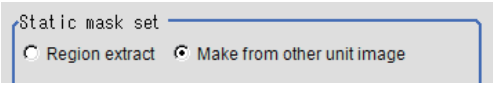
3 Adjust the mask created in the Static mask setting area.



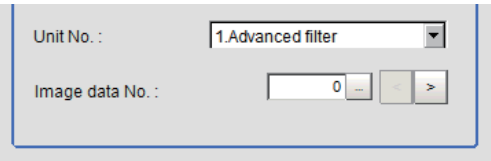
Setting item	Setting value [Factory default]	Description
Region reverse	• Checked • [Unchecked]	Place a check to revert the created mask region.
Dilate erosion level	-10 to 10 [0]	Perform fine adjustment on the mask region using expansions/shrinkage. The region is expanded if a positive value is set. The region is shrunk if a negative value is set.

● Creating a static mask from an image of another unit

1 In the Static mask set area, select "Make from other unit image".



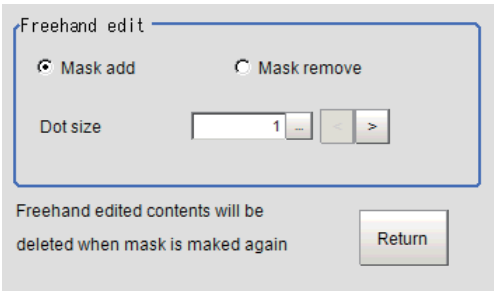
2 Set the unit number and image data number.



Setting item	Setting value [Factory default]	Description
Unit No.	---	Specify the number of the unit whose image will be referenced. The reference unit should be able to output binarized images. For example, select a labeling filter processing image for advanced filtering.
Image data No.	0 to 3 [0]	If the unit supports advanced filtering, numbers 0 to 3 can be set. Otherwise, it is fixed to 0.

Performing fine adjustment on a static mask

1 To perform fine adjustment on a mask region, click [Freehand edit] in the Static mask setting area.



Setting item	Setting value [Factory default]	Description
Freehand edit	• Mask add] • Mask remove	Select a process performed using the free hand edit.
Dot size	1 to 20 [1]	Set the size of dots used when drawing images on the screen.

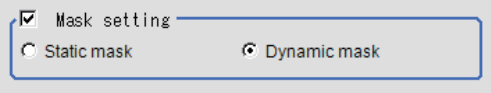
2 Click [Return] to exit the free hand edit.

● Clearing the static mask setting

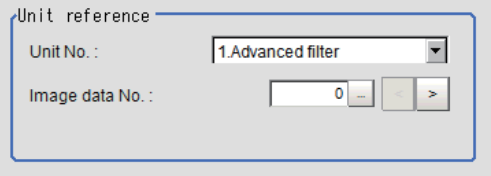
To clear the static mask setting, click [Clear].

Creating a dynamic mask

1 In the Mask setting area, select "Dynamic mask".



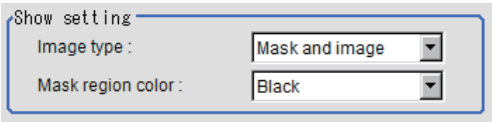
2 Set the unit number and image data number in the Unit reference area.



Setting item	Setting value [Factory default]	Description
Unit No.	---	Set the number of the unit being referred to for the mask region. The reference unit should be able to output binarized images. For example, select a labeling filter processing image for advanced filtering.
Image data No.	0 to 3 [0]	If the unit supports advanced filtering, numbers 0 to 3 can be set. Otherwise, it is fixed to 0.

Setting display

Perform the display setting if required.



Setting item	Setting value [Factory default]	Description
Image type	• Measure image • Mask binary image • [Mask and image]	Select the type of an image to be displayed. Measure image: Measured image Mask binary image: Binarized image for masking Mask and image: Post-masking image
Mask region color	• [Black] • White • Red • Green • Blue	Select the display color of the mask region. A part of color which is specified in [Mask region color] is not measured.

2-18-4 Measurement Parameters (Color Data)

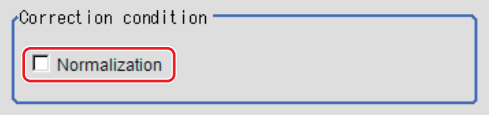
Set the reference color and judgment conditions.

For color cameras:

1 In the Item Tab area, click [Measurement].

2 If necessary, check the "Normalization" option in the "Correction condition" area.

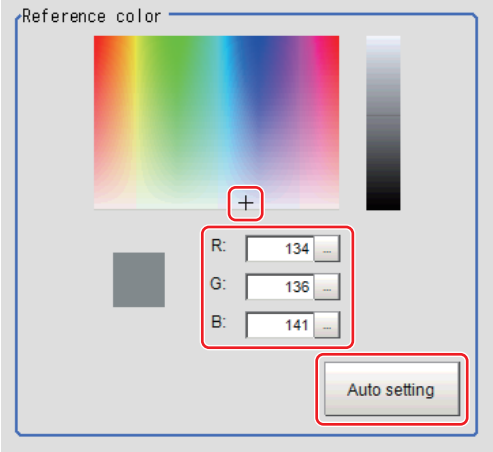
Normally, the factory default value will be used. After changing a setting, check whether measurement can be done properly by performing an actual measurement.



Setting item	Set value [Factory default]	Description
Normalization	• Checked • [Unchecked]	Specify whether to normalize the brightness in calculating the color difference. When checked, the result is not affected by the total brightness and only the color tone can be detected.

3 In the "Reference color" area, specify the reference color.

This operation is not needed when there is a check at "Auto update reference color." when the region is registered.

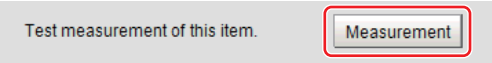


Setting method	Description
Color chart	Clicking the color chart displays the RGB values for the specified color at the bottom.
R, G, B	Set the RGB values with numbers.
Auto setting	If you click [Auto setting], the average color of the measurement region is displayed as the reference color.

2-18-5 Judgement Condition (Color Data)

This item specifies the judgement condition for measurement results.

1 When the setting has been changed, click [Measurement] to verify whether measurements can be made correctly.



2 In the RGB Judgement condition area, set the judgement condition.

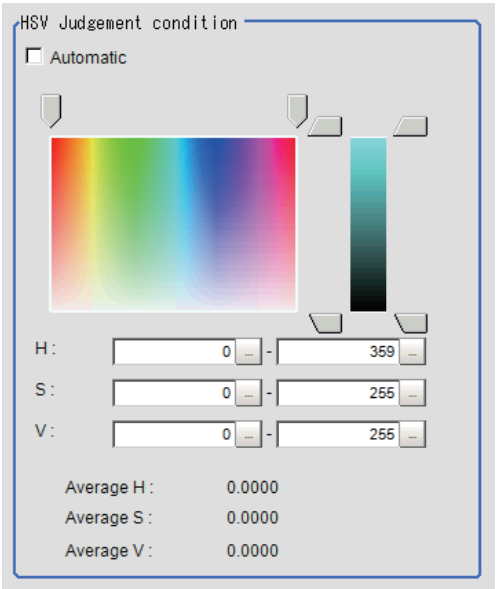
Setting item	Setting value	Description
Color difference	0 to 442	Specify the upper and lower limit values for the difference between the average color of the measurement region and the reference color.
Color deviation	0 to 221	Specify the upper and lower limit values for the deviation of the average color in the measurement region.

HSV parameters can also be used to set the judgement condition.

1 Place a check at [Automatic].

2 In the Image Display area, specify the color range you want to detect by dragging the cursor from the upper left corner to the lower right corner of that area.

The color of the specified area is automatically set.



Setting item	Setting value [Factory default]	Description
Automatic	• Checked • [Unchecked]	Specifying the color to be measured on the image automatically sets the hue, saturation, and brightness.
H	0 to 359	Set the color phase (difference of color hues).
S	0 to 255	Set color saturation (difference of color saturation).
V	0 to 255	Set the brightness (difference of brightness).

For monochrome cameras

1 When the setting has been changed, click [Measurement] to verify whether measurements can be made correctly.

2 Set up the judgement condition.

Setting item	Setting value	Description
Density average	0 to 255	Specify the upper and lower limit values for judging the average density of the measurement region.
Density deviation	0 to 127	Specify the upper and lower limit values for the deviation of the average density in the measurement region.

2-18-6 Output Parameters (Color Data)

Specifies whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

1 Click [Output parameter] in the Item Tab area.

2 Choose whether or not to reflect this in the scene overall judgement in "Reflect to overall judgement" area.

Setting item	Set value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-18-7 Key Points for Test Measurement and Adjustment (Color Data)

The following content can be confirmed in the "Detail result" area using text.

• For color cameras

Displayed items	Description
Judge	Judgement result
Average R	R (red) element average value
Average G	G (green) element average value
Average B	B (blue) element average value
Color difference	The color difference between the average color and reference color in the measurement region
Color deviation	Color deviation in the measurement region
H average	Average H (Hue) component value
S average	Average S (Saturation) component value
V average	Average V (Value) component value

• For monochrome cameras

Displayed items	Description
Judge	Judgement result
Density average	Difference between the average density and the reference density in the measurement region
Density deviation	Density deviation in the measurement region

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

Parameter to be adjusted	Remedy
Measurement	For a color camera, place a check at [Normalization].

● When the processing speed is slow

Parameter to be adjusted	Remedy
Region setting	Set the measurement region to be as small as possible.

2-18-8 Measurement Results for Which Output Is Possible (Color Data)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

- For color cameras

Measurement items	Character string	Description
Judge	JG	Judgement result
R average	AR	R (red) element average value
G average	AG	G (green) element average value
B average	AB	B (blue) element average value
Color difference	AD	The color difference between the average color and reference color in the measurement region
Color deviation	DV	Color deviation in the measurement region
H average	AH	Average H (Hue) component value
S average	AS	Average S (Saturation) component value
V average	AV	Average V (Value) component value

- For monochrome cameras

Measurement items	Character string	Description
Judge	JG	Judgement result
Density average	AD	Difference between the average density and the reference density in the measurement region
Density deviation	DV	Color deviation in the measurement region

2-18-9 External Reference Tables (Color Data)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Average R component value	averageR	Get only	0 to 255
6	Average G component value	averageG	Get only	0 to 255
7	Average B component value	averageB	Get only	0 to 255
8	Color difference	difference	Get only	0 to 442
9	Color deviation	deviation	Get only	0 to 221
10	Density average (monochrome)	monoAverage	Get only	0 to 255
11	Density deviation (monochrome)	monoDeviation	Get only	0 to 127
12	Reference average value	standardAverage	Get only	0 to 255
13	Reference deviation value	standardDifference	Get only	0 to 127
14	Density average value difference	monoDiffAverage	Get only	0 to 255
15	Density deviation value difference	monoDiffDeviation	Get only	0 to 127
16	H average value	averageH	Get only	0 to 359
17	S average value	averageS	Get only	0 to 255
18	V average value	averageV	Get only	0 to 255
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Normalization	normalization	Set/Get	0: OFF 1: ON
121	Reference color R	referenceR	Set/Get	0 to 255
122	Reference color G	referenceG	Set/Get	0 to 255
123	Reference color B	referenceB	Set/Get	0 to 255
124	Upper limit for color difference	upperDifference	Set/Get	0 to 442
125	Lower limit for color difference	lowerDifference	Set/Get	0 to 442
126	Upper limit for color deviation	upperDeviation	Set/Get	0 to 221
127	Lower limit for color deviation	lowerDeviation	Set/Get	0 to 221
128	Reference density average	standardMonoAverage	Set/Get	0 to 255
129	Reference density deviation	standardMonoDeviation	Set/Get	0 to 127
130	Upper limit for density average (for monochrome cameras only)	monoUpperDiffrence	Set/Get	0 to 255
131	Lower limit for density average (for monochrome cameras only)	monoLowerDifference	Set/Get	0 to 255
132	Upper limit for density deviation (for monochrome cameras only)	monoUpperDeviation	Set/Get	0 to 127

No.	Data name	Ident	Set/Get	Data range
133	Lower limit for density deviation (for monochrome cameras only)	monoLowerDeviation	Set/Get	0 to 127
134	Auto update reference color flag	standardFlag	Set/Get	0 to 1
136	Upper limit for H average value	upperH	Set/Get	0 to 359
137	Lower limit for H average value	lowerH	Set/Get	0 to 359
138	Upper limit for S average value	upperS	Set/Get	0 to 255
139	Lower limit for S average value	lowerS	Set/Get	0 to 255
140	Upper limit for V average value	upperV	Set/Get	0 to 255
141	Lower limit for V average value	lowerV	Set/Get	0 to 255
155	Dynamic mask unit reference no	DynUnitNo	Set/Get	-1 to 9,999
156	Dynamic mask image no	DynImageNo	Set/Get	0 to 99
158	Display image type	ChkChoose	Set/Get	0: Measure image 1: Mask binary image 2: Mask and image
164	Mask region display color	maskRegionColor	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
90000	Inspection area figure Count	figArea0_count	Set/Get	0 to 8
90001	Inspection area figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
90002	Inspection area figure0 mode	figArea0_fig0_mode	Set/Get	0: OR 1: NOT
90014	Inspection area figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	Inspection area figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	Inspection area figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	Inspection area figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90018	Inspection area figure0 Ellipse Center Position X	figArea0_fig0_ellipse_CX	Set/Get	-99,999 to 99,999
90019	Inspection area figure0 Ellipse Center Position Y	figArea0_fig0_ellipse_CY	Set/Get	-99,999 to 99,999
90020	Inspection area figure0 Ellipse RadiusX	figArea0_fig0_ellipse_RX	Set/Get	1 to 99,999
90021	Inspection area figure0 Ellipse RadiusY	figArea0_fig0_ellipse_RY	Set/Get	1 to 99,999
90025	Inspection area figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	Inspection area figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90027	Inspection area figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	Inspection area figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90040	Inspection area figure0 Polygon Point Count	figArea0_fig0_polygon_count	Set/Get	3 to 10
90041	Inspection area figure0 Polygon Point1 Position X	figArea0_fig0_polygon_x0	Set/Get	-99,999 to 99,999
90042	Inspection area figure0 Polygon Point1 Position Y	figArea0_fig0_polygon_y0	Set/Get	-99,999 to 99,999
90043	Inspection area figure0 Polygon Point2 Position X	figArea0_fig0_polygon_x1	Set/Get	-99,999 to 99,999
90044	Inspection area figure0 Polygon Point2 Position Y	figArea0_fig0_polygon_y1	Set/Get	-99,999 to 99,999
90045	Inspection area figure0 Polygon Point3 Position X	figArea0_fig0_polygon_x2	Set/Get	-99,999 to 99,999
90046	Inspection area figure0 Polygon Point3 Position Y	figArea0_fig0_polygon_y2	Set/Get	-99,999 to 99,999
90047	Inspection area figure0 Polygon Point4 Position X	figArea0_fig0_polygon_x3	Set/Get	-99,999 to 99,999
90048	Inspection area figure0 Polygon Point4 Position Y	figArea0_fig0_polygon_y3	Set/Get	-99,999 to 99,999
90049	Inspection area figure0 Polygon Point5 Position X	figArea0_fig0_polygon_x4	Set/Get	-99,999 to 99,999
90050	Inspection area figure0 Polygon Point5 Position Y	figArea0_fig0_polygon_y4	Set/Get	-99,999 to 99,999
90051	Inspection area figure0 Polygon Point6 Position X	figArea0_fig0_polygon_x5	Set/Get	-99,999 to 99,999
90052	Inspection area figure0 Polygon Point6 Position Y	figArea0_fig0_polygon_y5	Set/Get	-99,999 to 99,999
90053	Inspection area figure0 Polygon Point7 Position X	figArea0_fig0_polygon_x6	Set/Get	-99,999 to 99,999
90054	Inspection area figure0 Polygon Point7 Position Y	figArea0_fig0_polygon_y6	Set/Get	-99,999 to 99,999
90055	Inspection area figure0 Polygon Point8 Position X	figArea0_fig0_polygon_x7	Set/Get	-99,999 to 99,999
90056	Inspection area figure0 Polygon Point8 Position Y	figArea0_fig0_polygon_y7	Set/Get	-99,999 to 99,999
90057	Inspection area figure0 Polygon Point9 Position X	figArea0_fig0_polygon_x8	Set/Get	-99,999 to 99,999
90058	Inspection area figure0 Polygon Point9 Position Y	figArea0_fig0_polygon_y8	Set/Get	-99,999 to 99,999
90059	Inspection area figure0 Polygon Point10 Position X	figArea0_fig0_polygon_x9	Set/Get	-99,999 to 99,999
90060	Inspection area figure0 Polygon Point10 Position Y	figArea0_fig0_polygon_y9	Set/Get	-99,999 to 99,999
90099	Inspection area figure Update	figArea0_update	Set only	1: Update
90101	Inspection area figure1 Type	figArea0_fig1_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
90102	Inspection area figure1 mode	figArea0_fig1_mode	Set/Get	0: OR 1: NOT
90114	Inspection area figure1 Rectangle Upper left position X	figArea0_fig1_box_X0	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90115	Inspection area figure1 Rectangle Upper left position Y	figArea0_fig1_box_Y0	Set/Get	-99,999 to 99,999
90116	Inspection area figure1 Rectangle Lower right position X	figArea0_fig1_box_X1	Set/Get	-99,999 to 99,999
90117	Inspection area figure1 Rectangle Lower right position Y	figArea0_fig1_box_Y1	Set/Get	-99,999 to 99,999
90118	Inspection area figure1 Ellipse Center Position X	figArea0_fig1_ellipse_CX	Set/Get	-99,999 to 99,999
90119	Inspection area figure1 Ellipse Center Position Y	figArea0_fig1_ellipse_CY	Set/Get	-99,999 to 99,999
90120	Inspection area figure1 Ellipse RadiusX	figArea0_fig1_ellipse_RX	Set/Get	1 to 99,999
90121	Inspection area figure1 Ellipse RadiusY	figArea0_fig1_ellipse_RY	Set/Get	1 to 99,999
90125	Inspection area figure1 Circumference Center Position X	figArea0_fig1_circleW_X	Set/Get	-99,999 to 99,999
90126	Inspection area figure1 Circumference Center Position Y	figArea0_fig1_circleW_Y	Set/Get	-99,999 to 99,999
90127	Inspection area figure1 Circumference Radius	figArea0_fig1_circleW_R	Set/Get	0 to 99,999
90128	Inspection area figure1 Circumference Width	figArea0_fig1_circleW_W	Set/Get	0 to 99,999
90140	Inspection area figure1 Polygon Point Count	figArea0_fig1_polygon_count	Set/Get	3 to 10
90141	Inspection area figure1 Polygon Point1 Position X	figArea0_fig1_polygon_x0	Set/Get	-99,999 to 99,999
90142	Inspection area figure1 Polygon Point1 Position Y	figArea0_fig1_polygon_y0	Set/Get	-99,999 to 99,999
90143	Inspection area figure1 Polygon Point2 Position X	figArea0_fig1_polygon_x1	Set/Get	-99,999 to 99,999
90144	Inspection area figure1 Polygon Point2 Position Y	figArea0_fig1_polygon_y1	Set/Get	-99,999 to 99,999
90145	Inspection area figure1 Polygon Point3 Position X	figArea0_fig1_polygon_x2	Set/Get	-99,999 to 99,999
90146	Inspection area figure1 Polygon Point3 Position Y	figArea0_fig1_polygon_y2	Set/Get	-99,999 to 99,999
90147	Inspection area figure1 Polygon Point4 Position X	figArea0_fig1_polygon_x3	Set/Get	-99,999 to 99,999
90148	Inspection area figure1 Polygon Point4 Position Y	figArea0_fig1_polygon_y3	Set/Get	-99,999 to 99,999
90149	Inspection area figure1 Polygon Point5 Position X	figArea0_fig1_polygon_x4	Set/Get	-99,999 to 99,999
90150	Inspection area figure1 Polygon Point5 Position Y	figArea0_fig1_polygon_y4	Set/Get	-99,999 to 99,999
90151	Inspection area figure1 Polygon Point6 Position X	figArea0_fig1_polygon_x5	Set/Get	-99,999 to 99,999
90152	Inspection area figure1 Polygon Point6 Position Y	figArea0_fig1_polygon_y5	Set/Get	-99,999 to 99,999
90153	Inspection area figure1 Polygon Point7 Position X	figArea0_fig1_polygon_x6	Set/Get	-99,999 to 99,999
90154	Inspection area figure1 Polygon Point7 Position Y	figArea0_fig1_polygon_y6	Set/Get	-99,999 to 99,999
90155	Inspection area figure1 Polygon Point8 Position X	figArea0_fig1_polygon_x7	Set/Get	-99,999 to 99,999
90156	Inspection area figure1 Polygon Point8 Position Y	figArea0_fig1_polygon_y7	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90157	Inspection area figure1 Polygon Point9 Position X	figArea0_fig1_polygon_x8	Set/Get	-99,999 to 99,999
90158	Inspection area figure1 Polygon Point9 Position Y	figArea0_fig1_polygon_y8	Set/Get	-99,999 to 99,999
90159	Inspection area figure1 Polygon Point10 Position X	figArea0_fig1_polygon_x9	Set/Get	-99,999 to 99,999
90160	Inspection area figure1 Polygon Point10 Position Y	figArea0_fig1_polygon_y9	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
90701	Inspection area figure7 Type	figArea0_fig7_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
90702	Inspection area figure7 mode	figArea0_fig7_mode	Set/Get	0: OR 1: NOT
90714	Inspection area figure7 Rectangle Upper left position X	figArea0_fig7_box_X0	Set/Get	-99,999 to 99,999
90715	Inspection area figure7 Rectangle Upper left position Y	figArea0_fig7_box_Y0	Set/Get	-99,999 to 99,999
90716	Inspection area figure7 Rectangle Lower right position X	figArea0_fig7_box_X1	Set/Get	-99,999 to 99,999
90717	Inspection area figure7 Rectangle Lower right position Y	figArea0_fig7_box_Y1	Set/Get	-99,999 to 99,999
90718	Inspection area figure7 Ellipse Center Position X	figArea0_fig7_ellipse_CX	Set/Get	-99,999 to 99,999
90719	Inspection area figure7 Ellipse Center Position Y	figArea0_fig7_ellipse_CY	Set/Get	-99,999 to 99,999
90720	Inspection area figure7 Ellipse RadiusX	figArea0_fig7_ellipse_RX	Set/Get	1 to 99,999
90721	Inspection area figure7 Ellipse RadiusY	figArea0_fig7_ellipse_RY	Set/Get	1 to 99,999
90725	Inspection area figure7 Circumference Center Position X	figArea0_fig7_circleW_X	Set/Get	-99,999 to 99,999
90726	Inspection area figure7 Circumference Center Position Y	figArea0_fig7_circleW_Y	Set/Get	-99,999 to 99,999
90727	Inspection area figure7 Circumference Radius	figArea0_fig7_circleW_R	Set/Get	0 to 99,999
90728	Inspection area figure7 Circumference Width	figArea0_fig7_circleW_W	Set/Get	0 to 99,999
90740	Inspection area figure7 Polygon Point Count	figArea0_fig7_polygon_count	Set/Get	3 to 10
90741	Inspection area figure7 Polygon Point1 Position X	figArea0_fig7_polygon_x0	Set/Get	-99,999 to 99,999
90742	Inspection area figure7 Polygon Point1 Position Y	figArea0_fig7_polygon_y0	Set/Get	-99,999 to 99,999
90743	Inspection area figure7 Polygon Point2 Position X	figArea0_fig7_polygon_x1	Set/Get	-99,999 to 99,999
90744	Inspection area figure7 Polygon Point2 Position Y	figArea0_fig7_polygon_y1	Set/Get	-99,999 to 99,999
90745	Inspection area figure7 Polygon Point3 Position X	figArea0_fig7_polygon_x2	Set/Get	-99,999 to 99,999
90746	Inspection area figure7 Polygon Point3 Position Y	figArea0_fig7_polygon_y2	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90747	Inspection area figure7 Polygon Point4 Position X	figArea0_fig7_polygon_x3	Set/Get	-99,999 to 99,999
90748	Inspection area figure7 Polygon Point4 Position Y	figArea0_fig7_polygon_y3	Set/Get	-99,999 to 99,999
90749	Inspection area figure7 Polygon Point5 Position X	figArea0_fig7_polygon_x4	Set/Get	-99,999 to 99,999
90750	Inspection area figure7 Polygon Point5 Position Y	figArea0_fig7_polygon_y4	Set/Get	-99,999 to 99,999
90751	Inspection area figure7 Polygon Point6 Position X	figArea0_fig7_polygon_x5	Set/Get	-99,999 to 99,999
90752	Inspection area figure7 Polygon Point6 Position Y	figArea0_fig7_polygon_y5	Set/Get	-99,999 to 99,999
90753	Inspection area figure7 Polygon Point7 Position X	figArea0_fig7_polygon_x6	Set/Get	-99,999 to 99,999
90754	Inspection area figure7 Polygon Point7 Position Y	figArea0_fig7_polygon_y6	Set/Get	-99,999 to 99,999
90755	Inspection area figure7 Polygon Point8 Position X	figArea0_fig7_polygon_x7	Set/Get	-99,999 to 99,999
90756	Inspection area figure7 Polygon Point8 Position Y	figArea0_fig7_polygon_y7	Set/Get	-99,999 to 99,999
90757	Inspection area figure7 Polygon Point9 Position X	figArea0_fig7_polygon_x8	Set/Get	-99,999 to 99,999
90758	Inspection area figure7 Polygon Point9 Position Y	figArea0_fig7_polygon_y8	Set/Get	-99,999 to 99,999
90759	Inspection area figure7 Polygon Point10 Position X	figArea0_fig7_polygon_x9	Set/Get	-99,999 to 99,999
90760	Inspection area figure7 Polygon Point10 Position Y	figArea0_fig7_polygon_y9	Set/Get	-99,999 to 99,999
92000	Mask area figure Count	figArea1_count	Set/Get	1
92001	Mask area figure0 Type	figArea1_fig0_type	Set/Get	8: Rectangle
92002	Mask area figure0 mode	figArea1_fig0_mode	Set/Get	0: OR
92014	Mask area figure0 Rectangle Upper left position X	figArea1_fig0_box_X0	Set/Get	-99,999 to 99,999
92015	Mask area figure0 Rectangle Upper left position Y	figArea1_fig0_box_Y0	Set/Get	-99,999 to 99,999
92016	Mask area figure0 Rectangle Lower right position X	figArea1_fig0_box_X1	Set/Get	-99,999 to 99,999
92017	Mask area figure0 Rectangle Lower right position Y	figArea1_fig0_box_Y1	Set/Get	-99,999 to 99,999
92099	Mask area figure Update	figArea1_update	Set only	1: Update
93000	Selected area figure Count	figArea2_count	Set/Get	0 to 8
93001	Selected area figure0 Type	figArea2_fig0_type	Set/Get	8: Rectangle
93002	Selected area figure0 mode	figArea2_fig0_mode	Set/Get	0: OR 1: NOT
93014	Selected area figure0 Rectangle Upper left position X	figArea2_fig0_box_X0	Set/Get	-99,999 to 99,999
93015	Selected area figure0 Rectangle Upper left position Y	figArea2_fig0_box_Y0	Set/Get	-99,999 to 99,999
93016	Selected area figure0 Rectangle Lower right position X	figArea2_fig0_box_X1	Set/Get	-99,999 to 99,999
93017	Selected area figure0 Rectangle Lower right position Y	figArea2_fig0_box_Y1	Set/Get	-99,999 to 99,999
93099	Selected area figure Update	figArea2_update	Set only	1: Update
93101	Selected area figure1 Type	figArea2_fig1_type	Set/Get	8: Rectangle

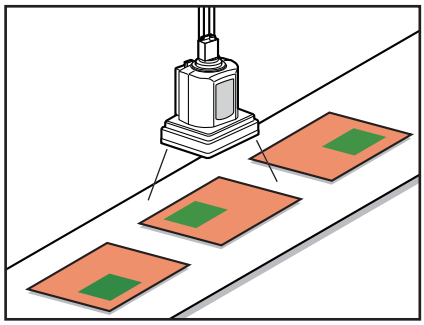
No.	Data name	Ident	Set/Get	Data range
93102	Selected area figure1 mode	figArea2_fig1_mode	Set/Get	0: OR 1: NOT
93114	Selected area figure1 Rectangle Upper left position X	figArea2_fig1_box_X0	Set/Get	-99,999 to 99,999
93115	Selected area figure1 Rectangle Upper left position Y	figArea2_fig1_box_Y0	Set/Get	-99,999 to 99,999
93116	Selected area figure1 Rectangle Lower right position X	figArea2_fig1_box_X1	Set/Get	-99,999 to 99,999
93117	Selected area figure1 Rectangle Lower right position Y	figArea2_fig1_box_Y1	Set/Get	-99,999 to 99,999
93201	Selected area figure2 Type	figArea2_fig2_type	Set/Get	8: Rectangle
93202	Selected area figure2 mode	figArea2_fig2_mode	Set/Get	0: OR 1: NOT
93214	Selected area figure2 Rectangle Upper left position X	figArea2_fig2_box_X0	Set/Get	-99,999 to 99,999
93215	Selected area figure2 Rectangle Upper left position Y	figArea2_fig2_box_Y0	Set/Get	-99,999 to 99,999
93216	Selected area figure2 Rectangle Lower right position X	figArea2_fig2_box_X1	Set/Get	-99,999 to 99,999
93217	Selected area figure2 Rectangle Lower right position Y	figArea2_fig2_box_Y1	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
93701	Selected area figure7 Type	figArea2_fig7_type	Set/Get	8: Rectangle
93702	Selected area figure7 mode	figArea2_fig7_mode	Set/Get	0: OR 1: NOT
93714	Selected area figure7 Rectangle Upper left position X	figArea2_fig7_box_X0	Set/Get	-99,999 to 99,999
93715	Selected area figure7 Rectangle Upper left position Y	figArea2_fig7_box_Y0	Set/Get	-99,999 to 99,999
93716	Selected area figure7 Rectangle Lower right position X	figArea2_fig7_box_X1	Set/Get	-99,999 to 99,999
93717	Selected area figure7 Rectangle Lower right position Y	figArea2_fig7_box_Y1	Set/Get	-99,999 to 99,999

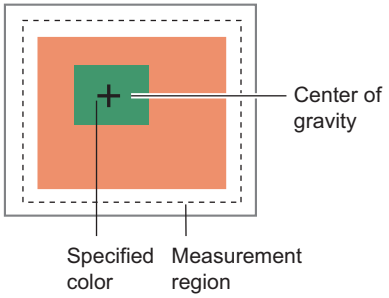
2-19 Gravity and Area

Inspect using the area of the specified color.

Used in the Following Case

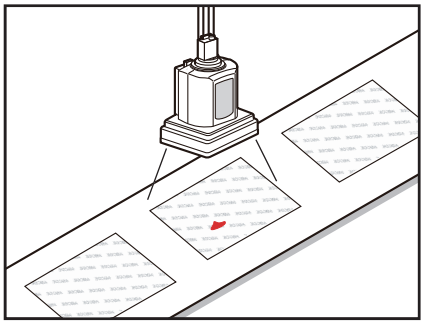
- Label deviation measurement

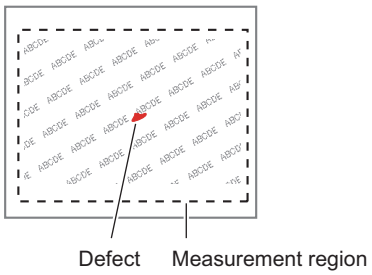




Measurement can be enabled by gravity coordinates of specified color in measurement region.

- Detection of defects, contamination, and stains of measurement objects whose appearance is not defined





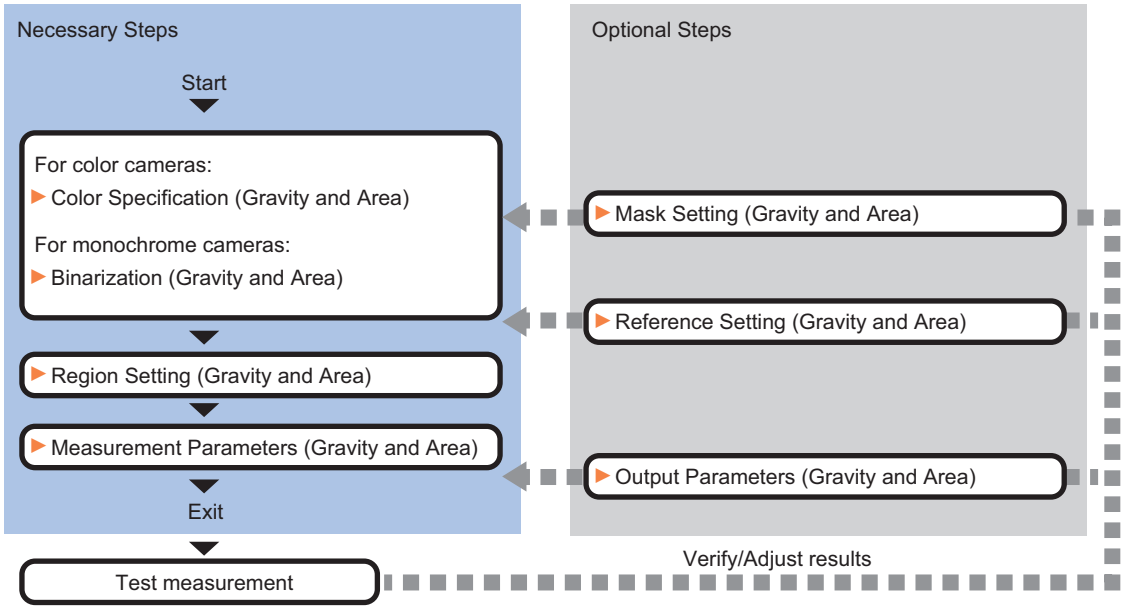
Measurement can be enabled by area of specified color in measurement region.

Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-19-1 Settings Flow (Gravity and Area)

Set the Gravity and Area with the following steps.



List of Gravity and Area Items

Item name	Description
Color (for color cameras only)	This item selects the color whose area and center of gravity are to be measured. Since the color hue, color saturation, and brightness can be selected, then fine-tuning can be performed to colors. Refer to *2-19-2 Color Specification (Gravity and Area)* on page 2-266.
Binary (for monochrome cameras only)	This item specifies the binary level for converting 256-tone grayscale images input from the camera into binary images. Converted white pixels are measured. Adjust the binary level so that the measurement object is converted to white pixels. Refer to *2-19-3 Binarization (Gravity and Area)* on page 2-268.
Region setting	This item is used to set up the measurement area. While the input image can be measured as a whole, a quick and reliable measurement can be performed by set up the measured range. Refer to *2-19-4 Region Setting (Gravity and Area)* on page 2-268.
Mask setting	Set it when masking a region. The measurement result of another processing item can also be used for masking. Refer to *2-19-5 Mask Setting (Gravity and Area)* on page 2-269.
Ref. setting	This item can be changed if necessary. Usually, the central position of the registered region is registered as the reference position. Refer to *2-19-6 Reference Setting (Gravity and Area)* on page 2-271.
Measurement	This item specifies the judgement condition for measurement results. Specify the upper and lower limit values for the area and the gravity center X/Y. Measurement parameters can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used. Refer to *2-19-7 Measurement Parameters (Gravity and Area)* on page 2-273.

Item name	Description
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. Refer to *2-19-8 Output Parameters (Gravity and Area)* on page 2-274.

2-19-2 Color Specification (Gravity and Area)

When connecting a color camera, specify the color to be measured. There are two specification methods: specifying the color to be extracted in the image or specifying the color with the hue, saturation, and brightness values.

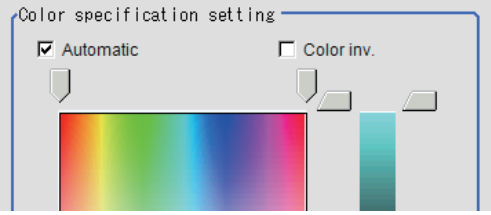
This section describes how to specify colors in an image and gives an example of the procedure for finely adjusting with numeric input afterwards.

1 In the Item Tab area, click [Color].

2 Place a check at [Automatic].

3 In the Image Display area, specify the color range you want to detect by dragging the cursor from the upper left corner to the lower right corner of that area.

The color of the specified area is automatically set.

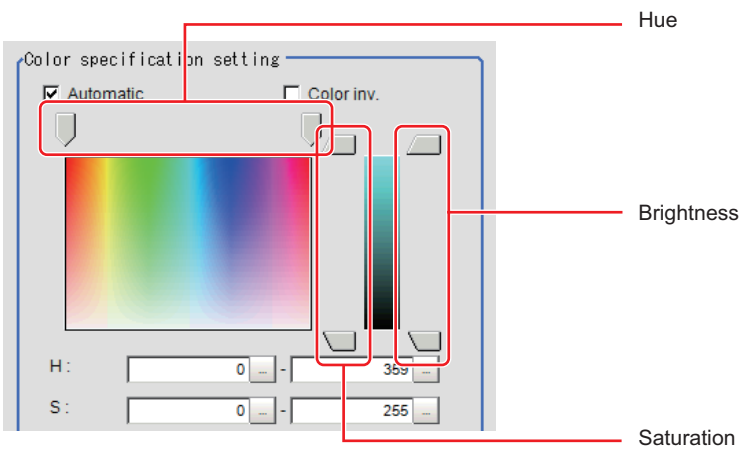


4 Finely adjust the hue, saturation, and brightness if necessary.

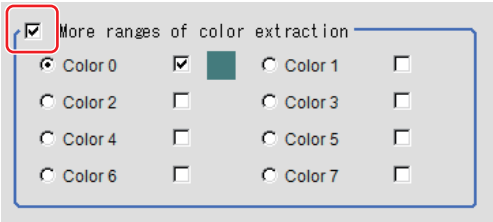
Adjust either by adjusting on the color chart or by inputting numbers.

Item	Set value [Factory default]	Description
H	0 to 359	Specify the color phase (difference of color hues).
S	0 to 255	Specify color saturation (difference of color saturation).
V	0 to 255	Specify the brightness (difference of brightness).
Automatic	• Checked • [Unchecked]	Specifying the color to be measured on the image automatically sets the hue, saturation, and brightness.
Color inv.	• Checked • [Unchecked]	Everything other than the specified color becomes the measurement target.

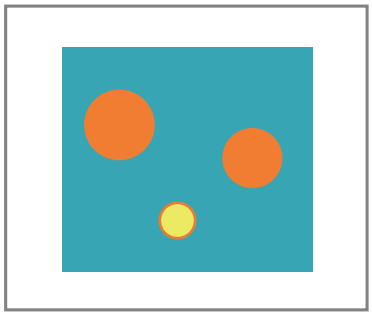
- About color charts



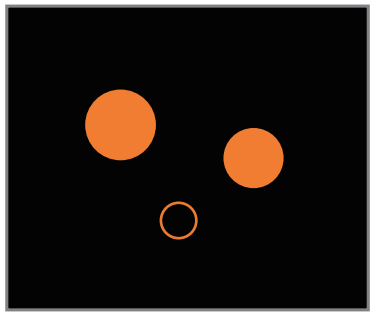
5 To specify multiple colors, place a check at "More ranges of color extraction".



Setting item	Set value [Factory default]	Description
More ranges of color extraction	• Checked • [Unchecked]	If you place a check at this option, you can set up to 8 colors.

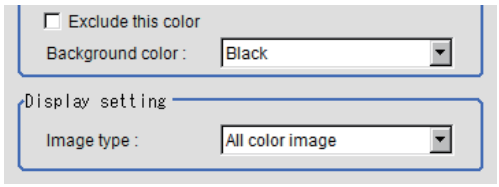


Extract image
(before specifying colors)



Extract image
(after specifying colors – background color: black)

6 If necessary, set the display conditions for displayed images.



Setting item	Set value [Factory default]	Description
Exclude this color	• Checked • [Unchecked]	If you place a check at this option, pixels within the HSV range are excluded from color extraction. The priority order for exclusion is that the higher color extraction range numbers are given priority. This setting is disabled if "More ranges of color extraction" is unchecked.
Background color	• [Black] • White • Red • Green • Blue	The background section outside the extracted image is filled with the specified colors.
Image type	• Measurement image • [All color image] • Selected color image • Binary image	This sets the state of the image to display.

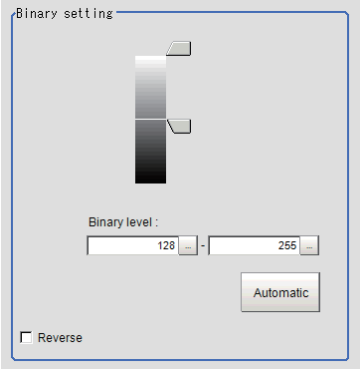
2-19-3 Binarization (Gravity and Area)

When a monochrome camera is connected, the 256-tone grayscale images taken in from the camera are converted into binary black-and-white images before the images are measured. Converted white pixels are measured.

This specifies the level for converting grayscale images into binary images.

1 In the Item Tab area, click [Binary].

2 In the "Binary setting" area, specify the reference density range.



Item		Set value [Factory default]	Description
Binary level	Upper limit value	0 to 255 [255]	Specify the level for converting 256-tone grayscale images to binary images. Adjust the binary level so that the measurement object is converted to white pixels. You can also set the binary level so that only intermediate density is measured.
	Lower limit value	0 to 255 [128]	
Automatic		---	Optimum binary levels are calculated automatically and set.
Reverse		• Checked • [Unchecked]	This item reverses black and white colors.

2-19-4 Region Setting (Gravity and Area)

This item is used to set up the measurement area. It is possible to measure the entire input image, but restricting the range enables accurate measurement in a short period of time.

Use a rectangle, circle (ellipse), circumference, or polygon to specify a measurement region for [Gravity and Area]. Up to 8 figures can be combined to draw the measurement region.

1 In the Item Tab area, click [Region setting].

2 Use the Drawing tools to specify the measurement region.

3 Click [OK] in the Figure setting area.
- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

4 If necessary, in the "Display setting" area, set up display settings for the images displayed in the Image Display area.

Setting item	Set value [Factory default]	Description
Extract image	• [Checked] • Unchecked	If you place a check at this option, image set with the color specification is displayed.

2-19-5 Mask Setting (Gravity and Area)

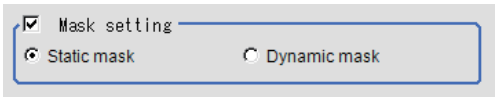
Mask the measurement region when measuring it.

There are two types of masks, namely, a static mask that sets the mask region independent of measurement and a dynamic mask that uses images generated in another unit for each measurement.

Creating a static mask

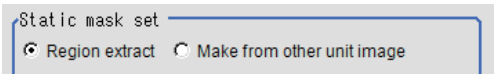
A static mask can be created manually or from an image of another unit.

1 In the Mask setting area, select "Static mask".

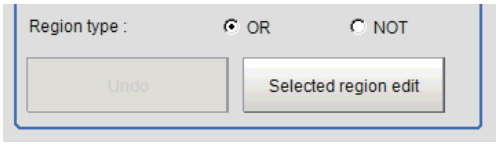


● Generating a mask manually

1 In the Static mask set area, select "Region extract".



2 Select the selection region type OR or NOT and drag an image directly.



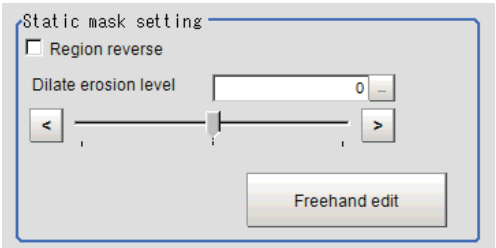
A region is created along successive similar colors from the selected place. It is not masked if the selection region type is OR.

It is masked if the selection region type is NOT.

To deselect a selected region, click [Undo].

To edit a region selected with OR/NOT, click [Selected region edit].

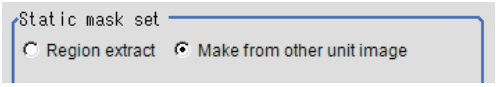
3 Adjust the mask created in the Static mask setting area.



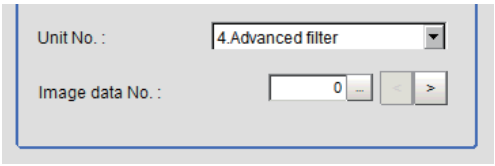
Setting item	Setting value [Factory default]	Description
Region reverse	• Checked • [Unchecked]	Place a check to revert the created mask region.
Dilate erosion level	-10 to 10 [0]	Perform fine adjustment on the mask region using expansions/shrinkage. The region is expanded if a positive value is set. The region is shrunk if a negative value is set.

● Creating a static mask from an image of another unit

1 In the Static mask set area, select "Make from other unit image".



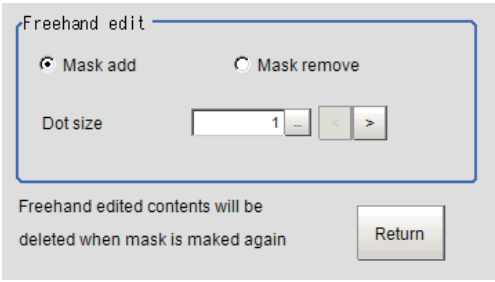
2 Set the unit number and image data number.



Setting item	Setting value [Factory default]	Description
Unit No.	----	Specify the number of the unit whose image will be referenced. The reference unit should be able to output binarized images. For example, select a labeling filter processing image for advanced filtering.
Image data No.	0 to 3 [0]	If the unit supports advanced filtering, numbers 0 to 3 can be set. Otherwise, it is fixed to 0.

Performing fine adjustment on a static mask

1 To perform fine adjustment on a mask region, click [Freehand edit] in the Static mask setting area.



Setting item	Setting value [Factory default]	Description
Freehand edit	• [Mask add] • Mask remove	Select a process performed using the free hand edit.
Dot size	1 to 20 [1]	Set the size of dots used when drawing images on the screen.

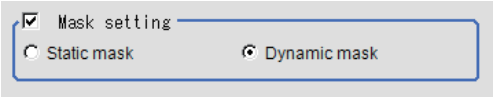
2 Click [Return] to exit the free hand edit.

● Clearing the static mask setting

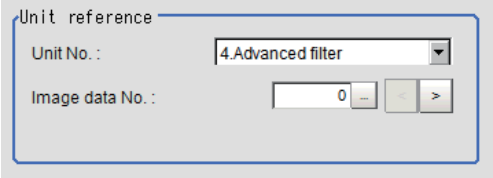
To clear the static mask setting, click [Clear].

Creating a dynamic mask

1 In the Mask setting area, select "Dynamic mask".



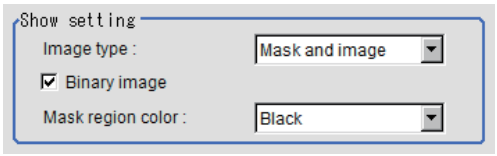
2 Set the unit number and image data number in the Unit reference area.



Setting item	Setting value [Factory default]	Description
Unit No.	-	Set the number of the unit being referred to for the mask region. The reference unit should be able to output binarized images. For example, select a labeling filter processing image for advanced filtering.
Image data No.	0 to 3 [0]	If the unit supports advanced filtering, numbers 0 to 3 can be set. Otherwise, it is fixed to 0.

Setting display

Perform the display setting if required.



Setting item	Setting value [Factory default]	Description
Image type	• Measure image • Mask binary image • [Mask and image]	Select the type of an image to be displayed. Measure image: Measured image Mask binary image: Binarized image for masking Mask and image: Post-masking image
Mask region color	• [Black] • White • Red • Green • Blue	Select the display color of the mask region. A part of color which is specified in [Mask region color] is not measured.

2-19-6 Reference Setting (Gravity and Area)

When the measurement region is set, the center of gravity is automatically set at the same time as the reference position. This item is used to change the reference position to any desired position. This is handy for measuring the position deviation from a certain position. In the same way for the reference area, when the region settings are made, they are set automatically based on the measurement region.

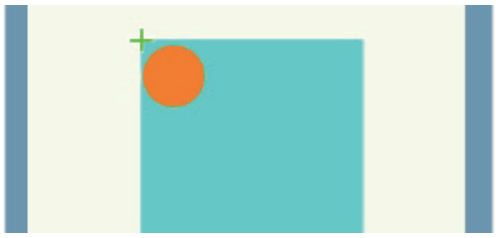
A reference position can be set either directly or by referencing a unit.

Specifying directly

Click a position on the image you want to use as a reference position, or set coordinate data for that point.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.



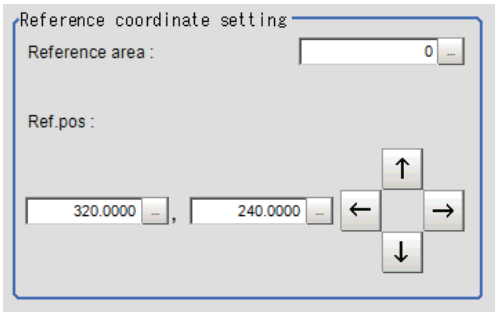
2 In the "Method" area, select "Numerical".

3 Click the position to be set as the reference.

Additional Information

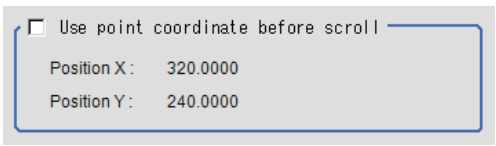
Displaying the image enlarged makes this clicking easier.
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.



5 To remeasure on the displayed image and set the reference, click the [Measure ref.] button.

6 To use data before position compensation for the reference setting coordinates, place a check at "Use point coordinate before scroll".



Referencing a unit

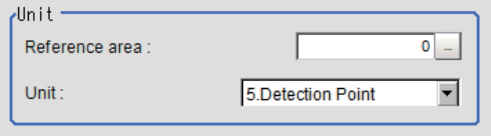
Set a reference by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

1. In the Item Tab area, click [Ref. setting].

   In the display area, the current reference position will be displayed as the crosshair cursor.

2. In the "Method" area, select "Unit".

3. In the scene in the "Unit" area, select a detection point unit.



4. Perform the next measurement, and the reference will be displayed.

2-19-7 Measurement Parameters (Gravity and Area)

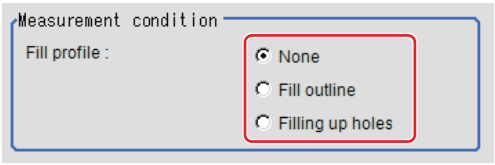
This item specifies the judgement condition for measurement results. Specify the upper and lower limit values for the area and the gravity center X/Y.

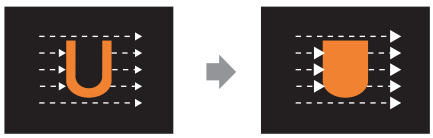
Measurement parameters can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used.

1. In the Item Tab area, click [Measurement].

2. If necessary, in the "Measurement condition" area, select an option for [Fill profile].

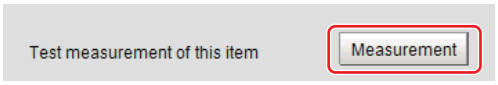
   If the measurement target has holes in it, specify how to process the holes. Normally, the factory default value will be used.



Setting item	Set value [Factory default]	Description
Fill profile	[None]	The empty section in the center is not filled in.
	Fill outline	In the measurement region, the part between the extracted-color start point and end point in the X-axis direction is measured as having the extracted color. Since filling is applied only to the X-axis direction, the processing is faster than filling up holes. Input image Fill profile image 
	Filling up holes	The part surrounded by the extracted color, like a doughnut hole, is filled with the extracted color. Input image Image after filling up hole 

3 If necessary, in the "Display setting" area, set up display settings for the images displayed in the Image Display area.

4 When the setting has been changed, click [Measurement] in the "Detail" area to verify whether measurements can be made correctly.



5 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limits.

Setting item	Set value	Description
Area	0 to 999999999.9999	Specify the area to be judged as OK.
Gravity X	-99999.9999 to 99999.9999	Specify the range of X-axis shifting that is judged to be OK.
Gravity Y	-99999.9999 to 99999.9999	Specify the range of Y-axis shifting that is judged to be OK.

2-19-8 Output Parameters (Gravity and Area)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgment results of this processing unit is reflected in the scene overall judgment.

2-19-9 Key Points for Test Measurement and Adjustment (Gravity and Area)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Area	Area
Gravity X	Gravity X
Gravity Y	Gravity Y

The image specified in the Sub-image number in image display setting is displayed in the Image Display area.

Sub image number.	Explanation of image to be displayed
0	Measurement image
1	Extract image

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

• For color cameras:

Parameter to be adjusted	Remedy
Color	Click the area whose color will be sampled and the area whose color will not be sampled. The setup should be such that two stable sections of hue, saturation and brightness are formed.

• For monochrome cameras:

Parameter to be adjusted	Remedy
Binary	Adjust the binary level.

2-19-10 Measurement Results for Which Output Is Possible (Gravity and Area)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Area	AR	Area
Gravity X	X	Center of gravity X coordinate
Gravity Y	Y	Center of gravity Y coordinate
Reference area	SA	Reference area
Reference point X	SX	Reference position X coordinate
Reference point Y	SY	Reference position Y coordinate

2-19-11 External Reference Tables (Gravity and Area)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mis-match) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Area	area	Get only	0 to 999,999,999.9999
6	Gravity X	gravityX	Get only	-99,999.9999 to 99,999.9999
7	Gravity Y	gravityY	Get only	-99,999.9999 to 99,999.9999
8	Reference area	referenceAreaMS	Get only	0 to 999,999,999
9	Reference X*1	referenceX	Get only	-99,999.9999 to 99,999.9999
10	Reference Y*1	referenceY	Get only	-99,999.9999 to 99,999.9999
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
126	Extract image	extractImage	Set/Get	0: OFF 1: ON
128	Fill profile	edgeFill	Set/Get	0: OFF 1: Fill profile 2: Filling up holes
129	Color inv. (reverse for mono-chrome)	areaInv	Set/Get	0: OFF 1: ON
132	Reference area	referenceArea	Set/Get	0 to 999,999,999
133	Reference X*2	referencePosX	Set/Get	0 to 99,999.9999
134	Reference Y*2	referencePosY	Set/Get	0 to 99,999.9999
135	Upper limit of the area	upperArea	Set/Get	0 to 999,999,999.9999
136	Lower limit of the area	lowerArea	Set/Get	0 to 999,999,999.9999

No.	Data name	Ident	Set/Get	Data range
137	Upper limit of gravity X	upperGravityX	Set/Get	-99,999.9999 to 99,999.9999
138	Lower limit of gravity X	lowerGravityX	Set/Get	-99,999.9999 to 99,999.9999
139	Upper limit of gravity Y	upperGravityY	Set/Get	-99,999.9999 to 99,999.9999
140	Lower limit of gravity Y	lowerGravityY	Set/Get	-99,999.9999 to 99,999.9999
141	Upper limit of the binary level	upperBinary	Set/Get	0 to 255
142	Lower limit of the binary level	lowerBinary	Set/Get	0 to 255
143	Binary image	binaryImage	Set/Get	0: OFF 1: ON
144	Image kind	imageKind	Set/Get	0: Measurement image 1: All color image 2: Selection color image 3: Binary image
145	Multiple selections	multiSelect	Set/Get	0: Multiple selections disabled 1: Multiple selections enabled
160+Nx10 (N: 0 to 7)	Flag used for registered color	flag	Set/Get	0: Not used 1: Used
161+Nx10 (N: 0 to 7)	Flag for registered color OR/NOT	orNot	Set/Get	0: OR 1: NOT
162+Nx10 (N: 0 to 7)	Register the max. color hue	upperH	Set/Get	0 to 359
163+Nx10 (N: 0 to 7)	Register the min. color hue	lowerH	Set/Get	0 to 359
164+Nx10 (N: 0 to 7)	Register the max. color saturation	upperS	Set/Get	0 to 255
165+Nx10 (N: 0 to 7)	Register the min. color saturation	lowerS	Set/Get	0 to 255
166+Nx10 (N: 0 to 7)	Register the max. color brightness	upperV	Set/Get	0 to 255
167+Nx10 (N: 0 to 7)	Register the min. color brightness	lowerV	Set/Get	0 to 255
168+Nx10 (N: 0 to 7)	Background color	background	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
301	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
302	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit
303	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
304	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999
305	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999
316	Dynamic mask unit reference no	DynUnitNo	Set/Get	-1 to 9,999
317	Dynamic mask image no	DynImageNo	Set/Get	0 to 99
319	Display image type	ChkChoose	Set/Get	0: Measure image 1: Mask binary image 2: Mask and image

No.	Data name	Ident	Set/Get	Data range
325	Mask region display color	maskRegionColor	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
90000	Inspection area figure Count	figArea0_count	Set/Get	0 to 8
90001	Inspection area figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
90002	Inspection area figure0 mode	figArea0_fig0_mode	Set/Get	0: OR 1: NOT
90014	Inspection area figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	Inspection area figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	Inspection area figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	Inspection area figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90018	Inspection area figure0 Ellipse Center Position X	figArea0_fig0_ellipse_CX	Set/Get	-99,999 to 99,999
90019	Inspection area figure0 Ellipse Center Position Y	figArea0_fig0_ellipse_CY	Set/Get	-99,999 to 99,999
90020	Inspection area figure0 Ellipse RadiusX	figArea0_fig0_ellipse_RX	Set/Get	1 to 99,999
90021	Inspection area figure0 Ellipse RadiusY	figArea0_fig0_ellipse_RY	Set/Get	1 to 99,999
90025	Inspection area figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	Inspection area figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	Inspection area figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	Inspection area figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90040	Inspection area figure0 Polygon Point Count	figArea0_fig0_polygon_count	Set/Get	3 to 10
90041	Inspection area figure0 Polygon Point1 Position X	figArea0_fig0_polygon_x0	Set/Get	-99,999 to 99,999
90042	Inspection area figure0 Polygon Point1 Position Y	figArea0_fig0_polygon_y0	Set/Get	-99,999 to 99,999
90043	Inspection area figure0 Polygon Point2 Position X	figArea0_fig0_polygon_x1	Set/Get	-99,999 to 99,999
90044	Inspection area figure0 Polygon Point2 Position Y	figArea0_fig0_polygon_y1	Set/Get	-99,999 to 99,999
90045	Inspection area figure0 Polygon Point3 Position X	figArea0_fig0_polygon_x2	Set/Get	-99,999 to 99,999
90046	Inspection area figure0 Polygon Point3 Position Y	figArea0_fig0_polygon_y2	Set/Get	-99,999 to 99,999
90047	Inspection area figure0 Polygon Point4 Position X	figArea0_fig0_polygon_x3	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90048	Inspection area figure0 Polygon Point4 Position Y	figArea0_fig0_polygon_y3	Set/Get	-99,999 to 99,999
90049	Inspection area figure0 Polygon Point5 Position X	figArea0_fig0_polygon_x4	Set/Get	-99,999 to 99,999
90050	Inspection area figure0 Polygon Point5 Position Y	figArea0_fig0_polygon_y4	Set/Get	-99,999 to 99,999
90051	Inspection area figure0 Polygon Point6 Position X	figArea0_fig0_polygon_x5	Set/Get	-99,999 to 99,999
90052	Inspection area figure0 Polygon Point6 Position Y	figArea0_fig0_polygon_y5	Set/Get	-99,999 to 99,999
90053	Inspection area figure0 Polygon Point7 Position X	figArea0_fig0_polygon_x6	Set/Get	-99,999 to 99,999
90054	Inspection area figure0 Polygon Point7 Position Y	figArea0_fig0_polygon_y6	Set/Get	-99,999 to 99,999
90055	Inspection area figure0 Polygon Point8 Position X	figArea0_fig0_polygon_x7	Set/Get	-99,999 to 99,999
90056	Inspection area figure0 Polygon Point8 Position Y	figArea0_fig0_polygon_y7	Set/Get	-99,999 to 99,999
90057	Inspection area figure0 Polygon Point9 Position X	figArea0_fig0_polygon_x8	Set/Get	-99,999 to 99,999
90058	Inspection area figure0 Polygon Point9 Position Y	figArea0_fig0_polygon_y8	Set/Get	-99,999 to 99,999
90059	Inspection area figure0 Polygon Point10 Position X	figArea0_fig0_polygon_x9	Set/Get	-99,999 to 99,999
90060	Inspection area figure0 Polygon Point10 Position Y	figArea0_fig0_polygon_y9	Set/Get	-99,999 to 99,999
90099	Inspection area figure Update	figArea0_update	Set only	1: Update
90101	Inspection area figure1 Type	figArea0_fig1_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
90102	Inspection area figure1 mode	figArea0_fig1_mode	Set/Get	0: OR 1: NOT
90114	Inspection area figure1 Rectangle Upper left position X	figArea0_fig1_box_X0	Set/Get	-99,999 to 99,999
90115	Inspection area figure1 Rectangle Upper left position Y	figArea0_fig1_box_Y0	Set/Get	-99,999 to 99,999
90116	Inspection area figure1 Rectangle Lower right position X	figArea0_fig1_box_X1	Set/Get	-99,999 to 99,999
90117	Inspection area figure1 Rectangle Lower right position Y	figArea0_fig1_box_Y1	Set/Get	-99,999 to 99,999
90118	Inspection area figure1 Ellipse Center Position X	figArea0_fig1_ellipse_CX	Set/Get	-99,999 to 99,999
90119	Inspection area figure1 Ellipse Center Position Y	figArea0_fig1_ellipse_CY	Set/Get	-99,999 to 99,999
90120	Inspection area figure1 Ellipse RadiusX	figArea0_fig1_ellipse_RX	Set/Get	1 to 99,999
90121	Inspection area figure1 Ellipse RadiusY	figArea0_fig1_ellipse_RY	Set/Get	1 to 99,999
90125	Inspection area figure1 Circumference Center Position X	figArea0_fig1_circleW_X	Set/Get	-99,999 to 99,999
90126	Inspection area figure1 Circumference Center Position Y	figArea0_fig1_circleW_Y	Set/Get	-99,999 to 99,999
90127	Inspection area figure1 Circumference Radius	figArea0_fig1_circleW_R	Set/Get	0 to 99,999

No.	Data name	Ident	Set/Get	Data range
90128	Inspection area figure1 Circumference Width	figArea0_fig1_circleW_W	Set/Get	0 to 99,999
90140	Inspection area figure1 Polygon Point Count	figArea0_fig1_polygon_count	Set/Get	3 to 10
90141	Inspection area figure1 Polygon Point1 Position X	figArea0_fig1_polygon_x0	Set/Get	-99,999 to 99,999
90142	Inspection area figure1 Polygon Point1 Position Y	figArea0_fig1_polygon_y0	Set/Get	-99,999 to 99,999
90143	Inspection area figure1 Polygon Point2 Position X	figArea0_fig1_polygon_x1	Set/Get	-99,999 to 99,999
90144	Inspection area figure1 Polygon Point2 Position Y	figArea0_fig1_polygon_y1	Set/Get	-99,999 to 99,999
90145	Inspection area figure1 Polygon Point3 Position X	figArea0_fig1_polygon_x2	Set/Get	-99,999 to 99,999
90146	Inspection area figure1 Polygon Point3 Position Y	figArea0_fig1_polygon_y2	Set/Get	-99,999 to 99,999
90147	Inspection area figure1 Polygon Point4 Position X	figArea0_fig1_polygon_x3	Set/Get	-99,999 to 99,999
90148	Inspection area figure1 Polygon Point4 Position Y	figArea0_fig1_polygon_y3	Set/Get	-99,999 to 99,999
90149	Inspection area figure1 Polygon Point5 Position X	figArea0_fig1_polygon_x4	Set/Get	-99,999 to 99,999
90150	Inspection area figure1 Polygon Point5 Position Y	figArea0_fig1_polygon_y4	Set/Get	-99,999 to 99,999
90151	Inspection area figure1 Polygon Point6 Position X	figArea0_fig1_polygon_x5	Set/Get	-99,999 to 99,999
90152	Inspection area figure1 Polygon Point6 Position Y	figArea0_fig1_polygon_y5	Set/Get	-99,999 to 99,999
90153	Inspection area figure1 Polygon Point7 Position X	figArea0_fig1_polygon_x6	Set/Get	-99,999 to 99,999
90154	Inspection area figure1 Polygon Point7 Position Y	figArea0_fig1_polygon_y6	Set/Get	-99,999 to 99,999
90155	Inspection area figure1 Polygon Point8 Position X	figArea0_fig1_polygon_x7	Set/Get	-99,999 to 99,999
90156	Inspection area figure1 Polygon Point8 Position Y	figArea0_fig1_polygon_y7	Set/Get	-99,999 to 99,999
90157	Inspection area figure1 Polygon Point9 Position X	figArea0_fig1_polygon_x8	Set/Get	-99,999 to 99,999
90158	Inspection area figure1 Polygon Point9 Position Y	figArea0_fig1_polygon_y8	Set/Get	-99,999 to 99,999
90159	Inspection area figure1 Polygon Point10 Position X	figArea0_fig1_polygon_x9	Set/Get	-99,999 to 99,999
90160	Inspection area figure1 Polygon Point10 Position Y	figArea0_fig1_polygon_y9	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
90701	Inspection area figure7 Type	figArea0_fig7_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
90702	Inspection area figure7 mode	figArea0_fig7_mode	Set/Get	0: OR 1: NOT
90714	Inspection area figure7 Rectangle Upper left position X	figArea0_fig7_box_X0	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90715	Inspection area figure7 Rectangle Upper left position Y	figArea0_fig7_box_Y0	Set/Get	-99,999 to 99,999
90716	Inspection area figure7 Rectangle Lower right position X	figArea0_fig7_box_X1	Set/Get	-99,999 to 99,999
90717	Inspection area figure7 Rectangle Lower right position Y	figArea0_fig7_box_Y1	Set/Get	-99,999 to 99,999
90718	Inspection area figure7 Ellipse Center Position X	figArea0_fig7_ellipse_CX	Set/Get	-99,999 to 99,999
90719	Inspection area figure7 Ellipse Center Position Y	figArea0_fig7_ellipse_CY	Set/Get	-99,999 to 99,999
90720	Inspection area figure7 Ellipse RadiusX	figArea0_fig7_ellipse_RX	Set/Get	1 to 99,999
90721	Inspection area figure7 Ellipse RadiusY	figArea0_fig7_ellipse_RY	Set/Get	1 to 99,999
90725	Inspection area figure7 Circumference Center Position X	figArea0_fig7_circleW_X	Set/Get	-99,999 to 99,999
90726	Inspection area figure7 Circumference Center Position Y	figArea0_fig7_circleW_Y	Set/Get	-99,999 to 99,999
90727	Inspection area figure7 Circumference Radius	figArea0_fig7_circleW_R	Set/Get	0 to 99,999
90728	Inspection area figure7 Circumference Width	figArea0_fig7_circleW_W	Set/Get	0 to 99,999
90740	Inspection area figure7 Polygon Point Count	figArea0_fig7_polygon_count	Set/Get	3 to 10
90741	Inspection area figure7 Polygon Point1 Position X	figArea0_fig7_polygon_x0	Set/Get	-99,999 to 99,999
90742	Inspection area figure7 Polygon Point1 Position Y	figArea0_fig7_polygon_y0	Set/Get	-99,999 to 99,999
90743	Inspection area figure7 Polygon Point2 Position X	figArea0_fig7_polygon_x1	Set/Get	-99,999 to 99,999
90744	Inspection area figure7 Polygon Point2 Position Y	figArea0_fig7_polygon_y1	Set/Get	-99,999 to 99,999
90745	Inspection area figure7 Polygon Point3 Position X	figArea0_fig7_polygon_x2	Set/Get	-99,999 to 99,999
90746	Inspection area figure7 Polygon Point3 Position Y	figArea0_fig7_polygon_y2	Set/Get	-99,999 to 99,999
90747	Inspection area figure7 Polygon Point4 Position X	figArea0_fig7_polygon_x3	Set/Get	-99,999 to 99,999
90748	Inspection area figure7 Polygon Point4 Position Y	figArea0_fig7_polygon_y3	Set/Get	-99,999 to 99,999
90749	Inspection area figure7 Polygon Point5 Position X	figArea0_fig7_polygon_x4	Set/Get	-99,999 to 99,999
90750	Inspection area figure7 Polygon Point5 Position Y	figArea0_fig7_polygon_y4	Set/Get	-99,999 to 99,999
90751	Inspection area figure7 Polygon Point6 Position X	figArea0_fig7_polygon_x5	Set/Get	-99,999 to 99,999
90752	Inspection area figure7 Polygon Point6 Position Y	figArea0_fig7_polygon_y5	Set/Get	-99,999 to 99,999
90753	Inspection area figure7 Polygon Point7 Position X	figArea0_fig7_polygon_x6	Set/Get	-99,999 to 99,999
90754	Inspection area figure7 Polygon Point7 Position Y	figArea0_fig7_polygon_y6	Set/Get	-99,999 to 99,999
90755	Inspection area figure7 Polygon Point8 Position X	figArea0_fig7_polygon_x7	Set/Get	-99,999 to 99,999
90756	Inspection area figure7 Polygon Point8 Position Y	figArea0_fig7_polygon_y7	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90757	Inspection area figure7 Polygon Point9 Position X	figArea0_fig7_polygon_x8	Set/Get	-99,999 to 99,999
90758	Inspection area figure7 Polygon Point9 Position Y	figArea0_fig7_polygon_y8	Set/Get	-99,999 to 99,999
90759	Inspection area figure7 Polygon Point10 Position X	figArea0_fig7_polygon_x9	Set/Get	-99,999 to 99,999
90760	Inspection area figure7 Polygon Point10 Position Y	figArea0_fig7_polygon_y9	Set/Get	-99,999 to 99,999
91000	Mask area figure Count	figArea1_count	Set/Get	1
91001	Mask area figure0 Type	figArea1_fig0_type	Set/Get	8: Rectangle
91002	Mask area figure0 mode	figArea1_fig0_mode	Set/Get	0: OR
91014	Mask area figure0 Rectangle Upper left position X	figArea1_fig0_box_X0	Set/Get	-99,999 to 99,999
91015	Mask area figure0 Rectangle Upper left position Y	figArea1_fig0_box_Y0	Set/Get	-99,999 to 99,999
91016	Mask area figure0 Rectangle Lower right position X	figArea1_fig0_box_X1	Set/Get	-99,999 to 99,999
91017	Mask area figure0 Rectangle Lower right position Y	figArea1_fig0_box_Y1	Set/Get	-99,999 to 99,999
91099	Mask area figure Update	figArea1_update	Set only	1: Update
92000	Selected area figure Count	figArea2_count	Set/Get	0 to 8
92001	Selected area figure0 Type	figArea2_fig0_type	Set/Get	8: Rectangle
92002	Selected area figure0 mode	figArea2_fig0_mode	Set/Get	0: OR 1: NOT
92014	Selected area figure0 Rectangle Upper left position X	figArea2_fig0_box_X0	Set/Get	-99,999 to 99,999
92015	Selected area figure0 Rectangle Upper left position Y	figArea2_fig0_box_Y0	Set/Get	-99,999 to 99,999
92016	Selected area figure0 Rectangle Lower right position X	figArea2_fig0_box_X1	Set/Get	-99,999 to 99,999
92017	Selected area figure0 Rectangle Lower right position Y	figArea2_fig0_box_Y1	Set/Get	-99,999 to 99,999
92099	Selected area figure Update	figArea2_update	Set only	1: Update
92101	Selected area figure1 Type	figArea2_fig1_type	Set/Get	8: Rectangle
92102	Selected area figure1 mode	figArea2_fig1_mode	Set/Get	0: OR 1: NOT
92114	Selected area figure1 Rectangle Upper left position X	figArea2_fig1_box_X0	Set/Get	-99,999 to 99,999
92115	Selected area figure1 Rectangle Upper left position Y	figArea2_fig1_box_Y0	Set/Get	-99,999 to 99,999
92116	Selected area figure1 Rectangle Lower right position X	figArea2_fig1_box_X1	Set/Get	-99,999 to 99,999
92117	Selected area figure1 Rectangle Lower right position Y	figArea2_fig1_box_Y1	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
92701	Selected area figure7 Type	figArea2_fig7_type	Set/Get	8: Rectangle
92702	Selected area figure7 mode	figArea2_fig7_mode	Set/Get	0: OR 1: NOT
92714	Selected area figure7 Rectangle Upper left position X	figArea2_fig7_box_X0	Set/Get	-99,999 to 99,999
92715	Selected area figure7 Rectangle Upper left position Y	figArea2_fig7_box_Y0	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
92716	Selected area figure7 Rectangle Lower right position X	figArea2_fig7_box_X1	Set/Get	-99,999 to 99,999
92717	Selected area figure7 Rectangle Lower right position Y	figArea2_fig7_box_Y1	Set/Get	-99,999 to 99,999

*1. The reference coordinates based on the selection in the Method area of the [Ref.setting] tab can be Get only.

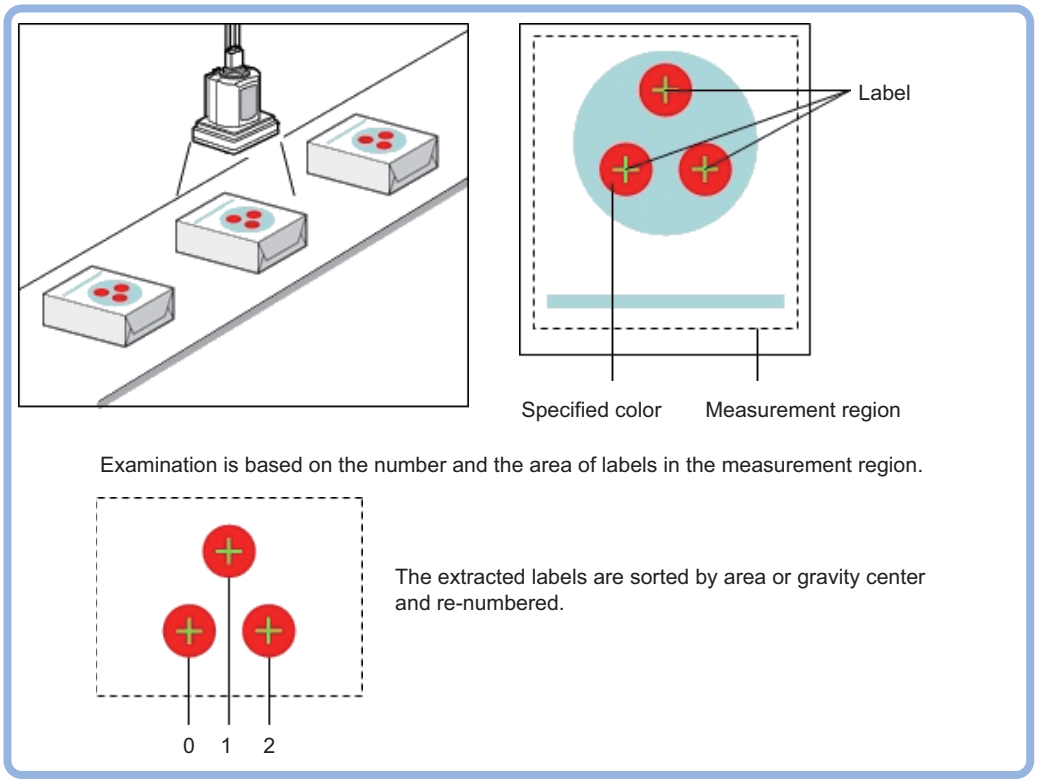
*2. The reference coordinates based on the selection of Numerical in the Method area of the [Ref.setting] tab can be Set/Get.

2-20 Labeling

You can count the number of labels with a specified color or find the area and center of gravity of a specified label number.

Used in the Following Case

Label count inspection

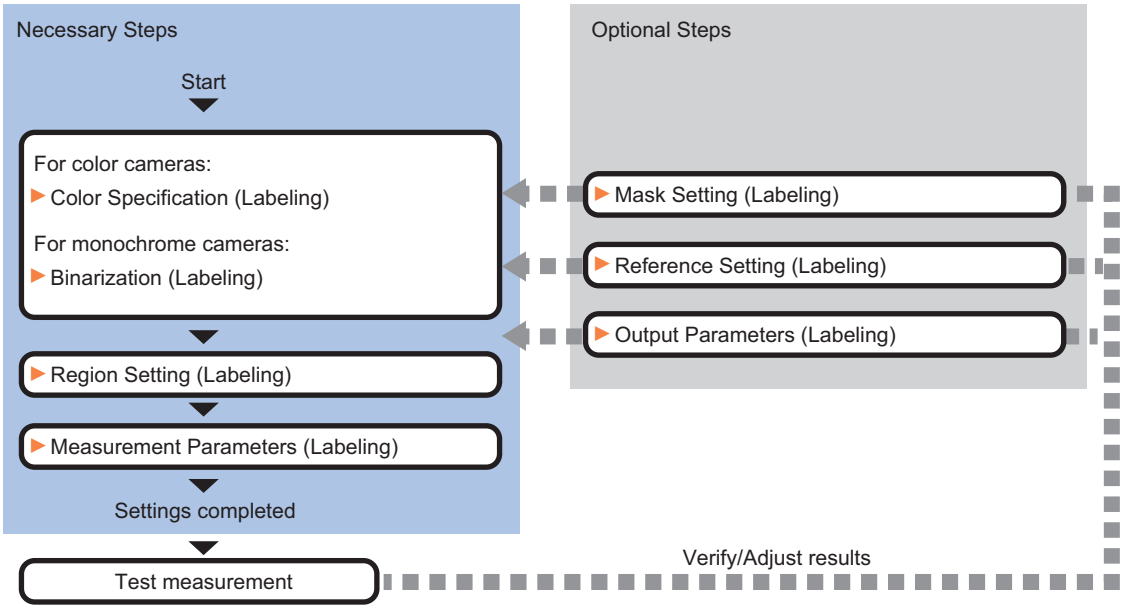


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-20-1 Settings Flow (Labeling)

Labeling can be set up as follows.



List of Labeling Items

Item name	Description
Color (for color cameras only)	This item selects the color whose area and center of gravity are to be measured. Since the color hue, color saturation, and brightness can be selected, then fine-tuning can be performed to colors. For details, refer to *2-20-2 Color Specification (Labeling)* on page 2-286.
Binary (for monochrome cameras only)	This item specifies the binary level for converting 256-tone grayscale images input from the camera into binary images. Converted white pixels are measured. Adjust the binary level so that the measurement object is converted to white pixels. For details, refer to *2-20-3 Binarization (Labeling)* on page 2-288.
Region setting	This item is used to set up the measurement area. While the input image can be measured as a whole, a quick and reliable measurement can be performed by set up the measured range. For details, refer to *2-20-4 Region Setting (Labeling)* on page 2-289.
Mask setting	Set it when masking a region. The measurement result of another processing item can also be used for masking. For details, refer to *2-20-5 Mask Setting (Labeling)* on page 2-290.
Ref. setting	This item can be changed if necessary. Usually, the central position of the registered region is registered as the reference position. For details, refer to *2-20-6 Reference Setting (Labeling)* on page 2-293.
Measurement	This item specifies the judgement condition for measurement results. It specifies the upper and lower limit values for the number of labels, the area and the center of gravity X and Y. Measurement parameters can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used. For details, refer to *2-20-7 Measurement Parameters (Labeling)* on page 2-295.

Item name	Description
Output parameter	This item can be changed if necessary. Normally, the factory default value may be used. Use the output parameter to specify how to handle the coordinates. For details, refer to *2-20-9 Output Parameters (Labeling)* on page 2-299.

2-20-2 Color Specification (Labeling)

When connecting a color camera, specify the color to be measured. There are two specification methods: specifying the color to be extracted in the image or specifying the color with the hue, saturation, and brightness values.

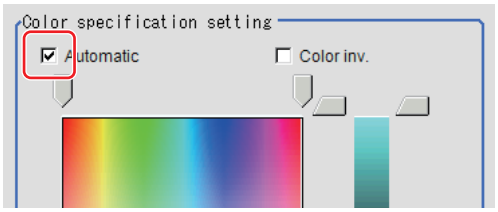
This section describes how to specify colors in an image and gives an example of the procedure for finely adjusting with numeric input afterwards.

1 In the Item Tab area, click [Color].

2 Place a check at [Automatic].

3 In the Image Display area, specify the color range you want to detect by dragging the cursor from the upper left corner to the lower right corner of that area.

The color of the specified area is automatically set.

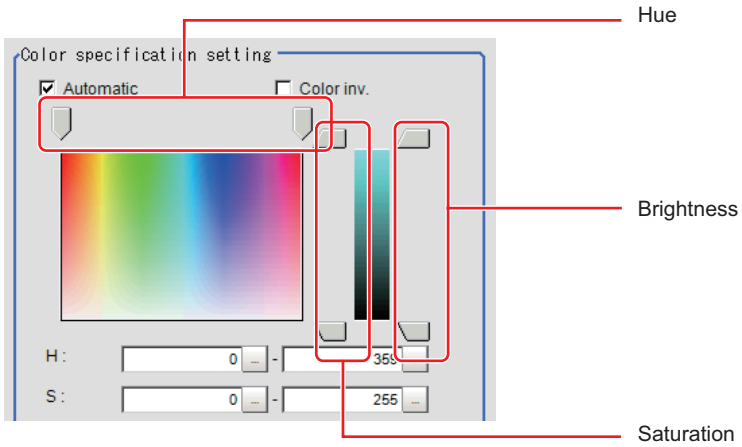


4 Finely adjust the hue, saturation, and brightness if necessary.

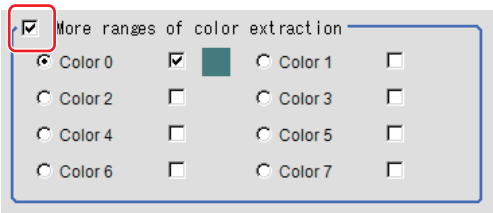
Adjust either by adjusting on the color chart or by inputting numbers.

Item	Set value [Factory default]	Description
H	0 to 359	Specify the color phase (difference of color hues).
S	0 to 255	Specify color saturation (difference of color saturation).
V	0 to 255	Specify the brightness (difference of brightness).
Automatic	• Checked • [Unchecked]	Specifying the color to be measured on the image automatically sets the hue, saturation, and brightness.
Color inv.	• Checked • [Unchecked]	Everything other than the specified color becomes the measurement target.

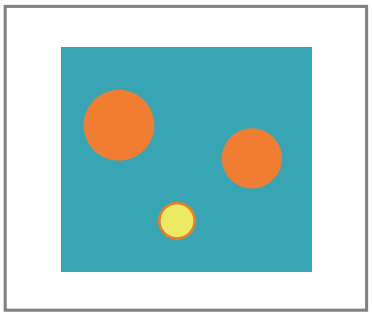
- About color charts



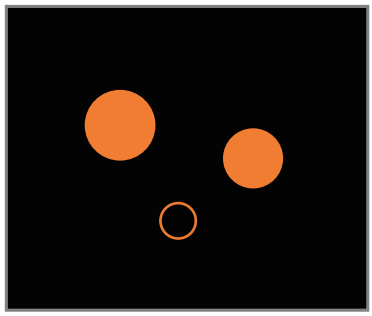
5 To specify multiple colors, place a check at "More ranges of color extraction".



Setting item	Set value [Factory default]	Description
More ranges of color extraction	• Checked • [Unchecked]	If you place a check at this option, you can set up to 8 colors.

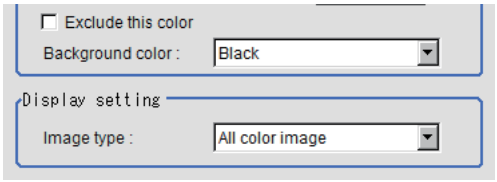


Extract image
(before specifying colors)



Extract image
(after specifying colors – background color: black)

6 If necessary, set the display conditions for displayed images.



Setting item	Set value [Factory default]	Description
Exclude this color	• Checked • [Unchecked]	If you place a check at this option, pixels within the HSV range are excluded from color extraction. The priority order for exclusion is that the higher color extraction range numbers are given priority. This setting is disabled if "More ranges of color extraction" is unchecked.

Setting item	Set value [Factory default]	Description
Background color	• [Black] • White • Red • Green • Blue	The background section outside the extracted image is filled with the specified colors.
Image type	• Measurement image • [All color image] • Selected color image • Binary image	This sets the state of the image to display.

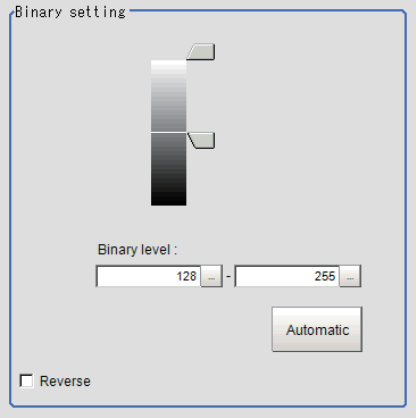
2-20-3 Binarization (Labeling)

When a monochrome camera is connected, the 256-tone grayscale images taken in from the camera are converted into binary black-and-white images before the images are measured. Converted white pixels are measured.

This specifies the level for converting grayscale images into binary images.

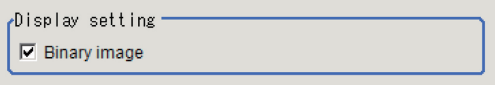
1 In the Item Tab area, click [Binary].

2 In the "Binary setting" area, specify the reference density range.



Item		Set value [Factory default]	Description
Binary level	Upper limit value	0 to 255 [255]	Specify the level for converting 256-tone grayscale images to binary images. Adjust the binary level so that the measurement object is converted to white pixels. You can also set the binary level so that only intermediate density is measured.
	Lower limit value	0 to 255 [128]	
Automatic		-	Optimum binary levels are calculated automatically and set.
Reverse		• [Checked] • Unchecked	This item reverses black and white colors.

3 If necessary, in the "Display setting" area, set up display settings for the images displayed in the Image Display area.



Setting item	Set value [Factory default]	Description
Binary image	• [Checked] • Unchecked	The image is displayed in binary with black and white.

2-20-4 Region Setting (Labeling)

This item is used to set up the measurement area. It is possible to measure the entire input image, but restricting the range enables accurate measurement in a short period of time.

Use a rectangle, straight line, circle (ellipse), circumference, arc, wide arc, or polygon to specify a measurement region for [Labeling].

1 In the Item Tab area, click [Region setting].

2 Use the Drawing tools to specify the measurement region.

3 In the figure setting area, specify a region to be measured.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

5 If necessary, in the "Display setting" area, set up display settings for the images displayed in the Image Display area.

- For color cameras:

Setting item	Set value [Factory default]	Description
Extract image	• [Checked] • Unchecked	If you place a check at this option, image set with the color specification are displayed.

- For monochrome cameras:

Setting item	Set value [Factory default]	Description
Binary image	• [Checked] • Unchecked	The image is displayed in binary with black and white.

2-20-5 Mask Setting (Labeling)

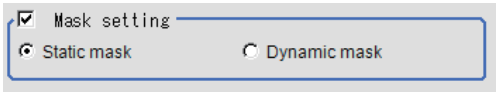
Mask the measurement region when measuring it.

There are two types of masks, namely, a static mask that sets the mask region independent of measurement and a dynamic mask that uses images generated in another unit for each measurement.

Creating a static mask

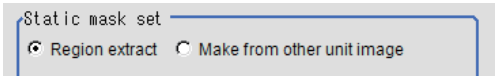
A static mask can be created manually or from an image of another unit.

1 In the Mask setting area, select "Static mask".



● Generating a mask manually

1 In the Static mask set area, select "Region extract".



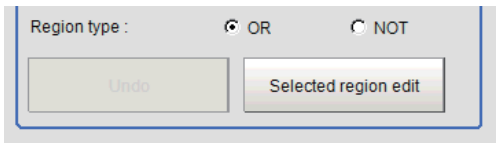
2 Select the selection region type OR or NOT and drag an image directly.

A region is created along successive similar colors from the selected place. It is not masked if the selection region type is OR.

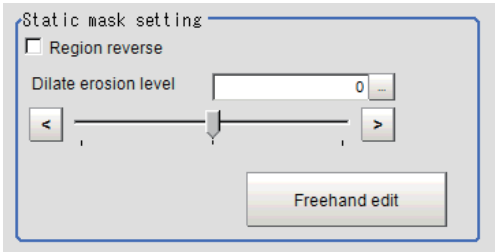
It is masked if the selection region type is NOT.

To deselect a selected region, click [Undo].

To edit a region selected with OR/NOT, click [Selected region edit].



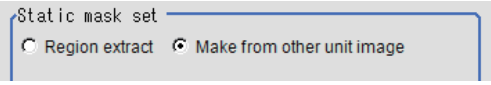
3 Adjust the mask created in the Static mask setting area.



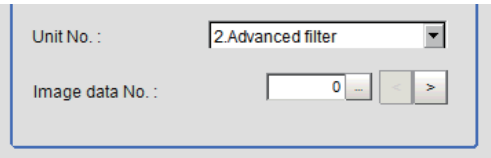
Setting item	Setting value [Factory default]	Description
Region reverse	• Checked • [Unchecked]	Place a check to revert the created mask region.
Binary image	• [Checked] • Unchecked	The image is displayed in binary with black and white.
Dilate erosion level	-10 to 10 [0]	Perform fine adjustment on the mask region using expansions/shrinkage. The region is expanded if a positive value is set. The region is shrunk if a negative value is set.

● Creating a static mask from an image of another unit

1 In the Static mask set area, select "Make from other unit image".



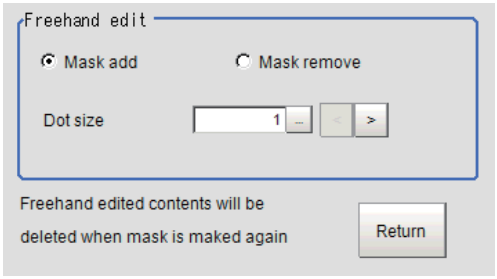
2 Set the unit number and image data number.



Setting item	Setting value [Factory default]	Description
Unit No.	-	Specify the number of the unit whose image will be referenced. The reference unit should be able to output binarized images. For example, select a labeling filter processing image for advanced filtering.
Image data No.	0 to 3 [0]	If the unit supports advanced filtering, numbers 0 to 3 can be set. Otherwise, it is fixed to 0.

Performing fine adjustment on a static mask

1 To perform fine adjustment on a mask region, click [Freehand edit] in the Static mask setting area.



Setting item	Setting value [Factory default]	Description
Freehand edit	• [Mask add] • Mask remove	Select a process performed using the free hand edit.
Dot size	1 to 20 [1]	Set the size of dots used when drawing images on the screen.

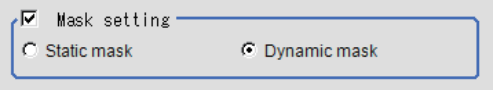
2 Click [Return] to exit the free hand edit.

● Clearing the static mask setting

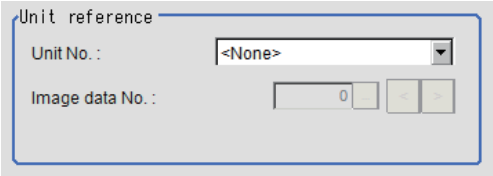
To clear the static mask setting, click [Clear].

Creating a dynamic mask

1 In the Mask setting area, select "Dynamic mask".



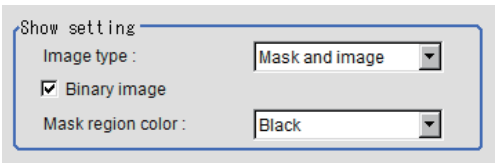
2 Set the unit number and image data number in the Unit reference area.



Setting item	Setting value [Factory default]	Description
Unit No.	-	Set the number of the unit being referred to for the mask region. The reference unit should be able to output binarized images. For example, select a labeling filter processing image for advanced filtering.
Image data No.	0 to 3 [0]	If the unit supports advanced filtering, numbers 0 to 3 can be set. Otherwise, it is fixed to 0.

Setting display

Perform the display setting if required.



Setting item	Setting value [Factory default]	Description
Image type	• Measure image • Mask binary image • [Mask and image]	Select the type of an image to be displayed. Measure image: Measured image Mask binary image: Binarized image for masking Mask and image: Post-masking image
Mask region color	• [Black] • White • Red • Green • Blue	Select the display color of the mask region. A part of color which is specified in [Mask region color] is not measured.

2-20-6 Reference Setting (Labeling)

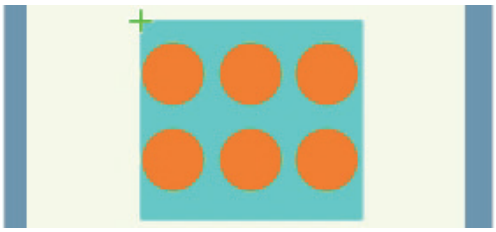
This item can be changed if necessary. When the region is set, the reference position is automatically set at the center of gravity of the measurement region. In the same way for the reference area, when the region settings are made, they are set automatically based on the measurement region.
This item can be used to change the reference position to any desired position.
A reference position can be set either directly or by referencing a unit.

Specifying directly

Click a position on the image you want to use as a reference position, or set coordinate data for that point.

1 In the Item Tab area, click [Ref. setting].

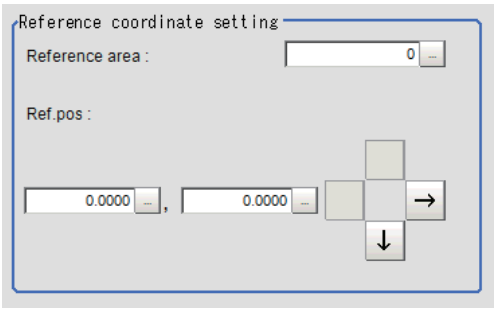
In the display area, the current reference position will be displayed as the crosshair cursor.



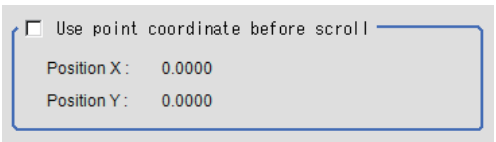
2 In the "Method" area, select "Numerical".

3 Click the position to be set as the reference.

4 Make fine adjustments using numeric value inputs or the arrow buttons as required.



5 To use data before position compensation for the reference setting coordinates, place a check at "Use point coordinate before scroll".



6 If necessary, in the "Display setting" area, set up display settings for the images displayed in the Image Display area.

Setting item	Set value [Factory default]	Description
Binary image	• [Checked] • Unchecked	The image is displayed in binary with black and white.

Referencing a unit

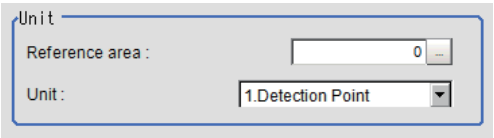
Set a reference by referencing a detection point unit with registered X coordinate, Y coordinate and angle data.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".

3 In the scene in the "Unit" area, select a detection point unit.



4 Perform the next measurement, and the reference will be displayed.

5 If necessary, in the "Display setting" area, set up display settings for the images displayed in the Image Display area.

Setting item	Set value [Factory default]	Description
Binary image	• [Checked] • Unchecked	The image is displayed in binary with black and white.

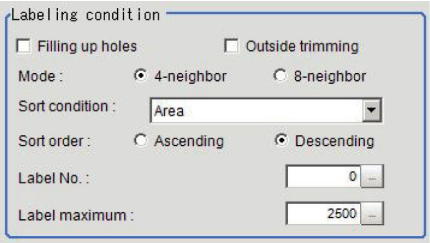
2-20-7 Measurement Parameters (Labeling)

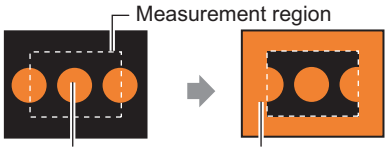
This item specifies the judgement condition for measurement results.

Measurement parameters can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used.

1 In the Item Tab area, click [Measurement].

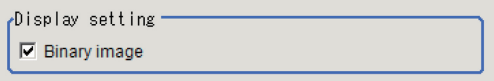
2 If necessary, in the "Labeling condition" area, specify a value for each item.



Setting item	Set value [Factory default]	Description
Filling up holes	• Checked • [Unchecked]	Select the process method for the part encircled by the designated color circle. When checked, the hole is processed as having the specified color. Input image → Image after filling up hole 
Outside trimming	• Checked • [Unchecked]	This option can be used only when there is a section of the designated color in the measurement region that does not need to be measured. When "Checked" is set, the whole area outside of the measurement region is extracted as having the specified color.  Measurement region When calculating the position and area of this label The area outside of the measurement region turns into the color of the measurement target. Sort mode: Area descending Label No.: 1 With the settings above, the position and area of the middle label will be measured.
Mode	• [4-neighbor] • 8-neighbor	Specifies the connection conditions for labeling. 4-neighbor: Process contiguous parts up, down, left, and right of the target pixel as the same label. 8-neighbor: Add oblique directions to the 4-neighbor processing.

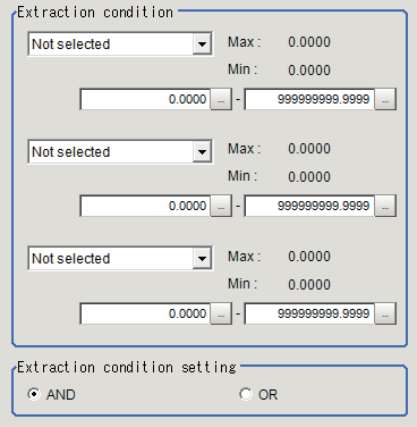
Setting item	Set value [Factory default]	Description
Sort condition	• [Area] • X • Y • Elliptic major axis • Elliptic minor axis • Elliptic ratio • Rectangle width • Rectangle height • Rectangle X1 • Rectangle Y1 • Perimeter • Circularity • Fit rect major axis • Fit rect minor axis • Fit rect ratio • Inscribed circle X • Inscribed circle Y • Inscribed circle R • Circum. circle X • Circum. circle Y • Circum. circle R • Number of holes	Specify the conditions by which label number is re-assigned. When sorting referencing the X and Y coordinates, the upper left is the origin.
Sort order	• Ascending • [Descending]	Set the direction for sorting. Ascending: Numbers are assigned from smaller values to larger. Descending: Numbers are assigned from larger values to smaller.
Label No.	FZ5-L Series / FZ5-600 Series: 0 to 2499 [0] FH Series / FZ5-800 Series / FZ5-1100 Series / FZ5-1200 Series: 0 to 9998 [0]	Set the label number for the data to be output.
Label maximum	FZ5-L Series / FZ5-600 Series: 1 to 2500 [2500] FH Series / FZ5-800 Series / FZ5-1100 Series / FZ5-1200 Series: 1 to 9999 [2500]	Set the maximum number of labels to be output.

3 If necessary, in the "Display setting" area, set up display settings for the images displayed in the Image Display area.



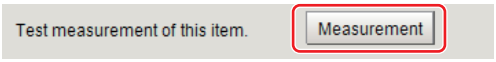
Setting item	Set value [Factory default]	Description
Binary image	• [Checked] • Unchecked	The image is displayed in binary with black and white.

4 Set the extraction conditions.



Setting item	Set value [Factory default]	Description
Extraction condition	• [Not selected] • Area • Gravity X • Gravity Y • Elliptic major axis • Elliptic minor axis • Elliptic ratio • Rectangle width • Rectangle height • Rectangle X1 • Rectangle Y1 • Perimeter • Circularity • Fit rect major axis • Fit rect minor axis • Inscribed circle R • Circum. circle R • Number of holes	Set the extraction conditions.
Extraction condition setting	• [AND] • OR	Set the "Extraction conditions". AND: When all the set "Extraction conditions" are fulfilled. OR: When any of the set "Extraction conditions" is fulfilled.

5 When the setting has been changed, click [Measurement] in the "Detail" area to verify whether measurements can be made correctly.



2-20-8 Judgement Conditions (Labeling)

1 In the Item Tab area, click [Judgement].

2 If necessary, specify a value for each item.

To set feature quantities 4-7, click the [Feature data 4-7] button.

Setting item		Set value [Factory default]	Description
Judgement condition			Set up the judgement condition.
	• [None] • Number of labels • Total area • Area • Gravity X • Gravity Y • Elliptic axis angle • Elliptic major axis • Elliptic minor axis • Elliptic ratio • Rectangle width • Rectangle height • Rectangle X1 • Rectangle Y1 • Perimeter • Circularity • Fit rect major axis • Fit rect minor axis • Fit rect ratio • Inscribed circle X • Inscribed circle Y • Inscribed circle R • Circum. circle X • Circum. circle Y • Circum. circle R • Number of holes	0.000 to 9999999.999	

3 If necessary, in the "Display setting" area, set up display settings for the images displayed in the Image Display area.

2-20-9 Output Parameters (Labeling)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgment results of this processing unit is reflected in the scene overall judgment.

2-20-10 Key Points for Test Measurement and Adjustment (Labeling)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Number of labels	Number of labels
Area	Area
Gravity X	Gravity X
Gravity Y	Gravity Y

The image specified in the Sub-image number in image display setting is displayed in the Image Display area.

Sub image number.	Explanation of image to be displayed
0	Measurement image
1	Extracted image

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

- For color cameras:

Parameter to be adjusted	Remedy
Color	Click the area whose color will be sampled and the area whose color will not be sampled. The setup should be such that two stable sections of hue, saturation and brightness are formed.

- For monochrome cameras:

Parameter to be adjusted	Remedy
Binary	Adjust the binary level.

2-20-11 Measurement Results for Which Output Is Possible (Labeling)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Number of labels	L	Number of labels
Total area	TAR	Total area
Area	AR	Area
Gravity X	X	Center of gravity X coordinate
Gravity Y	Y	Center of gravity Y coordinate
Reference area	SA	Reference area
Reference X	SX	Reference position X coordinate
Reference Y	SY	Reference position Y coordinate
Feature data 0 to 7	FDA to FDH	Measurement value of Feature data which is selected in Judgement condition.
Feature data 0 to 7 [0]	FDA0 to FDH0	Measurement date of feature quantity
Feature data 0 to 7 [1]	FDA1 to FDH1	Measurement date of feature quantity
Feature data 0 to 7 [2]	FDA2 to FDH2	Measurement date of feature quantity
• • •	• • •	• • •
Feature data 0 to 7 [99]	FDA99 to FDH99	Measurement date of feature quantity

2-20-12 External Reference Tables (Labeling)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Number of labels	numOfLabels	Get only	0 to 2500: FZ5-3□□, FZ5-6□□ 0 to 9999: FH-1□□□, FH-2□□□, FH-3□□□, FH-5□□□, FZ5-8□□, FZ5-11□□, FZ5-12□□
6	Area	area	Get only	0 to 999,999,999.9999
7	Gravity X	gravityX	Get only	-99,999.9999 to 99,999.9999
8	Gravity Y	gravityY	Get only	-99,999.9999 to 99,999.9999
9	Reference area	referenceAreaMS	Get only	0 to 999,999,999.9999
10	Reference X[*1]	referenceX	Get only	-99,999.9999 to 99,999.9999
11	Reference Y[*1]	referenceY	Get only	-99,999.9999 to 99,999.9999
50+N (N: 0 to 7)	Feature data	featDataVal	Get only	-999,999,999.9999 to 999,999,999.9999
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
126	Extract image	extractImage	Set/Get	0: OFF 1: ON
128	Reference area	referenceArea	Set/Get	0 to 999,999,999
129	Reference X[*2]	referencePosX	Set/Get	0 to 99,999.9999
130	Reference Y[*2]	referencePosY	Set/Get	0 to 99,999.9999
131	Color inv. (reverse for monochrome)	areaInv	Set/Get	0: OFF 1: ON
132	Filling up holes	fillingUpHoles	Set/Get	0: OFF 1: ON
133	Outside trimming	trimming	Set/Get	0: OFF 1: ON
134	Upper limit of the object area range	upperLabelArea	Set/Get	0 to 999,999,999
135	Lower limit of the object area range	lowerLabelArea	Set/Get	0 to 999,999,999

No.	Data Name	Ident	Set/Get	Data range
136	Sort condition	sortCondition	Set/Get	0: Area Ascending 1: Descending 2: Gravity X Ascending 3: Gravity X Descending 4: Gravity Y Ascending 5: Gravity Y Descending 6: Elliptic major axis Ascending 7: Elliptic major axis Descending 8: Elliptic minor axis Ascending 9: Elliptic minor axis Descending 10: Elliptic ratio Ascending 11: Elliptic ratio Descending 12: Rectangle width Ascending 13: Rectangle width Descending 14: Rectangle height Ascending 15: Rectangle height Descending 16: Rectangle X1 Ascending 17: Rectangle X1 Descending 18: Rectangle Y1 Ascending 19: Rectangle Y1 Descending 20: Perimeter Ascending 21: Perimeter Descending 22: Circularity Ascending 23: Circularity Descending 24: Fit rect major axis Ascending 25: Fit rect major axis Descending 26: Fit rect minor axis Ascending 27: Fit rect minor axis Descending 28: Fit rect ratio Ascending 29: Fit rect ratio Descending 30: Inscribed circle X Ascending 31: Inscribed circle X Descending 32: Inscribed circle Y Ascending 33: Inscribed circle Y Descending 34: Inscribed circle R Ascending 35: Inscribed circle R Descending 36: Circum. circle X Ascending 37: Circum. circle X Descending 38: Circum. circle Y Ascending 39: Circum. circle Y Descending 40: Circum. circle R Ascending 41: Circum. circle R Descending 42: Number of holes Ascending 43: Number of holes Descending

No.	Data Name	Ident	Set/Get	Data range
137	Label No.	labelNo	Set/Get	0 to 2499: FZ5-3□□, FZ5-6□□ 0 to 9998: FH-1□□□, FH-2□□□, FH-3□□□, FH-5□□□, FZ5-8□□, FZ5-11□□, FZ5-12□□
138	Upper limit of the number of labels	upperLabel	Set/Get	0 to 2500: FZ5-3□□, FZ5-6□□ 0 to 9999: FH-1□□□, FH-2□□□, FH-3□□□, FH-5□□□, FZ5-8□□, FZ5-11□□, FZ5-12□□
139	Lower limit of the number of labels	lowerLabel	Set/Get	0 to 2500: FZ5-3□□, FZ5-6□□ 0 to 9999: FH-1□□□, FH-2□□□, FH-3□□□, FH-5□□□, FZ5-8□□, FZ5-11□□, FZ5-12□□
140	Upper limit of the area	upperArea	Set/Get	0 to 999,999,999.9999
141	Lower limit of the area	lowerArea	Set/Get	0 to 999,999,999.9999
142	Upper limit of the gravity X	upperGravityX	Set/Get	-99,999.9999 to 99,999.9999
143	Lower limit of the gravity X	lowerGravityX	Set/Get	-99,999.9999 to 99,999.9999
144	Upper limit of the gravity Y	upperGravityY	Set/Get	-99,999.9999 to 99,999.9999
145	Lower limit of the gravity Y	lowerGravityY	Set/Get	-99,999.9999 to 99,999.9999
146	Upper limit of the binary level (for monochrome cameras only)	upperBinary	Set/Get	0 to 255
147	Lower limit of the binary level (for monochrome cameras only)	lowerBinary	Set/Get	0 to 255
148	Binary image (for monochrome cameras only)	binaryImage	Set/Get	0: OFF 1: ON
149	Image kind	imageKind	Set/Get	0: Measurement image 1: All color image 2: Selection color image 3: Binary image
150	Multiple selections	multiSelect	Set/Get	0: Multiselect NG 1: MultiSelect OK
153	Extraction condition	filterCondSetting	Set/Get	0: AND 1: OR
154	Label maximum	labelMaxNum	Set/Get	1 to 9,999
155	Mode	neighborhoodMode	Set/Get	0: 4-neighbor 1: 8-neighbor
160+Nx10 (N: 0 to 7)	Flag used for registered color	flag	Set/Get	0: Not used 1: Used
161+Nx10 (N: 0 to 7)	Flag for registered color OR/NOT	orNot	Set/Get	0: OR 1: NOT
162+Nx10 (N: 0 to 7)	Register the max. color hue	upperH	Set/Get	0 to 359
163+Nx10 (N: 0 to 7)	Register the min. color hue	lowerH	Set/Get	0 to 359

No.	Data Name	Ident	Set/Get	Data range
164+Nx10 (N: 0 to 7)	Register the max. color saturation	upperS	Set/Get	0 to 255
165+Nx10 (N: 0 to 7)	Register the min. color saturation	lowerS	Set/Get	0 to 255
166+Nx10 (N: 0 to 7)	Register the max. color brightness	upperV	Set/Get	0 to 255
167+Nx10 (N: 0 to 7)	Register the min. color brightness	lowerV	Set/Get	0 to 255
168+Nx10 (N: 0 to 7)	Background color	background	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
301	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
302	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit
303	Use point coordinate before scroll	beforeScrollRefMode	Set/Get	0: Not use 1: Use
304	Position X before scroll	beforeScrollRefPosX	Set/Get	-99,999.9999 to 99,999.9999
305	Position Y before scroll	beforeScrollRefPosY	Set/Get	-99,999.9999 to 99,999.9999
316	Dynamic mask unit reference no	DynUnitNo	Set/Get	-1 to 9,999
317	Dynamic mask image no	DynImageNo	Set/Get	0 to 99
319	Display image type	ChkChoose	Set/Get	0: Measure image 1: Mask binary image 2: Mask and image
325	Mask region display color	maskRegionColor	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue

No.	Data Name	Ident	Set/Get	Data range
501+Nx10 (N: 0 to 2)	Filter condition	filterCond	Set/Get	0: Not selected 1: Area 2: Gravity X 3: Gravity Y 4: Elliptic major axis 5: Elliptic minor axis 6: Elliptic ratio 7: Rectangle width 8: Rectangle height 9: Rectangle X1 10: Rectangle Y1 11: Perimeter 12: Circularity 13: Fit rect major axis 14: Fit rect minor axis 15: Inscribed circle R 16: Circum. circle R 17: Number of holes
503+Nx10 (N: 0 to 2)	Upper limit of filter condition	upperFilter	Set/Get	-999,999,999.9999 to 999,999,999.9999
504+Nx10 (N: 0 to 2)	Lower limit of filter condition	lowerFilter	Set/Get	-999,999,999.9999 to 999,999,999.9999

No.	Data Name	Ident	Set/Get	Data range
600+Nx10 (N: 0 to 7)	Judge condition	featCond	Set/Get	0: Not selected 1: Number of labels 2: Total area 3: Area 4: Gravity X 5: Gravity Y 6: Elliptic axis angle 7: Elliptic major axis 8: Elliptic minor axis 9: Elliptic ratio 10: Rectangle width 11: Rectangle height 12: Rectangle X1 13: Rectangle Y1 14: Perimeter 15: Circularity 16: Fit rect major axis 17: Fit rect minor axis 18: Fit rect ratio 19: Inscribed circle X 20: Inscribed circle Y 21: Inscribed circle R 22: Circum. circle X 23: Circum. circle Y 24: Circum. circle R 25: Number of holes
601+Nx10 (N: 0 to 7)	Judge condition display flag	featDisp	Set/Get	0 to 1
602+Nx10 (N: 0 to 7)	Upper limit of judge condition	upperFeat	Set/Get	-999,999,999.9999 to 999,999,999.9999
603+Nx10 (N: 0 to 7)	Lower limit of judge condition	lowerFeat	Set/Get	-999,999,999.9999 to 999,999,999.9999
1000+N (N: 0 to 99)	Feature data A	FDA	Get only	-999,999,999.9999 to 999,999,999.9999
1100+N (N: 0 to 99)	Feature data B	FDB	Get only	-999,999,999.9999 to 999,999,999.9999
1200+N (N: 0 to 99)	Feature data C	FDC	Get only	-999,999,999.9999 to 999,999,999.9999
1300+N (N: 0 to 99)	Feature data D	FDD	Get only	-999,999,999.9999 to 999,999,999.9999
1400+N (N: 0 to 99)	Feature data E	FDE	Get only	-999,999,999.9999 to 999,999,999.9999
1500+N (N: 0 to 99)	Feature data F	FDF	Get only	-999,999,999.9999 to 999,999,999.9999
1600+N (N: 0 to 99)	Feature data G	FDG	Get only	-999,999,999.9999 to 999,999,999.9999
1700+N (N: 0 to 99)	Feature data H	FDH	Get only	-999,999,999.9999 to 999,999,999.9999

No.	Data Name	Ident	Set/Get	Data range
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
90000	Inspection area figure Count	figArea0_count	Set/Get	0 to 8
90001	Inspection area figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90002	Inspection area figure0 mode	figArea0_fig0_mode	Set/Get	0: OR 1: NOT
90014	Inspection area figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	Inspection area figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	Inspection area figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	Inspection area figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90018	Inspection area figure0 Ellipse Center Position X	figArea0_fig0_ellipse_CX	Set/Get	-99,999 to 99,999
90019	Inspection area figure0 Ellipse Center Position Y	figArea0_fig0_ellipse_CY	Set/Get	-99,999 to 99,999
90020	Inspection area figure0 Ellipse RadiusX	figArea0_fig0_ellipse_RX	Set/Get	1 to 99,999
90021	Inspection area figure0 Ellipse RadiusY	figArea0_fig0_ellipse_RY	Set/Get	1 to 99,999
90025	Inspection area figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	Inspection area figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	Inspection area figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	Inspection area figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90034	Inspection area figure0 Wide arc Center Position X	figArea0_fig0_arcW_X	Set/Get	-99,999 to 99,999
90035	Inspection area figure0 Wide arc Center Position Y	figArea0_fig0_arcW_Y	Set/Get	-99,999 to 99,999
90036	Inspection area figure0 Wide arc Radius	figArea0_fig0_arcW_R	Set/Get	0 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90037	Inspection area figure0 Wide arc Start angle	figArea0_-fig0_arcW_SA	Set/Get	-180 to 180
90038	Inspection area figure0 Wide arc End angle	figArea0_-fig0_arcW_EA	Set/Get	-180 to 180
90039	Inspection area figure0 Wide arc Width	figArea0_fig0_arcW_W	Set/Get	0 to 99,999
90040	Inspection area figure0 Polygon Point Count	figArea0_fig0_polygon_count	Set/Get	3 to 10
90041	Inspection area figure0 Polygon Point1 Position X	figArea0_fig0_polygon_x0	Set/Get	-99,999 to 99,999
90042	Inspection area figure0 Polygon Point1 Position Y	figArea0_fig0_polygon_y0	Set/Get	-99,999 to 99,999
90043	Inspection area figure0 Polygon Point2 Position X	figArea0_fig0_polygon_x1	Set/Get	-99,999 to 99,999
90044	Inspection area figure0 Polygon Point2 Position Y	figArea0_fig0_polygon_y1	Set/Get	-99,999 to 99,999
90045	Inspection area figure0 Polygon Point3 Position X	figArea0_fig0_polygon_x2	Set/Get	-99,999 to 99,999
90046	Inspection area figure0 Polygon Point3 Position Y	figArea0_fig0_polygon_y2	Set/Get	-99,999 to 99,999
90047	Inspection area figure0 Polygon Point4 Position X	figArea0_fig0_polygon_x3	Set/Get	-99,999 to 99,999
90048	Inspection area figure0 Polygon Point4 Position Y	figArea0_fig0_polygon_y3	Set/Get	-99,999 to 99,999
90049	Inspection area figure0 Polygon Point5 Position X	figArea0_fig0_polygon_x4	Set/Get	-99,999 to 99,999
90050	Inspection area figure0 Polygon Point5 Position Y	figArea0_fig0_polygon_y4	Set/Get	-99,999 to 99,999
90051	Inspection area figure0 Polygon Point6 Position X	figArea0_fig0_polygon_x5	Set/Get	-99,999 to 99,999
90052	Inspection area figure0 Polygon Point6 Position Y	figArea0_fig0_polygon_y5	Set/Get	-99,999 to 99,999
90053	Inspection area figure0 Polygon Point7 Position X	figArea0_fig0_polygon_x6	Set/Get	-99,999 to 99,999
90054	Inspection area figure0 Polygon Point7 Position Y	figArea0_fig0_polygon_y6	Set/Get	-99,999 to 99,999
90055	Inspection area figure0 Polygon Point8 Position X	figArea0_fig0_polygon_x7	Set/Get	-99,999 to 99,999
90056	Inspection area figure0 Polygon Point8 Position Y	figArea0_fig0_polygon_y7	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90057	Inspection area figure0 Polygon Point9 Position X	figArea0_fig0_polygon_x8	Set/Get	-99,999 to 99,999
90058	Inspection area figure0 Polygon Point9 Position Y	figArea0_fig0_polygon_y8	Set/Get	-99,999 to 99,999
90059	Inspection area figure0 Polygon Point10 Position X	figArea0_fig0_polygon_x9	Set/Get	-99,999 to 99,999
90060	Inspection area figure0 Polygon Point10 Position Y	figArea0_fig0_polygon_y9	Set/Get	-99,999 to 99,999
90099	Inspection area figure Update	figArea0_update	Set only	1: Update
90101	Inspection area figure1 Type	figArea0_fig1_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90102	Inspection area figure1 mode	figArea0_fig1_mode	Set/Get	0: OR 1: NOT
90114	Inspection area figure1 Rectangle Upper left position X	figArea0_fig1_box_X0	Set/Get	-99,999 to 99,999
90115	Inspection area figure1 Rectangle Upper left position Y	figArea0_fig1_box_Y0	Set/Get	-99,999 to 99,999
90116	Inspection area figure1 Rectangle Lower right position X	figArea0_fig1_box_X1	Set/Get	-99,999 to 99,999
90117	Inspection area figure1 Rectangle Lower right position Y	figArea0_fig1_box_Y1	Set/Get	-99,999 to 99,999
90118	Inspection area figure1 Ellipse Center Position X	figArea0_fig1_ellipse_CX	Set/Get	-99,999 to 99,999
90119	Inspection area figure1 Ellipse Center Position Y	figArea0_fig1_ellipse_CY	Set/Get	-99,999 to 99,999
90120	Inspection area figure1 Ellipse RadiusX	figArea0_fig1_ellipse_RX	Set/Get	1 to 99,999
90121	Inspection area figure1 Ellipse RadiusY	figArea0_fig1_ellipse_RY	Set/Get	1 to 99,999
90125	Inspection area figure1 Circumference Center Position X	figArea0_fig1_circleW_X	Set/Get	-99,999 to 99,999
90126	Inspection area figure1 Circumference Center Position Y	figArea0_fig1_circleW_Y	Set/Get	-99,999 to 99,999
90127	Inspection area figure1 Circumference Radius	figArea0_fig1_circleW_R	Set/Get	0 to 99,999
90128	Inspection area figure1 Circumference Width	figArea0_fig1_circleW_W	Set/Get	0 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90134	Inspection area figure1 Wide arc Center Position X	figArea0_fig1_arcW_X	Set/Get	-99,999 to 99,999
90135	Inspection area figure1 Wide arc Center Position Y	figArea0_fig1_arcW_Y	Set/Get	-99,999 to 99,999
90136	Inspection area figure1 Wide arc Radius	figArea0_fig1_arcW_R	Set/Get	0 to 99,999
90137	Inspection area figure1 Wide arc Start angle	figArea0_-fig1_arcW_SA	Set/Get	-180 to 180
90138	Inspection area figure1 Wide arc End angle	figArea0_-fig1_arcW_EA	Set/Get	-180 to 180
90139	Inspection area figure1 Wide arc Width	figArea0_fig1_arcW_W	Set/Get	0 to 99,999
90140	Inspection area figure1 Polygon Point Count	figArea0_fig1_polygon_count	Set/Get	3 to 10
90141	Inspection area figure1 Polygon Point1 Position X	figArea0_fig1_polygon_x0	Set/Get	-99,999 to 99,999
90142	Inspection area figure1 Polygon Point1 Position Y	figArea0_fig1_polygon_y0	Set/Get	-99,999 to 99,999
90143	Inspection area figure1 Polygon Point2 Position X	figArea0_fig1_polygon_x1	Set/Get	-99,999 to 99,999
90144	Inspection area figure1 Polygon Point2 Position Y	figArea0_fig1_polygon_y1	Set/Get	-99,999 to 99,999
90145	Inspection area figure1 Polygon Point3 Position X	figArea0_fig1_polygon_x2	Set/Get	-99,999 to 99,999
90146	Inspection area figure1 Polygon Point3 Position Y	figArea0_fig1_polygon_y2	Set/Get	-99,999 to 99,999
90147	Inspection area figure1 Polygon Point4 Position X	figArea0_fig1_polygon_x3	Set/Get	-99,999 to 99,999
90148	Inspection area figure1 Polygon Point4 Position Y	figArea0_fig1_polygon_y3	Set/Get	-99,999 to 99,999
90149	Inspection area figure1 Polygon Point5 Position X	figArea0_fig1_polygon_x4	Set/Get	-99,999 to 99,999
90150	Inspection area figure1 Polygon Point5 Position Y	figArea0_fig1_polygon_y4	Set/Get	-99,999 to 99,999
90151	Inspection area figure1 Polygon Point6 Position X	figArea0_fig1_polygon_x5	Set/Get	-99,999 to 99,999
90152	Inspection area figure1 Polygon Point6 Position Y	figArea0_fig1_polygon_y5	Set/Get	-99,999 to 99,999
90153	Inspection area figure1 Polygon Point7 Position X	figArea0_fig1_polygon_x6	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90154	Inspection area figure1 Polygon Point7 Position Y	figArea0_fig1_polygon_y6	Set/Get	-99,999 to 99,999
90155	Inspection area figure1 Polygon Point8 Position X	figArea0_fig1_polygon_x7	Set/Get	-99,999 to 99,999
90156	Inspection area figure1 Polygon Point8 Position Y	figArea0_fig1_polygon_y7	Set/Get	-99,999 to 99,999
90157	Inspection area figure1 Polygon Point9 Position X	figArea0_fig1_polygon_x8	Set/Get	-99,999 to 99,999
90158	Inspection area figure1 Polygon Point9 Position Y	figArea0_fig1_polygon_y8	Set/Get	-99,999 to 99,999
90159	Inspection area figure1 Polygon Point10 Position X	figArea0_fig1_polygon_x9	Set/Get	-99,999 to 99,999
90160	Inspection area figure1 Polygon Point10 Position Y	figArea0_fig1_polygon_y9	Set/Get	-99,999 to 99,999
90201	Inspection area figure2 Type	figArea0_fig2_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90202	Inspection area figure2 mode	figArea0_fig2_mode	Set/Get	0: OR 1: NOT
90214	Inspection area figure2 Rectangle Upper left position X	figArea0_fig2_box_X0	Set/Get	-99,999 to 99,999
90215	Inspection area figure2 Rectangle Upper left position Y	figArea0_fig2_box_Y0	Set/Get	-99,999 to 99,999
• • •	• • •	• • •	• • •	• • •
90301	Inspection area figure3 Type	figArea0_fig3_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90302	Inspection area figure3 mode	figArea0_fig3_mode	Set/Get	0: OR 1: NOT
90314	Inspection area figure3 Rectangle Upper left position X	figArea0_fig3_box_X0	Set/Get	-99,999 to 99,999
90315	Inspection area figure3 Rectangle Upper left position Y	figArea0_fig3_box_Y0	Set/Get	-99,999 to 99,999
• • •	• • •	• • •	• • •	• • •

No.	Data Name	Ident	Set/Get	Data range
90401	Inspection area figure4 Type	figArea0_fig4_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90402	Inspection area figure4 mode	figArea0_fig4_mode	Set/Get	0: OR 1: NOT
90414	Inspection area figure4 Rectangle Upper left position X	figArea0_fig4_box_X0	Set/Get	-99,999 to 99,999
90415	Inspection area figure4 Rectangle Upper left position Y	figArea0_fig4_box_Y0	Set/Get	-99,999 to 99,999
• • •	• • •	• • •	• • •	• • •
90501	Inspection area figure5 Type	figArea0_fig5_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90502	Inspection area figure5 mode	figArea0_fig5_mode	Set/Get	0: OR 1: NOT
90514	Inspection area figure5 Rectangle Upper left position X	figArea0_fig5_box_X0	Set/Get	-99,999 to 99,999
90515	Inspection area figure5 Rectangle Upper left position Y	figArea0_fig5_box_Y0	Set/Get	-99,999 to 99,999
• • •	• • •	• • •	• • •	• • •
90601	Inspection area figure6 Type	figArea0_fig6_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90602	Inspection area figure6 mode	figArea0_fig6_mode	Set/Get	0: OR 1: NOT
90614	Inspection area figure6 Rectangle Upper left position X	figArea0_fig6_box_X0	Set/Get	-99,999 to 99,999
90615	Inspection area figure6 Rectangle Upper left position Y	figArea0_fig6_box_Y0	Set/Get	-99,999 to 99,999
• • •	• • •	• • •	• • •	• • •

No.	Data Name	Ident	Set/Get	Data range
90701	Inspection area figure7 Type	figArea0_fig7_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90702	Inspection area figure7 mode	figArea0_fig7_mode	Set/Get	0: OR 1: NOT
90714	Inspection area figure7 Rectangle Upper left position X	figArea0_fig7_box_X0	Set/Get	-99,999 to 99,999
90715	Inspection area figure7 Rectangle Upper left position Y	figArea0_fig7_box_Y0	Set/Get	-99,999 to 99,999
• • •	• • •	• • •	• • •	• • •
91000	Mask area figure Count	figArea1_count	Set/Get	1
91001	Mask area figure0 Type	figArea1_fig0_type	Set/Get	8: Rectangle
91002	Mask area figure0 mode	figArea1_fig0_mode	Set/Get	0: OR
91014	Mask area figure0 Rectangle Upper left position X	figArea1_fig0_box_X0	Set/Get	-99,999 to 99,999
91015	Mask area figure0 Rectangle Upper left position Y	figArea1_fig0_box_Y0	Set/Get	-99,999 to 99,999
91016	Mask area figure0 Rectangle Lower right position X	figArea1_fig0_box_X1	Set/Get	-99,999 to 99,999
91017	Mask area figure0 Rectangle Lower right position Y	figArea1_fig0_box_Y1	Set/Get	-99,999 to 99,999
91099	Mask area figure Update	figArea1_update	Set only	1: Update
92000	Selected area figure Count	figArea2_count	Set/Get	0 to 8
92001	Selected area figure0 Type	figArea2_fig0_type	Set/Get	8: Rectangle
92002	Selected area figure0 mode	figArea2_fig0_mode	Set/Get	0: OR 1: NOT
92014	Selected area figure0 Rectangle Upper left position X	figArea2_fig0_box_X0	Set/Get	-99,999 to 99,999
92015	Selected area figure0 Rectangle Upper left position Y	figArea2_fig0_box_Y0	Set/Get	-99,999 to 99,999
92016	Selected area figure0 Rectangle Lower right position X	figArea2_fig0_box_X1	Set/Get	-99,999 to 99,999
92017	Selected area figure0 Rectangle Lower right position Y	figArea2_fig0_box_Y1	Set/Get	-99,999 to 99,999
92099	Selected area figure Update	figArea2_update	Set only	1: Update

No.	Data Name	Ident	Set/Get	Data range
92101	Selected area figure1 Type	figArea2_fig1_type	Set/Get	8: Rectangle
92102	Selected area figure1 mode	figArea2_fig1_mode	Set/Get	0: OR 1: NOT
92114	Selected area figure1 Rectangle Upper left position X	figArea2_fig1_box_X0	Set/Get	-99,999 to 99,999
92115	Selected area figure1 Rectangle Upper left position Y	figArea2_fig1_box_Y0	Set/Get	-99,999 to 99,999
92116	Selected area figure1 Rectangle Lower right position X	figArea2_fig1_box_X1	Set/Get	-99,999 to 99,999
92117	Selected area figure1 Rectangle Lower right position Y	figArea2_fig1_box_Y1	Set/Get	-99,999 to 99,999
92201	Selected area figure2 Type	figArea2_fig2_type	Set/Get	8: Rectangle
92202	Selected area figure2 mode	figArea2_fig2_mode	Set/Get	0: OR 1: NOT
92214	Selected area figure2 Rectangle Upper left position X	figArea2_fig2_box_X0	Set/Get	-99,999 to 99,999
92215	Selected area figure2 Rectangle Upper left position Y	figArea2_fig2_box_Y0	Set/Get	-99,999 to 99,999
92216	Selected area figure2 Rectangle Lower right position X	figArea2_fig2_box_X1	Set/Get	-99,999 to 99,999
92217	Selected area figure2 Rectangle Lower right position Y	figArea2_fig2_box_Y1	Set/Get	-99,999 to 99,999
92301	Selected area figure3 Type	figArea2_fig3_type	Set/Get	8: Rectangle
92302	Selected area figure3 mode	figArea2_fig3_mode	Set/Get	0: OR 1: NOT
92314	Selected area figure3 Rectangle Upper left position X	figArea2_fig3_box_X0	Set/Get	-99,999 to 99,999
92315	Selected area figure3 Rectangle Upper left position Y	figArea2_fig3_box_Y0	Set/Get	-99,999 to 99,999
92316	Selected area figure3 Rectangle Lower right position X	figArea2_fig3_box_X1	Set/Get	-99,999 to 99,999
92317	Selected area figure3 Rectangle Lower right position Y	figArea2_fig3_box_Y1	Set/Get	-99,999 to 99,999
92401	Selected area figure4 Type	figArea2_fig4_type	Set/Get	8: Rectangle
92402	Selected area figure4 mode	figArea2_fig4_mode	Set/Get	0: OR 1: NOT
92414	Selected area figure4 Rectangle Upper left position X	figArea2_fig4_box_X0	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92415	Selected area figure4 Rectangle Upper left position Y	figArea2_fig4_box_Y0	Set/Get	-99,999 to 99,999
92416	Selected area figure4 Rectangle Lower right position X	figArea2_fig4_box_X1	Set/Get	-99,999 to 99,999
92417	Selected area figure4 Rectangle Lower right position Y	figArea2_fig4_box_Y1	Set/Get	-99,999 to 99,999
92501	Selected area figure5 Type	figArea2_fig5_type	Set/Get	8: Rectangle
92502	Selected area figure5 mode	figArea2_fig5_mode	Set/Get	0: OR 1: NOT
92514	Selected area figure5 Rectangle Upper left position X	figArea2_fig5_box_X0	Set/Get	-99,999 to 99,999
92515	Selected area figure5 Rectangle Upper left position Y	figArea2_fig5_box_Y0	Set/Get	-99,999 to 99,999
92516	Selected area figure5 Rectangle Lower right position X	figArea2_fig5_box_X1	Set/Get	-99,999 to 99,999
92517	Selected area figure5 Rectangle Lower right position Y	figArea2_fig5_box_Y1	Set/Get	-99,999 to 99,999
92601	Selected area figure6 Type	figArea2_fig6_type	Set/Get	8: Rectangle
92602	Selected area figure6 mode	figArea2_fig6_mode	Set/Get	0: OR 1: NOT
92614	Selected area figure6 Rectangle Upper left position X	figArea2_fig6_box_X0	Set/Get	-99,999 to 99,999
92615	Selected area figure6 Rectangle Upper left position Y	figArea2_fig6_box_Y0	Set/Get	-99,999 to 99,999
92616	Selected area figure6 Rectangle Lower right position X	figArea2_fig6_box_X1	Set/Get	-99,999 to 99,999
92617	Selected area figure6 Rectangle Lower right position Y	figArea2_fig6_box_Y1	Set/Get	-99,999 to 99,999
92701	Selected area figure7 Type	figArea2_fig7_type	Set/Get	8: Rectangle
92702	Selected area figure7 mode	figArea2_fig7_mode	Set/Get	0: OR 1: NOT
92714	Selected area figure7 Rectangle Upper left position X	figArea2_fig7_box_X0	Set/Get	-99,999 to 99,999
92715	Selected area figure7 Rectangle Upper left position Y	figArea2_fig7_box_Y0	Set/Get	-99,999 to 99,999
92716	Selected area figure7 Rectangle Lower right position X	figArea2_fig7_box_X1	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92717	Selected area figure7 Rectangle Lower right position Y	figArea2_fig7_box_Y1	Set/Get	-99,999 to 99,999

*1. The reference coordinates based on the selection in the Method area of the [Ref.setting] tab can be Get only.

*2. The reference coordinates based on the selection of Numerical in the Method area of the [Ref.setting] tab can be Set/Get.

2-21 Label Data

This processing item can not be used in the FHV series.

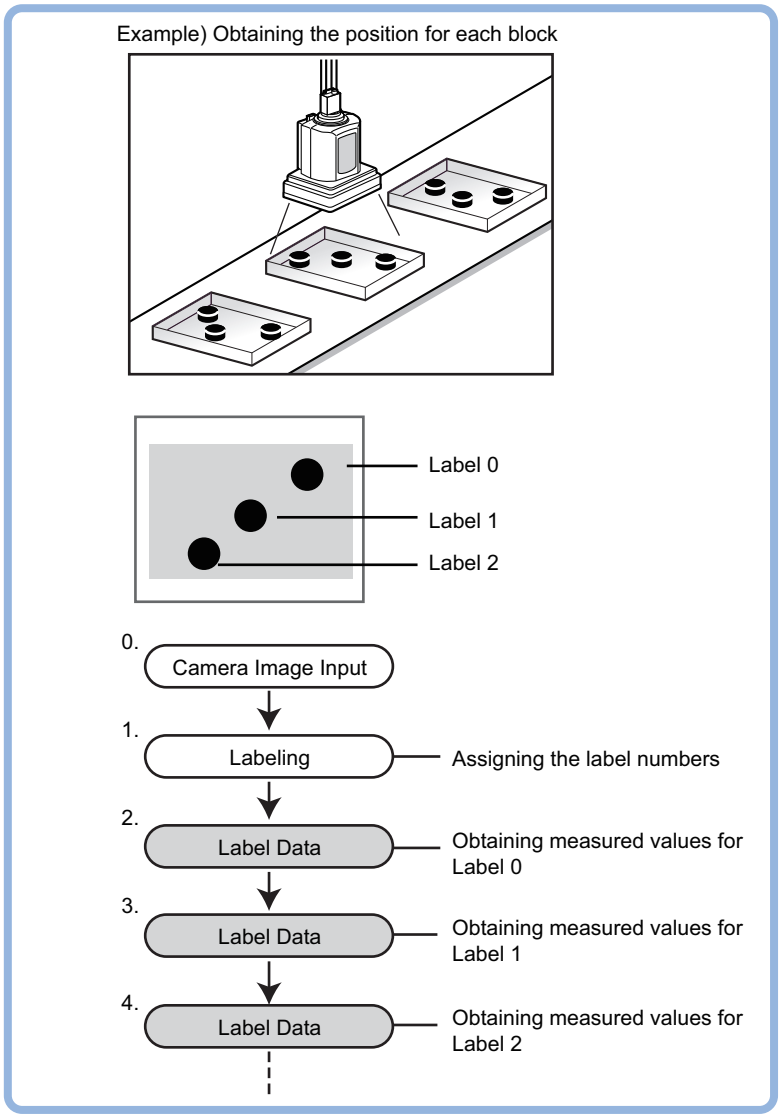
You can specify a desired label number and obtain measurement values for that label stored by other processing units.

The processing items that can be set up as reference objects are the following items that perform the labeling processing.

- Labeling

Used in the Following Case

Label position acquisition



Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

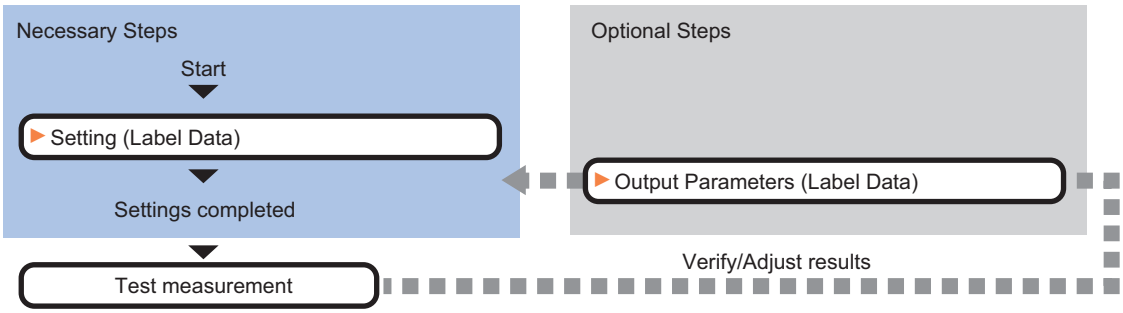
Additional Information

Do not insert the following processing items between Label Data and Labeling units.

- Camera Image Input
- Camera Switching
- Position Compensation
- Color Gray Filter
- Filtering

2-21-1 Settings Flow (Label Data)

Set up the label data with the following steps.



List of Label Data Items

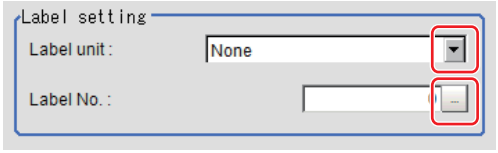
Item name	Description
Setting	Specify the unit number and label number of the processing unit that is designated as the reference object. In addition, specify the judgement conditions for measurement results. Specify the upper and lower limit values for the area and the gravity center X/Y. Refer to *2-21-2 Setting (Label Data)* on page 2-318.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. Refer to *2-21-3 Output Parameters (Label Data)* on page 2-320.

2-21-2 Setting (Label Data)

Specify the unit number and label number of the unit set for labeling reference. In addition, specify the judgement conditions for measurement results.

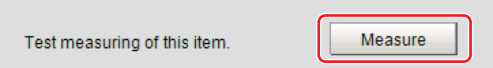
After changing a setting, check whether measurement can be done properly by performing an actual measurement.

1. In the Item Tab area, click [Setting].
2. In the "Label setting" area, specify each item.



Setting item	Set value [Factory default]	Description
Label unit	[None] to 9999	Specify the number of the unit for which the reference object processing item has been set up. As an option, display the number of the unit for which the following processing items have been set up. • Labeling
Label No.	[0] to 2499 (For FZ5-3□□, FZ5-6□□) [0] to 9998 (For FH-1□□□, FH-3□□□, FZ5-8□□, FZ5-11□□, FZ5-12□□)	Specify the number of the label for the reference object.

3 When the setting has been changed, click [Measure] in the Detail area to verify whether measurements can be made correctly.



4 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

Setting item	Set value	Description
Area	0 to 999999999.9999	Specify the area to be judged as OK.
Gravity X	-99999.9999 to 99999.9999	Specify the range of X-axis shifting that is judged to be OK.
Gravity Y	-99999.9999 to 99999.9999	Specify the range of Y-axis shifting that is judged to be OK.

2-21-3 Output Parameters (Label Data)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-21-4 Test Measurement (Label Data)

The following contents are displayed as text in the "Detail result" area.

Displayed items	Description
Judge	Judgement result
Area	Area
Gravity X	Gravity X
Gravity Y	Gravity Y

2-21-5 Measurement Results for Which Output Is Possible (Label Data)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Label No.	LN	Label No.
Area	AR	Area
Gravity X-coordinate	X	Center of gravity X position
Gravity Y-coordinate	Y	Center of gravity Y position

2-21-6 External Reference Tables (Label data)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Label No.	label	Get only	0 to 2,499: FZ5-3□□, FZ5-6□□ 0 to 9,998: FH-1□□□, FH-2□□□, FH-3□□□, FH-5□□□, FZ5-8□□, FZ5-11□□, FZ5-12□□
6	Area	area	Get only	0 to 999,999,999.9999
7	Gravity X	gravityX	Get only	-99,999.9999 to 99,999.9999
8	Gravity Y	gravityY	Get only	-99,999.9999 to 99,999.9999
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Label unit	labelUnit	Set/Get	-1 to 9,999
121	Label No.	labelNo	Set/Get	0 to 2,499: FZ5-3□□, FZ5-6□□ 0 to 9,998: FH-1□□□, FH-2□□□, FH-3□□□, FH-5□□□, FZ5-8□□, FZ5-11□□, FZ5-12□□
122	Upper limit of the area	upperArea	Set/Get	0 to 999,999,999.9999
123	Lower limit of the area	lowerArea	Set/Get	0 to 999,999,999.9999
124	Upper limit of gravity X	upperGravityX	Set/Get	-99,999.9999 to 99,999.9999
125	Lower limit of gravity X	lowerGravityX	Set/Get	-99,999.9999 to 99,999.9999
126	Upper limit of gravity Y	upperGravityY	Set/Get	-99,999.9999 to 99,999.9999
127	Lower limit of gravity Y	lowerGravityY	Set/Get	-99,999.9999 to 99,999.9999

2-22 Defect

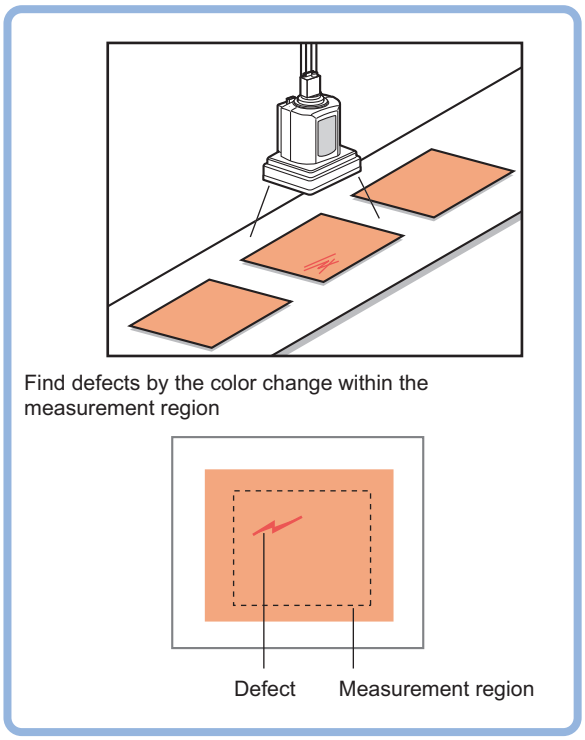
This processing item can not be used in the FHV series.

Detect defects and contamination using color variation within the measurement region.

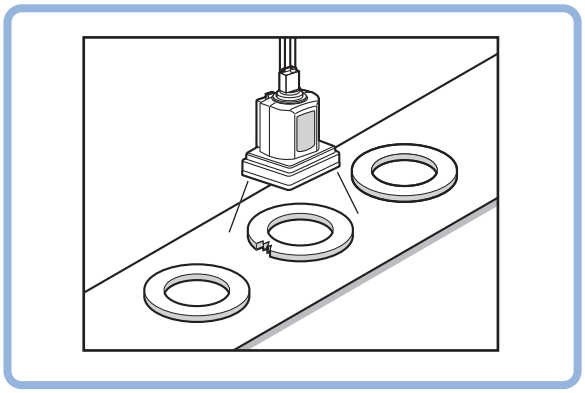
This is real color processing, so even if defect and contamination colors change or the background color changes, stable inspection is possible.

Used in the Following Case

- Detecting defects, contaminations and spots on plain measurement objects



- Measure appearance defects and defects of parts



Important

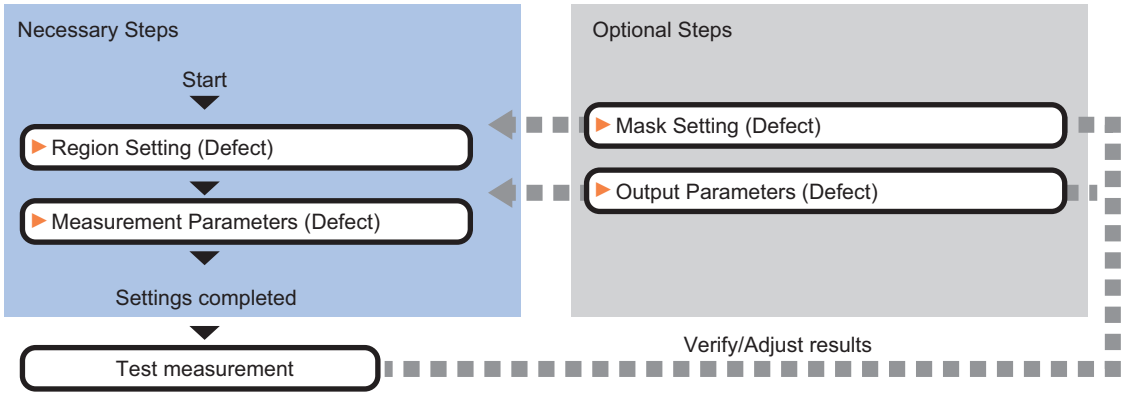
Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

Additional Information

With Defect, defects and contamination on patterns and characters can not be detected.

2-22-1 Settings Flow (Defect)

Make the defect/contamination settings with the following flow.



List of Defect Items

Item name	Description
Region setting	This item is used to set up the measurement area. Instead of measuring the entire input image, narrowing the measurement area shortens the processing time. For details, refer to *2-22-2 Region Setting (Defect)* on page 2-324.
Mask setting	Set it when masking a region. The measurement result of another processing item can also be used for masking. For details, refer to *2-22-3 Mask Setting (Defect)* on page 2-325.
Measurement	This item specifies the judgement condition for measurement results. Measurement parameters can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used. For details, refer to *2-22-4 Measurement Parameters (Defect)* on page 2-328.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. For details, refer to *2-22-5 Output Parameters (Defect)* on page 2-330.

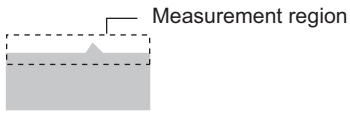
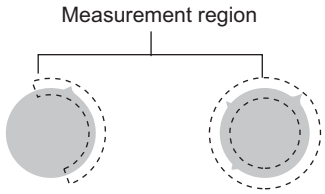
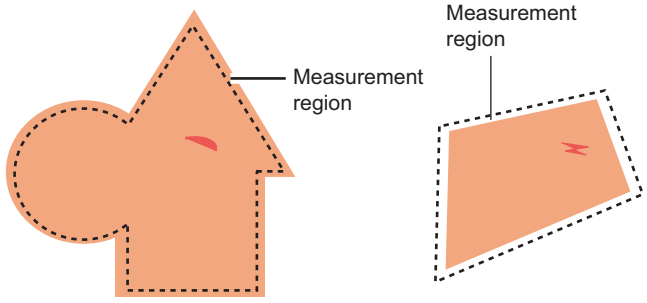
2-22-2 Region Setting (Defect)

This item is used to set up the measurement area.

Use a rectangle, wide line, ellipse (circle), wide circle, wide arc or polygon to specify a measurement region for [Defect]. Up to 8 figures can be drawn.

Important

A mask cannot be made with only one region specified using Wide line, Wide circle, or Arc, as the figure.

PT	Description
Wide line	Selected when detecting defects and burrs of the measurement objects. 
Wide circle, wide arc	Selected when detecting defects and burrs of the circle measurement objects. 
Rectangle, ellipse (circle), polygon	Selected when detecting the overall defects of specified zones and measurement objects. 

1. In the Item Tab area, click [Region setting].
2. Use the Drawing tools to specify the measurement region.

   Up to 8 figures can be combined.
3. Click [OK] in the Figure setting area.
   - [OK]: Changes the settings and returns to the previous menu.
   - [Cancel]: Changes are discarded. Returns to the previous menu.
   - [Apply]: Updates the settings without leaving edit window.

2-22-3 Mask Setting (Defect)

Mask the measurement region when measuring it.

There are two types of masks, namely, a static mask that sets the mask region independent of measurement and a dynamic mask that uses images generated in another unit for each measurement.

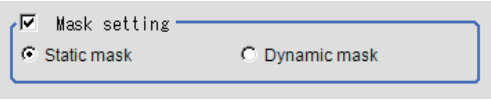
Important

A mask cannot be made with only one region specified using Wide line, Wide circle, or Arc, as the figure.

Creating a static mask

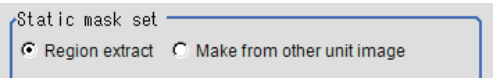
A static mask can be created manually or from an image of another unit.

1 In the Mask setting area, select "Static mask".

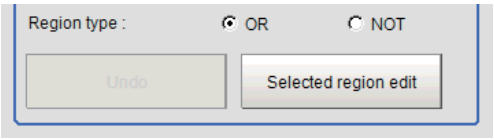


● Generating a mask manually

1 In the Static mask set area, select "Region extract".



2 Select the selection region type OR or NOT and drag an image directly.



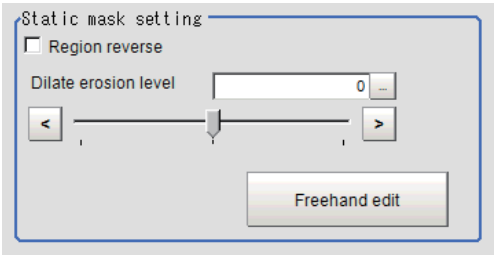
A region is created along successive similar colors from the selected place. It is not masked if the selection region type is OR.

It is masked if the selection region type is NOT.

To deselect a selected region, click [Undo].

To edit a region selected with OR/NOT, click [Selected region edit].

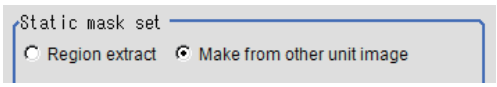
3 Adjust the mask created in the Static mask setting area.



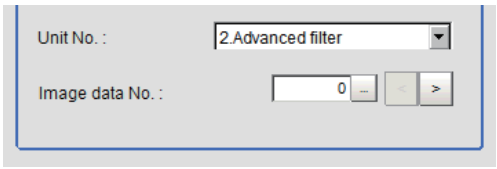
Setting item	Setting value [Factory default]	Description
Region reverse	• Checked • [Unchecked]	Place a check to revert the created mask region.
Dilate erosion level	-10 to 10 [0]	Perform fine adjustment on the mask region using expansions/shrinkage. The region is expanded if a positive value is set. The region is shrunk if a negative value is set.

● Creating a static mask from an image of another unit

1 In the Static mask set area, select "Make from other unit image".



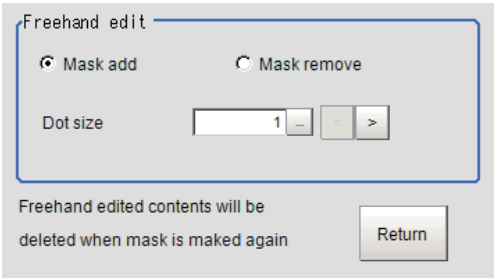
2 Set the unit number and image data number.



Setting item	Setting value [Factory default]	Description
Unit No.	-	Specify the number of the unit whose image will be referenced. The reference unit should be able to output binarized images. For example, select a labeling filter processing image for advanced filtering.
Image data No.	0 to 3 [0]	If the unit supports advanced filtering, numbers 0 to 3 can be set. Otherwise, it is fixed to 0.

Performing fine adjustment on a static mask

1 To perform fine adjustment on a mask region, click [Freehand edit] in the Static mask setting area.



Setting item	Setting value [Factory default]	Description
Freehand edit	• [Mask add] • Mask remove	Select a process performed using the free hand edit.
Dot size	1 to 20 [1]	Set the size of dots used when drawing images on the screen.

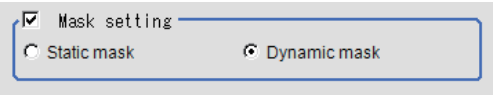
2 Click [Return] to exit the free hand edit.

● Clearing the static mask setting

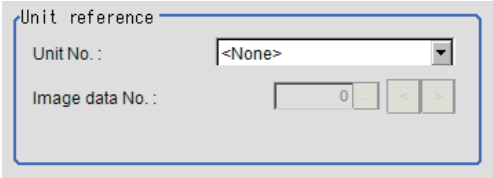
To clear the static mask setting, click [Clear].

Creating a dynamic mask

1 In the Mask setting area, select "Dynamic mask".



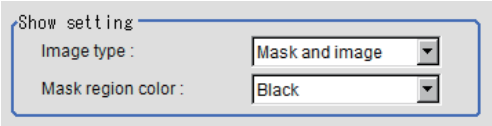
2 Set the unit number and image data number in the Unit reference area.



Setting item	Setting value [Factory default]	Description
Unit No.	-	Set the number of the unit being referred to for the mask region. The reference unit should be able to output binarized images. For example, select a labeling filter processing image for advanced filtering.
Image data No.	0 to 3 [0]	If the unit supports advanced filtering, numbers 0 to 3 can be set. Otherwise, it is fixed to 0.

Setting display

Perform the display setting if required.



Setting item	Setting value [Factory default]	Description
Image type	• Measure image • Mask binary image • [Mask and image]	Select the type of an image to be displayed. Measure image: Measured image Mask binary image: Binarized image for masking Mask and image: Post-masking image
Mask region color	• [Black] • White • Red • Green • Blue	Select the display color of the mask region. A part of color which is specified in [Mask region color] is not measured.

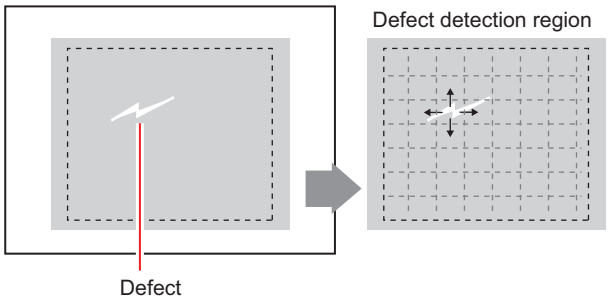
2-22-4 Measurement Parameters (Defect)

This item specifies the judgement condition for measurement results. Measurement parameters can be changed as needed to address unstable measurement results or to increase the processing speed.

Additional Information

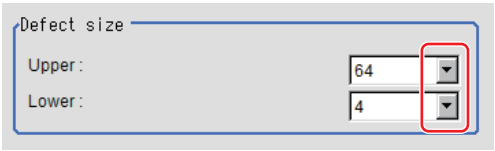
Defect detection mechanism

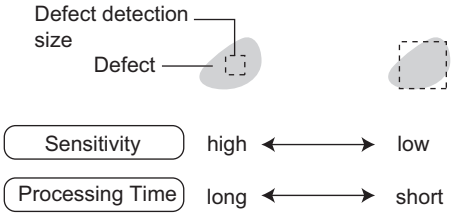
- After measurement region is drawn, a rectangle (defect detection region) is automatically formed in this region. While moving the defect detection region around, calculate the RGB color averages at each location and find the defect detection difference with surrounding defects. This difference is called the defect level. Calculate the defect level for all defect detection areas. If the maximum value exceeds the judgement value, it is judged that there are defects in the measurement region.



1 In the Item Tab area, click [Measurement].

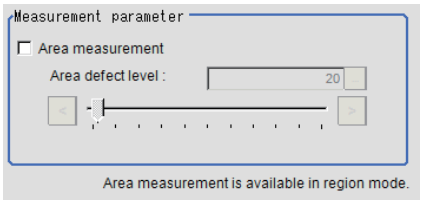
2 Set the value of each item in the "Defect size" area.



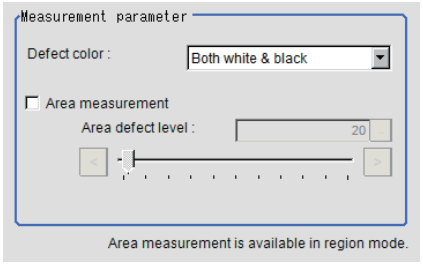
Setting item	Set value [Factory default]	Description
Defect size	• 4 • 8 • 12 • 16 • 24 • 32 • 64 [4] to [64]	Specify the upper and lower limits of defect detection size based on the size of scratch or contamination to be detected. A defect detection region is automatically created with the number of pixels for the defects size. The larger the difference between upper and lower limits, the easier to detect defects/contamination of various sizes. For both upper and lower limits, higher values for defect detection size limits leads to weaker detection sensitivity and shorter processing time. 

3 If necessary, set the value of each item in the "Measurement parameter" area.

- For color cameras:



- For monochrome cameras:



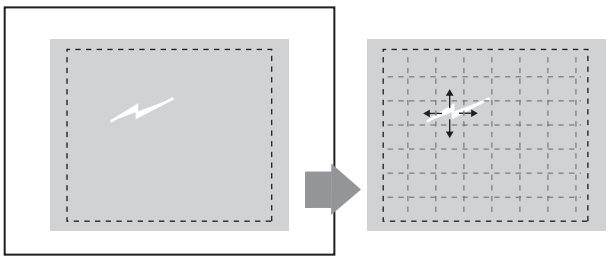
Setting item	Set value [Factory default]	Description
Area measurement	• Checked • [Unchecked]	Place a check when you want to measure the size of defects. This item can divide the high defect detection regions into groups and output the surface and center of gravity coordinates of the group with the largest area. However, when only one region is specified with "Wide line", "Wide circle", or "Arc", area measurement is not possible.
Area defect level	0 to 999 [20]	If you place a heck at Area Measurement, set defect level counted in the defect area.
Detect color (for monochrome cameras only)	Black only	Select this value to detect defects that look darker than the back-ground.
	White only	Select this value to detect defects that look lighter than the back-ground.
	[Both white & black]	Select this value when the brightness of defects is not known.

Additional Information

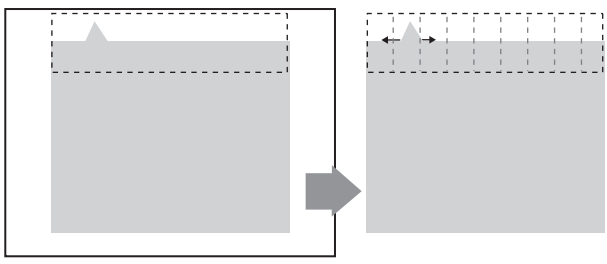
Region inspection mode

The comparison direction depends on the measurement region shapes and number.

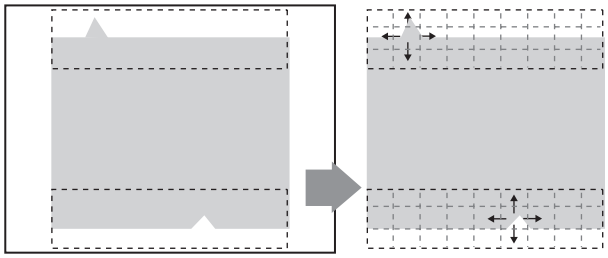
For a rectangle, ellipse or polygon, comparison is with the defect detection regions above, below, left and right. This is called region inspection mode.



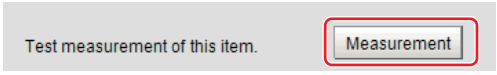
For a wide line, wide arc or wide circle, comparison is only with the two neighboring defect detection regions.



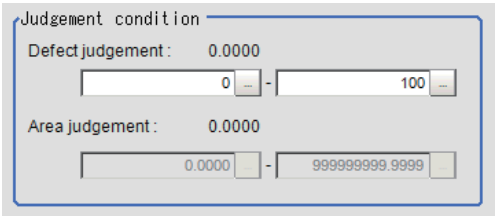
However, even for a wide line, wide arc or wide circle, when two or more figures are drawn, measurement is in region inspection mode.



4 When the setting has been changed, click [Measurement] in the Detail area to verify whether measurements can be made correctly.



5 Set up the judgement condition.



Item	Set value [Factory default]	Description
Defect judgement	0 to 999 [0] to [100]	Specify the range of defect judgement values that are judged to be OK.
Area judgement	0 to 307200 (for a 0.3-megapixel camera) 0 to 1920000 (for a 2-megapixel camera) 0 to 4320000 (for a 5-megapixel camera)	Specify the range of area judgement values that are judged to be OK.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

2-22-5 Output Parameters (Defect)

Specifies whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

1 Click [Output parameter] in the Item Tab area.

2 Choose whether or not to reflect this in the scene overall judgement in "Reflect to overall judgement" area.

Setting item	Set value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-22-6 Key Points for Test Measurement and Adjustment (Defect)

In the "Detail result" area on the Main screen, you can confirm the following contents in text.

Displayed items	Description
Judge	Judgement result
Defect	Measured defect level
Position X	X Coordinate of measured defect position
Position Y	Y coordinate of measured defect position
Area	The measured maximum defect area
Gravity X	The center of gravity X coordinates of the measured maximum defect area
Gravity Y	The center of gravity Y coordinates of the measured maximum defect area

The image specified in the Sub-image number in image display setting is displayed in the Image Display area.

Sub image number.	Explanation of image to be displayed
0	Measurement image
1	Defect profile [when area measurement is present]

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

- Noise is detected as defects.

Parameter to be adjusted	Remedy
Measurement	Specify a larger value for "Defect judgement" in the judgement conditions.

- Judgement will be NG.

Parameter to be adjusted	Remedy
Measurement	Make the measurement region larger than the lower limit of the defect size. Or make the lower limit of the defect detection size smaller than the measurement region.

● When the processing speed is slow

Parameter to be adjusted	Remedy
Measurement	Specify a larger value for the "Defect size".
	Reduce the difference between the upper and lower limits of [Defect size].

2-22-7 Measurement Results for Which Output Is Possible (Defect)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	Judgement result
Defect	F	Measured defect level
Position of defect	X	X Coordinate of measured defect position
Position of defect	Y	Y coordinate of measured defect position
Defect area	AR	The measured maximum defect area
Defect gravity	GX	The center of gravity X coordinates of the measured maximum defect area
Defect gravity	GY	The center of gravity Y coordinates of the measured maximum defect area

2-22-8 External Reference Tables (Defect)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mis-match) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Defect	defect	Get only	0 to 999
6	Position X	defectX	Get only	0 to 99,999.9999
7	Position Y	defectY	Get only	0 to 99,999.9999
8	Defect area	area	Get only	0 to 999,999,999.9999
9	Defect gravity X	gravityX	Get only	0 to 99,999.9999
10	Defect gravity Y	gravityY	Get only	0 to 99,999.9999
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Upper limit of defect size	upperDefect	Set/Get	0: 4 1: 8 2: 12 3: 16 4: 24 5: 32 6: 64
121	Lower limit of defect size	lowerDefect	Set/Get	0: 4 1: 8 2: 12 3: 16 4: 24 5: 32 6: 64

No.	Data name	Ident	Set/Get	Data range
122	Upper limit of defect judgement	criteriaValue	Set/Get	0 to 999
123	Defect color	colorWound	Set/Get	0: Both 1: White 2: Black
124	Area measurement	measArea	Set/Get	0: OFF 1: ON
125	Area meas. LV	areaJudge	Set/Get	0 to 999
126	Upper limit of area judgement	upperArea	Set/Get	0 to 999,999,999.9999
127	Lower limit of area judgement	lowerArea	Set/Get	0 to 999,999,999.9999
128	Lower limit of defect judgement	lowerCriteriaValue	Set/Get	0 to 999
155	Dynamic mask unit reference no	dynUnitNo	Set/Get	-1 to 9,999
156	Dynamic mask image no	dynImageNo	Set/Get	0 to 99
158	Display image type	chkChoose	Set/Get	0: Measure image 1: Mask binary image 2: Mask and image
164	Mask region display color	maskRegionColor	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
90000	Inspection area figure Count	figArea0_count	Set/Get	0 to 8
90001	Inspection area figure0 Type	figArea0_fig0_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90002	Inspection area figure0 mode	figArea0_fig0_mode	Set/Get	0: OR 1: NOT
90009	Inspection area figure0 Wide line Start point X	figArea0_fig0_lineW_X0	Set/Get	-99,999 to 99,999
90010	Inspection area figure0 Wide line Start point Y	figArea0_fig0_lineW_Y0	Set/Get	-99,999 to 99,999
90011	Inspection area figure0 Wide line End point X	figArea0_fig0_lineW_X1	Set/Get	-99,999 to 99,999
90012	Inspection area figure0 Wide line End point Y	figArea0_fig0_lineW_Y1	Set/Get	-99,999 to 99,999
90013	Inspection area figure0 Wide line Width	figArea0_fig0_lineW_W	Set/Get	0 to 99,999
90014	Inspection area figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	Inspection area figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	Inspection area figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	Inspection area figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90018	Inspection area figure0 Ellipse Center Position X	figArea0_fig0_ellipse_CX	Set/Get	-99,999 to 99,999
90019	Inspection area figure0 Ellipse Center Position Y	figArea0_fig0_ellipse_CY	Set/Get	-99,999 to 99,999
90020	Inspection area figure0 Ellipse RadiusX	figArea0_fig0_ellipse_RX	Set/Get	1 to 99,999
90021	Inspection area figure0 Ellipse RadiusY	figArea0_fig0_ellipse_RY	Set/Get	1 to 99,999
90025	Inspection area figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	Inspection area figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	Inspection area figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	Inspection area figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90034	Inspection area figure0 Wide arc Center Position X	figArea0_fig0_arcW_X	Set/Get	-99,999 to 99,999
90035	Inspection area figure0 Wide arc Center Position Y	figArea0_fig0_arcW_Y	Set/Get	-99,999 to 99,999
90036	Inspection area figure0 Wide arc Radius	figArea0_fig0_arcW_R	Set/Get	0 to 99,999
90037	Inspection area figure0 Wide arc Start angle	figArea0_fig0_arcW_SA	Set/Get	-180 to 180
90038	Inspection area figure0 Wide arc End angle	figArea0_fig0_arcW_EA	Set/Get	-180 to 180
90039	Inspection area figure0 Wide arc Width	figArea0_fig0_arcW_W	Set/Get	0 to 99,999
90040	Inspection area figure0 Polygon Point Count	figArea0_fig0_polygon_count	Set/Get	3 to 10
90041	Inspection area figure0 Polygon Point1 Position X	figArea0_fig0_polygon_x0	Set/Get	-99,999 to 99,999
90042	Inspection area figure0 Polygon Point1 Position Y	figArea0_fig0_polygon_y0	Set/Get	-99,999 to 99,999
90043	Inspection area figure0 Polygon Point2 Position X	figArea0_fig0_polygon_x1	Set/Get	-99,999 to 99,999
90044	Inspection area figure0 Polygon Point2 Position Y	figArea0_fig0_polygon_y1	Set/Get	-99,999 to 99,999
90045	Inspection area figure0 Polygon Point3 Position X	figArea0_fig0_polygon_x2	Set/Get	-99,999 to 99,999
90046	Inspection area figure0 Polygon Point3 Position Y	figArea0_fig0_polygon_y2	Set/Get	-99,999 to 99,999
90047	Inspection area figure0 Polygon Point4 Position X	figArea0_fig0_polygon_x3	Set/Get	-99,999 to 99,999
90048	Inspection area figure0 Polygon Point4 Position Y	figArea0_fig0_polygon_y3	Set/Get	-99,999 to 99,999
90049	Inspection area figure0 Polygon Point5 Position X	figArea0_fig0_polygon_x4	Set/Get	-99,999 to 99,999
90050	Inspection area figure0 Polygon Point5 Position Y	figArea0_fig0_polygon_y4	Set/Get	-99,999 to 99,999
90051	Inspection area figure0 Polygon Point6 Position X	figArea0_fig0_polygon_x5	Set/Get	-99,999 to 99,999
90052	Inspection area figure0 Polygon Point6 Position Y	figArea0_fig0_polygon_y5	Set/Get	-99,999 to 99,999
90053	Inspection area figure0 Polygon Point7 Position X	figArea0_fig0_polygon_x6	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90054	Inspection area figure0 Polygon Point7 Position Y	figArea0_fig0_polygon_y6	Set/Get	-99,999 to 99,999
90055	Inspection area figure0 Polygon Point8 Position X	figArea0_fig0_polygon_x7	Set/Get	-99,999 to 99,999
90056	Inspection area figure0 Polygon Point8 Position Y	figArea0_fig0_polygon_y7	Set/Get	-99,999 to 99,999
90057	Inspection area figure0 Polygon Point9 Position X	figArea0_fig0_polygon_x8	Set/Get	-99,999 to 99,999
90058	Inspection area figure0 Polygon Point9 Position Y	figArea0_fig0_polygon_y8	Set/Get	-99,999 to 99,999
90059	Inspection area figure0 Polygon Point10 Position X	figArea0_fig0_polygon_x9	Set/Get	-99,999 to 99,999
90060	Inspection area figure0 Polygon Point10 Position Y	figArea0_fig0_polygon_y9	Set/Get	-99,999 to 99,999
90099	Inspection area figure Update	figArea0_update	Set only	1: Update
90101	Inspection area figure1 Type	figArea0_fig1_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90102	Inspection area figure1 mode	figArea0_fig1_mode	Set/Get	0: OR 1: NOT
90109	Inspection area figure1 Wide line Start point X	figArea0_fig1_lineW_X0	Set/Get	-99,999 to 99,999
90110	Inspection area figure1 Wide line Start point Y	figArea0_fig1_lineW_Y0	Set/Get	-99,999 to 99,999
90111	Inspection area figure1 Wide line End point X	figArea0_fig1_lineW_X1	Set/Get	-99,999 to 99,999
90112	Inspection area figure1 Wide line End point Y	figArea0_fig1_lineW_Y1	Set/Get	-99,999 to 99,999
90113	Inspection area figure1 Wide line Width	figArea0_fig1_lineW_W	Set/Get	0 to 99,999
90114	Inspection area figure1 Rectangle Upper left position X	figArea0_fig1_box_X0	Set/Get	-99,999 to 99,999
90115	Inspection area figure1 Rectangle Upper left position Y	figArea0_fig1_box_Y0	Set/Get	-99,999 to 99,999
90116	Inspection area figure1 Rectangle Lower right position X	figArea0_fig1_box_X1	Set/Get	-99,999 to 99,999
90117	Inspection area figure1 Rectangle Lower right position Y	figArea0_fig1_box_Y1	Set/Get	-99,999 to 99,999
90118	Inspection area figure1 Ellipse Center Position X	figArea0_fig1_ellipse_CX	Set/Get	-99,999 to 99,999
90119	Inspection area figure1 Ellipse Center Position Y	figArea0_fig1_ellipse_CY	Set/Get	-99,999 to 99,999
90120	Inspection area figure1 Ellipse Radius X	figArea0_fig1_ellipse_RX	Set/Get	1 to 99,999
90121	Inspection area figure1 Ellipse Radius Y	figArea0_fig1_ellipse_RY	Set/Get	1 to 99,999
90125	Inspection area figure1 Circumference Center Position X	figArea0_fig1_circleW_X	Set/Get	-99,999 to 99,999
90126	Inspection area figure1 Circumference Center Position Y	figArea0_fig1_circleW_Y	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90127	Inspection area figure1 Circumference Radius	figArea0_fig1_circleW_R	Set/Get	0 to 99,999
90128	Inspection area figure1 Circumference Width	figArea0_fig1_circleW_W	Set/Get	0 to 99,999
90134	Inspection area figure1 Wide arc Center Position X	figArea0_fig1_arcW_X	Set/Get	-99,999 to 99,999
90135	Inspection area figure1 Wide arc Center Position Y	figArea0_fig1_arcW_Y	Set/Get	-99,999 to 99,999
90136	Inspection area figure1 Wide arc Radius	figArea0_fig1_arcW_R	Set/Get	0 to 99,999
90137	Inspection area figure1 Wide arc Start angle	figArea0_fig1_arcW_SA	Set/Get	-180 to 180
90138	Inspection area figure1 Wide arc End angle	figArea0_fig1_arcW_EA	Set/Get	-180 to 180
90139	Inspection area figure1 Wide arc Width	figArea0_fig1_arcW_W	Set/Get	0 to 99,999
90140	Inspection area figure1 Polygon Point Count	figArea0_fig1_polygon_count	Set/Get	3 to 10
90141	Inspection area figure1 Polygon Point1 Position X	figArea0_fig1_polygon_x0	Set/Get	-99,999 to 99,999
90142	Inspection area figure1 Polygon Point1 Position Y	figArea0_fig1_polygon_y0	Set/Get	-99,999 to 99,999
90143	Inspection area figure1 Polygon Point2 Position X	figArea0_fig1_polygon_x1	Set/Get	-99,999 to 99,999
90144	Inspection area figure1 Polygon Point2 Position Y	figArea0_fig1_polygon_y1	Set/Get	-99,999 to 99,999
90145	Inspection area figure1 Polygon Point3 Position X	figArea0_fig1_polygon_x2	Set/Get	-99,999 to 99,999
90146	Inspection area figure1 Polygon Point3 Position Y	figArea0_fig1_polygon_y2	Set/Get	-99,999 to 99,999
90147	Inspection area figure1 Polygon Point4 Position X	figArea0_fig1_polygon_x3	Set/Get	-99,999 to 99,999
90148	Inspection area figure1 Polygon Point4 Position Y	figArea0_fig1_polygon_y3	Set/Get	-99,999 to 99,999
90149	Inspection area figure1 Polygon Point5 Position X	figArea0_fig1_polygon_x4	Set/Get	-99,999 to 99,999
90150	Inspection area figure1 Polygon Point5 Position Y	figArea0_fig1_polygon_y4	Set/Get	-99,999 to 99,999
90151	Inspection area figure1 Polygon Point6 Position X	figArea0_fig1_polygon_x5	Set/Get	-99,999 to 99,999
90152	Inspection area figure1 Polygon Point6 Position Y	figArea0_fig1_polygon_y5	Set/Get	-99,999 to 99,999
90153	Inspection area figure1 Polygon Point7 Position X	figArea0_fig1_polygon_x6	Set/Get	-99,999 to 99,999
90154	Inspection area figure1 Polygon Point7 Position Y	figArea0_fig1_polygon_y6	Set/Get	-99,999 to 99,999
90155	Inspection area figure1 Polygon Point8 Position X	figArea0_fig1_polygon_x7	Set/Get	-99,999 to 99,999
90156	Inspection area figure1 Polygon Point8 Position Y	figArea0_fig1_polygon_y7	Set/Get	-99,999 to 99,999
90157	Inspection area figure1 Polygon Point9 Position X	figArea0_fig1_polygon_x8	Set/Get	-99,999 to 99,999
90158	Inspection area figure1 Polygon Point9 Position Y	figArea0_fig1_polygon_y8	Set/Get	-99,999 to 99,999
90159	Inspection area figure1 Polygon Point10 Position X	figArea0_fig1_polygon_x9	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90160	Inspection area figure1 Polygon Point10 Position Y	figArea0_fig1_polygon_y9	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
90701	Inspection area figure7 Type	figArea0_fig7_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90702	Inspection area figure7 mode	figArea0_fig7_mode	Set/Get	0: OR 1: NOT
90709	Inspection area figure7 Wide line Start point X	figArea0_fig7_lineW_X0	Set/Get	-99,999 to 99,999
90710	Inspection area figure7 Wide line Start point Y	figArea0_fig7_lineW_Y0	Set/Get	-99,999 to 99,999
90711	Inspection area figure7 Wide line End point X	figArea0_fig7_lineW_X1	Set/Get	-99,999 to 99,999
90712	Inspection area figure7 Wide line End point Y	figArea0_fig7_lineW_Y1	Set/Get	-99,999 to 99,999
90713	Inspection area figure7 Wide line Width	figArea0_fig7_lineW_W	Set/Get	0 to 99,999
90714	Inspection area figure7 Rectangle Upper left position X	figArea0_fig7_box_X0	Set/Get	-99,999 to 99,999
90715	Inspection area figure7 Rectangle Upper left position Y	figArea0_fig7_box_Y0	Set/Get	-99,999 to 99,999
90716	Inspection area figure7 Rectangle Lower right position X	figArea0_fig7_box_X1	Set/Get	-99,999 to 99,999
90717	Inspection area figure7 Rectangle Lower right position Y	figArea0_fig7_box_Y1	Set/Get	-99,999 to 99,999
90718	Inspection area figure7 Ellipse Center Position X	figArea0_fig7_ellipse_CX	Set/Get	-99,999 to 99,999
90719	Inspection area figure7 Ellipse Center Position Y	figArea0_fig7_ellipse_CY	Set/Get	-99,999 to 99,999
90720	Inspection area figure7 Ellipse RadiusX	figArea0_fig7_ellipse_RX	Set/Get	1 to 99,999
90721	Inspection area figure7 Ellipse RadiusY	figArea0_fig7_ellipse_RY	Set/Get	1 to 99,999
90725	Inspection area figure7 Circumference Center Position X	figArea0_fig7_circleW_X	Set/Get	-99,999 to 99,999
90726	Inspection area figure7 Circumference Center Position Y	figArea0_fig7_circleW_Y	Set/Get	-99,999 to 99,999
90727	Inspection area figure7 Circumference Radius	figArea0_fig7_circleW_R	Set/Get	0 to 99,999
90728	Inspection area figure7 Circumference Width	figArea0_fig7_circleW_W	Set/Get	0 to 99,999
90734	Inspection area figure7 Wide arc Center Position X	figArea0_fig7_arcW_X	Set/Get	-99,999 to 99,999
90735	Inspection area figure7 Wide arc Center Position Y	figArea0_fig7_arcW_Y	Set/Get	-99,999 to 99,999
90736	Inspection area figure7 Wide arc Radius	figArea0_fig7_arcW_R	Set/Get	0 to 99,999

No.	Data name	Ident	Set/Get	Data range
90737	Inspection area figure7 Wide arc Start angle	figArea0_fig7_arcW_SA	Set/Get	-180 to 180
90738	Inspection area figure7 Wide arc End angle	figArea0_fig7_arcW_EA	Set/Get	-180 to 180
90739	Inspection area figure7 Wide arc Width	figArea0_fig7_arcW_W	Set/Get	0 to 99,999
90740	Inspection area figure7 Polygon Point Count	figArea0_fig7_polygon_count	Set/Get	3 to 10
90741	Inspection area figure7 Polygon Point1 Position X	figArea0_fig7_polygon_x0	Set/Get	-99,999 to 99,999
90742	Inspection area figure7 Polygon Point1 Position Y	figArea0_fig7_polygon_y0	Set/Get	-99,999 to 99,999
90743	Inspection area figure7 Polygon Point2 Position X	figArea0_fig7_polygon_x1	Set/Get	-99,999 to 99,999
90744	Inspection area figure7 Polygon Point2 Position Y	figArea0_fig7_polygon_y1	Set/Get	-99,999 to 99,999
90745	Inspection area figure7 Polygon Point3 Position X	figArea0_fig7_polygon_x2	Set/Get	-99,999 to 99,999
90746	Inspection area figure7 Polygon Point3 Position Y	figArea0_fig7_polygon_y2	Set/Get	-99,999 to 99,999
90747	Inspection area figure7 Polygon Point4 Position X	figArea0_fig7_polygon_x3	Set/Get	-99,999 to 99,999
90748	Inspection area figure7 Polygon Point4 Position Y	figArea0_fig7_polygon_y3	Set/Get	-99,999 to 99,999
90749	Inspection area figure7 Polygon Point5 Position X	figArea0_fig7_polygon_x4	Set/Get	-99,999 to 99,999
90750	Inspection area figure7 Polygon Point5 Position Y	figArea0_fig7_polygon_y4	Set/Get	-99,999 to 99,999
90751	Inspection area figure7 Polygon Point6 Position X	figArea0_fig7_polygon_x5	Set/Get	-99,999 to 99,999
90752	Inspection area figure7 Polygon Point6 Position Y	figArea0_fig7_polygon_y5	Set/Get	-99,999 to 99,999
90753	Inspection area figure7 Polygon Point7 Position X	figArea0_fig7_polygon_x6	Set/Get	-99,999 to 99,999
90754	Inspection area figure7 Polygon Point7 Position Y	figArea0_fig7_polygon_y6	Set/Get	-99,999 to 99,999
90755	Inspection area figure7 Polygon Point8 Position X	figArea0_fig7_polygon_x7	Set/Get	-99,999 to 99,999
90756	Inspection area figure7 Polygon Point8 Position Y	figArea0_fig7_polygon_y7	Set/Get	-99,999 to 99,999
90757	Inspection area figure7 Polygon Point9 Position X	figArea0_fig7_polygon_x8	Set/Get	-99,999 to 99,999
90758	Inspection area figure7 Polygon Point9 Position Y	figArea0_fig7_polygon_y8	Set/Get	-99,999 to 99,999
90759	Inspection area figure7 Polygon Point10 Position X	figArea0_fig7_polygon_x9	Set/Get	-99,999 to 99,999
90760	Inspection area figure7 Polygon Point10 Position Y	figArea0_fig7_polygon_y9	Set/Get	-99,999 to 99,999
91000	Mask area figure Count	figArea1_count	Set/Get	1
91001	Mask area figure0 Type	figArea1_fig0_type	Set/Get	8: Rectangle
91002	Mask area figure0 mode	figArea1_fig0_mode	Set/Get	0: OR
91014	Mask area figure0 Rectangle Upper left position X	figArea1_fig0_box_X0	Set/Get	-99,999 to 99,999
91015	Mask area figure0 Rectangle Upper left position Y	figArea1_fig0_box_Y0	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
91016	Mask area figure0 Rectangle Lower right position X	figArea1_fig0_box_X1	Set/Get	-99,999 to 99,999
91017	Mask area figure0 Rectangle Lower right position Y	figArea1_fig0_box_Y1	Set/Get	-99,999 to 99,999
91099	Mask area figure Update	figArea1_update	Set only	1: Update
92000	Selected area figure Count	figArea2_count	Set/Get	0 to 8
92001	Selected area figure0 Type	figArea2_fig0_type	Set/Get	8: Rectangle
92002	Selected area figure0 mode	figArea2_fig0_mode	Set/Get	0: OR 1: NOT
92014	Selected area figure0 Rectangle Upper left position X	figArea2_fig0_box_X0	Set/Get	-99,999 to 99,999
92015	Selected area figure0 Rectangle Upper left position Y	figArea2_fig0_box_Y0	Set/Get	-99,999 to 99,999
92016	Selected area figure0 Rectangle Lower right position X	figArea2_fig0_box_X1	Set/Get	-99,999 to 99,999
92017	Selected area figure0 Rectangle Lower right position Y	figArea2_fig0_box_Y1	Set/Get	-99,999 to 99,999
92099	Selected area figure Update	figArea2_update	Set only	1: Update
92101	Selected area figure1 Type	figArea2_fig1_type	Set/Get	8: Rectangle
92102	Selected area figure1 mode	figArea2_fig1_mode	Set/Get	0: OR 1: NOT
92114	Selected area figure1 Rectangle Upper left position X	figArea2_fig1_box_X0	Set/Get	-99,999 to 99,999
92115	Selected area figure1 Rectangle Upper left position Y	figArea2_fig1_box_Y0	Set/Get	-99,999 to 99,999
92116	Selected area figure1 Rectangle Lower right position X	figArea2_fig1_box_X1	Set/Get	-99,999 to 99,999
92117	Selected area figure1 Rectangle Lower right position Y	figArea2_fig1_box_Y1	Set/Get	-99,999 to 99,999
92201	Selected area figure2 Type	figArea2_fig2_type	Set/Get	8: Rectangle
92202	Selected area figure2 mode	figArea2_fig2_mode	Set/Get	0: OR 1: NOT
92214	Selected area figure2 Rectangle Upper left position X	figArea2_fig2_box_X0	Set/Get	-99,999 to 99,999
92215	Selected area figure2 Rectangle Upper left position Y	figArea2_fig2_box_Y0	Set/Get	-99,999 to 99,999
92216	Selected area figure2 Rectangle Lower right position X	figArea2_fig2_box_X1	Set/Get	-99,999 to 99,999
92217	Selected area figure2 Rectangle Lower right position Y	figArea2_fig2_box_Y1	Set/Get	-99,999 to 99,999
92301	Selected area figure3 Type	figArea2_fig3_type	Set/Get	8: Rectangle
92302	Selected area figure3 mode	figArea2_fig3_mode	Set/Get	0: OR 1: NOT
92314	Selected area figure3 Rectangle Upper left position X	figArea2_fig3_box_X0	Set/Get	-99,999 to 99,999
92315	Selected area figure3 Rectangle Upper left position Y	figArea2_fig3_box_Y0	Set/Get	-99,999 to 99,999
92316	Selected area figure3 Rectangle Lower right position X	figArea2_fig3_box_X1	Set/Get	-99,999 to 99,999
92317	Selected area figure3 Rectangle Lower right position Y	figArea2_fig3_box_Y1	Set/Get	-99,999 to 99,999
92401	Selected area figure4 Type	figArea2_fig4_type	Set/Get	8: Rectangle
92402	Selected area figure4 mode	figArea2_fig4_mode	Set/Get	0: OR 1: NOT

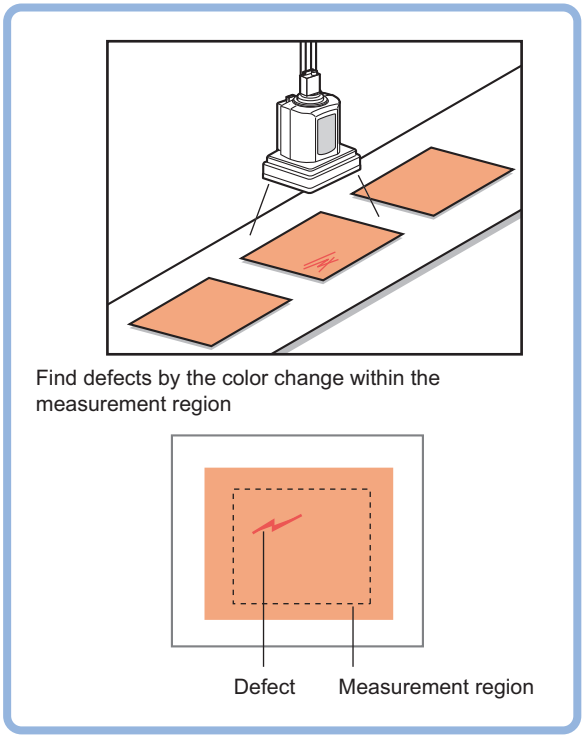
No.	Data name	Ident	Set/Get	Data range
92414	Selected area figure4 Rectangle Upper left position X	figArea2_fig4_box_X0	Set/Get	-99,999 to 99,999
92415	Selected area figure4 Rectangle Upper left position Y	figArea2_fig4_box_Y0	Set/Get	-99,999 to 99,999
92416	Selected area figure4 Rectangle Lower right position X	figArea2_fig4_box_X1	Set/Get	-99,999 to 99,999
92417	Selected area figure4 Rectangle Lower right position Y	figArea2_fig4_box_Y1	Set/Get	-99,999 to 99,999
92501	Selected area figure5 Type	figArea2_fig5_type	Set/Get	8: Rectangle
92502	Selected area figure5 mode	figArea2_fig5_mode	Set/Get	0: OR 1: NOT
92514	Selected area figure5 Rectangle Upper left position X	figArea2_fig5_box_X0	Set/Get	-99,999 to 99,999
92515	Selected area figure5 Rectangle Upper left position Y	figArea2_fig5_box_Y0	Set/Get	-99,999 to 99,999
92516	Selected area figure5 Rectangle Lower right position X	figArea2_fig5_box_X1	Set/Get	-99,999 to 99,999
92517	Selected area figure5 Rectangle Lower right position Y	figArea2_fig5_box_Y1	Set/Get	-99,999 to 99,999
92601	Selected area figure6 Type	figArea2_fig6_type	Set/Get	8: Rectangle
92602	Selected area figure6 mode	figArea2_fig6_mode	Set/Get	0: OR 1: NOT
92614	Selected area figure6 Rectangle Upper left position X	figArea2_fig6_box_X0	Set/Get	-99,999 to 99,999
92615	Selected area figure6 Rectangle Upper left position Y	figArea2_fig6_box_Y0	Set/Get	-99,999 to 99,999
92616	Selected area figure6 Rectangle Lower right position X	figArea2_fig6_box_X1	Set/Get	-99,999 to 99,999
92617	Selected area figure6 Rectangle Lower right position Y	figArea2_fig6_box_Y1	Set/Get	-99,999 to 99,999
92701	Selected area figure7 Type	figArea2_fig7_type	Set/Get	8: Rectangle
92702	Selected area figure7 mode	figArea2_fig7_mode	Set/Get	0: OR 1: NOT
92714	Selected area figure7 Rectangle Upper left position X	figArea2_fig7_box_X0	Set/Get	-99,999 to 99,999
92715	Selected area figure7 Rectangle Upper left position Y	figArea2_fig7_box_Y0	Set/Get	-99,999 to 99,999
92716	Selected area figure7 Rectangle Lower right position X	figArea2_fig7_box_X1	Set/Get	-99,999 to 99,999
92717	Selected area figure7 Rectangle Lower right position Y	figArea2_fig7_box_Y1	Set/Get	-99,999 to 99,999

2-23 Precise Defect

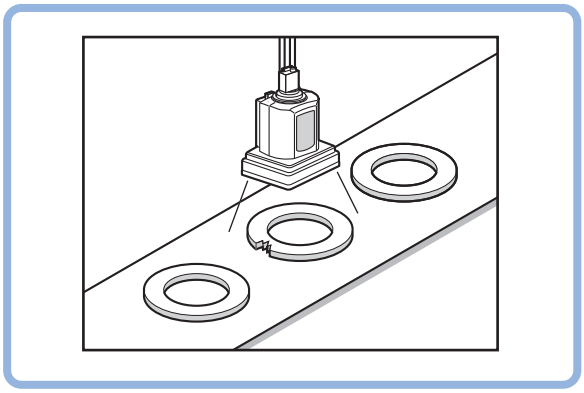
Defects and contamination on plain measurement objects can be detected with high precision by performing differential processing on the image. By changing the size of elements used for detection, comparison intervals, etc., fine customization of speed and precision is possible.

Used in the Following Case

- Detecting defects, contaminations and spots on plain measurement objects



- Measure appearance defects and defects of parts

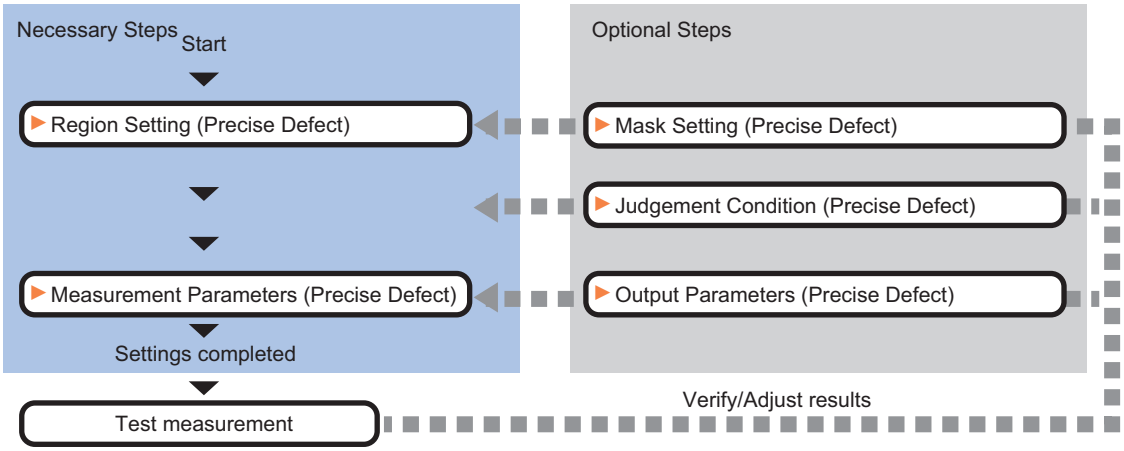


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-23-1 Settings Flow (Precise Defect)

Precise Defect settings are made with the following flow.



List of Precise Defect Items

Item name	Description
Region setting	This item is used to set up the measurement area. Instead of measuring the entire input image, narrowing the measurement area shortens the processing time. For details, refer to *2-23-2 Region Setting (Precise Defect)* on page 2-343.
Mask setting	Set it when masking a region. The measurement result of another processing item can also be used for masking. For details, refer to *2-23-3 Mask Setting (Precise Defect)* on page 2-344.
Measurement	This item specifies the judgement condition for measurement results. Measurement parameters can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used. For details, refer to *2-23-4 Measurement Parameters (Precise Defect)* on page 2-347.
Judgement condition	This item can be changed if necessary. Normally, the factory default value will be used. This item specifies the judgement condition for measurement results. For details, refer to *2-23-5 Judgement Condition (Precise Defect)* on page 2-349.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. For details, refer to *2-23-6 Output Parameters (Precise Defect)* on page 2-351.

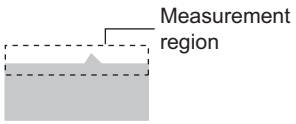
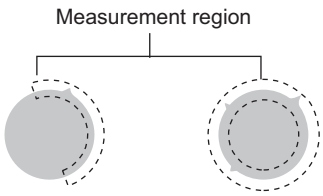
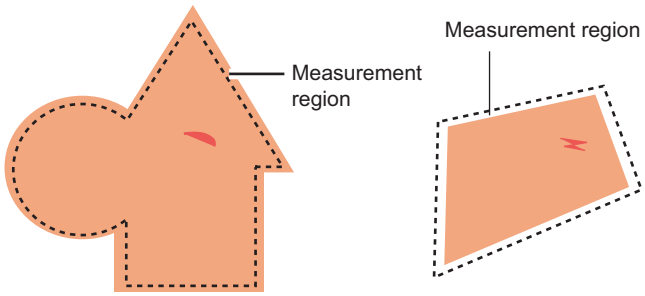
2-23-2 Region Setting (Precise Defect)

This item is used to set up the measurement area.

Use a rectangle, wide line, ellipse (circle), wide circle, wide arc or polygon to specify a measurement region for [Precise Defect]. Up to 8 figures can be drawn.

Important

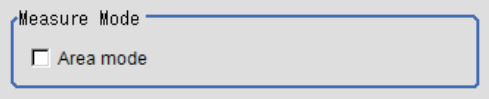
A mask cannot be made with only one region specified using Wide line, Wide circle, or Arc, as the figure.

PT	Description
Wide line	Selected when detecting defects and burrs of the measurement objects. Measurement can be performed in region mode by checking "Measure in region mode". 
Circumference, Wide arc	Selected when detecting defects and burrs of the circle measurement objects. Measurement can be performed in region mode by checking "Measure in region mode". 
Rectangle, Ellipse (circle), Polygon	Selected when detecting the overall defects of specified zones and measurement objects. 

1. In the Item Tab area, click [Region setting].
2. Use the Drawing tools to specify the measurement region.

   Up to 8 figures can be combined.
3. Click [OK] in the Figure setting area.
   - [OK]: Changes the settings and returns to the previous menu.
   - [Cancel]: Changes are discarded. Returns to the previous menu.
   - [Apply]: Updates the settings without leaving edit window.

4 When performing measurement in region mode for wide line, wide circle or arc in a single figure, check "Area" in the Measure Mode area.



Additional Information

In Precise Defect, the measurement mode depends on the number and type of registered region figures.

The method for creating elements differs depending on the measurement mode.

Refer to *Measurement mode* on page 2-348.

2-23-3 Mask Setting (Precise Defect)

Mask the measurement region when measuring it.

There are two types of masks, namely, a static mask that sets the mask region independent of measurement and a dynamic mask that uses images generated in another unit for each measurement.

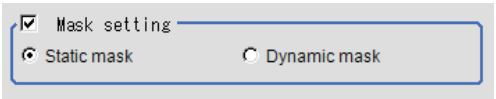
Important

A mask cannot be made with only one region specified using Wide line, Wide circle, or Arc, as the figure.

Creating a static mask

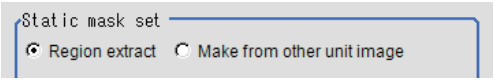
A static mask can be created manually or from an image of another unit.

1 In the Mask setting area, select "Static mask".



● Generating a mask manually

1 In the Static mask set area, select "Region extract".



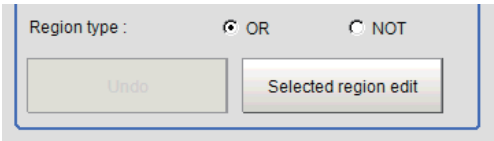
2 Select the selection region type OR or NOT and drag an image directly.

A region is created along successive similar colors from the selected place. It is not masked if the selection region type is OR.

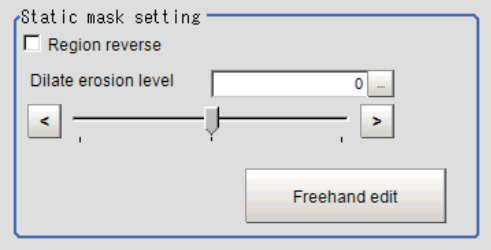
It is masked if the selection region type is NOT.

To deselect a selected region, click [Undo].

To edit a region selected with OR/NOT, click [Selected region edit].



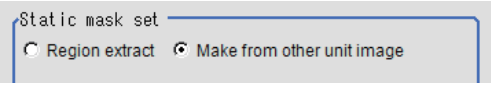
3 Adjust the mask created in the Static mask setting area.



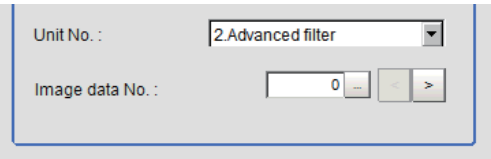
Setting item	Setting value [Factory default]	Description
Region reverse	• Checked • [Unchecked]	Place a check to revert the created mask region.
Dilate erosion level	-10 to 10 [0]	Perform fine adjustment on the mask region using expansions/shrinkage. The region is expanded if a positive value is set. The region is shrunk if a negative value is set.

● Creating a static mask from an image of another unit

1 In the Static mask set area, select "Make from other unit image".



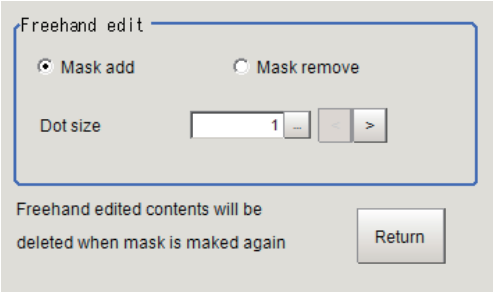
2 Set the unit number and image data number.



Setting item	Setting value [Factory default]	Description
Unit No.	-	Specify the number of the unit whose image will be referenced. The reference unit should be able to output binarized images. For example, select a labeling filter processing image for advanced filtering.
Image data No.	0 to 3 [0]	If the unit supports advanced filtering, numbers 0 to 3 can be set. Otherwise, it is fixed to 0.

Performing fine adjustment on a static mask

1 To perform fine adjustment on a mask region, click [Freehand edit] in the Static mask setting area.



Setting item	Setting value [Factory default]	Description
Freehand edit	• [Mask add] • Mask remove	Select a process performed using the free hand edit.
Dot size	1 to 20 [1]	Set the size of dots used when drawing images on the screen.

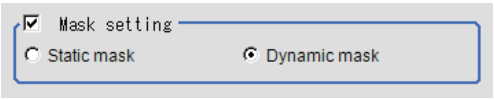
2 Click [Return] to exit the free hand edit.

● Clearing the static mask setting

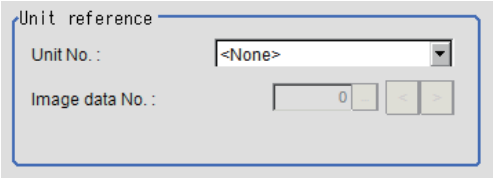
To clear the static mask setting, click [Clear].

Creating a dynamic mask

1 In the Mask setting area, select "Dynamic mask".



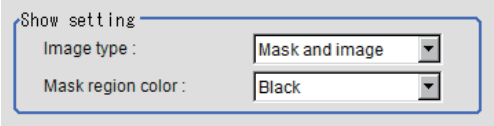
2 Set the unit number and image data number in the Unit area.



Setting item	Setting value [Factory default]	Description
Unit No.	-	Set the number of the unit being referred to for the mask region. The reference unit should be able to output binarized images. For example, select a labeling filter processing image for advanced filtering.
Image data No.	0 to 3 [0]	If the unit supports advanced filtering, numbers 0 to 3 can be set. Otherwise, it is fixed to 0.

Setting display

Perform the display setting if required.



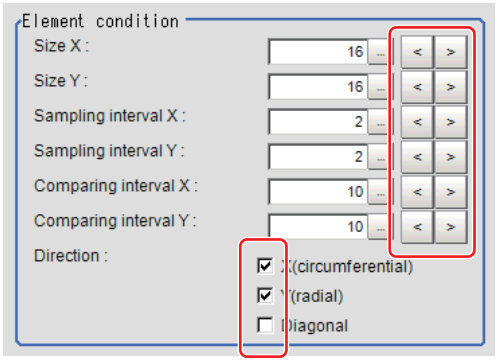
Setting item	Setting value [Factory default]	Description
Image type	• Measure image • Mask binary image • [Mask and image]	Select the type of an image to be displayed. Measure image: Measured image Mask binary image: Binarized image for masking Mask and image: Post-masking image
Mask region color	• [Black] • White • Red • Green • Blue	Select the display color of the mask region. A part of color which is specified in [Mask region color] is not measured.

2-23-4 Measurement Parameters (Precise Defect)

This item specifies the judgement condition for measurement results. Measurement parameters can be changed as needed to address unstable measurement results or to increase the processing speed.

1 In the Item Tab area, click [Measurement].

2 Set the detection parameters.



Setting item	Set value [Factory default]	Description
Size X	4 to 64 [16]	Specify the X-axis size of defects/contamination to be detected. The higher this value, the higher the degree of defects for large defects. Specify in units of pixels.
Size Y	4 to 64 [16]	Specify the Y-axis size of defects/contamination to be detected. The higher this value, the higher the degree of defects for large defects. Specify in units of pixels.
Sampling interval X	1 to 64 [2]	Specify the interval for creating elements along the X axis. The smaller this value, the greater the defect detection performance, but the slower the processing speed. Specify in units of pixels.

Setting item	Set value [Factory default]	Description
Sampling interval Y	1 to 64 [2]	Specify the interval for creating elements along the Y axis. The smaller this value, the greater the defect detection performance, but the slower the processing speed. Specify in units of pixels.
Comparing interval X	1 to 32 [10]	Set the number of neighboring elements compared with when the degree of defect is calculated, For example, if the sampling interval X is set to 4 and the comparing interval X is set to 2, comparison is with separate elements of 4 × 2 = 8 pixels along the X axis.
Comparing interval Y	1 to 32 [10]	This sets the number of neighboring elements compared with when the degree of defect is calculated, For example, if the sampling interval Y is set to 4 and the comparing interval Y is set to 2, comparison is with separate elements of 4 × 2 = 8 pixels along the Y axis.
Direction	• X (circumferential) • Y (radial) • Diagonal	Set the direction for detecting defects. The smaller the direction setting count, the shorter the processing time.

Additional Information

Measurement mode

In Precise Defect measurement, the measurement mode depends on the number of registered region figures and their types. The way to make elements depends on the measurement mode. The relationship between the figure and measurement mode is as in the table below.

	Single figure						Multiple figures
	Line	Circumference	Arc	Ellipse	Rectangle	Polygon	
Measurement mode	Line	Wide circle and arc	Wide circle and arc	Region	Region	Region	Region

- Line mode:

  The direction parallel to the measurement region straight line is the X axis and the direction perpendicular is the Y axis. The shape of elements is rectangular. The element width and length are the number of pixels specified with the element size X and Y.

- Wide circle and arc mode:

  The circumferential direction along the measurement region wide circle (arc) is the X axis and the radial direction is the Y axis. The shape of elements is fan-shaped. If the circumference length of the wide circle (arc) of the measurement region is set to N, the element circumferential direction width is 360 degrees × the element size X / N. The element radial direction width is the number of pixels specified with the element size Y. The element circumferential direction width is defined as an angle, so the closer the element to the outer circumference, the larger the element.

- Region mode:

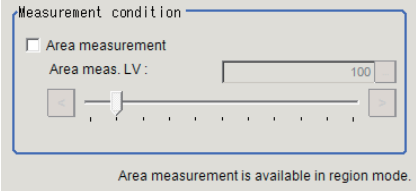
  The direction parallel to the measurement region is the X axis and the direction perpendicular is the Y axis. The shape of elements is rectangular. The element width and length are the number of pixels specified with the element size X and Y.

3 If necessary, set the value of each item in the "Measurement condition" area.

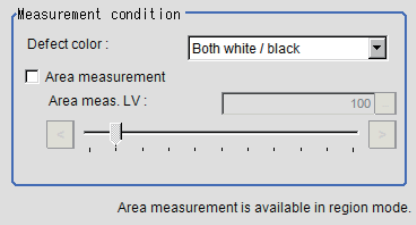
For value input method, refer to *Appendixes Basic Knowledge about Operations Inputting Values* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

The "Area meas. LV" can be set also by dragging the slider or by clicking the buttons at the ends of the slider.

- For color cameras:



- For monochrome cameras:



Setting item	Set value [Factory default]	Description
Defect color (for monochrome cameras only)	Black	Select this value when defects look blackish compared to the background.
	White	Select this value when defects look whitish compared to the background.
	[Both white / black]	Select this value when the brightness of defects is not known.
Area measurement	• Checked • [Unchecked]	Place a check when you want to measure the size of defects. This item can divide the high defect detection regions into groups and output the surface and center of gravity coordinates of the group with the largest area. Area measurement is not possible with only one region specified using Wide line, Wide circle, or Arc, as the figure. However, if "Area mode" is checked, Area measurement can be performed with only one of the above figures.
Area meas. LV	0 to 999 [100]	If you place a heck at Area Measurement, set defect level counted in the defect area.

2-23-5 Judgement Condition (Precise Defect)

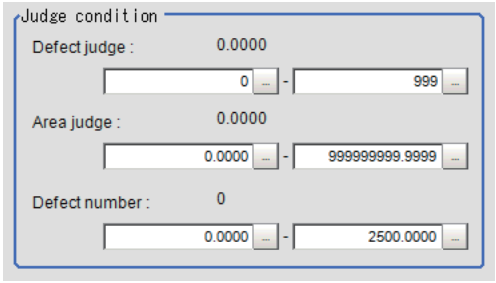
This item specifies the judgement condition for measurement results.

1 In the Item Tab area, click [Judgement condition].

2 When the setting has been changed, click [Measure] in the "Detail" area to verify whether measurements can be made correctly.

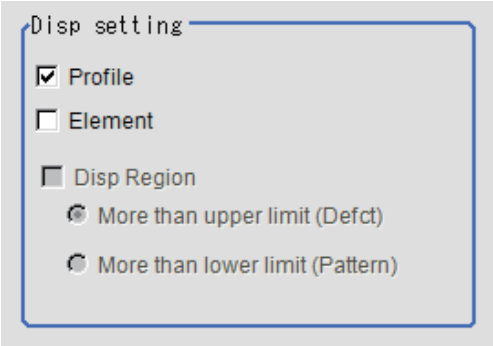
3 Set up the judgement condition.

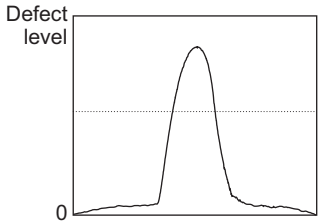
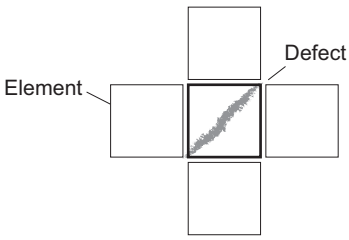
[Area judge] and [Defect Number] are allowable only when you check the [Area measurement] in Measurement parameter.



Setting item	Setting value [Factory default]	Description
Defect judge	0 to 999	Specify the range of defect judgement values that are judged to be OK.
Area judge	0 to 999,999,999.9999 0 to 307,200 (0.3 megapixel cameras) 0 to 1,920,000 (2 megapixel cameras) 0 to 4,320,000 (5 megapixel cameras)	Specify the range of area judgement values that are judged to be OK.
Defect number	0 to 2,500	Specify the range of the number of defects that are judged to be OK.

4 If necessary, set the display conditions for displayed images.



Setting item	Set value [Factory default]	Description
Profile	• [Checked] • Unchecked	Set the profile display. The maximum degree of defect along the X(circumferential) and Y(radial) is displayed with red lines. If you click in the measurement region on the image area, the profile in the XY directions from this point is displayed with yellow lines. 
Element	• Checked • [Unchecked]	Set the comparison element display. Elements are created automatically during measurement. The density is calculated for each element and the position of defects/contamination is detected from the degree of their variation. 
Disp Region	• [Checked] • Unchecked	Place a check to display the defect area. If checked, specify More than upper limit (Defct) or More than lower limit (Pattern).

2-23-6 Output Parameters (Precise Defect)

Specifies whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

1 Click [Output parameter] in the Item Tab area.

2 Choose whether or not to reflect this in the scene overall judgement in "Reflect to overall judgement" area.

Setting item	Set value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-23-7 Key Points for Test Measurement and Adjustment (Precise Defect)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Defect value	Measured defect level
Position X	X Coordinate of measured defect position
Position Y	Y coordinate of measured defect position
Defect Area	The measured maximum defect area
Gravity X	The center of gravity X coordinates of the measured maximum defect area
Gravity Y	The center of gravity Y coordinates of the measured maximum defect area
Defect number	Number of measured defects

The image specified in the Sub-image number in image display setting is displayed in the Image Display area.

Sub image number	Explanation of image to be displayed
0	Measurement image
1	Defect profile [when area measurement is present] If the region display is enabled, the defect area display image specified [when no area measurement].

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

- Noise is detected as defects.

Parameter to be adjusted	Remedy
Measurement	Specify a larger value for "Defect judge" in the judgement conditions.

- Judgement will be NG.

Parameter to be adjusted	Remedy
Measurement	Make the measurement region larger than the value of the element size.

● When the processing speed is slow

Parameter to be adjusted	Remedy
Measurement	Specify a larger value for the element creation interval.

2-23-8 Measurement Results for Which Output Is Possible (Precise Defect)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	Judgement result
Defect	F	Measured defect level
Measurement coordinate X	X	X Coordinate of measured defect position
Measurement coordinate Y	Y	Y coordinate of measured defect position
Defect area	AR	The measured maximum defect area
Gravity X	GX	The center of gravity X coordinates of the measured maximum defect area
Gravity Y	GY	The center of gravity Y coordinates of the measured maximum defect area
Defect number	NM	Number of measured defects

2-23-9 External Reference Tables (Precise Defect)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mis-match) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Defect	defect	Get only	0 to 999
6	Position X	defectX	Get only	0 to 999,999,999.9999
7	Position Y	defectY	Get only	0 to 999,999,999.9999
8	Area	area	Get only	0 to 999,999,999.9999
9	Gravity X	gravityX	Get only	0 to 999,999,999.9999
10	Gravity Y	gravityY	Get only	0 to 999,999,999.9999
11	Defect number	defectNum	Get only	0 to 2,500
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Size X	xElmSize	Set/Get	4 to 64
121	Size Y	yElmSize	Set/Get	4 to 64
122	Sampling interval X	xElmPitch	Set/Get	1 to 64
123	Sampling interval Y	yElmPitch	Set/Get	1 to 64
124	Comparing interval X	xCompPitch	Set/Get	1 to 32
125	Comparing interval Y	yCompPitch	Set/Get	1 to 32

No.	Data name	Ident	Set/Get	Data range
126	Detection object color	color	Set/Get	0: Both white/black 1: White 2: Black
127	Defect detection direction X	directionX	Set/Get	0: OFF 1: ON
128	Defect detection direction Y	directionY	Set/Get	0: OFF 1: ON
129	Inclined defect detection direction	direction8	Set/Get	0: OFF 1: ON
130	Upper limit of defect judgement value	criteriaValue	Set/Get	0 to 999
131	Area measurement	measArea	Set/Get	0: OFF 1: ON
132	Area meas. LV	areaJudge	Set/Get	0 to 999
133	Upper limit of area judgement	upperArea	Set/Get	0 to 999,999,999.9999
134	Profile display	dispProfile	Set/Get	0: OFF 1: ON
135	Element display	dispElement	Set/Get	0: OFF 1: ON
136	Lower limit of area judgement	lowerArea	Set/Get	0 to 999,999,999.9999
137	Lower limit of defect judgement value	lowerCriteriaValue	Set/Get	0 to 999
138	Area mode	checkMode	Set/Get	0: OFF 1: ON
139	Region display	dispRegion	Set/Get	0: OFF 1: ON
140	Defect number Lower Judge	lowerNum	Set/Get	0 to 2,500
141	Defect number Upper Judge	upperNum	Set/Get	0 to 2,500
142	Display defect kind	dispDefectKind	Set/Get	0: More than upper limit (Defct) 1: More than lower limit (Pattern)
155	Dynamic mask unit reference no	dynUnitNo	Set/Get	-1 to 9,999
156	Dynamic mask image no	dynImageNo	Set/Get	0 to 99
158	Display image type	chkChoose	Set/Get	0: Measure image 1: Mask binary image 2: Mask and image
164	Mask region display color	maskRegionColor	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
6002	Format	cameraColor	Set/Get	1: monochrome camera 2: color camera
10000+N×3 (N:0 to 2499)	Gravity X	gravityX	Get only	0 to 999,999,999.9999
10001+N×3 (N:0 to 2499)	Gravity Y	gravityY	Get only	0 to 999,999,999.9999
10002+N×3 (N:0 to 2499)	Area	area	Get only	0 to 999,999,999.9999
90000	Inspection area figure Count	figArea0_count	Set/Get	0 to 8

No.	Data name	Ident	Set/Get	Data range
90001	Inspection area figure0 Type	figArea0_fig0_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90002	Inspection area figure0 mode	figArea0_fig0_mode	Set/Get	0: OR 1: NOT
90009	Inspection area figure0 Wide line Start point X	figArea0_-fig0_lineW_X0	Set/Get	-99,999 to 99,999
90010	Inspection area figure0 Wide line Start point Y	figArea0_-fig0_lineW_Y0	Set/Get	-99,999 to 99,999
90011	Inspection area figure0 Wide line End point X	figArea0_-fig0_lineW_X1	Set/Get	-99,999 to 99,999
90012	Inspection area figure0 Wide line End point Y	figArea0_-fig0_lineW_Y1	Set/Get	-99,999 to 99,999
90013	Inspection area figure0 Wide line Width	figArea0_-fig0_lineW_W	Set/Get	0 to 99,999
90014	Inspection area figure0 Rectangle Upper left position X	figArea0_fig0_box-_X0	Set/Get	-99,999 to 99,999
90015	Inspection area figure0 Rectangle Upper left position Y	figArea0_fig0_box-_Y0	Set/Get	-99,999 to 99,999
90016	Inspection area figure0 Rectangle Lower right position X	figArea0_fig0_box-_X1	Set/Get	-99,999 to 99,999
90017	Inspection area figure0 Rectangle Lower right position Y	figArea0_fig0_box-_Y1	Set/Get	-99,999 to 99,999
90018	Inspection area figure0 Ellipse Center Position X	figArea0_fig0_ellipse_CX	Set/Get	-99,999 to 99,999
90019	Inspection area figure0 Ellipse Center Position Y	figArea0_fig0_ellipse_CY	Set/Get	-99,999 to 99,999
90020	Inspection area figure0 Ellipse RadiusX	figArea0_fig0_ellipse_RX	Set/Get	1 to 99,999
90021	Inspection area figure0 Ellipse RadiusY	figArea0_fig0_ellipse_RY	Set/Get	1 to 99,999
90025	Inspection area figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	Inspection area figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	Inspection area figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	Inspection area figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90034	Inspection area figure0 Wide arc Center Position X	figArea0_-fig0_arcW_X	Set/Get	-99,999 to 99,999
90035	Inspection area figure0 Wide arc Center Position Y	figArea0_-fig0_arcW_Y	Set/Get	-99,999 to 99,999
90036	Inspection area figure0 Wide arc Radius	figArea0_-fig0_arcW_R	Set/Get	0 to 99,999
90037	Inspection area figure0 Wide arc Start angle	figArea0_-fig0_arcW_SA	Set/Get	-180 to 180
90038	Inspection area figure0 Wide arc End angle	figArea0_-fig0_arcW_EA	Set/Get	-180 to 180
90039	Inspection area figure0 Wide arc Width	figArea0_-fig0_arcW_W	Set/Get	0 to 99,999

No.	Data name	Ident	Set/Get	Data range
90040	Inspection area figure0 Polygon Point Count	figArea0_fig0_polygon_count	Set/Get	3 to 10
90041	Inspection area figure0 Polygon Point1 Position X	figArea0_fig0_polygon_x0	Set/Get	-99,999 to 99,999
90042	Inspection area figure0 Polygon Point1 Position Y	figArea0_fig0_polygon_y0	Set/Get	-99,999 to 99,999
90043	Inspection area figure0 Polygon Point2 Position X	figArea0_fig0_polygon_x1	Set/Get	-99,999 to 99,999
90044	Inspection area figure0 Polygon Point2 Position Y	figArea0_fig0_polygon_y1	Set/Get	-99,999 to 99,999
90045	Inspection area figure0 Polygon Point3 Position X	figArea0_fig0_polygon_x2	Set/Get	-99,999 to 99,999
90046	Inspection area figure0 Polygon Point3 Position Y	figArea0_fig0_polygon_y2	Set/Get	-99,999 to 99,999
90047	Inspection area figure0 Polygon Point4 Position X	figArea0_fig0_polygon_x3	Set/Get	-99,999 to 99,999
90048	Inspection area figure0 Polygon Point4 Position Y	figArea0_fig0_polygon_y3	Set/Get	-99,999 to 99,999
90049	Inspection area figure0 Polygon Point5 Position X	figArea0_fig0_polygon_x4	Set/Get	-99,999 to 99,999
90050	Inspection area figure0 Polygon Point5 Position Y	figArea0_fig0_polygon_y4	Set/Get	-99,999 to 99,999
90051	Inspection area figure0 Polygon Point6 Position X	figArea0_fig0_polygon_x5	Set/Get	-99,999 to 99,999
90052	Inspection area figure0 Polygon Point6 Position Y	figArea0_fig0_polygon_y5	Set/Get	-99,999 to 99,999
90053	Inspection area figure0 Polygon Point7 Position X	figArea0_fig0_polygon_x6	Set/Get	-99,999 to 99,999
90054	Inspection area figure0 Polygon Point7 Position Y	figArea0_fig0_polygon_y6	Set/Get	-99,999 to 99,999
90055	Inspection area figure0 Polygon Point8 Position X	figArea0_fig0_polygon_x7	Set/Get	-99,999 to 99,999
90056	Inspection area figure0 Polygon Point8 Position Y	figArea0_fig0_polygon_y7	Set/Get	-99,999 to 99,999
90057	Inspection area figure0 Polygon Point9 Position X	figArea0_fig0_polygon_x8	Set/Get	-99,999 to 99,999
90058	Inspection area figure0 Polygon Point9 Position Y	figArea0_fig0_polygon_y8	Set/Get	-99,999 to 99,999
90059	Inspection area figure0 Polygon Point10 Position X	figArea0_fig0_polygon_x9	Set/Get	-99,999 to 99,999
90060	Inspection area figure0 Polygon Point10 Position Y	figArea0_fig0_polygon_y9	Set/Get	-99,999 to 99,999
90099	Inspection area figure Update	figArea0_update	Set only	1: Update
90101	Inspection area figure1 Type	figArea0_fig1_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90102	Inspection area figure1 mode	figArea0_fig1_mode	Set/Get	0: OR 1: NOT
90109	Inspection area figure1 Wide line Start point X	figArea0_-fig1_lineW_X0	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90110	Inspection area figure1 Wide line Start point Y	figArea0_-fig1_lineW_Y0	Set/Get	-99,999 to 99,999
90111	Inspection area figure1 Wide line End point X	figArea0_-fig1_lineW_X1	Set/Get	-99,999 to 99,999
90112	Inspection area figure1 Wide line End point Y	figArea0_-fig1_lineW_Y1	Set/Get	-99,999 to 99,999
90113	Inspection area figure1 Wide line Width	figArea0_-fig1_lineW_W	Set/Get	0 to 99,999
90114	Inspection area figure1 Rectangle Upper left position X	figArea0_fig1_box-_X0	Set/Get	-99,999 to 99,999
90115	Inspection area figure1 Rectangle Upper left position Y	figArea0_fig1_box-_Y0	Set/Get	-99,999 to 99,999
90116	Inspection area figure1 Rectangle Lower right position X	figArea0_fig1_box-_X1	Set/Get	-99,999 to 99,999
90117	Inspection area figure1 Rectangle Lower right position Y	figArea0_fig1_box-_Y1	Set/Get	-99,999 to 99,999
90118	Inspection area figure1 Ellipse Center Position X	figArea0_fig1_ellipse_CX	Set/Get	-99,999 to 99,999
90119	Inspection area figure1 Ellipse Center Position Y	figArea0_fig1_ellipse_CY	Set/Get	-99,999 to 99,999
90120	Inspection area figure1 Ellipse RadiusX	figArea0_fig1_ellipse_RX	Set/Get	1 to 99,999
90121	Inspection area figure1 Ellipse RadiusY	figArea0_fig1_ellipse_RY	Set/Get	1 to 99,999
90125	Inspection area figure1 Circumference Center Position X	figArea0_fig1_circleW_X	Set/Get	-99,999 to 99,999
90126	Inspection area figure1 Circumference Center Position Y	figArea0_fig1_circleW_Y	Set/Get	-99,999 to 99,999
90127	Inspection area figure1 Circumference Radius	figArea0_fig1_circleW_R	Set/Get	0 to 99,999
90128	Inspection area figure1 Circumference Width	figArea0_fig1_circleW_W	Set/Get	0 to 99,999
90134	Inspection area figure1 Wide arc Center Position X	figArea0_-fig1_arcW_X	Set/Get	-99,999 to 99,999
90135	Inspection area figure1 Wide arc Center Position Y	figArea0_-fig1_arcW_Y	Set/Get	-99,999 to 99,999
90136	Inspection area figure1 Wide arc Radius	figArea0_-fig1_arcW_R	Set/Get	0 to 99,999
90137	Inspection area figure1 Wide arc Start angle	figArea0_-fig1_arcW_SA	Set/Get	-180 to 180
90138	Inspection area figure1 Wide arc End angle	figArea0_-fig1_arcW_EA	Set/Get	-180 to 180
90139	Inspection area figure1 Wide arc Width	figArea0_-fig1_arcW_W	Set/Get	0 to 99,999
90140	Inspection area figure1 Polygon Point Count	figArea0_fig1_polygon_count	Set/Get	3 to 10
90141	Inspection area figure1 Polygon Point1 Position X	figArea0_fig1_polygon_x0	Set/Get	-99,999 to 99,999
90142	Inspection area figure1 Polygon Point1 Position Y	figArea0_fig1_polygon_y0	Set/Get	-99,999 to 99,999
90143	Inspection area figure1 Polygon Point2 Position X	figArea0_fig1_polygon_x1	Set/Get	-99,999 to 99,999
90144	Inspection area figure1 Polygon Point2 Position Y	figArea0_fig1_polygon_y1	Set/Get	-99,999 to 99,999
90145	Inspection area figure1 Polygon Point3 Position X	figArea0_fig1_polygon_x2	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90146	Inspection area figure1 Polygon Point3 Position Y	figArea0_fig1_polygon_y2	Set/Get	-99,999 to 99,999
90147	Inspection area figure1 Polygon Point4 Position X	figArea0_fig1_polygon_x3	Set/Get	-99,999 to 99,999
90148	Inspection area figure1 Polygon Point4 Position Y	figArea0_fig1_polygon_y3	Set/Get	-99,999 to 99,999
90149	Inspection area figure1 Polygon Point5 Position X	figArea0_fig1_polygon_x4	Set/Get	-99,999 to 99,999
90150	Inspection area figure1 Polygon Point5 Position Y	figArea0_fig1_polygon_y4	Set/Get	-99,999 to 99,999
90151	Inspection area figure1 Polygon Point6 Position X	figArea0_fig1_polygon_x5	Set/Get	-99,999 to 99,999
90152	Inspection area figure1 Polygon Point6 Position Y	figArea0_fig1_polygon_y5	Set/Get	-99,999 to 99,999
90153	Inspection area figure1 Polygon Point7 Position X	figArea0_fig1_polygon_x6	Set/Get	-99,999 to 99,999
90154	Inspection area figure1 Polygon Point7 Position Y	figArea0_fig1_polygon_y6	Set/Get	-99,999 to 99,999
90155	Inspection area figure1 Polygon Point8 Position X	figArea0_fig1_polygon_x7	Set/Get	-99,999 to 99,999
90156	Inspection area figure1 Polygon Point8 Position Y	figArea0_fig1_polygon_y7	Set/Get	-99,999 to 99,999
90157	Inspection area figure1 Polygon Point9 Position X	figArea0_fig1_polygon_x8	Set/Get	-99,999 to 99,999
90158	Inspection area figure1 Polygon Point9 Position Y	figArea0_fig1_polygon_y8	Set/Get	-99,999 to 99,999
90159	Inspection area figure1 Polygon Point10 Position X	figArea0_fig1_polygon_x9	Set/Get	-99,999 to 99,999
90160	Inspection area figure1 Polygon Point10 Position Y	figArea0_fig1_polygon_y9	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
90701	Inspection area figure7 Type	figArea0_fig7_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90702	Inspection area figure7 mode	figArea0_fig7_mode	Set/Get	0: OR 1: NOT
90709	Inspection area figure7 Wide line Start point X	figArea0_-fig7_lineW_X0	Set/Get	-99,999 to 99,999
90710	Inspection area figure7 Wide line Start point Y	figArea0_-fig7_lineW_Y0	Set/Get	-99,999 to 99,999
90711	Inspection area figure7 Wide line End point X	figArea0_-fig7_lineW_X1	Set/Get	-99,999 to 99,999
90712	Inspection area figure7 Wide line End point Y	figArea0_-fig7_lineW_Y1	Set/Get	-99,999 to 99,999
90713	Inspection area figure7 Wide line Width	figArea0_-fig7_lineW_W	Set/Get	0 to 99,999
90714	Inspection area figure7 Rectangle Upper left position X	figArea0_fig7_box-_X0	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90715	Inspection area figure7 Rectangle Upper left position Y	figArea0_fig7_box_Y0	Set/Get	-99,999 to 99,999
90716	Inspection area figure7 Rectangle Lower right position X	figArea0_fig7_box_X1	Set/Get	-99,999 to 99,999
90717	Inspection area figure7 Rectangle Lower right position Y	figArea0_fig7_box_Y1	Set/Get	-99,999 to 99,999
90718	Inspection area figure7 Ellipse Center Position X	figArea0_fig7_ellipse_CX	Set/Get	-99,999 to 99,999
90719	Inspection area figure7 Ellipse Center Position Y	figArea0_fig7_ellipse_CY	Set/Get	-99,999 to 99,999
90720	Inspection area figure7 Ellipse RadiusX	figArea0_fig7_ellipse_RX	Set/Get	1 to 99,999
90721	Inspection area figure7 Ellipse RadiusY	figArea0_fig7_ellipse_RY	Set/Get	1 to 99,999
90725	Inspection area figure7 Circumference Center Position X	figArea0_fig7_circleW_X	Set/Get	-99,999 to 99,999
90726	Inspection area figure7 Circumference Center Position Y	figArea0_fig7_circleW_Y	Set/Get	-99,999 to 99,999
90727	Inspection area figure7 Circumference Radius	figArea0_fig7_circleW_R	Set/Get	0 to 99,999
90728	Inspection area figure7 Circumference Width	figArea0_fig7_circleW_W	Set/Get	0 to 99,999
90734	Inspection area figure7 Wide arc Center Position X	figArea0_fig7_arcW_X	Set/Get	-99,999 to 99,999
90735	Inspection area figure7 Wide arc Center Position Y	figArea0_fig7_arcW_Y	Set/Get	-99,999 to 99,999
90736	Inspection area figure7 Wide arc Radius	figArea0_fig7_arcW_R	Set/Get	0 to 99,999
90737	Inspection area figure7 Wide arc Start angle	figArea0_fig7_arcW_SA	Set/Get	-180 to 180
90738	Inspection area figure7 Wide arc End angle	figArea0_fig7_arcW_EA	Set/Get	-180 to 180
90739	Inspection area figure7 Wide arc Width	figArea0_fig7_arcW_W	Set/Get	0 to 99,999
90740	Inspection area figure7 Polygon Point Count	figArea0_fig7_polygon_count	Set/Get	3 to 10
90741	Inspection area figure7 Polygon Point1 Position X	figArea0_fig7_polygon_x0	Set/Get	-99,999 to 99,999
90742	Inspection area figure7 Polygon Point1 Position Y	figArea0_fig7_polygon_y0	Set/Get	-99,999 to 99,999
90743	Inspection area figure7 Polygon Point2 Position X	figArea0_fig7_polygon_x1	Set/Get	-99,999 to 99,999
90744	Inspection area figure7 Polygon Point2 Position Y	figArea0_fig7_polygon_y1	Set/Get	-99,999 to 99,999
90745	Inspection area figure7 Polygon Point3 Position X	figArea0_fig7_polygon_x2	Set/Get	-99,999 to 99,999
90746	Inspection area figure7 Polygon Point3 Position Y	figArea0_fig7_polygon_y2	Set/Get	-99,999 to 99,999
90747	Inspection area figure7 Polygon Point4 Position X	figArea0_fig7_polygon_x3	Set/Get	-99,999 to 99,999
90748	Inspection area figure7 Polygon Point4 Position Y	figArea0_fig7_polygon_y3	Set/Get	-99,999 to 99,999
90749	Inspection area figure7 Polygon Point5 Position X	figArea0_fig7_polygon_x4	Set/Get	-99,999 to 99,999
90750	Inspection area figure7 Polygon Point5 Position Y	figArea0_fig7_polygon_y4	Set/Get	-99,999 to 99,999

No.	Data name	Ident	Set/Get	Data range
90751	Inspection area figure7 Polygon Point6 Position X	figArea0_fig7_polygon_x5	Set/Get	-99,999 to 99,999
90752	Inspection area figure7 Polygon Point6 Position Y	figArea0_fig7_polygon_y5	Set/Get	-99,999 to 99,999
90753	Inspection area figure7 Polygon Point7 Position X	figArea0_fig7_polygon_x6	Set/Get	-99,999 to 99,999
90754	Inspection area figure7 Polygon Point7 Position Y	figArea0_fig7_polygon_y6	Set/Get	-99,999 to 99,999
90755	Inspection area figure7 Polygon Point8 Position X	figArea0_fig7_polygon_x7	Set/Get	-99,999 to 99,999
90756	Inspection area figure7 Polygon Point8 Position Y	figArea0_fig7_polygon_y7	Set/Get	-99,999 to 99,999
90757	Inspection area figure7 Polygon Point9 Position X	figArea0_fig7_polygon_x8	Set/Get	-99,999 to 99,999
90758	Inspection area figure7 Polygon Point9 Position Y	figArea0_fig7_polygon_y8	Set/Get	-99,999 to 99,999
90759	Inspection area figure7 Polygon Point10 Position X	figArea0_fig7_polygon_x9	Set/Get	-99,999 to 99,999
90760	Inspection area figure7 Polygon Point10 Position Y	figArea0_fig7_polygon_y9	Set/Get	-99,999 to 99,999
91000	Mask area figure Count	figArea1_count	Set/Get	1
91001	Mask area figure0 Type	figArea1_fig0_type	Set/Get	8: Rectangle
91002	Mask area figure0 mode	figArea1_fig0_mode	Set/Get	0: OR
91014	Mask area figure0 Rectangle Upper left position X	figArea1_fig0_box_X0	Set/Get	-99,999 to 99,999
91015	Mask area figure0 Rectangle Upper left position Y	figArea1_fig0_box_Y0	Set/Get	-99,999 to 99,999
91016	Mask area figure0 Rectangle Lower right position X	figArea1_fig0_box_X1	Set/Get	-99,999 to 99,999
91017	Mask area figure0 Rectangle Lower right position Y	figArea1_fig0_box_Y1	Set/Get	-99,999 to 99,999
91099	Mask area figure Update	figArea1_update	Set only	1: Update
92000	Selected area figure Count	figArea2_count	Set/Get	0 to 8
92001	Selected area figure0 Type	figArea2_fig0_type	Set/Get	8: Rectangle
92002	Selected area figure0 mode	figArea2_fig0_mode	Set/Get	0: OR 1: NOT
92014	Selected area figure0 Rectangle Upper left position X	figArea2_fig0_box_X0	Set/Get	-99,999 to 99,999
92015	Selected area figure0 Rectangle Upper left position Y	figArea2_fig0_box_Y0	Set/Get	-99,999 to 99,999
92016	Selected area figure0 Rectangle Lower right position X	figArea2_fig0_box_X1	Set/Get	-99,999 to 99,999
92017	Selected area figure0 Rectangle Lower right position Y	figArea2_fig0_box_Y1	Set/Get	-99,999 to 99,999
92099	Selected area figure Update	figArea2_update	Set only	1: Update
92101	Selected area figure1 Type	figArea2_fig1_type	Set/Get	8: Rectangle
92102	Selected area figure1 mode	figArea2_fig1_mode	Set/Get	0: OR 1: NOT
92114	Selected area figure1 Rectangle Upper left position X	figArea2_fig1_box_X0	Set/Get	-99,999 to 99,999
92115	Selected area figure1 Rectangle Upper left position Y	figArea2_fig1_box_Y0	Set/Get	-99,999 to 99,999
92116	Selected area figure1 Rectangle Lower right position X	figArea2_fig1_box_X1	Set/Get	-99,999 to 99,999

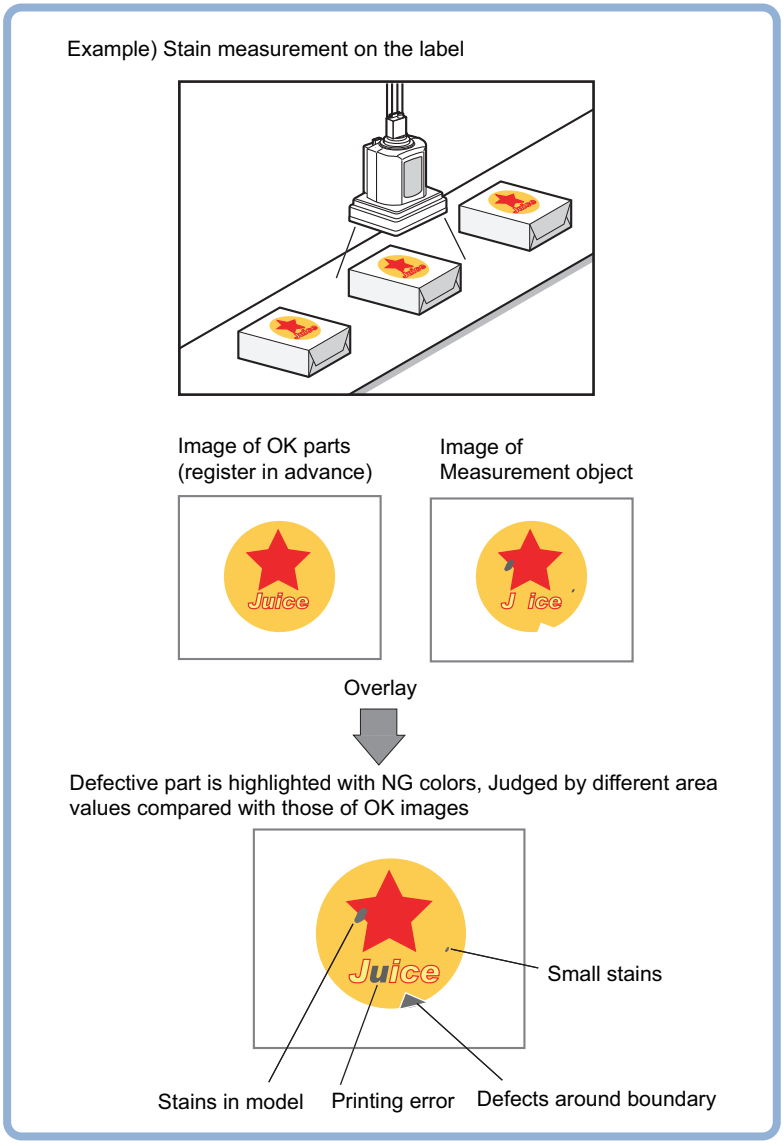
No.	Data name	Ident	Set/Get	Data range
92117	Selected area figure1 Rectangle Lower right position Y	figArea2_fig1_box_Y1	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
92701	Selected area figure7 Type	figArea2_fig7_type	Set/Get	8: Rectangle
92702	Selected area figure7 mode	figArea2_fig7_mode	Set/Get	0: OR 1: NOT
92714	Selected area figure7 Rectangle Upper left position X	figArea2_fig7_box_X0	Set/Get	-99,999 to 99,999
92715	Selected area figure7 Rectangle Upper left position Y	figArea2_fig7_box_Y0	Set/Get	-99,999 to 99,999
92716	Selected area figure7 Rectangle Lower right position X	figArea2_fig7_box_X1	Set/Get	-99,999 to 99,999
92717	Selected area figure7 Rectangle Lower right position Y	figArea2_fig7_box_Y1	Set/Get	-99,999 to 99,999

2-24 Fine Matching

Differences can be detected in a fast and highly precise way by overlapping registered fine images with input images (matching).

Used in the Following Case

To precisely detect trivial defects at the edges of text and patterns

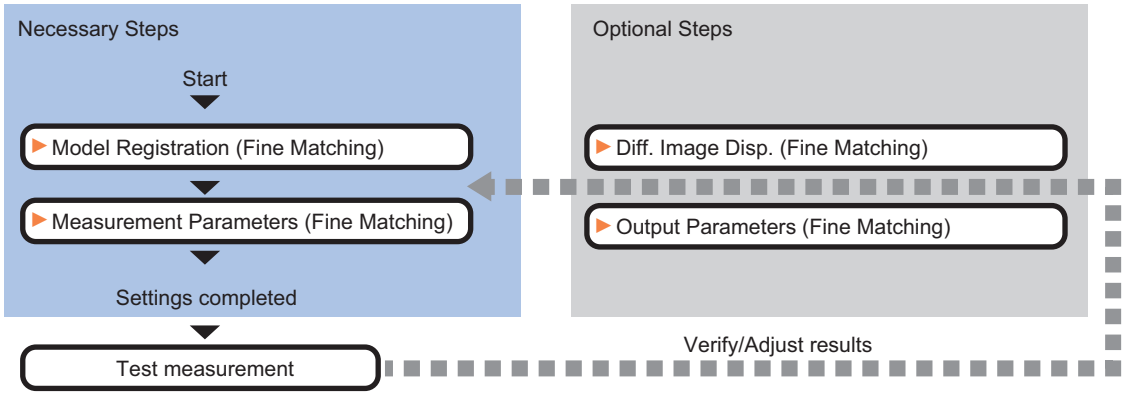


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-24-1 Settings Flow (Fine Matching)

Set up fine matching in the follow steps.

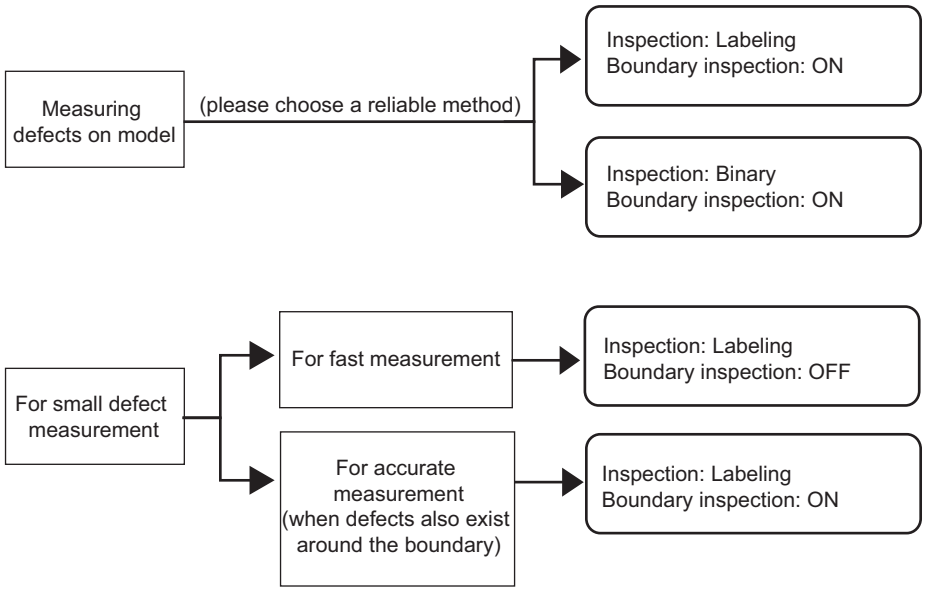


List of Fine Matching Items

Item name	Description
Model register	This item registers the pattern characteristic of the measurement image as a model. Model parameter values can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used. Refer to *2-24-2 Model Registration (Fine Matching)* on page 2-363.
Diff. image disp.	Modify this setting as necessary when defects cannot be detected successfully. This sets the reference grayscale used when calculating differences between the model and the inspected object image. Normally, the factory default value will be used. Refer to *2-24-3 Difference Image Display (Fine Matching)* on page 2-364.
Measurement	This item specifies the judgement condition for measurement results. Specify the criteria to judge the measurement result if the X and Y coordinates and the correlation values with the model are OK. Measurement parameters can be changed as needed to address unstable measurement results or to increase the processing speed. Refer to *2-24-4 Measurement Parameters (Fine Matching)* on page 2-367.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. Refer to *2-24-5 Output Parameters (Fine Matching)* on page 2-369.

Additional Information

Specify [Boundary inspection] in [Model register] and [Inspection] in [Measurement] according to the inspection objectives.



2-24-2 Model Registration (Fine Matching)

Register a fine image as the model. By matching this model with input images, unmatched parts will be detected as defects during inspection.

Additional Information

Ranges that can be registered as models

- The two pixels on the edge of the screen are not registered as a model.
- The registering range will be lower if the images of measurement object are set with Filtering. When you set the image reading range using a camera with the partial scanning function, the range is also limited. Refer to *3-2 Filtering* on page 3-9.
- When figures are drawn overlapping, the settings for objects set up afterward are enabled. For details, refer to *Appendixes Setting Figures* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

1 In the Item Tab area, click [Model register].

When setting a new model, you do not have to click [Model register].

2 Use the Drawing tools to specify the model registration range.

3 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

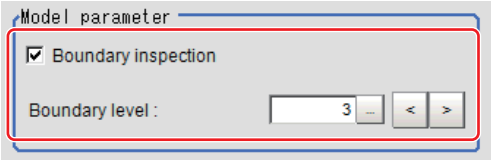
The model is registered.

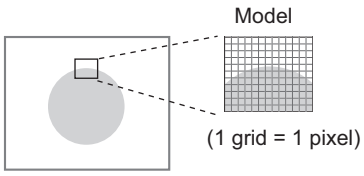
Changing Model Parameters

The range can be changed as needed to address unstable measurement results. Normally, the factory default value will be used.

After changing a setting, check whether measurement can be done properly by performing an actual measurement.

1 In the "Model parameter" area, specify a value for each item.



Setting item	Set value [Factory default]	Description
Boundary inspection	[Checked]	Defects around boundaries with color changes can also be detected. The edges similar to those in the model image are not regarded as defects. Check this option when inspecting defects around boundaries, such as chips and burrs. Defects along a direction different from the model image profile are detected in the range of pixels of profile ± boundary level.
	Unchecked	Boundary areas are excluded from the inspection. This can prevent matching mistakes due to positional deviation of measurement objects, but defects around boundaries cannot be detected. "Boundary level" can be used to specify how many pixels around boundaries should be excluded from the inspection.  Measurement image  If the measurement object moves up slightly, its difference with the model will be detected as the edge part.  When setting Edge Measurement to “Disabled”, the range of the “Model edge ± Boundary level” will be outside of the measurement object. Example) When “Edge level” is 3, the range with a width of 6 pixels will not be outside of the measurement object.
Boundary level	0 to 9 [3]	Select the degree of assimilation of variations around boundaries. Depending on the "Boundary inspection" value, the meaning is different.

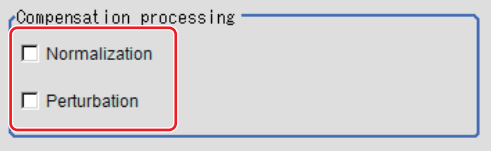
2-24-3 Difference Image Display (Fine Matching)

This sets the reference grayscale used when calculating differences between the model and the inspected object image. Modify this setting as necessary when defects cannot be detected successfully. Normally, the factory default value will be used.

After changing a setting, check whether measurement can be done properly by performing an actual measurement.

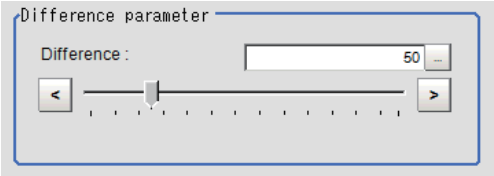
1 In the Item Tab area, click [Diff. image disp.].

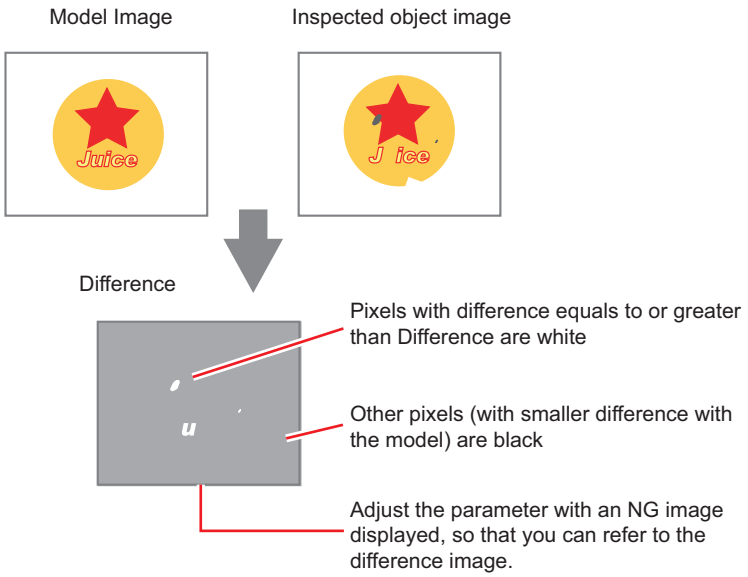
2 In the "Compensation processing" area, select a value for each item.



Setting item	Set value [Factory default]	Description
Normalization	• Checked • [Unchecked]	Specify whether to perform normalization based on the brightness in the registered model. When Normalization is checked, the density is adjusted before matching, so that the matching is not affected by changes in the total image brightness or the lighting fluctuations. When normalization is performed on the measured objects without patterns, the total image brightness is changed and the measurement does not work correctly. Model image  Measurement image (When the whole image turns dark) 
Perturbation	• Checked • [Unchecked]	If you place a check here, in order to prevent mistaken detection of slight positional deviation of measurement objects as differences, slight positional deviations are corrected before matching. However, this requires more processing time.

3 Input the "Difference" in the "Difference parameter" area.



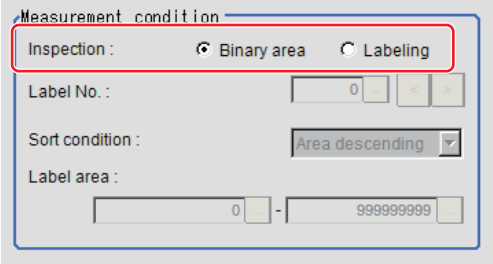
Item	Set value [Factory default]	Description
Difference	0 to 255 [50]	This sets the reference grayscale used when calculating differences between the model and the inspected object image. Pixels with a difference equal to or greater than Difference are converted to white and other pixels are converted to black, so that only defects are converted to white and measured. 

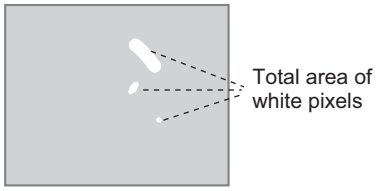
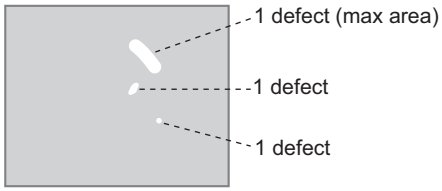
2-24-4 Measurement Parameters (Fine Matching)

This item specifies the judgement conditions for measurement conditions and measurement results.

1 In the Item Tab area, click [Measurement].

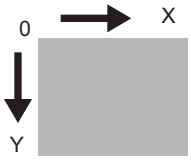
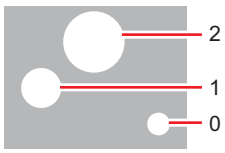
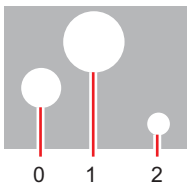
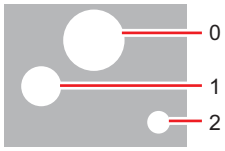
2 Select "Inspection" in the "Measurement condition" area.



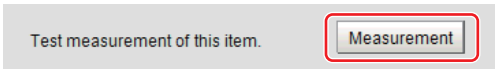
Setting item	Set value [Factory default]	Description
Inspection	Images that are different from the model will be converted into binary images internally. "Inspection" that is used to detect binary images should be selected.	
	[Binary area]	Defect is judged based on the total area of white pixels. 
	Labeling	A white pixel will be detected as 1 label, which is then compared with a label which is consistent with the set conditions to determine whether or not it is a defect. 

If "Binary area" is selected, the following operations are not necessary.

When Labeling is selected, the following items are set.

Item	Set value [Factory default]	Description
Label No.	0 to 2499 [0]	Specify the label number used to determine whether defects exist. Different settings for "Sort condition" will lead to different number assignment.
Sort condition	Specify the conditions by which label number is re-assigned. When sorting referencing the X and Y coordinates, the upper left is the origin. This will not affect the coordinate systems set up through the [Camera Image Input] calibration. 	
	Area ascending	Number re-assigning begins from the labels with smaller areas. 
	[Area descending]	Number re-assigning begins from labels with larger area.
	X ascending	Number re-assigning begins from the label with a smaller gravity X coordinate. 
	X descending	Number re-assigning begins from the label with a larger gravity X coordinate.
	Y ascending	Number re-assigning begins from the label with a smaller gravity Y coordinate. 
	Y descending	Number re-assigning begins from the label with a larger gravity Y coordinate.
Label area	[0] to [999999999]	Specify the range of the area to be judged as a label.

3 When the setting has been changed, click [Measurement] in the Detail area to verify whether measurements can be made correctly.



4 Set up the judgement condition.

Setting item	Set value	Description
Quantity	0 to 9999	Specify the range of the number of labels that is judged to be OK. When "Binary area" is used, the white pixels as a whole will be regarded as one label.
Area	0 to 999999999.9999	Specify the range of the area that is judged to be OK. When the "Labeling" is used, the area of the label number will be specified instead.
Defect pos X	-99999.9999 to 99999.9999	Specify the X and Y axis move ranges for the center of gravity positions that are judged to be OK. When the "Labeling" is used, the center of gravity position of the label number will be specified instead.
Defect pos Y	-99999.9999 to 99999.9999	Specify the X and Y axis move ranges for the center of gravity positions that are judged to be OK. When the "Labeling" is used, the center of gravity position of the label number will be specified instead.

Additional Information

Defect coordinates give the center of gravity position of detected defects.

2-24-5 Output Parameters (Fine Matching)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-24-6 Key Points for Test Measurement and Adjustment (Fine Matching)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Quantity	Number of defects
Area	Defect area
Defect coordinate X	Defect coordinate X
Defect coordinate Y	Defect coordinate Y

The image specified in the Sub-image number in image display setting is displayed in the Image Display area.

Sub image number.	Explanation of image to be displayed
0	Measurement image
1	Difference image display

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

- When non-existent defects are detected around the boundary

Parameter to be adjusted	Remedy
Model	Uncheck "Boundary inspection".
Measurement	Set "Labeling" as the "Inspection".

- When noise is detected as defects/defects cannot be detected

Parameter to be adjusted	Remedy
Diff. image disp.	Adjust "Difference".

- Measurement object near plain area

Parameter to be adjusted	Remedy
Diff. image disp.	Uncheck "Normalization".

● When the processing speed is slow

Parameter to be adjusted	Remedy
Model	Uncheck "Boundary inspection".
Measurement	Set "Labeling" as the "Inspection".

2-24-7 Measurement Results for Which Output Is Possible (Fine Matching)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	Judgement result
Quantity	DA	Number of labeling
Area	AR	Area
Defect position	X	X coordinate of center of gravity position of measured defects
Defect position	Y	Y coordinate of center of gravity position of measured defects

2-24-8 External Reference Tables (Fine Matching)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Number of labeling	numOfLabels	Get only	0 to 9,999
6	Area	areaValue	Get only	0 to 999,999,999.9999
7	Position X	defectX	Get only	-99,999.9999 to 99,999.9999
8	Position Y	defectY	Get only	-99,999.9999 to 99,999.9999
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Boundary inspection	boundaryInspection	Set/Get	0: OFF 1: ON
121	Boundary level	boundaryLevel	Set/Get	0 to 9
122	Normalization	normalization	Set/Get	0: OFF 1: ON
123	Perturbation	perturbation	Set/Get	0: OFF 1: ON
124	Difference	difference	Set/Get	0 to 255
125	Inspection	inspection	Set/Get	0: Binary 1: Labeling
126	Label No.	labelNo	Set/Get	0 to 2,499
127	Sort condition	sortCondition	Set/Get	0: Area ascending 1: Area descending 2: X ascending 3: X descending 4: Y ascending 5: Y descending

No.	Data name	Ident	Set/Get	Data range
128	Upper limit of label area condition	upperLabelArea	Set/Get	0 to 999,999,999
129	Lower limit of label area condition	lowerLabelArea	Set/Get	0 to 999,999,999
130	Upper limit of quantity judgement	upperQuantity	Set/Get	0 to 9,999
131	Lower limit of quantity judgement	lowerQuantity	Set/Get	0 to 9,999
132	Upper limit of area judgement	upperArea	Set/Get	0 to 999,999,999.9999
133	Lower limit of area judgement	lowerArea	Set/Get	0 to 999,999,999.9999
134	Upper limit of position X	upperDefectX	Set/Get	-99,999.9999 to 99,999.9999
135	Lower limit of position X	lowerDefectX	Set/Get	-99,999.9999 to 99,999.9999
136	Upper limit of position Y	upperDefectY	Set/Get	-99,999.9999 to 99,999.9999
137	Lower limit of position Y	lowerDefectY	Set/Get	-99,999.9999 to 99,999.9999
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera

2-25 Character Inspection

Using model images registered in a [Model Dictionary], this processing item performs character recognition by correlation searches.

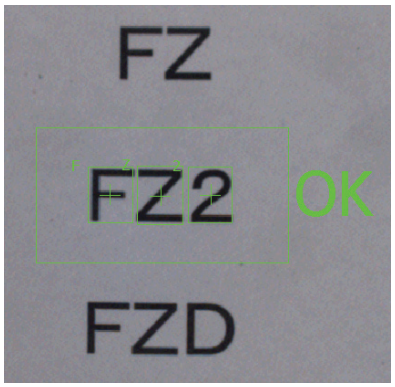
Important

The model dictionary needs to be created in advance.
Refer to *2-27 Model Dictionary* on page 2-396.

Used in the Following Case

When identifying standard character data (check of product model name)

Example) Product type inspection

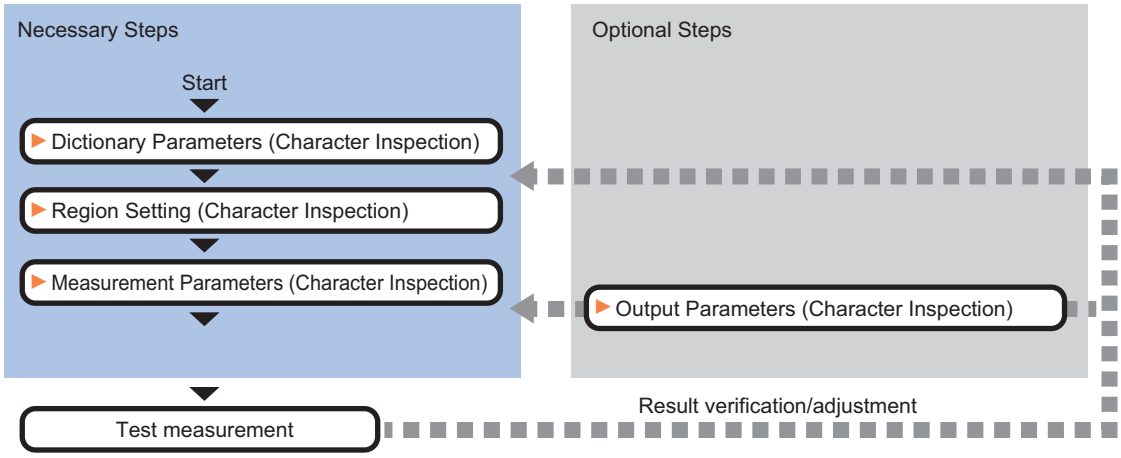


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-25-1 Settings Flow (Character Inspection)

The setting procedure for character inspection is as follows:



List of Character Inspection Items

Item name	Description
Dictionary	This item specifies the processing unit number for the model dictionary to use for character recognition. Refer to *2-25-2 Dictionary Parameters (Character Inspection)* on page 2-374.
Region setting	This item is used to set up the measurement area. Instead of measuring the entire input image, narrowing the measurement area shortens the processing time. Refer to *2-25-3 Region Setting (Character Inspection)* on page 2-375.
Measurement	This item specifies the judgement condition for measurement results. Specify the criteria to judge the measurement result if the X and Y coordinates and the correlation values with the model are OK. Refer to *2-25-4 Measurement Parameters (Character Inspection)* on page 2-376.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. Refer to *2-25-5 Output Parameters (Character Inspection)* on page 2-377.

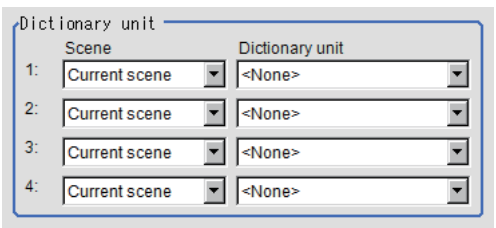
2-25-2 Dictionary Parameters (Character Inspection)

This item selects the processing unit number for the model dictionary to use for character inspection.

1 In the Item Tab area, click [Dictionary].

2 In the "Dictionary unit" area, select the unit number.

A dictionary unit other than the currently used scene can also be used.



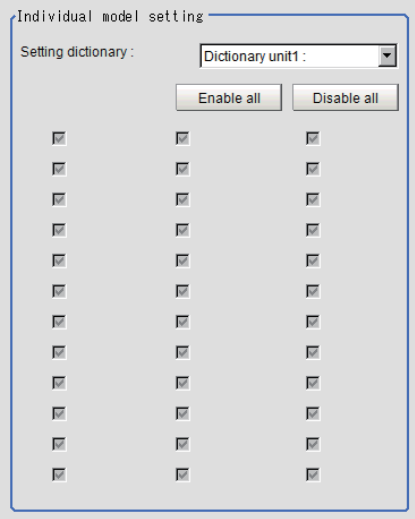
3 If necessary, specify an index to use.

(1) Click [▼] and select the dictionary unit to be specified.

The following character strings are registered.

(2) Place a check at the character(s) to use for character inspection.

Click the [Enable all]/[Disable all] button to enable/disable all registered characters.



4 Click [OK].

The model dictionary to use is set.

2-25-3 Region Setting (Character Inspection)

This item is used to set up the measurement area.

Instead of measuring the entire input image, narrowing the measurement area shortens the processing time.

This item specifies the measurement region of [Character Inspection] using a rectangle.

1 In the Item Tab area, click [Region setting].

2 Click [Edit].

The figure setting area is displayed.

3 Specify the area in which to search for the model.

The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

Additional Information

Number of characters that can be inspected

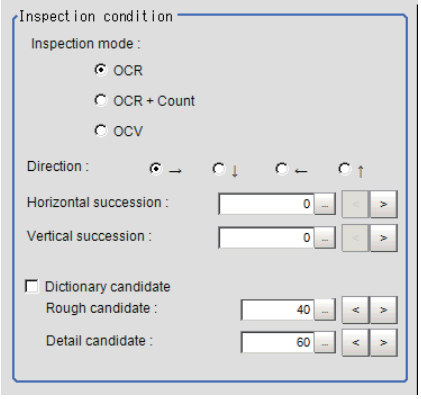
Up to 32 characters can be inspected in the measurement region.

2-25-4 Measurement Parameters (Character Inspection)

Set the character inspection contents, the trimming method and the judgement conditions for the measurement results.

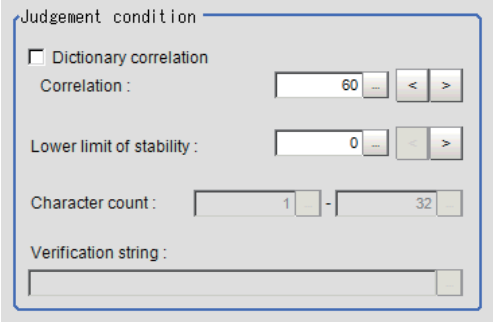
1 In the Item Tab area, click [Measurement].

2 In the "Inspection condition" area, specify a value for each item.



Setting item	Set value [Factory default]	Description
Inspection mode	• [OCR] • OCR + Count • OCV	Select the inspection mode of characters. • OCR: The character string is read in. • OCR + Count: The character string is read in. Also, the number of characters is inspected. • OCV: Inspects whether or not the same characters are lined up as the preset correct character string combination.
Direction	• [→] ↓ ← ↑	Specify the direction of character reading.
Horizontal succession	[0] to 99	If characters are too close together to read in well, set a larger value. Specify the allowable overlapping width possible to read models in the unit of pixel. This item is valid when "Direction" is [→] [←].
Vertical succession	[0] to 99	Specify the allowable overlapping width possible to read models in the unit of pixel. This item is valid when "Direction" is [↓] [↑].
Dictionary candidate	• [Unchecked] (Not used) • Checked (Used)	Specify whether to use candidate point levels specified in the Model Dictionary or not.
Rough candidate	0 to 100 [40]	When "Dictionary candidate" is unchecked, specify a value for the Rough candidate.
Detail candidate	0 to 100 [60]	When "Dictionary candidate" is unchecked, specify a value for the Detailed candidate.

3 Set up the judgement condition.



Setting item		Set value [Factory default]	Description
Dictionary correlation		• [Unchecked] (Not used) • [Checked] (Used)	Specify whether to use the correlation lower limit set in the Model Dictionary or not.
	Correlation	0 to 100 [60]	When "Dictionary correlation" is unchecked, specify the Correlation.
Lower limit of stability		0 to 100 [0]	The displayed stability value is the value obtained by subtracting the correlation value of the second candidate from the correlation value of the first candidate for the read character. The stability is low when the difference between the candidate correlation values is small, and there is a possibility that the character was misread. A stability higher than the lower limit of stability is OK.
Character count		1 to 32	When "Inspection mode" is "OCR + Count", specify the judgement condition for the number of characters.
Verification string		A string with up to 32 characters. [(None)]	When "Inspection mode" is "OCV", specify the Verification string. "*" in the Verification string is a wild card. Verification of whether a character is "*" is not possible. For sections to be judged OK no matter what characters are present and to just inspect whether or not there are characters at all, use "*".

2-25-5 Output Parameters (Character Inspection)

Select how measurement results are output to an external device. This item can be changed if necessary. Normally, the factory default value will be used.

1 Click [Output parameter] in the Item Tab area.

2 Specify a value for each item.

Setting item	Set value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Select whether have the judgement result of this processing unit reflected in the overall judgement of the scene.

Setting item		Set value [Factory default]	Description
Character output	Character output	• [Unchecked] • Checked	Specify whether to output read-in character strings to an external device.
	Output device	• [RS-232C/ RS-422] • Ethernet	When "Character output" is checked (output), this specifies the device to which strings are output. A character string is output as an ASCII code character string plus a delimiter. When kanji or other characters that are not ASCII codes are included, they are not output correctly. When Ethernet is selected, the destination IP address is determined by the system settings. For details, refer to *Non-procedure Communications* in the *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Cat. No. Z342).

Additional Information

For character output, if there was no read character string, then the delimiter is output.

2-25-6 Key Points for Test Measurement and Adjustment (Character Inspection)

The following content is displayed in the "Detail result" area as text.

Displayed items	Color of display	Description
Judge	OK/Unmeasured: Black NG: Red	Judgement result
NG cause	0: Black Other than 0: Red	The following character strings are displayed. When there are multiple factors, the output is ORed. If both the correlation value and the character count are NG, "3" is output. 0: OK 1: Correlation values NG 2: Character count NG 4: Verification NG 8: OCV NG 8: Stability NG
Chara count	When the NG cause is the character count NG: Red Other NG: Black	The number of measured characters is displayed.
Read string	When the NG cause is verification NG: Red Other NG: Black	A character string read from the target unit is displayed.
Correlation value	When the NG cause for each character is the correlation value NG: Red Other NG: Black	The correlation values for each character are displayed. Example) When 0123 is read Correlation values: 0(99) 1(56) 2(80) 3(27)
Stability	When the NG cause of each character is stability NG: Red Otherwise: Black	Shows the stability of each character.

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

- When the reading is unstable

Parameter to be adjusted	Remedy
Measurement	If characters are close, specify larger values for "Horizontal succession", "Vertical succession".

- The judgement is NG (insufficient memory).

Parameter to be adjusted	Remedy
Region setting	Specify as small a value as possible for FigureInfo=Region.

● When the processing speed is slow

Parameter to be adjusted	Remedy
Region setting	Specify as small a value as possible for FigureInfo=Region.

2-25-7 Measurement Results for Which Output Is Possible (Character Inspection)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	Judgement result
Chara. Num	NUM	Chara. Num
NG cause	NG	NG cause
For following items, additional expression data with 32 characters is allocated for each character. (* represents the character number.)		
Unit No.*	CUNO*	Detected unit No. for the *th character
Index No.*	CINDEX*	Detected index number for the *th character
Model No.*	CMODEL*	Detected model number for the *th character
Chara. code*	CCHAR*	Character code for the *th character For details, refer to *Appendixes Character Code Table* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
NG Cause *	CNG*	NG cause for the *th character

Output of Character String in PLC Link

In PLC Link communication, if you check the [Character output] for output parameters, the character string and NULL(0x00) are output to the data output area of PLC Link.

Refer to *2-25-5 Output Parameters (Character Inspection)* on page 2-377.

1 Output Format

Take the following case as an example. Number of measurement is one. Reading character string is 32. Command: Read character strings 0123456789…UV, Command, Response, and Data Output area are as follows.

For details, refer to *Communicating with PLC Link, Command Details for PLC Link, EtherNet/IP, and EtherCAT* in *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

- Command (PLC to Sensor Controller)

Top Channel		Description
+3	+2	
0010	1010	Performs one measurement.

- Response (Sensor Controller to PLC)

Top Channel		Description
Top channel	Data	
+2	1010	Command Code
+3	0010	Target command code is responded.
+4	0000	Response code
+5	0000	Command execution result.

- Data Output Area (Sensor Controller to PLC)

  When read the 32 character strings (0123456789…UV), the result continues as follows.

  ASCII code data + NULL (0x00)

Top channel	Name	Description
+0	1st character, 2nd character	3031 (ASCII code of the character 0, ASCII code of the character 1)
+1	3rd character, 4th character	3233 (ASCII code of the character 2 ASCII code of the character 3)
⋮		
+15	31st character, 32th character	5556 (ASCII code of the character U ASCII code of the character V)
+16	NULL	0x00 (NULL)

Additional Information

If no character string, NULL(0x00) is output.

2 How to get the character string

Perform the Data Output Request (DSA) and Data Output Completion (GATE) as in the case of Data Output.

All character string is included in one data. Thereby, Data Output Request (DSA) is performed once if there is one Character Inspection unit.

Output of Character string with Non-procedure Communications

Check the [Character output] in Output parameter to output the character string with Non-procedure communication.

Refer to *2-25-5 Output Parameters (Character Inspection)* on page 2-377.

1 Output Format

Take the following case as an example. Number of measurement is one.

Reading character string is 32. Command, Response, and Data Output area are

For details, refer to *Non-procedure Communications and MEASURE or M in Non-procedure Command Details* in *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

- Command (PLC to Sensor Controller)

M	E	A	S	U	R	E	C_R	or	M	C_R

- Response (Sensor Controller to PLC)

O	K	C_R

0123456789…UV(Character string data)	C_R

Additional Information

- If no character string, refer to the following.

O	K	C_R

C_R

Output of Character string with EtherNet/IP Message Communications

In EtherNet/IP message communication, output of character string is possible using UNITDATA command which acquires the measurement value.

Outputs the character string data measured in Character Inspection and NULL (0x00).

For details, refer to *Communicating with the Sensor Controller with EtherNet/IP Message Communications, Non-procedure Communications and UNITDATA or UD in Non-procedure Command Details* in *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

1 Output Format

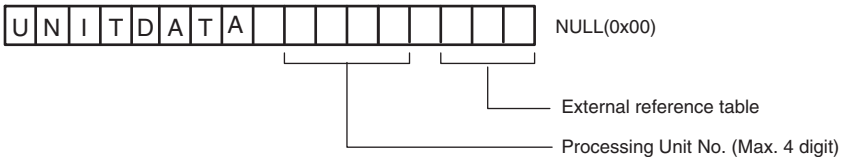
Take the following case as an example. Number of measurement is one.

Reading character string is 32. Command: Read character strings 0123456789…UV, Command, Response, and Data Output area are as follows.

Described example is only a part of Attribute.

- Command (PLC to Sensor Controller)

  Specify the command character string equivalent to a non-procedure command. Attach NULL(0x00) at the end of the character string. No line feed code is required. The size of the send data includes the NULL(0x00) at the end of the character string.



- Response (Sensor Controller to PLC)

  Character string data equivalent to the Non-procedure command reception character string is returned. Null (0x00) is inserted in the reception character string delimiter section. The size of the reception data includes the final NULL(0x00).

  0123456789…UV(Character string data) NULL(0x00) O(0x4F) K(0x4b) NULL(0x00)

Additional Information

- If no character string, refer to the following.

  NULL(0x00) O(0x4F) K(0x4b) NULL(0x00)

- When output the multiple lines, change the external reference table No. of UNITDATA, and then read the character strings.

2-25-8 External Reference Tables (Character Inspection)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
1	Chara. Num	characterNum	Get only	0 to 32
2	NG Cause	nGCause	Get only	0x0000 to 0x0015
3	Read string	readString	Get only	Character string
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Dictionary unit number 1	dicUnit0	Set/Get	-1: OFF 0 to 9,999
121	Dictionary unit number 2	dicUnit1	Set/Get	-1: OFF 0 to 9,999
122	Dictionary unit number 3	dicUnit2	Set/Get	-1: OFF 0 to 9,999
123	Dictionary unit number 4	dicUnit3	Set/Get	-1: OFF 0 to 9,999
124	Inspection mode	inspectMode	Set/Get	0: OCR 1: OCR + Count 2: OCV

No.	Data name	Ident	Set/Get	Data range
125	Direction	direction	Set/Get	0: → 1: ↓ 2: ← 3: ↑
126	Character output	outputFlag	Set/Get	0: OFF 1: ON
127	Character output destination	outputDevice	Set/Get	0: RS-232C/RS-422 1: Ethernet
129	Horizontal succession	horizPermit	Set/Get	0 to 99
130	Vertical succession	vertPermit	Set/Get	0 to 99
132	Dictionary candidate point level usage flag	dicCandidate	Set/Get	0: Not used 1: Used
133	Rough candidate	roughCandidate	Set/Get	0 to 100
134	Detail candidate	detailCandidate	Set/Get	0 to 100
135	Dictionary correlation usage flag	dicCorrelation	Set/Get	0: Not used 1: Used
136	Lower limit of the corr.	lowerCorrlation	Set/Get	0 to 100
137	Upper limit of chara. Num	upperCharNum	Set/Get	1 to 32
138	Lower limit of chara. Num	lowerCharNum	Set/Get	1 to 32
139	Verification string	compareString	Set/Get	Character string
140+N (N: 0 to 35)	Model 1 usage flag	FirstModelEnable	Set/Get	0: Not used 1: Used
176+N (N: 0 to 35)	Model 2 usage flag	SecondModelEnable	Set/Get	0: Not used 1: Used
212+N (N: 0 to 35)	Model 3 usage flag	ThirdModelEnable	Set/Get	0: Not used 1: Used
248+N (N: 0 to 35)	Model 4 usage flag	FourthModelEnable	Set/Get	0: Not used 1: Used
284	Scene No. 1	dicScene0	Set/Get	-1: Current scene 0 to 9,999
285	Scene No. 2	dicScene1	Set/Get	-1: Current scene 0 to 9,999
286	Scene No. 3	dicScene2	Set/Get	-1: Current scene 0 to 9,999
287	Scene No. 4	dicScene3	Set/Get	-1: Current scene 0 to 9,999
288	Lower limit of stability	lowerStability	Set/Get	0 to 100
1000+N (N: 0 to 31)	Unit No.	unitNo	Get only	-1: OFF 0 to 9,999
1032+N (N: 0 to 31)	Detected index	indexNo	Get only	0 to 35
1064+N (N: 0 to 31)	Detected model No.	modelNo	Get only	0 to 4
1096+N (N: 0 to 31)	Chara. code	charCode	Get only	0 to 0xFFFF (UTF-16 code)
1128+N (N: 0 to 31)	Detected NG Cause	NGCause	Get only	0 to 15

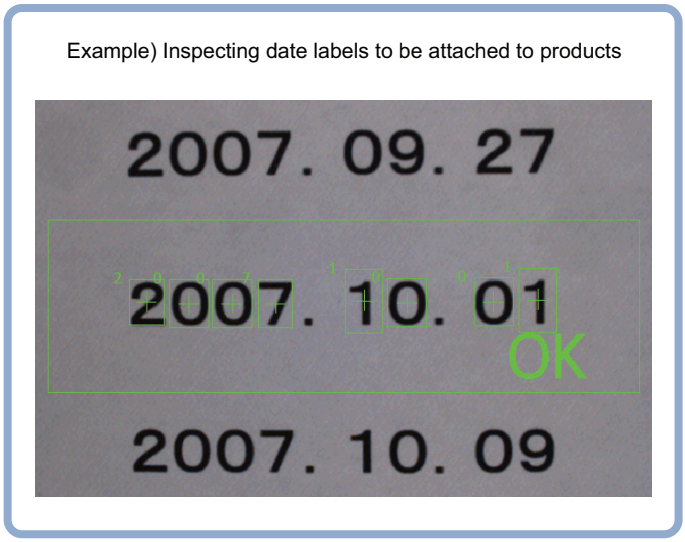
No.	Data name	Ident	Set/Get	Data range
1160+N (N: 0 to 31)	Correlation value	correlation	Get only	0 to 100
1192+N (N: 0 to 31)	Detected coordinate X	positionX	Get only	-99,999.9999 to 99,999.9999
1224+N (N: 0 to 31)	Detected coordinate Y	positionY	Get only	-99,999.9999 to 99,999.9999
1256+N (N: 0 to 31)	Detected angle	angle	Get only	-180 to 180
1288+N (N: 0 to 31)	Reference X	standardX	Get only	-99,999.9999 to 99,999.9999
1320+N (N: 0 to 31)	Reference Y	standartY	Get only	-99,999.9999 to 99,999.9999
1352+N (N: 0 to 31)	Reference angle	standardAngle	Get only	-180 to 180
1384+N (N: 0 to 31)	Detected Scene No.	sceneNo	Get only	-1: Current scene 0 to 9,999
1416+N (N: 0 to 31)	Second correlation value	secondCorrelation	Get only	0 to 100
1448+N (N: 0 to 31)	Second index No.	secondIndexNo	Get only	0 to 35
1480+N (N: 0 to 31)	Stability	stability	Get only	0 to 100
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

2-26 Date Verification

This processing item creates a target string from the current date/time and compares it with read-in strings.

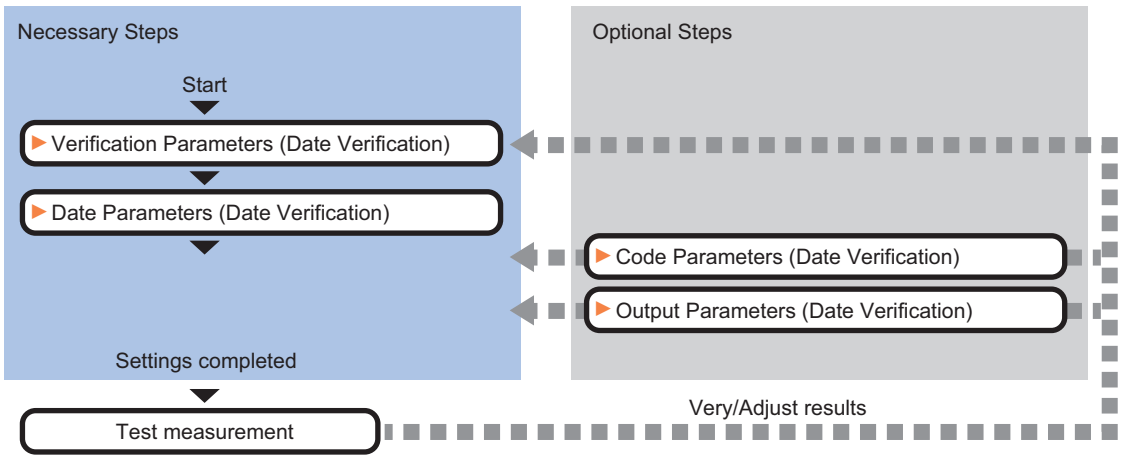
Used in the Following Case

When inspecting date of manufacture



2-26-1 Settings Flow (Date Verification)

Follow the steps below to set up [Date Verification].



List of Date Verification Items

Item name	Description
Verification	This item sets parameters of the verification string. Refer to *2-26-2 Verification Parameters (Date Verification)* on page 2-386.
Date parameter	This item sets the date/time format and update conditions. Refer to *2-26-3 Date Parameters (Date Verification)* on page 2-388.
Code parameter	Set this to print the date encrypted in such a way that it is difficult for the user to recognize. Setting what codes show also makes possible automatic updating. Refer to *2-26-4 Code Parameters (Date Verification)* on page 2-390.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Use the output parameter to specify how to handle the coordinates. Refer to *2-26-5 Output Parameters (Date Verification)* on page 2-393.

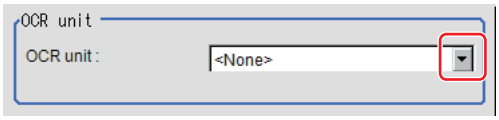
2-26-2 Verification Parameters (Date Verification)

This item sets the verification target and the verification source character string.

The character string read in Character Inspection is the target for verification.

1 In the Item Tab area, click [Verification].

2 This item sets the general OCR unit for verification.

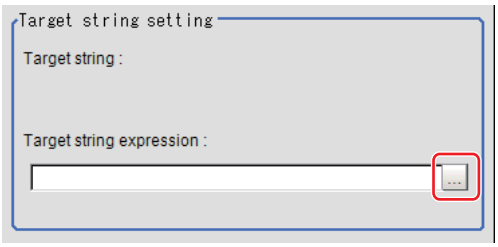


Additional Information

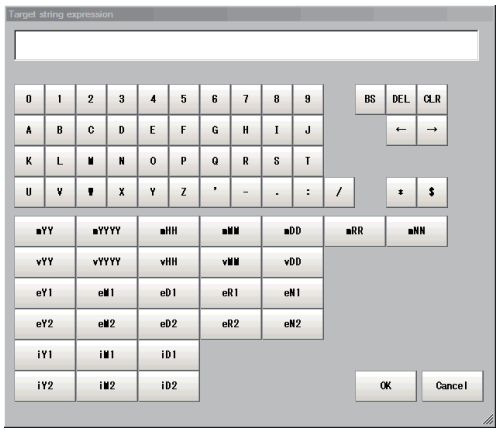
Always set Character Inspection in a unit before the Date Verification unit.

3 In the "Target string setting" area, click [...] for "Target string expression".

The String setting dialog is displayed.



4 This item sets the character string that is the source for verification.
Input the date format and the preceding and following character strings.



Label	Description
0 to 9	Normal numeric value input
A to Z	Normal alphabet input
‘ - . : /	Normal mark input
*	Character presence judgement
$	Number judgement
mYY	The last two digits of the current year
mYYYY	Four digits of the current year
mHH	Two digits of the current year in the Japanese Heisei calendar
mMM	Current month
mDD	Current day
mRR	Current hour
mNN	Current minute
vYY	The last two digits of the year after a set period of time
vYYYY	Four digits of the year after a set period of time
vHH	Two digits of the year after a set period of time in the Japanese Heisei calendar
vMM	Month after a set period of time
vDD	Day after a set period of time
eY1	Encrypted year 1
eM1	Encrypted month 1
eD1	Encrypted day 1
eR1	Encrypted hour 1
eN1	Encrypted minute 1
eY2	Encrypted year 2
eM2	Encrypted month 2
eD2	Encrypted day 2
eR2	Encrypted hour 2
eN2	Encrypted minute 2
iY1	Encrypted year 1 after a set period of time
iM1	Encrypted month 1 after a set period of time
iD1	Encrypted day 1 after a set period of time
iY2	Encrypted year 2 after a set period of time
iM2	Encrypted month 2 after a set period of time
iD2	Encrypted day 2 after a set period of time

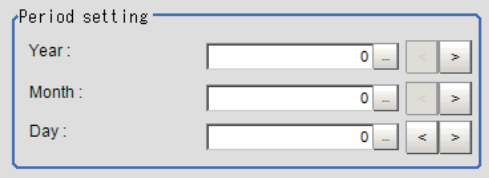
5 Click [OK].

2-26-3 Date Parameters (Date Verification)

This item sets the date/time format and update conditions.

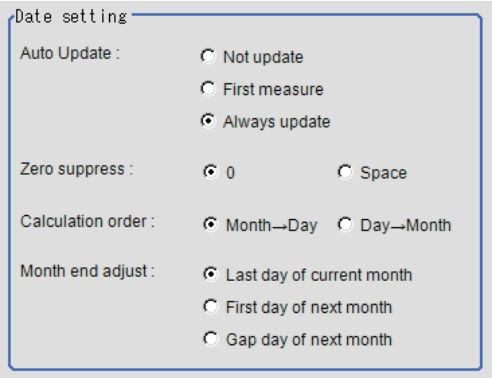
1 In the Item Tab area, click [Date parameter].

2 When comparing with character strings with an expiration date limit, set each item in the "Period setting" area.



Setting item	Set value [Factory default]	Description
Year	0 to 99 [0]	This item sets the usage period from the current date.
Month	0 to 99 [0]	
Day	-999 to 999 [0]	

3 In the "Date setting" area, specify a value for each item.



Setting item	Set value [Factory default]	Description
Auto Update	• Not update • First measure • [Always update]	Set the year, month and day updating conditions. The clock time is always updated. • Not update: The date is stored into memory when the processing unit is registered. The date is not updated until the next time date update is executed with the menu. • First measure: The date is updated during the first measurement after start up. • Always update: The date is updated every measurement.
Zero suppress	• [0] • Space	Set how the tens digits of the month and day are displayed.
Calculation order	• [Month→Day] • Day→Month	Set whether to calculate the month first or the day first when the usage period is set. (This affects calculation of end of month.)

Setting item	Set value [Factory default]	Description
Month end adjust	• [Last day of current month] • First day of next month • Gap day of next month	Set the adjustment method that will be used if the result of the expiration date calculation is an invalid date.

Additional Information

Use the following examples as reference for setting of the date parameter.

E.g.1 Measurement is performed on 9/30, and the period setting is: Year: 1, Month: 1, Day: 1.

- [Month→Day]: A month is added to 9/30, and the result will be 10/30.
  A day is added to 10/30, and the result will be 10/31.
- [Day→Month]: A day is added to 9/30, and the result will be 10/1.
  A month is added to 10/1, and the result will be 11/1.

E.g.2 Measurement is performed on 1/31, and the period setting is: Year: 0, Month: 1, Day: 1.

- [Month→Day]: A month is added to 1/31, and the result will be 2/31.
  The month end adjustment will be applied since 2/31 does not exist.
  The result of the month end adjustment plus 1 will be the verification string.

Month end adjust	Result
Last day of current month	2/28
First day of next month	3/1
Gap day of next month	3/3

- [Day→Month]: A day is added to 1/31, and the result will be 2/1.
  The month end adjustment will not be applied since 2/31 exists.
  A month is added to 2/1, and the result will be 3/1.

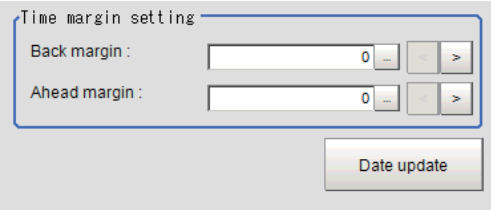
E.g.3 Measurement is performed on 10/30, and the period setting is: Year: 0, Month: 1, Day: 1.

- [Month→Day]: A month is added to 10/30, and the result will be 11/30.
  The month end adjustment will not be applied since 11/30 exists.
  A day is added to 11/30, and the result will be 12/1.
- [Day→Month]: A day is added to 10/30, and the result will be 10/31.
  A month is added to 10/31, and the result will be 11/31.
  The month end adjustment will be applied since 11/31 does not exist.

Month end adjust	Result
Last day of current month	11/30
First day of next month	12/1
Gap day of next month	12/1

4 Set the time margin.

Clicking [Date update] updates the date information of the verification string.



Setting item	Set value [Factory default]	Description
Back margin	0 to 99 [0]	Sets a time range up to the current time to be judged OK. The unit is minutes. Example) When set to 10, a character string from 0 to 10 minutes before the Verification string time is judged: OK.
Ahead margin	0 to 99 [0]	Sets a time range up to the current time to be judged OK. The unit is minutes. Example) When set to 10, a character string from 0 to 10 minutes before the Verification string time is judged: OK.

2-26-4 Code Parameters (Date Verification)

Preset what the codes show so that date verification is possible even when printing the date encrypted in such a way that it is difficult for the user to recognize.

The setting methods are to set on the screen or set with a PC.

Important

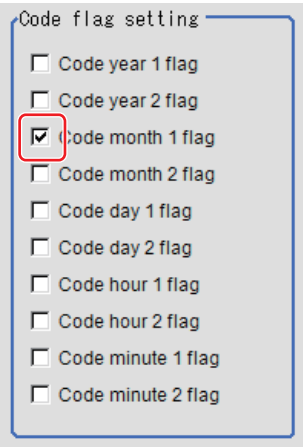
If a usage period is set, encrypted characters cannot be used for character verification.

Setting on the Screen

This describes the setting method, using an example in which October is encrypted as X.

1 In the Item Tab area, click [Code parameter].

2 Place a check at "Code month 1 flag".

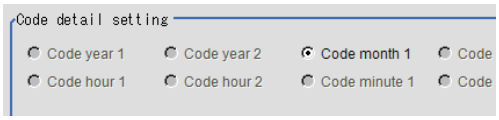


Additional Information

Code month 1 and code month 2

Set up code files for 2 patterns in order to be ready for setup changes. Select a check at the one to use.

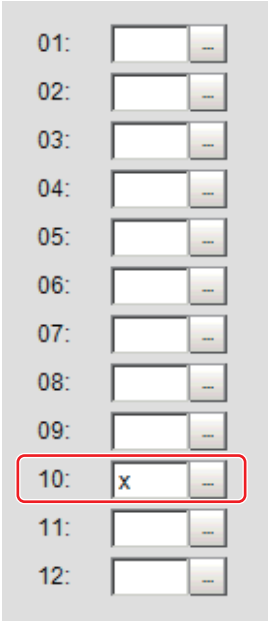
3 Place a check at "Code month 1" in the "Code detail setting" area.



4 Click [...] for "10".

The software keyboard is displayed. Input "X".

Input a character string of up to 4 characters.



Setting with a PC

Code files are complex, so performing the settings with a PC makes file editing easier and minimizes mistakes.

Saving an empty CSV file first and then editing and reading it with a PC makes setting the values more efficient.

● Saving code files

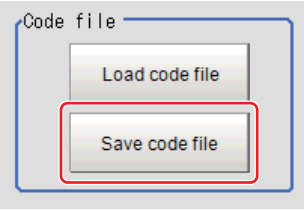
Make an empty file for editing on the PC.

If encryption parameters are already set on the screen, a file reflecting those settings is saved.

1 In the Item Tab area, click [Code parameter].

2 Place a check at the flag used in the encrypted character strings to be edited.

3 In the "Code file" area, click [Save code file].

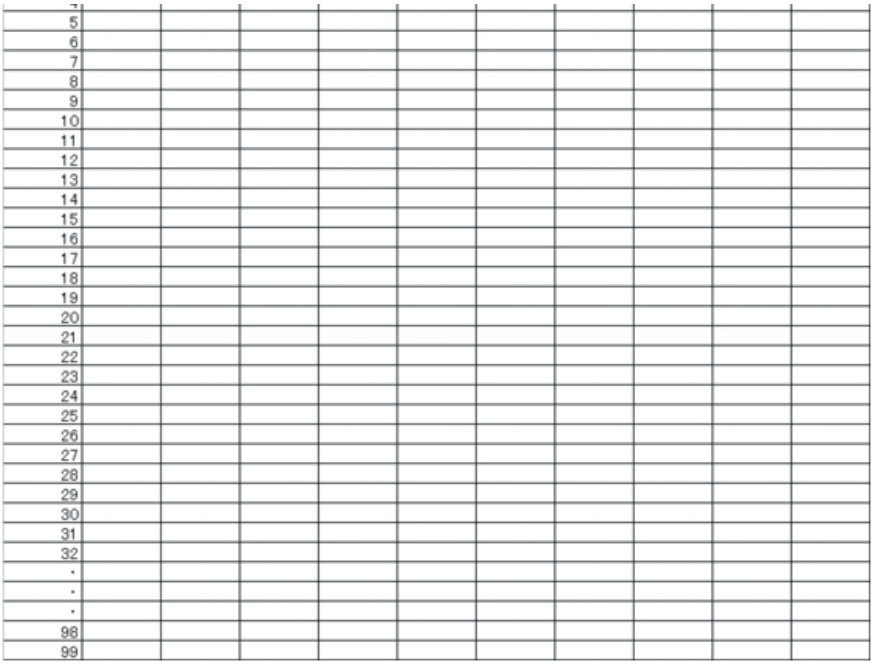


4 Set the save destination folder and file name, and click [OK].

The code file is saved (in CSV format).

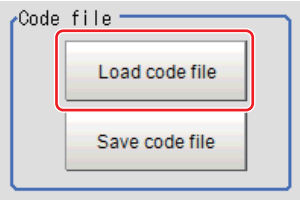
● Code file format

- The first line shows the "Code".
- The second line shows the "Flag". Input "1" when used.
- The third line and subsequent lines contain codes for each number.
  Months and days start from "1".



● Reading code files

1. In the Item Tab area, click [Code parameter].
2. In the "Code file" area, click [Load code file].



3. In the file selection window, select the code file (in CSV format) to read and click [OK].
   The code file is read and the content is displayed in the window.

2-26-5 Output Parameters (Date Verification)

Specifies whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

1. Click [Output parameter] in the Item Tab area.
2. Choose whether or not to reflect this in the scene overall judgement in "Reflect to overall judgement" area.

Setting item	Set value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-26-6 Test Measurement (Date Verification)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Target string	Target string setting is displayed.
Read string	A character string read from the OCR unit is displayed.

2-26-7 Measurement Results for Which Output Is Possible (Date Verification)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result

2-26-8 External Reference Tables (Date Verification)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
1	Target string	targetString	Get only	Character string
2	Read string	readString	Get only	Character string
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	OCR unit number	ocrUnit	Set/Get	-1: Null 0 to 9,999
124	Verification string	stringExpress	Set/Get	Character string
125	Term year	termYear	Set/Get	0 to 99
126	Term month	termMonth	Set/Get	0 to 99
127	Term day	termDay	Set/Get	-999 to 999
128	Auto Update	autoUpdate	Set/Get	0: Not update 1: First measurement after startup 2: Always update
129	Zero suppress	zeroSuppress	Set/Get	0: 0 1: Space
130	Calculation order	orderMonthDay	Set/Get	0: Month → Day 1: Day → Month
131	Month end adjust	adjustMonthEnd	Set/Get	0: Last day of now 1: First day of next 2: Gap day of next
132	Back margin	forwardMargin	Set/Get	0 to 99
133	Ahead margin	backMargin	Set/Get	0 to 99
134	Code year 1 flag	flagYear1	Set/Get	0: Not used 1: Used
135	Code year 2 flag	flagYear2	Set/Get	0: Not used 1: Used
136	Code month 1 flag	flagMonth1	Set/Get	0: Not used 1: Used
137	Code month 2 flag	flagMonth2	Set/Get	0: Not used 1: Used
138	Code day 1 flag	flagDay1	Set/Get	0: Not used 1: Used
139	Code day 2 flag	flagDay2	Set/Get	0: Not used 1: Used
140	Code hour 1 flag	flagHour1	Set/Get	0: Not used 1: Used
141	Code hour 2 flag	flagHour2	Set/Get	0: Not used 1: Used

No.	Data name	Ident	Set/Get	Data range
142	Code minute 1 flag	flagMinute1	Set/Get	0: Not used 1: Used
143	Code minute 2 flag	flagMinute2	Set/Get	0: Not used 1: Used
150	String year 1 flag	stringYear1	Set/Get	Character string
151	String year 2 flag	stringYear2	Set/Get	Character string
152	String month 1 flag	stringMonth1	Set/Get	Character string
153	String month 2 flag	stringMonth2	Set/Get	Character string
154	String day 1 flag	stringDay1	Set/Get	Character string
155	String day 2 flag	stringDay2	Set/Get	Character string
156	String hour 1 flag	stringHour1	Set/Get	Character string
157	String hour 2 flag	stringHour2	Set/Get	Character string
158	String minute 1 flag	stringMinute1	Set/Get	Character string
159	String minute 2 flag	stringMinute2	Set/Get	Character string
160	Operation code number	operateStringNo	Set/Get	0 to 99
1000+N (N: 0 to 99)	String year 1 data	stringYear1	Set/Get	Character string
1100+N (N: 0 to 99)	String year 2 data	stringYear2	Set/Get	Character string
1200	String month 1 data1	stringMonth100	Set/Get	Character string
1201	String month 1 data2	stringMonth101	Set/Get	Character string
. . .	. . .	. . .	. . .	. . .
1211	String month 1 data12	stringMonth111	Set/Get	Character string
1300	String month 2 data1	stringMonth200	Set/Get	Character string
1301	String month 2 data2	stringMonth201	Set/Get	Character string
. . .	. . .	. . .	. . .	. . .
1311	String month 2 data12	stringMonth211	Set/Get	Character string
1400	String day 1 data1	stringDay100	Set/Get	Character string
1401	String day 1 data2	stringDay101	Set/Get	Character string
. . .	. . .	. . .	. . .	. . .
1430	String day 1 data31	stringDay130	Set/Get	Character string
1500	String day 2 data1	stringDay200	Set/Get	Character string
1501	String day 2 data2	stringDay201	Set/Get	Character string
. . .	. . .	. . .	. . .	. . .
1530	String day 2 data31	stringDay230	Set/Get	Character string
1600+N (N: 0 to 23)	String hour 1 data	stringHour1	Set/Get	Character string
1700+N (N: 0 to 23)	String hour 2 data	stringHour2	Set/Get	Character string
1800+N (N: 0 to 59)	String minute 1 data	stringMinute1	Set/Get	Character string
1900+N (N: 0 to 59)	String minute 2 data	stringMinute2	Set/Get	Character string

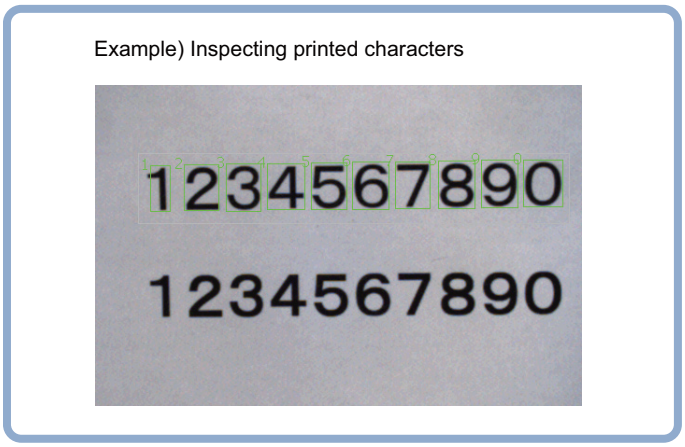
2-27 Model Dictionary

Register a model to use for [Character Inspection].

Model data registered in the [Model Dictionary] can be referred to from multiple [Character Inspection] items in the same scene.

Used in the Following Case

To create the dictionary to be used for Character Inspection and Date Verification

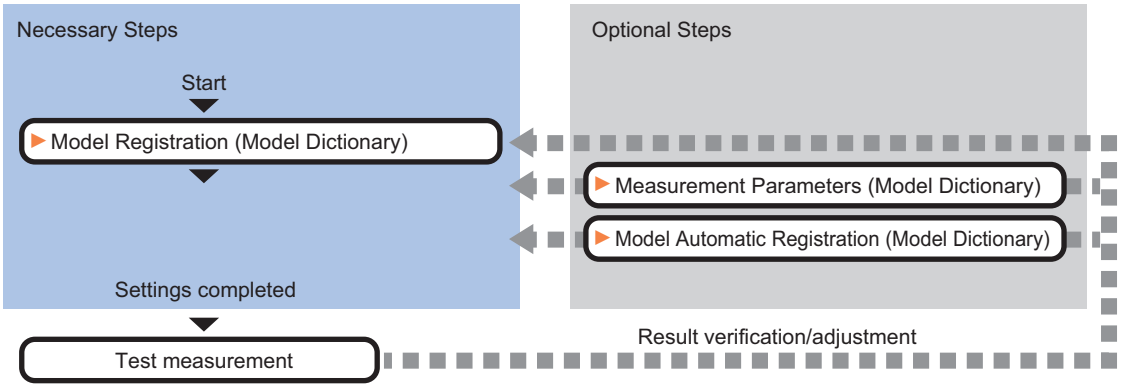


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-27-1 Settings Flow (Model Dictionary)

Follow the steps below to set up [Model Dictionary].



List of Model Dictionary Items

Model Dictionary items are explained below.

Item name	Description
Model	Register the characters and marks as the model. Model parameter values can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used. Refer to *2-27-2 Model Registration (Model Dictionary)* on page 2-397.
Measurement	This item can be changed if necessary. Refer to *2-27-3 Measurement Parameters (Model Dictionary)* on page 2-400.
Auto registration	When registering multiple characters as models, auto registration is handy. This method encloses a character string, cuts out one character at a time from it and registers them as models. Refer to *2-27-4 Model Automatic Registration (Model Dictionary)* on page 2-400.

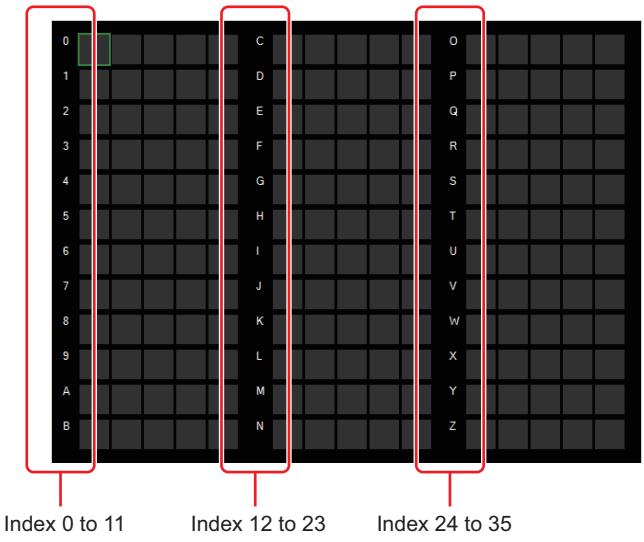
2-27-2 Model Registration (Model Dictionary)

Register the characters and marks as the model.

Models can be registered with any of 36 indexes, from 0 to 35, and up to 5 models can be registered for each index.

Select the character type.

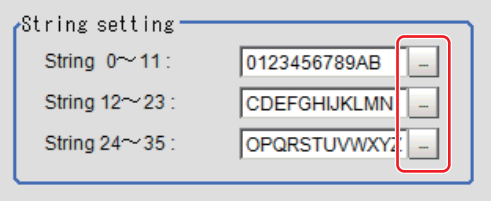
By factory default, 0 to 9 and A to Z are assigned to indexes 0 to 35. These assignments can be changed as necessary with the "%" and "#" codes.



1 In the Item Tab area, click [Model].

When setting a new model, you do not have to click [Model].

2 Set the character type.



Registering a Model

This method is for registering models one character at a time.

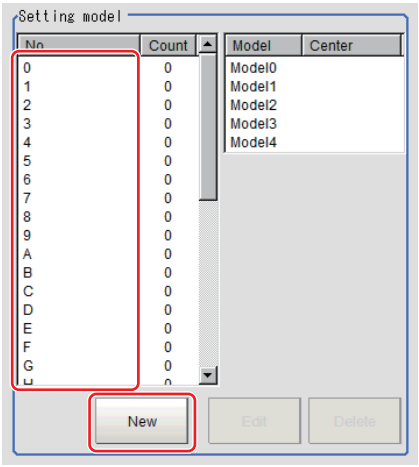
Important

When registering multiple characters as models, auto registration is handy.
Refer to *2-27-4 Model Automatic Registration (Model Dictionary)* on page 2-400.

1 In the Item Tab area, click [Model].

2 When the measurement object is rotating, set the Angle range for the "Model parameter" area.
Refer to *Changing Model Parameters* on page 2-399.

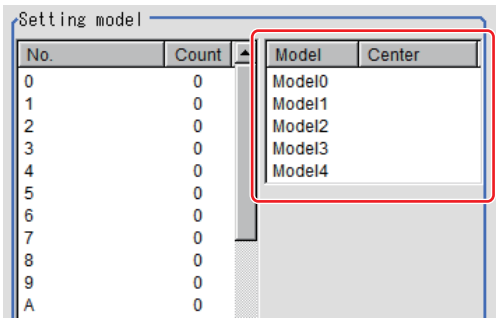
3 Select the index to register the model in, then click [New].



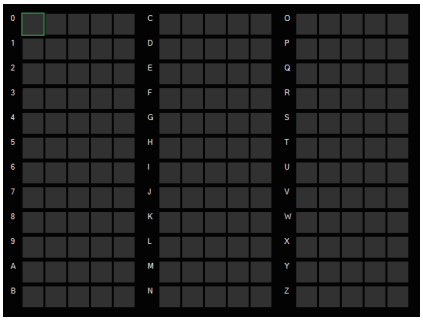
4 Use the Drawing tools to specify the model registration range.

5 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.



The image specified for the model is displayed in the Image Display area.



6 To register two or more models, repeat the Steps 3 to 5.

Changing Model Parameters

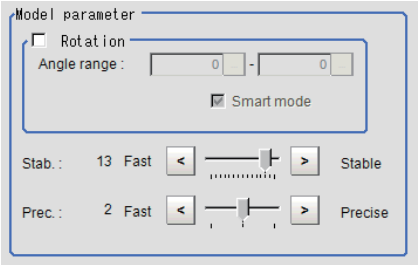
Model parameter values can be changed as needed to address unstable measurement results or to increase the processing speed. Normally, the factory default value will be used.

After changing a setting, check whether measurement can be done properly by performing an actual measurement.

Important

After model parameters are modified, re-register all models.

1 In the "Model parameter" area, specify a value for each item.



Setting item		Set value [Factory default]	Description
Rotation		• Checked • [Unchecked]	When the measurement object rotates, place a check at "Rotation" and set the Angle range during a search. The normal direction is clockwise.
	Angle range	-45 to 45 [0]	
Smart mode		• [Checked] • Unchecked	Checking the "Smart mode" option enables a high-speed rotation search. The stability may be lowered when the model shape aspect ratio is large or when the NOT mask is used.
Stab.		1 to 15 [13]	Specify which is to have priority, detection stability or speed. If lowering stability does not speed up processing, it is likely that many candidates have been detected. In this case, specify a larger value for "Candidate level" or "Stab."
Prec.		1 to 3 [2]	Specify which is to have priority, measurement positional precision or speed.

2-27-3 Measurement Parameters (Model Dictionary)

This item can be changed if necessary. Normally, the factory default value will be used.

1 In the Item Tab area, click [Measurement].

2 In the "Measurement condition" area, specify a value for each item.

Setting item	Set value [Factory default]	Description
Batch setting	• [Checked] • Unchecked	Specify whether to set all Measurement values at the same time. • Checked: The same contents are set for all indexes. • Unchecked: The contents are only set for the selected index.
Correlation	0 to 100 [60]	Specify the lower limit of correlation values that are judged to be OK. This is the threshold for whether or not the candidate can be read in as a character.
Rough candidate	0 to 100 [40]	Specify the threshold value with which to detect candidate points in a rough search. Specify a smaller value when model search results are unstable.
Detail candidate	0 to 100 [60]	Specify the threshold value with which to detect candidate points in a detail search. Only the candidate points higher than this level are extracted as characters.

2-27-4 Model Automatic Registration (Model Dictionary)

This method encloses a character string, cuts out one character at a time from it and registers them as models. When an auto extraction region is set enclosing the character string, the characters are automatically extracted one at a time. Register each character in the appropriate character index. If 5 models have already been registered for an index, auto registration cannot be set.

1 In the Item Tab area, click [Auto registration].

2 In the Detail area, select "Auto extract region".

3 Click [Edit].

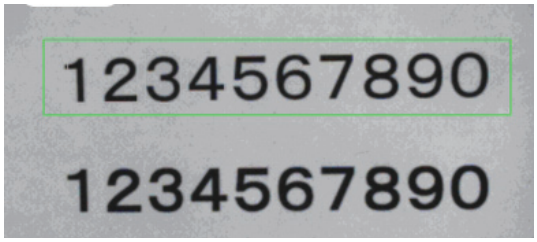
4 Specify the range to register as the auto extract region using the Drawing tools.

5 In the figure setting area, click [OK].

The auto extract region is registered.

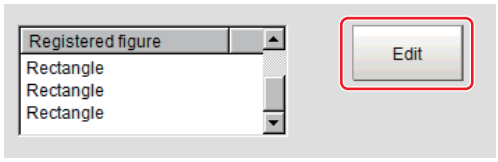
6 Click [Extract model].

A model is extracted automatically and the extracted result (gray frame) is displayed in the Image Display area.



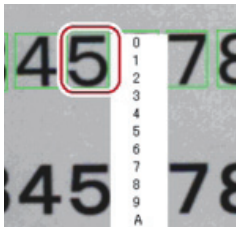
7 In the Detail area, select "Auto model region".

8 To adjust an extracted region, click [Edit].



9 Click the model region in the Image Display area.

An index list is displayed.



10 Select the index to register to.

11 Click [Register model].

A message which indicates the number of registered models is displayed.

12 Click [OK].

The model is registered.

With the same operation, register the models for the other extraction regions.

2-27-5 Key Points for Test Measurement and Adjustment (Model Dictionary)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

Parameter to be adjusted	Remedy
Model	If the model image consists of detailed figures, specify a larger value for "Stab.".
	When "Rotation" is selected, if the model shape is complex, uncheck the "Smart mode" option.
Measurement	If images that should be judged OK vary greatly, specify a smaller value for "Candidate level".

● When the processing speed is slow

Parameter to be adjusted	Remedy
Model	If the model image is a simple figure or a large figure, specify a smaller value for "Stab." If lowering stability does not speed up processing, it is likely that many candidates have been detected. Raise the "Candidate level" in [Measurement].
	When "Rotation" is selected, if the model shape is simple, place a check at the "Smart mode" option.
Measurement	If images that should be judged OK vary little, specify a larger value for "Candidate level".

2-27-6 Measurement Results for Which Output Is Possible (Model Dictionary)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	Judgement result

2-27-7 External Reference Tables (Model Dictionary)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
121	With rotation	rotation	Set/Get	0: OFF 1: ON
122	Upper limit of the rotation angle	endAngle	Set/Get	-45 to 45
123	Lower limit of the rotation angle	startAngle	Set/Get	-45 to 45

No.	Data name	Ident	Set/Get	Data range
125	Smart mode	smartMode	Set/Get	0: OFF 1: ON
126	Stab.	stability	Set/Get	1 to 15
127	Prec.	accuracy	Set/Get	1 to 3
140	Character string	string	Set/Get	0 to 35
200+N (N: 0 to 35)	Lower limit of the corr.	lowerCorrelation	Set/Get	0 to 100
300+N (N: 0 to 35)	Candidate point level (approximate search)	roughCandidate	Set/Get	0 to 100
400+N (N: 0 to 35)	Candidate point level (detail)	detailCandidate	Set/Get	0 to 100
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera

2-28 2D Code

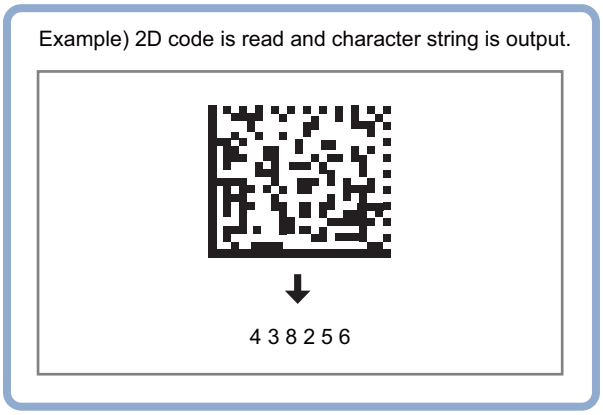
Read in 2D Code.

The read-in results can be utilized to classify target objects.

With 2D Code, detailed communication and reading result can be output.

Used in the Following Case

To classify with 2D Code

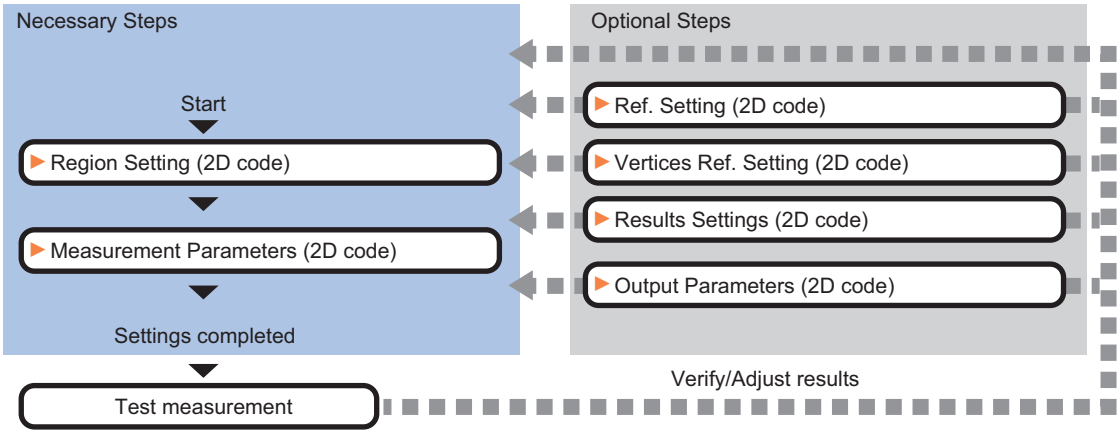


Important

- Does not support 2D Code with Japanese included. Supports 2D Code that are composed entirely of ASCII code.
- Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-28-1 Settings Flow (2D Code)

The setting procedure for 2D Code is as follows.



List of 2D Code Items

Item name	Description
Region setting	This item is used to set up the measurement area. Restricting the measurement range can shorten the processing time. Refer to *2-28-2 Region Setting (2D Code)* on page 2-405.
Measurement	This item specifies the judgement condition for measurement results. Set the code type and the number of characters to be judged as OK. Refer to *2-28-3 Measurement Parameters (2D Code)* on page 2-406.
Ref. setting	This item is used to set the reference setting. Refer to *2-28-4 Reference Setting (2D Code)* on page 2-410.
Vertices Ref. setting	This item is used to set the position of each vertices. Refer to *2-28-7 Output Parameters (2D Code)* on page 2-413.
Result setting	Set the measurement results. Judgement results can be classified. Refer to *2-28-4 Reference Setting (2D Code)* on page 2-410.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Refer to *2-28-7 Output Parameters (2D Code)* on page 2-413.

2-28-2 Region Setting (2D Code)

Specify the rectangular area in which to search for 2D Code.

Restricting the measurement range can shorten the processing time.

1 In the Item Tab area, click [Region setting].

2 Click [Edit].

The figure setting area is displayed.

3 Specify the area in which to search for 2D Code.

The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

Important

- Normal (DataMatrix/QRCode/MicroQR/PDF417/MicroPDF417):
  Set the measurement region to be 1600 × 1200 or less.
- DPM mode (DataMatrix/QRCode):
  Set the measurement region to be 2448 × 2044 or less.
- Set the measurement region such that it contains only 1 2D Code.
  If there is more than one 2D Code in the measurement region, measurement may not be performed correctly.

2-28-3 Measurement Parameters (2D Code)

This item specifies the judgement conditions for measurement conditions and measurement results.

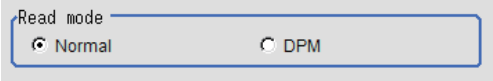
When the [Teaching] button is clicked, detailed settings are set automatically.

If you then click the [Measurement] button, measurement is executed, the detected 2D Code region is displayed on the image and the measurement results are displayed as measurement value of the judgement condition.

If measurement cannot be carried out successfully with this procedure, adjust the parameters shown below.

1 In the Item Tab area, click [Measurement].

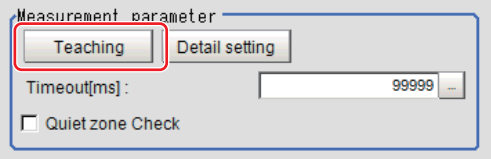
2 Select the read mode.



Setting item	Set value [Factory default]	Description
Read mode	• [Normal] • DPM	Usually, set this to "Normal". Select DPM to read 2D code to which direct parts marking (DPM) was applied.

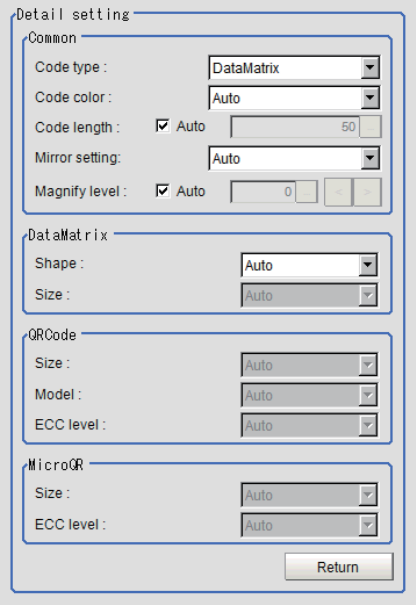
3 To teach, click [Teaching].

The detailed settings are set automatically.



Setting item	Set value [Factory default]	Description
Timeout	50 to 99999 [99999]	Stop and terminate the process if the measurement for this processing item cannot be completed within the specified time period. Note that the actual timeout time may be longer than the specified time period.
Quiet zone Check (only when the read mode is Normal)	• Checked • [Unchecked]	Check if there is any space around 2D code. (When code type is PDF417/MicroPDF417, this function is disable.)

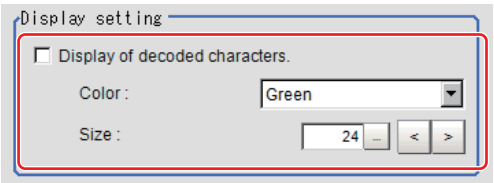
4 When making the detailed settings, click "Detail setting" and set each item.



Setting item		Set value [Factory default]	Description
Common			
	Code type	• [DataMatrix] • QRCode • MicroQR • PDF417 • MicroPDF	Set the code type. The readable size for each code type are as follows. • Symble size DataMatrix: 64 × 64 cells or less QRCode: 57 × 57 cells (Version.10) or less • Size of 1 cell Normal (DataMatrix/QRCode/MicroQR) : Image more than 4 × 4 pix. DPM (DataMatrix/QRCode) : Image more than 4 × 4 pix. • Module size Normal (PDF417/MicroPDF417) : Set aspect ratio to be greater than 3:1, then print it. Capture image with a horizontal length greater than 3 pix.
	Code color	• [Auto] • Black • White	Specify the color of the 2D Code to read. Auto: Select to automatically determine the color setting. Black: Select this for black 2D Code with white background. White: Select this for white 2D Code with black background.
	Code length: Auto	• [Checked] • Unchecked	Place a check when automatically determining the code length.
	Code length	50 to 2448 [50]	Specify the code length.
	Mirror setting	• [Auto] • Normal • Reverse	Specify whether to reverse the image horizontally.
	Magnify level: Auto	• [Checked] • Unchecked	Select whether to automatically set the reduction ratio of images when reading code.
	Magnify level	• 0 to 4 • [0]	Set the reduction ratio for images when reading code. It is determined by the teaching process.

Setting item		Set value [Factory default]	Description
DataMatrix			Specify when DataMatrix is selected for Code type.
	Shape	• [Auto] • Square • Rectangle	Set the shape of DataMatrix.
	Size	For square • [Auto] • 10 × 10 • 12 × 12 • : • 64 × 64 For rectangle: • [Auto] • 8 × 18 • 8 × 32 • : • 16 × 48	Set the size of DataMatrix.
QRCode			Specify when QRCode is selected for Code type.
	Size	• [Auto] • 21 × 21 • 25 × 25 • : • 57 × 57	Set the size of QR code.
	Model	• [Auto] • Model 1 • Model 2	Set the model of QR code.
	ECC level	• [Auto] • M • L • H • Q	Specify the ECC level (error correction level) for QR code.
MicroQR			Specify when MicroQR is selected for Code type.
	Size	• [Auto] • 11 × 11 • 13 × 13 • 15 × 15 • 17 × 17	Select the size of MicroQR.
	ECC level	• [Auto] • L • M • Q	Select the ECC level (error correction level) for MicroQR.

5 Make the display settings for read-in character strings.



Setting item	Set value [Factory default]	Description
Display of decoded characters.	• [Unchecked] • Checked	Place a check when displaying the read-in character strings on the screen.
Color	• Black • White • Red • [Green] • Blue	Specify the color of characters displayed on the screen.
Size	10 to 200 [24]	Set the display size for character strings.

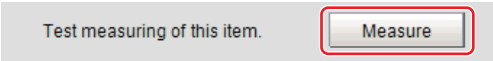
6 To read codes containing group separators, set a group separator replacement condition.

Setting item	Set value [Factory default]	Description
Replace group separator with specified character string	• [Checked] • Unchecked	If you select [Normal] for the reading mode, check this check-box to replace each group separator with another character string.
Replacement character string	---	Set the character string to replace group separators with.

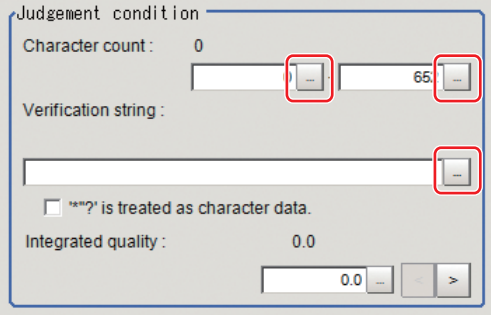
Additional Information

Replacing each group separator (control character) with the specified character string enables codes containing group separators to be read and compared to a comparison character string.

7 When the setting has been changed, click [Measure] in the "Detail" area to verify whether measurements can be made correctly.



8 Set up the judgement condition.



Setting item	Set value	Description
Character count	0 to 652	Specify the character count to be judged as OK.
Verification string	---	Specify the classification strings to be judged as OK. Up to 652 characters can be set.
'*' '?' is treated as character data.	• Checked • [Unchecked]	Checked: '*' and '?' are handled as normal characters. Unchecked: '*' and '?' are handled as special characters. '*': Substitution for character string (with 0 or more characters) '?': Substitution for 1character
Integrated quality (lower limit value) (only when the read mode is Normal)	0.0 to 4.0 [0]	Specify the integrated quality to be judged as OK. It can be set when the code type is DataMatrix, PDF417 or Micro-PDF417.

2-28-4 Reference Setting (2D Code)

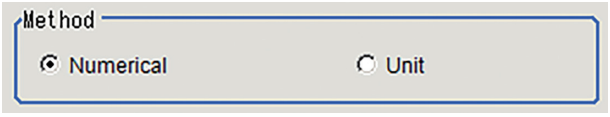
Set a center position and the angle for a 2D code.

There are two setting methods, directly or referencing a unit.

Specifying Directly

Click a position on the image as a reference position or input coordinate data for it.

1. In the Item Tab area, click [Ref. setting].
2. In the display area, the current reference position will be displayed as the crosshair cursor.
3. In the "Method" area, select "Numerical".



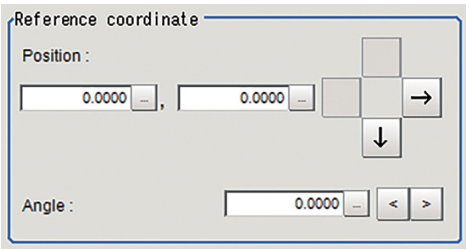
4. Click the position to be set as the reference.

Additional Information

Displaying the image enlarged makes this clicking easier.

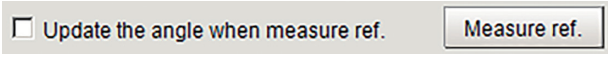
For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function in the Vision System FH/FHV/FZ5 Series User's Manual (Z365)*.

5. Make fine adjustments using numeric value inputs or the arrow buttons as required.

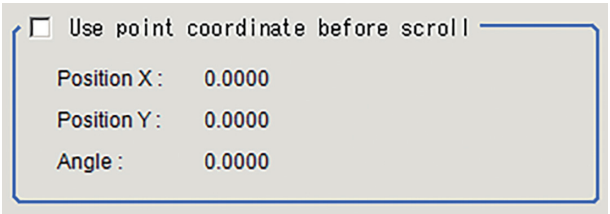


6. Set the reference angle with a numeric value.
7. To remeasure on the displayed image and set the reference, click the [Measure ref.] button.

   To update the reference angle at the time of reference measurement, place a check at "Update the angle when measure ref.".



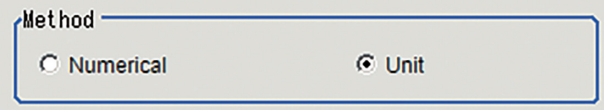
8. To use data before position compensation for the reference setting coordinates, check the "Use point coordinate before scroll".



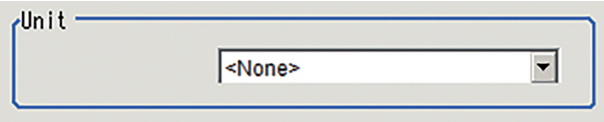
Referencing a Unit

Set a reference position by referencing a processing unit with registered X coordinate, Y coordinate, and angle data.

1. In the Item Tab area, click [Ref. setting].
   In the display area, the current reference position will be displayed as the crosshair cursor.
2. In the "Method" area, select "Unit".



3. In the "Unit" area, select a processing unit registered.



4. Perform the next measurement.
   The reference position will be displayed.

2-28-5 Vertices Reference Setting (2D Code)

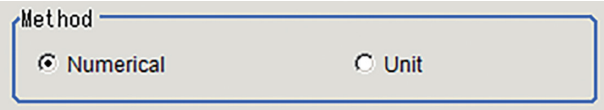
Set each vertex position of a 2D code. The each vertex position does not correspond to camera coordinates. The positions are determined by a shape of the code.

There are two setting methods, directly or referencing a unit.

Specifying Directly

Click a position on the image as a reference position or input coordinate data for it.

1. In the Item Tab area, click [Vertices Ref. setting].
2. In the display area, the current each vertex position will be displayed with a box.
3. In the “Method” area, select “Numerical”.



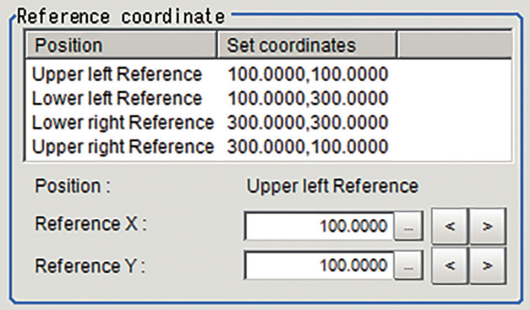
4. Drag and drop the box on the each vertex position.

Additional Information

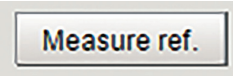
Displaying the image enlarged makes this clicking easier.

For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function in the Vision System FH/FHV/FZ5 Series User's Manual (Z365)*.

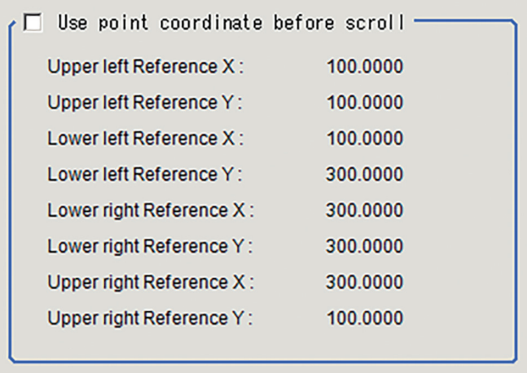
5 Make fine adjustments using numeric value inputs or the arrow buttons as required.



6 To set the each vertex position by re-measuring the current displayed image, click [Measure ref.] button.



7 To use data before position compensation for the each vertex position, check the “Use point coordinate before scroll”.



Referencing a Unit

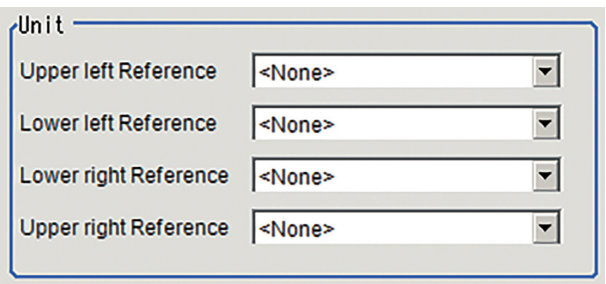
Set each vertex position by referencing a processing unit with registered X coordinate and Y coordinate.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".

3 In the "Unit" area, select a processing unit registered.



4 Perform the next measurement.

Each vertex position will be displayed.

2-28-6 Results Settings (2D Code)

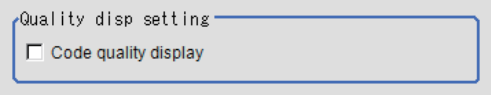
Results can be classified according to the judgement results.

1 In the Item Tab area, click [Result setting].

2 Register the character string that will be the reference for classification.

Setting item	Set value	Description
Classification string	-	Set the Comparison character string. Up to 652 characters can be set.
'*' '?' is treated as character data.	• Checked • [Unchecked]	Checked: '*' and '?' are handled as normal characters. Unchecked: '*' and '?' are handled as special characters. '*': Substitution for character string (with 0 or more characters) '?': Substitution for 1character

3 If necessary, set the quality display for the Detail Result Pane.



Setting item	Set value	Description
Code quality display	• Checked • [Unchecked]	Select whether or not to display the integrated quality.

Additional Information

All of the items cannot be displayed due to the displayed items is too many in the Detail Result Pane.

When display all of the items, change the Detail Result Pane size.

For details, refer to *Arranging Windows* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

2-28-7 Output Parameters (2D Code)

Select how measurement results are output to an external device. This item can be changed if necessary. Normally, the factory default value will be used.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.
Character output	• Checked • [Unchecked]	Set whether to output character strings.

Setting item		Set value [Factory default]	Description
Communication output		• [RS-232C/ RS-422] • Ethernet	Set the output destination. When Ethernet is selected, the destination IP address is determined by the system settings. For details, refer to *Non-procedure Communications in the Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Cat. No. Z342).
	Header	• [None] • STX • ESC	Set the header of communication output.
	Footer	• [CR] • CR+LF • ETX • LF	Set the footer of communication output.
	FCS	• Available • [None]	Set whether to output FCS (frame check sequence). FCS performs an XOR of each byte from the beginning to the end of data and converts the result (8 bits) into two ASCII format characters. The reliability of communication can be increased by adding FCS to the output data.
Reading character output			
	Reading character output	• [Checked] • Unchecked	Set whether to output character strings.
	Output range specify	• Checked • [Unchecked]	Set when specifying the range of character strings to be output. This can be set to a range of 1 to 652.
	Output range specify	1 to 652 [1] to [652]	Specify the range of output character count. This can be set to a range of 1 to 652.
	Character count output	• Checked • [Unchecked]	Specify whether to output the character count of the character string.
	Character code size	• [2bytes] • 4bytes	Select the character code size for character output.
	Code quality output	• [Checked] • Unchecked	The setting is enabled if you select [DPM] for the measurement parameter read mode. Set whether to output the 2D Code quality.
Output when reading error occurs			
	Error character output	• Checked • [Unchecked]	Specify whether to output the specified character string when there is a reading error. If a check is placed, the character string entered in the lower frame is output. Up to 20 characters can be input.
	Error code output	• Checked • [Unchecked]	Set whether to output error codes. Error codes are as follows: 0: Normal termination -1: 2D Code not found -3: Timeout -7: Processing terminated due to too much data

Character Output

Characters are output in the ASCII format as follows:

- When read successfully
  Header + character count + code quality + reading characters + FCS + footer + delimiters
- When not read successfully
  Header + error code + error characters + FCS + footer + delimiters

Item	Description
Header	What is specified for the Header is output. (None may be specified.) None is output for PLC link.
Character count	This is output only when "Character count output" is specified. Only the reading characters are counted as part of the character count, and if "Output range specify" is specified, the character count of only that range is output. For example, if no character is present in the output range, such as when the read character count is 1 and the output range is 2 to 3, 0 will be output. If "Reading character output" is not specified, 0 will be output. If kanji characters are included in the reading characters, one kanji character is counted as 1. (This is different from byte count.) The output can be switched between 2 bytes and 4 bytes. 0 is added to the left digit if the character count is less than the byte count (Example: 0010 for 10). "--" is output if the character count in 2-byte output reaches 100 or more.
Code quality	This is output only when the "Code quality output" is specified. The output format is "CxxxFxxxExxx". C represents the contrast, while F and E represent the focus and the cell recognition rate, respectively. xxx represents each value (0 to 100), and 0 is added to the left digit if the value is less than 3 digits (Example: 005 for 5).
Reading character	This is output only if "Reading character output" is specified. If "Output range specify" is specified, only the characters of that range are output. For example, if no character is present in the output range, such as when the read character count is 1 and the output range is 2 to 3, no character will be output.
Error code	This is output only when "Error code output" is specified.
Error character	This is output only when "Error character output" is specified.
FCS	This is output only when "FCS" is set to "Available". The value obtained through an XOR in unit of bytes is output. The applicable range includes the character count, code quality, reading characters, error codes and error characters. 0 will be output if nothing that can be output is present in the applicable range. None is output for PLC link.
Footer	What is specified for the Footer is output. None is output for PLC link.
Delimiter	The delimiters specified in the system data are added only for serial communication non-procedure output.

2-28-8 Key Points for Test Measurement and Adjustment (2D Code)

The following contents are displayed in the Detail Result Pane.

Displayed items	Description
Judge	Judgement result
Index	Index matched as the result of comparison with the classification comparison character strings
Detected character count	Number of characters detected
Detected character strings	Character strings detected
Cell recognition rate[*1]	A value used to check the error correction rate. The fewer the words whose errors corrected, the better the recognition rate.
Contrast[*1]	Evaluate the sharpness of an image. If an image is defocused, code cannot be identified. The displayed value will be smaller as it becomes defocused.
Focus[*1]	Evaluate the number of false cell detections in the finder pattern, timing pattern and data region. The displayed value is smaller when there are many false cell detections and reading is unstable.
Overall quality[*2]	An overall quality grade for the read code. This is given the lowest weight of the various quality grades.
Decode[*2]	A quality decode which shows whether the decode is successful or not.
Contrast[*2]	A quality grade which shows the contrast. The grade will be high when the difference of highest and lowest brightness are large in code region.
Modulation[*2]	A quality grade which shows the uniformity of cells brightness.
Fixed pattern damage[*2]	A quality grade which shows the damage level of the followings: • Finder pattern • Timing pattern • Quiet zone
Axis non-uniformity[*2]	A quality grade which shows the ratio of code width and height. A cell figure which is close-to-square has high grade.
Error correction during unused time[*2]	A quality grade which shows the amount of vertical displacement from the ideal position.
Print Scale[*2]	A quality grade that shows the percentage of error corrected items. Fewer error-corrected words results in a higher grade.
Print expansion/contraction X[*2]	A quality grade which shows the uniformity of black cell size and white cell size in the X direction results in a higher grade.
Print expansion/contraction Y[*2]	A quality grade which shows the uniformity of black cell size and white cell size in the Y direction results in a higher grade.
Scan[*2]	---
Overall quality[*3]	An overall quality grade for the read code. This is given the lowest weight of the various quality grades.
Decode[*3]	A quality grade which shows whether the start pattern, stop pattern, or specified line were successfully decoded, or not.
RAP contrast[*3]	A quality grade which shows whether the start pattern, stop pattern, or specified line were successfully decoded, or not. The grade will be high when the difference of highest and lowest brightness are large in pattern region.
RAP reflectance[*3]	A quality grade which shows the contrast of the start pattern, stop pattern, or specified line. The grade will be high when the difference of highest and lowest brightness are large in pattern region.

Displayed items	Description
RAP edge contrast*3	A quality grade which shows the contrast of the start pattern, stop pattern, or specified line. Verify the smallest contrast between bar and space.
RAP modulation*3	A quality grade which shows the brightness uniformity of the start pattern, stop pattern, or specified line. Verify the lowest edge contrast as against to the symbol contrast.
RAP defect*3	A quality grade which shows the brightness uniformity of the start pattern, stop pattern, or specified line. Verify the uniformity of brightness between bar and space.
RAP decodability*3	A quality grade which shows the printed accuracy of start pattern, stop pattern, or specified lines. A grade is high when the width of bar or space is close to the standard values.
RAP additional*3	A quality grade which shows whether there is a sufficient Quiet zone for start pattern, stop pattern, or specified line.
RAP overall quality*3	An overall quality grade for parts of the start pattern, stop pattern, or specified line.
Code word yield*3	A grade quality which shows the efficiency to read the data by scanning the record. An evaluation of the number of code is successful decoded when repeat to scan the code.
Unused error correction*3	A quality grade that shows the percentage of error corrected items. A grade which is less errors is high grade.
Decodability*3	A quality grade which shows the printed accuracy of codes parts. A grade is high when the width of bar or space is close to the standard values.
Defect*3	A quality grade which shows the uniformity of codes brightness. Verify the uniformity of brightness between bar and space.
Modulation*3	A quality grade which shows the uniformity of codes brightness. Verify the lowest edge contrast as against to the symbol contrast.

*1. Read mode: Only displayed in DPM mode.

*2. Read mode: Displayed if it is standard, the code type is DM and "Code quality display" is selected.

*3. Read mode: Displayed if it is standard, the code type is PDF417/MicroPDF417 and "Code quality display" is selected.

The display items checked in the result settings tab Grade display setting are displayed.

The grade code is displayed with a letter with numeric expression in parentheses, such as "A (4) to F (0)".

Additional Information

When the reading mode is DPM, a red circle is displayed on the cell where the judgment of the white cell / black cell is corrected in the image display area.

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

- When codes cannot be read in correctly

Parameter to be adjusted	Remedy
Region setting	Check whether there are codes to read in the measurement region.
Measurement parameter	Check if the settings, such as "Code type", "Code color", "Code length", and "Mirror setting", are specified correctly.
Timeout	Check to make sure that the specified time is not too short.

Important

- Codes may not be recognized if the code size is set too small or too large.
- Use input images with a size of 2500 × 2500 pixels or less. Images as described below would not be measurable.
  - Images taken by a camera with five mega-pixel, or higher resolution.
  - Images that have been merged by function of [Panorama] and [Polar Transformation] etc., and whose size exceeds 2500 × 2500 pixels.

2-28-9 Measurement Results for Which Output Is Possible (2D Code)

Measurement items	Character string	Description
Judgement	JG	Judgement result
Decoded character count	DN	Character count
Index	IDX	Index matched as the result of comparison with the classification comparison character strings
Cell recognition rate	CRR	The rate is calculated based on the "the number of error code word to be correctable", which is determined by the size and the error correction level, and the number of error code words that are actually corrected. (1 - (number of error code words corrected) / (number of error code words that can be corrected)) × 100
Contrast	CT	Contrast
Focus	FCS	Focus
Overall quality (Standard: DM)	GD0	This is given the lowest weight of the various quality grades. This grades value is most small in each qualities.
Decode (Standard: DM)	GD1	A quality grade which shows whether the decode is successful or not.
Contrast	GD2	A quality grade which shows the contrast. The grade will be high when the difference of highest and lowest brightness are large in code region.
Modulation	GD3	A quality grade which shows the uniformity of cells brightness.
Fixed pattern damage	GD4	A quality grade which shows the damage level of the finder pattern, the timing pattern, and the quiet zone.
Axis non-uniformity	GD5	A quality grade which shows the ratio of code width and height. A cell figure which is close-to-square has high grade.
Grid non-uniformity	GD6	A quality grade which shows the deviation from the ideal position of each cell.

Measurement items	Character string	Description
Unused error correction	GD7	A quality grade that shows the percentage of error corrected items. A grade which is less errors is high grade.
Print Scale	GD8	A quality grade which shows the size uniformity of black cells and white cells. It corresponds to whichever is the lower grade value between Print Scale X and Print Scale Y.
Print Scale X	GD9	Higher uniformity in the sizes of black cells and white cells in the X direction results in a higher grade for this.
Print Scale Y	GD10	Higher uniformity in the sizes of black cells and white cells in the Y direction results in a higher grade for this.
Overall quality (Standard: PDF417/Micro-PDF)	GP0	This overall grade is a code to be read. This is given the lowest weight of the various quality grades.
Decode (Standard: PDF417/Micro-PDF)	GP1	A quality grade which shows whether the start pattern, stop pattern, or specified line were successfully decoded, or not.
RAP contrast	GP2	A quality grade which shows whether the start pattern, stop pattern, or specified line were successfully decoded, or not. The grade will be high when the difference of highest and lowest brightness are large in pattern region.
RAP reflectance	GP3	A quality grade which shows the contrast of the start pattern, stop pattern, or specified line. The grade will be high when the difference of highest and lowest brightness are large in pattern region.
RAP edge contrast	GP4	A quality grade which shows the contrast of the start pattern, stop pattern, or specified line. Verify the smallest contrast between bar and space.
RAP modulation	GP5	A quality grade which shows the brightness uniformity of the start pattern, stop pattern, or specified line. Verify the lowest edge contrast as against to the symbol contrast.
RAP defection	GP6	A quality grade that shows the percentage of error corrected items. A grade which is less errors is high grade.
RAP decidability	GP7	A quality grade which shows whether there is a sufficient Quiet zone for start pattern, stop pattern, or specified line. A grade is high when the width of bar or space is close to the standard values.
RAP additional	GP8	A quality grade which shows whether there is a sufficient Quiet zone for start pattern, stop pattern, or specified line.
RAP overall quality	GP9	An overall quality grade for parts of the start pattern, stop pattern, or specified line.
Code word yield	GP10	A quality grade that shows the percentage of error corrected items. An evaluation of the number of code is successful decoded when repeat to scan the code.
Unused error correction	GP11	A quality grade that shows the percentage of error corrected items. A grade which is less errors is high grade.
Decidability	GP12	A quality grade which shows the printed accuracy of codes parts. A grade is high when the width of bar or space is close to the standard values.
Defect	GP13	A quality grade which shows the uniformity of codes brightness. Verify the uniformity of brightness between bar and space.
Modulation	GP14	A quality grade which shows the brightness uniformity of the start pattern, stop pattern, or specified line. Verify the lowest edge contrast as against to the symbol contrast.

Output of Character String in PLC Link

In PLC Link communication, check the [Character output] to output the character string.

Refer to *2-28-7 Output Parameters (2D Code)* on page 2-413.

1 Output Format

Take the following case as an example.

Number of measurement is one. Reading character string is 32. Command: Read character strings 0123456789...UV, Command, Response, and Data Output area are as follows.

In this case, the following conditions are applied.

[Reading character output] is checked.

[Character count output] and [Error character output] are unchecked.

For details, refer to *Communicating with PLC Link, Command Details for PLC Link, EtherNet/IP, and EtherCAT* in *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

- Command (PLC to Sensor Controller)

Top Channel		Description
+3	+2	
0010	1010	Performs one measurement.

- Response (Sensor Controller to PLC)

Response Area		Description
Top channel	Data	
+2	1010	Command Code
+3	0010	Target command code is responded.
+4	0000	Response code
+5	0000	Command execution result.

- Data Output Area (Sensor Controller to PLC)
  When read the 32 character strings (0123456789…UV), the result continues as follows.
  ASCII code data + NULL (0x00)

Top channel	Name	Description
+0	1st character, 2nd character	3031 (ASCII code of the character 0 , ASCII code of the character 1)
+1	3rd character, 4th character	3233 (ASCII code of the character 2 ASCII code of the character 3)
⋮		
+15	31st character, 32th character	5556 (ASCII code of the character U ASCII code of the character V)
+16	NULL	0x00 (NULL)

Additional Information

- If no character string, data is not output and no updating of data.
  When check the [Error character output], output the error character string + NULL(0x00).
- When the character string is 2 bytes, i.e. Shift-JIS. the maximum number of character string is 16. Outputs one character per one channel.

2 How to get the character string

Perform the Data Output Request (DSA) and Data Output Completion (GATE) as in the case of Data Output via PLC Link serial data output.

All character string is included in one data. Thereby, Data Output Request (DSA) is performed once there is only one 2D Code unit.

Output of Character String with Non-procedure Communications

Check the [Character output] in Output parameter to output the character string with Non-procedure communication.

Refer to *2-28-7 Output Parameters (2D Code)* on page 2-413.

1 Output Format

Take the following case as an example. Number of measurement is one.

Reading character string is 32. Read character strings 0123456789…UV, Command, Response, and Data Output area are as follows.

In this case, the following conditions are applied.

[Reading character output] is checked.

[Character count output] and [Error character output] are unchecked.

For details, refer to *Non-procedure Communications and MEASURE or M in Non-procedure Command Details* in *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

- Command (PLC to Sensor Controller)

M	E	A	S	U	R	E	C_R	or	M	C_R

- Response (Sensor Controller to PLC)

O	K	C_R

Header + 0123456789…UV(Character string data) + Footer	C_R

Additional Information

- If no character string, data is not output and no updating of data.

O	K	C_R

Header + Footer	C_R

- When check the [Error character output], as follow.

O	K	C_R

Header + Error character string + Footer	C_R

Output of Character string with EtherNet/IP Message Communications

In EtherNet/IP message communication, output of character string is possible using UNITDATA command which acquires the measurement value.

Outputs the character string data which is measured in Character Inspection and NULL (0x00).

For details, refer to *Communicating with the Sensor Controller with EtherNet/IP Message Communications, Non-procedure Communications and UNITDATA or UD in Non-procedure Command Details* in *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

1 Output Format

Take the following case as an example. Send UNITDATA command. Reading character string is 32. Command: Read character strings 0123456789...UV, Command, Response, and Data Output area are the followings.

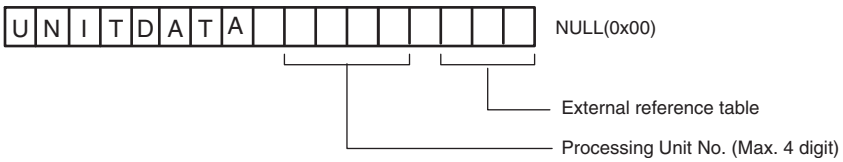
Described example is only a part of Attribute.

- Command (PLC to Sensor Controller)

  Specify the command character string equivalent to a non-procedure command.

  Attach NULL (0x00) at the end of the character string. No line feed code is required.

  The size of the send data includes the NULL (0x00) at the end of the character string.



- Response (Sensor Controller to PLC)

  Character string data equivalent to the Non-procedure command reception character string is returned. Null (0x00) is inserted in the reception character string delimiter section. The size of the reception data includes the final NULL (0x00).

0123456789…UV(Character string data) NULL(0x00) O(0x4F) K(0x4b) NULL(0x00)

Additional Information

- If no character string, refer to the following.

NULL(0x00) O(0x4F) K(0x4b) NULL(0x00)

- When output the multiple lines, change the external reference table No. of UNITDATA, and then read the character strings.

2-28-10 External Reference Tables (2D Code)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
6	Number of decoded characters	decodeCharNum	Get only	---
7	Decoded characters	decodeCharStr	Get only	Character string
8	Index	index	Get only	---
9	Error code	errCode	Get only	0: Normal -1: Not found 2DCode -3: Timeout -7: Too much data to finish
10	Output String	outputCharStr	Get only	Character string
18	Read ratio	readRatio	Get only	-
19	Contrast	contrast	Get only	0 to 100
20	Focus	focus	Get only	0 to 100
21	Overall quality (Normal: DM)	overallQualityD	Get only	0 to 4
22	Decode (Normal: DM)	decodeD	Get only	0 to 4
23	Contrast	contrastD	Get only	0 to 4
24	Modulation	modulationD	Get only	0 to 4
25	Fixed pattern damage	fixedPatternDamage	Get only	0 to 4
26	Axial nonuniformity	axialNonuniformity	Get only	0 to 4
27	Grid nonuniformity	gridNonuniformity	Get only	0 to 4
28	Unused error correction	unusedErrorD	Get only	0 to 4
29	Print Scale	printScale	Get only	0 to 4
30	Print Scale X	printScaleX	Get only	0 to 4
31	Print Scale Y	printScaleY	Get only	0 to 4
33	Overall quality (Normal: PDF417/MicroPDF)	overallQualityPDF	Get only	0 to 4
34	Decode (Normal: PDF417/MicroPDF)	decodePDF	Get only	0 to 4
35	RAP contrast	rapContrast	Get only	0 to 4
36	RAP reflectance	rapReflect	Get only	0 to 4
37	RAP edge contrast	rapEdgeContrast	Get only	0 to 4
38	RAP modulation	rapModulation	Get only	0 to 4
39	RAP defect	rapDefect	Get only	0 to 4
40	RAP decodability	rapDecodability	Get only	0 to 4
41	RAP additional	rapAddionail	Get only	0 to 4
42	RAP overall quality	rapOverall	Get only	0 to 4
43	Code word yield	codeWordYield	Get only	0 to 4
44	Unused error correction	unusedErrorPDF	Get only	0 to 4
45	Decodability	decodabilityPDF	Get only	0 to 4
46	Defect	defectPDF	Get only	0 to 4
47	Modulation	modulationPDF	Get only	0 to 4
50	Position X	positionX	Get only	---
51	Position Y	positionY	Get only	---
52	Angle	angle	Get only	---

No.	Data Name	Ident	Set/Get	Data range
53	Reference position X	referenceX	Get only	---
54	Reference position Y	referenceY	Get only	---
55	Reference angle	referenceAngle	Get only	---
70	Upper left reference position X	referenceSXA	Get only	-99,999.9999 to 99,999.9999
71	Upper left reference position Y	referenceSYA	Get only	-99,999.9999 to 99,999.9999
72	Lower left reference position X	referenceSXB	Get only	-99,999.9999 to 99,999.9999
73	Lower left reference position Y	referenceSYB	Get only	-99,999.9999 to 99,999.9999
74	Lower right reference position X	referenceSXC	Get only	-99,999.9999 to 99,999.9999
75	Lower right reference position Y	referenceSYC	Get only	-99,999.9999 to 99,999.9999
76	Upper right reference position X	referenceSXD	Get only	-99,999.9999 to 99,999.9999
77	Upper right reference position Y	referenceSYD	Get only	-99,999.9999 to 99,999.9999
80	GS1 flag	gs1Flag	Get only	0: Normal code 1: GS1 code
90	Upper left position X	positionMXA	Get only	-99,999 to 99,999
91	Upper left position Y	positionMYA	Get only	-99,999 to 99,999
92	Lower left position X	positionMXB	Get only	-99,999 to 99,999
93	Lower left position Y	positionMYB	Get only	-99,999 to 99,999
94	Lower right position X	positionMXC	Get only	-99,999 to 99,999
95	Lower right position Y	positionMYC	Get only	-99,999 to 99,999
96	Upper right position X	positionMXD	Get only	-99,999 to 99,999
97	Upper right position Y	positionMYD	Get only	-99,999 to 99,999
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
107	Reference X	referencePosX	Set/Get	0 to 99,999.9999
108	Reference Y	referencePosY	Set/Get	0 to 99,999.9999
109	Reference angle	referencePosAngle	Set/Get	-180.0000 to 180.0000
110	Upper left reference X	referencePosSXA	Set/Get	0 to 99,999.9999
111	Upper left reference Y	referencePosSYA	Set/Get	0 to 99,999.9999
112	Lower left reference X	referencePosSXB	Set/Get	0 to 99,999.9999
113	Lower left reference Y	referencePosSYB	Set/Get	0 to 99,999.9999
114	Lower right reference X	referencePosSXC	Set/Get	0 to 99,999.9999
115	Lower right reference Y	referencePosSYC	Set/Get	0 to 99,999.9999
116	Upper right reference X	referencePosSXD	Set/Get	0 to 99,999.9999
117	Upper right reference Y	referencePosSYD	Set/Get	0 to 99,999.9999
120	Code type	code_type	Set/Get	Normal: 0: DataMatrix 1: QRCode 2: MicroQR 3: PDF417 4: MicroPDF DPM: 0: Auto 1: DataMatrix 2: QRCode
121	Code color	code_color	Set/Get	0: Auto 1: Black 2: White

No.	Data Name	Ident	Set/Get	Data range
122	Square size	dm_squSize	Set/Get	0: Auto 1: 10x10 2: 12x12 ... 16: 64x64
123	Rectangle size	dm_recSize	Set/Get	0: Auto 1: 8x18 2: 8x32 ... 6: 16x48
124	QR size	qr_size	Set/Get	0: Auto 1: 21x21 2: 25x25 ... 10: 57x57
125	DM shape	dm_shape	Set/Get	0: Auto 1: DM Square 2: DM Rectangle
126	QR shape	qr_shape	Set/Get	0: Auto 1: Square
127	Code length	code_length	Set/Get	50 to 2,448
128	Mirror setting	mirrorimage	Set/Get	0: Auto 1: Normal 2: Reverse
129	QR model	qr_model	Set/Get	0: Auto 1: Model 1 2: Model 2
130	QR ECC level	qr_ecclevel	Set/Get	0: Auto 1: M 2: L 3: H 4: Q
131	Timeout	timeout	Set/Get	50 to 99,999 [ms]
132	Speed mode	speedmode	Set/Get	0: Fast 1: Precise
133	Flag of character output	out_char	Set/Get	0: Not output 1: Output
134	Output range	out_rng	Set/Get	0: Not set 1: Set
135	Output terminator	out_last	Set/Get	1 to 652
136	Output starter	out_first	Set/Get	1 to 652
137	Output device	outputDevice	Set/Get	0: RS-232C/RS-422 1: Ethernet
138	Character output on NG	errorOut	Set/Get	0: Not output 1: Output
139	Error output message	errorMessage	Set/Get	Character string
140	Code length auto setting	code_lengthAuto	Set/Get	1: Auto 0: Use specified code length
141	Error code output on NG	out_ng	Set/Get	0: Not output 1: Output
142	Magnify level	magnifyLevel	Set/Get	0 to 4
143	Magnify level auto	magnifyAuto	Set/Get	0: OFF 1: ON
144	Quiet zone check	qz_check	Set/Get	0: OFF 1: ON
145	Integrated quality	lowerOverallGrade	Set/Get	0.0 to 4.0

No.	Data Name	Ident	Set/Get	Data range
146	Read mode	readMode	Set/Get	0: Normal 1: DPM
147	MicroQR size	microqr_size	Set/Get	0: Auto 1: 11 x 11 2: 13 x 13 3: 15 x 15 4: 17 x 17
148	ECC level	microqr_ecclevel	Set/Get	0: Auto 1: L 2: M 3: Q
170	Upper limit for character number	upperCharNum	Set/Get	0 to 652
171	Lower limit for character number	lowerCharNum	Set/Get	0 to 652
172	Judge compare string	judgeCompString	Set/Get	Character string
173	Wildcard usage flag for judgement	judgeCompWildcard	Set/Get	0: '*' and '?' is treated as wildcard. 1: '*' and '?' is treated as string.
174	Wildcard usage flag for classification	compWildcard	Set/Get	0: '*' and '?' is treated as wildcard. 1: '*' and '?' is treated as string.
175	Result display character	resultDisp	Set/Get	0: OFF 1: ON
176	Display color	dispColor	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
177	Display size	dispSize	Set/Get	10 to 200
178	Header	rsHeader	Set/Get	0: None 1: STX 2: ESC
179	Footer	rsFooter	Set/Get	0: CR 1: CR+LF 2: ETX 3: LF
180	FCS flag	fcsFlag	Set/Get	0: OFF 1: ON
181	Flag of output char number	countCharFlag	Set/Get	0: None 1: 2 bytes 2: 4 bytes
182	Output code quality	qualityFlag	Set/Get	0: Not output 1: Output
183	Display code quality	DispqualityFlag	Set/Get	0: OFF 1: ON
184	Flag of IO output char	outcharIOFlag	Set/Get	0: OFF 1: ON
185	Replace GS by any string	replaceGS	Set/Get	0: OFF 1: ON
186	Replace string	replaceString	Set/Get	Character string
231	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
232	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit

No.	Data Name	Ident	Set/Get	Data range
233	Update the reference angle	updateAngleFlg	Set/Get	0: Not update 1: Update
236	Use point coordinate before scroll (Central reference setting)	beforeScrollRefMode	Set/Get	0: Not use 1: Use
237	Position X before scroll	beforeScrollRefPosX	Get only	-99,999.9999 to 99,999.9999
238	Position Y before scroll	beforeScrollRefPosY	Get only	-99,999.9999 to 99,999.9999
239	Angle before scroll	beforeScrollRefAngle	Get only	-180 to 180
240	Upper left position X before scroll	beforeScrollRefPosSXA	Get only	-99,999.9999 to 99,999.9999
241	Upper left position Y before scroll	beforeScrollRefPosSYA	Get only	-99,999.9999 to 99,999.9999
242	Lower left position X before scroll	beforeScrollRefPosSXB	Get only	-99,999.9999 to 99,999.9999
243	Lower left position Y before scroll	beforeScrollRefPosSYB	Get only	-99,999.9999 to 99,999.9999
244	Lower right position X before scroll	beforeScrollRefPosSXC	Get only	-99,999.9999 to 99,999.9999
245	Lower right position Y before scroll	beforeScrollRefPosSYC	Get only	-99,999.9999 to 99,999.9999
246	Upper right position X before scroll	beforeScrollRefPosSXD	Get only	-99,999.9999 to 99,999.9999
247	Upper right position Y before scroll	beforeScrollRefPosSYD	Get only	-99,999.9999 to 99,999.9999
248	Setting unit of Upper left reference coordinate	refAUnitNo	Set/Get	-1 to 9,999
249	Setting unit of Lower left reference coordinate	refBUnitNo	Set/Get	-1 to 9,999
250	Setting unit of Lower right reference coordinate	refCUnitNo	Set/Get	-1 to 9,999
251	Setting unit of Upper right reference coordinate	refDUnitNo	Set/Get	-1 to 9,999
252	Setting type of vertex reference coordinate	VerRefSettingType	Set/Get	0: Numerical 1: Unit
253	Use point coordinate before scroll (Vertices reference setting)	beforeScrollVerRefMode	Set/Get	0: Not use 1: Use
300+N (N: 0 to 300)	Compare string	compString	Set/Get	Character string
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

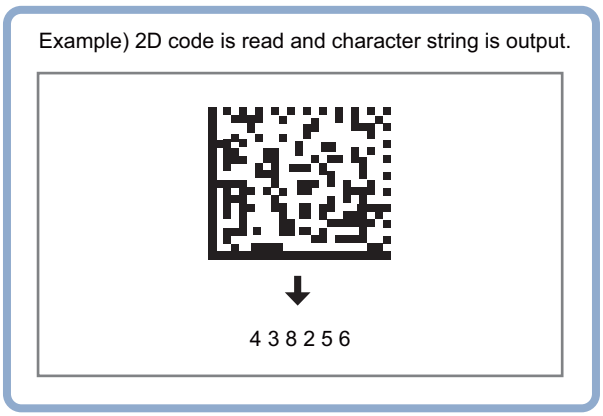
2-29 2D Code II

This processing item reads Data Matrix that is a type of 2D Code.

This processing item has function optimized for reading Data Matrix of 2D code.

Used in the Following Case

To classify with 2D Code (Data Matrix)



Important

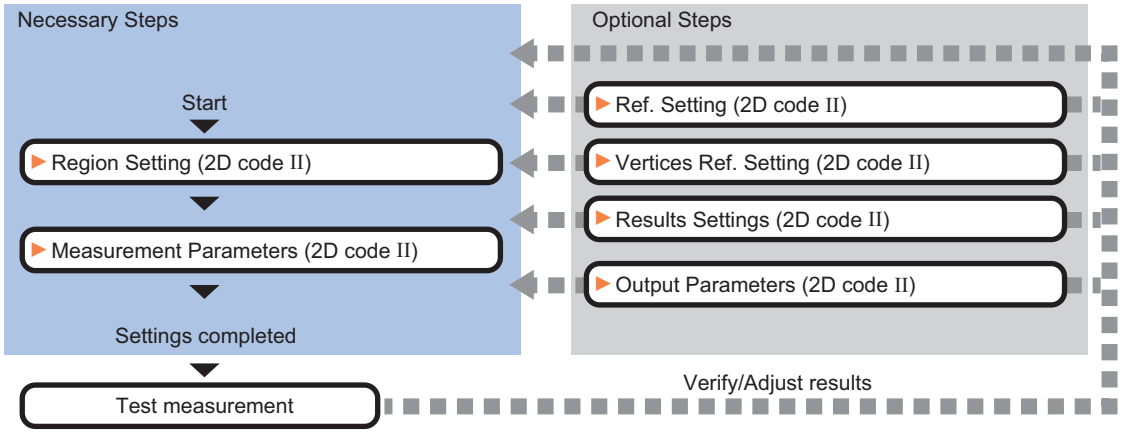
- Does not support 2D Code with Japanese included. Supports 2D Code that are composed entirely of ASCII code.
- Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.
- Please take a image of the code so that it becomes the size equal to or larger than the cell size on the image.

  Reading only: 2 pixels

  Calculating printing quality: 5 pixels

2-29-1 Settings Flow (2D Code II)

The setting procedure for 2D Code II is as follows.



List of 2D Code II Items

Item name	Description
Region setting	This item is used to set up the measurement area. Restricting the measurement range can shorten the processing time. Refer to *2-29-2 Region Setting (2D Code II)* on page 2-429.
Measurement	This item specifies the judgement condition for measurement results. Set the code type and the number of characters to be judged as OK. Refer to *2-29-3 Measurement Parameters (2D Code II)* on page 2-430.
Ref. setting	This item is used to set the reference setting. Refer to *2-29-4 Reference Setting (2D Code II)* on page 2-433.
Vertices Ref. setting	This item is used to set the position of each vertices. Refer to *2-29-5 Vertices Reference Setting (2D Code II)* on page 2-435.
Result setting	Set the measurement results. Judgement results can be classified. Refer to *2-29-6 Results Settings (2D Code II)* on page 2-436.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Refer to *2-29-7 Output Parameters (2D Code II)* on page 2-437.

2-29-2 Region Setting (2D Code II)

Specify the rectangular area in which to search for 2D Code.

Restricting the measurement range can shorten the processing time.

1 In the Item Tab area, click [Region setting].

2 Click [Edit].

The figure setting area is displayed.

3 Specify the area in which to search for 2D Code.

4 Click [OK] in the Figure setting area.

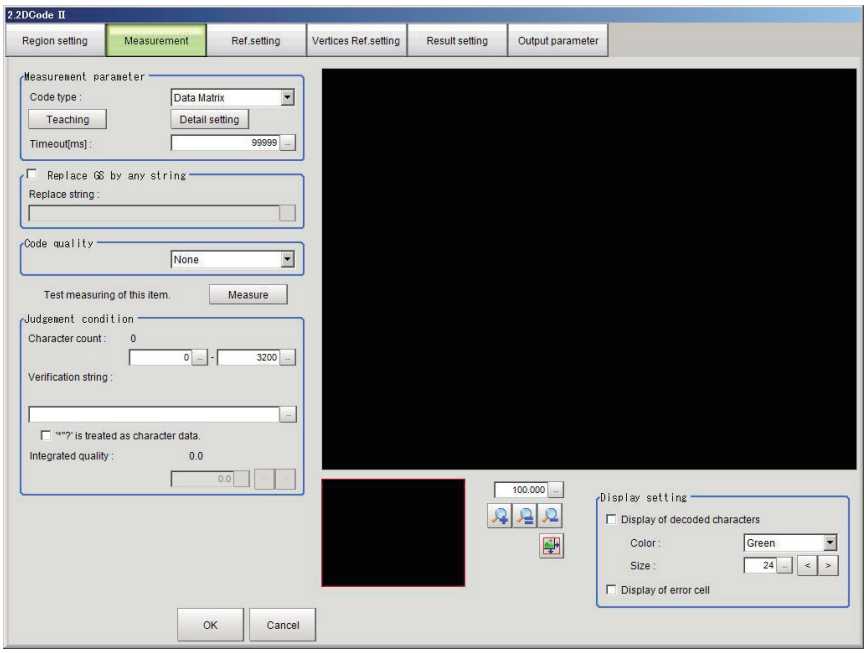
- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

Important

Set the measurement region such that it contains only 1 2D Code.

If there is more than one 2D Code in the measurement region, measurement may not be performed correctly.

2-29-3 Measurement Parameters (2D Code II)



This item specifies the judgement conditions for measurement conditions and measurement results.

When the [Teaching] button is clicked, detailed settings are set automatically.

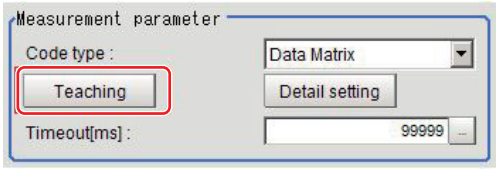
If you then click the [Measurement] button, measurement is executed, the detected 2D Code region is displayed on the image and the measurement results are displayed as measurement value of the judgement condition.

If measurement cannot be carried out successfully with this procedure, adjust the parameters shown below.

1 In the Item Tab area, click [Measurement].

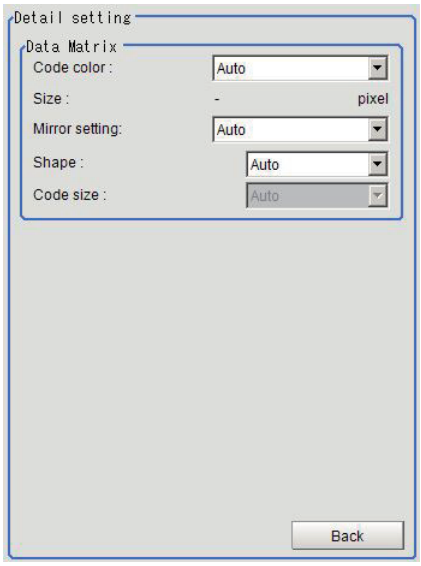
2 To teach, click [Teaching].

The detailed settings are set automatically.



Setting item	Set value [Factory default]	Description
Timeout	50 to 99999 [99999]	Stop and terminate the process if the measurement for this processing item cannot be completed within the specified time period. Note that the actual timeout time may be longer than the specified time period.

3 When making the detailed settings, click "Detail setting" and set each item.



Setting item	Setting value [Factory default]	Description
Code color	• [Auto] • Black • White	Select the color of the 2D Code to read. Auto: Select to automatically determine the color setting. Black: Select this for black 2D Code with white background. White: Select this for white 2D Code with black background.
Size		Display an average value based on calculated cell longitudinal/lateral sizes by performing “Teaching”.
Mirror setting	• [Auto] • Normal • Reverse	Select whether or not to reverse the image horizontally.
Shape	• [Auto] • Square • Rectangle	Select the shape of Data Matrix.
Code size	For Auto • [Auto] For square • 10 × 10 • 12 × 12 • : • 144 x 144 For rectangle: • [Auto] • 8 × 18 • 8 × 32 • : • 16 × 48	Select the size of Data Matrix.

4 To read codes containing group separators, set a group separator replacement condition.

Setting item	Set value [Factory default]	Description
Replace group separator with specified character string	• Checked • [Unchecked]	If you select [Normal] for the reading mode, check this checkbox to replace each group separator with another character string.
Replacement character string	---	Set the character string to replace group separators with.

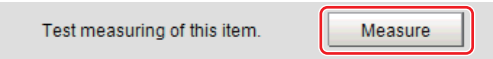
5 Set the Code Quality.

Setting item	Set value [Factory default]	Description
Code Quality	• [None] • ISO/IEC 15415 • ISO/IEC TR29158	Select the quality standard to apply.

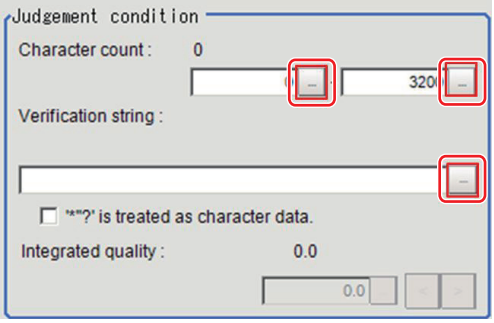
Additional Information

Replacing each group separator (control character) with the specified character string enables codes containing group separators to be read and compared to a comparison character string.

6 When the setting has been changed, click [Measure] to verify whether measurements can be made correctly.

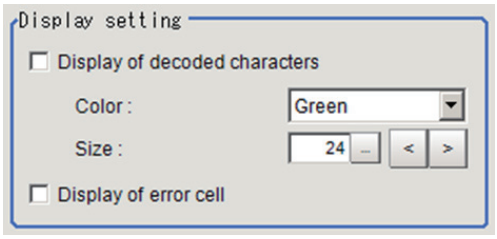


7 Set up the judgement condition.



Setting item	Set value	Description
Character count	0 to 3,200	Specify the character count to be judged as OK.
Verification string	---	Specify the classification strings to be judged as OK. Up to 3,200 characters can be set.
'*' '?' is treated as character data.	• Checked • [Unchecked]	Checked: '*' and '?' are handled as normal characters. Unchecked: '*' and '?' are handled as special characters. '*': Substitution for character string (with 0 or more characters) '?': Substitution for 1character
Integrated quality (lower limit value) (only when the read mode is Normal)	0.0 to 4.0 [0.0]	Specify the integrated quality to be judged as OK.

8 Set the display conditions for decoded characters.



Setting item	Set value	Description
Display of decoded characters	• [Unchecked] • Checked	Check this when display the decoded characters.
Color	• Black • White • Red • [Green] • Blue	Select the color for displayed characters.
Size	• 10 to 200 • [24]	Set the size of displayed characters.
Display of error cell	• [Unchecked] • Checked	Check this when displaying cells that an error is detected.

2-29-4 Reference Setting (2D Code II)

Set a center position and the angle for a 2D code.

There are two setting methods, directly or referencing a unit.

Specifying Directly

Click a position on the image as a reference position or input coordinate data for it.

1 In the Item Tab area, click [Ref. setting].

2 In the display area, the current reference position will be displayed as the crosshair cursor.

3 In the “Method” area, select “Numerical”.

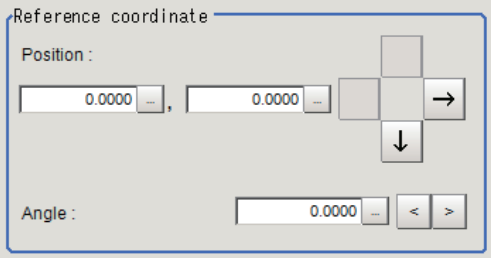
4 Click the position to be set as the reference.

Additional Information

Displaying the image enlarged makes this clicking easier.

For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function in the Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

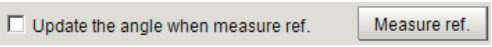
5 Make fine adjustments using numeric value inputs or the arrow buttons as required.



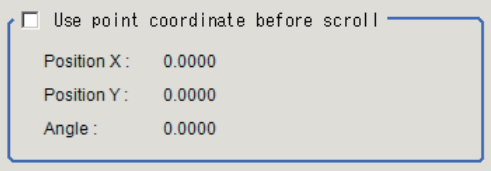
6 Set the reference angle with a numeric value.

7 To remeasure on the displayed image and set the reference, click the [Measure ref.] button.

To update the reference angle at the time of reference measurement, place a check at "Update the angle when measure ref.".



8 To use data before position compensation for the reference setting coordinates, check the "Use point coordinate before scroll".



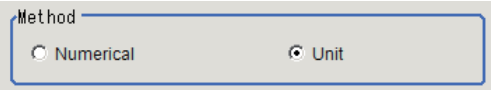
Referencing a Unit

Set a reference position by referencing a processing unit with registered X coordinate, Y coordinate, and angle data.

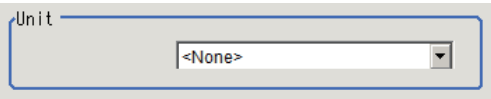
1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".



3 In the "Unit" area, select a processing unit registered.



4 Perform the next measurement.

The reference position will be displayed.

2-29-5 Vertices Reference Setting (2D Code II)

Set each vertex position of a 2D code. The each vertex position does not correspond to camera coordinates. The positions are determined by a shape of the code.

There are two setting methods, directly or referencing a unit.

Specifying Directly

Click a position on the image as a reference position or input coordinate data for it.

1. In the Item Tab area, click [Vertices Ref. setting].
2. In the display area, the current each vertex position will be displayed with a box.
3. In the “Method” area, select “Numerical”.

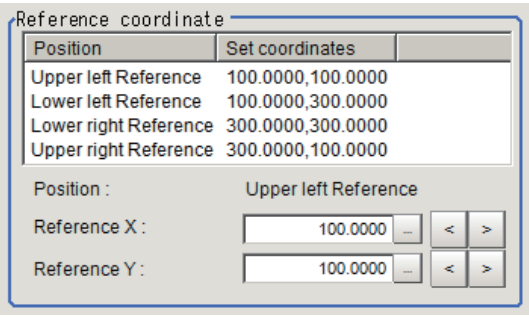
4. Drag and drop the box on the each vertex position.

Additional Information

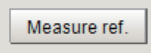
Displaying the image enlarged makes this clicking easier.

For details, refer to *Appendixes Basic Knowledge about Operations Using the Zoom Function in the Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

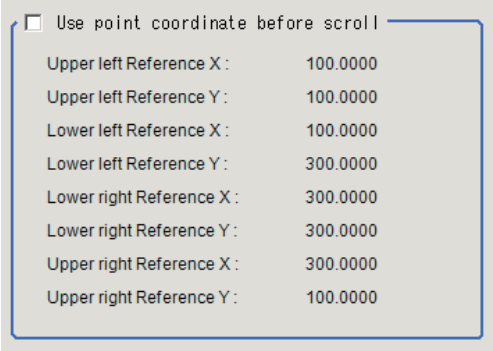
5. Make fine adjustments using numeric value inputs or the arrow buttons as required.



6. To set the each vertex position by re-measuring the current displayed image, click [Measure ref.] button.



7. To use data before position compensation for the each vertex position, check the “Use point coordinate before scroll”.



Referencing a Unit

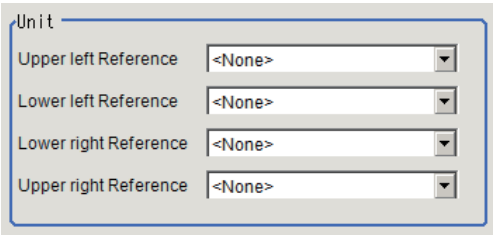
Set each vertex position by referencing a processing unit with registered X coordinate and Y coordinate.

1 In the Item Tab area, click [Ref. setting].

In the display area, the current reference position will be displayed as the crosshair cursor.

2 In the "Method" area, select "Unit".

3 In the "Unit" area, select a processing unit registered.



4 Perform the next measurement.

Each vertex position will be displayed.

2-29-6 Results Settings (2D Code II)

Results can be classified according to the judgement results.

1 In the Item Tab area, click [Result setting].

2 Register the character string that will be the reference for classification.

Setting item	Set value	Description
Classification string	-	Set the Comparison character string. Up to 652 characters can be set.
'*' '?' is treated as character data.	• Checked • [Unchecked]	Checked: '*' and '?' are handled as normal characters. Unchecked: '*' and '?' are handled as special characters. '*': Substitution for character string (with 0 or more characters) '?': Substitution for 1character

2-29-7 Output Parameters (2D Code II)

Select how measurement results are output to an external device. This item can be changed if necessary. Normally, the factory default value will be used.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item		Set value [Factory default]	Description
Reflect to overall judgement		• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.
Reading character output			
	Reading character output	• [Checked] • Unchecked	Set whether to output character strings.
	Output range specify	• Checked • [Unchecked]	Set when specifying the range of character strings to be output. This can be set to a range of 1 to 3,200.
	Output range specify	1 to 3200 [1] to [3200]	Specify the range of output character count. This can be set to a range of 1 to 3,200.
	Character count output	• Checked • [Unchecked]	Specify whether to output the character count of the character string.
	Character code size	• [2bytes] • 4bytes	Select the character code size for character output.
	Code quality output	• [Checked] • Unchecked	This item is enabled when either ISO/IEC 15415 or ISO/IEC TR29158 was set at "Code quality" in "Measurement" tab. The setting is enabled if you select [DPM] for the measurement parameter read mode. Set whether to output the 2D Code quality.
Output when reading error occurs			
	Error character output	• Checked • [Unchecked]	Specify whether to output the specified character string when there is a reading error. If a check is placed, the character string entered in the lower frame is output. Up to 20 characters can be input.
	Error code output	• Checked • [Unchecked]	Set whether to output error codes. Error codes are as follows: 0: Normal termination -1: 2D Code not found -3: Timeout -7: Processing terminated due to too much data

2-29-8 Key Points for Test Measurement and Adjustment (2D Code II)

The following contents are displayed in the Detail Result Pane.

Displayed items	Description
Judge	Judgement result
Index	Index matched as the result of comparison with the classification comparison character strings
Detected character count	Number of characters detected
Detected character strings	Character strings detected
Cell recognition rate*1	A value used to check the error correction rate. The fewer the words whose errors corrected, the better the recognition rate.
Contrast*1	Evaluate the sharpness of an image. If an image is defocused, code cannot be identified. The displayed value will be smaller as it becomes defocused.
Focus*1	Evaluate the number of false cell detections in the finder pattern, timing pattern and data region. The displayed value is smaller when there are many false cell detections and reading is unstable.
Overall quality*2	An overall quality grade for the read code. This is given the lowest weight of the various quality grades.
Decode*2	A quality decode which shows whether the decode is successful or not.
Contrast*2	A quality grade which shows the contrast. The grade will be high when the difference of highest and lowest brightness are large in code region.
Modulation*2	A quality grade which shows the uniformity of cells brightness.
Fixed pattern damage*2	A quality grade which shows the damage level of the followings: • Finder pattern • Timing pattern • Quiet zone
Axis non-uniformity*2	A quality grade which shows the ratio of code width and height. A cell figure which is close-to-square has high grade.
Error correction during unused time*2	A quality grade which shows the amount of vertical displacement from the ideal position.
Print Scale*2	A quality grade that shows the percentage of error corrected items. Fewer error-corrected words results in a higher grade.
Print expansion/contraction X*2	A quality grade which shows the uniformity of black cell size and white cell size in the X direction results in a higher grade.
Print expansion/contraction Y*2	A quality grade which shows the uniformity of black cell size and white cell size in the Y direction results in a higher grade.
Scan*2	---
Overall quality*3	An overall quality grade for the read code. This is given the lowest weight of the various quality grades.
Decode*3	A quality grade which shows whether the start pattern, stop pattern, or specified line were successfully decoded, or not.
RAP contrast*3	A quality grade which shows whether the start pattern, stop pattern, or specified line were successfully decoded, or not. The grade will be high when the difference of highest and lowest brightness are large in pattern region.
RAP reflectance*3	A quality grade which shows the contrast of the start pattern, stop pattern, or specified line. The grade will be high when the difference of highest and lowest brightness are large in pattern region.

Displayed items	Description
RAP edge contrast*3	A quality grade which shows the contrast of the start pattern, stop pattern, or specified line. Verify the smallest contrast between bar and space.
RAP modulation*3	A quality grade which shows the brightness uniformity of the start pattern, stop pattern, or specified line. Verify the lowest edge contrast as against to the symbol contrast.
RAP defect*3	A quality grade which shows the brightness uniformity of the start pattern, stop pattern, or specified line. Verify the uniformity of brightness between bar and space.
RAP decodability*3	A quality grade which shows the printed accuracy of start pattern, stop pattern, or specified lines. A grade is high when the width of bar or space is close to the standard values.
RAP additional*3	A quality grade which shows whether there is a sufficient Quiet zone for start pattern, stop pattern, or specified line.
RAP overall quality*3	An overall quality grade for parts of the start pattern, stop pattern, or specified line.
Code word yield*3	A grade quality which shows the efficiency to read the data by scanning the record. An evaluation of the number of code is successful decoded when repeat to scan the code.
Unused error correction*3	A quality grade that shows the percentage of error corrected items. A grade which is less errors is high grade.
Decodability*3	A quality grade which shows the printed accuracy of codes parts. A grade is high when the width of bar or space is close to the standard values.
Defect*3	A quality grade which shows the uniformity of codes brightness. Verify the uniformity of brightness between bar and space.
Modulation*3	A quality grade which shows the uniformity of codes brightness. Verify the lowest edge contrast as against to the symbol contrast.

*1. Read mode: Only displayed in DPM mode.

*2. Read mode: Displayed if it is standard, the code type is DM and "Code quality display" is selected.

*3. Read mode: Displayed if it is standard, the code type is PDF417/MicroPDF417 and "Code quality display" is selected.

The display items checked in the result settings tab Grade display setting are displayed.

The grade code is displayed with a letter with numeric expression in parentheses, such as "A (4) to F (0)".

Additional Information

When the reading mode is DPM, a red circle is displayed on the cell where the judgment of the white cell / black cell is corrected in the image display area.

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

- When codes cannot be read in correctly

Parameter to be adjusted	Remedy
Region setting	Check whether there are codes to read in the measurement region.
Measurement parameter	Check if the settings, such as "Code type", "Code color", "Code length", and "Mirror setting", are specified correctly.
Timeout	Check to make sure that the specified time is not too short.

Important

Codes may not be recognized if the code size is set too small or too large.

2-29-9 Measurement Results for Which Output Is Possible (2D Code II)

Measurement items	Character string	Description
Judgement	JG	Judgement result
Decoded character count	DN	Character count
Index	IDX	Index matched as the result of comparison with the classification comparison character strings
Cell recognition rate	CRR	The rate is calculated based on the "the number of error code word to be correctable", which is determined by the size and the error correction level, and the number of error code words that are actually corrected. (1 - (number of error code words corrected) / (number of error code words that can be corrected)) × 100
Contrast	CT	Contrast
Focus	FCS	Focus
Overall quality (Standard: DM)	GD0	This is given the lowest weight of the various quality grades. This grades value is most small in each qualities.
Decode (Standard: DM)	GD1	A quality grade which shows whether the decode is successful or not.
Contrast	GD2	A quality grade which shows the contrast. The grade will be high when the difference of highest and lowest brightness are large in code region.
Modulation	GD3	A quality grade which shows the uniformity of cells brightness.
Fixed pattern damage	GD4	A quality grade which shows the damage level of the finder pattern, the timing pattern, and the quiet zone.
Axis non-uniformity	GD5	A quality grade which shows the ratio of code width and height. A cell figure which is close-to-square has high grade.
Grid non-uniformity	GD6	A quality grade which shows the deviation from the ideal position of each cell.
Unused error correction	GD7	A quality grade that shows the percentage of error corrected items. A grade which is less errors is high grade.
Print Scale	GD8	A quality grade which shows the size uniformity of black cells and white cells. It corresponds to whichever is the lower grade value between Print Scale X and Print Scale Y.

Measurement items	Character string	Description
Print Scale X	GD9	Higher uniformity in the sizes of black cells and white cells in the X direction results in a higher grade for this.
Print Scale Y	GD10	Higher uniformity in the sizes of black cells and white cells in the Y direction results in a higher grade for this.
RAP contrast	GP2	A quality grade which shows whether the start pattern, stop pattern, or specified line were successfully decoded, or not. The grade will be high when the difference of highest and lowest brightness are large in pattern region.
RAP reflectance	GP3	A quality grade which shows the contrast of the start pattern, stop pattern, or specified line. The grade will be high when the difference of highest and lowest brightness are large in pattern region.
RAP edge contrast	GP4	A quality grade which shows the contrast of the start pattern, stop pattern, or specified line. Verify the smallest contrast between bar and space.
RAP modulation	GP5	A quality grade which shows the brightness uniformity of the start pattern, stop pattern, or specified line. Verify the lowest edge contrast as against to the symbol contrast.
RAP defection	GP6	A quality grade that shows the percentage of error corrected items. A grade which is less errors is high grade.
RAP decidability	GP7	A quality grade which shows whether there is a sufficient Quiet zone for start pattern, stop pattern, or specified line. A grade is high when the width of bar or space is close to the standard values.
RAP additional	GP8	A quality grade which shows whether there is a sufficient Quiet zone for start pattern, stop pattern, or specified line.
RAP overall quality	GP9	An overall quality grade for parts of the start pattern, stop pattern, or specified line.
Code word yield	GP10	A quality grade that shows the percentage of error corrected items. An evaluation of the number of code is successful decoded when repeat to scan the code.
Unused error correction	GP11	A quality grade that shows the percentage of error corrected items. A grade which is less errors is high grade.
Decidability	GP12	A quality grade which shows the printed accuracy of codes parts. A grade is high when the width of bar or space is close to the standard values.
Defect	GP13	A quality grade which shows the uniformity of codes brightness. Verify the uniformity of brightness between bar and space.
Modulation	GP14	A quality grade which shows the brightness uniformity of the start pattern, stop pattern, or specified line. Verify the lowest edge contrast as against to the symbol contrast.

2-29-10 External Reference Tables (2D Code II)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
6	Number of decoded characters	decodeCharNum	Get only	-
7	Decoded characters	decodeCharStr	Get only	Character string
8	Index	index	Get only	-
9	Error code	errCode	Get only	0: Normal -1: Not found 2DCode -3: Timeout -7: Too much data to finish
10	Output String	outputCharStr	Get only	Character string
50	Position X	positionX	Get only	-99,999.9999 to 99,999.9999
51	Position Y	positionY	Get only	-99,999.9999 to 99,999.9999
52	Angle	angle	Get only	-180.0000 to 180.0000
53	Reference position X	referenceX	Get only	-99,999.9999 to 99,999.9999
54	Reference position Y	referenceY	Get only	-99,999.9999 to 99,999.9999
55	Reference angle	referenceAngle	Get only	-180.0000 to 180.0000
70	Upper left reference position X	referenceSXA	Get only	-99,999.9999 to 99,999.9999
71	Upper left reference position Y	referenceSYA	Get only	-99,999.9999 to 99,999.9999
72	Lower left reference position X	referenceSXB	Get only	-99,999.9999 to 99,999.9999
73	Lower left reference position Y	referenceSYB	Get only	-99,999.9999 to 99,999.9999
74	Lower right reference position X	referenceSXC	Get only	-99,999.9999 to 99,999.9999
75	Lower right reference position Y	referenceSYC	Get only	-99,999.9999 to 99,999.9999
76	Upper right reference position X	referenceSXD	Get only	-99,999.9999 to 99,999.9999
77	Upper right reference position Y	referenceSYD	Get only	-99,999.9999 to 99,999.9999
90	Upper left position X	positionMXA	Get only	-99,999 to 99,999
91	Upper left position Y	positionMYA	Get only	-99,999 to 99,999
92	Lower left position X	positionMXB	Get only	-99,999 to 99,999
93	Lower left position Y	positionMYB	Get only	-99,999 to 99,999
94	Lower right position X	positionMXC	Get only	-99,999 to 99,999
95	Lower right position Y	positionMYC	Get only	-99,999 to 99,999
96	Upper right position X	positionMXD	Get only	-99,999 to 99,999
97	Upper right position Y	positionMYD	Get only	-99,999 to 99,999
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
107	Reference X	referencePosX	Set/Get	0 to 99,999.9999
108	Reference Y	referencePosY	Set/Get	0 to 99,999.9999
109	Reference angle	referencePosAngle	Set/Get	-180.0 to 180.0
110	Upper left reference X	referencePosSXA	Set/Get	0 to 99,999.9999

No.	Data Name	Ident	Set/Get	Data range
111	Upper left reference Y	referencePosSYA	Set/Get	0 to 99,999.9999
112	Lower left reference X	referencePosSXB	Set/Get	0 to 99,999.9999
113	Lower left reference Y	referencePosSYB	Set/Get	0 to 99,999.9999
114	Lower right reference X	referencePosSXC	Set/Get	0 to 99,999.9999
115	Lower right reference Y	referencePosSYC	Set/Get	0 to 99,999.9999
116	Upper right reference X	referencePosSXD	Set/Get	0 to 99,999.9999
117	Upper right reference Y	referencePosSYD	Set/Get	0 to 99,999.9999
120	Code type	code_type	Set/Get	0: Data Matrix
121	Code color	code_color	Set/Get	0: Auto 1: Black 2: White
122	Square size	dm_squSize	Set/Get	0: 10×10 2: 12×12 ... 23: 144×144
123	Rectangle size	dm_recSize	Set/Get	0: 8×18 2: 8×32 ... 5: 16×48
125	DM shape	dm_shape	Set/Get	0: Auto 1: Square 2: Rectangle
127	Cell size	cell_size	Get only	0 to 9,999
128	Mirror setting	mirrorimage	Set/Get	0: Auto 1: Normal 2: Reverse
131	Timeout	timeout	Set/Get	10 to 99,999
134	Output range	out_rng	Set/Get	0: Not set 1: Set
135	Output terminator	out_last	Set/Get	1 to 3,200
136	Output starter	out_first	Set/Get	1 to 3,200
138	Character output on NG	errorOut	Set/Get	0: Not output 1: Output
139	Error output message	errorMessage	Set/Get	Character string
141	Error code output on NG	out_ng	Set/Get	0: Not output 1: Output
145	Integrated quality	lowerOverallGrade	Set/Get	0.0 to 4.0
170	Upper limit for character number	upperCharNum	Set/Get	0 to 3,200
171	Lower limit for character number	lowerCharNum	Set/Get	0 to 3,200
172	Judge compare string	judgeCompString	Set/Get	Character string
173	Wildcard usage flag for judgement	judgeCompWildcard	Set/Get	0: '*' and '?' are treated as wildcard. 1: '*' and '?' are treated as string.
174	Wildcard usage flag for classification	compWildcard	Set/Get	0: '*' and '?' are treated as wildcard. 1: '*' and '?' are treated as string.
175	Result display character	resultDisp	Set/Get	0: OFF 1: ON

No.	Data Name	Ident	Set/Get	Data range
176	Display color	dispColor	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
177	Display size	dispSize	Set/Get	10 to 200
178	Header	rsHeader	Set/Get	0: None 1: STX 2: ESC
179	Footer	rsFooter	Set/Get	0: CR 1: CR+LF 2: ETX 3: LF
180	FCS flag	fcsFlag	Set/Get	0: OFF 1: ON
181	Flag of output char number	countCharFlag	Set/Get	0: None 1: 2 bytes 2: 4 bytes
182	Output code quality	qualityFlag	Set/Get	0: Not output 1: Output
184	Flag of IO output char	outcharIOFlag	Set/Get	0: OFF 1: ON
185	Replace GS by any string	replaceGS	Set/Get	0: OFF 1: ON
186	Replace string	replaceString	Set/Get	Character string
187	Error cell flag	ErrorCellDisp	Set/Get	0: OFF 1: ON
200	Grade Setting	gradeSetting	Set/Get	0: None 1: ISO/IEC 15415 2: ISO/IEC TR29158
231	Setting unit of reference coordinate	refUnitNo	Set/Get	-1 to 9,999
232	Setting type of reference coordinate	refSettingType	Set/Get	0: Numerical 1: Unit
233	Update the reference angle	updateAngleFlg	Set/Get	0: Not update 1: Update
236	Use point coordinate before scroll (Central reference setting)	beforeScrollRefMode	Set/Get	0: Not use 1: Use
237	Position X before scroll	beforeScrollRefPosX	Get only	-99,999.9999 to 99,999.9999
238	Position Y before scroll	beforeScrollRefPosY	Get only	-99,999.9999 to 99,999.9999
239	Angle before scroll	beforeScrollRefAngle	Get only	-180 to 180
240	Upper left position X before scroll	beforeScrollRefPosSXA	Get only	-99,999.9999 to 99,999.9999
241	Upper left position Y before scroll	beforeScrollRefPosSYA	Get only	-99,999.9999 to 99,999.9999
242	Lower left position X before scroll	beforeScrollRefPosSXB	Get only	-99,999.9999 to 99,999.9999
243	Lower left position Y before scroll	beforeScrollRefPosSYB	Get only	-99,999.9999 to 99,999.9999

No.	Data Name	Ident	Set/Get	Data range
244	Lower right position X before scroll	beforeScrollRefPosSXC	Get only	-99,999.9999 to 99,999.9999
245	Lower right position Y before scroll	beforeScrollRefPosSYC	Get only	-99,999.9999 to 99,999.9999
246	Upper right position X before scroll	beforeScrollRefPosSXD	Get only	-99,999.9999 to 99,999.9999
247	Upper right position Y before scroll	beforeScrollRefPosSYD	Get only	-99,999.9999 to 99,999.9999
248	Setting unit of Upper left reference coordinate	refAUnitNo	Set/Get	-1 to 9,999
249	Setting unit of Lower left reference coordinate	refBUnitNo	Set/Get	-1 to 9,999
250	Setting unit of Lower right reference coordinate	refCUnitNo	Set/Get	-1 to 9,999
251	Setting unit of Upper right reference coordinate	refDUnitNo	Set/Get	-1 to 9,999
252	Setting type of vertex reference coordinate	VerRefSettingType	Set/Get	0: Numerical 1: Unit
253	Use point coordinate before scroll (Vertices reference setting)	beforeScrollVerRefMode	Set/Get	0: Not use 1: Use
300+N (N: 0 to 35)	Compare string	compString	Set/Get	Character string
10000	Overall qualiy (ISO15415)	overallQualityISO15415	Get only	-1.0 to 4.0
10001	Decode (ISO15415)	decodeISO15415	Get only	-1.0 to 4.0
10002	Contrast (ISO15415)	contrastISO15415	Get only	-1.0 to 4.0
10003	Modulation (ISO15415)	modulationISO15415	Get only	-1.0 to 4.0
10004	Fixed pattern damage (ISO15415)	fixedPatternDamageISO15415	Get only	-1.0 to 4.0
10005	Axial nonuniformity (ISO15415)	axialNonuniformityISO15415	Get only	-1.0 to 4.0
10006	Grid nonuniformity (ISO15415)	gridNonuniformityISO15415	Get only	-1.0 to 4.0
10007	Unused error correction (ISO15415)	unusedErrorISO15415	Get only	-1.0 to 4.0
10008	Reflectance margin (ISO15415)	ReflectanceMarginISO15415	Get only	-1.0 to 4.0
10009	Print scale (ISO15415)	printScaleISO15415	Get only	-1.0 to 4.0
10010	Print scaleX (ISO15415)	printScaleXISO15415	Get only	-1.0 to 4.0
10011	Print scaleY (ISO15415)	printScaleYISO15415	Get only	-1.0 to 4.0
10050	Contrast value (ISO15415)	contrastValueISO15415	Get only	0.0 to 100.0
10051	Axial nonuniformity value (ISO15415)	axiNouniformityValueISO15415	Get only	0.0 to 100.0
10052	Grid nonuniformity value (ISO15415)	gridNouniformityValueISO15415	Get only	0.0 to 100.0
10053	Unused error value (ISO15415)	unusedErrorValueISO15415	Get only	0.0 to 100.0
10054	Print scale value (ISO15415)	printScaleValueISO15415	Get only	-1,000.0 to 1,000.0
10055	Print scaleX value (ISO15415)	printScaleXValueISO15415	Get only	-1,000.0 to 1,000.0
10056	Print scaleY value (ISO15415)	printScaleYValueISO15415	Get only	-1,000.0 to 1,000.0

No.	Data Name	Ident	Set/Get	Data range
10100	Overall qualiy (ISOTR29158)	overallQuality-ISOTR29158	Get only	-1.0 to 4.0
10101	Decode (ISOTR29158)	decodeISOTR29158	Get only	-1.0 to 4.0
10102	Contrast (ISOTR29158)	contrastISOTR29158	Get only	-1.0 to 4.0
10103	Modulation (ISOTR29158)	modulation-ISOTR29158	Get only	-1.0 to 4.0
10104	Fixed pattern damage (ISOTR29158)	fixedPatternDamage-ISOTR29158	Get only	-1.0 to 4.0
10105	Axial nonuniformity (ISOTR29158)	axialNonuniformity-ISOTR29158	Get only	-1.0 to 4.0
10106	Grid nonuniformity (ISOTR29158)	gridNonuniformity-ISOTR29158	Get only	-1.0 to 4.0
10107	Unused error correction (ISOTR29158)	unusedError-ISOTR29158	Get only	-1.0 to 4.0
10108	Print scale (ISOTR29158)	printScaleISOTR29158	Get only	-1.0 to 4.0
10109	Print scaleX (ISOTR29158)	printScaleXI-SOTR29158	Get only	-1.0 to 4.0
10110	Print scaleY (ISOTR29158)	printScaleY-ISOTR29158	Get only	-1.0 to 4.0
10150	Contrast value (ISOTR29158)	contrastVal-ueISOTR29158	Get only	-0.0 to 100.0
10151	Axial nonuniformity value (ISOTR29158)	axiNouniformityVal-ueISOTR29158	Get only	0.0 to 100.0
10152	Grid nonuniformity value (ISOTR29158)	gridNouniformityVal-ueISOTR29158	Get only	0.0 to 100.0
10153	Unused error value (ISOTR29158)	unusedErrorVal-ueISOTR29158	Get only	0.0 to 100.0
10154	Print scale value (ISOTR29158)	printScaleVal-ueISOTR29158	Get only	-1,000.0 to 1,000.0
10155	Print scaleX value (ISOTR29158)	printScaleXVal-ueISOTR29158	Get only	-1,000.0 to 1,000.0
10156	Print scaleY value (ISOTR29158)	printScaleYVal-ueISOTR29158	Get only	-1,000.0 to 1,000.0
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

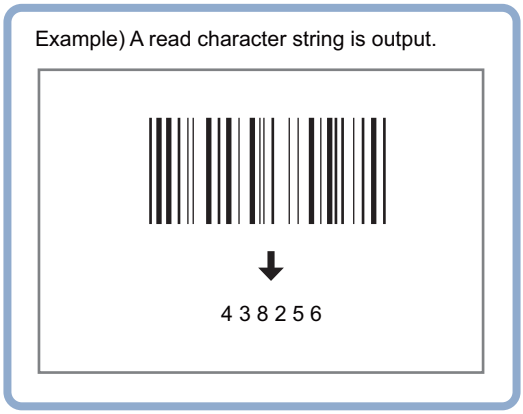
2-30 Barcode

Read in barcodes.

Processing can also classify the read-in results.

Used in the Following Case

To read in barcodes and output them to an external device

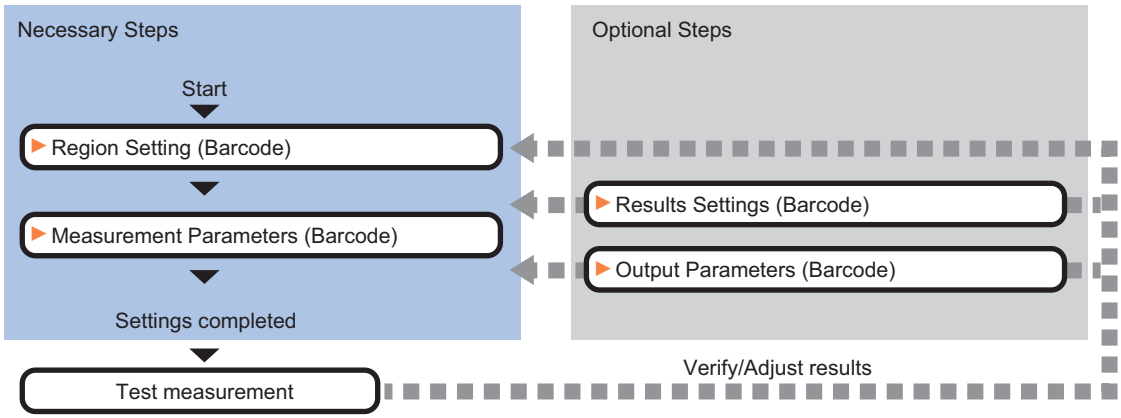


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-30-1 Settings Flow (Barcode)

Barcode can be set up as follows.



List of Barcode Items

Item name	Description
Region setting	This item is used to set up the measurement area. Restricting the measurement area can shorten the processing time. Refer to *2-30-2 Region Setting (Barcode)* on page 2-448.
Measurement	This item specifies the judgement condition for measurement results. Set the code type and the number of characters to be judged as OK. Refer to *2-30-3 Measurement Parameters (Barcodes)* on page 2-448.
Result setting	Set the measurement results. Judgement results can be classified. Refer to *2-30-4 Results Settings (Barcode)* on page 2-452.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Refer to *2-30-5 Output Parameters (Barcode)* on page 2-452.

2-30-2 Region Setting (Barcode)

Specify the rectangular area in which to search for the barcodes.

Restricting the measurement area can shorten the processing time.

1 In the Item Tab area, click [Region setting].

2 Click [Edit].

The figure setting area is displayed.

3 Specify the area in which to search for the barcodes.

The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

Important

- Set the measurement region to be 2448 × 2044, or less.
- Set the measurement region such that it contains only 1 barcode.
  If there is more than one bar code in the measurement region, measurement may not be performed correctly.
- Set the measurement region such that it includes a quiet zone.

2-30-3 Measurement Parameters (Barcodes)

This item sets the judgement conditions for measurement conditions and measurement results.

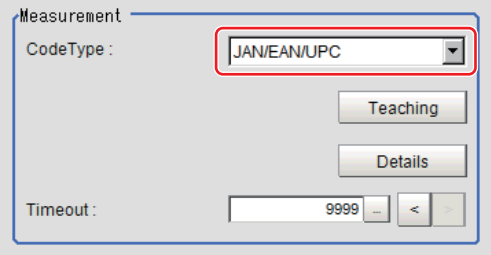
When the Teaching button is clicked, the code type and advanced settings are set automatically.

If you then click the Measure button, measurement is executed, the detected barcode region is displayed on the image and the measurement results are displayed as measurement value of the judgement condition.

If measurement cannot be carried out successfully with this procedure, adjust the parameters shown below.

1 In the Item Tab area, click [Measurement].

2 In the "Measurement" area, set the Code Type.



Setting item	Set value [Factory default]	Description
Code Type	• [JAN/EAN/UPC] • Code39 • Codabar • ITF • Code93 • Code 128/GS1-128 • GS1 DataBar • Pharmacode	Select the code type for the code to read. • JAN/EAN/UPC: Read JAN/EAN/UPC-format barcodes. • Code39: Read Code39-format barcodes. • Codabar: Read Codabar(NW-7)-format barcodes. • ITF: Read ITF(Interleaved 2 of 5)-format barcodes. • Code93: Read Code93-format barcodes. • Code 128/GS1-128: Read barcodes in the Code128/GS-128 and GS1-128 Composite Code (CC-A, CC-B, CC-C) formats. • GS1 DataBar: Read barcodes in the GS1 DataBar* (Truncated, Stacked, Omni-directional, Stacked Omni-directional, Limited, Expanded, Expanded Stacked) and GS1-DataBar Composite Code (CC-A, CC-B) formats. • Pharmacode: Read Pharmacode-format barcodes.

Additional Information

The designations of the following code types are standardized to those conforming to GS1Databar from 2010.
With FH/FHV/FZ5, current designation "GS1Databar" and old designation "RSS" are both indicated.
Select each code type of a new designation conforming to GS1DataBar.
GS1 Databar code type new/old comparison table

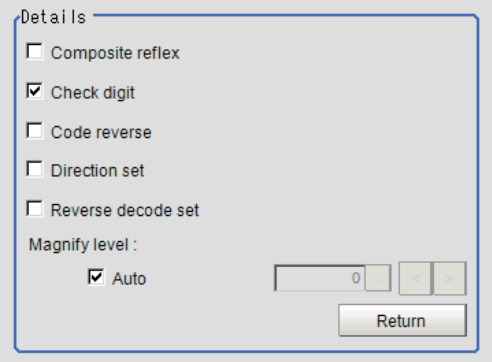
Code type name	Official name
GS1 DataBar (RSS-14)	GS1 DataBar Omni-directional
GS1 DataBar (RSS Lim.)	GS1 DataBar Limited
GS1 DataBar (RSS Exp.)	GS1 DataBar Expanded

3 To set measurement parameters automatically, click [Teaching].

The following setting items have their detailed settings automatically set.

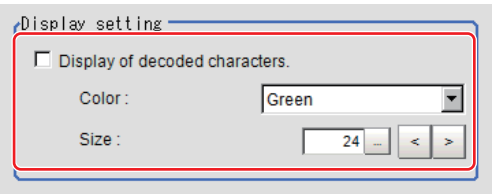
- Code Type
- Composite reflex
- Auto Magnify level
- Magnify level

4 When making the detailed settings, click "Details" and set each item.



Setting item	Set value [Factory default]	Description
Composite reflex	• Checked • [Unchecked]	Select whether or not to read composite code.
Check digit	• [Checked] • Unchecked	Select whether or not to perform check using the check digit. When check is performed, the check digit is not included in the read character string.
Code reverse	• Checked • [Unchecked]	Select whether or not to read reversed black/white code.
Direction set	• Checked • [Unchecked]	Select the direction in which to read barcodes. Reading is performed horizontally when there is no check. Reading is performed vertically when there is a check. This item is selectable when the code type is “Pharmacode.”
Reverse decode set	• Checked • [Unchecked]	Select whether or not to use reverse mode. This item is selectable when the code type is "Pharmacode."
Auto magnify level	• [Checked] • Unchecked	Select whether or not to set the image magnify level automatically when reading code. Stable reading is enabled if there is a check, but the processing time will increase.
Magnify level	0 to 4 [4]	Set the image magnify level to be applied when reading code. If reading the code is difficult for a high-resolution Camera or image, increase the value. The value is updated when teaching is performed.

5 When changing the display settings, set each item in the "Display setting" area.



Setting item	Set value [Factory default]	Description
Display of decoded characters	• [Unchecked] • Checked	Place a check when displaying the read-in character strings on the screen.
Color	• Black • White • Red • [Green] • Blue	Select the display color for character strings.
Size	10 to 200 [24]	Set the display size for character strings.

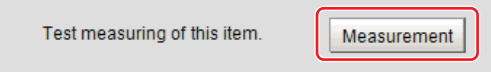
6 If you select [GS1 DataBar] or [GS1-128] for the code type, set a group separator replacement condition.

Setting item	Set value [Factory default]	Description
Replace group separator with specified character string	• [Checked] • Unchecked	If you select [GS1-128] or [GS1 DataBar] for the code type, check this checkbox to replace each group separator with another character string.
Replacement character string	---	Set the character string to replace group separators with.

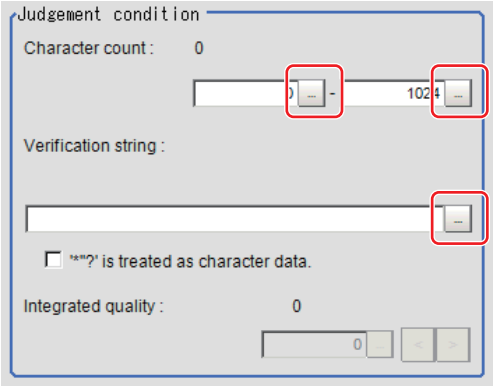
Additional Information

Replacing each group separator (control character) with the specified character string enables codes containing group separators to be read and compared to a comparison character string.

7 When the setting has been changed, click [Measurement] in the "Detail" area to verify whether measurements can be made correctly.



8 Set up the judgement condition.



Setting item	Set value	Description
Character count	0 to 1024 [1024]	Specify the character count to be judged as OK.
Verification string	Up to 1023 characters can be set.	Specify the character strings to be judged as OK.
'*' '?' is treated as character data.	• Checked • [Unchecked]	Checked: '*' and '?' are handled as normal characters. Unchecked: '*' and '?' are handled as special characters. '*': Substitution for character string (with 0 or more characters) '?': Substitution for 1character
Integrated quality	0 to 4 [4]	Specify the integrated quality to be judged as OK.*1

*1. This can be set when "Code quality display" of "Display setting for print quality" in [Result setting] tab has been checked.

2-30-4 Results Settings (Barcode)

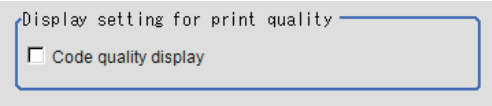
Results can be classified according to the judgement results.

1 In the Item Tab area, click [Result setting].

2 Register the character string that will be the reference for classification.

Setting item	Set value	Description
Classification string	-	Set the Verification string. Up to 1023 characters can be set.
'*' '?' is treated as character data.	• Checked • [Unchecked]	Checked: '*' and '?' are handled as normal characters. Unchecked: '*' and '?' are handled as special characters. '*': Substitution for character string (with 0 or more characters) '?': Substitution for 1character

3 If necessary, set the quality display for the "Detail result" display area.



Setting item	Set value	Description
Code quality display	• Checked • [Unchecked]	Select whether or not to display integrated quality.

2-30-5 Output Parameters (Barcode)

Select how measurement results are output to an external device. This item can be changed if necessary. Normally, the factory default value will be used.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Set value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.
Character output	• Checked • [Unchecked]	Set whether to output character strings.
Error output	• Checked • [Unchecked]	Set whether to output errors.
Error output character string	---	Input the character string output when there is an error. Up to 20 characters can be input.
Output device	• [RS-232C/RS-422] • Ethernet	When "Character output" is checked (character strings are output), specify the device to which character strings are output. A character string is output as an ASCII code character string plus a delimiter. When Ethernet is selected, the destination IP address is determined by the system settings. For details, refer to *Non-procedure Communications* in the *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Cat. No. Z342).

2-30-6 Key Points for Test Measurement and Adjustment (Barcode)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Index	Index matched as the result of comparison with the classification comparison character strings
Character count	Number of characters detected
Read string	Character strings detected Up to 40 characters are displayed (with a new line after every 15th character). From the 41st character on is displayed as "...". Example) Detected character strings • 123456789012345 • 123456789012345 • 1234567890... (□ indicates a double-byte space.)
Overall quality*1	Result of overall quality

*1. This is displayed only when "Code quality display" check box is selected in the result setting (Barcode).

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

- After teaching has been executed, the read-in character contents are different.

Parameter to be adjusted	Remedy
Measurement	The code type may have been detected incorrectly. • Select the code type manually, then measure again. • Set the Narrow bar size and Wide bar size in the Advanced setting to match the displayed barcode image, then execute teaching again. • If the bars are too narrow or there is not much difference in density between the background and the image, correct the image with filtering and execute teaching.

2-30-7 Measurement Results for Which Output Is Possible (Barcode)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items*1	Character string	Description
Judgement	JG	Judgement result
Number of decoded character	DN	Number of characters detected
Index	IDX	Index matched as the result of comparison with the classification comparison character strings
Overall quality	GT	This is an overall grade for Composite codes. It is the lower of the two grade values, Overall quality 1D and Overall quality 2D. If the read code is not a Composite code, the grade will be Overall quality 1D.

Measurement items[*1]	Character string	Description
Overall quality 1D	GB0	This overall grade is a code to be read. This grade value is the lowest of all the Barcode quality grades.
Decode 1D	GB1	A quality grade which shows whether the decode of the Barcode is successful or not.
Symbol contrast 1D	GB2	A quality grade which shows the contrast of the barcode. The grade will be high when the difference of highest and lowest brightness are large in pattern region.
Minimum reflection ratio 1D	GB3	A quality grade which shows the contrast of the barcode. The grade will be high when the difference of highest and lowest brightness are large in pattern region.
Minimum edge contrast 1D	GB4	A quality grade which shows the contrast of the barcode. Verify the smallest contrast between bar and space.
Modulation 1D	GB5	A quality grade which shows the brightness uniformity of the barcode. Verify the lowest edge contrast as against to the symbol contrast.
Defect 1D	GB6	A quality grade which shows the brightness uniformity of the barcode. A quality grade which shows the brightness uniformity between the bars and spaces.
Decodability 1D	GB7	A quality grade which shows the printed accuracy of barcode. A grade is high when the width of bar or space is close to the standard values.
Additional 1D	GB8	It is a quality grade specific to the barcode code type.
Overall quality 2D	GP0	This is an overall grade for 2D Code component of a Composite code. This grade value is the lowest of all the 2D Code quality grades.
Decode 2D	GP1	A quality grade which shows whether the start pattern, stop pattern, or specified line were successfully decoded, or not.
RAP symbol contrast	GP2	A Contrast quality grade for the start pattern, stop pattern, or specified line. The grade will be high when the difference of highest and lowest brightness are large in pattern region.
RAP minimum reflection ratio	GP3	A Contrast quality grade for the start pattern, stop pattern, or specified line. The grade will be high when the difference of highest and lowest brightness are large in pattern region.
RAP minimum edge contrast	GP4	A Contrast quality grade for the start pattern, stop pattern, or specified line. Verify the smallest contrast between bar and space.
RAP modulation	GP5	A quality grade which shows the brightness uniformity of the start pattern, stop pattern, or specified line. Verify the lowest edge contrast as against to the symbol contrast.
RAP defect	GP6	A quality grade which shows the brightness uniformity of the start pattern, stop pattern, or specified line. A grade which is less errors is high grade.
RAP decodability	GP7	A quality grade which shows the printed accuracy of start pattern, stop pattern, or specified lines. A grade is high when the width of bar or space is close to the standard values.
RAP additional	GP8	A quality grade which shows whether there is a sufficient Quiet zone for start pattern, stop pattern, or specified line.
RAP overall quality	GP9	An overall quality grade for parts of the start pattern, stop pattern, or specified line.
Code word yield	GP10	A grade quality which shows the efficiency to read the data by scanning the record. An evaluation of the number of code is successful decoded when repeat to scan the code.

Measurement items*1	Character string	Description
Unused error correction	GP11	A quality grade that shows the percentage of error corrected items. Fewer error-corrected words results in a higher grade.
Decodability 2D	GP12	A quality grade which shows the printed accuracy of codes parts. A grade is high when the width of bar or space is close to the standard values.
Defect 2D	GP13	A quality grade which shows the uniformity of codes brightness. Verify the uniformity of brightness between bar and space.
Additional 2D	GP14	A quality grade which shows the brightness uniformity of the code language component. Verify the lowest edge contrast as against to the symbol contrast.

*1. "Overall quality 1D" to "Additional 1D" are measurement items of the barcode component of a Composite code. "Overall quality 2D" to "Modulation 2D" are measurement items of the 2D Code component of a Composite code.

Output of Character String in PLC Link

In PLC Link communication, check the [Character output] to output the character string and NULL(0x00) to the data output area of PLC Link.

Refer to *2-30-5 Output Parameters (Barcode)* on page 2-452.

1 Output Format

Take the following case as an example.

Number of measurement is one. Reading character string is 32. Command: Read character strings 0123456789...UV, Response, and Data Output area are as follows.

For details, refer to *Communicating with PLC Link, Command Details for PLC Link, EtherNet/IP, and EtherCAT* in *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

- Command (PLC to Sensor Controller)

Top channel		Description
+3	+2	
0010	1010	Performs one measurement.

- Response (Sensor Controller to PLC)

Response Area		Description
Top channel	Data	
+2	1010	Command Code
+3	0010	Target response is responded.
+4	0000	Response code
+5	0000	Command execution result.

- Data Area (Sensor Controller to PLC)

  When output the 32 character strings (0123456789…UV), the result continues as follows.

  ASCII code data + NULL (0x00)

Top channel	Name	Description
+0	1st character, 2nd character	3031 (ASCII code of the character 0 , ASCII code of the character 1)
+1	3rd character, 4th character	3233 (ASCII code of the character 2 ASCII code of the character 3)
⋮		
+15	31st character, 32th character	5556 (ASCII code of the character U ASCII code of the character V)
+16	NULL	0x00 (NULL)

Additional Information

If no character string, data is not output and no updating of data.

When check the [Error character output], output the error character string + NULL (0x00).

2 How to get the character string

Perform the Data Output Request (DSA) and Data Output Completion (GATE) as in the case of Data Output.

All character string are included one data. Thereby, Data Output Request (DSA) is performed once if there is only one Barcode unit.

Output of Character string with Non-procedure Communications

Check the [Character output] in Output parameter to output the character string with Non-procedure communication.

Refer to *2-30-5 Output Parameters (Barcode)* on page 2-452.

1 Output Format

Take the following case as an example. Number of measurement is one.

Reading character string is 32. Read character strings 0123456789… UV, Command, Response, and Data Output area are as follows.

In this case, the following conditions are applied.

[Reading character output] is checked.

[Character count output] and [Error character output] are unchecked.

For details, refer to *Non-procedure Communications and MEASURE or M in Non-procedure Command Details* in *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

- Command (PLC to Sensor Controller)

M	E	A	S	U	R	E	C_R

or

M	C_R

- Response (Sensor Controller to PLC)

O	K	C_R

0123456789…UV(Character string data)	C_R

Additional Information

- If [Error output] is not checked and no character string, refer to the following.

O	K	C_R

C_R

- If [Error output] is checked and no character string, refer to the following.

O	K	C_R

(Error character string data)	C_R

Output of Character string with EtherNet/IP Message Communications

In EtherNet/IP message communication, output of character string is possible using UNITDATA command which acquires the measurement value.

Outputs the character string data which measured in Character Inspection and NULL(0x00).

For details, refer to *Communicating with the Sensor Controller with EtherNet/IP Message Communications, Non-procedure Communications and UNITDATA or UD in Non-procedure Command Details* in *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

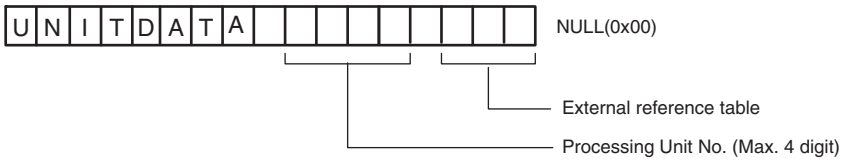
1 Output Format

Take the following case as an example. Send UNITDATA command. Reading character string is 32: Read character string 01233456789... UV, Command, Response, and Data Output area are the followings. Described example is only a part of Attribute.

- Command (PLC to Sensor Controller)

  Specify the command character string equivalent to a non-procedure command. Attach NULL (0x00) at the end of the character string. No line feed code is required.

  The size of the send data includes the NULL (0x00) at the end of the character string.



- Response (Sensor Controller to PLC)

  Character string data equivalent to the Non-procedure command reception character string is returned. Null (0x00) is inserted in the reception character string delimiter section.

  The size of the reception data includes the final NULL (0x00).

  If no character string, refer to the following.

0123456789…UV(Character string data) NULL(0x00) O(0x4F) K(0x4b) NULL(0x00)

Additional Information

- If no character string, refer to the following.

NULL(0x00) O(0x4F) K(0x4b) NULL(0x00)

- When output the multiple lines, change the external reference table No. of UNITDATA, and then read the character strings.

2-30-8 External Reference Tables (Barcode)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
6	Number of decoded characters	decodeCharNum	Get only	-
7	Decoded string	decodeCharStr	Get only	Character string
8	Index	index	Get only	-
9	Overall quality	overallQuality	Get only	0 to 4
10	Overall quality 1D	overallQuality1D	Get only	0 to 4
11	Decode 1D	decode1D	Get only	0 to 4
12	Symbol contrast 1D	symbolContrast	Get only	0 to 4
13	Reflect min 1D	minRefrect	Get only	0 to 4
14	Edge contrast 1D	minEdgeContrast	Get only	0 to 4
15	Modulation 1D	modulation1D	Get only	0 to 4
16	Defect 1D	defect1D	Get only	0 to 4
17	Decode ability 1D	decodability1D	Get only	0 to 4
18	Additional 1D	additional1D	Get only	0 to 4
19	Overall quality 2D	overallQualityPDF	Get only	0 to 4
20	Decode 2D	decodePDF	Get only	0 to 4
21	RAP contrast	rapContrast	Get only	0 to 4
22	RAP reflectance	rapReflect	Get only	0 to 4
23	RAP edge contrast	rapEdgeContrast	Get only	0 to 4
24	RAP modulation	rapModulation	Get only	0 to 4
25	RAP defect	rapDefect	Get only	0 to 4
26	RAP decodability	rapDecodability	Get only	0 to 4
27	RAP additional	rapAdditional	Get only	0 to 4
28	RAP overall quality	rapOverall	Get only	0 to 4
29	Code word yield	codeWordYield	Get only	0 to 4
30	Unused error correction	unusedErrorPDF	Get only	0 to 4
31	Decodability 2D	decodabilityPDF	Get only	0 to 4
32	Defect 2D	defectPDF	Get only	0 to 4
33	Modulation 2D	modulationPDF	Get only	0 to 4
40	Output String	outputCharStr	Get only	Character string
80	GS1 flag	gs1Flag	Get only	0: Normal code 1: GS1 code
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Code type	codeType	Set/Get	0: JAN/EAN/UPC 1: Code39 2: Codabar 3: ITF 4: Code93 5: Code128/GS1-128 6: GS1 DataBar 7: Pharmacode

No.	Data Name	Ident	Set/Get	Data range
121	Wildcard usage flag for judgement	judgeCompWildcard	Set/Get	0: '*' and '?' are treated as wild-card. 1: '*' and '?' are treated as string.
122	Wildcard usage flag for classification	compWildcard	Set/Get	0: '*' and '?' are treated as wild-card. 1: '*' and '?' are treated as string.
123	Result display character	resultDisp	Set/Get	0: OFF 1: ON
124	Display color	dispColor	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
125	Display size	dispSize	Set/Get	10 to 200
136	Check digit	checkDigit	Set/Get	0: OFF 1: ON
162	Upper limit for character number	upperCharNum	Set/Get	0 to 1,024
163	Lower limit for character number	lowerCharNum	Set/Get	0 to 1,024
164	Judge compare string	judgeCompString	Set/Get	Character string
170	Code reverse	codeColor	Set/Get	0: Not reverse 1: Reverse
171	Composite reflex	composite	Set/Get	0: Not reflex 1: Reflex
172	Timeout	timeout	Set/Get	0 to 9,999
173	Direction set	directPharma	Set/Get	0: OFF 1: ON
174	Reverse decode set	reversePharma	Set/Get	0: OFF 1: ON
175	Lower limit for overall grade	lowerOverallGrade	Set/Get	0.0 to 4.0
190	Overall quality set	integratedQuality-DispSet	Set/Get	0: OFF 1: ON
191	Replace Group Separator (GS) by any string	replaceGS	Set/Get	0: OFF 1: ON
192	Replace string	replaceString	Set/Get	Character string
200	Auto	magnifyAuto	Set/Get	0: OFF 1: ON
201	Magnify level	magnifyLevel	Set/Get	0 to 4
300+N (N: 0 to 35)	Compare string	compString	Set/Get	Character string
400	Flag of character output	outputFlag	Set/Get	0: OFF 1: ON
401	Output device	outputDevice	Set/Get	0: RS-232C/RS-422 1: Ethernet
402	Error output	errorOut	Set/Get	0: OFF 1: ON
403	Error string	errorMessage	Set/Get	Character string
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

2-31 OCR User Dictionary

Use the OCR user dictionary to store dictionary data to be used in [OCR].

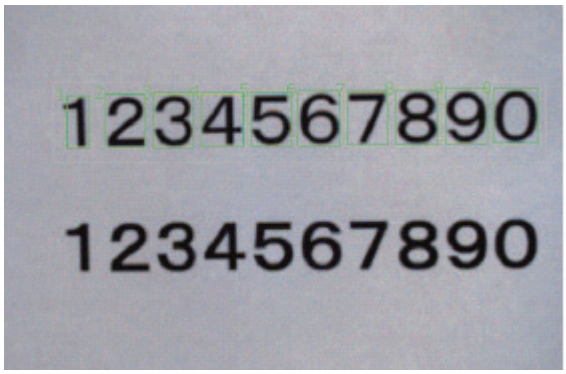
Use this function when you need to recognize special font characters or other characters that cannot be recognized using the built-in dictionary for [OCR].

The dictionary data stored in the [OCR User Dictionary] can be referenced from multiple instances of [OCR].

Used in the Following Case

To create a OCR user dictionary to be used in OCR.

Example: Inspecting printed characters

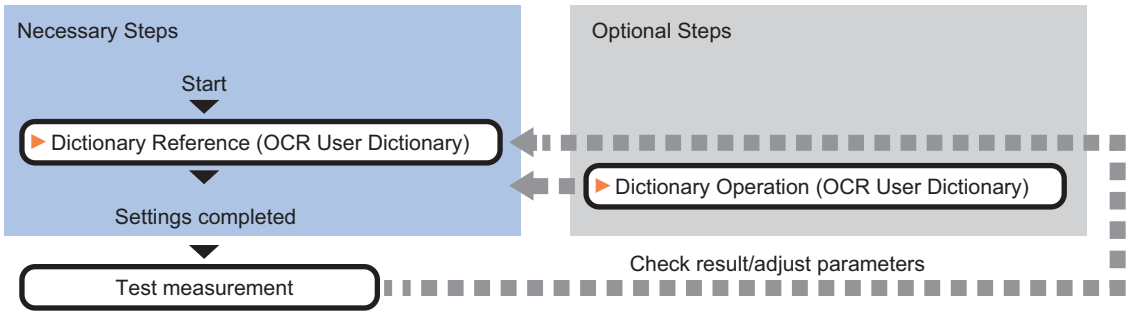


Important

- Dictionary data cannot be shared between the OCR user dictionary and the model dictionary.
- The OCR user dictionary can be used for OCR. It cannot be used for general character inspection.
- Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-31-1 Settings Flow (OCR User Dictionary)

Set up the OCR user dictionary according to the following steps.



List of OCR User Dictionary Items

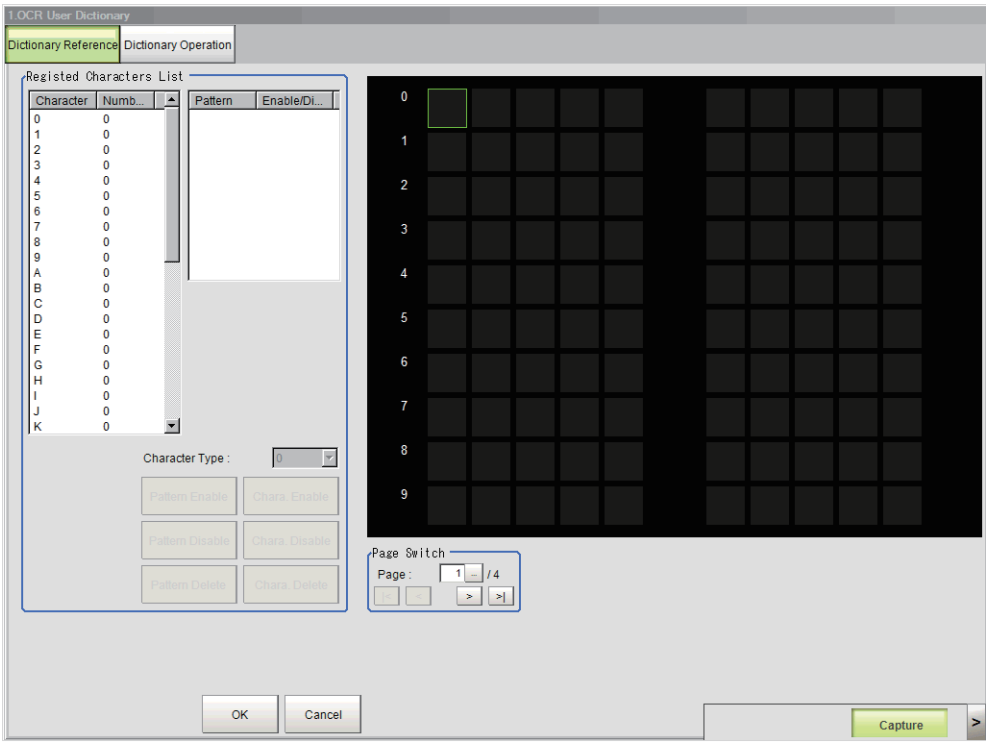
The following items can be set in the OCR user dictionary.

Item name	Description
Dictionary Reference	Configure the dictionary data browse settings, character data enable settings used for dictionary reference, and other settings. Refer to *2-31-2 Dictionary Reference (OCR User Dictionary)* on page 2-462.
Dictionary Operation	Dictionary operations are saving dictionary data to a file and loading dictionary data from a file. Refer to *2-31-3 Dictionary Operation (OCR User Dictionary)* on page 2-464.

2-31-2 Dictionary Reference (OCR User Dictionary)

Configure the dictionary data browse settings, character data enable settings used for dictionary reference, and other settings. Dictionary data that can be referenced is data stored using dictionary registration in the OCR processing item.

Refer to *2-32-6 Dictionary Registration (OCR)* on page 2-480.



Setting Pattern Enable/Disable

For each character type, enable the patterns that you want to use for OCR and disable the patterns that you do not want to use.

1. In the Item Tab area, click [Dictionary Reference].
2. Select the character type from the list in the registered characters list area.
3. Set the items in the registered characters list area.

Setting item	Setting value [Factory default]	Description
Pattern enable/disable	• [ON] • OFF	If you do not want to use a pattern for OCR, remove the checkmark from “Pattern”.
Character Code	0 to 9, A to Z, :/)(	Set the character code of the character type.

Additional Information

Up to 10 patterns can be used for each character type.

Changing a Character Code Registered in a Pattern

A character code registered in one of the multiple patterns in each character type can be changed to a different character code.

1. Select the character type from the list in the registered characters list area.
2. Select the pattern that you want to change from the pattern list.
3. Select the character code in [Character Code].

   The character code of the character pattern selected in the list is changed.

Setting Character Type Enable/Disable

Enable character types that you want to use for OCR and disable character types that you do not want to use.

1. Select the character type from the list in the registered characters list area.
2. Click [Chara. Disable].

   The character type selected in the list is disabled. To enable the character type, click [Chara. Enable].

Deleting a Character Type

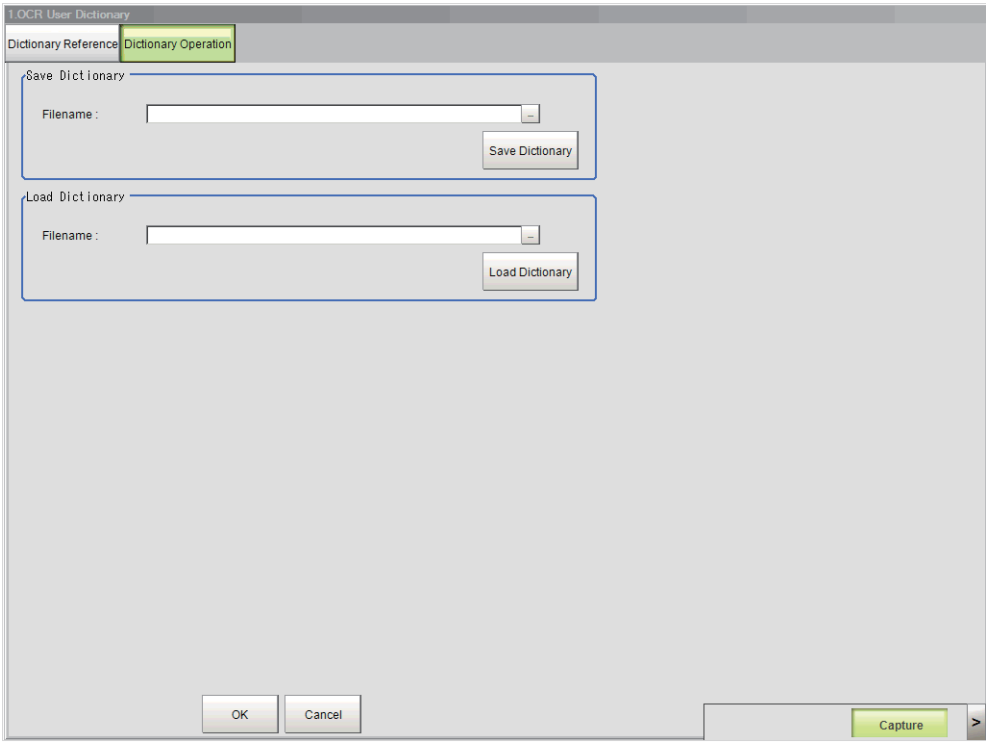
You can delete a character type that has been registered in the dictionary.

1. Select the character type from the list in the registered characters list area.
2. Click [Chara. Delete].

   The character type selected in the list is deleted.

2-31-3 Dictionary Operation (OCR User Dictionary)

Dictionary operations are saving dictionary data to a file and loading dictionary data from a file.



Saving Dictionary Data to a File

The dictionary data of an OCR user dictionary processing unit can be saved to a file.

1 In the Item Tab area, click [Dictionary Operation].

2 In the save dictionary area, specify a value for each item.

Setting item	Setting value [Factory default]	Description
Filename	-	Set the file name used to saved the dictionary data of the processing unit.

3 Click [Save Dictionary].

The dictionary data is saved under the file name in the location specified in “Filename”.

Loading Dictionary Data From a File

You can load a dictionary data file and use the data as dictionary data of the OCR user dictionary processing unit.

1 In the load dictionary area, specify a value for each item.

Setting item	Setting value [Factory default]	Description
Filename	-	Set the name of the dictionary data file to be loaded as dictionary data of the processing unit.

2 Click [Load Dictionary].

The dictionary data of the file specified by the file name is loaded.

Additional Information

Dictionary data can be saved and loaded as a file with the extension “cbd”.

2-31-4 Key Points for Test Measurement and Adjustment (OCR User Dictionary)

You can adjust the parameters while you perform test measurements and check the measurement results to increase the measurement precision and speed.

Select the adjustment method by considering the following point.

Check the measurement results that can be displayed and output in “Measurement Results for Which Output Is Possible”.

Items Displayed in the Detail Result Area

The following measurement results are displayed in the “Detail result” area as text.

Displayed Item	Description
Judge	Displays the judgement result for the processing unit.

Items Displayed in the Image Display Area

You can specify a sub-image number to display the next image in the image display area.

Sub image number	Description
0	The measurement image appears.

2-31-5 Measurement Results for Which Output Is Possible (OCR User Dictionary)

The measurement results provided by OCR user dictionary are shown below. The measurement results appear in the “Detail Result” area, and you can also use result output processing items to output the measurement results to an external device.

Measurement result	Character string	Description
Judge	JG	The judgement result for the processing unit

2-32 OCR

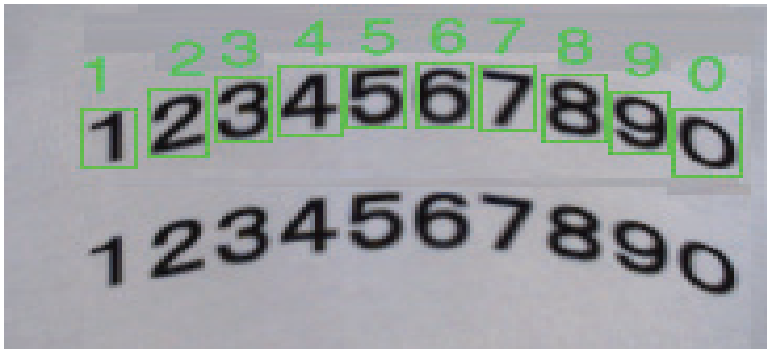
Characters in images can be recognized and read as text information using the internal font information without the need to prepare dictionary data. Using your own dictionary data (OCR User Dictionary), you can also recognize characters in a special font.

OCR provides a higher level of recognition stability than character inspection when reading closely spaced characters, curved text strings, and other deviational characters. Setup is easy because there is no need to create a dictionary.

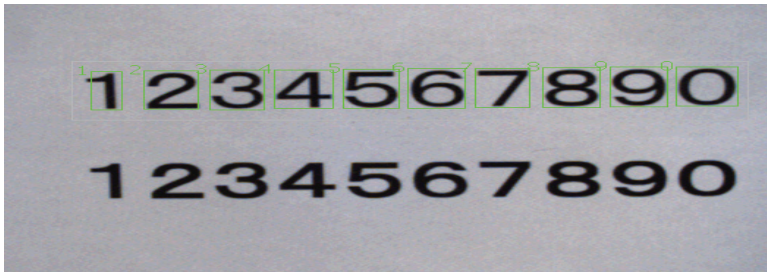
Used in the Following Case

Reading characters printed on a product

Example: Inspection of expiration date, lot number, or other text printed on a curved surface such as a can or bottle.



Example: Inspection of manufacturing date, expiration date, or other text printed on a package or label.



Important

- The following characters are acceptable for OCR function.
  - Letters (A to Z)
  - Numbers (0 to 9)
  - Period (.)
  - Colon (:)
  - Hyphen (-)
  - Apostrophe (')
  - Left parenthese (()
  - Rightparentheses ())
  - Slash (/)
- Note that measurement cannot be done on a continuing sequence of the following symbols.
  - Period (.)
  - Colon (:)
  - Hyphen (-)
  - Apostrophe (')
  - Left parenthese (()
  - Rightparentheses ())
  - Slash (/)

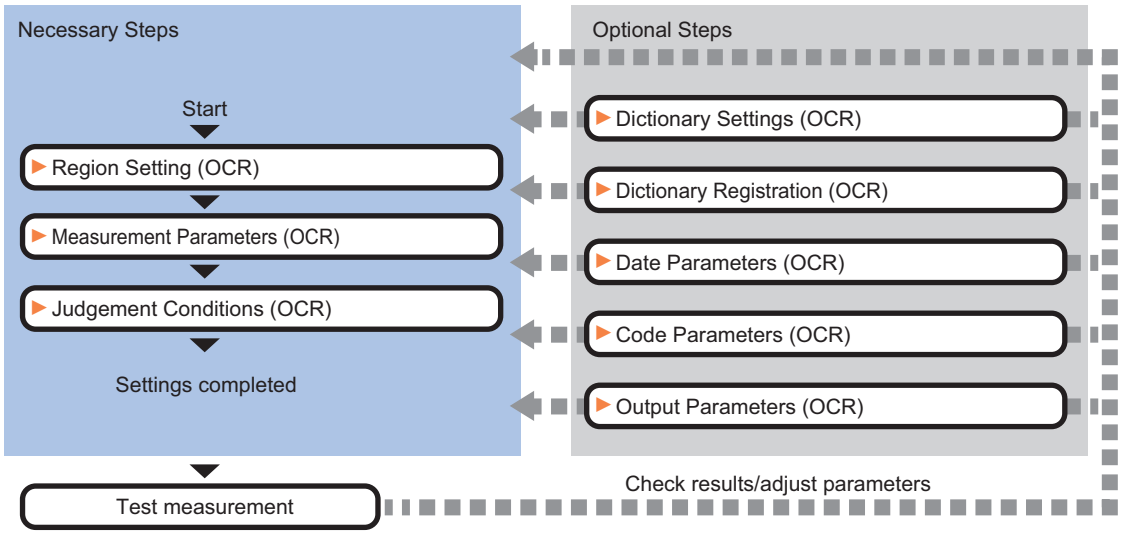
  Example

  123./ABC

  Period and slash are contiguous.
- Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-32-1 Settings Flow (OCR)

Set up OCR according to the following steps.



List of OCR Items

The following items can be set in OCR.

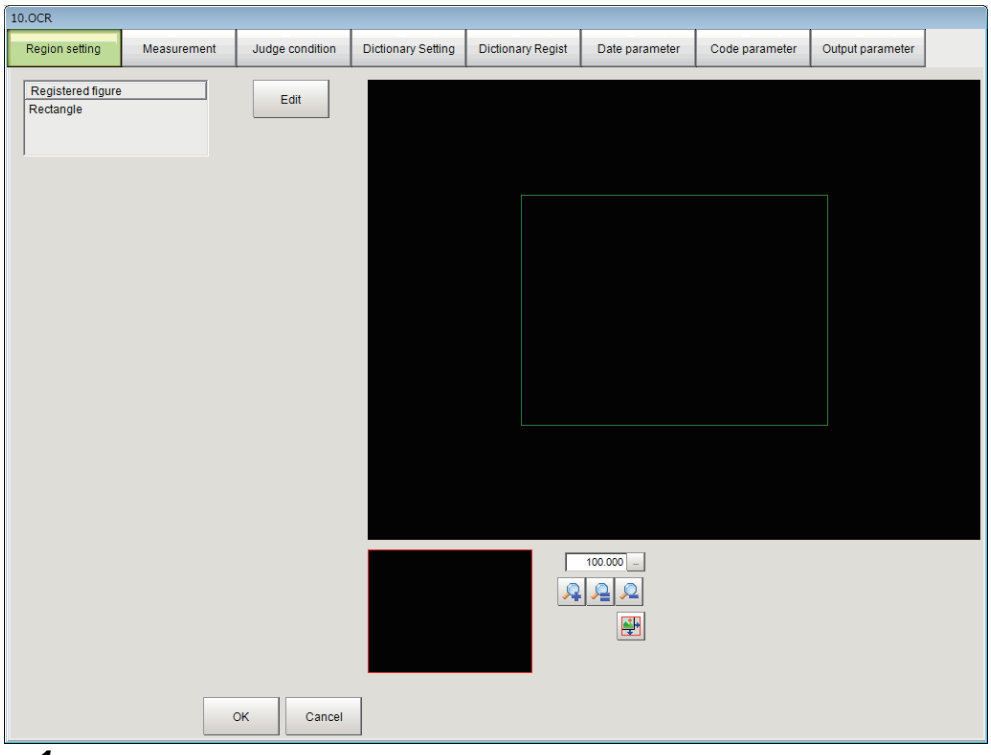
Item name	Description
Region setting	For the measurement region, set the region of the image over which you want to detect characters. By narrowing the measurement region (as opposed to measuring the entire input image), this function allows you to shorten the processing time. Refer to *2-32-2 Region Setting (OCR)* on page 2-469.

Item name	Description
Measurement	Set the measurement conditions. Refer to *2-32-3 Measurement Parameters (OCR)* on page 2-470.
Judgement condition	Set the conditions for judging the measurement results. Refer to *2-32-4 Judgement Conditions (OCR)* on page 2-474.
Dictionary Setting	Use this item to change the dictionary setting. Set the dictionary to be used for OCR. Refer to *2-32-5 Dictionary Settings (OCR)* on page 2-479.
Dictionary Regist	Use this item to perform dictionary registration. Registers characters to OCR User Dictionary as the registered dictionary. Refer to *2-32-6 Dictionary Registration (OCR)* on page 2-480.
Date parameter	Set the date and time format and update conditions. Refer to *2-32-7 Date Parameters (OCR)* on page 2-481.
Code parameter	Use this item to change code parameters. For the code parameters, set the format of code characters used to measure coded dates. Refer to *2-32-8 Code Parameters (OCR)* on page 2-484.
Output parameter	Use this item to change the output parameters. Set the conditions and parameters for outputting measurement results to other processing units or external devices. Refer to *2-32-9 Output Parameters (OCR)* on page 2-488.

2-32-2 Region Setting (OCR)

For the measurement region, set the region of the image over which you want to detect characters..

By narrowing the measurement region (as opposed to measuring the entire input image), this function allows you to shorten the processing time.



1 In the Item Tab area, click [Region setting].

2 Click [Edit].

3 Set the region over which the model is to be searched for.

4 Click [OK] in the Figure setting area.

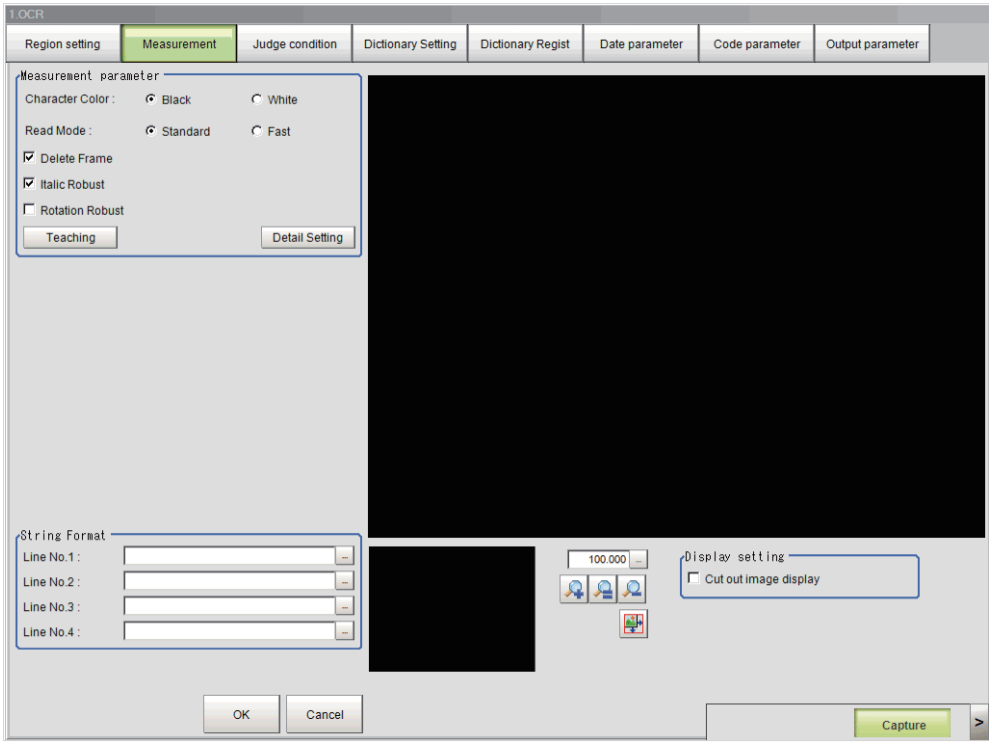
- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

Important

- The size of the measurement region should be at least 30 x 30 pixels.
- The measurement region should not include characters that exceed 32 characters x four lines.
- The measurement of a measurement region that the region height and width are 6,400 pix or more will be judged as NG.

2-32-3 Measurement Parameters (OCR)

Set the measurement conditions.



Setting the Measurement Parameters

Set the conditions for measurement processing and the parameters that are required for measurement.

1 Click [Measurement] in the Item Tab area.

2 In the measurement area, specify a value for each item.

Setting item	Setting value [Factory default]	Description
Character Color	• [Black] • White	Set the color of the characters to be recognized.
Read Mode	• [Normal] • Fast	Set the read mode used for OCR. When there is a large interval between characters, set “Fast”.
Delete Frame	• Unchecked • [Checked]	To remove as noise black pixels that border the measurement region, select “Delete Frame”.
Italic Robust	• Unchecked • [Checked]	If the characters you want to recognize are in italics, select “Italic Robust”.
Rotation Robust	• [Unchecked] • Checked	If the characters you want to recognize are rotated, select “Rotation Robust”. The rotation range is ±15 degrees.

3 Click “...” on each line from the first line to the fourth line in the string format area.

The “String setting” (character string settings) dialog box appears.

4 Set each character string.

Enter formats of the alphabetical characters or date to be read.

Examples of Acceptable Formats

- To recognize the text string "2014/01/01," enter "2014/01/01" in the string format area.
- To recognize four-digit numbers, enter as [####], where each "#" represents a number, in the string format area.

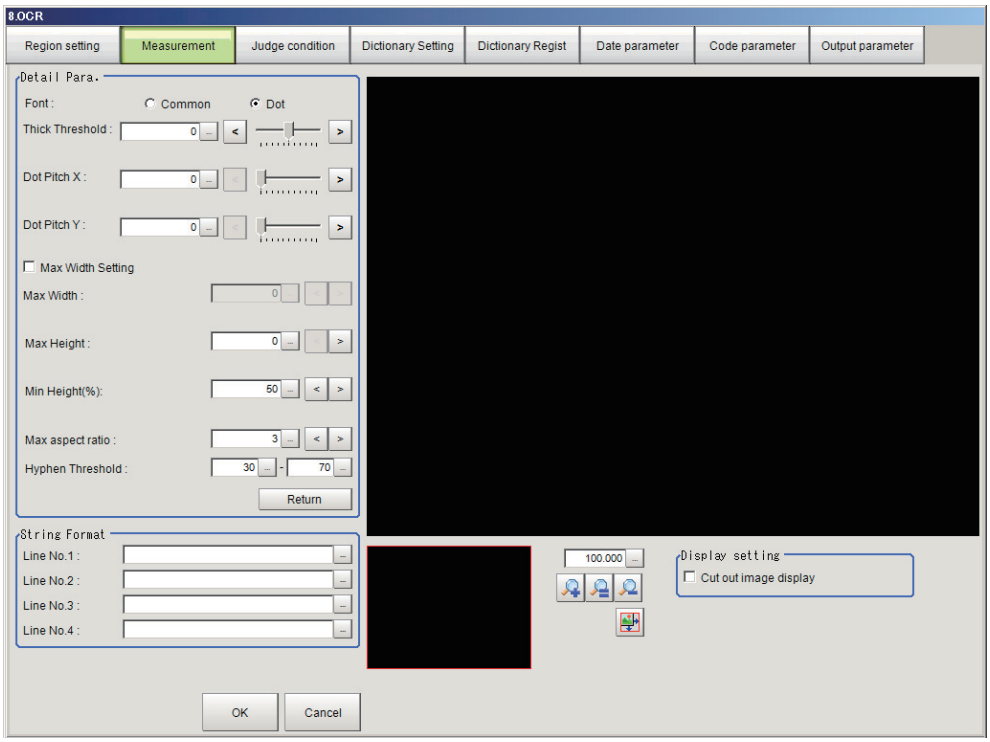
Important

String format settings are disabled when OCV is selected as the Inspection mode.

Label	Description
0 to 9	Normal numeric value input
A to Z	Normal alphabetic character input
' - . : /()	Normal symbol input
*	Uppercase alphabetic character judgement, Numeric character judgement and Symbol judgement
$	Uppercase alphabetic character judgement
#	Numeric character judgement
?	Uppercase alphabetic character judgement and numeric character judgement
@	Symbol judgement

5 Click [OK].

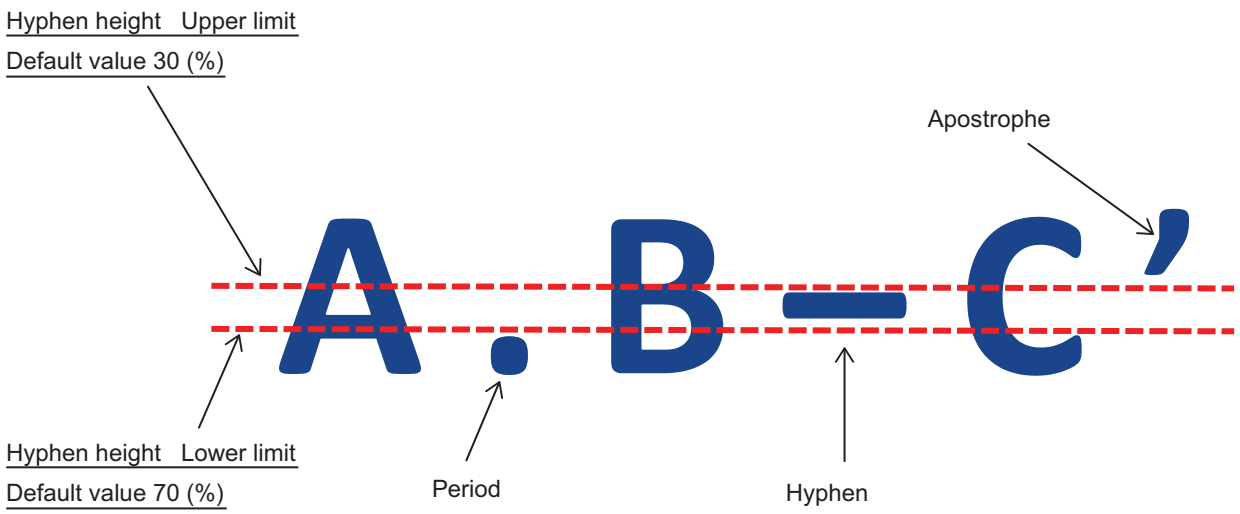
6 Click [Detail setting] in the measurement area and set each item.



Setting item	Setting value [Factory default]	Description
Font	• Common • [Dot]	Set the font of the characters to be recognized.
Thick Threshold	-128 to 128 [0]	Set the thickness of the characters to be recognized. If the cut-out characters have a fine shape or are broken, increase the “Thick Threshold” setting. To check the shape of cut-out characters, select “Cut out image display” in “Display setting”.
Dot Pitch X	0 to 99 [0]	Set the horizontal dot pitch of characters to be recognized. When the font is “Common”, set the horizontal width of character breaks. When the font is “Dot”, set the horizontal dot interval.
Dot Pitch Y	0 to 99 [0]	Set the vertical dot pitch of characters to be recognized. When the font is “Common”, set the vertical width of character breaks. When the font is “Dot”, set the vertical dot interval.
Max Width Setting	• [Unchecked] • Checked	Select this checkbox to set a maximum width for characters to be recognized.
Max Width	0 to 9,999 [0]	Set the maximum width of characters to be recognized.
Max Height	0 to 9,999 [0]	Set the maximum height of characters to be recognized.
Min Height(%)	0 to 100 [50]	Set the minimum height of characters to be recognized. Set the relative value (%) with respect to the maximum "Max Height". Characters below the Min Height(%) are recognized as symbols.

Setting item	Setting value [Factory default]	Description
Max aspect ratio	1 to 10 [3]	Set the maximum aspect ratio (calculated from height/width) of characters to be recognized. Characters with an aspect ratio greater than the “Max aspect ratio” are recognized as special characters or symbols. Special characters and symbols are determined by the specified character string format. • When number is specified, special characters are recognized as "I" or "J". • When alphabetical character is specified, special characters are recognized as "1". • When symbol is specified, special characters are recognized as ":".
Hyphen Threshold	0 to 100 [30] to [70]	Set an upper and lower height limit as a percentage of the neighboring character for recognition of characters as hyphens (-). Characters that fit between the upper and lower limits of the [Hyphen Threshold] are recognized as hyphens. Characters that are above the upper limit of the “Hyphen Threshold” are recognized as apostrophes ('), and characters that are below the lower limit of the “Hyphen Threshold” are recognized as periods.*

*Hyphen Threshold value



Teaching of Characters to be Recognized

The optimum measurement parameters can be set by teaching characters included in the image.

1 In the measurement area, click [Teaching].

The teaching screen appears.

Setting item	Setting value [Factory default]	Description
Teach without correct result	• Unchecked • [Checked]	Select this checkbox to teach without the correct result. If recognition does not stabilize, remove the checkmark and set the correct string.

2 Click “...” for the correct string on each line from the first line to the fourth line.

The character string setting screen appears.

3 Set the character string that is the correct result for teaching.

4 Click [OK].

The string setting screen closes and the correct string is set. To set the measurement result of this processing unit as the correct string, click “Measure Result Reflect”.

5 Click [OK].

Teaching is executed and the teaching screen closes. The teaching information is applied to the detailed parameters.

● Checking Measurement Results in the Image (Display Setting)

You can change the display settings to check the processing conditions for measurements on the image.

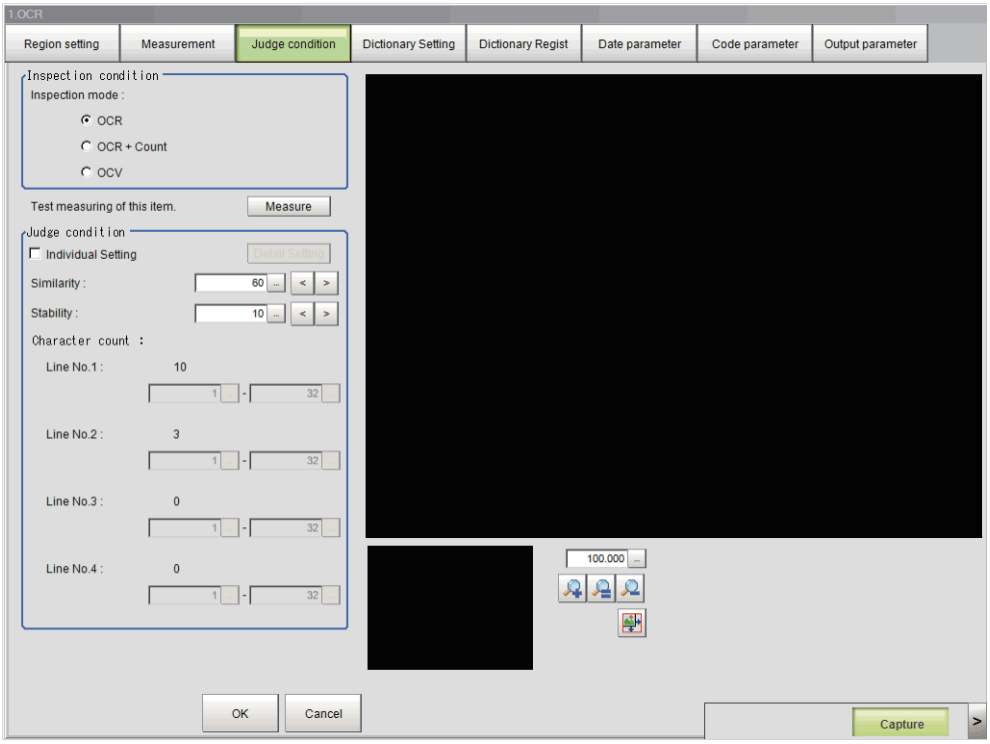
1 In the display setting area, set a value for each item.

2 Check the conditions of measurement processing on the image and set the measurement parameters.

Setting item	Setting value [Factory default]	Description
Cut out image display	• Checked • [Unchecked]	To check the shape of cut-out characters, select the “Cut out image display” checkbox. The gray region displayed in the cut-out image display is the region bounded by the [Dot Pitch Y] and [Dot Pitch X] parameters.

2-32-4 Judgement Conditions (OCR)

Set the conditions for judging the measurement results.



1 In the Item Tab area, click [Judgement condition].

2 In the inspection condition area, set a value for each item.

Setting item	Setting value [Factory default]	Description
Inspection mode		Set the inspection mode.
	• [OCR]	Read the printed character strings and inspect them with the Judge condition.
	• OCR + Count	Read the characters and check if the number of the characters is within the range set in Judge condition.*1
	• OCV	Read the characters and check if the character string is same as the verification string set in Judge condition.

*1. The Count inspection does not give judgment for the presence of character strings. If you set the number of characters for Line No.1 to No.4 as judge condition, when the system read the three lines of characters, inspection is executed for those three lines. No character is read for Line No. 4; however the judgment will not be NG.

Setting All Judgement Conditions by Line

Set judgement conditions for all characters by line.

1 In the judgement condition area, set a value for each item.

If you want to set the similarity and stability judgement conditions separately, click “Detail setting”.

Setting item	Setting value [Factory default]	Description
Individual Setting	• [Unchecked] • Checked	If you want to set the similarity and stability judgement conditions separately for each character, select the “Individual setting” checkbox. When the [Individual setting] checkbox is selected, “Detail setting” is enabled.
Similarity	0 to 100 [60]	Set a lower limit value for the similarity. The similarity is the level of resemblance of the character that is read to the font information of the correct string. The more the read character resembles the font information of the correct string, the higher the similarity.
Stability	0 to 100 [10]	Set a lower limit value for the stability. The stability is expressed as the value that results when the similarity of the second candidate for the read character is subtracted from the similarity of the first candidate. The lower the amount of difference in similarities between candidates, the higher the possibility that a character reading error will occur. If the 2nd candidate can not be detected, the stability is output as 100 regardless of the correlation of the 1st candidate. The result is “OK” when the stability is higher than the “Stability”.
Character count (Line No.1)	1 to 32 [1] to [32]	This can be set when “OCR + Count” is selected for the inspection mode. Set the judgement condition for the number of characters on the 1st line.
Character count (Line No.2)	1 to 32 [1] to [32]	This can be set when “OCR + Count” is selected for the inspection mode. Set the judgement condition for the number of characters on the 2nd line.

Setting item	Setting value [Factory default]	Description
Character count (Line No.3)	1 to 32 [1] to [32]	This can be set when “OCR + Count” is selected for the inspection mode. Set the judgement condition for the number of characters on the 3rd line.
Character count (Line No.4)	1 to 32 [1] to [32]	This can be set when “OCR + Count” is selected for the inspection mode. Set the judgement condition for the number of characters on the 4th line.
OCV Condition	• [Direct set] • Unit	This can be set when "OCV" is selected for the inspection mode. Select the specification method for specifying the character verification string. Use [Unit] if wanting to use the measurement results for other processing units in the measurement flow as the character verification string.
Unit	• [<None>] • Processing unit in the measurement flow	The setting is enabled if [OCV] is specified for the inspection mode and [Unit] is specified for the OCV condition. Select the processing unit with the measurement results that are to be used for the character verification string. A list of processing items that can be selected for the reference unit is given below. • 2DCode • Barcode
Verification String(Line No.1)	---	This can be set when “OCV” is selected for the inspection mode. Set the character string that you want to verify on the 1st line.*1
Verification String(Line No.2)	---	This can be set when “OCV” is selected for the inspection mode. Set the character string that you want to verify on the 2nd line.*1
Verification String(Line No.3)	---	This can be set when “OCV” is selected for the inspection mode. Set the character string that you want to verify on the 3rd line.*1
Verification String(Line No.4)	---	This can be set when “OCV” is selected for the inspection mode. Set the character string that you want to verify on the 4th line.*1
Verification limits 1	• [Unchecked] • Checked	The setting is enabled if [OCV] is specified for the inspection mode and [Unit] is specified for the OCV condition. Click on the [Verification limits 1] checkbox to turn it ON to verify the character string on the first line.
	1 to 1024 [1] to [1024]	The setting is enabled if [OCV] is specified for the inspection mode, [Unit] is specified for the OCV condition, and the [Verification limits 1] checkbox is checked. Set the range for the character string that is to be used as the character verification string on the first line of the measurement results for the processing unit specified by the reference unit.

Setting item	Setting value [Factory default]	Description
Verification limits 2	• [Unchecked] • Checked	The setting is enabled if [OCV] is specified for the inspection mode and [Unit] is specified for the OCV condition. Click on the [Verification limits 2] checkbox to turn it ON to verify the character string on the second line.
	1 to 1024 [1] to [1024]	The setting is enabled if [OCV] is specified for the inspection mode, [Unit] is specified for the OCV condition, and the [Verification limits 2] checkbox is checked. Set the range for the character string that is to be used as the character verification string on the second line of the measurement results for the processing unit specified by the reference unit.
Verification limits 3	• [Unchecked] • Checked	The setting is enabled if [OCV] is specified for the inspection mode and [Unit] is specified for the OCV condition. Click on the [Verification limits 3] checkbox to turn it ON to verify the character string on the third line.
	1 to 1024 [1] to [1024]	The setting is enabled if [OCV] is specified for the inspection mode, [Unit] is specified for the OCV condition, and the [Verification limits 3] checkbox is checked. Set the range for the character string that is to be used as the character verification string on the third line of the measurement results for the processing unit specified by the reference unit.
Verification limits 4	• [Unchecked] • Checked	The setting is enabled if [OCV] is specified for the inspection mode and [Unit] is specified for the OCV condition. Click on the [Verification limits 4] checkbox to turn it ON to verify the character string on the fourth line.
	1 to 1024 [1] to [1024]	The setting is enabled if [OCV] is specified for the inspection mode, [Unit] is specified for the OCV condition, and the [Verification limits 4] checkbox is checked. Set the range for the character string that is to be used as the character verification string on the fourth line of the measurement results for the processing unit specified by the reference unit.

*1. The characters that can be used for Verification String are shown in the table.

Examples of Acceptable Formats

To recognize a character string of <three upper-case alphabetic characters>-<four-digit current year>-<two-digit current month>, enter "$$$-####/##" in the string format area."

Label	Description
0 to 9	Normal numeric value input
A to Z	Normal alphabet input
‘ - . : /	Normal mark input
*	Character presence judgement
$	Number judgement
mYY	The last two digits of the current year
mYYYY	Four digits of the current year
mHH	Two digits of the current year in the Japanese Heisei calendar
mMM	Current month
mDD	Current day
mRR	Current hour
mNN	Current minute
vYY	The last two digits of the year after a set period of time
vYYYY	Four digits of the year after a set period of time
vHH	Two digits of the year after a set period of time in the Japanese Heisei calendar

Label	Description
vMM	Month after a set period of time
vDD	Day after a set period of time
eY1	Encrypted year 1
eM1	Encrypted month 1
eD1	Encrypted day 1
eR1	Encrypted hour 1
eN1	Encrypted minute 1
eY2	Encrypted year 2
eM2	Encrypted month 2
eD2	Encrypted day 2
eR2	Encrypted hour 2
eN2	Encrypted minute 2
iY1	Encrypted year 1 after a set period of time
iM1	Encrypted month 1 after a set period of time
iD1	Encrypted day 1 after a set period of time
iY2	Encrypted year 2 after a set period of time
iM2	Encrypted month 2 after a set period of time
iD2	Encrypted day 2 after a set period of time

Setting Judgement Conditions Individually by Character

Set judgement conditions for all characters individually by character.

1 In the judgement condition area, click [Detail setting].

The individual judgement condition area appears.

2 Set the items in the individual judgement condition area.

Setting item	Setting value [Factory default]	Description
Batch setting	• Unchecked • [Checked]	If you want to set the similarity and stability judgement conditions at once for all characters, select the “Batch setting” checkbox.
Lower limit of similarity	0 to 100 [60]	Set a lower limit value for the similarity.
Lower limit of stability	0 to 100 [10]	Set a lower limit value for the stability.

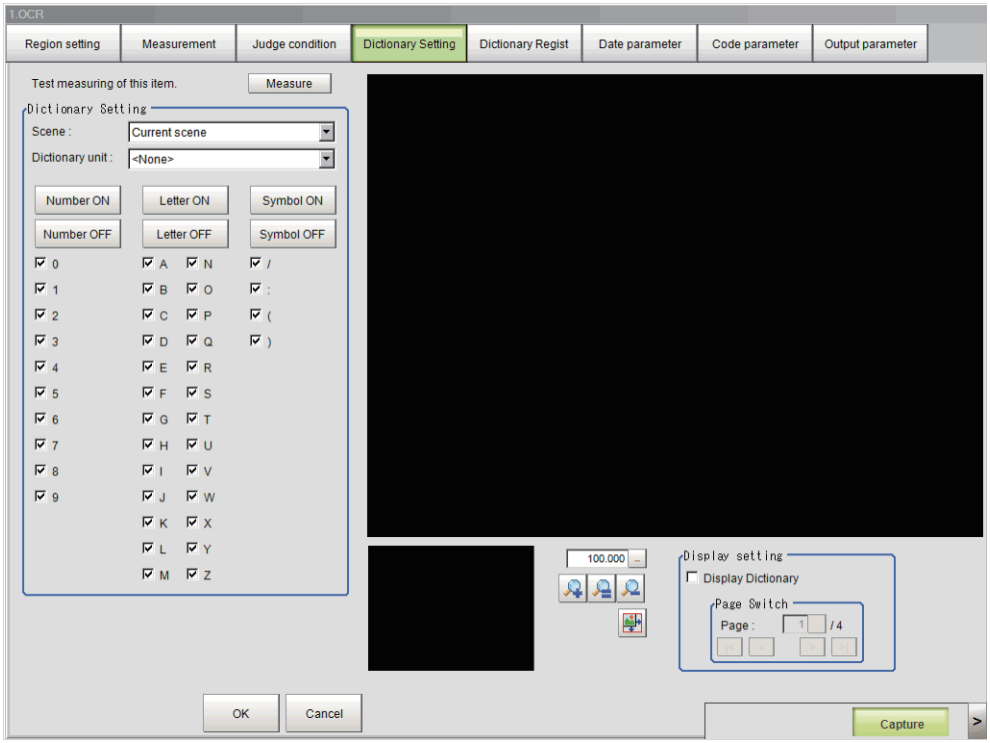
Additional Information

Each time a measurement is performed, the measurement result is displayed next to each item. You can use these values as a reference when setting the judgement conditions.

2-32-5 Dictionary Settings (OCR)

Use this item to change the dictionary settings.

Set the dictionary to be used for OCR.



Individually Selecting the Index Used for OCR

Individually set each index that is used and each index that is not used in the dictionary used for OCR.

1 In the Item Tab area, click [Dictionary Setting].

2 In the dictionary setting area, set a value for each item.

Setting item	Setting value [Factory default]	Description
Scene	-1 to 127 [-1: Current scene]	Set the scene number in which the dictionary unit to be used in OCR is registered
Dictionary unit	-1 to 9999 [-1: <None>]	Set the Processing Unit number for the OCR Dictionary Unit you want to use for OCR.
Character type specification	• Unchecked • [Checked]	Select the checkbox of the character type that you want to use for OCR. Unchecking the checkmark will cause the characters specified in [OCR user dictionary] to be disabled from use.

3 Click [Measure].

A test measurement of the measurement image is executed using the current settings, and the measurement results appear on the image. Check if the measurement is correct.

Selecting All Indexes Used for OCR at Once

Set all indexes that are used and not used at once in the dictionary used for OCR.

1 Click [Number ON].

The checkboxes for all numbers in the indexes are selected. Click “Number ON”, “Letter ON”, or “Symbol ON” depending on which type you want to select at once.

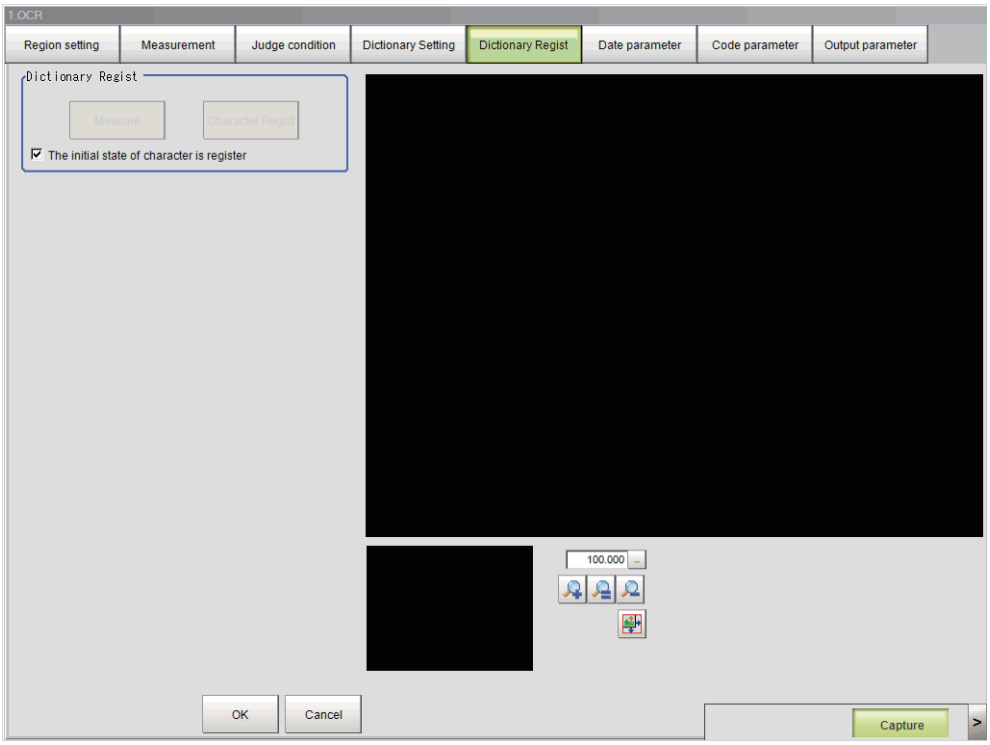
To remove all checkmarks, click “Number OFF”, “Letter OFF”, or “Symbol OFF” depending on which type you want to unselect at once.

2-32-6 Dictionary Registration (OCR)

Use this item to perform dictionary registration.

Dictionary registration consists of registering characters in a OCR user dictionary.

Set when you want to measure characters in a special font or when characters are incorrectly recognized.



1 In the Item Tab area, click [Dictionary Regist].

2 In the dictionary setting area, set a value for each item.

Setting item	Setting value [Factory default]	Description
The initial state of code is register	• [Checked] • Unchecked	To register all successfully measured characters in the dictionary after confirmation measurement, select the “The initial state of code is register” checkbox. The registration state of each character after confirmation measurement will be “register”.

3 Click [Measure].

Measurement is executed and the results appear on the image.

4 Click the characters on the image.

You can set “Regist or not” and “Character” for the clicked characters.

Setting item	Setting value [Factory default]	Description
Regist or not	• unregist • [register]	To register the characters in the dictionary, select “register”.
Character	0 to 9, A to Z, :/()	Set the character code of the character you want to register.

5 Click [Character Regist].

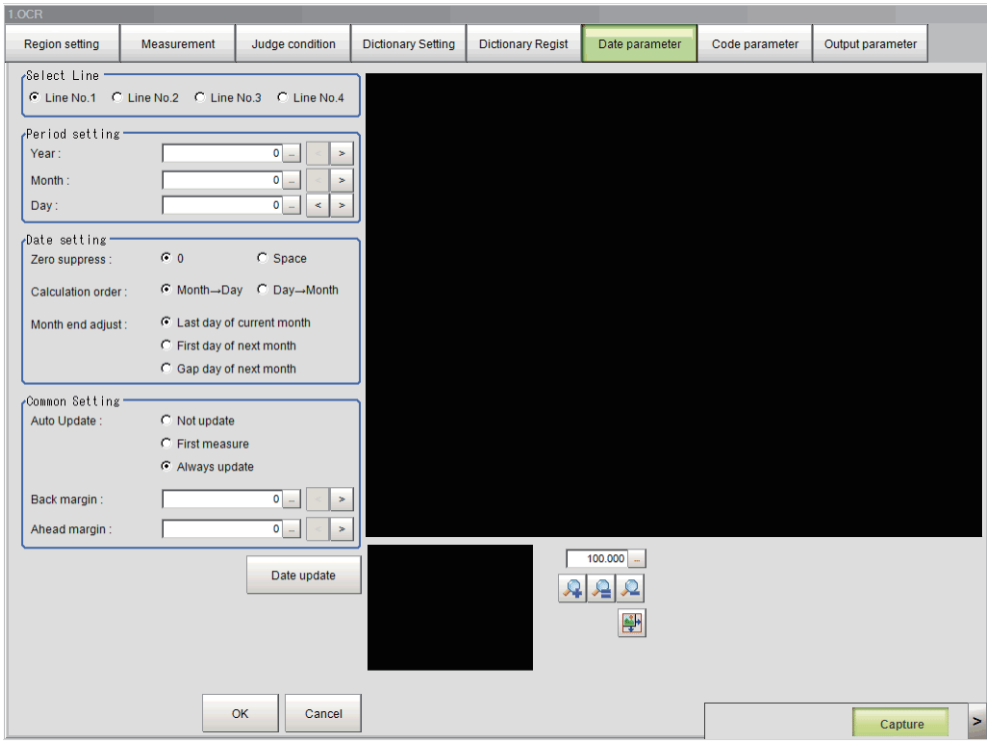
The characters set with “regist” in “Regist or not” and the character codes set with “Code” are registered in the OCR user dictionary processing unit set in “Dictionary unit” on the “Dictionary Setting” item tab, and the number of characters that were registered appears.

Important

If the settings are not configured on the “Dictionary Setting” item tab, [OCR User Dictionary] cannot be clicked. Always configure the dictionary settings before registering characters in the dictionary.

2-32-7 Date Parameters (OCR)

Set the date and time format and update conditions.



1 Click [Date parameter] in the Item Tab area.

2 In the Select Line (line selection) area, set a value for each item.

Setting item	Setting value [Factory default]	Description
Select Line	• [Line No.1] • Line No.2 • Line No.3 • Line No.4	Set the line to which the usage period that will be set in the subsequent step applies.

3 In the period setting area, set a value for each item.

Setting item	Setting value [Factory default]	Description
Year	0 to 99 [0]	Set the usage period from the current date.
Month	0 to 99 [0]	Set the usage period from the current date.
Day	-999 to 999 [0]	Set the usage period from the current date.

4 In the date setting area, set a value for each item.

Setting item	Setting value [Factory default]	Description
Zero suppress	• [0] • Space	Set the display method for the 10's digit when the month or day is a one-digit number.
Calculation order	• [Month→Day] • Day→Month	Set whether calculation starts from the month or the day when a usage period is set. The usage expiration date varies depending on the order of calculation, such as when the usage period spans a month that has 31 days and a month that has 30 days. Select this setting based on the calculation method used for the usage expiration date.
Month end adjust	• [Last day of current month] • First day of next month • Gap day of next month	Select the adjustment method to be used when a non-existent month and day result from calculation of the usage expiration date. Select this setting based on your actual management procedure. Example: January 31, usage expiration date is one month “Last day of current month” = February 28 “First day of next month” = March 1 “Gap day of next month” = March 3

5 In the common setting area, set a value for each item.

Setting item	Setting value [Factory default]	Description
Auto Update	• Not update • First measure • [Always update]	Select the condition for updating the date. The time is always updated. • Not update The date is not automatically updated. Update the date using the menu. • First measure The date is updated at the first measurement after the sensor controller is started up. When the controller is not kept running more than one day, the date is updated the first time measurement is performed after the controller is started up following a change of date. • [Always update] The date is updated when measurement is performed. When the controller is kept running more than one day, the date is updated the first time measurement is performed after the date changes.
Back margin	0 to 99 [0]	Set an appropriate count back time from the current time. Set in units of minutes. Set this when the printing time is different from the inspection time.
Ahead margin	0 to 99 [0]	Set an appropriate count forward time from the current time. Set in units of minutes. Set this when the printing time is different from the inspection time.

Click [Date update] to update the date information used for the verification characters.

Additional Information

Use the following examples as reference for setting of the date parameter.

E.g.1 Measurement is performed on 9/30, and the period setting is: Year: 1, Month: 1, Day: 1.

- [Month→Day]: A month is added to 9/30, and the result will be 10/30.
  A day is added to 10/30, and the result will be 10/31.
- [Day→Month]: A day is added to 9/30, and the result will be 10/1.
  A month is added to 10/1, and the result will be 11/1.

E.g.2 Measurement is performed on 1/31, and the period setting is: Year: 0, Month: 1, Day: 1.

- [Month→Day]: A month is added to 1/31, and the result will be 2/31.
  The month end adjustment will be applied since 2/31 does not exist.
  The result of the month end adjustment plus 1 will be the verification string.

Month end adjust	Result
Last day of current month	2/28
First day of next month	3/1
Gap day of next month	3/3

- [Day→Month]: A day is added to 1/31, and the result will be 2/1.
  The month end adjustment will not be applied since 2/31 exists.
  A month is added to 2/1, and the result will be 3/1.

E.g.3 Measurement is performed on 10/30, and the period setting is: Year: 0, Month: 1, Day: 1.

- [Month→Day]: A month is added to 10/30, and the result will be 11/30.
  The month end adjustment will not be applied since 11/30 exists.
  A day is added to 11/30, and the result will be 12/1.
- [Day→Month]: A day is added to 10/30, and the result will be 10/31.
  A month is added to 10/31, and the result will be 11/31.
  The month end adjustment will be applied since 11/31 does not exist.

Month end adjust	Result
Last day of current month	11/30
First day of next month	12/1
Gap day of next month	12/1

2-32-8 Code Parameters (OCR)

Use this item to change code parameters.

For the code parameters, set the format of code characters used to measure coded dates.

Important

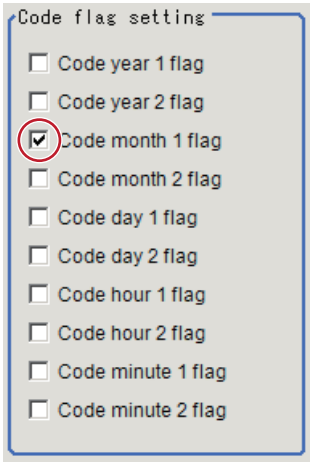
When a usage period is set, coded characters cannot be used in OCV.

Setting on the Screen

The setting procedure is explained below using the example of X as the code for October.

1 Click [Code parameter] in the Item Tab area.

2 Select the “Code month 1 flag” checkbox.

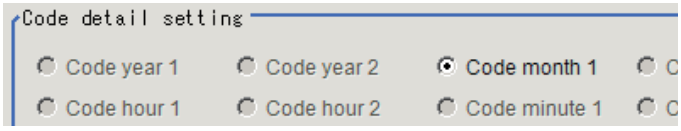


Additional Information

Code month 1 and Code month 2

Two code file patterns can be set to enable readiness for a setup change. Select the checkbox of the file to be used.

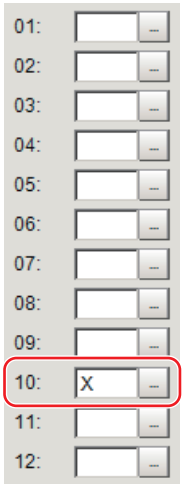
3 In the code detail setting area, select the “Code month 1 flag” checkbox.



4 Click [...] next to “10”.

A software keyboard appears. Enter “X”.

A maximum of four characters can be entered.



Setting on a computer

Code files are complex. Using a computer to configure settings reduces mistakes and allows easy editing.

By saving a blank CSV file, editing the file on a computer, and then loading the file, you can efficiently configure settings.

● Saving a Code File

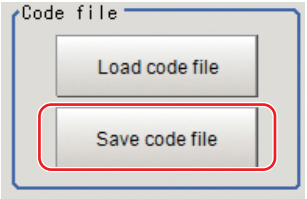
Create a blank file for editing on a computer.

If code parameters are already set on the screen, those settings are applied to the file that is saved.

1 Click [Code parameter] in the Item Tab area.

2 Select the checkboxes of the flags of the code character strings to be edited.

3 Click [Save code file] in the code file area.



4 Set the folder and file name and click [OK].

The code file (CSV format) is saved.

Format of the Code File

- “Item” appears on the 1st line.
- “Flag” appears on the 2nd line. To use the item, set “1”.
- On the 3rd and following lines, the code corresponding to each number appears.
  The month and day start from “1”.

4										
5										
6										
7										
8										
9										
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11										
12										
13										
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22										
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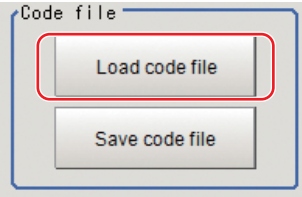
.										
98										
99										

Loading a Code File

1 Click [Code parameter] in the Item Tab area.

2 Click [Load code file] in the code file area.

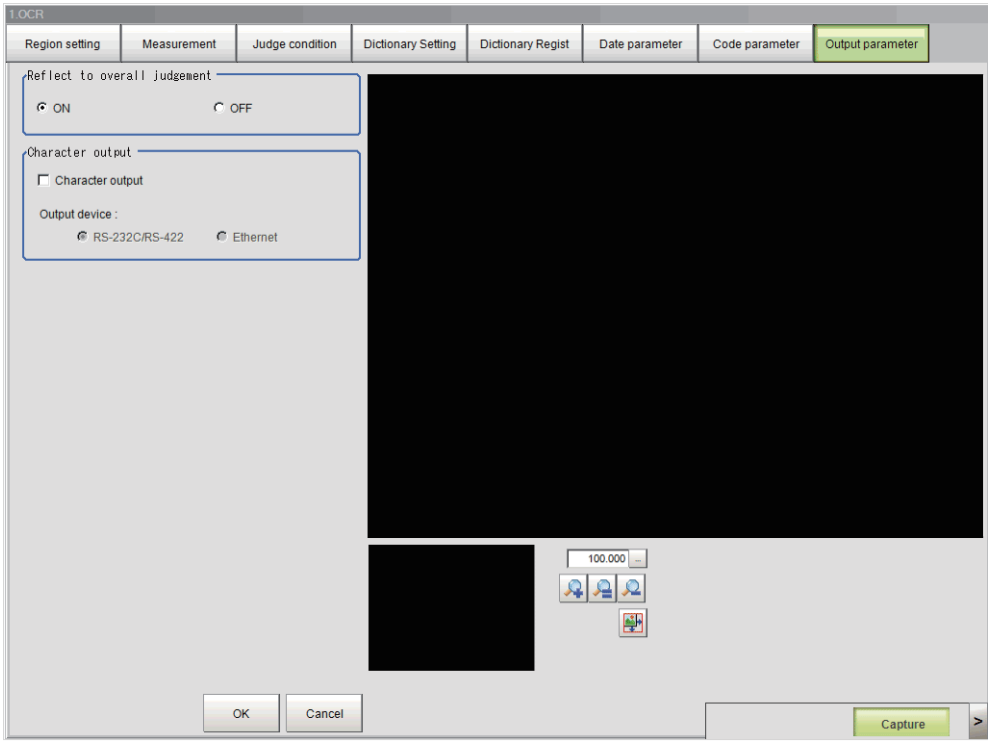


3 Select the code file (CSV format) to be loaded in the file selection screen, and click [OK].
The code file is loaded and displayed on the screen.

2-32-9 Output Parameters (OCR)

Use this item to change the output parameters.

The output parameters are the conditions and parameters for outputting measurement results to other processing units or external devices. Normally, the factory default values can be used.



1 Click [Output parameter] in the Item Tab area.

2 Specify a value for each item.

Setting item		Setting value [Factory default]	Description
Reflect to the overall judgement		• [ON] • OFF	Set whether the judgement result from this processing unit is applied to the overall scene judgement.
Character output	Character output	• [Unchecked] • Checked	Select whether recognized character strings are externally output.
	Output device	• [RS-232C/RS-422] • Ethernet	This can be set when the [Character output] checkbox is selected. Select the character output destination. Any characters such as kanji that are not ASCII code characters will not be correctly output. When Ethernet is selected, the destination IP address is determined by the system settings. For details, refer to *Non-procedure Communications in the Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Cat. No. Z342). The character string is output as follows. • When only one line is output Normal: String + NULL + Delimiter (CR) PLCLink: String + NULL + NULL • When two lines are output Normal: String + NULL + String + NULL + Delimiter (CR) PLCLink: string + NULL + string + NULL + NULL

Additional Information

If there are no character strings that have been read when character output is executed, NULL (0x00) is output.

2-32-10 Key Points for Test Measurement and Adjustment (OCR)

You can adjust the parameters while you perform test measurements and check the measurement results to increase the measurement precision and speed.

Select the adjustment method by considering the following point.

Check the measurement results that can be displayed and output in “Measurement Results for Which Output Is Possible”.

Refer to *2-32-11 Measurement Results for Which Output is Possible (OCR)* on page 2-493.

Additional Information

When you perform test measurement, the display of the details and image are updated according to the measurement results.

Items Displayed in the Detail Result Area

The following measurement results are displayed in the “Detail result” area as text.

Displayed items	Description
Judge	Displays the judgement result for the processing unit.
NG cause	When the judgement result of the processing unit is NG, a description of the NG is shown as the NG cause. 0: OK 1: OCV NG 2: Similarity NG 4: Stability NG 8: Character count NG When there are multiple NG causes, the sum of the NG cause values is output. Example: When a Similarity NG (2) and a Character count NG (8) occur, 10 is output in the NG cause.
Character count	Displays the number of characters in the detected character string.
Read string	Displays the detected character string.
Target string	Displays the verification string.

Items Displayed in the Image Display Area

You can specify a sub-image number to display the next image in the image display area.

Sub image number	Description
0	The measurement image appears.

When the Measurement Results Deviate or are Imprecise

You can use the following methods to improve measurement precision and stability.

● When the measurement results are unstable

Parameter to be adjusted	Troubleshooting
Measurement Refer to *2-32-3 Measurement Parameters (OCR)* on page 2-470	If the measurement region is large, excessive time may be required for measurement processing. Set as small a measurement region as possible.
	The [String format] (character string format) setting or correct string may not match the characters being read. Set a character format string that matches the characters being read, and check the teaching results.
	You may be using “Fast” mode to measure a character string with a small interval between characters. Set the read mode to “Normal”.
	The characters being measured may have a large height or a large width. Set a maximum aspect ratio for “Max aspect ratio” in “Detail setting” so that the ratio accords with the length and width of the characters being read. You can check the shape of the characters in the cut-out image display.

● When a specific character is misrecognized

Parameter to be adjusted	Troubleshooting
Dictionary Regist Refer to *2-32-6 Dictionary Registration (OCR)* on page 2-480	The character being read may be similar to another character in the dictionary in the processing item. Register the character being read in the dictionary.

● The result of date verification does not stabilize

Parameter to be adjusted	Troubleshooting
Date parameter Refer to *2-32-7 Date Parameters (OCR)* on page 2-481	One-digit and two-digit formats may be mixed together in the printed month/day. In the date settings, change the “Zero suppress” (10’s digit display) setting to match the actual printed format.

Adjusting the Processing Speed of Measurements

You can use the following methods to improve the measurement processing speed.

● When the processing speed is slow

Parameter to be adjusted	Troubleshooting
Region setting Refer to *2-32-2 Region Setting (OCR)* on page 2-469	If the measurement region is large, excessive time may be required for measurement processing. Set as small a measurement region as possible.
Measurement Refer to *2-32-3 Measurement Parameters (OCR)* on page 2-470	You may be using “Normal” mode to measure a character string with a large interval between characters. Set the read mode to “Fast”.
Date parameter Refer to *2-32-7 Date Parameters (OCR)* on page 2-481	In date verification, the margin set before and after the date may be too large. For date verification, set the “Back margin” and “Ahead margin” to a smaller value.

Adjusting Parameters Other Than Measurement Precision and Speed

You can use the following methods to adjust parameters other than measurement precision and speed.

● When teaching fails

Parameter to be adjusted	Troubleshooting
Measurement Refer to *2-32-3 Measurement Parameters (OCR)* on page 2-470	You may be using “Fast” mode to measure a character string with a small interval between characters. Set the read mode to “Normal”.
	The [String format] (character string format) setting or correct string may not match the characters being read. Set a character format string that matches the characters being read, and set the appropriate correct string.
	The characters being measured may have a large height or a large width. Set a maximum aspect ratio for “Max aspect ratio” in “Detail setting” so that the ratio accords with the length and width of the characters being read. You can check the shape of the characters in the cut-out image display.
	It is possible that a hyphen “-” or colon “:” is misrecognized. In “Detail setting”, set upper and lower limits for “Hyphen Threshold” (hyphen height) that accord with the characters being read.
	The characters being read may have a long and thin shape. Set a maximum character height for “Max Height” that accords with the shape of the characters being read. You can check the shape of the characters in the cut-out image display.
	The characters being read may be in close proximity to peripheral characters. Set the following parameters in the detailed settings. • Set a smaller value for “Thick Threshold” (the thickness level). • Set a smaller value for “Dot Pitch X” (the vertical dot interval) or “Dot Pitch Y” (the horizontal dot interval). • Select the “Max Width Setting” (maximum character width) checkbox and set the maximum character width.
	It is possible that the characters being read are faint, fine, or broken. Set the following parameters in the detailed settings. • Set a larger value for “Thick Threshold” (the thickness level). • Set a larger value for “Dot Pitch X” (the vertical dot interval) or “Dot Pitch Y” (the horizontal dot interval).
Dictionary Regist Refer to *2-32-6 Dictionary Registration (OCR)* on page 2-480	The character being read may be similar to another character in the dictionary in the processing item. Register the character being read in the dictionary.

2-32-11 Measurement Results for Which Output is Possible (OCR)

The measurement results provided by OCR are shown below. The measurement results appear in the "Detail Result" area, and you can also use result output processing items to output the measurement results to an external device.

Refer to the "External Reference Tables" for the parameters that can be referenced, including measurement results.

Refer to *2-32-12 External Reference Tables (OCR)* on page 2-497.

Measurement item	Character string	Description
Judge	JG	The judgement result of the processing unit
Chara. Num(Line No.1)	NUM0	Number of characters on the 1st line
Chara. Num(Line No.2)	NUM1	Number of characters on the 2nd line
Chara. Num(Line No.3)	NUM2	Number of characters on the 3rd line
Chara. Num(Line No.4)	NUM3	Number of characters on the 4th line
NG Cause(Line No.1)	LNG0	1st line NG cause
NG Cause(Line No.2)	LNG1	2nd line NG cause
NG Cause(Line No.3)	LNG2	3rd line NG cause
NG Cause(Line No.4)	LNG3	4th line NG cause

Output of Character String in PLC Link

In PLC Link communication, check the [Character output] to output the character string and NULL(0x00) +delimiter (NULL (0x00)) are output to the data output area of PLC Link.

Refer to *2-32-9 Output Parameters (OCR)* on page 2-488.

1 Output Format

Take the following case as an example.

Number of measurement is one. Reading character string is 32. Command: Read character strings 0123456789... UV, Response, and Data Output area are as follows.

For details, refer to *Communicating with PLC Link, Command Details for PLC Link, EtherNet/IP, and EtherCAT* in *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

- Command (PLC to Sensor Controller)

Top channel		Description
+3	+2	
0010	1010	Performs one measurement.

- Response (Sensor Controller to PLC)

Response Area		Description
Top channel	Data	
+2	1010	Command Code
+3	0010	Target response is responded.
+4	0000	Response code
+5	0000	Command execution result.

- Data Output Area (Sensor Controller to PLC)
  When output the 32 character strings (0123456789…UV), the result continues as follows.
  ASCII code data + NULL (0x00) +delimiter (NULL (0x00)).

Top channel	Name	Description
+0	1st character, 2nd character	3031 (ASCII code of the character 2 ASCII code of the character 1)
+1	3rd character, 4th character	3233 (ASCII code of the character 2 ASCII code of the character 3)
⋮		
+15ch	31st character, 32th character	5556 (ASCII code of the character U ASCII code of the character V)
+16ch	NULL, NULL	0x0000 (NULL, NULL)

Additional Information

- If no character string, outputs NULL(0x00) + Delimiter NULL(0x00).
  When check the [Error character output], output the error character string + NULL(0x00).
- When the character string is 2 bytes, i.e. Shift-JIS. the maximum number of character string is 16.
  Outputs one character per one channel.

2 How to get the character string

Perform the Data Output Request (DSA) and Data Output Completion (GATE) as in the case of Data Output.

All character string is included one data. Thereby, Data Output Request (DSA) is performed once if there is only one OCR unit.

Additional Information

- When output the multiple lines, NULL(0x00) is inserted between the lines and at the end of the last line.
  When the following case, output result is "ABC0x001230x000x00".
  - 1st line is "ABC"
  - 2nd line is "123"
- Cannot skip the blank lines. Lines after the blank line is not output.
- When the following case, output result is "ABC0x000x00".
  - 1st characters are "ABC"
  - 2nd characters are "DEF"
  - 3rd characters are "123"
  - 4th characters are "456" and 2nd line cannot be read.

Output of Character string with Non-procedure Communications

Check the [Character output] in Output parameter to output the character string and NULL (0x00) with Non-procedure communication.

Refer to *2-32-9 Output Parameters (OCR)* on page 2-488.

1 Output Format

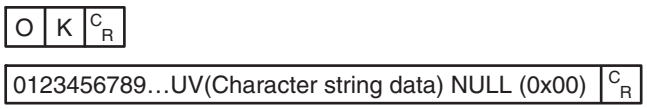
Take the following case as an example. Number of measurement is one.

Reading character string is 32. Read character strings 0123456789…UV, Command, Response, and Data Output area are as follows.

For details, refer to *Non-procedure Communications and MEASURE or M in Non-procedure Command Details* in *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

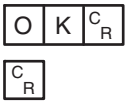
- Command (PLC to Sensor Controller)

- Response (Sensor Controller to PLC)



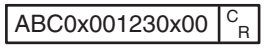
Additional Information

- If no character string, the response is as follows.

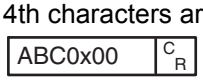


- When output the multiple lines, NULL(0x00) is inserted between the lines and at the end of the last line.

  When the following case, output result is "ABC0x001230x000x00".
  - 1st line is "ABC"
  - 2nd line is "123"



- Cannot skip the blank lines. Lines after the blank line is not output.
  When the following case, output result is "ABC0x00".
  - 1st characters are "ABC"
  - 2nd characters are "DEF"
  - 3rd characters are "123"
  - 4th characters are "456" and 2nd line cannot be read.



Output of Character string with EtherNet/IP Message Communications

In EtherNet/IP message communication, output of character string is possible using UNITDATA command which acquires the measurement value.

Outputs the character string data which is measured with OCR and NULL(0x00).

For details, refer to *Communicating with the Sensor Controller with EtherNet/IP Message Communications, Non-procedure Communications and UNITDATA or UD in Non-procedure Command Details* in *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

1 Output Format

Take the following case as an example. Send UNITDATA command. Reading character string is 32. Command, Response, and Data Output area are the followings.

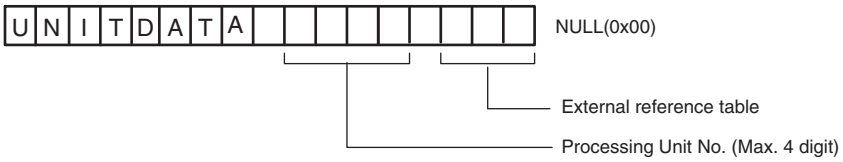
Described example is only a part of Attribute.

- Command (PLC to Sensor Controller)

  Specify the command character string equivalent to a non-procedure command.

  Attach NULL(0x00) at the end of the character string. No line feed code is required.

  The size of the send data includes the NULL(0x00) at the end of the character string.



- Response (Sensor Controller to PLC)

  Character string data equivalent to the Non-procedure command reception character string is returned. Null (0x00) is inserted in the reception character string delimiter section.

  The size of the reception data includes the final NULL(0x00).

  0123456789…UV(Character string data) NULL(0x00) O(0x4F) K(0x4b) NULL(0x00)

Additional Information

- If no character string, refer to the following.

  NULL(0x00) O(0x4F) K(0x4b) NULL(0x00)

- When output the multiple lines, change the external reference table No. of UNITDATA, and then read the character strings.

2-32-12 External Reference Tables (OCR)

By specifying a number, you can access the following data from processing items that support processing unit data setting/acquisition, and from control commands.

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
1	Chara. Num (Line No.1)	characterNum0	Get only	0 to 32
2	Chara. Num (Line No.2)	characterNum1	Get only	0 to 32
3	Chara. Num (Line No.3)	characterNum2	Get only	0 to 32
4	Chara. Num (Line No.4)	characterNum3	Get only	0 to 32
5	NG Cause (Line No.1)	lineNGCause0	Get only	0x0000 to 0x000F
6	NG Cause (Line No.2)	lineNGCause1	Get only	0x0000 to 0x000F
7	NG Cause (Line No.3)	lineNGCause2	Get only	0x0000 to 0x000F
8	NG Cause (Line No.4)	lineNGCause3	Get only	0x0000 to 0x000F
20	Read string (Line No.1)	readString0	Get only	Character string
21	Read string (Line No.2)	readString1	Get only	Character string
22	Read string (Line No.3)	readString2	Get only	Character string
23	Read string (Line No.4)	readString3	Get only	Character string
30	Target String (Line No.1)	targetString0	Get only	Character string
31	Target String (Line No.2)	targetString1	Get only	Character string
32	Target String (Line No.3)	targetString2	Get only	Character string
33	Target String (Line No.4)	targetString3	Get only	Character string
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
104	Character output	outputFlag	Set/Get	0: OFF 1: ON
105	Character output destination	outputDevice	Set/Get	0: RS-232C/RS-422 1: Ethernet
110	Read Mode	readMode	Set/Get	0: Standard 1: Fast
120	Character color	characterColor	Set/Get	0: Black 1: White
121	Delete Frame	deleteFrame	Set/Get	0: OFF 1: ON
122	Italic Robust	italicRobust	Set/Get	0: OFF 1: ON

No.	Data Name	Ident	Set/Get	Data range
123	Rotation Robust	rotationRobust	Set/Get	0: OFF 1: ON
124	Hyphen Low Threshold	hyphenHighThreshold	Set/Get	0 to 100
125	Hyphen High Threshold	hyphenLowThreshold	Set/Get	0 to 100
126	Font No.	fontNo	Set/Get	0: Common dictionary 1: Dot dictionary
127	Thick Threshold	threshold	Set/Get	-128 to 128
128	Dot Pitch X	dotPitchX	Set/Get	0 to 99
129	Dot pitch Y	dotPitchY	Set/Get	0 to 99
130	Max Width Setting Flag	maxWidthSettingManual	Set/Get	0: OFF 1: ON
131	Max Width	maxWidth	Set/Get	0 to 9,999
132	Max Height	maxHeight	Set/Get	0 to 9,999
133	Min Height [%]	minHeight	Set/Get	0 to 100
135	Max aspect ratio	longCharaThreshold	Set/Get	1 to 10
136	Inspection mode	checkMode	Set/Get	0: OCR 1: OCR + Count 2: OCV
137	Similarity/Stability Individual setting	respectiveSetting	Set/Get	0: OFF 1: ON
138	Lower Limit of similarity	judgeScore	Set/Get	0 to 100
139	Lower Limit of stability	judgeDiff	Set/Get	0 to 100
140	Dictionary Scene No.	dicScene	Set/Get	-1: Current scene 0 to 9,999
141	Dictionary Unit No.	dicUnit	Set/Get	-1: OFF 0 to 9,999
142	Teach without correct result	liteTeach	Set/Get	0: OFF 1: ON
143	The initial state of character is register	isRegisterAll	Set/Get	0: OFF 1: ON
144	Setting type of reference verification string	checkSet	Set/Get	0: Direct 1: Unit
145	Setting unit of reference verification string	unitChoose	Set/Get	-1: OFF 0 to 9,999
200	Teaching String (Line No.1)	teachString0	Set/Get	Character string
201	Teaching String (Line No.2)	teachString1	Set/Get	Character string
202	Teaching String (Line No.3)	teachString2	Set/Get	Character string
203	Teaching String (Line No.4)	teachString3	Set/Get	Character string
210	Format String (Line No.1)	formatString0	Set/Get	Character string
211	Format String (Line No.2)	formatString1	Set/Get	Character string
212	Format String (Line No.3)	formatString2	Set/Get	Character string
213	Format String (Line No.4)	formatString3	Set/Get	Character string
220	Compare String (Line No.1)	compareString0	Set/Get	Character string

No.	Data Name	Ident	Set/Get	Data range
221	Compare String (Line No.2)	compareString1	Set/Get	Character string
222	Compare String (Line No.3)	compareString2	Set/Get	Character string
223	Compare String (Line No.4)	compareString3	Set/Get	Character string
230	Lower Limit of Chara. Num (Line No.1)	lowerCharacterCount0	Set/Get	1 to 32
231	Lower Limit of Chara. Num (Line No.2)	lowerCharacterCount1	Set/Get	1 to 32
232	Lower Limit of Chara. Num (Line No.3)	lowerCharacterCount2	Set/Get	1 to 32
233	Lower Limit of Chara. Num (Line No.4)	lowerCharacterCount3	Set/Get	1 to 32
240	Upper Limit of Chara. Num (Line No.1)	upperCharacterCount0	Set/Get	1 to 32
241	Upper Limit of Chara. Num (Line No.2)	upperCharacterCount1	Set/Get	1 to 32
242	Upper Limit of Chara. Num (Line No.3)	upperCharacterCount2	Set/Get	1 to 32
243	Upper Limit of Chara. Num (Line No.4)	upperCharacterCount3	Set/Get	1 to 32
250	Lower limit of verification string (Line No.1)	unitCompareLow0	Set/Get	1 to 3,200
251	Lower limit of verification string (Line No.2)	unitCompareLow1	Set/Get	1 to 3,200
252	Lower limit of verification string (Line No.3)	unitCompareLow2	Set/Get	1 to 3,200
253	Lower limit of verification string (Line No.4)	unitCompareLow3	Set/Get	1 to 3,200
260	Upper limit of verification string (Line No.1)	unitCompareUpp0	Set/Get	1 to 3,200
261	Upper limit of verification string (Line No.2)	unitCompareUpp1	Set/Get	1 to 3,200
262	Upper limit of verification string (Line No.3)	unitCompareUpp2	Set/Get	1 to 3,200
263	Upper limit of verification string (Line No.4)	unitCompareUpp3	Set/Get	1 to 3,200
270	Verification string (Line No.1) flag	chkChoose1	Set/Get	0: Disable 1: Enable
271	Verification string (Line No.2) flag	chkChoose2	Set/Get	0: Disable 1: Enable
272	Verification string (Line No.3) flag	chkChoose3	Set/Get	0: Disable 1: Enable
273	Verification string (Line No.4) flag	chkChoose4	Set/Get	0: Disable 1: Enable
300+N (N: 0 to 39)	Lower Limit of similarity	lowerScore	Set/Get	0 to 100
400+N (N: 0 to 39)	Lower Limit of stability	lowerDiff	Set/Get	0 to 100
500+N (N: 0 to 39)	Dictionary Enable Flag	enableDB	Set/Get	0: Not used 1: Used

No.	Data Name	Ident	Set/Get	Data range
1128	Auto Update	autoUpdate	Set/Get	0: Not update 1: First measurement after startup 2: Always update
1132	Back margin	forwardMargin	Set/Get	0 to 99
1133	Ahead margin	backMargin	Set/Get	0 to 99
1134	Code year 1 flag	flagYear1	Set/Get	0: Not used 1: Used
1135	Code year 2 flag	flagYear2	Set/Get	0: Not used 1: Used
1136	Code month 1 flag	flagMonth1	Set/Get	0: Not used 1: Used
1137	Code month 2 flag	flagMonth2	Set/Get	0: Not used 1: Used
1138	Code day 1 flag	flagDay1	Set/Get	0: Not used 1: Used
1139	Code day 2 flag	flagDay2	Set/Get	0: Not used 1: Used
1140	Code hour 1 flag	flagHour1	Set/Get	0: Not used 1: Used
1141	Code hour 2 flag	flagHour2	Set/Get	0: Not used 1: Used
1142	Code minute 1 flag	flagMinute1	Set/Get	0: Not used 1: Used
1143	Code minute 2 flag	flagMinute2	Set/Get	0: Not used 1: Used
1150	String year 1 flag	stringYear1	Set/Get	Character string
1151	String year 2 flag	stringYear2	Set/Get	Character string
1152	String month 1 flag	stringMonth1	Set/Get	Character string
1153	String month 2 flag	stringMonth2	Set/Get	Character string
1154	String day 1 flag	stringDay1	Set/Get	Character string
1155	String day 2 flag	stringDay2	Set/Get	Character string
1156	String hour 1 flag	stringHour1	Set/Get	Character string
1157	String hour 2 flag	stringHour2	Set/Get	Character string
1158	String minute 1 flag	stringMinute1	Set/Get	Character string
1159	String minute 2 flag	stringMinute2	Set/Get	Character string
1160	Operation code number	operateStringNo	Set/Get	0 to 99
2000	Term year (Line No.1)	termYear0	Set/Get	0 to 99
2001	Term year (Line No.2)	termYear1	Set/Get	0 to 99
2002	Term year (Line No.3)	termYear2	Set/Get	0 to 99
2003	Term year (Line No.4)	termYear3	Set/Get	0 to 99
2004	Term month (Line No.1)	termMonth0	Set/Get	0 to 99
2005	Term month (Line No.2)	termMonth1	Set/Get	0 to 99
2006	Term month (Line No.3)	termMonth2	Set/Get	0 to 99
2007	Term month (Line No.4)	termMonth3	Set/Get	0 to 99
2008	Term day (Line No.1)	termDay0	Set/Get	-999 to +999
2009	Term day (Line No.2)	termDay1	Set/Get	-999 to +999
2010	Term day (Line No.3)	termDay2	Set/Get	-999 to +999
2011	Term day (Line No.4)	termDay3	Set/Get	-999 to +999
2012	Zero suppress (Line No.1)	zeroSuppress0	Set/Get	0: 0 1: Space

No.	Data Name	Ident	Set/Get	Data range
2013	Zero suppress (Line No.2)	zeroSuppress1	Set/Get	0: 0 1: Space
2014	Zero suppress (Line No.3)	zeroSuppress2	Set/Get	0: 0 1: Space
2005	Zero suppress (Line No.4)	zeroSuppress3	Set/Get	0: 0 1: Space
2016	Calculation order (Line No.1)	orderMonthDay0	Set/Get	0: Month → Day 1: Day → Month
2017	Calculation order (Line No.2)	orderMonthDay1	Set/Get	0: Month → Day 1: Day → Month
2018	Calculation order (Line No.3)	orderMonthDay2	Set/Get	0: Month → Day 1: Day → Month
2019	Calculation order (Line No.4)	orderMonthDay3	Set/Get	0: Month → Day 1: Day → Month
2020	Month end adjust (Line No.1)	adjustMonthEnd0	Set/Get	0: Last day of now 1: First day of next 2: Gap day of next
2021	Month end adjust (Line No.2)	adjustMonthEnd1	Set/Get	0: Last day of now 1: First day of next 2: Gap day of next
2022	Month end adjust (Line No.3)	adjustMonthEnd2	Set/Get	0: Last day of now 1: First day of next 2: Gap day of next
2023	Month end adjust (Line No.4)	adjustMonthEnd3	Set/Get	0: Last day of now 1: First day of next 2: Gap day of next
3000+N (N: 0 to 99)	String year 1 data	stringYear1_	Set/Get	Character string
3100+N (N: 0 to 99)	String year 2 data	stringYear2_	Set/Get	Character string
3200	String month 1 data 1	stringMonth1_00	Set/Get	Character string
3201	String month 1 data 2	stringMonth1_01	Set/Get	Character string
3202	String month 1 data 3	stringMonth1_02	Set/Get	Character string
3203	String month 1 data 4	stringMonth1_03	Set/Get	Character string
3204	String month 1 data 5	stringMonth1_04	Set/Get	Character string
3205	String month 1 data 6	stringMonth1_05	Set/Get	Character string
3206	String month 1 data 7	stringMonth1_06	Set/Get	Character string
3207	String month 1 data 8	stringMonth1_07	Set/Get	Character string
3208	String month 1 data 9	stringMonth1_08	Set/Get	Character string
3209	String month 1 data 10	stringMonth1_09	Set/Get	Character string
3210	String month 1 data 11	stringMonth1_10	Set/Get	Character string
3211	String month 1 data 12	stringMonth1_11	Set/Get	Character string
3300	String month 2 data 1	stringMonth2_00	Set/Get	Character string
3301	String month 2 data 2	stringMonth2_01	Set/Get	Character string
3302	String month 2 data 3	stringMonth2_02	Set/Get	Character string
3303	String month 2 data 4	stringMonth2_03	Set/Get	Character string
3304	String month 2 data 5	stringMonth2_04	Set/Get	Character string
3305	String month 2 data 6	stringMonth2_05	Set/Get	Character string
3306	String month 2 data 7	stringMonth2_06	Set/Get	Character string
3307	String month 2 data 8	stringMonth2_07	Set/Get	Character string
3308	String month 2 data 9	stringMonth2_08	Set/Get	Character string

No.	Data Name	Ident	Set/Get	Data range
3309	String month 2 data 10	stringMonth2_09	Set/Get	Character string
3310	String month 2 data 11	stringMonth2_10	Set/Get	Character string
3311	String month 2 data 12	stringMonth2_11	Set/Get	Character string
3400	String day 1 data 1	stringDay1_00	Set/Get	Character string
3401	String day 1 data 2	stringDay1_01	Set/Get	Character string
3402	String day 1 data 3	stringDay1_02	Set/Get	Character string
3403	String day 1 data 4	stringDay1_03	Set/Get	Character string
3404	String day 1 data 5	stringDay1_04	Set/Get	Character string
3405	String day 1 data 6	stringDay1_05	Set/Get	Character string
3406	String day 1 data 7	stringDay1_06	Set/Get	Character string
3407	String day 1 data 8	stringDay1_07	Set/Get	Character string
3408	String day 1 data 9	stringDay1_08	Set/Get	Character string
3409	String day 1 data 10	stringDay1_09	Set/Get	Character string
3410	String day 1 data 11	stringDay1_10	Set/Get	Character string
3411	String day 1 data 12	stringDay1_11	Set/Get	Character string
3412	String day 1 data 13	stringDay1_12	Set/Get	Character string
3413	String day 1 data 14	stringDay1_13	Set/Get	Character string
3414	String day 1 data 15	stringDay1_14	Set/Get	Character string
3415	String day 1 data 16	stringDay1_15	Set/Get	Character string
3416	String day 1 data 17	stringDay1_16	Set/Get	Character string
3417	String day 1 data 18	stringDay1_17	Set/Get	Character string
3418	String day 1 data 19	stringDay1_18	Set/Get	Character string
3419	String day 1 data 20	stringDay1_19	Set/Get	Character string
3420	String day 1 data 21	stringDay1_20	Set/Get	Character string
3421	String day 1 data 22	stringDay1_21	Set/Get	Character string
3422	String day 1 data 23	stringDay1_22	Set/Get	Character string
3423	String day 1 data 24	stringDay1_23	Set/Get	Character string
3424	String day 1 data 25	stringDay1_24	Set/Get	Character string
3425	String day 1 data 26	stringDay1_25	Set/Get	Character string
3426	String day 1 data 27	stringDay1_26	Set/Get	Character string
3427	String day 1 data 28	stringDay1_27	Set/Get	Character string
3428	String day 1 data 29	stringDay1_28	Set/Get	Character string
3429	String day 1 data 30	stringDay1_29	Set/Get	Character string
3430	String day 1 data 31	stringDay1_30	Set/Get	Character string
3500	String day 2 data 1	stringDay2_00	Set/Get	Character string
3501	String day 2 data 2	stringDay2_01	Set/Get	Character string
3502	String day 2 data 3	stringDay2_02	Set/Get	Character string
3503	String day 2 data 4	stringDay2_03	Set/Get	Character string
3504	String day 2 data 5	stringDay2_04	Set/Get	Character string
3505	String day 2 data 6	stringDay2_05	Set/Get	Character string
3506	String day 2 data 7	stringDay2_06	Set/Get	Character string
3507	String day 2 data 8	stringDay2_07	Set/Get	Character string
3508	String day 2 data 9	stringDay2_08	Set/Get	Character string
3509	String day 2 data 10	stringDay2_09	Set/Get	Character string
3510	String day 2 data 11	stringDay2_10	Set/Get	Character string
3511	String day 2 data 12	stringDay2_11	Set/Get	Character string
3512	String day 2 data 13	stringDay2_12	Set/Get	Character string
3513	String day 2 data 14	stringDay2_13	Set/Get	Character string
3514	String day 2 data 15	stringDay2_14	Set/Get	Character string
3515	String day 2 data 16	stringDay2_15	Set/Get	Character string
3516	String day 2 data 17	stringDay2_16	Set/Get	Character string
3517	String day 2 data 18	stringDay2_17	Set/Get	Character string
3518	String day 2 data 19	stringDay2_18	Set/Get	Character string

No.	Data Name	Ident	Set/Get	Data range
3519	String day 2 data 20	stringDay2_19	Set/Get	Character string
3520	String day 2 data 21	stringDay2_20	Set/Get	Character string
3521	String day 2 data 22	stringDay2_21	Set/Get	Character string
3522	String day 2 data 23	stringDay2_22	Set/Get	Character string
3523	String day 2 data 24	stringDay2_23	Set/Get	Character string
3524	String day 2 data 25	stringDay2_24	Set/Get	Character string
3525	String day 2 data 26	stringDay2_25	Set/Get	Character string
3526	String day 2 data 27	stringDay2_26	Set/Get	Character string
3527	String day 2 data 28	stringDay2_27	Set/Get	Character string
3528	String day 2 data 29	stringDay2_28	Set/Get	Character string
3529	String day 2 data 30	stringDay2_29	Set/Get	Character string
3530	String day 2 data 31	stringDay2_30	Set/Get	Character string
3600+N (N: 0 to 23)	String hour 1 data	stringHour1_	Set/Get	Character string
3700+N (N: 0 to 23)	String hour 2 data	stringHour2_	Set/Get	Character string
3800+N (N: 0 to 59)	String minute 1 data	stringMinute1_	Set/Get	Character string
3900+N (N: 0 to 59)	String minute 2 data	stringMinute2_	Set/Get	Character string
10000+N (N: 0 to 31)	Character code (Line No.1)	charCode0_	Get only	0 to 0xFFFF
11000+N (N: 0 to 31)	Character code (Line No.2)	charCode1_	Get only	0 to 0xFFFF
12000+N (N: 0 to 31)	Character code (Line No.3)	charCode2_	Get only	0 to 0xFFFF
13000+N (N: 0 to 31)	Character code (Line No.4)	charCode3_	Get only	0 to 0xFFFF
20000+N (N: 0 to 31)	NG Clause (Line No.1)	ngCause0_	Get only	0 to 15
21000+N (N: 0 to 31)	NG Clause (Line No.2)	ngCause1_	Get only	0 to 15
22000+N (N: 0 to 31)	NG Clause (Line No.3)	ngCause2_	Get only	0 to 15
23000+N (N: 0 to 31)	NG Clause (Line No.4)	ngCause3_	Get only	0 to 15
30000+N (N: 0 to 31)	Similarity (Line No.1)	similarity0_	Get only	0 to 100
31000+N (N: 0 to 31)	Similarity (Line No.2)	similarity1_	Get only	0 to 100
32000+N (N: 0 to 31)	Similarity (Line No.3)	similarity2_	Get only	0 to 100
33000+N (N: 0 to 31)	Similarity (Line No.4)	similarity3_	Get only	0 to 100
40000+N (N: 0 to 31)	Stability (Line No.1)	stability0_	Get only	0 to 100
41000+N (N: 0 to 31)	Stability (Line No.2)	stability1_	Get only	0 to 100
42000+N (N: 0 to 31)	Stability (Line No.3)	stability2_	Get only	0 to 100

No.	Data Name	Ident	Set/Get	Data range
43000+N (N: 0 to 31)	Stability (Line No.4)	stability3_	Get only	0 to 100
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

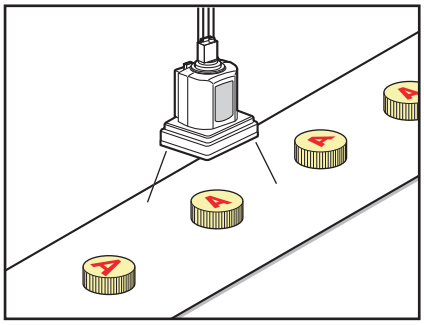
2-33 Circle Angle

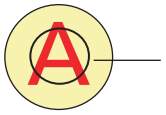
This processing item can not be used in the FHV series.

Used in the Following Case

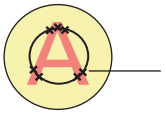
To correct the tilting of circle measurement objects

Example) Appearance measurement while correcting the nut rotation

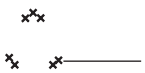




Draw a circle to encircle the part that has the basic features of the image in order to define the registering conditions for featured points/measured points.

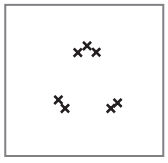


Based on the conditions defined on the sensor controller, inspect the featured points on the circumference with the pixel unit, which will be registered as the reference position.

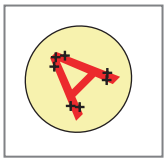


(Featured points for the reference position)

Reference image



Input image



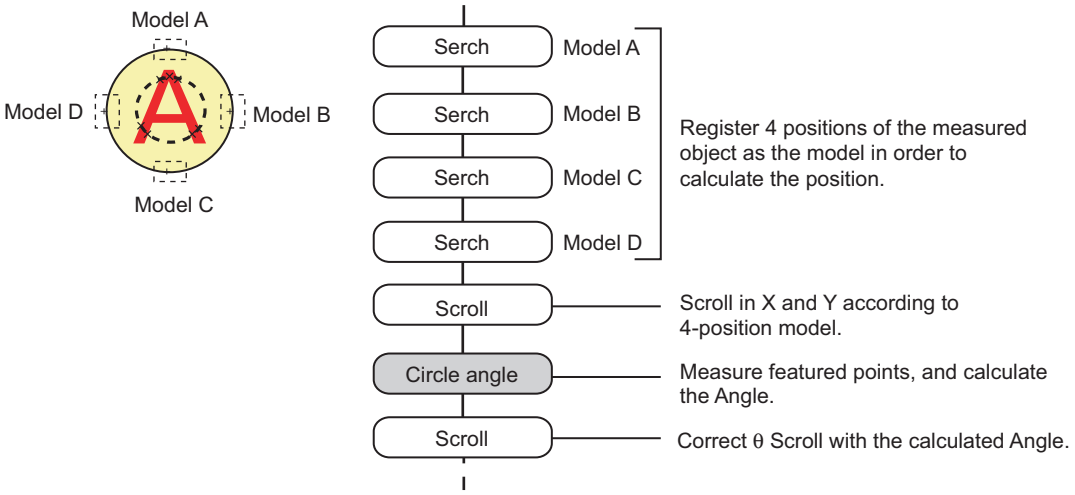
The degree of angle is calculated by comparing the featured points of the reference image with those of the input image.

Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

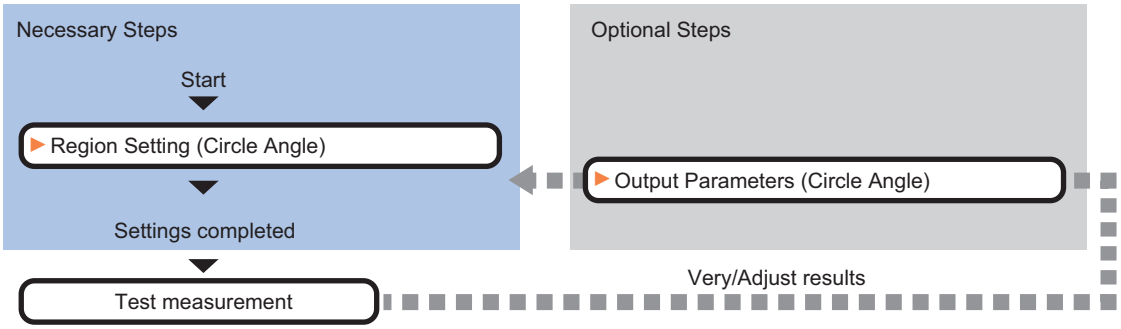
Additional Information

The center position of the measured object should be always fixed in order to efficiently use the Circle Angle. Prior to Circle Angle, processing items related to position correction should be performed, making the central coordinates of the measurement object stay at a fixed position.
Example)



2-33-1 Settings Flow (Circle Angle)

The Circle Angle should be set up with the following procedure.



List of Circle Angle Items

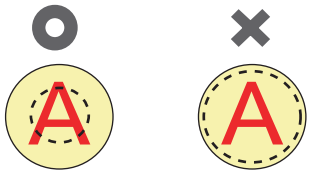
Item name	Description
Region setting	This item is used to set up the measurement area. Instead of measuring the entire input image, narrowing the measurement area shortens the processing time. If measurement results are unstable, change detection conditions as needed. Normally, the factory default value will be used. Refer to *2-33-2 Region Setting (Circle Angle)* on page 2-507.
Output parameter	This item can be changed if necessary. Normally, the factory default value may be used. Select the measurement result coordinates and set how to handle the coordinates. Refer to *2-33-3 Output Parameters (Circle Angle)* on page 2-509.

2-33-2 Region Setting (Circle Angle)

This item is used to set up the measurement area. This item specifies the measurement region for [Circle Angle] with a circle. Ellipses cannot be set. If measurement results are unstable, change detection conditions as needed.

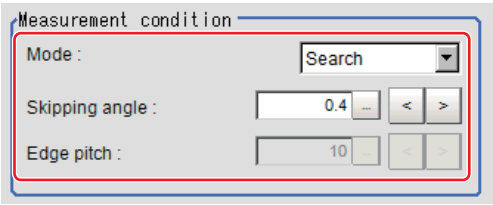
Additional Information

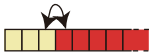
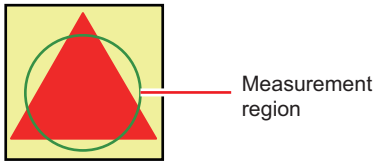
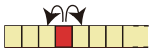
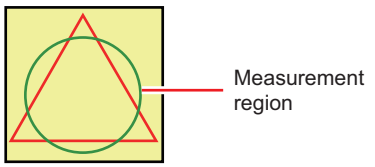
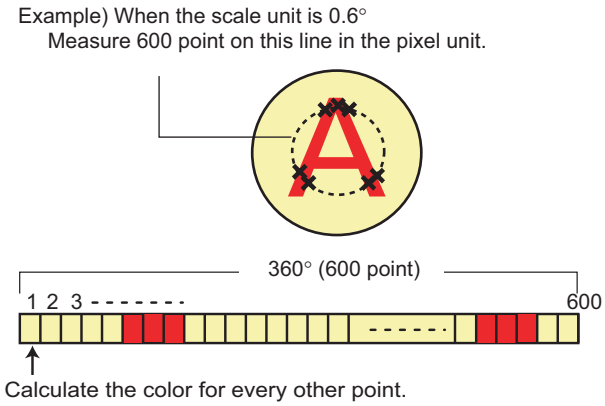
When drawing the measurement region, the featured part should lie on the circumference.



1. In the Item Tab area, click [Region setting].
2. Use the Drawing tools to specify the measurement region.
3. Click [OK] in the Figure setting area.
   - [OK]: Changes the settings and returns to the previous menu.
   - [Cancel]: Changes are discarded. Returns to the previous menu.
   - [Apply]: Updates the settings without leaving edit window.
4. If necessary, set a value for each item in the "Measurement condition" area.

   After changing a setting, check whether measurement can be done properly by performing an actual measurement.



Setting item	Set value [Factory default]	Description
Mode	[Search]	This option compares the color difference with the surrounding pixels and determines the angle based on the color information.
	Edge	The angle is determined based on the position of the points with a large color difference from the neighboring pixels. This mode is suitable for the following types of measurement objects.  
	Defect	The angle is determined based on the position of the points with a large color difference from the surrounding pixels. This mode is suitable for the following types of measurement objects.  
Skipping angle	0.1 to 10 [0.4]	Specify the interval degrees for extracting points. The color of all the points on the circumference (360° circumference/skipping angle) corresponding to the set skipping angle.  For the initial setting, the optimal value will be automatically set up based on the radius of the drawn circle. The bigger the value set, the faster the processing, but the lower the detection angle and rotation precision.
Edge pitch	1 to 99 [10]	Specify the spacing for calculating the color difference. This item is enabled only when "Mode" is set to "Edge" or "Defect".

Note Comparison is with the pixel separated by exactly the comparison interval (the value set in "Edge Pitch").

2-33-3 Output Parameters (Circle Angle)

Specify how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

Important

After setting up the measurement parameters, changing the output parameters will cause measurement results to vary accordingly. If the output parameters have been changed, re-specify the measurement, too.

1 Click [Output parameter] in the Item Tab area.

2 Set up each item.

Setting item	Set value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position deflection correction is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.

2-33-4 Key Points for Test Measurement and Adjustment (Circle Angle)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Rotation angle	Measured Angle
Center position X	Center position X of circle in measurement results
Center position Y	Center position Y of circle in measurement results
Reference angle	Angle of the circle drawn as the measurement region
Reference X	Reference position X of the circle drawn as the measurement region
Reference Y	Reference position Y of the circle drawn as the measurement region

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are unstable

Parameter to be adjusted	Remedy
Region setting	Specify a smaller value for the "Skipping angle".
Measurement flow	When the center position of measurement objects is not fixed, add position compensation to the flow so that the central coordinates of the measurement objects give a fixed position.

● When the processing speed is slow

Parameter to be adjusted	Remedy
Region setting	Specify a larger value for the "Skipping angle".
	Set the "Mode" to "Edge" or "Defect".

2-33-5 Measurement Results for Which Output Is Possible (Circle Angle)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	Judgement result
Center position X	X	Center position X of circle in measurement results
Center position Y	Y	Center position Y of circle in measurement results
Rotation angle	TH	Angle of measurement results Output range -180° to 180°
Reference position X	SX	Reference position X of the circle drawn as the measurement region*1
Reference position Y	SY	Reference Y of the circle drawn as the measurement region *1
Reference angle	ST	Angle drawn as the measurement region

*1. Since measuring is performed at the same position every time for Circle Angle, "Center X = Reference SX, Center Y = Reference SY".

2-33-6 External Reference Tables (Circle Angle)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Center position X	centerX	Get only	-99,999.9999 to 99,999.9999
6	Center position Y	centerY	Get only	-99,999.9999 to 99,999.9999
7	Rotation angle	angle	Get only	-180 to 180
8	Reference X	referenceX	Get only	-99,999.9999 to 99,999.9999
9	Reference Y	referenceY	Get only	-99,999.9999 to 99,999.9999
10	Reference angle	referenceAngle	Get only	-180 to 180
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
120	Mode	mode	Set/Get	0: Search 1: Edge 2: Defect
121	Skipping angle	thinning	Set/Get	0.1 to 10
122	Edge pitch	edgePitch	Set/Get	1 to 99
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
90000	figure0 Count	figArea0_count	Set/Get	0 to 1

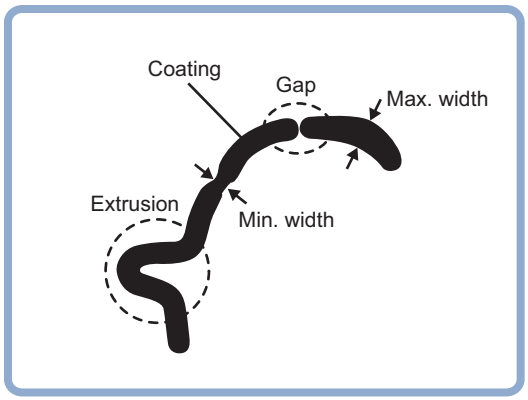
No.	Data Name	Ident	Set/Get	Data range
90001	figure0 Type	figArea0_fig0_type	Set/Get	32: Circle 64: Circumference
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90022	figure0 Circle Center Position X	figArea0_fig0_circle_X	Set/Get	-99,999 to 99,999
90023	figure0 Circle Center Position Y	figArea0_fig0_circle_Y	Set/Get	-99,999 to 99,999
90024	figure0 Circle Radius	figArea0_fig0_circle_R	Set/Get	1 to 99,999
90025	figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

2-34 Glue Bead Inspection

Inspect the coated condition of coating (sealer, etc.). You can inspect coating of a specified color for gaps or runoffs along the coating path. In addition to inspecting the above, you can also measure the maximum width, minimum width and average of coating.

Used in the Following Case

When you want to inspect coating for gaps and runoffs

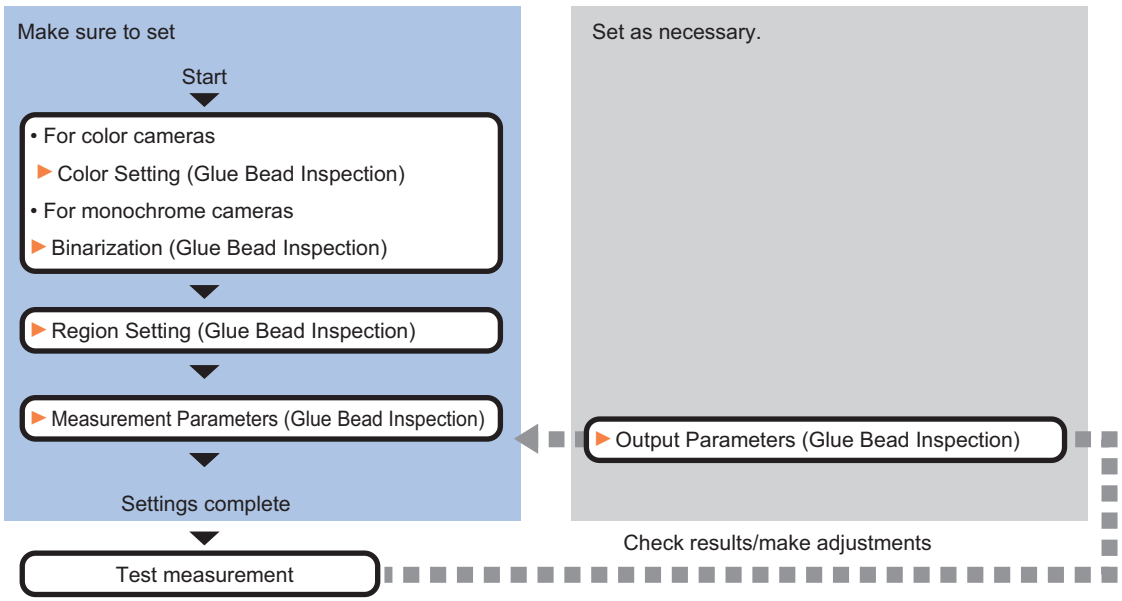


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

2-34-1 Settings Flow (Glue Bead Inspection)

Setting of coating gap inspection follows the flow shown below.



List of Glue Bead Inspection Items

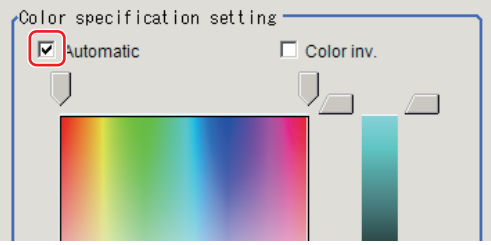
Item name	Description
Color (for color cameras only)	Set the color of coating to be extracted. Refer to *2-34-2 Color Setting (Glue Bead Inspection)* on page 2-513.
Binarization (for monochrome cameras only)	This item specifies the binary level for converting 256-tone grayscale images input from the camera into binary images. Converted white pixels are measured. Adjust the binary level so that the measurement object is converted to white pixels. Refer to *2-34-3 Binarization (Glue Bead Inspection)* on page 2-515.
Region setting	Set the inspection region. Refer to *2-34-4 Region Setting (Glue Bead Inspection)* on page 2-516.
Measurement	Set up the measurement condition and judgement condition. Refer to *2-34-5 Measurement Parameters (Glue Bead Inspection)* on page 2-519.
Output parameter	Specifies whether or not the judgement results of the processing unit is reflected in the scene overall judgement. Refer to *2-34-6 Output Parameters (Glue Bead Inspection)* on page 2-520.

2-34-2 Color Setting (Glue Bead Inspection)

Set the color of coating to be extracted. Make sure the regions other than coating will be shown in the specified background color. There are two setting methods: setting the color to be extracted in the image or setting the color with the hue, saturation, and brightness values. This section describes with an example of the procedure for setting colors in an image and adjusting with numeric input afterwards.

1 In the Item Tab area, click [Color].

2 Place a check at [Automatic].



3 In the Image Display area, specify the color range you want to detect by dragging the cursor from the upper left corner to the lower right corner of that area.

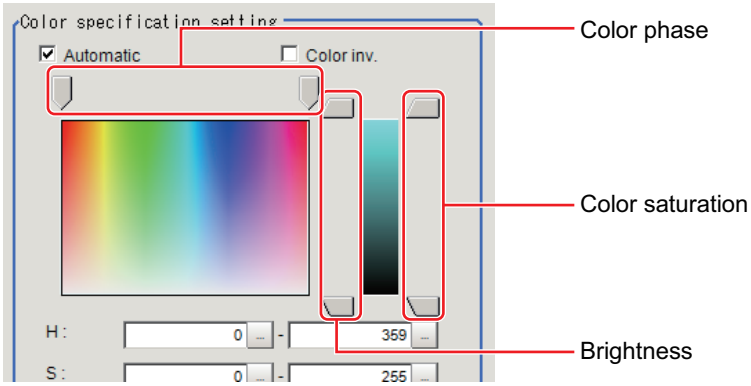
The color of the specified area is automatically set.

4 Finely adjust the hue, saturation, and brightness if necessary.

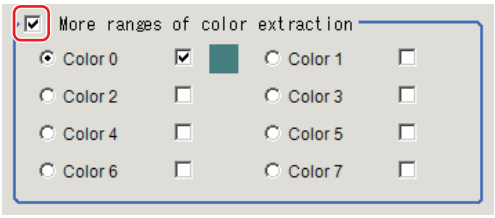
Adjust either by adjusting on the color chart or by inputting numbers.

Setting item	Setting value [Factory default]	Description
H	0 to 359	Set the color phase (difference of color hues).
S	0 to 255	Set color saturation (difference of color saturation).
V	0 to 255	Set the brightness (difference of brightness).
Automatic	• Checked • [Unchecked]	Setting the color to be extracted on the image automatically sets the hue, saturation, and brightness.
Color inv.	• Checked • [Unchecked]	Everything other than the specified color becomes the extraction target.

- About color charts

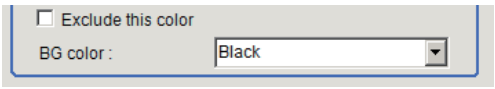


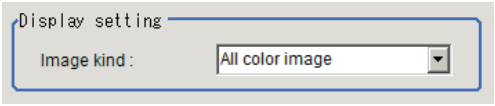
5 In multiple setting areas, specify each item.



Setting item	Setting value [Factory default]	Description
More ranges of color extraction	Checked [Unchecked]	If you place a check at this option, you can set up to 8 colors.

6 If necessary, set the display conditions for displayed images.





Setting item	Setting value [Factory default]	Description
Exclude this color	• Checked • [Unchecked]	Placing a check here excludes the pixels in the specified color range from the extraction target. The priority order for exclusion is that the higher color extraction range numbers are given priority. This setting is disabled if "More ranges of color extraction" is unchecked.
BG color	• [Black] • White • Red • Green • Blue	The background section outside the extracted image is filled with the selected colors.
Image kind	• Measurement image • [All color image] • Selection color image • Binary image	This selects the state of the image to display.

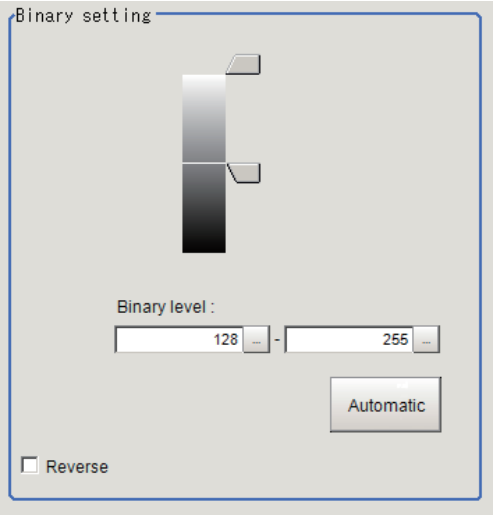
2-34-3 Binarization (Glue Bead Inspection)

When a monochrome camera is connected, the 256-tone grayscale images taken in from the camera are converted into binary black-and-white images before the images are measured. Converted white pixels are measured.

This specifies the level for converting grayscale images into binary images.

1 In the Item Tab area, click [Binary].

2 In the "Binary setting" area, set the reference density range.



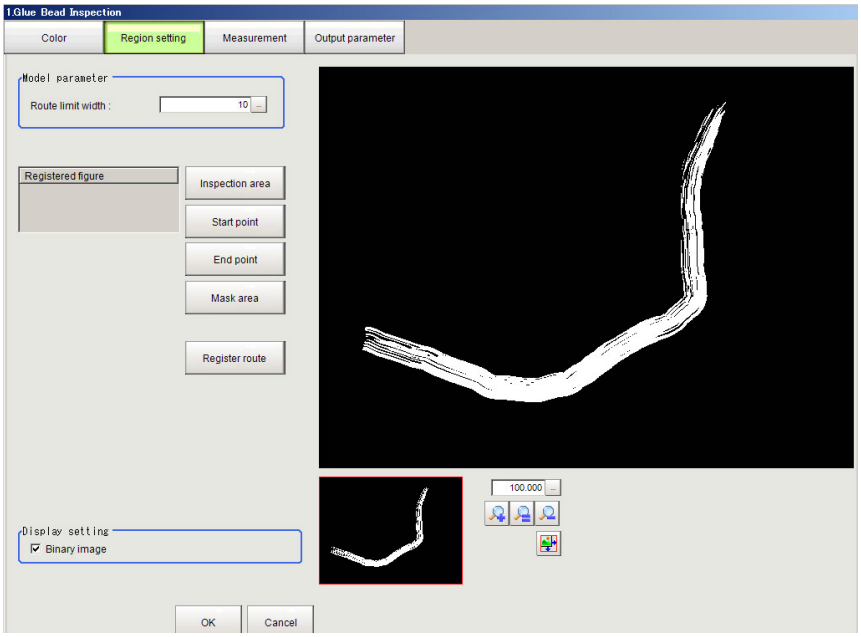
Setting item		Setting value [Factory default]	Description
Binary level	Upper limit	0 to 255 [128]	Specify the level for converting 256-tone grayscale images to binary images. Set the binary level so that the measurement object is converted to white pixels. You can also set the binary level so that only intermediate density is measured.
	Lower limit	0 to 255 [128]	
Automatic		-	Optimum binary levels are calculated automatically and set.
Reverse		• Checked • [Unchecked]	This item reverses black and white colors.

3 If necessary, set up display settings for the images displayed in the "Display setting" area.

Setting item	Setting value [Factory default]	Description
Binary image	• [Checked] • Unchecked	The image is displayed in binary with black and white.

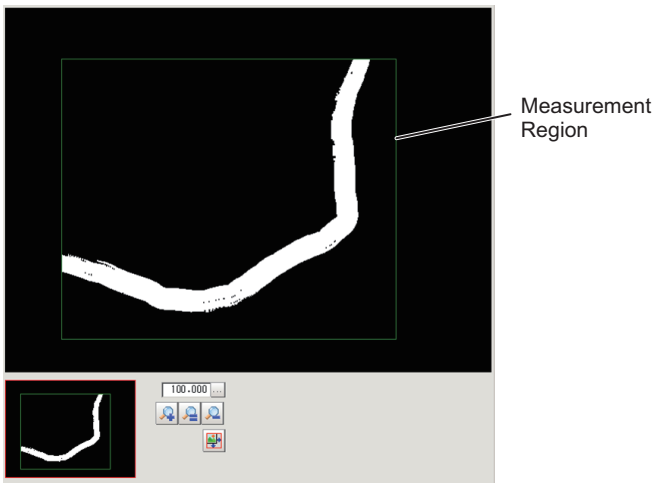
2-34-4 Region Setting (Glue Bead Inspection)

Set the inspection region and extract the coating path. All you need is register three items--measurement region, start line and end line--and then click [Register route], and a path will be extracted automatically.

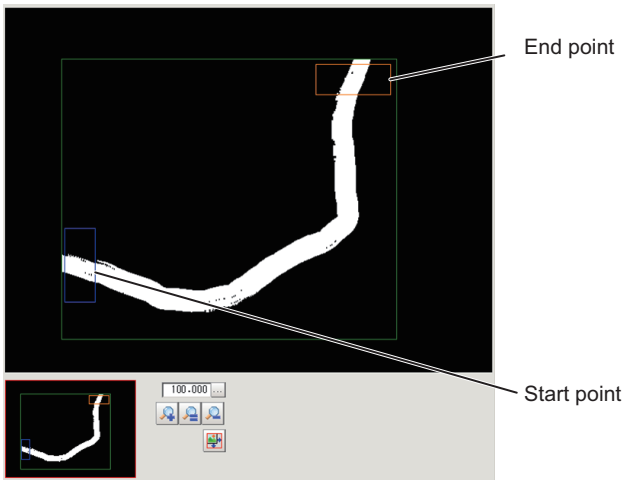


1 Click [Region setting] in the item tab area.

2 Click [Inspection area] and register the measurement region.



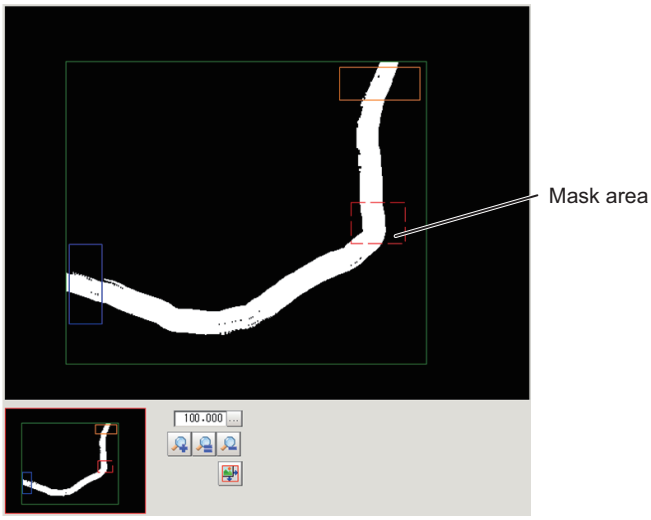
3 Register the start position of the region with [Start point] and the end position with [End point]. Register the positions so that they perpendicularly bisect the glueing.



Important

- Make sure that nothing protrudes from the measurement region.
- If they diagonally bisect the glueing, the areas will become the maximum width making it impossible to accurately measure the area.
- Set the distance between the start line and end line wider than expected glue break width. To inspect glue bead in made in round shape, register two Glue Bead Inspection processing items to perform inspection in two regions.

4 If necessary, use [Mask area] to register the mask region (region in which the measurement results get ignored).

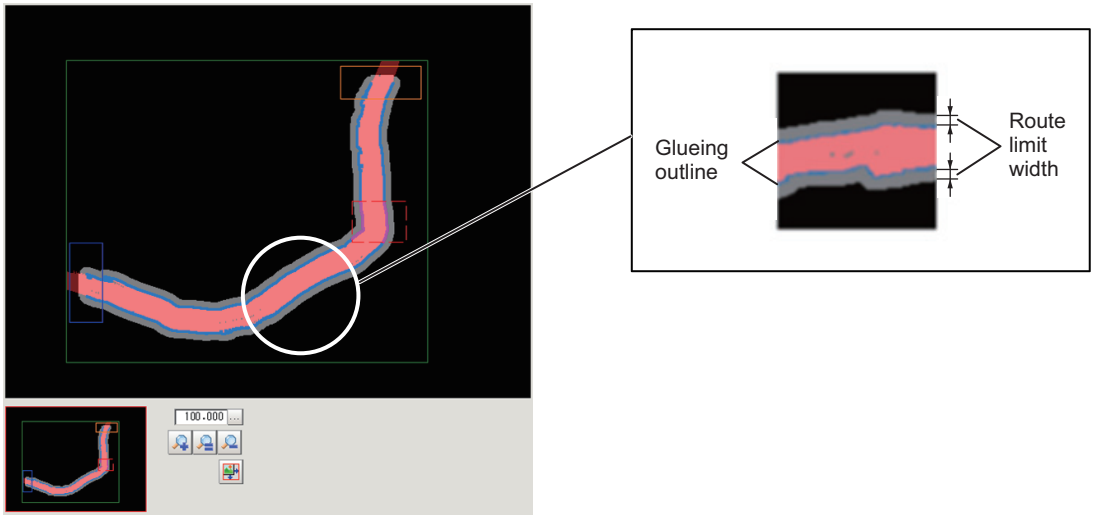


5 Click [Register route].

Create an outline of the glueing.

Glueing outline (blue, mask region is red): Calculates the width based on this outline information

Route limit width (gray): The outline + route limit width outline areas are registered. When the glueing goes exceeding this width, it is recognized that the glueing is applied outside of the route and an error occurs.



6 If necessary, set the following parameters in the "Model parameter" area.

Setting item	Setting value [Factory default]	Description
Route limit width	2 to 100 [10]	Specify a glueing route width to be judged as "OK". When it exceeds the set area the inspection result will be "NG". The unit is pixel.

7 If necessary, set up display settings for the images in the "Display setting" area.

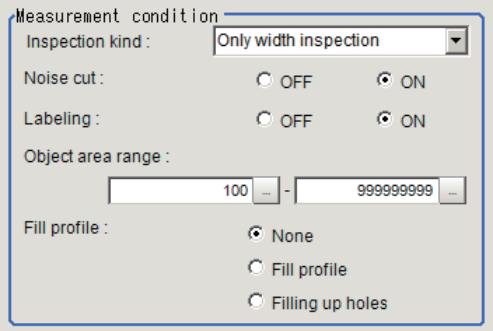
Setting item	Setting value [Factory default]	Description
Binary image	• [Checked] • Unchecked	When checked, the binary image is displayed.

2-34-5 Measurement Parameters (Glue Bead Inspection)

Set the inspection measurement conditions and the judgement conditions for the measurement results.

1 In the Item Tab area, click [Measurement].

2 In the "Measurement condition" area, specify a value for each item.

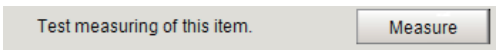


Setting item	Setting value [Factory default]	Description
Inspection kind	• [Only width inspection] • Only route inspection • Both inspection	Select the inspection type.
Noise cut	• OFF • [ON]	Select whether or not to process noise removal. Set this option if fine pixel noises generate. Basically the processing should be set to "ON" to ensure stable measurement.
Labeling	• OFF • [ON]	Select whether or not to process noise removal using the labeling filter. Set this option if noises generate. You can use this processing to measure only the labels in the range set in "Object area range ". Basically the processing should be set to "ON" to ensure stable measurement.
Object area range	0 to 99999999 [100 to 99999999]	Set the area range of labels to be measured.
Fill profile	• [None] • Fill profile • Filling up holes	Select the fill profile method. You can use the Fill profile setting item when the Labeling setting item is set to ON.

3 In the "Display setting" area, set the image display settings.

Setting item	Setting value [Factory default]	Description
Binary image	• [Checked] • Unchecked	Use this option when binary images are displayed.

4 When the setting has been changed, click [Measure] in the "Detail" area to verify whether measurements can be made correctly.



5 Set up the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

Setting item	Setting value [Factory default]	Description
Route len. (Long)	0.0000 to 99999.9999 [0.0000] to [99999.9999]	Set the range of path lengths (long) that is judged to be OK.
Route len. (Short)	0.0000 to 99999.9999 [0.0000] to [99999.9999]	Set the range of path lengths (short) that is judged to be OK.
Min. width	0.0000 to 99999.9999 [0.0000] to [99999.9999]	Set the minimum width that is judged to be OK.
Max. width	0.0000 to 99999.9999 [0.0000] to [99999.9999]	Set the maximum width that is judged to be OK.
Avg. width	0.0000 to 99999.9999 [0.0000] to [99999.9999]	Set the average width that is judged to be OK.
Gap width	0.0000 to 99999.9999 [0.0000]	Set the gap width along a path that are judged to be OK.

2-34-6 Output Parameters (Glue Bead Inspection)

Set how measurement results are output to an external device. This item can be changed if necessary. Normally, the factory default value will be used.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Setting value [Factory default]	Description
Output coordinates	• [After scroll] • Before scroll	As measurement results, select whether to output coordinate values to external devices before or after the position compensation is applied.
Calibration	• [OFF] • ON	Select whether to reflect the calibration in the values output to the external device as measurement results. ON: Output the coordinates converted into actual dimensions. OFF: Output the camera coordinate values.
Reflect to overall judgement	• [ON] • OFF	Specify whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

2-34-7 Key Points for Test Measurement and Adjustment (Glue Bead Inspection)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
State	Coated condition of measured coating
Min. width	Maximum width of measured coating
Max. width	Minimum width of measured coating
Gap width	Gap width of measured coating

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When a path creation error occurs

State	Parameter to be adjusted	Troubleshooting
Either the start position or end position is set outside the measurement region.	Region setting	Set the start position or end position, whichever is applicable, inside the measurement region.
Either the start position or end position is yet to be registered.	Region setting	Set the start position or end position, whichever is applicable.
Either the start position or end position is inappropriate to fully enclose coating.	Region setting	Register the start position or end position, whichever is applicable, so that the two positions are set vertically across coating.
Coating is gapped between the start position and end position.	Region setting	If coating is gapped in the middle, register multiple coating gap inspections and set separate inspection parts.
Width between paths of a spiral path is sometimes measured.	Region setting	Divide the spiral into regions corresponding to individual turns and set a unit for each region.

● When judgement is NG

State	Parameter to be adjusted	Troubleshooting
The judgement is NG (insufficient memory)	Region setting	Adjust the region so that the reference path becomes shorter.

2-34-8 Measurement Results for Which Output is Possible (Glue Bead Inspection)

Measurement items	Character string	Description
Judge	JG	1: OK 0: Unmeasured -1: NG
State	ST	Condition of measured result 0: Detectable 1: Gapped 2: Path error -1: Unmeasured -2: Region not yet registered -3: Coating not yet detected -4: Excessive path (insufficient memory)
Min. width	MINWD	Min. width
Max. width	MAXWD	Max. width
Average width	AVGWD	Average width
Gap width	GAPWD	Gap width
Coordinate X1 with the minimum width	MINX1	X coordinate X 1 with the minimum width
Coordinate Y with the minimum width	MINY1	Y Coordinate Y1 with the minimum width

Measurement items	Character string	Description
Coordinate X2 with the minimum width	MINX2	X coordinate X2 with the minimum width
Coordinate Y2 with the minimum width	MINY2	Y coordinate Y2 with the minimum width
Coordinate X1 with the maximum width	MAXX1	X coordinate X 1 with the maximum width
Coordinate Y1 with the maximum width	MAXY1	Y coordinate Y1 with the maximum width
Coordinate X2 with the maximum width	MAXX2	X coordinate X2 with the maximum width
Coordinate Y2 with the maximum width	MAXY2	Y coordinate Y2 with the maximum width
Coordinate X1 of gap width	GAPX1	X coordinate X1 of gap width
Coordinate Y1 of gap width	GAPY1	Y coordinate Y1 of gap width
Coordinate X2 of gap width	GAPX2	X coordinate X2 of gap width
Coordinate Y2 of gap width	GAPY2	Y coordinate Y2 of gap width

2-34-9 External Reference Tables (Glue Bead Inspection)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Status	state	Get only	---
6	Min. width	minWidth	Get only	---
7	Max. width	maxWidth	Get only	---
8	Avg. width	aveWidth	Get only	---
9	Gap width	lackWidth	Get only	---
10	Route len. (Long)	lenLong	Get only	---
11	Route len. (Short)	lenShort	Get only	---
101	Output coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
128	Fill profile	edgeFill	Set/Get	0: OFF 1: Fill profile 2: Filling up holes
129	Color inv.	areaInv	Set/Get	0: OFF 1: ON

No.	Data Name	Ident	Set/Get	Data range
130	Noise cut	noiseCut	Set/Get	0: OFF 1: ON
131	Route limit width	maskWidth	Set/Get	2 to 100
132	Upper limit of the Min.width	upperMinWidth	Set/Get	0 to 99,999.9999
133	Lower limit of the Min.width	lowerMinWidth	Set/Get	0 to 99,999.9999
134	Upper limit of the Max. width	upperMaxWidth	Set/Get	0 to 99,999.9999
135	Lower limit of the Max. width	lowerMaxWidth	Set/Get	0 to 99,999.9999
136	Upper limit of the average width	upperAveWidth	Set/Get	0 to 99,999.9999
137	Lower limit of the average width	lowerAveWidth	Set/Get	0 to 99,999.9999
138	Upper limit of the Gap width	upperLackWidth	Set/Get	0 to 99,999.9999
139	Lower limit of the Gap width	lowerLackWidth	Set/Get	0 to 99,999.9999
142	Upper limit of the area	upperBinary	Set/Get	0 to 255
143	Lower limit of the area	lowerBinary	Set/Get	0 to 255
144	Binary image	binaryImage	Set/Get	0: OFF 1: ON
145	Scan line 0	counterClockwise0	Set/Get	0: Clockwise 1: AntiClockwise
146	Scan line 1	counterClockwise1	Set/Get	0: Clockwise 1: AntiClockwise
147	Upper limit of the Route len. (Long)	upperLenLong	Set/Get	0 to 99,999.9999
148	Lower limit of the Route len. (Long)	lowerLenLong	Set/Get	0 to 99,999.9999
149	Upper limit of the Route len. (Short)	upperLenShort	Set/Get	0 to 99,999.9999
150	Lower limit of the Route len. (Short)	lowerLenShort	Set/Get	0 to 99,999.9999
151	Multiple selections	multiSelect	Set/Get	0: Multiselect NG 1: MultiSelect OK
152	Image kind	imageKind	Set/Get	0: Measurement image 1: All color image 2: Selection color image 3: Binary image
153	Upper limit of Object area range	upperFillLabelArea	Set/Get	0 to 999,999,999
154	Lower limit of Object area range	lowerFillLabelArea	Set/Get	0 to 999,999,999
155	Labeling	labelingOnOff	Set/Get	0: OFF 1: ON
156	Inspection kind	inspectionKind	Set/Get	0: Width's inspection only 1: Route's inspection only 2: Width and route's inspection
160+Nx10 (N: 0 to 7)	Flag N used for registered color	flag	Set/Get	0: OFF 1: ON
161+Nx10 (N: 0 to 7)	Flag N for registered color OR/NOT	orNot	Set/Get	0: OR 1: NOT

No.	Data Name	Ident	Set/Get	Data range
162+Nx10 (N: 0 to 7)	Register the max. color hue	upperH	Set/Get	0 to 359
163+Nx10 (N: 0 to 7)	Register the min. color hue	lowerH	Set/Get	0 to 359
164+Nx10 (N: 0 to 7)	Register the max. color saturation	upperS	Set/Get	0 to 255
165+Nx10 (N: 0 to 7)	Register the min. color saturation	lowerS	Set/Get	0 to 255
166+Nx10 (N: 0 to 7)	Register the max. color brightness	upperV	Set/Get	0 to 255
167+Nx10 (N: 0 to 7)	Register the min. color brightness	lowerV	Set/Get	0 to 255
168+Nx10 (N: 0 to 7)	Background color	background	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
1000+Nx2 (N: 0 to 1)	Min.width X	minX	Get only	-
1001+Nx2 (N: 0 to 1)	Min.width Y	minY	Get only	-
1004+Nx2 (N: 0 to 1)	Max.width X	maxX	Get only	-
1005+Nx2 (N: 0 to 1)	Max.width Y	maxY	Get only	-
1008+Nx2 (N: 0 to 1)	Gap pos. X	lackX	Get only	-
1009+Nx2 (N: 0 to 1)	Gap pos. Y	lackY	Get only	-
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
90000	Inspection area figure Count	figArea0_count	Set/Get	0 to 10
90001	Inspection area figure0 Type	figArea0_fig0_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90002	Inspection area figure0 mode	figArea0_fig0_mode	Set/Get	0: OR 1: NOT
90009	Inspection area figure0 Wide line Start point X	figArea0_fig0_lineW_X0	Set/Get	-99,999 to 99,999
90010	Inspection area figure0 Wide line Start point Y	figArea0_fig0_lineW_Y0	Set/Get	-99,999 to 99,999
90011	Inspection area figure0 Wide line End point X	figArea0_fig0_lineW_X1	Set/Get	-99,999 to 99,999
90012	Inspection area figure0 Wide line End point Y	figArea0_fig0_lineW_Y1	Set/Get	-99,999 to 99,999
90013	Inspection area figure0 Wide line Width	figArea0_fig0_lineW_W	Set/Get	0 to 99,999
90014	Inspection area figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90015	Inspection area figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	Inspection area figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	Inspection area figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90018	Inspection area figure0 Ellipse Center Position X	figArea0_fig0_ellipse_CX	Set/Get	-99,999 to 99,999
90019	Inspection area figure0 Ellipse Center Position Y	figArea0_fig0_ellipse_CY	Set/Get	-99,999 to 99,999
90020	Inspection area figure0 Ellipse RadiusX	figArea0_fig0_ellipse_RX	Set/Get	1 to 99,999
90021	Inspection area figure0 Ellipse RadiusY	figArea0_fig0_ellipse_RY	Set/Get	1 to 99,999
90025	Inspection area figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	Inspection area figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	Inspection area figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	Inspection area figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90034	Inspection area figure0 Wide arc Center Position X	figArea0_fig0_arcW_X	Set/Get	-99,999 to 99,999
90035	Inspection area figure0 Wide arc Center Position Y	figArea0_fig0_arcW_Y	Set/Get	-99,999 to 99,999
90036	Inspection area figure0 Wide arc Radius	figArea0_fig0_arcW_R	Set/Get	0 to 99,999
90037	Inspection area figure0 Wide arc Start angle	figArea0_fig0_arcW_SA	Set/Get	-180 to 180
90038	Inspection area figure0 Wide arc End angle	figArea0_fig0_arcW_EA	Set/Get	-180 to 180
90039	Inspection area figure0 Wide arc Width	figArea0_fig0_arcW_W	Set/Get	0 to 99,999
90040	Inspection area figure0 Polygon Point Count	figArea0_fig0_polygon_count	Set/Get	3 to 10
90041	Inspection area figure0 Polygon Point1 Position X	figArea0_fig0_polygon_x0	Set/Get	-99,999 to 99,999
90042	Inspection area figure0 Polygon Point1 Position Y	figArea0_fig0_polygon_y0	Set/Get	-99,999 to 99,999
90043	Inspection area figure0 Polygon Point2 Position X	figArea0_fig0_polygon_x1	Set/Get	-99,999 to 99,999
90044	Inspection area figure0 Polygon Point2 Position Y	figArea0_fig0_polygon_y1	Set/Get	-99,999 to 99,999
90045	Inspection area figure0 Polygon Point3 Position X	figArea0_fig0_polygon_x2	Set/Get	-99,999 to 99,999
90046	Inspection area figure0 Polygon Point3 Position Y	figArea0_fig0_polygon_y2	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90047	Inspection area figure0 Polygon Point4 Position X	figArea0_fig0_polygon_x3	Set/Get	-99,999 to 99,999
90048	Inspection area figure0 Polygon Point4 Position Y	figArea0_fig0_polygon_y3	Set/Get	-99,999 to 99,999
90049	Inspection area figure0 Polygon Point5 Position X	figArea0_fig0_polygon_x4	Set/Get	-99,999 to 99,999
90050	Inspection area figure0 Polygon Point5 Position Y	figArea0_fig0_polygon_y4	Set/Get	-99,999 to 99,999
90051	Inspection area figure0 Polygon Point6 Position X	figArea0_fig0_polygon_x5	Set/Get	-99,999 to 99,999
90052	Inspection area figure0 Polygon Point6 Position Y	figArea0_fig0_polygon_y5	Set/Get	-99,999 to 99,999
90053	Inspection area figure0 Polygon Point7 Position X	figArea0_fig0_polygon_x6	Set/Get	-99,999 to 99,999
90054	Inspection area figure0 Polygon Point7 Position Y	figArea0_fig0_polygon_y6	Set/Get	-99,999 to 99,999
90055	Inspection area figure0 Polygon Point8 Position X	figArea0_fig0_polygon_x7	Set/Get	-99,999 to 99,999
90056	Inspection area figure0 Polygon Point8 Position Y	figArea0_fig0_polygon_y7	Set/Get	-99,999 to 99,999
90057	Inspection area figure0 Polygon Point9 Position X	figArea0_fig0_polygon_x8	Set/Get	-99,999 to 99,999
90058	Inspection area figure0 Polygon Point9 Position Y	figArea0_fig0_polygon_y8	Set/Get	-99,999 to 99,999
90059	Inspection area figure0 Polygon Point10 Position X	figArea0_fig0_polygon_x9	Set/Get	-99,999 to 99,999
90060	Inspection area figure0 Polygon Point10 Position Y	figArea0_fig0_polygon_y9	Set/Get	-99,999 to 99,999
90099	Inspection area figure Update	figArea0_update	Set only	1: Update
90101	Inspection area figure1 Type	figArea0_fig1_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90102	Inspection area figure1 mode	figArea0_fig1_mode	Set/Get	0: OR 1: NOT
90109	Inspection area figure1 Wide line Start point X	figArea0_fig1_lineW_X0	Set/Get	-99,999 to 99,999
90110	Inspection area figure1 Wide line Start point Y	figArea0_fig1_lineW_Y0	Set/Get	-99,999 to 99,999
90111	Inspection area figure1 Wide line End point X	figArea0_fig1_lineW_X1	Set/Get	-99,999 to 99,999
90112	Inspection area figure1 Wide line End point Y	figArea0_fig1_lineW_Y1	Set/Get	-99,999 to 99,999
90113	Inspection area figure1 Wide line Width	figArea0_fig1_lineW_W	Set/Get	0 to 99,999
90114	Inspection area figure1 Rectangle Upper left position X	figArea0_fig1_box_X0	Set/Get	-99,999 to 99,999
90115	Inspection area figure1 Rectangle Upper left position Y	figArea0_fig1_box_Y0	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90116	Inspection area figure1 Rectangle Lower right position X	figArea0_fig1_box_X1	Set/Get	-99,999 to 99,999
90117	Inspection area figure1 Rectangle Lower right position Y	figArea0_fig1_box_Y1	Set/Get	-99,999 to 99,999
90118	Inspection area figure1 Ellipse Center Position X	figArea0_fig1_ellipse_CX	Set/Get	-99,999 to 99,999
90119	Inspection area figure1 Ellipse Center Position Y	figArea0_fig1_ellipse_CY	Set/Get	-99,999 to 99,999
90120	Inspection area figure1 Ellipse RadiusX	figArea0_fig1_ellipse_RX	Set/Get	1 to 99,999
90121	Inspection area figure1 Ellipse RadiusY	figArea0_fig1_ellipse_RY	Set/Get	1 to 99,999
90125	Inspection area figure1 Circumference Center Position X	figArea0_fig1_circleW_X	Set/Get	-99,999 to 99,999
90126	Inspection area figure1 Circumference Center Position Y	figArea0_fig1_circleW_Y	Set/Get	-99,999 to 99,999
90127	Inspection area figure1 Circumference Radius	figArea0_fig1_circleW_R	Set/Get	0 to 99,999
90128	Inspection area figure1 Circumference Width	figArea0_fig1_circleW_W	Set/Get	0 to 99,999
90134	Inspection area figure1 Wide arc Center Position X	figArea0_fig1_arcW_X	Set/Get	-99,999 to 99,999
90135	Inspection area figure1 Wide arc Center Position Y	figArea0_fig1_arcW_Y	Set/Get	-99,999 to 99,999
90136	Inspection area figure1 Wide arc Radius	figArea0_fig1_arcW_R	Set/Get	0 to 99,999
90137	Inspection area figure1 Wide arc Start angle	figArea0_fig1_arcW_SA	Set/Get	-180 to 180
90138	Inspection area figure1 Wide arc End angle	figArea0_fig1_arcW_EA	Set/Get	-180 to 180
90139	Inspection area figure1 Wide arc Width	figArea0_fig1_arcW_W	Set/Get	0 to 99,999
90140	Inspection area figure1 Polygon Point Count	figArea0_fig1_polygon_count	Set/Get	3 to 10
90141	Inspection area figure1 Polygon Point1 Position X	figArea0_fig1_polygon_x0	Set/Get	-99,999 to 99,999
90142	Inspection area figure1 Polygon Point1 Position Y	figArea0_fig1_polygon_y0	Set/Get	-99,999 to 99,999
90143	Inspection area figure1 Polygon Point2 Position X	figArea0_fig1_polygon_x1	Set/Get	-99,999 to 99,999
90144	Inspection area figure1 Polygon Point2 Position Y	figArea0_fig1_polygon_y1	Set/Get	-99,999 to 99,999
90145	Inspection area figure1 Polygon Point3 Position X	figArea0_fig1_polygon_x2	Set/Get	-99,999 to 99,999
90146	Inspection area figure1 Polygon Point3 Position Y	figArea0_fig1_polygon_y2	Set/Get	-99,999 to 99,999
90147	Inspection area figure1 Polygon Point4 Position X	figArea0_fig1_polygon_x3	Set/Get	-99,999 to 99,999
90148	Inspection area figure1 Polygon Point4 Position Y	figArea0_fig1_polygon_y3	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90149	Inspection area figure1 Polygon Point5 Position X	figArea0_fig1_polygon_x4	Set/Get	-99,999 to 99,999
90150	Inspection area figure1 Polygon Point5 Position Y	figArea0_fig1_polygon_y4	Set/Get	-99,999 to 99,999
90151	Inspection area figure1 Polygon Point6 Position X	figArea0_fig1_polygon_x5	Set/Get	-99,999 to 99,999
90152	Inspection area figure1 Polygon Point6 Position Y	figArea0_fig1_polygon_y5	Set/Get	-99,999 to 99,999
90153	Inspection area figure1 Polygon Point7 Position X	figArea0_fig1_polygon_x6	Set/Get	-99,999 to 99,999
90154	Inspection area figure1 Polygon Point7 Position Y	figArea0_fig1_polygon_y6	Set/Get	-99,999 to 99,999
90155	Inspection area figure1 Polygon Point8 Position X	figArea0_fig1_polygon_x7	Set/Get	-99,999 to 99,999
90156	Inspection area figure1 Polygon Point8 Position Y	figArea0_fig1_polygon_y7	Set/Get	-99,999 to 99,999
90157	Inspection area figure1 Polygon Point9 Position X	figArea0_fig1_polygon_x8	Set/Get	-99,999 to 99,999
90158	Inspection area figure1 Polygon Point9 Position Y	figArea0_fig1_polygon_y8	Set/Get	-99,999 to 99,999
90159	Inspection area figure1 Polygon Point10 Position X	figArea0_fig1_polygon_x9	Set/Get	-99,999 to 99,999
90160	Inspection area figure1 Polygon Point10 Position Y	figArea0_fig1_polygon_y9	Set/Get	-99,999 to 99,999
90201	Inspection area figure2 Type	figArea0_fig2_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90202	Inspection area figure2 mode	figArea0_fig2_mode	Set/Get	0: OR 1: NOT
90209	Inspection area figure2 Wide line Start point X	figArea0_fig2_lineW_X0	Set/Get	-99,999 to 99,999
90210	Inspection area figure2 Wide line Start point Y	figArea0_fig2_lineW_Y0	Set/Get	-99,999 to 99,999
90211	Inspection area figure2 Wide line End point X	figArea0_fig2_lineW_X1	Set/Get	-99,999 to 99,999
90212	Inspection area figure2 Wide line End point Y	figArea0_fig2_lineW_Y1	Set/Get	-99,999 to 99,999
90213	Inspection area figure2 Wide line Width	figArea0_fig2_lineW_W	Set/Get	0 to 99,999
90214	Inspection area figure2 Rectangle Upper left position X	figArea0_fig2_box_X0	Set/Get	-99,999 to 99,999
90215	Inspection area figure2 Rectangle Upper left position Y	figArea0_fig2_box_Y0	Set/Get	-99,999 to 99,999
90216	Inspection area figure2 Rectangle Lower right position X	figArea0_fig2_box_X1	Set/Get	-99,999 to 99,999
90217	Inspection area figure2 Rectangle Lower right position Y	figArea0_fig2_box_Y1	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90218	Inspection area figure2 Ellipse Center Position X	figArea0_fig2_ellipse_CX	Set/Get	-99,999 to 99,999
90219	Inspection area figure2 Ellipse Center Position Y	figArea0_fig2_ellipse_CY	Set/Get	-99,999 to 99,999
90220	Inspection area figure2 Ellipse RadiusX	figArea0_fig2_ellipse_RX	Set/Get	1 to 99,999
90221	Inspection area figure2 Ellipse RadiusY	figArea0_fig2_ellipse_RY	Set/Get	1 to 99,999
90225	Inspection area figure2 Circumference Center Position X	figArea0_fig2_circleW_X	Set/Get	-99,999 to 99,999
90226	Inspection area figure2 Circumference Center Position Y	figArea0_fig2_circleW_Y	Set/Get	-99,999 to 99,999
90227	Inspection area figure2 Circumference Radius	figArea0_fig2_circleW_R	Set/Get	0 to 99,999
90228	Inspection area figure2 Circumference Width	figArea0_fig2_circleW_W	Set/Get	0 to 99,999
90234	Inspection area figure2 Wide arc Center Position X	figArea0_fig2_arcW_X	Set/Get	-99,999 to 99,999
90235	Inspection area figure2 Wide arc Center Position Y	figArea0_fig2_arcW_Y	Set/Get	-99,999 to 99,999
90236	Inspection area figure2 Wide arc Radius	figArea0_fig2_arcW_R	Set/Get	0 to 99,999
90237	Inspection area figure2 Wide arc Start angle	figArea0_fig2_arcW_SA	Set/Get	-180 to 180
90238	Inspection area figure2 Wide arc End angle	figArea0_fig2_arcW_EA	Set/Get	-180 to 180
90239	Inspection area figure2 Wide arc Width	figArea0_fig2_arcW_W	Set/Get	0 to 99,999
90240	Inspection area figure2 Polygon Point Count	figArea0_fig2_polygon_count	Set/Get	3 to 10
90241	Inspection area figure2 Polygon Point1 Position X	figArea0_fig2_polygon_x0	Set/Get	-99,999 to 99,999
90242	Inspection area figure2 Polygon Point1 Position Y	figArea0_fig2_polygon_y0	Set/Get	-99,999 to 99,999
90243	Inspection area figure2 Polygon Point2 Position X	figArea0_fig2_polygon_x1	Set/Get	-99,999 to 99,999
90244	Inspection area figure2 Polygon Point2 Position Y	figArea0_fig2_polygon_y1	Set/Get	-99,999 to 99,999
90245	Inspection area figure2 Polygon Point3 Position X	figArea0_fig2_polygon_x2	Set/Get	-99,999 to 99,999
90246	Inspection area figure2 Polygon Point3 Position Y	figArea0_fig2_polygon_y2	Set/Get	-99,999 to 99,999
90247	Inspection area figure2 Polygon Point4 Position X	figArea0_fig2_polygon_x3	Set/Get	-99,999 to 99,999
90248	Inspection area figure2 Polygon Point4 Position Y	figArea0_fig2_polygon_y3	Set/Get	-99,999 to 99,999
90249	Inspection area figure2 Polygon Point5 Position X	figArea0_fig2_polygon_x4	Set/Get	-99,999 to 99,999
90250	Inspection area figure2 Polygon Point5 Position Y	figArea0_fig2_polygon_y4	Set/Get	-99,999 to 99,999
90251	Inspection area figure2 Polygon Point6 Position X	figArea0_fig2_polygon_x5	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90252	Inspection area figure2 Polygon Point6 Position Y	figArea0_fig2_polygon_y5	Set/Get	-99,999 to 99,999
90253	Inspection area figure2 Polygon Point7 Position X	figArea0_fig2_polygon_x6	Set/Get	-99,999 to 99,999
90254	Inspection area figure2 Polygon Point7 Position Y	figArea0_fig2_polygon_y6	Set/Get	-99,999 to 99,999
90255	Inspection area figure2 Polygon Point8 Position X	figArea0_fig2_polygon_x7	Set/Get	-99,999 to 99,999
90256	Inspection area figure2 Polygon Point8 Position Y	figArea0_fig2_polygon_y7	Set/Get	-99,999 to 99,999
90257	Inspection area figure2 Polygon Point9 Position X	figArea0_fig2_polygon_x8	Set/Get	-99,999 to 99,999
90258	Inspection area figure2 Polygon Point9 Position Y	figArea0_fig2_polygon_y8	Set/Get	-99,999 to 99,999
90259	Inspection area figure2 Polygon Point10 Position X	figArea0_fig2_polygon_x9	Set/Get	-99,999 to 99,999
90260	Inspection area figure2 Polygon Point10 Position Y	figArea0_fig2_polygon_y9	Set/Get	-99,999 to 99,999
90301	Inspection area figure3 Type	figArea0_fig3_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90302	Inspection area figure3 mode	figArea0_fig3_mode	Set/Get	0: OR 1: NOT
90309	Inspection area figure3 Wide line Start point X	figArea0_fig3_lineW_X0	Set/Get	-99,999 to 99,999
90310	Inspection area figure3 Wide line Start point Y	figArea0_fig3_lineW_Y0	Set/Get	-99,999 to 99,999
90311	Inspection area figure3 Wide line End point X	figArea0_fig3_lineW_X1	Set/Get	-99,999 to 99,999
90312	Inspection area figure3 Wide line End point Y	figArea0_fig3_lineW_Y1	Set/Get	-99,999 to 99,999
90313	Inspection area figure3 Wide line Width	figArea0_fig3_lineW_W	Set/Get	0 to 99,999
90314	Inspection area figure3 Rectangle Upper left position X	figArea0_fig3_box_X0	Set/Get	-99,999 to 99,999
90315	Inspection area figure3 Rectangle Upper left position Y	figArea0_fig3_box_Y0	Set/Get	-99,999 to 99,999
90316	Inspection area figure3 Rectangle Lower right position X	figArea0_fig3_box_X1	Set/Get	-99,999 to 99,999
90317	Inspection area figure3 Rectangle Lower right position Y	figArea0_fig3_box_Y1	Set/Get	-99,999 to 99,999
90318	Inspection area figure3 Ellipse Center Position X	figArea0_fig3_ellipse_CX	Set/Get	-99,999 to 99,999
90319	Inspection area figure3 Ellipse Center Position Y	figArea0_fig3_ellipse_CY	Set/Get	-99,999 to 99,999
90320	Inspection area figure3 Ellipse RadiusX	figArea0_fig3_ellipse_RX	Set/Get	1 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90321	Inspection area figure3 Ellipse RadiusY	figArea0_fig3_ellipse_RY	Set/Get	1 to 99,999
90325	Inspection area figure3 Circumference Center Position X	figArea0_fig3_circleW_X	Set/Get	-99,999 to 99,999
90326	Inspection area figure3 Circumference Center Position Y	figArea0_fig3_circleW_Y	Set/Get	-99,999 to 99,999
90327	Inspection area figure3 Circumference Radius	figArea0_fig3_circleW_R	Set/Get	0 to 99,999
90328	Inspection area figure3 Circumference Width	figArea0_fig3_circleW_W	Set/Get	0 to 99,999
90334	Inspection area figure3 Wide arc Center Position X	figArea0_fig3_arcW_X	Set/Get	-99,999 to 99,999
90335	Inspection area figure3 Wide arc Center Position Y	figArea0_fig3_arcW_Y	Set/Get	-99,999 to 99,999
90336	Inspection area figure3 Wide arc Radius	figArea0_fig3_arcW_R	Set/Get	0 to 99,999
90337	Inspection area figure3 Wide arc Start angle	figArea0_fig3_arcW_SA	Set/Get	-180 to 180
90338	Inspection area figure3 Wide arc End angle	figArea0_fig3_arcW_EA	Set/Get	-180 to 180
90339	Inspection area figure3 Wide arc Width	figArea0_fig3_arcW_W	Set/Get	0 to 99,999
90340	Inspection area figure3 Polygon Point Count	figArea0_fig3_polygon_count	Set/Get	3 to 10
90341	Inspection area figure3 Polygon Point1 Position X	figArea0_fig3_polygon_x0	Set/Get	-99,999 to 99,999
90342	Inspection area figure3 Polygon Point1 Position Y	figArea0_fig3_polygon_y0	Set/Get	-99,999 to 99,999
90343	Inspection area figure3 Polygon Point2 Position X	figArea0_fig3_polygon_x1	Set/Get	-99,999 to 99,999
90344	Inspection area figure3 Polygon Point2 Position Y	figArea0_fig3_polygon_y1	Set/Get	-99,999 to 99,999
90345	Inspection area figure3 Polygon Point3 Position X	figArea0_fig3_polygon_x2	Set/Get	-99,999 to 99,999
90346	Inspection area figure3 Polygon Point3 Position Y	figArea0_fig3_polygon_y2	Set/Get	-99,999 to 99,999
90347	Inspection area figure3 Polygon Point4 Position X	figArea0_fig3_polygon_x3	Set/Get	-99,999 to 99,999
90348	Inspection area figure3 Polygon Point4 Position Y	figArea0_fig3_polygon_y3	Set/Get	-99,999 to 99,999
90349	Inspection area figure3 Polygon Point5 Position X	figArea0_fig3_polygon_x4	Set/Get	-99,999 to 99,999
90350	Inspection area figure3 Polygon Point5 Position Y	figArea0_fig3_polygon_y4	Set/Get	-99,999 to 99,999
90351	Inspection area figure3 Polygon Point6 Position X	figArea0_fig3_polygon_x5	Set/Get	-99,999 to 99,999
90352	Inspection area figure3 Polygon Point6 Position Y	figArea0_fig3_polygon_y5	Set/Get	-99,999 to 99,999
90353	Inspection area figure3 Polygon Point7 Position X	figArea0_fig3_polygon_x6	Set/Get	-99,999 to 99,999
90354	Inspection area figure3 Polygon Point7 Position Y	figArea0_fig3_polygon_y6	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90355	Inspection area figure3 Polygon Point8 Position X	figArea0_fig3_polygon_x7	Set/Get	-99,999 to 99,999
90356	Inspection area figure3 Polygon Point8 Position Y	figArea0_fig3_polygon_y7	Set/Get	-99,999 to 99,999
90357	Inspection area figure3 Polygon Point9 Position X	figArea0_fig3_polygon_x8	Set/Get	-99,999 to 99,999
90358	Inspection area figure3 Polygon Point9 Position Y	figArea0_fig3_polygon_y8	Set/Get	-99,999 to 99,999
90359	Inspection area figure3 Polygon Point10 Position X	figArea0_fig3_polygon_x9	Set/Get	-99,999 to 99,999
90360	Inspection area figure3 Polygon Point10 Position Y	figArea0_fig3_polygon_y9	Set/Get	-99,999 to 99,999
90401	Inspection area figure4 Type	figArea0_fig4_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90402	Inspection area figure4 mode	figArea0_fig4_mode	Set/Get	0: OR 1: NOT
90409	Inspection area figure4 Wide line Start point X	figArea0_fig4_lineW_X0	Set/Get	-99,999 to 99,999
90410	Inspection area figure4 Wide line Start point Y	figArea0_fig4_lineW_Y0	Set/Get	-99,999 to 99,999
90411	Inspection area figure4 Wide line End point X	figArea0_fig4_lineW_X1	Set/Get	-99,999 to 99,999
90412	Inspection area figure4 Wide line End point Y	figArea0_fig4_lineW_Y1	Set/Get	-99,999 to 99,999
90413	Inspection area figure4 Wide line Width	figArea0_fig4_lineW_W	Set/Get	0 to 99,999
90414	Inspection area figure4 Rectangle Upper left position X	figArea0_fig4_box_X0	Set/Get	-99,999 to 99,999
90415	Inspection area figure4 Rectangle Upper left position Y	figArea0_fig4_box_Y0	Set/Get	-99,999 to 99,999
90416	Inspection area figure4 Rectangle Lower right position X	figArea0_fig4_box_X1	Set/Get	-99,999 to 99,999
90417	Inspection area figure4 Rectangle Lower right position Y	figArea0_fig4_box_Y1	Set/Get	-99,999 to 99,999
90418	Inspection area figure4 Ellipse Center Position X	figArea0_fig4_ellipse_CX	Set/Get	-99,999 to 99,999
90419	Inspection area figure4 Ellipse Center Position Y	figArea0_fig4_ellipse_CY	Set/Get	-99,999 to 99,999
90420	Inspection area figure4 Ellipse RadiusX	figArea0_fig4_ellipse_RX	Set/Get	1 to 99,999
90421	Inspection area figure4 Ellipse RadiusY	figArea0_fig4_ellipse_RY	Set/Get	1 to 99,999
90425	Inspection area figure4 Circumference Center Position X	figArea0_fig4_circleW_X	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90426	Inspection area figure4 Circumference Center Position Y	figArea0_fig4_circleW_Y	Set/Get	-99,999 to 99,999
90427	Inspection area figure4 Circumference Radius	figArea0_fig4_circleW_R	Set/Get	0 to 99,999
90428	Inspection area figure4 Circumference Width	figArea0_fig4_circleW_W	Set/Get	0 to 99,999
90434	Inspection area figure4 Wide arc Center Position X	figArea0_fig4_arcW_X	Set/Get	-99,999 to 99,999
90435	Inspection area figure4 Wide arc Center Position Y	figArea0_fig4_arcW_Y	Set/Get	-99,999 to 99,999
90436	Inspection area figure4 Wide arc Radius	figArea0_fig4_arcW_R	Set/Get	0 to 99,999
90437	Inspection area figure4 Wide arc Start angle	figArea0_fig4_arcW_SA	Set/Get	-180 to 180
90438	Inspection area figure4 Wide arc End angle	figArea0_fig4_arcW_EA	Set/Get	-180 to 180
90439	Inspection area figure4 Wide arc Width	figArea0_fig4_arcW_W	Set/Get	0 to 99,999
90440	Inspection area figure4 Polygon Point Count	figArea0_fig4_polygon_count	Set/Get	3 to 10
90441	Inspection area figure4 Polygon Point1 Position X	figArea0_fig4_polygon_x0	Set/Get	-99,999 to 99,999
90442	Inspection area figure4 Polygon Point1 Position Y	figArea0_fig4_polygon_y0	Set/Get	-99,999 to 99,999
90443	Inspection area figure4 Polygon Point2 Position X	figArea0_fig4_polygon_x1	Set/Get	-99,999 to 99,999
90444	Inspection area figure4 Polygon Point2 Position Y	figArea0_fig4_polygon_y1	Set/Get	-99,999 to 99,999
90445	Inspection area figure4 Polygon Point3 Position X	figArea0_fig4_polygon_x2	Set/Get	-99,999 to 99,999
90446	Inspection area figure4 Polygon Point3 Position Y	figArea0_fig4_polygon_y2	Set/Get	-99,999 to 99,999
90447	Inspection area figure4 Polygon Point4 Position X	figArea0_fig4_polygon_x3	Set/Get	-99,999 to 99,999
90448	Inspection area figure4 Polygon Point4 Position Y	figArea0_fig4_polygon_y3	Set/Get	-99,999 to 99,999
90449	Inspection area figure4 Polygon Point5 Position X	figArea0_fig4_polygon_x4	Set/Get	-99,999 to 99,999
90450	Inspection area figure4 Polygon Point5 Position Y	figArea0_fig4_polygon_y4	Set/Get	-99,999 to 99,999
90451	Inspection area figure4 Polygon Point6 Position X	figArea0_fig4_polygon_x5	Set/Get	-99,999 to 99,999
90452	Inspection area figure4 Polygon Point6 Position Y	figArea0_fig4_polygon_y5	Set/Get	-99,999 to 99,999
90453	Inspection area figure4 Polygon Point7 Position X	figArea0_fig4_polygon_x6	Set/Get	-99,999 to 99,999
90454	Inspection area figure4 Polygon Point7 Position Y	figArea0_fig4_polygon_y6	Set/Get	-99,999 to 99,999
90455	Inspection area figure4 Polygon Point8 Position X	figArea0_fig4_polygon_x7	Set/Get	-99,999 to 99,999
90456	Inspection area figure4 Polygon Point8 Position Y	figArea0_fig4_polygon_y7	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90457	Inspection area figure4 Polygon Point9 Position X	figArea0_fig4_polygon_x8	Set/Get	-99,999 to 99,999
90458	Inspection area figure4 Polygon Point9 Position Y	figArea0_fig4_polygon_y8	Set/Get	-99,999 to 99,999
90459	Inspection area figure4 Polygon Point10 Position X	figArea0_fig4_polygon_x9	Set/Get	-99,999 to 99,999
90460	Inspection area figure4 Polygon Point10 Position Y	figArea0_fig4_polygon_y9	Set/Get	-99,999 to 99,999
90501	Inspection area figure5 Type	figArea0_fig5_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90502	Inspection area figure5 mode	figArea0_fig5_mode	Set/Get	0: OR 1: NOT
90509	Inspection area figure5 Wide line Start point X	figArea0_fig5_lineW_X0	Set/Get	-99,999 to 99,999
90510	Inspection area figure5 Wide line Start point Y	figArea0_fig5_lineW_Y0	Set/Get	-99,999 to 99,999
90511	Inspection area figure5 Wide line End point X	figArea0_fig5_lineW_X1	Set/Get	-99,999 to 99,999
90512	Inspection area figure5 Wide line End point Y	figArea0_fig5_lineW_Y1	Set/Get	-99,999 to 99,999
90513	Inspection area figure5 Wide line Width	figArea0_fig5_lineW_W	Set/Get	0 to 99,999
90514	Inspection area figure5 Rectangle Upper left position X	figArea0_fig5_box_X0	Set/Get	-99,999 to 99,999
90515	Inspection area figure5 Rectangle Upper left position Y	figArea0_fig5_box_Y0	Set/Get	-99,999 to 99,999
90516	Inspection area figure5 Rectangle Lower right position X	figArea0_fig5_box_X1	Set/Get	-99,999 to 99,999
90517	Inspection area figure5 Rectangle Lower right position Y	figArea0_fig5_box_Y1	Set/Get	-99,999 to 99,999
90518	Inspection area figure5 Ellipse Center Position X	figArea0_fig5_ellipse_CX	Set/Get	-99,999 to 99,999
90519	Inspection area figure5 Ellipse Center Position Y	figArea0_fig5_ellipse_CY	Set/Get	-99,999 to 99,999
90520	Inspection area figure5 Ellipse RadiusX	figArea0_fig5_ellipse_RX	Set/Get	1 to 99,999
90521	Inspection area figure5 Ellipse RadiusY	figArea0_fig5_ellipse_RY	Set/Get	1 to 99,999
90525	Inspection area figure5 Circumference Center Position X	figArea0_fig5_circleW_X	Set/Get	-99,999 to 99,999
90526	Inspection area figure5 Circumference Center Position Y	figArea0_fig5_circleW_Y	Set/Get	-99,999 to 99,999
90527	Inspection area figure5 Circumference Radius	figArea0_fig5_circleW_R	Set/Get	0 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90528	Inspection area figure5 Circumference Width	figArea0_fig5_circleW_W	Set/Get	0 to 99,999
90534	Inspection area figure5 Wide arc Center Position X	figArea0_fig5_arcW_X	Set/Get	-99,999 to 99,999
90535	Inspection area figure5 Wide arc Center Position Y	figArea0_fig5_arcW_Y	Set/Get	-99,999 to 99,999
90536	Inspection area figure5 Wide arc Radius	figArea0_fig5_arcW_R	Set/Get	0 to 99,999
90537	Inspection area figure5 Wide arc Start angle	figArea0_fig5_arcW_SA	Set/Get	-180 to 180
90538	Inspection area figure5 Wide arc End angle	figArea0_fig5_arcW_EA	Set/Get	-180 to 180
90539	Inspection area figure5 Wide arc Width	figArea0_fig5_arcW_W	Set/Get	0 to 99,999
90540	Inspection area figure5 Polygon Point Count	figArea0_fig5_polygon_count	Set/Get	3 to 10
90541	Inspection area figure5 Polygon Point1 Position X	figArea0_fig5_polygon_x0	Set/Get	-99,999 to 99,999
90542	Inspection area figure5 Polygon Point1 Position Y	figArea0_fig5_polygon_y0	Set/Get	-99,999 to 99,999
90543	Inspection area figure5 Polygon Point2 Position X	figArea0_fig5_polygon_x1	Set/Get	-99,999 to 99,999
90544	Inspection area figure5 Polygon Point2 Position Y	figArea0_fig5_polygon_y1	Set/Get	-99,999 to 99,999
90545	Inspection area figure5 Polygon Point3 Position X	figArea0_fig5_polygon_x2	Set/Get	-99,999 to 99,999
90546	Inspection area figure5 Polygon Point3 Position Y	figArea0_fig5_polygon_y2	Set/Get	-99,999 to 99,999
90547	Inspection area figure5 Polygon Point4 Position X	figArea0_fig5_polygon_x3	Set/Get	-99,999 to 99,999
90548	Inspection area figure5 Polygon Point4 Position Y	figArea0_fig5_polygon_y3	Set/Get	-99,999 to 99,999
90549	Inspection area figure5 Polygon Point5 Position X	figArea0_fig5_polygon_x4	Set/Get	-99,999 to 99,999
90550	Inspection area figure5 Polygon Point5 Position Y	figArea0_fig5_polygon_y4	Set/Get	-99,999 to 99,999
90551	Inspection area figure5 Polygon Point6 Position X	figArea0_fig5_polygon_x5	Set/Get	-99,999 to 99,999
90552	Inspection area figure5 Polygon Point6 Position Y	figArea0_fig5_polygon_y5	Set/Get	-99,999 to 99,999
90553	Inspection area figure5 Polygon Point7 Position X	figArea0_fig5_polygon_x6	Set/Get	-99,999 to 99,999
90554	Inspection area figure5 Polygon Point7 Position Y	figArea0_fig5_polygon_y6	Set/Get	-99,999 to 99,999
90555	Inspection area figure5 Polygon Point8 Position X	figArea0_fig5_polygon_x7	Set/Get	-99,999 to 99,999
90556	Inspection area figure5 Polygon Point8 Position Y	figArea0_fig5_polygon_y7	Set/Get	-99,999 to 99,999
90557	Inspection area figure5 Polygon Point9 Position X	figArea0_fig5_polygon_x8	Set/Get	-99,999 to 99,999
90558	Inspection area figure5 Polygon Point9 Position Y	figArea0_fig5_polygon_y8	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90559	Inspection area figure5 Polygon Point10 Position X	figArea0_fig5_polygon_x9	Set/Get	-99,999 to 99,999
90560	Inspection area figure5 Polygon Point10 Position Y	figArea0_fig5_polygon_y9	Set/Get	-99,999 to 99,999
90601	Inspection area figure6 Type	figArea0_fig6_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90602	Inspection area figure6 mode	figArea0_fig6_mode	Set/Get	0: OR 1: NOT
90609	Inspection area figure6 Wide line Start point X	figArea0_fig6_lineW_X0	Set/Get	-99,999 to 99,999
90610	Inspection area figure6 Wide line Start point Y	figArea0_fig6_lineW_Y0	Set/Get	-99,999 to 99,999
90611	Inspection area figure6 Wide line End point X	figArea0_fig6_lineW_X1	Set/Get	-99,999 to 99,999
90612	Inspection area figure6 Wide line End point Y	figArea0_fig6_lineW_Y1	Set/Get	-99,999 to 99,999
90613	Inspection area figure6 Wide line Width	figArea0_fig6_lineW_W	Set/Get	0 to 99,999
90614	Inspection area figure6 Rectangle Upper left position X	figArea0_fig6_box_X0	Set/Get	-99,999 to 99,999
90615	Inspection area figure6 Rectangle Upper left position Y	figArea0_fig6_box_Y0	Set/Get	-99,999 to 99,999
90616	Inspection area figure6 Rectangle Lower right position X	figArea0_fig6_box_X1	Set/Get	-99,999 to 99,999
90617	Inspection area figure6 Rectangle Lower right position Y	figArea0_fig6_box_Y1	Set/Get	-99,999 to 99,999
90618	Inspection area figure6 Ellipse Center Position X	figArea0_fig6_ellipse_CX	Set/Get	-99,999 to 99,999
90619	Inspection area figure6 Ellipse Center Position Y	figArea0_fig6_ellipse_CY	Set/Get	-99,999 to 99,999
90620	Inspection area figure6 Ellipse RadiusX	figArea0_fig6_ellipse_RX	Set/Get	1 to 99,999
90621	Inspection area figure6 Ellipse RadiusY	figArea0_fig6_ellipse_RY	Set/Get	1 to 99,999
90625	Inspection area figure6 Circumference Center Position X	figArea0_fig6_circleW_X	Set/Get	-99,999 to 99,999
90626	Inspection area figure6 Circumference Center Position Y	figArea0_fig6_circleW_Y	Set/Get	-99,999 to 99,999
90627	Inspection area figure6 Circumference Radius	figArea0_fig6_circleW_R	Set/Get	0 to 99,999
90628	Inspection area figure6 Circumference Width	figArea0_fig6_circleW_W	Set/Get	0 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90634	Inspection area figure6 Wide arc Center Position X	figArea0_fig6_arcW_X	Set/Get	-99,999 to 99,999
90635	Inspection area figure6 Wide arc Center Position Y	figArea0_fig6_arcW_Y	Set/Get	-99,999 to 99,999
90636	Inspection area figure6 Wide arc Radius	figArea0_fig6_arcW_R	Set/Get	0 to 99,999
90637	Inspection area figure6 Wide arc Start angle	figArea0_fig6_arcW_SA	Set/Get	-180 to 180
90638	Inspection area figure6 Wide arc End angle	figArea0_fig6_arcW_EA	Set/Get	-180 to 180
90639	Inspection area figure6 Wide arc Width	figArea0_fig6_arcW_W	Set/Get	0 to 99,999
90640	Inspection area figure6 Polygon Point Count	figArea0_fig6_polygon_count	Set/Get	3 to 10
90641	Inspection area figure6 Polygon Point1 Position X	figArea0_fig6_polygon_x0	Set/Get	-99,999 to 99,999
90642	Inspection area figure6 Polygon Point1 Position Y	figArea0_fig6_polygon_y0	Set/Get	-99,999 to 99,999
90643	Inspection area figure6 Polygon Point2 Position X	figArea0_fig6_polygon_x1	Set/Get	-99,999 to 99,999
90644	Inspection area figure6 Polygon Point2 Position Y	figArea0_fig6_polygon_y1	Set/Get	-99,999 to 99,999
90645	Inspection area figure6 Polygon Point3 Position X	figArea0_fig6_polygon_x2	Set/Get	-99,999 to 99,999
90646	Inspection area figure6 Polygon Point3 Position Y	figArea0_fig6_polygon_y2	Set/Get	-99,999 to 99,999
90647	Inspection area figure6 Polygon Point4 Position X	figArea0_fig6_polygon_x3	Set/Get	-99,999 to 99,999
90648	Inspection area figure6 Polygon Point4 Position Y	figArea0_fig6_polygon_y3	Set/Get	-99,999 to 99,999
90649	Inspection area figure6 Polygon Point5 Position X	figArea0_fig6_polygon_x4	Set/Get	-99,999 to 99,999
90650	Inspection area figure6 Polygon Point5 Position Y	figArea0_fig6_polygon_y4	Set/Get	-99,999 to 99,999
90651	Inspection area figure6 Polygon Point6 Position X	figArea0_fig6_polygon_x5	Set/Get	-99,999 to 99,999
90652	Inspection area figure6 Polygon Point6 Position Y	figArea0_fig6_polygon_y5	Set/Get	-99,999 to 99,999
90653	Inspection area figure6 Polygon Point7 Position X	figArea0_fig6_polygon_x6	Set/Get	-99,999 to 99,999
90654	Inspection area figure6 Polygon Point7 Position Y	figArea0_fig6_polygon_y6	Set/Get	-99,999 to 99,999
90655	Inspection area figure6 Polygon Point8 Position X	figArea0_fig6_polygon_x7	Set/Get	-99,999 to 99,999
90656	Inspection area figure6 Polygon Point8 Position Y	figArea0_fig6_polygon_y7	Set/Get	-99,999 to 99,999
90657	Inspection area figure6 Polygon Point9 Position X	figArea0_fig6_polygon_x8	Set/Get	-99,999 to 99,999
90658	Inspection area figure6 Polygon Point9 Position Y	figArea0_fig6_polygon_y8	Set/Get	-99,999 to 99,999
90659	Inspection area figure6 Polygon Point10 Position X	figArea0_fig6_polygon_x9	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90660	Inspection area figure6 Polygon Point10 Position Y	figArea0_fig6_polygon_y9	Set/Get	-99,999 to 99,999
90701	Inspection area figure7 Type	figArea0_fig7_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90702	Inspection area figure7 mode	figArea0_fig7_mode	Set/Get	0: OR 1: NOT
90709	Inspection area figure7 Wide line Start point X	figArea0_fig7_lineW_X0	Set/Get	-99,999 to 99,999
90710	Inspection area figure7 Wide line Start point Y	figArea0_fig7_lineW_Y0	Set/Get	-99,999 to 99,999
90711	Inspection area figure7 Wide line End point X	figArea0_fig7_lineW_X1	Set/Get	-99,999 to 99,999
90712	Inspection area figure7 Wide line End point Y	figArea0_fig7_lineW_Y1	Set/Get	-99,999 to 99,999
90713	Inspection area figure7 Wide line Width	figArea0_fig7_lineW_W	Set/Get	0 to 99,999
90714	Inspection area figure7 Rectangle Upper left position X	figArea0_fig7_box_X0	Set/Get	-99,999 to 99,999
90715	Inspection area figure7 Rectangle Upper left position Y	figArea0_fig7_box_Y0	Set/Get	-99,999 to 99,999
90716	Inspection area figure7 Rectangle Lower right position X	figArea0_fig7_box_X1	Set/Get	-99,999 to 99,999
90717	Inspection area figure7 Rectangle Lower right position Y	figArea0_fig7_box_Y1	Set/Get	-99,999 to 99,999
90718	Inspection area figure7 Ellipse Center Position X	figArea0_fig7_ellipse_CX	Set/Get	-99,999 to 99,999
90719	Inspection area figure7 Ellipse Center Position Y	figArea0_fig7_ellipse_CY	Set/Get	-99,999 to 99,999
90720	Inspection area figure7 Ellipse RadiusX	figArea0_fig7_ellipse_RX	Set/Get	1 to 99,999
90721	Inspection area figure7 Ellipse RadiusY	figArea0_fig7_ellipse_RY	Set/Get	1 to 99,999
90725	Inspection area figure7 Circumference Center Position X	figArea0_fig7_circleW_X	Set/Get	-99,999 to 99,999
90726	Inspection area figure7 Circumference Center Position Y	figArea0_fig7_circleW_Y	Set/Get	-99,999 to 99,999
90727	Inspection area figure7 Circumference Radius	figArea0_fig7_circleW_R	Set/Get	0 to 99,999
90728	Inspection area figure7 Circumference Width	figArea0_fig7_circleW_W	Set/Get	0 to 99,999
90734	Inspection area figure7 Wide arc Center Position X	figArea0_fig7_arcW_X	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90735	Inspection area figure7 Wide arc Center Position Y	figArea0_fig7_arcW_Y	Set/Get	-99,999 to 99,999
90736	Inspection area figure7 Wide arc Radius	figArea0_fig7_arcW_R	Set/Get	0 to 99,999
90737	Inspection area figure7 Wide arc Start angle	figArea0_fig7_arcW_SA	Set/Get	-180 to 180
90738	Inspection area figure7 Wide arc End angle	figArea0_fig7_arcW_EA	Set/Get	-180 to 180
90739	Inspection area figure7 Wide arc Width	figArea0_fig7_arcW_W	Set/Get	0 to 99,999
90740	Inspection area figure7 Polygon Point Count	figArea0_fig7_poly-gon_count	Set/Get	3 to 10
90741	Inspection area figure7 Polygon Point1 Position X	figArea0_fig7_polygon_x0	Set/Get	-99,999 to 99,999
90742	Inspection area figure7 Polygon Point1 Position Y	figArea0_fig7_polygon_y0	Set/Get	-99,999 to 99,999
90743	Inspection area figure7 Polygon Point2 Position X	figArea0_fig7_polygon_x1	Set/Get	-99,999 to 99,999
90744	Inspection area figure7 Polygon Point2 Position Y	figArea0_fig7_polygon_y1	Set/Get	-99,999 to 99,999
90745	Inspection area figure7 Polygon Point3 Position X	figArea0_fig7_polygon_x2	Set/Get	-99,999 to 99,999
90746	Inspection area figure7 Polygon Point3 Position Y	figArea0_fig7_polygon_y2	Set/Get	-99,999 to 99,999
90747	Inspection area figure7 Polygon Point4 Position X	figArea0_fig7_polygon_x3	Set/Get	-99,999 to 99,999
90748	Inspection area figure7 Polygon Point4 Position Y	figArea0_fig7_polygon_y3	Set/Get	-99,999 to 99,999
90749	Inspection area figure7 Polygon Point5 Position X	figArea0_fig7_polygon_x4	Set/Get	-99,999 to 99,999
90750	Inspection area figure7 Polygon Point5 Position Y	figArea0_fig7_polygon_y4	Set/Get	-99,999 to 99,999
90751	Inspection area figure7 Polygon Point6 Position X	figArea0_fig7_polygon_x5	Set/Get	-99,999 to 99,999
90752	Inspection area figure7 Polygon Point6 Position Y	figArea0_fig7_polygon_y5	Set/Get	-99,999 to 99,999
90753	Inspection area figure7 Polygon Point7 Position X	figArea0_fig7_polygon_x6	Set/Get	-99,999 to 99,999
90754	Inspection area figure7 Polygon Point7 Position Y	figArea0_fig7_polygon_y6	Set/Get	-99,999 to 99,999
90755	Inspection area figure7 Polygon Point8 Position X	figArea0_fig7_polygon_x7	Set/Get	-99,999 to 99,999
90756	Inspection area figure7 Polygon Point8 Position Y	figArea0_fig7_polygon_y7	Set/Get	-99,999 to 99,999
90757	Inspection area figure7 Polygon Point9 Position X	figArea0_fig7_polygon_x8	Set/Get	-99,999 to 99,999
90758	Inspection area figure7 Polygon Point9 Position Y	figArea0_fig7_polygon_y8	Set/Get	-99,999 to 99,999
90759	Inspection area figure7 Polygon Point10 Position X	figArea0_fig7_polygon_x9	Set/Get	-99,999 to 99,999
90760	Inspection area figure7 Polygon Point10 Position Y	figArea0_fig7_polygon_y9	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90801	Inspection area figure8 Type	figArea0_fig8_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90802	Inspection area figure8 mode	figArea0_fig8_mode	Set/Get	0: OR 1: NOT
90809	Inspection area figure8 Wide line Start point X	figArea0_fig8_lineW_X0	Set/Get	-99,999 to 99,999
90810	Inspection area figure8 Wide line Start point Y	figArea0_fig8_lineW_Y0	Set/Get	-99,999 to 99,999
90811	Inspection area figure8 Wide line End point X	figArea0_fig8_lineW_X1	Set/Get	-99,999 to 99,999
90812	Inspection area figure8 Wide line End point Y	figArea0_fig8_lineW_Y1	Set/Get	-99,999 to 99,999
90813	Inspection area figure8 Wide line Width	figArea0_fig8_lineW_W	Set/Get	0 to 99,999
90814	Inspection area figure8 Rectangle Upper left position X	figArea0_fig8_box_X0	Set/Get	-99,999 to 99,999
90815	Inspection area figure8 Rectangle Upper left position Y	figArea0_fig8_box_Y0	Set/Get	-99,999 to 99,999
90816	Inspection area figure8 Rectangle Lower right position X	figArea0_fig8_box_X1	Set/Get	-99,999 to 99,999
90817	Inspection area figure8 Rectangle Lower right position Y	figArea0_fig8_box_Y1	Set/Get	-99,999 to 99,999
90818	Inspection area figure8 Ellipse Center Position X	figArea0_fig8_ellipse_CX	Set/Get	-99,999 to 99,999
90819	Inspection area figure8 Ellipse Center Position Y	figArea0_fig8_ellipse_CY	Set/Get	-99,999 to 99,999
90820	Inspection area figure8 Ellipse RadiusX	figArea0_fig8_ellipse_RX	Set/Get	1 to 99,999
90821	Inspection area figure8 Ellipse RadiusY	figArea0_fig8_ellipse_RY	Set/Get	1 to 99,999
90825	Inspection area figure8 Circumference Center Position X	figArea0_fig8_circleW_X	Set/Get	-99,999 to 99,999
90826	Inspection area figure8 Circumference Center Position Y	figArea0_fig8_circleW_Y	Set/Get	-99,999 to 99,999
90827	Inspection area figure8 Circumference Radius	figArea0_fig8_circleW_R	Set/Get	0 to 99,999
90828	Inspection area figure8 Circumference Width	figArea0_fig8_circleW_W	Set/Get	0 to 99,999
90834	Inspection area figure8 Wide arc Center Position X	figArea0_fig8_arcW_X	Set/Get	-99,999 to 99,999
90835	Inspection area figure8 Wide arc Center Position Y	figArea0_fig8_arcW_Y	Set/Get	-99,999 to 99,999
90836	Inspection area figure8 Wide arc Radius	figArea0_fig8_arcW_R	Set/Get	0 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90837	Inspection area figure8 Wide arc Start angle	figArea0_fig8_arcW_SA	Set/Get	-180 to 180
90838	Inspection area figure8 Wide arc End angle	figArea0_fig8_arcW_EA	Set/Get	-180 to 180
90839	Inspection area figure8 Wide arc Width	figArea0_fig8_arcW_W	Set/Get	0 to 99,999
90840	Inspection area figure8 Polygon Point Count	figArea0_fig8_polygon_count	Set/Get	3 to 10
90841	Inspection area figure8 Polygon Point1 Position X	figArea0_fig8_polygon_x0	Set/Get	-99,999 to 99,999
90842	Inspection area figure8 Polygon Point1 Position Y	figArea0_fig8_polygon_y0	Set/Get	-99,999 to 99,999
90843	Inspection area figure8 Polygon Point2 Position X	figArea0_fig8_polygon_x1	Set/Get	-99,999 to 99,999
90844	Inspection area figure8 Polygon Point2 Position Y	figArea0_fig8_polygon_y1	Set/Get	-99,999 to 99,999
90845	Inspection area figure8 Polygon Point3 Position X	figArea0_fig8_polygon_x2	Set/Get	-99,999 to 99,999
90846	Inspection area figure8 Polygon Point3 Position Y	figArea0_fig8_polygon_y2	Set/Get	-99,999 to 99,999
90847	Inspection area figure8 Polygon Point4 Position X	figArea0_fig8_polygon_x3	Set/Get	-99,999 to 99,999
90848	Inspection area figure8 Polygon Point4 Position Y	figArea0_fig8_polygon_y3	Set/Get	-99,999 to 99,999
90849	Inspection area figure8 Polygon Point5 Position X	figArea0_fig8_polygon_x4	Set/Get	-99,999 to 99,999
90850	Inspection area figure8 Polygon Point5 Position Y	figArea0_fig8_polygon_y4	Set/Get	-99,999 to 99,999
90851	Inspection area figure8 Polygon Point6 Position X	figArea0_fig8_polygon_x5	Set/Get	-99,999 to 99,999
90852	Inspection area figure8 Polygon Point6 Position Y	figArea0_fig8_polygon_y5	Set/Get	-99,999 to 99,999
90853	Inspection area figure8 Polygon Point7 Position X	figArea0_fig8_polygon_x6	Set/Get	-99,999 to 99,999
90854	Inspection area figure8 Polygon Point7 Position Y	figArea0_fig8_polygon_y6	Set/Get	-99,999 to 99,999
90855	Inspection area figure8 Polygon Point8 Position X	figArea0_fig8_polygon_x7	Set/Get	-99,999 to 99,999
90856	Inspection area figure8 Polygon Point8 Position Y	figArea0_fig8_polygon_y7	Set/Get	-99,999 to 99,999
90857	Inspection area figure8 Polygon Point9 Position X	figArea0_fig8_polygon_x8	Set/Get	-99,999 to 99,999
90858	Inspection area figure8 Polygon Point9 Position Y	figArea0_fig8_polygon_y8	Set/Get	-99,999 to 99,999
90859	Inspection area figure8 Polygon Point10 Position X	figArea0_fig8_polygon_x9	Set/Get	-99,999 to 99,999
90860	Inspection area figure8 Polygon Point10 Position Y	figArea0_fig8_polygon_y9	Set/Get	-99,999 to 99,999
90901	Inspection area figure9 Type	figArea0_fig9_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon

No.	Data Name	Ident	Set/Get	Data range
90902	Inspection area figure9 mode	figArea0_fig9_mode	Set/Get	0: OR 1: NOT
90909	Inspection area figure9 Wide line Start point X	figArea0_fig9_lineW_X0	Set/Get	-99,999 to 99,999
90910	Inspection area figure9 Wide line Start point Y	figArea0_fig9_lineW_Y0	Set/Get	-99,999 to 99,999
90911	Inspection area figure9 Wide line End point X	figArea0_fig9_lineW_X1	Set/Get	-99,999 to 99,999
90912	Inspection area figure9 Wide line End point Y	figArea0_fig9_lineW_Y1	Set/Get	-99,999 to 99,999
90913	Inspection area figure9 Wide line Width	figArea0_fig9_lineW_W	Set/Get	0 to 99,999
90914	Inspection area figure9 Rectangle Upper left position X	figArea0_fig9_box_X0	Set/Get	-99,999 to 99,999
90915	Inspection area figure9 Rectangle Upper left position Y	figArea0_fig9_box_Y0	Set/Get	-99,999 to 99,999
90916	Inspection area figure9 Rectangle Lower right position X	figArea0_fig9_box_X1	Set/Get	-99,999 to 99,999
90917	Inspection area figure9 Rectangle Lower right position Y	figArea0_fig9_box_Y1	Set/Get	-99,999 to 99,999
90918	Inspection area figure9 Ellipse Center Position X	figArea0_fig9_ellipse_CX	Set/Get	-99,999 to 99,999
90919	Inspection area figure9 Ellipse Center Position Y	figArea0_fig9_ellipse_CY	Set/Get	-99,999 to 99,999
90920	Inspection area figure9 Ellipse RadiusX	figArea0_fig9_ellipse_RX	Set/Get	1 to 99,999
90921	Inspection area figure9 Ellipse RadiusY	figArea0_fig9_ellipse_RY	Set/Get	1 to 99,999
90925	Inspection area figure9 Circumference Center Position X	figArea0_fig9_circleW_X	Set/Get	-99,999 to 99,999
90926	Inspection area figure9 Circumference Center Position Y	figArea0_fig9_circleW_Y	Set/Get	-99,999 to 99,999
90927	Inspection area figure9 Circumference Radius	figArea0_fig9_circleW_R	Set/Get	0 to 99,999
90928	Inspection area figure9 Circumference Width	figArea0_fig9_circleW_W	Set/Get	0 to 99,999
90934	Inspection area figure9 Wide arc Center Position X	figArea0_fig9_arcW_X	Set/Get	-99,999 to 99,999
90935	Inspection area figure9 Wide arc Center Position Y	figArea0_fig9_arcW_Y	Set/Get	-99,999 to 99,999
90936	Inspection area figure9 Wide arc Radius	figArea0_fig9_arcW_R	Set/Get	0 to 99,999
90937	Inspection area figure9 Wide arc Start angle	figArea0_fig9_arcW_SA	Set/Get	-180 to 180
90938	Inspection area figure9 Wide arc End angle	figArea0_fig9_arcW_EA	Set/Get	-180 to 180
90939	Inspection area figure9 Wide arc Width	figArea0_fig9_arcW_W	Set/Get	0 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90940	Inspection area figure9 Polygon Point Count	figArea0_fig9_polygon_count	Set/Get	3 to 10
90941	Inspection area figure9 Polygon Point1 Position X	figArea0_fig9_polygon_x0	Set/Get	-99,999 to 99,999
90942	Inspection area figure9 Polygon Point1 Position Y	figArea0_fig9_polygon_y0	Set/Get	-99,999 to 99,999
90943	Inspection area figure9 Polygon Point2 Position X	figArea0_fig9_polygon_x1	Set/Get	-99,999 to 99,999
90944	Inspection area figure9 Polygon Point2 Position Y	figArea0_fig9_polygon_y1	Set/Get	-99,999 to 99,999
90945	Inspection area figure9 Polygon Point3 Position X	figArea0_fig9_polygon_x2	Set/Get	-99,999 to 99,999
90946	Inspection area figure9 Polygon Point3 Position Y	figArea0_fig9_polygon_y2	Set/Get	-99,999 to 99,999
90947	Inspection area figure9 Polygon Point4 Position X	figArea0_fig9_polygon_x3	Set/Get	-99,999 to 99,999
90948	Inspection area figure9 Polygon Point4 Position Y	figArea0_fig9_polygon_y3	Set/Get	-99,999 to 99,999
90949	Inspection area figure9 Polygon Point5 Position X	figArea0_fig9_polygon_x4	Set/Get	-99,999 to 99,999
90950	Inspection area figure9 Polygon Point5 Position Y	figArea0_fig9_polygon_y4	Set/Get	-99,999 to 99,999
90951	Inspection area figure9 Polygon Point6 Position X	figArea0_fig9_polygon_x5	Set/Get	-99,999 to 99,999
90952	Inspection area figure9 Polygon Point6 Position Y	figArea0_fig9_polygon_y5	Set/Get	-99,999 to 99,999
90953	Inspection area figure9 Polygon Point7 Position X	figArea0_fig9_polygon_x6	Set/Get	-99,999 to 99,999
90954	Inspection area figure9 Polygon Point7 Position Y	figArea0_fig9_polygon_y6	Set/Get	-99,999 to 99,999
90955	Inspection area figure9 Polygon Point8 Position X	figArea0_fig9_polygon_x7	Set/Get	-99,999 to 99,999
90956	Inspection area figure9 Polygon Point8 Position Y	figArea0_fig9_polygon_y7	Set/Get	-99,999 to 99,999
90957	Inspection area figure9 Polygon Point9 Position X	figArea0_fig9_polygon_x8	Set/Get	-99,999 to 99,999
90958	Inspection area figure9 Polygon Point9 Position Y	figArea0_fig9_polygon_y8	Set/Get	-99,999 to 99,999
90959	Inspection area figure9 Polygon Point10 Position X	figArea0_fig9_polygon_x9	Set/Get	-99,999 to 99,999
90960	Inspection area figure9 Polygon Point10 Position Y	figArea0_fig9_polygon_y9	Set/Get	-99,999 to 99,999
91000	Start point figure Count	figArea1_count	Set/Get	0 to 1
91001	Start point figure0 Type	figArea1_fig0_type	Set/Get	4: Wide line
91002	Start point figure0 mode	figArea1_fig0_mode	Set/Get	0: OR
91009	Start point figure0 Wide line Start point X	figArea1_fig0_lineW_X0	Set/Get	-99,999 to 99,999
91010	Start point figure0 Wide line Start point Y	figArea1_fig0_lineW_Y0	Set/Get	-99,999 to 99,999
91011	Start point figure0 Wide line End point X	figArea1_fig0_lineW_X1	Set/Get	-99,999 to 99,999
91012	Start point figure0 Wide line End point Y	figArea1_fig0_lineW_Y1	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
91013	Start point figure0 Wide line Width	figArea1_fig0_lineW_W	Set/Get	0 to 99,999
91099	Start point figure Update	figArea1_update	Set only	1: Update
92000	Mask area figure Count	figArea2_count	Set/Get	0 to 10
92001	Mask area figure0 Type	figArea2_fig0_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
92002	Mask area figure0 mode	figArea2_fig0_mode	Set/Get	0: OR 1: NOT
92009	Mask area figure0 Wide line Start point X	figArea2_fig0_lineW_X0	Set/Get	-99,999 to 99,999
92010	Mask area figure0 Wide line Start point Y	figArea2_fig0_lineW_Y0	Set/Get	-99,999 to 99,999
92011	Mask area figure0 Wide line End point X	figArea2_fig0_lineW_X1	Set/Get	-99,999 to 99,999
92012	Mask area figure0 Wide line End point Y	figArea2_fig0_lineW_Y1	Set/Get	-99,999 to 99,999
92013	Mask area figure0 Wide line Width	figArea2_fig0_lineW_W	Set/Get	0 to 99,999
92014	Mask area figure0 Rectangle Upper left position X	figArea2_fig0_box_X0	Set/Get	-99,999 to 99,999
92015	Mask area figure0 Rectangle Upper left position Y	figArea2_fig0_box_Y0	Set/Get	-99,999 to 99,999
92016	Mask area figure0 Rectangle Lower right position X	figArea2_fig0_box_X1	Set/Get	-99,999 to 99,999
92017	Mask area figure0 Rectangle Lower right position Y	figArea2_fig0_box_Y1	Set/Get	-99,999 to 99,999
92018	Mask area figure0 Ellipse Center Position X	figArea2_fig0_ellipse_CX	Set/Get	-99,999 to 99,999
92019	Mask area figure0 Ellipse Center Position Y	figArea2_fig0_ellipse_CY	Set/Get	-99,999 to 99,999
92020	Mask area figure0 Ellipse RadiusX	figArea2_fig0_ellipse_RX	Set/Get	1 to 99,999
92021	Mask area figure0 Ellipse RadiusY	figArea2_fig0_ellipse_RY	Set/Get	1 to 99,999
92025	Mask area figure0 Circumference Center Position X	figArea2_fig0_circleW_X	Set/Get	-99,999 to 99,999
92026	Mask area figure0 Circumference Center Position Y	figArea2_fig0_circleW_Y	Set/Get	-99,999 to 99,999
92027	Mask area figure0 Circumference Radius	figArea2_fig0_circleW_R	Set/Get	0 to 99,999
92028	Mask area figure0 Circumference Width	figArea2_fig0_circleW_W	Set/Get	0 to 99,999
92034	Mask area figure0 Wide arc Center Position X	figArea2_fig0_arcW_X	Set/Get	-99,999 to 99,999
92035	Mask area figure0 Wide arc Center Position Y	figArea2_fig0_arcW_Y	Set/Get	-99,999 to 99,999
92036	Mask area figure0 Wide arc Radius	figArea2_fig0_arcW_R	Set/Get	0 to 99,999
92037	Mask area figure0 Wide arc Start angle	figArea2_fig0_arcW_SA	Set/Get	-180 to 180
92038	Mask area figure0 Wide arc End angle	figArea2_fig0_arcW_EA	Set/Get	-180 to 180

No.	Data Name	Ident	Set/Get	Data range
92039	Mask area figure0 Wide arc Width	figArea2_fig0_arcW_W	Set/Get	0 to 99,999
92040	Mask area figure0 Polygon Point Count	figArea2_fig0_polygon_count	Set/Get	3 to 10
92041	Mask area figure0 Polygon Point1 Position X	figArea2_fig0_polygon_x0	Set/Get	-99,999 to 99,999
92042	Mask area figure0 Polygon Point1 Position Y	figArea2_fig0_polygon_y0	Set/Get	-99,999 to 99,999
92043	Mask area figure0 Polygon Point2 Position X	figArea2_fig0_polygon_x1	Set/Get	-99,999 to 99,999
92044	Mask area figure0 Polygon Point2 Position Y	figArea2_fig0_polygon_y1	Set/Get	-99,999 to 99,999
92045	Mask area figure0 Polygon Point3 Position X	figArea2_fig0_polygon_x2	Set/Get	-99,999 to 99,999
92046	Mask area figure0 Polygon Point3 Position Y	figArea2_fig0_polygon_y2	Set/Get	-99,999 to 99,999
92047	Mask area figure0 Polygon Point4 Position X	figArea2_fig0_polygon_x3	Set/Get	-99,999 to 99,999
92048	Mask area figure0 Polygon Point4 Position Y	figArea2_fig0_polygon_y3	Set/Get	-99,999 to 99,999
92049	Mask area figure0 Polygon Point5 Position X	figArea2_fig0_polygon_x4	Set/Get	-99,999 to 99,999
92050	Mask area figure0 Polygon Point5 Position Y	figArea2_fig0_polygon_y4	Set/Get	-99,999 to 99,999
92051	Mask area figure0 Polygon Point6 Position X	figArea2_fig0_polygon_x5	Set/Get	-99,999 to 99,999
92052	Mask area figure0 Polygon Point6 Position Y	figArea2_fig0_polygon_y5	Set/Get	-99,999 to 99,999
92053	Mask area figure0 Polygon Point7 Position X	figArea2_fig0_polygon_x6	Set/Get	-99,999 to 99,999
92054	Mask area figure0 Polygon Point7 Position Y	figArea2_fig0_polygon_y6	Set/Get	-99,999 to 99,999
92055	Mask area figure0 Polygon Point8 Position X	figArea2_fig0_polygon_x7	Set/Get	-99,999 to 99,999
92056	Mask area figure0 Polygon Point8 Position Y	figArea2_fig0_polygon_y7	Set/Get	-99,999 to 99,999
92057	Mask area figure0 Polygon Point9 Position X	figArea2_fig0_polygon_x8	Set/Get	-99,999 to 99,999
92058	Mask area figure0 Polygon Point9 Position Y	figArea2_fig0_polygon_y8	Set/Get	-99,999 to 99,999
92059	Mask area figure0 Polygon Point10 Position X	figArea2_fig0_polygon_x9	Set/Get	-99,999 to 99,999
92060	Mask area figure0 Polygon Point10 Position Y	figArea2_fig0_polygon_y9	Set/Get	-99,999 to 99,999
92099	Mask area figure Update	figArea2_update	Set only	1: Update
92101	Mask area figure1 Type	figArea2_fig1_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
92102	Mask area figure1 mode	figArea2_fig1_mode	Set/Get	0: OR 1: NOT
92109	Mask area figure1 Wide line Start point X	figArea2_fig1_lineW_X0	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92110	Mask area figure1 Wide line Start point Y	figArea2_fig1_lineW_Y0	Set/Get	-99,999 to 99,999
92111	Mask area figure1 Wide line End point X	figArea2_fig1_lineW_X1	Set/Get	-99,999 to 99,999
92112	Mask area figure1 Wide line End point Y	figArea2_fig1_lineW_Y1	Set/Get	-99,999 to 99,999
92113	Mask area figure1 Wide line Width	figArea2_fig1_lineW_W	Set/Get	0 to 99,999
92114	Mask area figure1 Rectangle Upper left position X	figArea2_fig1_box_X0	Set/Get	-99,999 to 99,999
92115	Mask area figure1 Rectangle Upper left position Y	figArea2_fig1_box_Y0	Set/Get	-99,999 to 99,999
92116	Mask area figure1 Rectangle Lower right position X	figArea2_fig1_box_X1	Set/Get	-99,999 to 99,999
92117	Mask area figure1 Rectangle Lower right position Y	figArea2_fig1_box_Y1	Set/Get	-99,999 to 99,999
92118	Mask area figure1 Ellipse Center Position X	figArea2_fig1_ellipse_CX	Set/Get	-99,999 to 99,999
92119	Mask area figure1 Ellipse Center Position Y	figArea2_fig1_ellipse_CY	Set/Get	-99,999 to 99,999
92120	Mask area figure1 Ellipse RadiusX	figArea2_fig1_ellipse_RX	Set/Get	1 to 99,999
92121	Mask area figure1 Ellipse RadiusY	figArea2_fig1_ellipse_RY	Set/Get	1 to 99,999
92125	Mask area figure1 Circumference Center Position X	figArea2_fig1_circleW_X	Set/Get	-99,999 to 99,999
92126	Mask area figure1 Circumference Center Position Y	figArea2_fig1_circleW_Y	Set/Get	-99,999 to 99,999
92127	Mask area figure1 Circumference Radius	figArea2_fig1_circleW_R	Set/Get	0 to 99,999
92128	Mask area figure1 Circumference Width	figArea2_fig1_circleW_W	Set/Get	0 to 99,999
92134	Mask area figure1 Wide arc Center Position X	figArea2_fig1_arcW_X	Set/Get	-99,999 to 99,999
92135	Mask area figure1 Wide arc Center Position Y	figArea2_fig1_arcW_Y	Set/Get	-99,999 to 99,999
92136	Mask area figure1 Wide arc Radius	figArea2_fig1_arcW_R	Set/Get	0 to 99,999
92137	Mask area figure1 Wide arc Start angle	figArea2_fig1_arcW_SA	Set/Get	-180 to 180
92138	Mask area figure1 Wide arc End angle	figArea2_fig1_arcW_EA	Set/Get	-180 to 180
92139	Mask area figure1 Wide arc Width	figArea2_fig1_arcW_W	Set/Get	0 to 99,999
92140	Mask area figure1 Polygon Point Count	figArea2_fig1_polygon_count	Set/Get	3 to 10
92141	Mask area figure1 Polygon Point1 Position X	figArea2_fig1_polygon_x0	Set/Get	-99,999 to 99,999
92142	Mask area figure1 Polygon Point1 Position Y	figArea2_fig1_polygon_y0	Set/Get	-99,999 to 99,999
92143	Mask area figure1 Polygon Point2 Position X	figArea2_fig1_polygon_x1	Set/Get	-99,999 to 99,999
92144	Mask area figure1 Polygon Point2 Position Y	figArea2_fig1_polygon_y1	Set/Get	-99,999 to 99,999
92145	Mask area figure1 Polygon Point3 Position X	figArea2_fig1_polygon_x2	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92146	Mask area figure1 Polygon Point3 Position Y	figArea2_fig1_polygon_y2	Set/Get	-99,999 to 99,999
92147	Mask area figure1 Polygon Point4 Position X	figArea2_fig1_polygon_x3	Set/Get	-99,999 to 99,999
92148	Mask area figure1 Polygon Point4 Position Y	figArea2_fig1_polygon_y3	Set/Get	-99,999 to 99,999
92149	Mask area figure1 Polygon Point5 Position X	figArea2_fig1_polygon_x4	Set/Get	-99,999 to 99,999
92150	Mask area figure1 Polygon Point5 Position Y	figArea2_fig1_polygon_y4	Set/Get	-99,999 to 99,999
92151	Mask area figure1 Polygon Point6 Position X	figArea2_fig1_polygon_x5	Set/Get	-99,999 to 99,999
92152	Mask area figure1 Polygon Point6 Position Y	figArea2_fig1_polygon_y5	Set/Get	-99,999 to 99,999
92153	Mask area figure1 Polygon Point7 Position X	figArea2_fig1_polygon_x6	Set/Get	-99,999 to 99,999
92154	Mask area figure1 Polygon Point7 Position Y	figArea2_fig1_polygon_y6	Set/Get	-99,999 to 99,999
92155	Mask area figure1 Polygon Point8 Position X	figArea2_fig1_polygon_x7	Set/Get	-99,999 to 99,999
92156	Mask area figure1 Polygon Point8 Position Y	figArea2_fig1_polygon_y7	Set/Get	-99,999 to 99,999
92157	Mask area figure1 Polygon Point9 Position X	figArea2_fig1_polygon_x8	Set/Get	-99,999 to 99,999
92158	Mask area figure1 Polygon Point9 Position Y	figArea2_fig1_polygon_y8	Set/Get	-99,999 to 99,999
92159	Mask area figure1 Polygon Point10 Position X	figArea2_fig1_polygon_x9	Set/Get	-99,999 to 99,999
92160	Mask area figure1 Polygon Point10 Position Y	figArea2_fig1_polygon_y9	Set/Get	-99,999 to 99,999
92201	Mask area figure2 Type	figArea2_fig2_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
92202	Mask area figure2 mode	figArea2_fig2_mode	Set/Get	0: OR 1: NOT
92209	Mask area figure2 Wide line Start point X	figArea2_fig2_lineW_X0	Set/Get	-99,999 to 99,999
92210	Mask area figure2 Wide line Start point Y	figArea2_fig2_lineW_Y0	Set/Get	-99,999 to 99,999
92211	Mask area figure2 Wide line End point X	figArea2_fig2_lineW_X1	Set/Get	-99,999 to 99,999
92212	Mask area figure2 Wide line End point Y	figArea2_fig2_lineW_Y1	Set/Get	-99,999 to 99,999
92213	Mask area figure2 Wide line Width	figArea2_fig2_lineW_W	Set/Get	0 to 99,999
92214	Mask area figure2 Rectangle Upper left position X	figArea2_fig2_box_X0	Set/Get	-99,999 to 99,999
92215	Mask area figure2 Rectangle Upper left position Y	figArea2_fig2_box_Y0	Set/Get	-99,999 to 99,999
92216	Mask area figure2 Rectangle Lower right position X	figArea2_fig2_box_X1	Set/Get	-99,999 to 99,999
92217	Mask area figure2 Rectangle Lower right position Y	figArea2_fig2_box_Y1	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92218	Mask area figure2 Ellipse Center Position X	figArea2_fig2_ellipse_CX	Set/Get	-99,999 to 99,999
92219	Mask area figure2 Ellipse Center Position Y	figArea2_fig2_ellipse_CY	Set/Get	-99,999 to 99,999
92220	Mask area figure2 Ellipse RadiusX	figArea2_fig2_ellipse_RX	Set/Get	1 to 99,999
92221	Mask area figure2 Ellipse RadiusY	figArea2_fig2_ellipse_RY	Set/Get	1 to 99,999
92225	Mask area figure2 Circumference Center Position X	figArea2_fig2_circleW_X	Set/Get	-99,999 to 99,999
92226	Mask area figure2 Circumference Center Position Y	figArea2_fig2_circleW_Y	Set/Get	-99,999 to 99,999
92227	Mask area figure2 Circumference Radius	figArea2_fig2_circleW_R	Set/Get	0 to 99,999
92228	Mask area figure2 Circumference Width	figArea2_fig2_circleW_W	Set/Get	0 to 99,999
92234	Mask area figure2 Wide arc Center Position X	figArea2_fig2_arcW_X	Set/Get	-99,999 to 99,999
92235	Mask area figure2 Wide arc Center Position Y	figArea2_fig2_arcW_Y	Set/Get	-99,999 to 99,999
92236	Mask area figure2 Wide arc Radius	figArea2_fig2_arcW_R	Set/Get	0 to 99,999
92237	Mask area figure2 Wide arc Start angle	figArea2_fig2_arcW_SA	Set/Get	-180 to 180
92238	Mask area figure2 Wide arc End angle	figArea2_fig2_arcW_EA	Set/Get	-180 to 180
92239	Mask area figure2 Wide arc Width	figArea2_fig2_arcW_W	Set/Get	0 to 99,999
92240	Mask area figure2 Polygon Point Count	figArea2_fig2_polygon_count	Set/Get	3 to 10
92241	Mask area figure2 Polygon Point1 Position X	figArea2_fig2_polygon_x0	Set/Get	-99,999 to 99,999
92242	Mask area figure2 Polygon Point1 Position Y	figArea2_fig2_polygon_y0	Set/Get	-99,999 to 99,999
92243	Mask area figure2 Polygon Point2 Position X	figArea2_fig2_polygon_x1	Set/Get	-99,999 to 99,999
92244	Mask area figure2 Polygon Point2 Position Y	figArea2_fig2_polygon_y1	Set/Get	-99,999 to 99,999
92245	Mask area figure2 Polygon Point3 Position X	figArea2_fig2_polygon_x2	Set/Get	-99,999 to 99,999
92246	Mask area figure2 Polygon Point3 Position Y	figArea2_fig2_polygon_y2	Set/Get	-99,999 to 99,999
92247	Mask area figure2 Polygon Point4 Position X	figArea2_fig2_polygon_x3	Set/Get	-99,999 to 99,999
92248	Mask area figure2 Polygon Point4 Position Y	figArea2_fig2_polygon_y3	Set/Get	-99,999 to 99,999
92249	Mask area figure2 Polygon Point5 Position X	figArea2_fig2_polygon_x4	Set/Get	-99,999 to 99,999
92250	Mask area figure2 Polygon Point5 Position Y	figArea2_fig2_polygon_y4	Set/Get	-99,999 to 99,999
92251	Mask area figure2 Polygon Point6 Position X	figArea2_fig2_polygon_x5	Set/Get	-99,999 to 99,999
92252	Mask area figure2 Polygon Point6 Position Y	figArea2_fig2_polygon_y5	Set/Get	-99,999 to 99,999
92253	Mask area figure2 Polygon Point7 Position X	figArea2_fig2_polygon_x6	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92254	Mask area figure2 Polygon Point7 Position Y	figArea2_fig2_polygon_y6	Set/Get	-99,999 to 99,999
92255	Mask area figure2 Polygon Point8 Position X	figArea2_fig2_polygon_x7	Set/Get	-99,999 to 99,999
92256	Mask area figure2 Polygon Point8 Position Y	figArea2_fig2_polygon_y7	Set/Get	-99,999 to 99,999
92257	Mask area figure2 Polygon Point9 Position X	figArea2_fig2_polygon_x8	Set/Get	-99,999 to 99,999
92258	Mask area figure2 Polygon Point9 Position Y	figArea2_fig2_polygon_y8	Set/Get	-99,999 to 99,999
92259	Mask area figure2 Polygon Point10 Position X	figArea2_fig2_polygon_x9	Set/Get	-99,999 to 99,999
92260	Mask area figure2 Polygon Point10 Position Y	figArea2_fig2_polygon_y9	Set/Get	-99,999 to 99,999
92301	Mask area figure3 Type	figArea2_fig3_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
92302	Mask area figure3 mode	figArea2_fig3_mode	Set/Get	0: OR 1: NOT
92309	Mask area figure3 Wide line Start point X	figArea2_fig3_lineW_X0	Set/Get	-99,999 to 99,999
92310	Mask area figure3 Wide line Start point Y	figArea2_fig3_lineW_Y0	Set/Get	-99,999 to 99,999
92311	Mask area figure3 Wide line End point X	figArea2_fig3_lineW_X1	Set/Get	-99,999 to 99,999
92312	Mask area figure3 Wide line End point Y	figArea2_fig3_lineW_Y1	Set/Get	-99,999 to 99,999
92313	Mask area figure3 Wide line Width	figArea2_fig3_lineW_W	Set/Get	0 to 99,999
92314	Mask area figure3 Rectangle Upper left position X	figArea2_fig3_box_X0	Set/Get	-99,999 to 99,999
92315	Mask area figure3 Rectangle Upper left position Y	figArea2_fig3_box_Y0	Set/Get	-99,999 to 99,999
92316	Mask area figure3 Rectangle Lower right position X	figArea2_fig3_box_X1	Set/Get	-99,999 to 99,999
92317	Mask area figure3 Rectangle Lower right position Y	figArea2_fig3_box_Y1	Set/Get	-99,999 to 99,999
92318	Mask area figure3 Ellipse Center Position X	figArea2_fig3_ellipse_CX	Set/Get	-99,999 to 99,999
92319	Mask area figure3 Ellipse Center Position Y	figArea2_fig3_ellipse_CY	Set/Get	-99,999 to 99,999
92320	Mask area figure3 Ellipse RadiusX	figArea2_fig3_ellipse_RX	Set/Get	1 to 99,999
92321	Mask area figure3 Ellipse RadiusY	figArea2_fig3_ellipse_RY	Set/Get	1 to 99,999
92325	Mask area figure3 Circumference Center Position X	figArea2_fig3_circleW_X	Set/Get	-99,999 to 99,999
92326	Mask area figure3 Circumference Center Position Y	figArea2_fig3_circleW_Y	Set/Get	-99,999 to 99,999
92327	Mask area figure3 Circumference Radius	figArea2_fig3_circleW_R	Set/Get	0 to 99,999
92328	Mask area figure3 Circumference Width	figArea2_fig3_circleW_W	Set/Get	0 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92334	Mask area figure3 Wide arc Center Position X	figArea2_fig3_arcW_X	Set/Get	-99,999 to 99,999
92335	Mask area figure3 Wide arc Center Position Y	figArea2_fig3_arcW_Y	Set/Get	-99,999 to 99,999
92336	Mask area figure3 Wide arc Radius	figArea2_fig3_arcW_R	Set/Get	0 to 99,999
92337	Mask area figure3 Wide arc Start angle	figArea2_fig3_arcW_SA	Set/Get	-180 to 180
92338	Mask area figure3 Wide arc End angle	figArea2_fig3_arcW_EA	Set/Get	-180 to 180
92339	Mask area figure3 Wide arc Width	figArea2_fig3_arcW_W	Set/Get	0 to 99,999
92340	Mask area figure3 Polygon Point Count	figArea2_fig3_polygon_count	Set/Get	3 to 10
92341	Mask area figure3 Polygon Point1 Position X	figArea2_fig3_polygon_x0	Set/Get	-99,999 to 99,999
92342	Mask area figure3 Polygon Point1 Position Y	figArea2_fig3_polygon_y0	Set/Get	-99,999 to 99,999
92343	Mask area figure3 Polygon Point2 Position X	figArea2_fig3_polygon_x1	Set/Get	-99,999 to 99,999
92344	Mask area figure3 Polygon Point2 Position Y	figArea2_fig3_polygon_y1	Set/Get	-99,999 to 99,999
92345	Mask area figure3 Polygon Point3 Position X	figArea2_fig3_polygon_x2	Set/Get	-99,999 to 99,999
92346	Mask area figure3 Polygon Point3 Position Y	figArea2_fig3_polygon_y2	Set/Get	-99,999 to 99,999
92347	Mask area figure3 Polygon Point4 Position X	figArea2_fig3_polygon_x3	Set/Get	-99,999 to 99,999
92348	Mask area figure3 Polygon Point4 Position Y	figArea2_fig3_polygon_y3	Set/Get	-99,999 to 99,999
92349	Mask area figure3 Polygon Point5 Position X	figArea2_fig3_polygon_x4	Set/Get	-99,999 to 99,999
92350	Mask area figure3 Polygon Point5 Position Y	figArea2_fig3_polygon_y4	Set/Get	-99,999 to 99,999
92351	Mask area figure3 Polygon Point6 Position X	figArea2_fig3_polygon_x5	Set/Get	-99,999 to 99,999
92352	Mask area figure3 Polygon Point6 Position Y	figArea2_fig3_polygon_y5	Set/Get	-99,999 to 99,999
92353	Mask area figure3 Polygon Point7 Position X	figArea2_fig3_polygon_x6	Set/Get	-99,999 to 99,999
92354	Mask area figure3 Polygon Point7 Position Y	figArea2_fig3_polygon_y6	Set/Get	-99,999 to 99,999
92355	Mask area figure3 Polygon Point8 Position X	figArea2_fig3_polygon_x7	Set/Get	-99,999 to 99,999
92356	Mask area figure3 Polygon Point8 Position Y	figArea2_fig3_polygon_y7	Set/Get	-99,999 to 99,999
92357	Mask area figure3 Polygon Point9 Position X	figArea2_fig3_polygon_x8	Set/Get	-99,999 to 99,999
92358	Mask area figure3 Polygon Point9 Position Y	figArea2_fig3_polygon_y8	Set/Get	-99,999 to 99,999
92359	Mask area figure3 Polygon Point10 Position X	figArea2_fig3_polygon_x9	Set/Get	-99,999 to 99,999
92360	Mask area figure3 Polygon Point10 Position Y	figArea2_fig3_polygon_y9	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92401	Mask area figure4 Type	figArea2_fig4_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
92402	Mask area figure4 mode	figArea2_fig4_mode	Set/Get	0: OR 1: NOT
92409	Mask area figure4 Wide line Start point X	figArea2_fig4_lineW_X0	Set/Get	-99,999 to 99,999
92410	Mask area figure4 Wide line Start point Y	figArea2_fig4_lineW_Y0	Set/Get	-99,999 to 99,999
92411	Mask area figure4 Wide line End point X	figArea2_fig4_lineW_X1	Set/Get	-99,999 to 99,999
92412	Mask area figure4 Wide line End point Y	figArea2_fig4_lineW_Y1	Set/Get	-99,999 to 99,999
92413	Mask area figure4 Wide line Width	figArea2_fig4_lineW_W	Set/Get	0 to 99,999
92414	Mask area figure4 Rectangle Upper left position X	figArea2_fig4_box_X0	Set/Get	-99,999 to 99,999
92415	Mask area figure4 Rectangle Upper left position Y	figArea2_fig4_box_Y0	Set/Get	-99,999 to 99,999
92416	Mask area figure4 Rectangle Lower right position X	figArea2_fig4_box_X1	Set/Get	-99,999 to 99,999
92417	Mask area figure4 Rectangle Lower right position Y	figArea2_fig4_box_Y1	Set/Get	-99,999 to 99,999
92418	Mask area figure4 Ellipse Center Position X	figArea2_fig4_ellipse_CX	Set/Get	-99,999 to 99,999
92419	Mask area figure4 Ellipse Center Position Y	figArea2_fig4_ellipse_CY	Set/Get	-99,999 to 99,999
92420	Mask area figure4 Ellipse RadiusX	figArea2_fig4_ellipse_RX	Set/Get	1 to 99,999
92421	Mask area figure4 Ellipse RadiusY	figArea2_fig4_ellipse_RY	Set/Get	1 to 99,999
92425	Mask area figure4 Circumference Center Position X	figArea2_fig4_circleW_X	Set/Get	-99,999 to 99,999
92426	Mask area figure4 Circumference Center Position Y	figArea2_fig4_circleW_Y	Set/Get	-99,999 to 99,999
92427	Mask area figure4 Circumference Radius	figArea2_fig4_circleW_R	Set/Get	0 to 99,999
92428	Mask area figure4 Circumference Width	figArea2_fig4_circleW_W	Set/Get	0 to 99,999
92434	Mask area figure4 Wide arc Center Position X	figArea2_fig4_arcW_X	Set/Get	-99,999 to 99,999
92435	Mask area figure4 Wide arc Center Position Y	figArea2_fig4_arcW_Y	Set/Get	-99,999 to 99,999
92436	Mask area figure4 Wide arc Radius	figArea2_fig4_arcW_R	Set/Get	0 to 99,999
92437	Mask area figure4 Wide arc Start angle	figArea2_fig4_arcW_SA	Set/Get	-180 to 180
92438	Mask area figure4 Wide arc End angle	figArea2_fig4_arcW_EA	Set/Get	-180 to 180
92439	Mask area figure4 Wide arc Width	figArea2_fig4_arcW_W	Set/Get	0 to 99,999
92440	Mask area figure4 Polygon Point Count	figArea2_fig4_polygon_count	Set/Get	3 to 10

No.	Data Name	Ident	Set/Get	Data range
92441	Mask area figure4 Polygon Point1 Position X	figArea2_fig4_polygon_x0	Set/Get	-99,999 to 99,999
92442	Mask area figure4 Polygon Point1 Position Y	figArea2_fig4_polygon_y0	Set/Get	-99,999 to 99,999
92443	Mask area figure4 Polygon Point2 Position X	figArea2_fig4_polygon_x1	Set/Get	-99,999 to 99,999
92444	Mask area figure4 Polygon Point2 Position Y	figArea2_fig4_polygon_y1	Set/Get	-99,999 to 99,999
92445	Mask area figure4 Polygon Point3 Position X	figArea2_fig4_polygon_x2	Set/Get	-99,999 to 99,999
92446	Mask area figure4 Polygon Point3 Position Y	figArea2_fig4_polygon_y2	Set/Get	-99,999 to 99,999
92447	Mask area figure4 Polygon Point4 Position X	figArea2_fig4_polygon_x3	Set/Get	-99,999 to 99,999
92448	Mask area figure4 Polygon Point4 Position Y	figArea2_fig4_polygon_y3	Set/Get	-99,999 to 99,999
92449	Mask area figure4 Polygon Point5 Position X	figArea2_fig4_polygon_x4	Set/Get	-99,999 to 99,999
92450	Mask area figure4 Polygon Point5 Position Y	figArea2_fig4_polygon_y4	Set/Get	-99,999 to 99,999
92451	Mask area figure4 Polygon Point6 Position X	figArea2_fig4_polygon_x5	Set/Get	-99,999 to 99,999
92452	Mask area figure4 Polygon Point6 Position Y	figArea2_fig4_polygon_y5	Set/Get	-99,999 to 99,999
92453	Mask area figure4 Polygon Point7 Position X	figArea2_fig4_polygon_x6	Set/Get	-99,999 to 99,999
92454	Mask area figure4 Polygon Point7 Position Y	figArea2_fig4_polygon_y6	Set/Get	-99,999 to 99,999
92455	Mask area figure4 Polygon Point8 Position X	figArea2_fig4_polygon_x7	Set/Get	-99,999 to 99,999
92456	Mask area figure4 Polygon Point8 Position Y	figArea2_fig4_polygon_y7	Set/Get	-99,999 to 99,999
92457	Mask area figure4 Polygon Point9 Position X	figArea2_fig4_polygon_x8	Set/Get	-99,999 to 99,999
92458	Mask area figure4 Polygon Point9 Position Y	figArea2_fig4_polygon_y8	Set/Get	-99,999 to 99,999
92459	Mask area figure4 Polygon Point10 Position X	figArea2_fig4_polygon_x9	Set/Get	-99,999 to 99,999
92460	Mask area figure4 Polygon Point10 Position Y	figArea2_fig4_polygon_y9	Set/Get	-99,999 to 99,999
92501	Mask area figure5 Type	figArea2_fig5_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
92502	Mask area figure5 mode	figArea2_fig5_mode	Set/Get	0: OR 1: NOT
92509	Mask area figure5 Wide line Start point X	figArea2_fig5_lineW_X0	Set/Get	-99,999 to 99,999
92510	Mask area figure5 Wide line Start point Y	figArea2_fig5_lineW_Y0	Set/Get	-99,999 to 99,999
92511	Mask area figure5 Wide line End point X	figArea2_fig5_lineW_X1	Set/Get	-99,999 to 99,999
92512	Mask area figure5 Wide line End point Y	figArea2_fig5_lineW_Y1	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92513	Mask area figure5 Wide line Width	figArea2_fig5_lineW_W	Set/Get	0 to 99,999
92514	Mask area figure5 Rectangle Upper left position X	figArea2_fig5_box_X0	Set/Get	-99,999 to 99,999
92515	Mask area figure5 Rectangle Upper left position Y	figArea2_fig5_box_Y0	Set/Get	-99,999 to 99,999
92516	Mask area figure5 Rectangle Lower right position X	figArea2_fig5_box_X1	Set/Get	-99,999 to 99,999
92517	Mask area figure5 Rectangle Lower right position Y	figArea2_fig5_box_Y1	Set/Get	-99,999 to 99,999
92518	Mask area figure5 Ellipse Center Position X	figArea2_fig5_ellipse_CX	Set/Get	-99,999 to 99,999
92519	Mask area figure5 Ellipse Center Position Y	figArea2_fig5_ellipse_CY	Set/Get	-99,999 to 99,999
92520	Mask area figure5 Ellipse RadiusX	figArea2_fig5_ellipse_RX	Set/Get	1 to 99,999
92521	Mask area figure5 Ellipse RadiusY	figArea2_fig5_ellipse_RY	Set/Get	1 to 99,999
92525	Mask area figure5 Circumference Center Position X	figArea2_fig5_circleW_X	Set/Get	-99,999 to 99,999
92526	Mask area figure5 Circumference Center Position Y	figArea2_fig5_circleW_Y	Set/Get	-99,999 to 99,999
92527	Mask area figure5 Circumference Radius	figArea2_fig5_circleW_R	Set/Get	0 to 99,999
92528	Mask area figure5 Circumference Width	figArea2_fig5_circleW_W	Set/Get	0 to 99,999
92534	Mask area figure5 Wide arc Center Position X	figArea2_fig5_arcW_X	Set/Get	-99,999 to 99,999
92535	Mask area figure5 Wide arc Center Position Y	figArea2_fig5_arcW_Y	Set/Get	-99,999 to 99,999
92536	Mask area figure5 Wide arc Radius	figArea2_fig5_arcW_R	Set/Get	0 to 99,999
92537	Mask area figure5 Wide arc Start angle	figArea2_fig5_arcW_SA	Set/Get	-180 to 180
92538	Mask area figure5 Wide arc End angle	figArea2_fig5_arcW_EA	Set/Get	-180 to 180
92539	Mask area figure5 Wide arc Width	figArea2_fig5_arcW_W	Set/Get	0 to 99,999
92540	Mask area figure5 Polygon Point Count	figArea2_fig5_polygon_count	Set/Get	3 to 10
92541	Mask area figure5 Polygon Point1 Position X	figArea2_fig5_polygon_x0	Set/Get	-99,999 to 99,999
92542	Mask area figure5 Polygon Point1 Position Y	figArea2_fig5_polygon_y0	Set/Get	-99,999 to 99,999
92543	Mask area figure5 Polygon Point2 Position X	figArea2_fig5_polygon_x1	Set/Get	-99,999 to 99,999
92544	Mask area figure5 Polygon Point2 Position Y	figArea2_fig5_polygon_y1	Set/Get	-99,999 to 99,999
92545	Mask area figure5 Polygon Point3 Position X	figArea2_fig5_polygon_x2	Set/Get	-99,999 to 99,999
92546	Mask area figure5 Polygon Point3 Position Y	figArea2_fig5_polygon_y2	Set/Get	-99,999 to 99,999
92547	Mask area figure5 Polygon Point4 Position X	figArea2_fig5_polygon_x3	Set/Get	-99,999 to 99,999
92548	Mask area figure5 Polygon Point4 Position Y	figArea2_fig5_polygon_y3	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92549	Mask area figure5 Polygon Point5 Position X	figArea2_fig5_polygon_x4	Set/Get	-99,999 to 99,999
92550	Mask area figure5 Polygon Point5 Position Y	figArea2_fig5_polygon_y4	Set/Get	-99,999 to 99,999
92551	Mask area figure5 Polygon Point6 Position X	figArea2_fig5_polygon_x5	Set/Get	-99,999 to 99,999
92552	Mask area figure5 Polygon Point6 Position Y	figArea2_fig5_polygon_y5	Set/Get	-99,999 to 99,999
92553	Mask area figure5 Polygon Point7 Position X	figArea2_fig5_polygon_x6	Set/Get	-99,999 to 99,999
92554	Mask area figure5 Polygon Point7 Position Y	figArea2_fig5_polygon_y6	Set/Get	-99,999 to 99,999
92555	Mask area figure5 Polygon Point8 Position X	figArea2_fig5_polygon_x7	Set/Get	-99,999 to 99,999
92556	Mask area figure5 Polygon Point8 Position Y	figArea2_fig5_polygon_y7	Set/Get	-99,999 to 99,999
92557	Mask area figure5 Polygon Point9 Position X	figArea2_fig5_polygon_x8	Set/Get	-99,999 to 99,999
92558	Mask area figure5 Polygon Point9 Position Y	figArea2_fig5_polygon_y8	Set/Get	-99,999 to 99,999
92559	Mask area figure5 Polygon Point10 Position X	figArea2_fig5_polygon_x9	Set/Get	-99,999 to 99,999
92560	Mask area figure5 Polygon Point10 Position Y	figArea2_fig5_polygon_y9	Set/Get	-99,999 to 99,999
92601	Mask area figure6 Type	figArea2_fig6_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
92602	Mask area figure6 mode	figArea2_fig6_mode	Set/Get	0: OR 1: NOT
92609	Mask area figure6 Wide line Start point X	figArea2_fig6_lineW_X0	Set/Get	-99,999 to 99,999
92610	Mask area figure6 Wide line Start point Y	figArea2_fig6_lineW_Y0	Set/Get	-99,999 to 99,999
92611	Mask area figure6 Wide line End point X	figArea2_fig6_lineW_X1	Set/Get	-99,999 to 99,999
92612	Mask area figure6 Wide line End point Y	figArea2_fig6_lineW_Y1	Set/Get	-99,999 to 99,999
92613	Mask area figure6 Wide line Width	figArea2_fig6_lineW_W	Set/Get	0 to 99,999
92614	Mask area figure6 Rectangle Upper left position X	figArea2_fig6_box_X0	Set/Get	-99,999 to 99,999
92615	Mask area figure6 Rectangle Upper left position Y	figArea2_fig6_box_Y0	Set/Get	-99,999 to 99,999
92616	Mask area figure6 Rectangle Lower right position X	figArea2_fig6_box_X1	Set/Get	-99,999 to 99,999
92617	Mask area figure6 Rectangle Lower right position Y	figArea2_fig6_box_Y1	Set/Get	-99,999 to 99,999
92618	Mask area figure6 Ellipse Center Position X	figArea2_fig6_ellipse_CX	Set/Get	-99,999 to 99,999
92619	Mask area figure6 Ellipse Center Position Y	figArea2_fig6_ellipse_CY	Set/Get	-99,999 to 99,999
92620	Mask area figure6 Ellipse RadiusX	figArea2_fig6_ellipse_RX	Set/Get	1 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92621	Mask area figure6 Ellipse RadiusY	figArea2_fig6_ellipse_RY	Set/Get	1 to 99,999
92625	Mask area figure6 Circumference Center Position X	figArea2_fig6_circleW_X	Set/Get	-99,999 to 99,999
92626	Mask area figure6 Circumference Center Position Y	figArea2_fig6_circleW_Y	Set/Get	-99,999 to 99,999
92627	Mask area figure6 Circumference Radius	figArea2_fig6_circleW_R	Set/Get	0 to 99,999
92628	Mask area figure6 Circumference Width	figArea2_fig6_circleW_W	Set/Get	0 to 99,999
92634	Mask area figure6 Wide arc Center Position X	figArea2_fig6_arcW_X	Set/Get	-99,999 to 99,999
92635	Mask area figure6 Wide arc Center Position Y	figArea2_fig6_arcW_Y	Set/Get	-99,999 to 99,999
92636	Mask area figure6 Wide arc Radius	figArea2_fig6_arcW_R	Set/Get	0 to 99,999
92637	Mask area figure6 Wide arc Start angle	figArea2_fig6_arcW_SA	Set/Get	-180 to 180
92638	Mask area figure6 Wide arc End angle	figArea2_fig6_arcW_EA	Set/Get	-180 to 180
92639	Mask area figure6 Wide arc Width	figArea2_fig6_arcW_W	Set/Get	0 to 99,999
92640	Mask area figure6 Polygon Point Count	figArea2_fig6_polygon_count	Set/Get	3 to 10
92641	Mask area figure6 Polygon Point1 Position X	figArea2_fig6_polygon_x0	Set/Get	-99,999 to 99,999
92642	Mask area figure6 Polygon Point1 Position Y	figArea2_fig6_polygon_y0	Set/Get	-99,999 to 99,999
92643	Mask area figure6 Polygon Point2 Position X	figArea2_fig6_polygon_x1	Set/Get	-99,999 to 99,999
92644	Mask area figure6 Polygon Point2 Position Y	figArea2_fig6_polygon_y1	Set/Get	-99,999 to 99,999
92645	Mask area figure6 Polygon Point3 Position X	figArea2_fig6_polygon_x2	Set/Get	-99,999 to 99,999
92646	Mask area figure6 Polygon Point3 Position Y	figArea2_fig6_polygon_y2	Set/Get	-99,999 to 99,999
92647	Mask area figure6 Polygon Point4 Position X	figArea2_fig6_polygon_x3	Set/Get	-99,999 to 99,999
92648	Mask area figure6 Polygon Point4 Position Y	figArea2_fig6_polygon_y3	Set/Get	-99,999 to 99,999
92649	Mask area figure6 Polygon Point5 Position X	figArea2_fig6_polygon_x4	Set/Get	-99,999 to 99,999
92650	Mask area figure6 Polygon Point5 Position Y	figArea2_fig6_polygon_y4	Set/Get	-99,999 to 99,999
92651	Mask area figure6 Polygon Point6 Position X	figArea2_fig6_polygon_x5	Set/Get	-99,999 to 99,999
92652	Mask area figure6 Polygon Point6 Position Y	figArea2_fig6_polygon_y5	Set/Get	-99,999 to 99,999
92653	Mask area figure6 Polygon Point7 Position X	figArea2_fig6_polygon_x6	Set/Get	-99,999 to 99,999
92654	Mask area figure6 Polygon Point7 Position Y	figArea2_fig6_polygon_y6	Set/Get	-99,999 to 99,999
92655	Mask area figure6 Polygon Point8 Position X	figArea2_fig6_polygon_x7	Set/Get	-99,999 to 99,999
92656	Mask area figure6 Polygon Point8 Position Y	figArea2_fig6_polygon_y7	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92657	Mask area figure6 Polygon Point9 Position X	figArea2_fig6_polygon_x8	Set/Get	-99,999 to 99,999
92658	Mask area figure6 Polygon Point9 Position Y	figArea2_fig6_polygon_y8	Set/Get	-99,999 to 99,999
92659	Mask area figure6 Polygon Point10 Position X	figArea2_fig6_polygon_x9	Set/Get	-99,999 to 99,999
92660	Mask area figure6 Polygon Point10 Position Y	figArea2_fig6_polygon_y9	Set/Get	-99,999 to 99,999
92701	Mask area figure7 Type	figArea2_fig7_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
92702	Mask area figure7 mode	figArea2_fig7_mode	Set/Get	0: OR 1: NOT
92709	Mask area figure7 Wide line Start point X	figArea2_fig7_lineW_X0	Set/Get	-99,999 to 99,999
92710	Mask area figure7 Wide line Start point Y	figArea2_fig7_lineW_Y0	Set/Get	-99,999 to 99,999
92711	Mask area figure7 Wide line End point X	figArea2_fig7_lineW_X1	Set/Get	-99,999 to 99,999
92712	Mask area figure7 Wide line End point Y	figArea2_fig7_lineW_Y1	Set/Get	-99,999 to 99,999
92713	Mask area figure7 Wide line Width	figArea2_fig7_lineW_W	Set/Get	0 to 99,999
92714	Mask area figure7 Rectangle Upper left position X	figArea2_fig7_box_X0	Set/Get	-99,999 to 99,999
92715	Mask area figure7 Rectangle Upper left position Y	figArea2_fig7_box_Y0	Set/Get	-99,999 to 99,999
92716	Mask area figure7 Rectangle Lower right position X	figArea2_fig7_box_X1	Set/Get	-99,999 to 99,999
92717	Mask area figure7 Rectangle Lower right position Y	figArea2_fig7_box_Y1	Set/Get	-99,999 to 99,999
92718	Mask area figure7 Ellipse Center Position X	figArea2_fig7_ellipse_CX	Set/Get	-99,999 to 99,999
92719	Mask area figure7 Ellipse Center Position Y	figArea2_fig7_ellipse_CY	Set/Get	-99,999 to 99,999
92720	Mask area figure7 Ellipse RadiusX	figArea2_fig7_ellipse_RX	Set/Get	1 to 99,999
92721	Mask area figure7 Ellipse RadiusY	figArea2_fig7_ellipse_RY	Set/Get	1 to 99,999
92725	Mask area figure7 Circumference Center Position X	figArea2_fig7_circleW_X	Set/Get	-99,999 to 99,999
92726	Mask area figure7 Circumference Center Position Y	figArea2_fig7_circleW_Y	Set/Get	-99,999 to 99,999
92727	Mask area figure7 Circumference Radius	figArea2_fig7_circleW_R	Set/Get	0 to 99,999
92728	Mask area figure7 Circumference Width	figArea2_fig7_circleW_W	Set/Get	0 to 99,999
92734	Mask area figure7 Wide arc Center Position X	figArea2_fig7_arcW_X	Set/Get	-99,999 to 99,999
92735	Mask area figure7 Wide arc Center Position Y	figArea2_fig7_arcW_Y	Set/Get	-99,999 to 99,999
92736	Mask area figure7 Wide arc Radius	figArea2_fig7_arcW_R	Set/Get	0 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92737	Mask area figure7 Wide arc Start angle	figArea2_fig7_arcW_SA	Set/Get	-180 to 180
92738	Mask area figure7 Wide arc End angle	figArea2_fig7_arcW_EA	Set/Get	-180 to 180
92739	Mask area figure7 Wide arc Width	figArea2_fig7_arcW_W	Set/Get	0 to 99,999
92740	Mask area figure7 Polygon Point Count	figArea2_fig7_polygon_count	Set/Get	3 to 10
92741	Mask area figure7 Polygon Point1 Position X	figArea2_fig7_polygon_x0	Set/Get	-99,999 to 99,999
92742	Mask area figure7 Polygon Point1 Position Y	figArea2_fig7_polygon_y0	Set/Get	-99,999 to 99,999
92743	Mask area figure7 Polygon Point2 Position X	figArea2_fig7_polygon_x1	Set/Get	-99,999 to 99,999
92744	Mask area figure7 Polygon Point2 Position Y	figArea2_fig7_polygon_y1	Set/Get	-99,999 to 99,999
92745	Mask area figure7 Polygon Point3 Position X	figArea2_fig7_polygon_x2	Set/Get	-99,999 to 99,999
92746	Mask area figure7 Polygon Point3 Position Y	figArea2_fig7_polygon_y2	Set/Get	-99,999 to 99,999
92747	Mask area figure7 Polygon Point4 Position X	figArea2_fig7_polygon_x3	Set/Get	-99,999 to 99,999
92748	Mask area figure7 Polygon Point4 Position Y	figArea2_fig7_polygon_y3	Set/Get	-99,999 to 99,999
92749	Mask area figure7 Polygon Point5 Position X	figArea2_fig7_polygon_x4	Set/Get	-99,999 to 99,999
92750	Mask area figure7 Polygon Point5 Position Y	figArea2_fig7_polygon_y4	Set/Get	-99,999 to 99,999
92751	Mask area figure7 Polygon Point6 Position X	figArea2_fig7_polygon_x5	Set/Get	-99,999 to 99,999
92752	Mask area figure7 Polygon Point6 Position Y	figArea2_fig7_polygon_y5	Set/Get	-99,999 to 99,999
92753	Mask area figure7 Polygon Point7 Position X	figArea2_fig7_polygon_x6	Set/Get	-99,999 to 99,999
92754	Mask area figure7 Polygon Point7 Position Y	figArea2_fig7_polygon_y6	Set/Get	-99,999 to 99,999
92755	Mask area figure7 Polygon Point8 Position X	figArea2_fig7_polygon_x7	Set/Get	-99,999 to 99,999
92756	Mask area figure7 Polygon Point8 Position Y	figArea2_fig7_polygon_y7	Set/Get	-99,999 to 99,999
92757	Mask area figure7 Polygon Point9 Position X	figArea2_fig7_polygon_x8	Set/Get	-99,999 to 99,999
92758	Mask area figure7 Polygon Point9 Position Y	figArea2_fig7_polygon_y8	Set/Get	-99,999 to 99,999
92759	Mask area figure7 Polygon Point10 Position X	figArea2_fig7_polygon_x9	Set/Get	-99,999 to 99,999
92760	Mask area figure7 Polygon Point10 Position Y	figArea2_fig7_polygon_y9	Set/Get	-99,999 to 99,999
92801	Mask area figure8 Type	figArea2_fig8_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
92802	Mask area figure8 mode	figArea2_fig8_mode	Set/Get	0: OR 1: NOT

No.	Data Name	Ident	Set/Get	Data range
92809	Mask area figure8 Wide line Start point X	figArea2_fig8_lineW_X0	Set/Get	-99,999 to 99,999
92810	Mask area figure8 Wide line Start point Y	figArea2_fig8_lineW_Y0	Set/Get	-99,999 to 99,999
92811	Mask area figure8 Wide line End point X	figArea2_fig8_lineW_X1	Set/Get	-99,999 to 99,999
92812	Mask area figure8 Wide line End point Y	figArea2_fig8_lineW_Y1	Set/Get	-99,999 to 99,999
92813	Mask area figure8 Wide line Width	figArea2_fig8_lineW_W	Set/Get	0 to 99,999
92814	Mask area figure8 Rectangle Upper left position X	figArea2_fig8_box_X0	Set/Get	-99,999 to 99,999
92815	Mask area figure8 Rectangle Upper left position Y	figArea2_fig8_box_Y0	Set/Get	-99,999 to 99,999
92816	Mask area figure8 Rectangle Lower right position X	figArea2_fig8_box_X1	Set/Get	-99,999 to 99,999
92817	Mask area figure8 Rectangle Lower right position Y	figArea2_fig8_box_Y1	Set/Get	-99,999 to 99,999
92818	Mask area figure8 Ellipse Center Position X	figArea2_fig8_ellipse_CX	Set/Get	-99,999 to 99,999
92819	Mask area figure8 Ellipse Center Position Y	figArea2_fig8_ellipse_CY	Set/Get	-99,999 to 99,999
92820	Mask area figure8 Ellipse RadiusX	figArea2_fig8_ellipse_RX	Set/Get	1 to 99,999
92821	Mask area figure8 Ellipse RadiusY	figArea2_fig8_ellipse_RY	Set/Get	1 to 99,999
92825	Mask area figure8 Circumference Center Position X	figArea2_fig8_circleW_X	Set/Get	-99,999 to 99,999
92826	Mask area figure8 Circumference Center Position Y	figArea2_fig8_circleW_Y	Set/Get	-99,999 to 99,999
92827	Mask area figure8 Circumference Radius	figArea2_fig8_circleW_R	Set/Get	0 to 99,999
92828	Mask area figure8 Circumference Width	figArea2_fig8_circleW_W	Set/Get	0 to 99,999
92834	Mask area figure8 Wide arc Center Position X	figArea2_fig8_arcW_X	Set/Get	-99,999 to 99,999
92835	Mask area figure8 Wide arc Center Position Y	figArea2_fig8_arcW_Y	Set/Get	-99,999 to 99,999
92836	Mask area figure8 Wide arc Radius	figArea2_fig8_arcW_R	Set/Get	0 to 99,999
92837	Mask area figure8 Wide arc Start angle	figArea2_fig8_arcW_SA	Set/Get	-180 to 180
92838	Mask area figure8 Wide arc End angle	figArea2_fig8_arcW_EA	Set/Get	-180 to 180
92839	Mask area figure8 Wide arc Width	figArea2_fig8_arcW_W	Set/Get	0 to 99,999
92840	Mask area figure8 Polygon Point Count	figArea2_fig8_polygon_count	Set/Get	3 to 10
92841	Mask area figure8 Polygon Point1 Position X	figArea2_fig8_polygon_x0	Set/Get	-99,999 to 99,999
92842	Mask area figure8 Polygon Point1 Position Y	figArea2_fig8_polygon_y0	Set/Get	-99,999 to 99,999
92843	Mask area figure8 Polygon Point2 Position X	figArea2_fig8_polygon_x1	Set/Get	-99,999 to 99,999
92844	Mask area figure8 Polygon Point2 Position Y	figArea2_fig8_polygon_y1	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92845	Mask area figure8 Polygon Point3 Position X	figArea2_fig8_polygon_x2	Set/Get	-99,999 to 99,999
92846	Mask area figure8 Polygon Point3 Position Y	figArea2_fig8_polygon_y2	Set/Get	-99,999 to 99,999
92847	Mask area figure8 Polygon Point4 Position X	figArea2_fig8_polygon_x3	Set/Get	-99,999 to 99,999
92848	Mask area figure8 Polygon Point4 Position Y	figArea2_fig8_polygon_y3	Set/Get	-99,999 to 99,999
92849	Mask area figure8 Polygon Point5 Position X	figArea2_fig8_polygon_x4	Set/Get	-99,999 to 99,999
92850	Mask area figure8 Polygon Point5 Position Y	figArea2_fig8_polygon_y4	Set/Get	-99,999 to 99,999
92851	Mask area figure8 Polygon Point6 Position X	figArea2_fig8_polygon_x5	Set/Get	-99,999 to 99,999
92852	Mask area figure8 Polygon Point6 Position Y	figArea2_fig8_polygon_y5	Set/Get	-99,999 to 99,999
92853	Mask area figure8 Polygon Point7 Position X	figArea2_fig8_polygon_x6	Set/Get	-99,999 to 99,999
92854	Mask area figure8 Polygon Point7 Position Y	figArea2_fig8_polygon_y6	Set/Get	-99,999 to 99,999
92855	Mask area figure8 Polygon Point8 Position X	figArea2_fig8_polygon_x7	Set/Get	-99,999 to 99,999
92856	Mask area figure8 Polygon Point8 Position Y	figArea2_fig8_polygon_y7	Set/Get	-99,999 to 99,999
92857	Mask area figure8 Polygon Point9 Position X	figArea2_fig8_polygon_x8	Set/Get	-99,999 to 99,999
92858	Mask area figure8 Polygon Point9 Position Y	figArea2_fig8_polygon_y8	Set/Get	-99,999 to 99,999
92859	Mask area figure8 Polygon Point10 Position X	figArea2_fig8_polygon_x9	Set/Get	-99,999 to 99,999
92860	Mask area figure8 Polygon Point10 Position Y	figArea2_fig8_polygon_y9	Set/Get	-99,999 to 99,999
92901	Mask area figure9 Type	figArea2_fig9_type	Set/Get	4: Wide line 8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
92902	Mask area figure9 mode	figArea2_fig9_mode	Set/Get	0: OR 1: NOT
92909	Mask area figure9 Wide line Start point X	figArea2_fig9_lineW_X0	Set/Get	-99,999 to 99,999
92910	Mask area figure9 Wide line Start point Y	figArea2_fig9_lineW_Y0	Set/Get	-99,999 to 99,999
92911	Mask area figure9 Wide line End point X	figArea2_fig9_lineW_X1	Set/Get	-99,999 to 99,999
92912	Mask area figure9 Wide line End point Y	figArea2_fig9_lineW_Y1	Set/Get	-99,999 to 99,999
92913	Mask area figure9 Wide line Width	figArea2_fig9_lineW_W	Set/Get	0 to 99,999
92914	Mask area figure9 Rectangle Upper left position X	figArea2_fig9_box_X0	Set/Get	-99,999 to 99,999
92915	Mask area figure9 Rectangle Upper left position Y	figArea2_fig9_box_Y0	Set/Get	-99,999 to 99,999
92916	Mask area figure9 Rectangle Lower right position X	figArea2_fig9_box_X1	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92917	Mask area figure9 Rectangle Lower right position Y	figArea2_fig9_box_Y1	Set/Get	-99,999 to 99,999
92918	Mask area figure9 Ellipse Center Position X	figArea2_fig9_ellipse_CX	Set/Get	-99,999 to 99,999
92919	Mask area figure9 Ellipse Center Position Y	figArea2_fig9_ellipse_CY	Set/Get	-99,999 to 99,999
92920	Mask area figure9 Ellipse RadiusX	figArea2_fig9_ellipse_RX	Set/Get	1 to 99,999
92921	Mask area figure9 Ellipse RadiusY	figArea2_fig9_ellipse_RY	Set/Get	1 to 99,999
92925	Mask area figure9 Circumference Center Position X	figArea2_fig9_circleW_X	Set/Get	-99,999 to 99,999
92926	Mask area figure9 Circumference Center Position Y	figArea2_fig9_circleW_Y	Set/Get	-99,999 to 99,999
92927	Mask area figure9 Circumference Radius	figArea2_fig9_circleW_R	Set/Get	0 to 99,999
92928	Mask area figure9 Circumference Width	figArea2_fig9_circleW_W	Set/Get	0 to 99,999
92934	Mask area figure9 Wide arc Center Position X	figArea2_fig9_arcW_X	Set/Get	-99,999 to 99,999
92935	Mask area figure9 Wide arc Center Position Y	figArea2_fig9_arcW_Y	Set/Get	-99,999 to 99,999
92936	Mask area figure9 Wide arc Radius	figArea2_fig9_arcW_R	Set/Get	0 to 99,999
92937	Mask area figure9 Wide arc Start angle	figArea2_fig9_arcW_SA	Set/Get	-180 to 180
92938	Mask area figure9 Wide arc End angle	figArea2_fig9_arcW_EA	Set/Get	-180 to 180
92939	Mask area figure9 Wide arc Width	figArea2_fig9_arcW_W	Set/Get	0 to 99,999
92940	Mask area figure9 Polygon Point Count	figArea2_fig9_polygon_count	Set/Get	3 to 10
92941	Mask area figure9 Polygon Point1 Position X	figArea2_fig9_polygon_x0	Set/Get	-99,999 to 99,999
92942	Mask area figure9 Polygon Point1 Position Y	figArea2_fig9_polygon_y0	Set/Get	-99,999 to 99,999
92943	Mask area figure9 Polygon Point2 Position X	figArea2_fig9_polygon_x1	Set/Get	-99,999 to 99,999
92944	Mask area figure9 Polygon Point2 Position Y	figArea2_fig9_polygon_y1	Set/Get	-99,999 to 99,999
92945	Mask area figure9 Polygon Point3 Position X	figArea2_fig9_polygon_x2	Set/Get	-99,999 to 99,999
92946	Mask area figure9 Polygon Point3 Position Y	figArea2_fig9_polygon_y2	Set/Get	-99,999 to 99,999
92947	Mask area figure9 Polygon Point4 Position X	figArea2_fig9_polygon_x3	Set/Get	-99,999 to 99,999
92948	Mask area figure9 Polygon Point4 Position Y	figArea2_fig9_polygon_y3	Set/Get	-99,999 to 99,999
92949	Mask area figure9 Polygon Point5 Position X	figArea2_fig9_polygon_x4	Set/Get	-99,999 to 99,999
92950	Mask area figure9 Polygon Point5 Position Y	figArea2_fig9_polygon_y4	Set/Get	-99,999 to 99,999
92951	Mask area figure9 Polygon Point6 Position X	figArea2_fig9_polygon_x5	Set/Get	-99,999 to 99,999
92952	Mask area figure9 Polygon Point6 Position Y	figArea2_fig9_polygon_y5	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
92953	Mask area figure9 Polygon Point7 Position X	figArea2_fig9_polygon_x6	Set/Get	-99,999 to 99,999
92954	Mask area figure9 Polygon Point7 Position Y	figArea2_fig9_polygon_y6	Set/Get	-99,999 to 99,999
92955	Mask area figure9 Polygon Point8 Position X	figArea2_fig9_polygon_x7	Set/Get	-99,999 to 99,999
92956	Mask area figure9 Polygon Point8 Position Y	figArea2_fig9_polygon_y7	Set/Get	-99,999 to 99,999
92957	Mask area figure9 Polygon Point9 Position X	figArea2_fig9_polygon_x8	Set/Get	-99,999 to 99,999
92958	Mask area figure9 Polygon Point9 Position Y	figArea2_fig9_polygon_y8	Set/Get	-99,999 to 99,999
92959	Mask area figure9 Polygon Point10 Position X	figArea2_fig9_polygon_x9	Set/Get	-99,999 to 99,999
92960	Mask area figure9 Polygon Point10 Position Y	figArea2_fig9_polygon_y9	Set/Get	-99,999 to 99,999
93000	End point figure Count	figArea3_count	Set/Get	0 to 1
93001	End point figure0 Type	figArea3_fig0_type	Set/Get	4: Wide line
93002	End point figure0 mode	figArea3_fig0_mode	Set/Get	0: OR
93009	End point figure0 Wide line Start point X	figArea3_fig0_lineW_X0	Set/Get	-99,999 to 99,999
93010	End point figure0 Wide line Start point Y	figArea3_fig0_lineW_Y0	Set/Get	-99,999 to 99,999
93011	End point figure0 Wide line End point X	figArea3_fig0_lineW_X1	Set/Get	-99,999 to 99,999
93012	End point figure0 Wide line End point Y	figArea3_fig0_lineW_Y1	Set/Get	-99,999 to 99,999
93013	End point figure0 Wide line Width	figArea3_fig0_lineW_W	Set/Get	0 to 99,999
93099	End point figure Update	figArea3_update	Set only	1: Update

3

Compensate image

This chapter describes how to apply positional compensation for measurement objects in the input image in order to measure accurately.

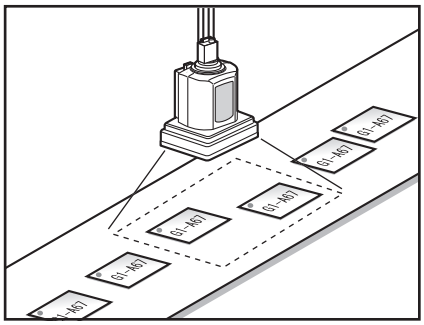
3-1 Position Compensation

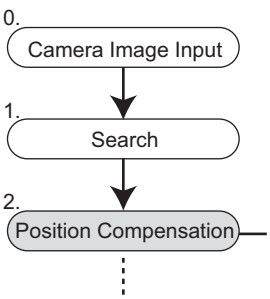
The positional deviation of measurement objects can be corrected using measured values saved by other processing units. Compare the measured coordinates with the reference coordinates of the applicable processing unit, and move the image by the amount of the difference.

Used in the Following Case

Even with different positions for the same measurement object, correct measurement can still be performed by correcting the position of the input image. There is no need to reposition the measurement object itself.

Example) Using the searched position to perform position compensation.





Use the measurement values (searched measurement coordinate X and Y) of the previous unit to modify the position of the measurement object

Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

Processing Units That Can Be Combined with Position Compensation

Position compensation corrects positions according to measured values (coordinates) from the immediately preceding processing unit. Combining the following processing units with position compensation is effective.

Processing unit type	Processing item name
Processing unit that performs search or matching (called "Search processing unit" hereafter.)	Refer to *2-1 Search* on page 2-9. Refer to *2-2 Flexible Search* on page 2-24. Refer to *2-4 ECM Search* on page 2-49. Refer to *2-33 Circle Angle* on page 2-505.
Processing unit that detects edge positions (called "Edge position processing unit" hereafter.)	Refer to *2-11 Edge Position* on page 2-152. Refer to *2-13 Scan Edge Position* on page 2-174.
Processing unit to detect the center of gravity (called "processing unit for gravity center detection".)	Refer to *2-19 Gravity and Area* on page 2-264. Refer to *2-20 Labeling* on page 2-284.

Important

- When the position compensation method ([Method]) is set to [1 unit scroll] or [2 unit scroll], position compensation will not be performed correctly if units other than the above unit(s) are present immediately before the [Position Compensation] unit within the scene.
- For processing units that are used in combination with position compensation, set [Calibration] to "OFF" in [Output parameter].
- The position compensation method causes some processing items to be NG when areas outside the image are included within the region. (Edge position/number of edge pins/fine matching/defects and contamination/ high-precision defects and contamination detection/ area gravity center/labeling/sophisticated labeling+/color average and deviation/scan edge position/scan edge width/circular shape angle acquisition)

3-1-1 Region Setting (Position Compensation)

When position compensation is set, the position is shifted by exactly the amount of the compensation, then measurement is performed. Restricting the region in which the image is moved can shorten the processing time.

1 In the Item Tab area, click [Region setting].

2 Use the Drawing tools to specify the measurement region.

3 Click [OK] in the Figure setting area.

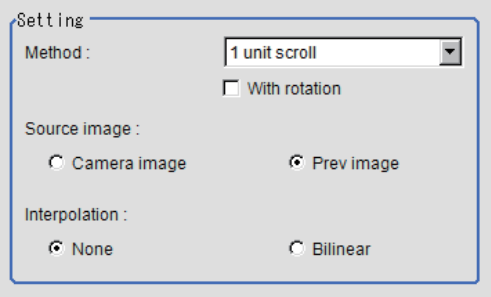
- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

3-1-2 Scroll Method (Position Compensation)

Set the compensation method for position compensation.

1 In the Item Tab area, click [Scroll method].

2 Set the parameters.



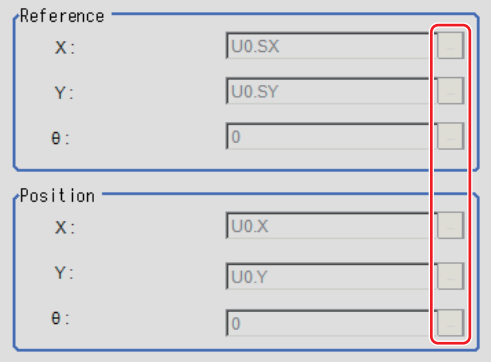
Setting item	Set value [Factory default]	Description
Method	[1 unit scroll]	This performs a position compensation by referring to the coordinates measured with the search processing unit or edge position processing unit*1 immediately before the [Position Compensation] (automatic processing unit). This moves the image by the difference between the measured coordinates and the reference coordinates of the referring search processing unit or edge position processing unit.
	2 unit scroll	This performs a position compensation by referring to the coordinates measured with the search processing unit or edge position processing unit*1 immediately before or two units before the [Position Compensation] (automatic processing unit).
	Calculation	Set whichever position compensation you prefer. Set the reference coordinates and measurement coordinates.
	Reset scroll	The image for the immediately preceding image input (Camera image input/Camera switching) is displayed. When position compensation has been performed, the status returns to that from before position compensation. If Filtering or Color Gray Filter had been performed, the original image with Filtering or Color Gray Filter released is displayed.
With rotation	• Checked • [Unchecked]	When "1 unit scroll" or "2 unit scroll" is selected as the setting method, place a check for executing position compensation in the rotation direction in addition to the XY directions.
Source image	Camera image	The camera input image that has not been subject to filtering is subject to compensation as is.
	[Prev image]	Images to which filtering and position compensation processing are applied in units even before the "Position Compensation" being set are the targets.
Interpolation	[None]	Position compensation is performed in units of pixels.
	Bilinear	This option joins more than one point with a line in order to find a desired approximate value. The image will become smoother.

*1. Refer to *Processing Units That Can Be Combined with Position Compensation* on page 3-5.

● **When you choose the "Calculation" option**

3 Using expressions, specify the "Reference" and "Position" which are used to determine the position compensation.

Differences between the respective values in the "Reference" and "Position" areas give the amount of position compensation to be performed.



Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12.

3-1-3 Key Points for Test Measurement and Adjustment (Position Compensation)

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image number.	Explanation of image to be displayed
0	After compensation
1	Before compensation

3-1-4 Measurement Results for Which Output Is Possible (Position Compensation)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Scroll X	DX	Scroll X
Scroll Y	DY	Scroll Y
Scroll θ	DT	Scroll θ
Measurement coordinate X	X	Measured value X coordinate
Measurement coordinate Y	Y	Measured value Y coordinate
Measurement angle θ	TH	Measure angle θ
Reference position X	SX	Reference X coordinate
Reference position Y	SY	Reference Y coordinate
Reference angle θ	ST	Reference angle θ

3-1-5 External Reference Tables (Position Compensation)

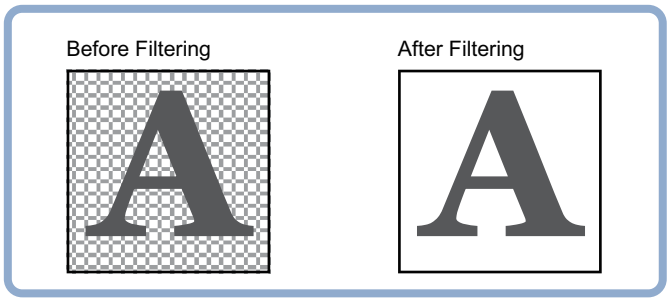
No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Scroll X	moveX	Get only	-99,999.9999 to 99,999.9999
6	Scroll Y	moveY	Get only	-99,999.9999 to 99,999.9999
7	Scroll theta	moveAngl	Get only	-999.9999 to 999.9999
8	Position X	measPosX	Get only	0 to 99,999.9999
9	Position Y	measPosY	Get only	0 to 99,999.9999
10	Measurement theta	measAngl	Get only	-999.9999 to 999.9999
11	Reference X	stdPosX	Get only	-99,999.9999 to 99,999.9999
12	Reference Y	stdPosY	Get only	-99,999.9999 to 99,999.9999
13	Reference theta	stdAngl	Get only	-999.9999 to 999.9999
120	Interpolation	compensation	Set/Get	0: None 1: Bilinear
121	Method	setupMode	Set/Get	0: 1 unit scroll 1: 2 unit scroll 2: Expression 3: Reset scroll
122	Scroll target	targetImage	Set/Get	0: Camera image 1: Prev. unit image
123	With rotation	rotation	Set/Get	0: OFF 1: ON
124	Reference position X	setDataRefX	Set/Get	Exp. character string
125	Reference position Y	setDataRefY	Set/Get	Exp. character string
126	Reference angle	setDataRefAngl	Set/Get	Exp. character string
127	Measurement position X	setDataPosX	Set/Get	Exp. character string
128	Measurement position Y	setDataPosY	Set/Get	Exp. character string
129	Measurement angle	setDataAngl	Set/Get	Exp. character string
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

3-2 Filtering

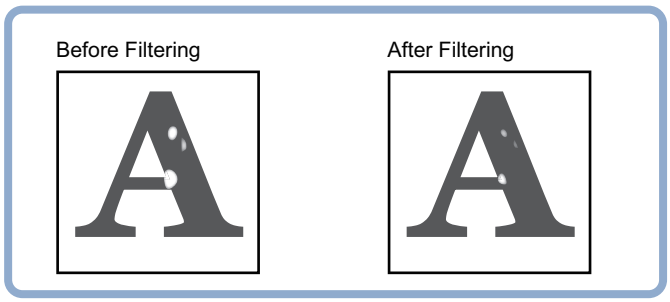
Process the images acquired from cameras in order to make them easier to measure.

Used in the Following Case

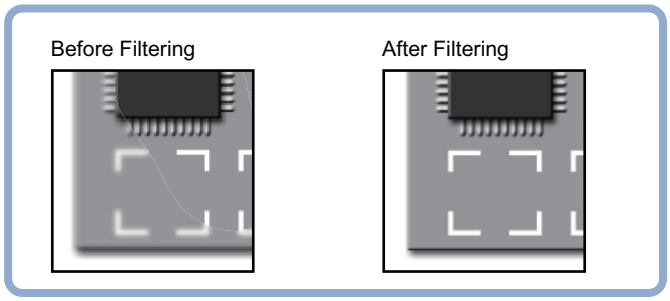
- Cutting out unnecessary background images to exclude them from the measurement region



- When noise is to be removed



- When the edges of marks you want to find cannot be found even though other edges have been extracted.



Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

3-2-1 Filtering Parameters (Filtering)

Treat the images loaded from the camera in order to make them easier to measure.

You can select from 10 filtering methods to match the image state.

1 In the Item Tab area, click [Filter parameter].

2 Set each item while checking the image.

Setting item	Set value [Factory default]	Description
Display	Through image display	The latest image is always input from the camera and displayed.
	[Freeze image display]	The image that was scanned in the immediately preceding measurement is displayed. Images can be updated at any time during measurement.
Target for filtering	[Camera image]	Filtering is applied to the images input from the camera that is set before this unit ([Filtering]) in the scene. Filtering is not performed.
	Previous image	Filtering is applied to the images which have been processed by the [Position Compensation] and [Filtering] units that are set before this unit ([Filtering]) in the scene.
Order of filtering	• [Filtering → BGS] • BGS → Filtering	Select the sequence of background suppression/filtering.
Filtering	• [OFF] • Weak smoothing • Strong smoothing • Dilate • Erosion • Median • Extract edges • Extract horizontal edges • Extract vertical edges • Enhance edges	Select the type of filtering. Refer to *Filtering Options and Examples* on page 3-11.
Filter size	• [3 × 3] • 5 × 5	Select whether to use information from several surrounding pixels. With mask size, the larger the setting value, the more of the surrounding pixel variation that can be assimilated.
BGS level	[0] to [255]	While looking at your image, specify the upper and lower limits for RGB to suppress as the background. Refer to *Background Suppression Level* on page 3-12.

Filtering Options and Examples

Treat the images loaded from the camera in order to make them easier to measure.

Types of filtering	The problems to be treated	Filtering description	Example
Weak smoothing Strong smoothing	Small flecks on the measurement object	Makes flecks less visible.	Makes stable searching possible and stable area measurement possible.
Dilate	Dark noise exists	This filtering removes dark noise by enlarging brighter areas.	Removing noise from measurement objects
Erosion	Brighter noise exists	This filtering removes brighter noise by shrinking brighter areas.	
Median	Small flecks on the measurement object	This filtering keep the profile and weaken flecks.	Edge positioning (Accuracy is not reduced)
Extract edges	Due to a comparatively lower image contrast, defects are difficult to extract	Extracts the boundary lines of the image (light and shade).	Defect inspection
Extract horizontal edges	Due to a comparatively lower image contrast, defects are difficult to extract	Extracts the boundary lines horizontal to the image (light and shade).	
Extract vertical edges	Due to a comparatively lower image contrast, defects are difficult to extract	Extracts the boundary lines vertical to the image (light and shade).	
Enhance edges	The measurement object is blurry (due to changes such as lighting fluctuation).	Clearly delineates the boundary lines between the light and dark in the image.	Edge positioning

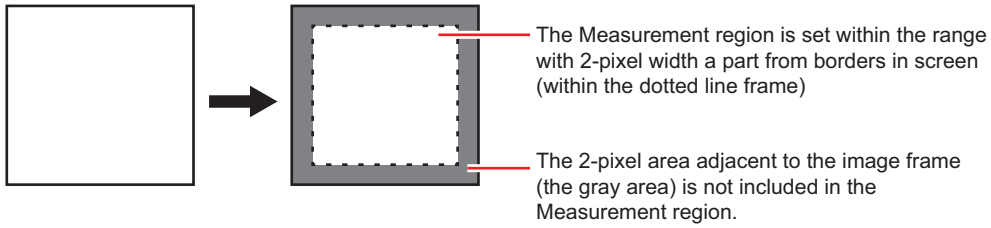
Notes on Filtering Setting

If filtering is applied to the image, the area around the image frame will become unstable. When a [Filtering] processing item has been set in the scene, ensure that measurement ranges, etc. set for other processing items are not included in the area around the image frame.

The width not included in the measurement range will vary depending on the mask size settings.

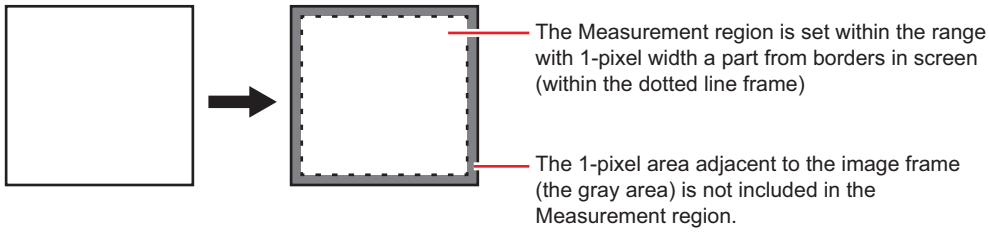
- Filter size: 5 × 5

  Make settings so that a width around the image frame equal to 2 pixels is not included in the measurement range.



- Filter size: 3 × 3

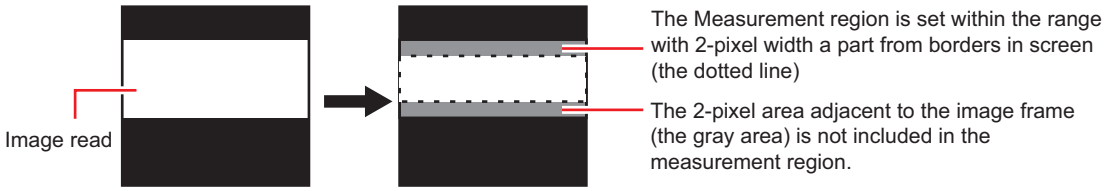
  Make settings so that a width around the image frame equal to 1 pixels is not included in the measurement range.



● When a partial scan is used to limit the load range

Set so as to not include the image loading range surroundings.

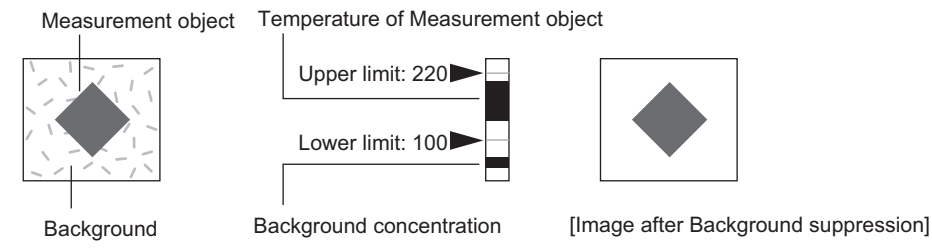
The width that will not be included in the measurement range is the same as the above. (In the following figure, filter size:5 × 5).



Background Suppression Level

The images below the lower limit and above the upper limit will be set to the lower and upper limits of brightness, respectively.

Example) lower limit: 100 upper limit: 220



Only images with a density of 100 to 220 can be measurement objects.

3-2-2 Region Setting (Filtering)

It is possible to target the entire screen, but restricting the range can shorten the processing time.

1 In the Item Tab area, click [Region setting].

2 Use the Drawing tools to specify the measurement region.

3 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

3-2-3 External Reference Tables (Filtering)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
120	Target	targetImage	Set/Get	0: Camera image 1: Prev. unit image
121	Filtering	filter	Set/Get	0 to 9
122	Order of filtering	order	Set/Get	0: Filtering → BGS 1: BGS → Filtering
123	Mask size	maskSize	Set/Get	0: 3*3 1: 5*5
124	BGS level Min.	backLower	Set/Get	0 to 255
125	BGS level Max.	backUpper	Set/Get	0 to 255

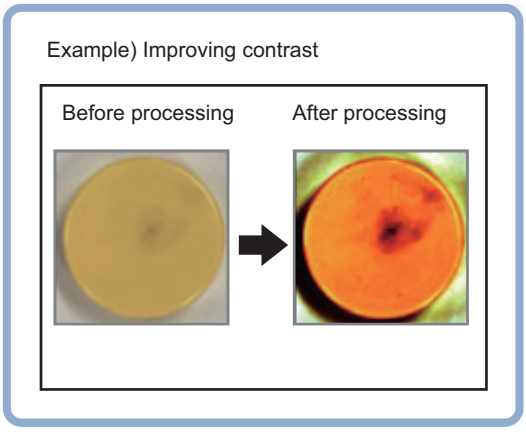
3-3 Background Suppression

Specifying a brightness range to use for measurement eliminates the section outside that range as background.

In addition, the extracted range is converted into values of 0 to 255, so the contrast can be emphasized.

Used in the Following Case

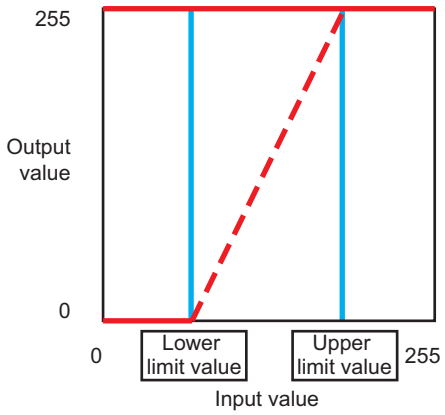
By extracting a specific brightness range, the contrast on the image can be improved, unnecessary background eliminated, etc.



● Basic concept of background suppression

Because input values from 0 to [Lower] are converted to level 0 and values from [Upper] to 255 are converted to level 255, the background in this range is eliminated.

Together with this, only [Lower] to [Upper] from the input values 0 to 255 are taken and those are converted to output values of 0 to 255, so the contrast within this range is emphasized.



Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

3-3-1 Filter Setting (Background Suppression)

This item sets the filter.

1 In the Item Tab area, click [Filter Setting].

2 In the "Display" area, click [Change display] to switch between camera image types.

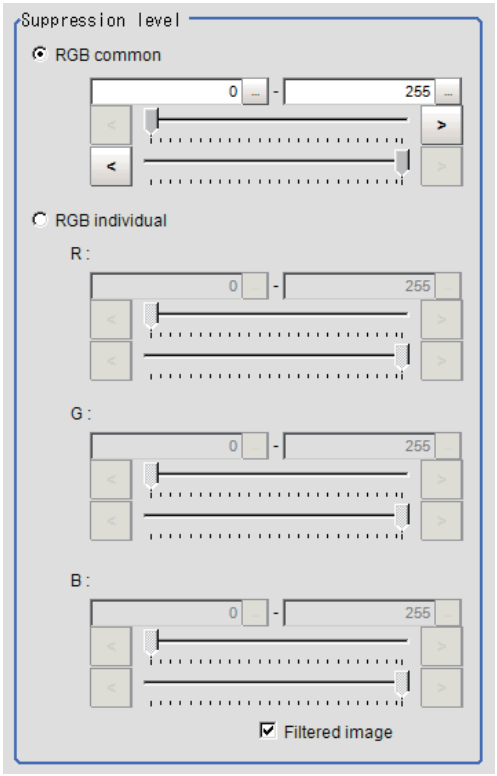
The displayed contents of the Image Display area will be switched.

Setting item	Set value [Factory default]	Description
Display	Through image display	The latest image is always input from the camera and displayed.
	[Freeze image display]	The image that was scanned in the immediately preceding measurement is displayed.

3 Set the background suppression level.

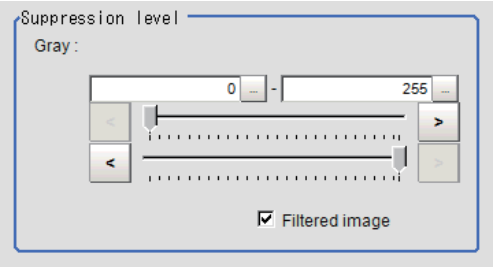
There are two setting methods: specifying the section in the image whose contrast is to be emphasized or specifying the extraction range with numeric values.

- For color cameras:



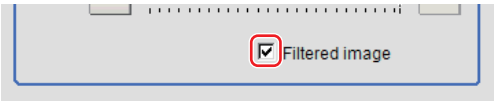
Item	Set value [Factory default]	Description
Suppression level	RGB common 0 to 255	The upper and lower limits for the background suppression level are set in common for RGB. The range from the set minimum to the set maximum is converted to 0 to 255.
	RGB individual 0 to 255	The maximum and minimum for the background suppression level are independently for RGB. The range from the set minimum to the set maximum is converted to 0 to 255.

- For monochrome cameras:



Setting item	Set value [Factory default]	Description
Gray	0 to 255	The set range is converted to 0 to 255.

4 As necessary, set the display image.



3-3-2 Region Setting (Background Suppression)

It is possible to target the entire screen, but restricting the range can shorten the processing time.

1 In the Item Tab area, click [Region setting].

2 Use the Drawing tools to specify the measurement region.

3 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

3-3-3 Measurement Results for Which Output Is Possible (Background Suppression)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result

3-3-4 External Reference Tables (Background Suppression)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
121	Color setting mode	colorMode	Set/Get	0: RGB common 1: RGB individual
122	Lower limit for common colors	lowCommon	Set/Get	0 to 255
123	Upper limit for common colors	uppCommon	Set/Get	0 to 255
124	MIN R	lowRed	Set/Get	0 to 255
125	MAX R	uppRed	Set/Get	0 to 255
126	MIN G	lowGreen	Set/Get	0 to 255
127	MAX G	uppGreen	Set/Get	0 to 255
128	MIN B	lowBlue	Set/Get	0 to 255
129	MAX B	uppBlue	Set/Get	0 to 255
130	Lower limit for shading	lowGray	Set/Get	0 to 255
131	Upper limit for shading	uppGray	Set/Get	0 to 255
132	Filtered image	highContrastImage	Set/Get	0: Image prior to transfer 1: Image after transfer
200	Transfer source image number	srcImageNo	Set/Get	0 to 9
201	Transfer destination image number	destImageNo	Set/Get	0 to 9
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

3-4 Brightness Correct Filter

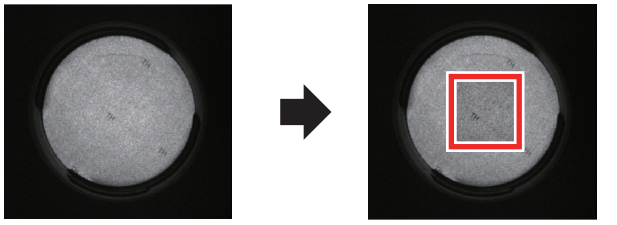
The filter can be used to correct the effect of the material and shape of the lighting and the measurement object.

Used in the Following Case

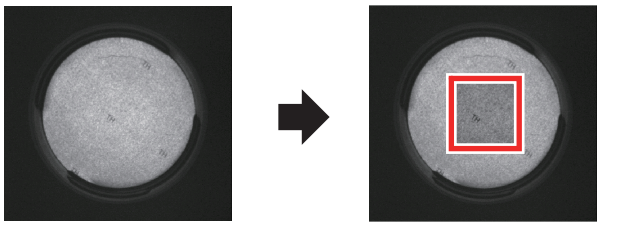
This is used when the image is non-uniform due to the effect of the material and shape of the lighting and the measurement object.

• Brightness correction

Even if the brightness of the measurement object changes due to the impact of the surrounding environment, consistent measurement results can be obtained by applying correction to a certain brightness.



Dark input image　　Brightness correction result

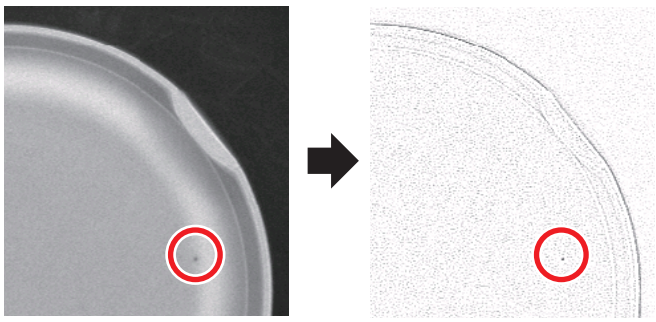


Bright input image　　Brightness correction result

Setting region

• Unevenness removal

If the image is uneven due to the influence of the shape, material, or the like of the measurement object, this function can be used to remove the unevenness and make defects easier to detect.



Input image　　Unevenness removal

Important

- This processing item is for monochrome only. When using a color camera, insert a color gray filter before this processing item. If a color image is input, it is NG (incompatible image).
- Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

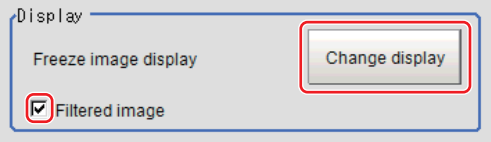
3-4-1 Filter Setting (Brightness Correct Filter)

This item sets the filter.

1 In the "Item Tab" area, click [Filter setting].

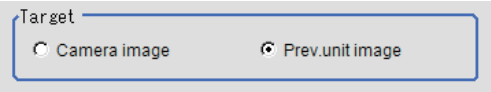
2 In the "Display" area, click [Change display] to switch between camera image types.

The displayed contents of the image display area will be switched.



Setting item	Setting value [Factory default]	Description
Display	Through image display	The latest image is always input from the camera and displayed.
	[Freeze image display]	The image that was scanned in the immediately preceding measurement is displayed.
Filtered image	• [Checked] • Unchecked	To display the original image, uncheck here.

3 Set the target image.

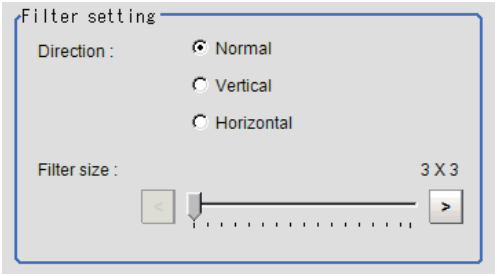


Setting item	Setting value [Factory default]	Description
Target	Camera image	The camera input image that has not been subject to filtering is subject to compensation as is.
	[Prev. unit image]	Images to which processing is applied in units even before the "Brightness correction" being set are the targets.

4 Set the correction method.

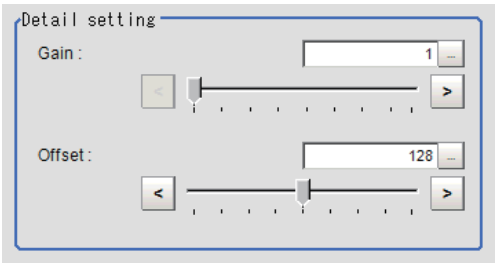
Setting item	Setting value [Factory default]	Description
Uneven removal	• Checked • [Unchecked]	When this is checked, unevenness removal is performed in addition to brightness correction.

5 Specify the filtering setting (only for "Uneven removal").



Setting item	Setting value [Factory default]	Description
Direction	• [Normal] • Vertical • Horizontal	Usually, set this to "Normal". If the direction of change of the unevenness is one direction, select the setting that is perpendicular to the direction of change of the unevenness.
Filter Size	3 to 255 [3]	Specify a larger value to match the size of the defects to be extracted. Only an odd number value can be specified.

6 Set the details.



Setting item	Setting value [Factory default]	Description
Gain	1 to 63 [1]	Adjust the contrast of an image after the correction. Specifying a larger value emphasizes the density differences within the image.
Offset	0 to 255 [128]	Adjust the brightness of an image after the correction. Specifying a larger value increases the brightness of the image.

3-4-2 Region Setting (Brightness Correct Filter)

It is possible to target the entire screen, but restricting the range can shorten the processing time.

1 In the Item Tab area, click [Region setting].

2 Use the drawing tools to specify the measurement region.

3 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

3-4-3 External Reference Tables (Brightness Correct Filter)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
120	Uneven removal (Method)	unevenRemoval	Set/Get	0: Without uneven removal (Brightness correction) 1: Uneven removal
121	Filter direction	direction	Set/Get	0: H&V 1: Horizontal 2: Vertical
122	Filter size	filterSize	Set/Get	3 to 255 N: Odd only
123	Gain	gain	Set/Get	1 to 63
124	Offset	offset	Set/Get	0 to 255
200	Conversion former image	srcImageNo	Set/Get	0 to 9
201	Destination image No.	destImageNo	Set/Get	0 to 9
202	Target image	targetImage	Set/Get	0: Camera image 1: Prev. unit image
203	display image	filteredImage	Set/Get	0: Display input image 1: Display filtered image
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

3-5 Color Gray Filter

This processing item converts a color image input from a color camera into a monochrome image.

The available filters are "Primary color filter (RGB)", "Complementary color filter (CMY)", "Brightness filter", and "HSV filter".

This processing item cannot be used with monochrome images. Such use causes a judgement of NG (incompatible image).

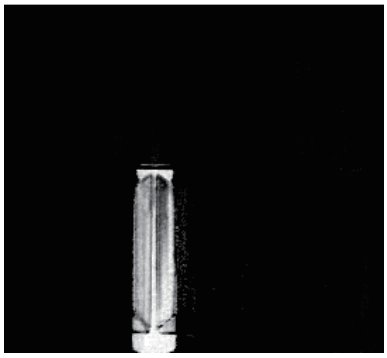
Additional Information

The processing items after Color Gray Filter are the same as when a monochrome camera is connected.

Used in the Following Case

To convert a color image to a monochrome image with a specific color enhanced

Example) To obtain a monochrome image with the dark red area enhanced



Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

3-5-1 Filter Setting (Color Gray Filter)

This item sets the filter.

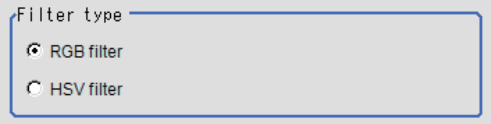
1 In the Item Tab area, click [Filter Setting].

2 In the "Display mode" area, click [Change display] to switch between camera image types.

The displayed contents of the Image Display area will be switched.

Setting item	Set value [Factory default]	Description
Display mode	Through image display	The latest image is always input from the camera and displayed.
	[Freeze image display]	The image that was scanned in the immediately preceding measurement is displayed.

3 Select the type of filter in the "Filter type" area.

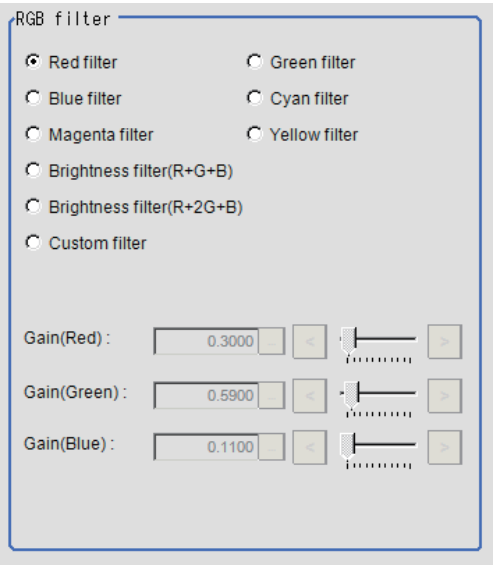


Setting item	Set value [Factory default]	Description
Filter type	[RGB filter]	Specify the color extraction range with R, G, and B.
	HSV filter	Specify the color extraction range with hue and color chroma.

- When RGB is selected

4 Select the type of color filter in the "RGB filter" area.

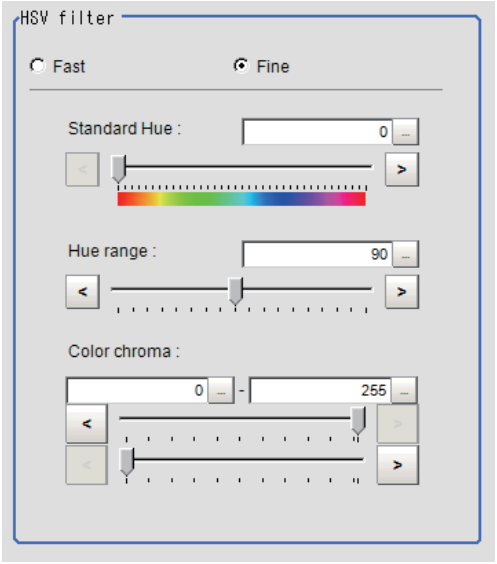
If "Custom filter" is selected, set the "Gain (Red)", "Gain (Green)", and "Gain (Blue)" as necessary.



Setting item	Set value [Factory default]	Description
RGB Filter	• [Red filter] • Green filter • Blue filter • Cyan filter • Magenta filter • Yellow filter • Brightness filter(R+G+B) • Brightness filter (R+2G+B) • Custom filter	This item produces the same effects as using the selected optical filters.
Gain (Red)	0.0001 to 9.9999 [0.3]	RGB gain values when processing with a custom filter. The density of the color component increases as the value increases. This can be set only when "Custom filter" is selected for RGB filter.
Gain (Green)	0.0001 to 9.9999 [0.59]	
Gain (Blue)	0.0001 to 9.9999 [0.11]	

- When you choose the HSV option

5 Select the type of filter in the "HSV filter" area.



Setting item	Set value [Factory default]	Description
HSV filter	• Fast • [Fine]	"Fast": The color extraction range is set only by hue. "Fine": Extraction is set by standard hue, hue range, and color chroma.
Standard Hue	[0] to 359	Specify the standard hue (tone) for the HSV filter. The density decreases as the difference in hue from the standard hue (difference in tone) increases.
Hue range	10 to 180 [90]	Specify the hue range (difference in tone) of the HSV filter. The hue difference is obtained by dividing the specified hue range into 255 subranges with the standard hue as the center subrange. The density of the hue outside the hue range is 0. This can only be set when "Fine" is selected.
Color chroma	[0] to [255]	Specify the upper and lower limits for saturation (vividness). This can only be set when "Fine" is selected.

3-5-2 External Reference Tables (Color Gray Filter)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
100	Filter kind	kind	Set/Get	0: RGB filter 1: HSV filter
101	RGB filter kind	kindColor	Set/Get	0: Red filter 1:Green filter 2: Blue filter 3: Cyan filter 4: Magenta filter 5: Yellow filter 6: Brightness filter (R+G+B) 7: Brightness filter (R+2G+B) 8: Custom filter
102	Gain (Red)	gainR	Set/Get	0.0001 to 9.9999
103	Gain (Green)	gainG	Set/Get	0.0001 to 9.9999
104	Gain (Blue)	gainB	Set/Get	0.0001 to 9.9999
105	HSV filter	kindColorGray	Set/Get	0: Fast 1: Fine
106	Standard Hue	standardH	Set/Get	0 to 359
107	Hue range	hueRange	Set/Get	10 to 180
108	Upper Limit for Saturation	upperS	Set/Get	0 to 255
109	Lower Limit for Saturation	lowerS	Set/Get	0 to 255
200	Conversion former image	srcImageNo	Set/Get	0 to 9
201	Destination image No.	destImageNo	Set/Get	0 to 9

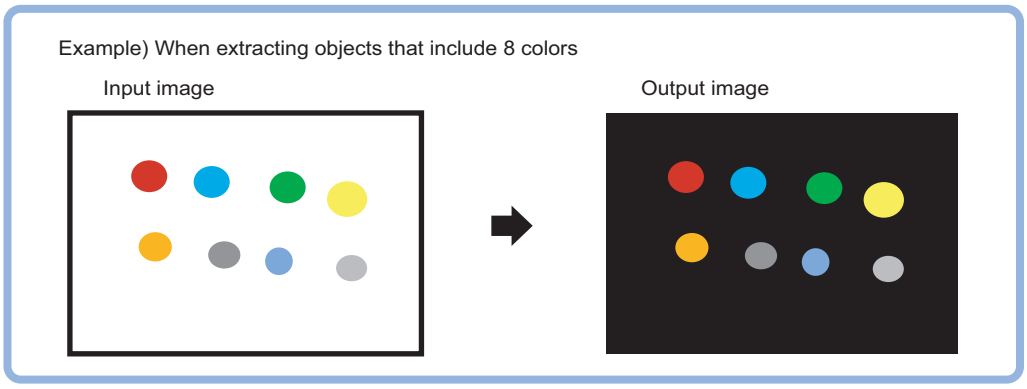
3-6 Extract Color Filter

The color image is extracted by color. Up to 8 ranges can be set.

However, this processing item cannot be used with monochrome images.

Used in the Following Case

To extract an object of different color.



Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

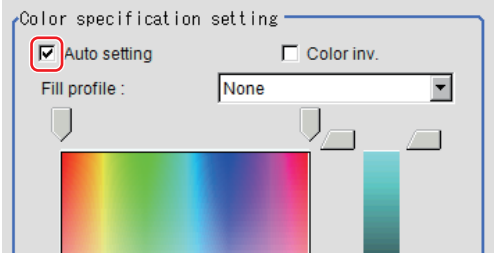
3-6-1 Color Specification (Extract Color Filter)

When connecting a color camera, specify the color to be measured. There are two specification methods: specifying the color to be extracted in the image or specifying the color with the hue, saturation, and brightness values.

This section describes how to specify colors in an image and gives an example of the procedure for finely adjusting with numeric input afterwards.

1. In the Item Tab area, click [Color setting].
2. Place a check at [Auto setting].
3. In the Image Display area, specify the color range you want to detect by dragging the cursor from the upper left corner to the lower right corner of that area.

   The color of the specified area is automatically set.



4 As necessary, select Fill profile.

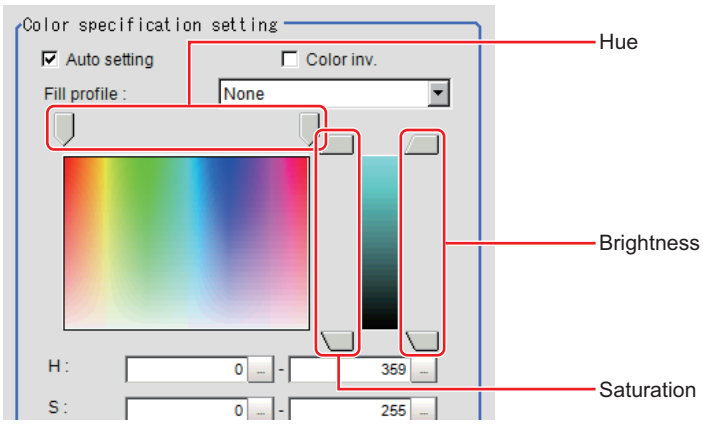
Item	Set value [Factory default]	Description
Fill profile	[None]	The empty section in the center is not filled in.
	Fill outline	In the measurement region, the part between the extracted-color start point and end point in the X-axis direction is measured as having the extracted color. Since filling is applied only to the X-axis direction, the processing is faster than filling up holes. Input image File profile image 
	Filling up holes	The part surrounded by the extracted color, like a doughnut hole, is filled with the extracted color. Input image Image after filling up hole 

5 Finely adjust the hue, saturation, and brightness if necessary.

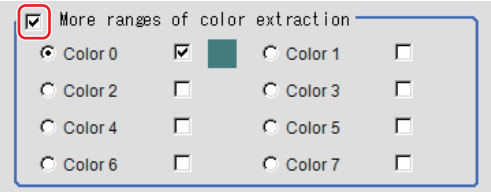
Adjust either by adjusting on the color chart or by inputting numbers.

Item	Set value [Factory default]	Description
H	0 to 359	Specify the color phase (difference of color hues).
S	0 to 255	Specify color saturation (difference of color saturation).
V	0 to 255	Specify the brightness (difference of brightness).
Auto setting	• Checked • [Unchecked]	Specifying the color to be measured on the image automatically sets the hue, saturation, and brightness.
Color inv.	• Checked • [Unchecked]	Everything other than the specified color becomes the measurement target.

- About color charts

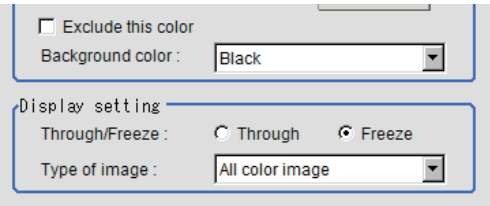


6 To specify multiple colors, place a check at "More ranges of color extraction".



Setting item	Set value [Factory default]	Description
More ranges of color extraction	• Checked • [Unchecked]	If you place a check at this option, you can set up to 8 colors.

7 If necessary, set the display conditions for displayed images.



Setting item	Set value [Factory default]	Description
Exclude this color	• Checked • [Unchecked]	If you place a check at this option, pixels within the HSV range are excluded from color extraction. The priority order for exclusion is that the higher color extraction range numbers are given priority. This setting is disabled if "More ranges of color extraction" is unchecked.
Background color	• [Black] • White • Red • Green • Blue	The background section outside the extracted image is filled with the specified colors. The background colors that can be set depend on the display settings. When "Color selected image" is selected, the background color can be set for each selected color. When All color image is selected, the background color for color extraction range 0 is used.
Through/Freeze	• Through • [Freeze]	For Through, the latest image from the camera is always displayed; for Freeze, the image that was scanned in the immediately preceding measurement is displayed.
Type of image	• Measurement image • [All color image] • Color selected image • Binary image	This sets the state of the image to display.

3-6-2 Region Setting (Extract Color Filter)

Use a rectangle to specify the area where the model is searched.

Instead of measuring the entire input image, narrowing the measurement area shortens the processing time.

1 In the Item Tab area, click [Region setting].

2 Click [Edit].

The figure setting area is displayed.

3 Specify the area in which to search for the model.

The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

3-6-3 Output Image (Extract Color Filter)

Setting item	Set value [Factory default]	Description
Output image setting	• [Binary image] • All color image	This sets the state of the image output.

3-6-4 Key Points for Test Measurement and Adjustment (Color Extraction Filter)

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image number.	Explanation of image to be displayed
0	Color extraction image
1	Measurement image

3-6-5 Measurement Results for Which Output Is Possible (Extract Color Filter)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result

3-6-6 External Reference Tables (Extract Color Filter)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	JG	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)

No.	Data Name	Ident	Set/Get	Data range
120	Fill profile	fill	Set/Get	0: OFF 1: Fill profile 2: Filling up holes
121	Inverse area presence	invert	Set/Get	0: OFF 1: ON
122	Image kind	imageKind	Set/Get	0: Measurement image 1: All color image 2: Selection color image 3: Binary image
123	Multiple selections	multiSelect	Set/Get	0: Multiple selections disabled 1: Multiple selections enabled
124	Output image	outputImage	Set/Get	0: Binary image 1: All color image
130+Nx10 (N: 0 to 7)	Usage flag	flag	Set/Get	0: Not used 1: Used
131+Nx10 (N: 0 to 7)	OR/NOT setting	orNot	Set/Get	0: OR 1: NOT
132+Nx10 (N: 0 to 7)	Register the max. color hue	upperH	Set/Get	0 to 359
133+Nx10 (N: 0 to 7)	Register the min. color hue	lowerH	Set/Get	0 to 359
134+Nx10 (N: 0 to 7)	Register the max. color saturation	upperS	Set/Get	0 to 255
135+Nx10 (N: 0 to 7)	Register the min. color saturation	lowerS	Set/Get	0 to 255
136+Nx10 (N: 0 to 7)	Register the max. color brightness	upperV	Set/Get	0 to 255
137+Nx10 (N: 0 to 7)	Register the min. color brightness	lowerV	Set/Get	0 to 255
138+Nx10 (N: 0 to 7)	Register the BG color	backGround	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
90000	figure0 Count	figArea0_count	Set/Get	1 to 8
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR 1: NOT
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90018	figure0 Ellipse Center Position X	figArea0_fig0_ellipse_CX	Set/Get	-99,999 to 99,999
90019	figure0 Ellipse Center Position Y	figArea0_fig0_ellipse_CY	Set/Get	-99,999 to 99,999
90020	figure0 Ellipse RadiusX	figArea0_fig0_ellipse_RX	Set/Get	1 to 99,999
90021	figure0 Ellipse RadiusY	figArea0_fig0_ellipse_RY	Set/Get	1 to 99,999
90025	figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90034	figure0 Wide arc Center Position X	figArea0_fig0_arcW_X	Set/Get	-99,999 to 99,999
90035	figure0 Wide arc Center Position Y	figArea0_fig0_arcW_Y	Set/Get	-99,999 to 99,999
90036	figure0 Wide arc Radius	figArea0_fig0_arcW_R	Set/Get	0 to 99,999
90037	figure0 Wide arc Start angle	figArea0_fig0_arcW_SA	Set/Get	-180 to 180
90038	figure0 Wide arc End angle	figArea0_fig0_arcW_EA	Set/Get	-180 to 180
90039	figure0 Wide arc Width	figArea0_fig0_arcW_W	Set/Get	0 to 99,999
90040	figure0 Polygon Point Count	figArea0_fig0_polygon_count	Set/Get	3 to 10
90041	figure0 Polygon Point1 Position X	figArea0_fig0_polygon_x0	Set/Get	-99,999 to 99,999
90042	figure0 Polygon Point1 Position Y	figArea0_fig0_polygon_y0	Set/Get	-99,999 to 99,999
90043	figure0 Polygon Point2 Position X	figArea0_fig0_polygon_x1	Set/Get	-99,999 to 99,999
90044	figure0 Polygon Point2 Position Y	figArea0_fig0_polygon_y1	Set/Get	-99,999 to 99,999
90045	figure0 Polygon Point3 Position X	figArea0_fig0_polygon_x2	Set/Get	-99,999 to 99,999
90046	figure0 Polygon Point3 Position Y	figArea0_fig0_polygon_y2	Set/Get	-99,999 to 99,999
90047	figure0 Polygon Point4 Position X	figArea0_fig0_polygon_x3	Set/Get	-99,999 to 99,999
90048	figure0 Polygon Point4 Position Y	figArea0_fig0_polygon_y3	Set/Get	-99,999 to 99,999
90049	figure0 Polygon Point5 Position X	figArea0_fig0_polygon_x4	Set/Get	-99,999 to 99,999
90050	figure0 Polygon Point5 Position Y	figArea0_fig0_polygon_y4	Set/Get	-99,999 to 99,999
90051	figure0 Polygon Point6 Position X	figArea0_fig0_polygon_x5	Set/Get	-99,999 to 99,999
90052	figure0 Polygon Point6 Position Y	figArea0_fig0_polygon_y5	Set/Get	-99,999 to 99,999
90053	figure0 Polygon Point7 Position X	figArea0_fig0_polygon_x6	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90054	figure0 Polygon Point7 Position Y	figArea0_fig0_polygon_y6	Set/Get	-99,999 to 99,999
90055	figure0 Polygon Point8 Position X	figArea0_fig0_polygon_x7	Set/Get	-99,999 to 99,999
90056	figure0 Polygon Point8 Position Y	figArea0_fig0_polygon_y7	Set/Get	-99,999 to 99,999
90057	figure0 Polygon Point9 Position X	figArea0_fig0_polygon_x8	Set/Get	-99,999 to 99,999
90058	figure0 Polygon Point9 Position Y	figArea0_fig0_polygon_y8	Set/Get	-99,999 to 99,999
90059	figure0 Polygon Point10 Position X	figArea0_fig0_polygon_x9	Set/Get	-99,999 to 99,999
90060	figure0 Polygon Point10 Position Y	figArea0_fig0_polygon_y9	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update
90101	figure1 Type	figArea0_fig1_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon
90102	figure1 mode	figArea0_fig1_mode	Set/Get	0: OR 1: NOT
90114	figure1 Rectangle Upper left position X	figArea0_fig1_box_X0	Set/Get	-99,999 to 99,999
90115	figure1 Rectangle Upper left position Y	figArea0_fig1_box_Y0	Set/Get	-99,999 to 99,999
90116	figure1 Rectangle Lower right position X	figArea0_fig1_box_X1	Set/Get	-99,999 to 99,999
90117	figure1 Rectangle Lower right position Y	figArea0_fig1_box_Y1	Set/Get	-99,999 to 99,999
90118	figure1 Ellipse Center Position X	figArea0_fig1_ellipse_CX	Set/Get	-99,999 to 99,999
90119	figure1 Ellipse Center Position Y	figArea0_fig1_ellipse_CY	Set/Get	-99,999 to 99,999
90120	figure1 Ellipse RadiusX	figArea0_fig1_ellipse_RX	Set/Get	1 to 99,999
90121	figure1 Ellipse RadiusY	figArea0_fig1_ellipse_RY	Set/Get	1 to 99,999
90125	figure1 Circumference Center Position X	figArea0_fig1_circleW_X	Set/Get	-99,999 to 99,999
90126	figure1 Circumference Center Position Y	figArea0_fig1_circleW_Y	Set/Get	-99,999 to 99,999
90127	figure1 Circumference Radius	figArea0_fig1_circleW_R	Set/Get	0 to 99,999
90128	figure1 Circumference Width	figArea0_fig1_circleW_W	Set/Get	0 to 99,999
90134	figure1 Wide arc Center Position X	figArea0_fig1_arcW_X	Set/Get	-99,999 to 99,999
90135	figure1 Wide arc Center Position Y	figArea0_fig1_arcW_Y	Set/Get	-99,999 to 99,999
90136	figure1 Wide arc Radius	figArea0_fig1_arcW_R	Set/Get	0 to 99,999
90137	figure1 Wide arc Start angle	figArea0_fig1_arcW_SA	Set/Get	-180 to 180

No.	Data Name	Ident	Set/Get	Data range
90138	figure1 Wide arc End angle	figArea0_-fig1_arcW_EA	Set/Get	-180 to 180
90139	figure1 Wide arc Width	figArea0_-fig1_arcW_W	Set/Get	0 to 99,999
90140	figure1 Polygon Point Count	figArea0_fig1_polygon_count	Set/Get	3 to 10
90141	figure1 Polygon Point1 Position X	figArea0_fig1_polygon_x0	Set/Get	-99,999 to 99,999
90142	figure1 Polygon Point1 Position Y	figArea0_fig1_polygon_y0	Set/Get	-99,999 to 99,999
90143	figure1 Polygon Point2 Position X	figArea0_fig1_polygon_x1	Set/Get	-99,999 to 99,999
90144	figure1 Polygon Point2 Position Y	figArea0_fig1_polygon_y1	Set/Get	-99,999 to 99,999
90145	figure1 Polygon Point3 Position X	figArea0_fig1_polygon_x2	Set/Get	-99,999 to 99,999
90146	figure1 Polygon Point3 Position Y	figArea0_fig1_polygon_y2	Set/Get	-99,999 to 99,999
90147	figure1 Polygon Point4 Position X	figArea0_fig1_polygon_x3	Set/Get	-99,999 to 99,999
90148	figure1 Polygon Point4 Position Y	figArea0_fig1_polygon_y3	Set/Get	-99,999 to 99,999
90149	figure1 Polygon Point5 Position X	figArea0_fig1_polygon_x4	Set/Get	-99,999 to 99,999
90150	figure1 Polygon Point5 Position Y	figArea0_fig1_polygon_y4	Set/Get	-99,999 to 99,999
90151	figure1 Polygon Point6 Position X	figArea0_fig1_polygon_x5	Set/Get	-99,999 to 99,999
90152	figure1 Polygon Point6 Position Y	figArea0_fig1_polygon_y5	Set/Get	-99,999 to 99,999
90153	figure1 Polygon Point7 Position X	figArea0_fig1_polygon_x6	Set/Get	-99,999 to 99,999
90154	figure1 Polygon Point7 Position Y	figArea0_fig1_polygon_y6	Set/Get	-99,999 to 99,999
90155	figure1 Polygon Point8 Position X	figArea0_fig1_polygon_x7	Set/Get	-99,999 to 99,999
90156	figure1 Polygon Point8 Position Y	figArea0_fig1_polygon_y7	Set/Get	-99,999 to 99,999
90157	figure1 Polygon Point9 Position X	figArea0_fig1_polygon_x8	Set/Get	-99,999 to 99,999
90158	figure1 Polygon Point9 Position Y	figArea0_fig1_polygon_y8	Set/Get	-99,999 to 99,999
90159	figure1 Polygon Point10 Position X	figArea0_fig1_polygon_x9	Set/Get	-99,999 to 99,999
90160	figure1 Polygon Point10 Position Y	figArea0_fig1_polygon_y9	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
90701	figure7 Type	figArea0_fig7_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 256: Wide arc 512: Polygon

No.	Data Name	Ident	Set/Get	Data range
90702	figure7 mode	figArea0_fig7_mode	Set/Get	0: OR 1: NOT
90714	figure7 Rectangle Upper left position X	figArea0_fig7_box_X0	Set/Get	-99,999 to 99,999
90715	figure7 Rectangle Upper left position Y	figArea0_fig7_box_Y0	Set/Get	-99,999 to 99,999
90716	figure7 Rectangle Lower right position X	figArea0_fig7_box_X1	Set/Get	-99,999 to 99,999
90717	figure7 Rectangle Lower right position Y	figArea0_fig7_box_Y1	Set/Get	-99,999 to 99,999
90718	figure7 Ellipse Center Position X	figArea0_fig7_ellipse_CX	Set/Get	-99,999 to 99,999
90719	figure7 Ellipse Center Position Y	figArea0_fig7_ellipse_CY	Set/Get	-99,999 to 99,999
90720	figure7 Ellipse RadiusX	figArea0_fig7_ellipse_RX	Set/Get	1 to 99,999
90721	figure7 Ellipse RadiusY	figArea0_fig7_ellipse_RY	Set/Get	1 to 99,999
90725	figure7 Circumference Center Position X	figArea0_fig7_circleW_X	Set/Get	-99,999 to 99,999
90726	figure7 Circumference Center Position Y	figArea0_fig7_circleW_Y	Set/Get	-99,999 to 99,999
90727	figure7 Circumference Radius	figArea0_fig7_circleW_R	Set/Get	0 to 99,999
90728	figure7 Circumference Width	figArea0_fig7_circleW_W	Set/Get	0 to 99,999
90734	figure7 Wide arc Center Position X	figArea0_fig7_arcW_X	Set/Get	-99,999 to 99,999
90735	figure7 Wide arc Center Position Y	figArea0_fig7_arcW_Y	Set/Get	-99,999 to 99,999
90736	figure7 Wide arc Radius	figArea0_fig7_arcW_R	Set/Get	0 to 99,999
90737	figure7 Wide arc Start angle	figArea0_fig7_arcW_SA	Set/Get	-180 to 180
90738	figure7 Wide arc End angle	figArea0_fig7_arcW_EA	Set/Get	-180 to 180
90739	figure7 Wide arc Width	figArea0_fig7_arcW_W	Set/Get	0 to 99,999
90740	figure7 Polygon Point Count	figArea0_fig7_polygon_count	Set/Get	3 to 10
90741	figure7 Polygon Point1 Position X	figArea0_fig7_polygon_x0	Set/Get	-99,999 to 99,999
90742	figure7 Polygon Point1 Position Y	figArea0_fig7_polygon_y0	Set/Get	-99,999 to 99,999
90743	figure7 Polygon Point2 Position X	figArea0_fig7_polygon_x1	Set/Get	-99,999 to 99,999
90744	figure7 Polygon Point2 Position Y	figArea0_fig7_polygon_y1	Set/Get	-99,999 to 99,999
90745	figure7 Polygon Point3 Position X	figArea0_fig7_polygon_x2	Set/Get	-99,999 to 99,999
90746	figure7 Polygon Point3 Position Y	figArea0_fig7_polygon_y2	Set/Get	-99,999 to 99,999
90747	figure7 Polygon Point4 Position X	figArea0_fig7_polygon_x3	Set/Get	-99,999 to 99,999

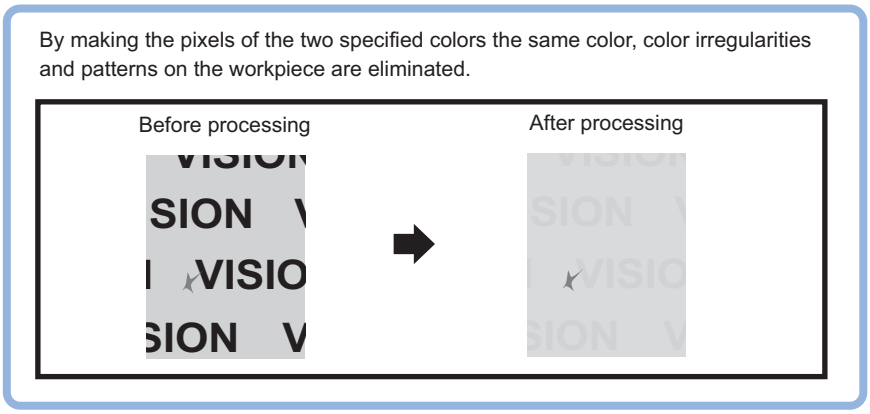
No.	Data Name	Ident	Set/Get	Data range
90748	figure7 Polygon Point4 Position Y	figArea0_fig7_polygon_y3	Set/Get	-99,999 to 99,999
90749	figure7 Polygon Point5 Position X	figArea0_fig7_polygon_x4	Set/Get	-99,999 to 99,999
90750	figure7 Polygon Point5 Position Y	figArea0_fig7_polygon_y4	Set/Get	-99,999 to 99,999
90751	figure7 Polygon Point6 Position X	figArea0_fig7_polygon_x5	Set/Get	-99,999 to 99,999
90752	figure7 Polygon Point6 Position Y	figArea0_fig7_polygon_y5	Set/Get	-99,999 to 99,999
90753	figure7 Polygon Point7 Position X	figArea0_fig7_polygon_x6	Set/Get	-99,999 to 99,999
90754	figure7 Polygon Point7 Position Y	figArea0_fig7_polygon_y6	Set/Get	-99,999 to 99,999
90755	figure7 Polygon Point8 Position X	figArea0_fig7_polygon_x7	Set/Get	-99,999 to 99,999
90756	figure7 Polygon Point8 Position Y	figArea0_fig7_polygon_y7	Set/Get	-99,999 to 99,999
90757	figure7 Polygon Point9 Position X	figArea0_fig7_polygon_x8	Set/Get	-99,999 to 99,999
90758	figure7 Polygon Point9 Position Y	figArea0_fig7_polygon_y8	Set/Get	-99,999 to 99,999
90759	figure7 Polygon Point10 Position X	figArea0_fig7_polygon_x9	Set/Get	-99,999 to 99,999
90760	figure7 Polygon Point10 Position Y	figArea0_fig7_polygon_y9	Set/Get	-99,999 to 99,999

3-7 Anti Color Shading

This filter eliminates color unevenness in the image. Unevenness is eliminated either by converting the two specified colors toward the color midway between them or by converting one of the two specified colors to approach the other. However, this processing item cannot be used with monochrome images.

Used in the Following Case

This is used when a work that would be expected to have uniform color has a non-uniform image due to the effect of tilting, uneven paint, or the like.



Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

3-7-1 Filter Setting (Anti Color Shading)

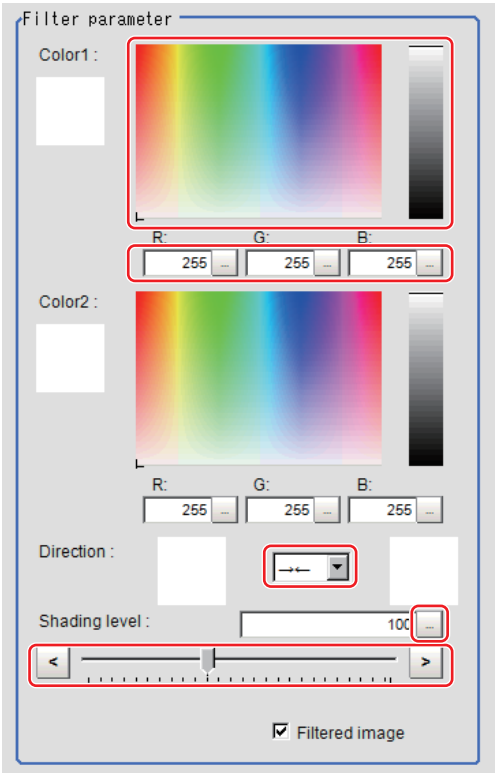
This item sets the filter.

1. In the Item Tab area, click [Filter setting].
2. In the "Display" area, click [Change display] to switch between camera image types.
   The displayed contents of the Image Display area will be switched.

Setting item	Set value [Factory default]	Description
Display	Through image display	The latest image is always input from the camera and displayed.
	[Freeze image display]	The image that was scanned in the immediately preceding measurement is displayed.

3 The section with color contrast on the image is enclosed.
The image with the contrast suppressed is displayed.

4 Adjust the color, conversion direction, and Anti Color Shading level as necessary.
The picked up 2 colors are displayed at Color 1 and Color 2.
Fine adjustments can also be made to the R, G, and B values and on the color chart.



Setting item	Set value [Factory default]	Description
Color1	• R 0 to [255] • G 0 to [255] • B 0 to [255]	The most separate two colors are picked up from the specified region. The sections corresponding to these colors in the region are converted to the color midway between the two.
Color2	• R 0 to [255] • G 0 to [255] • B 0 to [255]	

Setting item	Set value [Factory default]	Description
Direction	• [→←] → ←	Select the conversion method for the set Color 1 and Color 2. →←: Color 1 and Color 2 are converted to the color midway between the two. →: Color 1 is converted to Color 2. ←: Color 2 is converted to Color 1.
Shading level	0 to 255 [100]	Set the level for suppressing color contrast. The larger this value, the less the color contrast.

5 As necessary, set the display image.

Setting item	Set value [Factory default]	Description
Filtered image	• [Checked] • Unchecked	To display the original image, uncheck here.

3-7-2 Region Setting (Anti Color Shading)

It is possible to target the entire screen, but restricting the range can shorten the processing time.

1 In the Item Tab area, click [Region setting].

2 Use the Drawing tools to specify the measurement region.

3 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

3-7-3 Key Points for Test Measurement and Adjustment (Anti Color Shading)

The following content is displayed in the "Detail result" area as text.

Displayed item	Description
Judge	Judgement result

3-7-4 Measurement Results for Which Output Is Possible (Anti Color Shading)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result

3-7-5 External Reference Tables (Anti Color Shading)

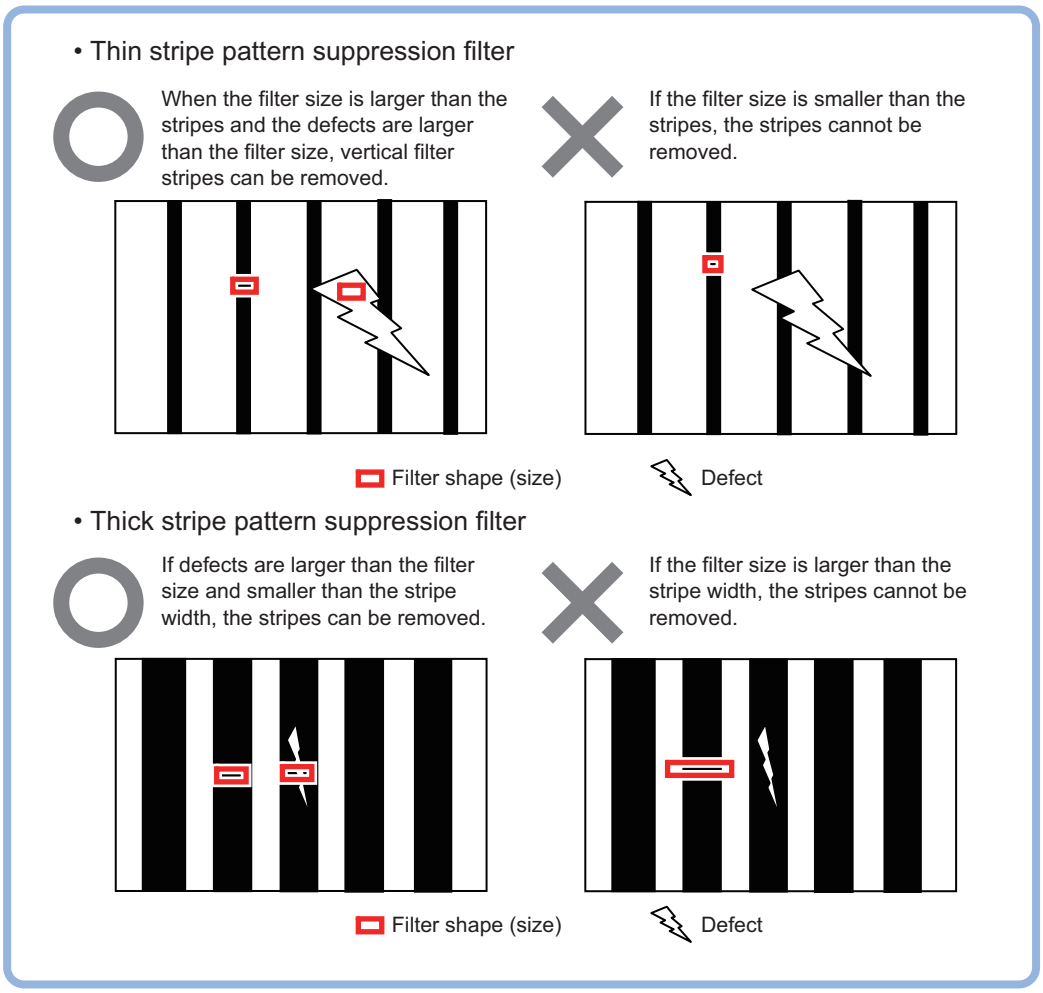
No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
100	Specified color R1	colorR1	Set/Get	0 to 255
101	Specified color G1	colorG1	Set/Get	0 to 255
102	Specified color B1	colorB1	Set/Get	0 to 255
103	Specified color R2	colorR2	Set/Get	0 to 255
104	Specified color G2	colorG2	Set/Get	0 to 255
105	Specified color B2	colorB2	Set/Get	0 to 255
106	Direction	mode	Set/Get	0: Color 1 →← Color 2 1: Color 1 → Color 2 2: Color 1 ← Color 2
107	Shading level	evenLevel	Set/Get	0 to 255
108	Filtered image	evenImage	Set/Get	0: OFF 1: ON
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

3-8 Stripes Removal Filter II

Eliminating a striped pattern or other background makes it possible to stably extract just the defect without it being affected by the background.

Used in the Following Case

To eliminate vertical stripes, or horizontal stripes from the target.



Important

- This processing item is for monochrome only. When using a color camera, insert a color gray filter before this processing item. If a color image is input, it is NG (incompatible image).
- Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

3-8-1 Filter Setting (Stripes Removal Filter II)

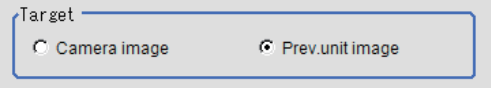
This item sets the filter.

1 In the "Item Tab" area, click [Filter Setting].

2 In the "Display" area, click [Change display] to switch between camera image types.
The displayed contents of the image display area will be switched.

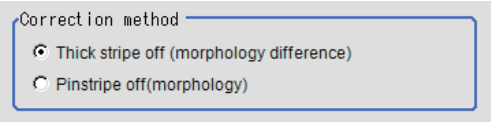
Setting item	Setting value [Factory default]	Description
Display	Through image display	The latest image is always input from the camera and displayed.
	[Freeze image display]	The image that was scanned in the immediately preceding measurement is displayed.
Filtered image	• [Checked] • Unchecked	To display the original image, uncheck here.

3 Set the target image.



Setting item	Setting value [Factory default]	Description
Target	Camera image	The camera input image that has not been subject to filtering is subject to compensation as is.
	[Prev. unit image]	Images to which processing is applied in units even before the "Stripes Removal Filter II" being set are the targets.

4 Set the correction method.

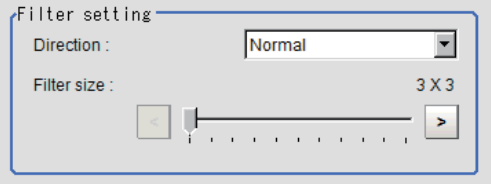


Setting item	Setting value [Factory default]	Description
Correction method	[Thick stripe off]	This item sets the filter size based on the size of the expected defect and removes the striped pattern.
	Pinstripe off	This item sets the filter size based on the width of the stripes and removes the striped pattern.

Important

When this setting is changed, the filter setting and the detail setting will be reset to the factory default values.

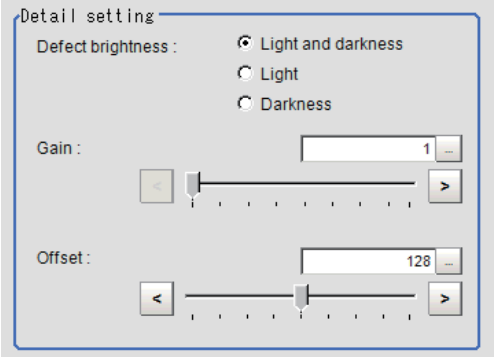
5 This sets the filter settings.



Setting item	Setting value [Factory default]	Description
Direction	• [Normal] • Vertical • Horizontal • Upper right • Lower right	Specify the filter direction.
Filter Size	3 to 63 [3]	The value is set based on the size of the defect to be extracted or the size of the stripes. Only an odd number value can be specified. For "Pinstripe off": Select a filter size larger than the width of the striped pattern. For "Thick stripe off": Select a filter size larger than the size of the defect to be detected.

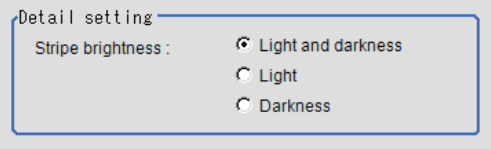
6 Set the details.

- Correction method: For "Thick stripe off"



Setting item	Setting value [Factory default]	Description
Defect brightness	• [Light and darkness] • Light • Darkness	Set the brightness of defects to be extracted from the background. To detect both white defects and black defects, select "Light and darkness".
Gain	1 to 63 [1]	Adjust the contrast of an image after the pattern suppression. Specifying a larger value emphasizes the density differences within the image.
Offset	0 to 255 [128]	Adjust the brightness of an image after the pattern suppression. Specifying a larger value increases the brightness of the image.

- Correction method: For "Pinstripe off"



Setting item	Setting value [Factory default]	Description
Stripe brightness	• [Light and darkness] • Light • Darkness	This item selects the color of the stripes to be deleted.

3-8-2 Region Setting (Stripes Removal Filter II)

It is possible to target the entire screen, but restricting the range can shorten the processing time.

1 In the Item Tab area, click [Region setting].

2 Use the drawing tools to specify the measurement region.

3 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

3-8-3 Test Measurement (Stripes Removal Filter II)

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image No.	Explanation of image to be displayed
0	Filtered image

3-8-4 External Reference Tables (Stripes Removal Filter II)

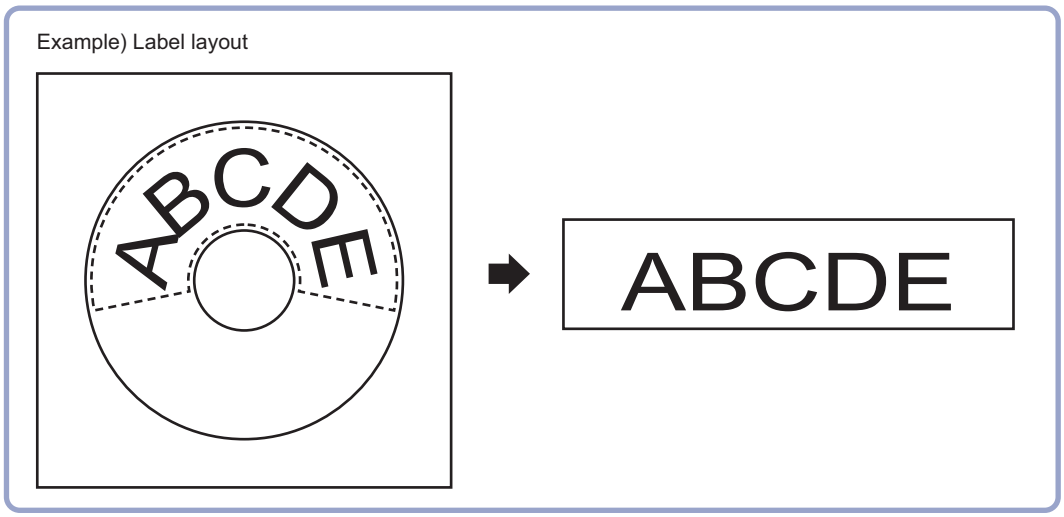
No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
120	Method	correctionMethod	Set/Get	0: Thick stripe cut 1: Thin stripe cut
121	Filter direction	direction	Set/Get	0: H&V 1: Horizontal 2: Vertical 3: Diagonal (upper right) 4: Diagonal (lower right)
122	Filter size	filterSize	Set/Get	3 to 63
123	Brightness	defectBrightness	Set/Get	0: Light and Dark 1: Light 2: Dark
124	Gain	gain	Set/Get	1 to 63
125	Offset	offset	Set/Get	0 to 255
200	Conversion former image	srcImageNo	Set/Get	0 to 9
201	Destination image No.	destImageNo	Set/Get	0 to 9
202	Target image	targetImage	Set/Get	0: Camera image 1: Prev. unit image
203	display image	filteredImage	Set/Get	0: Display Input image 1: Display filtered image
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

3-9 Polar Transformation

Wide circle and fan shape images are transformed in polar coordinates and converted into orthogonal coordinate images. The converted image is a measurement object for processing units in later stages.

Used in the Following Case

This is used for judging characters printed around the circumference of caps and the like.



Important

- When using polar transformation and a position list, display with [Polar Transformation]. If the image is displayed with [Camera Image Input] or the like before the [Polar Transformation], the graphic is not displayed correctly.
- Polar Transformation is always performed in a clockwise direction regardless of Region settings.
- Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

3-9-1 Region Setting (Polar Transformation)

Set a region enclosing the character string that is lined up along a circle. Polar Transformation's Region setting includes Circumference and Wide arc selections.

1 Use the Drawing tools to specify the measurement region.

2 Enclose the characters in the image.

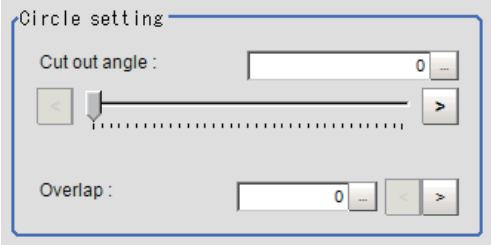
3 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

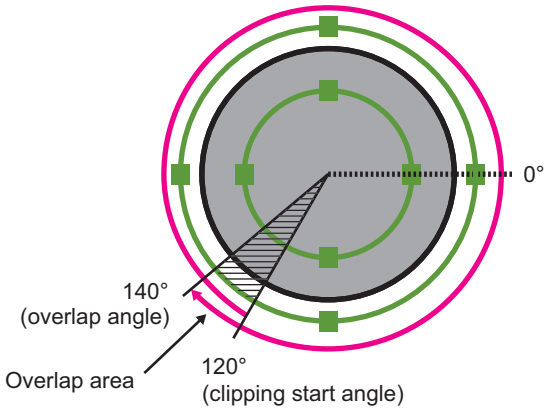
The measurement region is registered and displayed in the Image Display area.

4 When Circumference is selected, set the items in the "Circle setting" area.

When Wide arc is selected, detailed settings are not required.



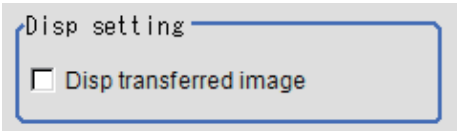
Setting item	Set value [Factory default]	Description
Cut out angle	[0] to 359	Set the angle for starting extraction when the figure is a wide circle.
Overlap	[0] to 180	Set the angle for overlap when the figure is a wide circle. The overlap angle indicates the end angle of the measurement range. This is set to measure extra overlapping from the start angle. Basically, set this larger than the extraction angle.



5 Place a check at [Disp transferred image].

Displays the polar transformed image in the image window.

The vertical and horizontal image sizes (in pixels) are displayed overlapped.



3-9-2 Key Points for Test Measurement and Adjustment (Polar Transformation)

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image number	Explanation of image to be displayed
0	Post-conversion image
1	Measurement image

3-9-3 Measurement Results for Which Output Is Possible (Polar Transformation)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result

3-9-4 External Reference Tables (Polar Transformation)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
120	Cut out angle	cutOutAngle	Set/Get	0 to 359
122	Overlap	overlapEnd	Set/Get	0 to 360
123	Disp transferred image	dispTransImage	Set/Get	0: Image prior to transfer 1: Image after transfer
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
90000	figure0 Count	figArea0_count	Set/Get	0 to 1
90001	figure0 Type	figArea0_fig0_type	Set/Get	64: Circumference 256: Wide arc
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90025	figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90034	figure0 Wide arc Center Position X	figArea0_fig0_arcW_X	Set/Get	-99,999 to 99,999
90035	figure0 Wide arc Center Position Y	figArea0_fig0_arcW_Y	Set/Get	-99,999 to 99,999
90036	figure0 Wide arc Radius	figArea0_fig0_arcW_R	Set/Get	0 to 99,999
90037	figure0 Wide arc Start angle	figArea0_-fig0_arcW_SA	Set/Get	-180 to 180
90038	figure0 Wide arc End angle	figArea0_-fig0_arcW_EA	Set/Get	-180 to 180
90039	figure0 Wide arc Width	figArea0_-fig0_arcW_W	Set/Get	0 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

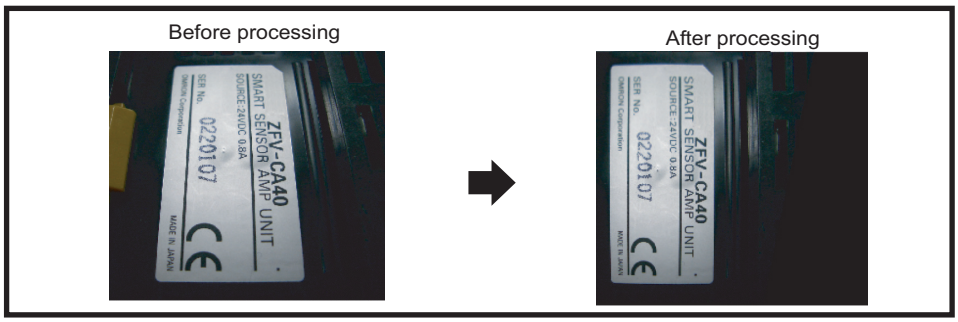
3-10 Trapezoidal Correction

If measurement is performed with the measurement object tilted or the camera tilted, the input image is converted to orthogonal coordinates.

Used in the Following Case

Processing a trapezoidal image shot tilted to make it easier to inspect

Perform processing so that a trapezoid-shaped image in which the object is displayed diagonally can be more easily inspected.



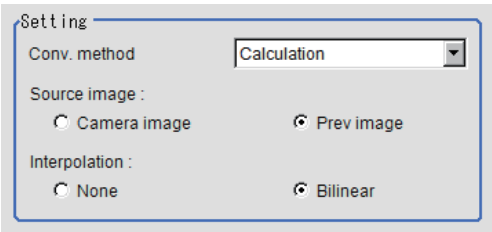
Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

3-10-1 Conversion Method (Trapezoidal Correction)

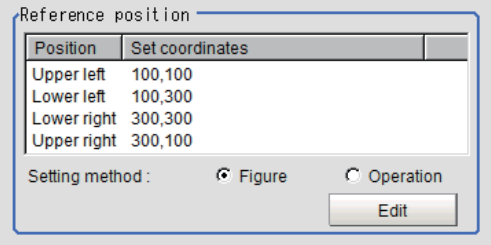
Set the input image conversion method.

1. In the Item Tab area, click [Conv. method].
   When making a new setting, you do not need to click [Conv. method].
2. As necessary, set the parameters.



Setting item	Set value [Factory default]	Description
Conv. method	• 4 unit reference • [Calculation]	Set the expression used for image conversion 4-unit reference: The parameters are set referencing the reference coordinates and measurement coordinates for the immediately preceding 4 units. Confirm that the units are arranged according to the upper left coordinate, lower left coordinate, lower right coordinate and upper right coordinate. To modify the expression for the reference position and measurement position set with 4-unit reference, select the Expression.
Source image	• Camera image • [Prev image]	Set the image to be compensated.
Interpolation	• None • [Bilinear]	Set the interpolation between pixels for image conversion. To reduce conversion time more than raise compensation precision, set "None".

3 Set the reference position.



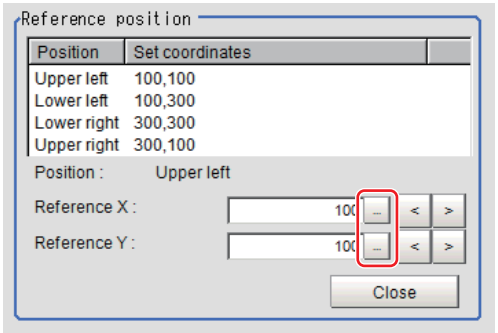
Setting item	Set value [Factory default]	Description
Setting method	• [Figure] • Operation	Set the method for setting the reference position. When fixed value is selected, specify the vertex position on the image. After setting with an expression, if the setting is changed to a fixed value, the result of the expression is reflected as a fixed value.

- When Operation is chosen

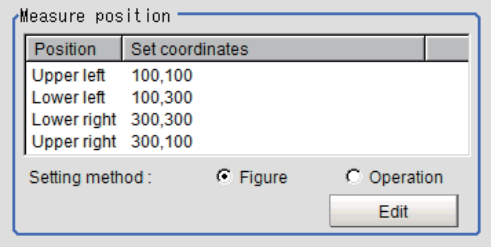
  Click [Edit].

  Click [...] and set the expression.

  Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12.

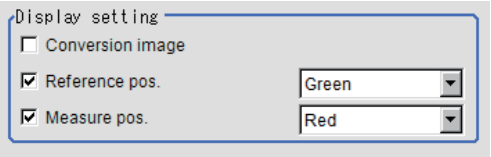


4 Set the measure position.



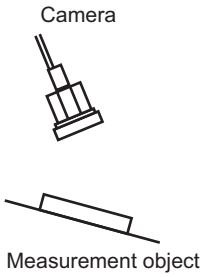
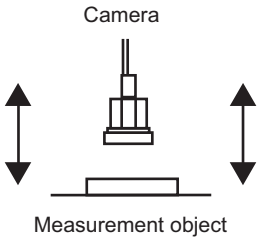
Setting item	Set value [Factory default]	Description
Setting method	• [Figure] • Operation	Set the method for setting the measurement position. When fixed value is selected, specify the vertex position on the image. After setting with an expression, if the setting is changed to a fixed value, the result of the expression is reflected as a fixed value.

5 Set the display settings as necessary.



Example of Setting

The setting examples for the reference position and measurement position.

Setting item	Pattern 1	Pattern 2
	Camera: Fixed tilt Work: No chatter 	Camera: Fixed vertical Work: Chatter 
Reference position	Figure	Figure
Measure position	Figure	Operation

● Pattern 1:

When the camera is installed tilted and there is no chatter in the work

- Refer to *Setting Example for when There Is No Chatter in the Work* on page 3-52 for when there is no chatter in the work.

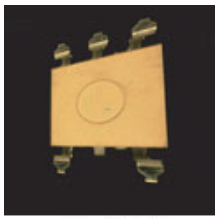
● Pattern 2:

When the camera is installed vertical and there is chatter in the work

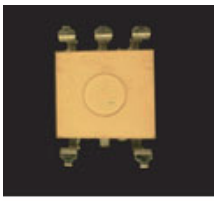
- Refer to *Setting Example for when There Is Chatter in the Work* on page 3-53 for when there is chatter in the work.

Setting Example for when There Is No Chatter in the Work

Even when there is a mechanical structure and the camera cannot be installed from the front, 4-point position information can be used to compensate for distortion in the image.
When you specify the four points used for distortion compensation and specify the positions where those four points should be as reference positions, the parameters for distortion compensation are set automatically. Each time a measurement is made, the distortion is automatically compensated for using these parameters.

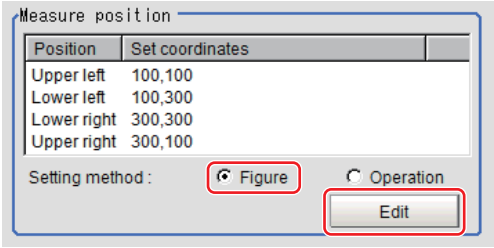


Crooked image

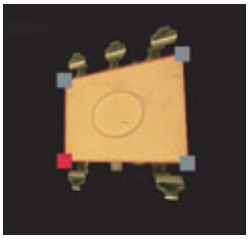


After revision

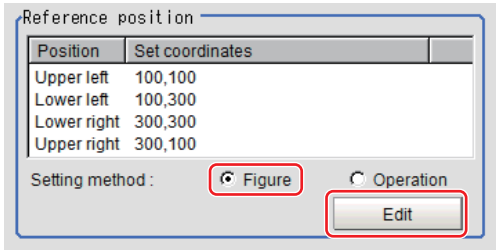
1 Select "Figure" for the measure position and click Edit.



2 Specify on the image which four points whose information to use for distortion compensation.

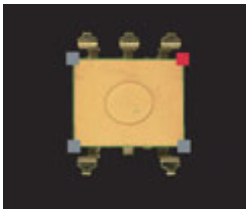


3 Select "Figure" for the reference position and click Edit.

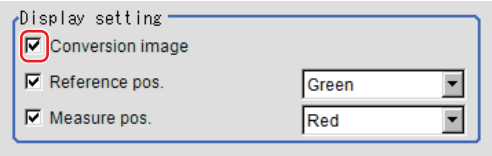


4 On the image, specify which information for the positions where the four specified points should be to use for distortion compensation.

When concrete coordinate positions are known or to measure them and find accurate positions, it is possible to set "Expression" and substitute measurement values from other processing units.



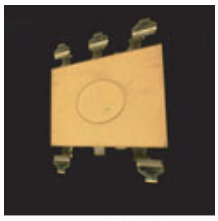
5 Place a check at "Conversion image" in the display settings and check the image in which the distortion has been compensated for.



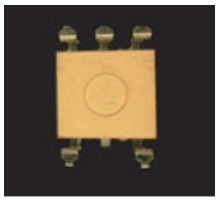
Setting Example for when There Is Chatter in the Work

Even when there is chatter in the work during transport and error is generated in the distance to the camera, 4-point position information can be used to compensate for distortion in the image.

Preset in other units so that when you specify the positions where the four points used for distortion compensation should be as reference positions, the 4-point position information can be acquired. Compensate for the distortion in the image so that the position information for the four points aligns with the reference positions when measurements are made. With this setting, 3D position deviation can be compensated for.

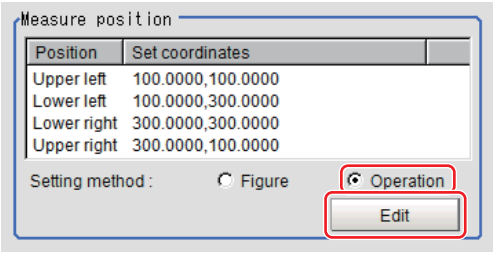


Crooked image



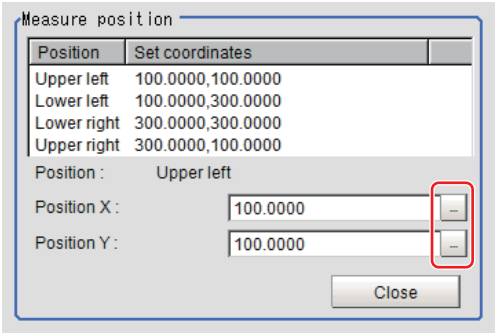
After revision

1 Select "Operation" for the measure position and click Edit.

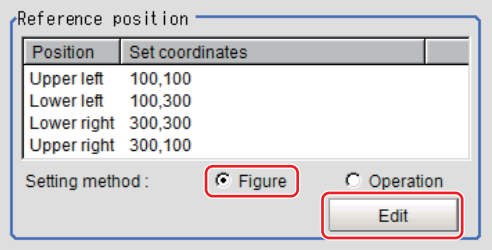


2 Specify with the expression which four points to use the information of for compensation.

Set the processing unit for acquiring the positions before the processing unit for trapezoidal distortion compensation.

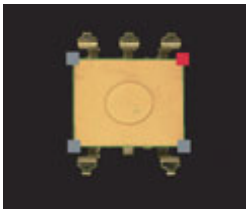


3 Select "Figure" for the reference position and click Edit.

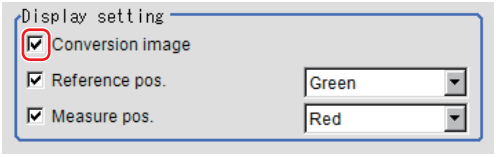


4 On the image, specify which information for the positions where the four specified points should be to use for distortion compensation.

When concrete coordinate positions are known or to measure them and find accurate positions, it is possible to set "Operation" and substitute measurement values from other processing units.



5 Place a check at "Conversion image" in the display settings and check the image in which the distortion has been compensated for.



3-10-2 Region Setting (Trapezoidal Correction)

Specify as a rectangle the range for compensating in the image.

Narrowing the compensation range instead of measuring the entire input image shortens the processing time.

1 In the Item Tab area, click [Region setting].

2 Click [Edit].

The figure setting area is displayed.

3 Specify the area in which to search for the model.

The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

3-10-3 Key Points for Test Measurement and Adjustment (Trapezoidal Correction)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image number	Explanation of image to be displayed
0	Post-conversion image

3-10-4 Measurement Results for Which Output Is Possible (Trapezoidal Correction)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result

3-10-5 External Reference Tables (Trapezoidal Correction)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
120	Compensation mode	compensation	Set/Get	0 to 1
121	Setting method	setupMode	Set/Get	0 to 1
122	Source image	targetImage	Set/Get	0 to 1
123	Reference position setting method	refPosSetMethod	Set/Get	0 to 1
124	Measurement position setting method	measPosSetMethod	Set/Get	0 to 1
125	Reference position display	referenceDisp	Set/Get	0 to 1
126	Reference position display color	referenceDispColor	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
127	Display coordinates	measureDisp	Set/Get	0 to 1
128	Color of the display coordinates	measureDispColor	Set/Get	0: Black 1: White 2: Red 3: Green 4: blue
129	Conversion image	convertImageDisp	Set/Get	0 to 1
200	Set data reference Upper left position X	setDataRefX0	Set/Get	Exp. character string *1
201	Set data reference Lower left position X	setDataRefX1	Set/Get	Exp. character string *1
202	Set data reference Lower right position X	setDataRefX2	Set/Get	Exp. character string *1
203	Set data reference Upper right position X	setDataRefX3	Set/Get	Exp. character string *1
300	Set data reference Upper left position Y	setDataRefY0	Set/Get	Exp. character string *1
301	Set data reference Lower left position Y	setDataRefY1	Set/Get	Exp. character string *1
302	Set data reference Lower right position Y	setDataRefY2	Set/Get	Exp. character string *1
303	Set data reference Upper right position Y	setDataRefY3	Set/Get	Exp. character string *1
400	Set data measurement Upper left position X	setDataMeasX0	Set/Get	Exp. character string *1
401	Set data measurement Lower left position X	setDataMeasX1	Set/Get	Exp. character string *1

No.	Data Name	Ident	Set/Get	Data range
402	Set data measurement Lower right position X	setDataMeasX2	Set/Get	Exp. character string *1
403	Set data measurement Upper right position X	setDataMeasX3	Set/Get	Exp. character string *1
500	Set data measurement Upper left position Y	setDataMeasY0	Set/Get	Exp. character string *1
501	Set data measurement Lower left position Y	setDataMeasY1	Set/Get	Exp. character string *1
502	Set data measurement Lower right position Y	setDataMeasY2	Set/Get	Exp. character string *1
503	Set data measurement Upper right position Y	setDataMeasY3	Set/Get	Exp. character string *1
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

*1. Numerical data can also be set in the data setting processing items for the processing unit, etc.

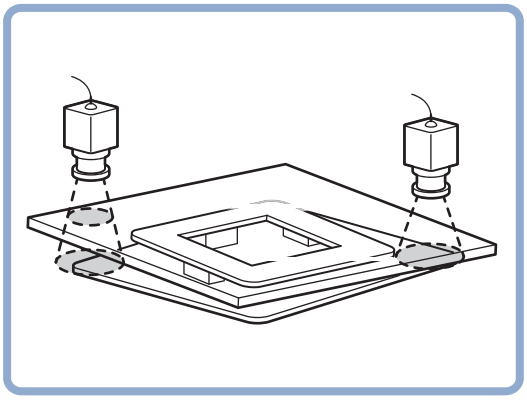
3-11 Machine Simulator

This processing item can not be used in the FHV series.

You can simulate the movement of an alignment mark and verify the operation of alignment-related processing items without an actual stage or robot. Actual coordinate system conditions (origin position, magnification, axis angle) can be set as desired in this processing item group. For the origin position, set the rotating center of the stage.

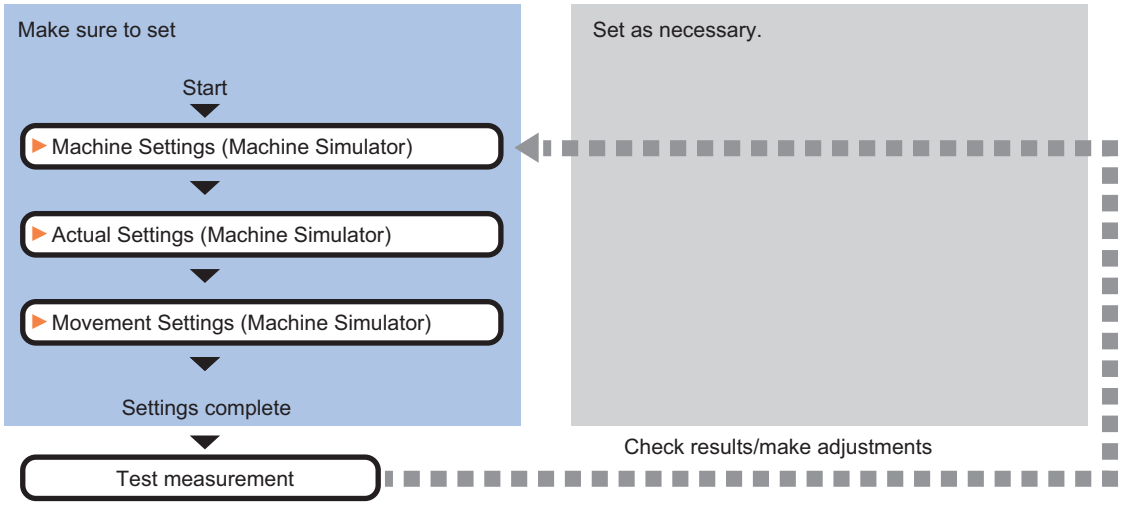
Used in the Following Case

- Check alignment operations before connecting the stage
- Create scene data before connecting the stage



3-11-1 Settings Flow (Machine Simulator)

Set up the machine simulator with the following steps.



List of Machine Simulator Items

Item name	Description
Machine setting	Select a processing item (stage data or robot data) under which external device information needed for calculation of travel distance of the actuator is held. Refer to *3-11-2 Machine Setting (Machine Simulator)* on page 3-59.
Actual setting	Set the origin position, magnification and the axis angle of the real coordination system. Set the conditions for the coordinate system of the stage or robot used. Refer to *3-11-3 Actual Setting (Machine Simulator)* on page 3-60.
Movement setting	Set the movement amount of each axis needed to move the image. When simulating a movement from other than the origin return position, also set the current axis position. Refer to *3-11-4 Movement Setting (Machine Simulator)* on page 3-61.

3-11-2 Machine Setting (Machine Simulator)

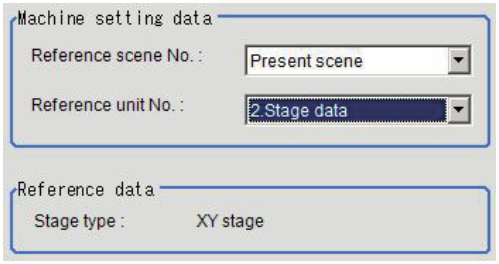
Select a processing item (stage data or robot data) under which external device information needed for calculation of travel distance of the actuator is held.

1 In the Item Tab area, click [Machine setting].

2 Select a processing unit holding external device information.

Information of the selected processing unit is displayed in the reference data display area.

Displayed contents will be change depending on selected type of Robot or Stage.



Setting item	Setting value [Factory default]	Description
Reference scene No.	[Present scene] Scenes 0 to 127	Select a scene number (stage data or robot data) under which external device information needed for calculation of travel distance of the actuator is held.
Reference unit No.	-	From among the referenced scene numbers, select a processing item (stage data or robot data) under which external device information needed for calculation of travel distance of the actuator is held.
Reference data	-	Display the settings of "Stage" or "Robot" processing item.

Additional Information

If the number of scenes is increased using the scene group conversion tool, the maximum value that can be selected in "Reference scene No." changes.

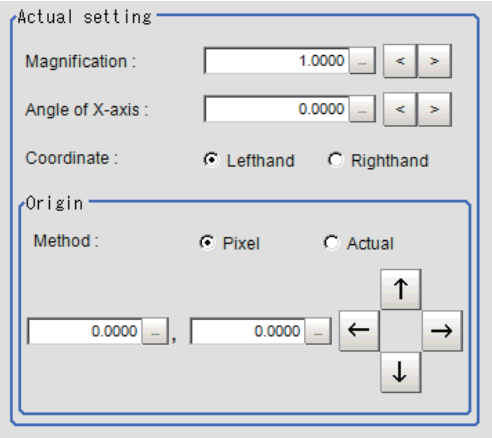
3-11-3 Actual Setting (Machine Simulator)

Use the procedure below to set actual-coordinate conditions (origin position, magnification, axis angle) in camera coordinates. Set the conditions for the coordinate system of the stage or robot used. Camera coordinates are the coordinates of the image captured by the camera, as measured in pixels. The camera-coordinate origin is at camera top-left. The X-axis is the horizontal axis. X-coordinate values increase from left to right. The Y-axis is the vertical axis. Y-coordinate values increase from top to bottom.

1 In the Item Tab area, click [Actual setting].

2 In the Actual setting area, set the conditions for the actual coordinate system.

When the setting is changed, the correction result is displayed in the image display area.



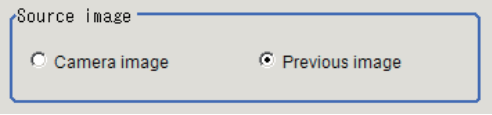
Setting item	Setting value [Factory default]	Description
Magnification	0.0001 to 9.9999 [1.0000]	Specify the ratio of 1 pixel to the actual dimensions. For example, if 1 pixel in the camera coordinates corresponds to an actual dimension of 1 mm, set 1. If 1 pixel in the camera coordinates corresponds to an actual dimension of 0.1 mm, set 0.1.
Angle of X-axis	-180.0000 to 180.0000 [0.0000]	If the movement amount of each axis is 0, set the X axis angle in the actual coordinate system of the camera.
Coordinate	• [Lefthand] • Righthand	Select the coordinate system to be used. Lefthand: Clockwise is forward when specifying the angles. Righthand: Counter-clockwise is forward when specifying the angles.
Method	• [Pixel] • Actual	Set the specification method for specifying the position of the center (origin) of the stage returned to the origin position. Pixel: Sets the pixel value for the origin in the camera coordinate system. Actual: Sets the value for the actual coordinates and not the pixel value for the origin on the camera image.
X Y	-99999.9999 to 99999.9999 [0.0000]	Set the coordinates for the method selected in [Method].

3-11-4 Movement Setting (Machine Simulator)

Set the movement amount of each axis needed to move the image. When simulating a movement from other than the origin return position, also set the current axis position.

1 In the Item Tab area, click [Movement setting].

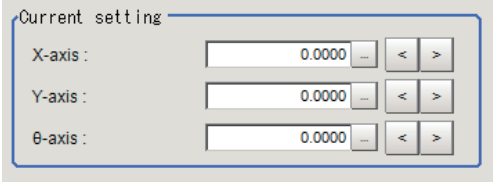
2 Select the target image to move in the Source image area.



Setting item	Setting value [Factory default]	Description
Source image	Camera image	The unfiltered input image from the camera directly becomes the target image to move.
	[Previous image]	The image filtered by a processing item before the "External device simulator" currently set before this item.

3 Set the current position of each axis in the Current setting area.

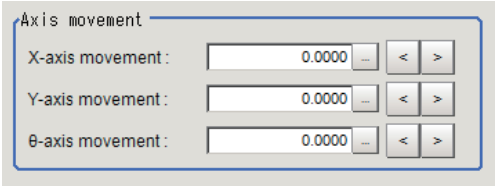
The setting items vary depending on the type of stage or robot.



Setting item	Setting value [Factory default]	Description
X-axis	-99999.9999 to 99999.9999 [0.0000]	Set the current position of each stage/robot axis.
Y-axis	-99999.9999 to 99999.9999 [0.0000]	
θ-axis	-180.0000 to 180.0000 [0.0000]	

4 In the "Axis movement" area, set the movement amount of each axis.

The setting items vary depending on the type of stage or robot.



Setting item	Setting value [Factory default]	Description
X-axis movement	-99999.9999 to 99999.9999 [0.0000]	Set the movement amount of each stage/robot axis.
Y-axis movement	-99999.9999 to 99999.9999 [0.0000]	
θ-axis movement	-360.0000 to 360.0000 [0.0000]	

3-11-5 Key Points for Test Measurement and Adjustment (Machine Simulator)

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image.	Explanation of image to be displayed
0, 2 to 31	Measurement image (Same when a list of positions is displayed)
1	Input image

Key Points for Adjustment

Adjust the setting parameters referring to the following points.

● The image is not compensated correctly

State	Parameter to be adjusted	Troubleshooting
The corrected image is completely different	Actual setting	The conditions for the actual coordinate system (origin position, magnification, axis angle) may not be set correctly. Check for input errors. In factory default, the real coordination system is same as the camera coordination.
The corrected image is slightly different	Movement setting	The current axis position may not be set correctly. Set this condition when simulating a movement from other than the origin return position. The current axis position is a parameter required for accurate calculation of the travel distance of the actuator.

● Other

State	Parameter to be adjusted	Troubleshooting
The reference unit number is <"None"> and cannot be selected.	Machine setting	Check if the reference scene number is selected correctly. Check if stage data processing items or robot data processing items are registered in the selected reference scene.
The reference unit number does not change during flow editing.	Machine setting	The system is designed this way. While a scene other than the current scene is referenced, the reference unit number does not change according to the editing of the flow. Change the flow so that the current scene will be referenced, or set the reference unit number again.

3-11-6 Measurement Results for Which Output Is Possible (Machine Simulator)

The following values can be output using processing items related to results output. It is also possible to refer to measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgment result

3-11-7 External Reference Tables (Machine Simulator)

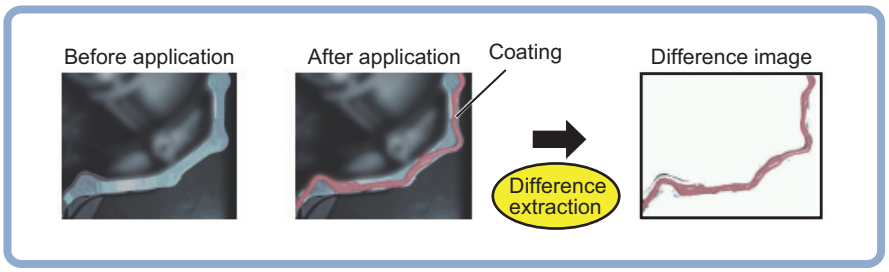
No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
120	Reference scene No.	sceneNo	Set/Get	-1: Current scene refered 0 to 9,999: Pointed scene refered
121	Reference unit No.	unitNo	Set/Get	-1: No reference 0 to 9,999: Pointed unit refered
122	Magnification	scale	Set/Get	0.0001 to 9.9999
123	Angle of X-axis	angle	Set/Get	-180 to 180
124	Coordinate	coordinate	Set/Get	0: Lefthand 1: Righthand
125	Origin X (pix)	centerX	Set/Get	-99,999.9999 to 99,999.9999
126	Origin Y (pix)	centerY	Set/Get	-99,999.9999 to 99,999.9999
127	Source image	targetImage	Set/Get	0: Camera image 1: Previous image
128	X-axis movement	moveX	Set/Get	-99,999.9999 to 99,999.9999
129	Y-axis movement	moveY	Set/Get	-99,999.9999 to 99,999.9999
130	θ-axis movement	moveTheta	Set/Get	-360 to 360
131	θ-axis (linear drive)	moveLinearTheta	Set/Get	-99,999.9999 to 99,999.9999
132	U-axis movement	moveU	Set/Get	-99,999.9999 to 99,999.9999
133	V-axis movement	moveV	Set/Get	-99,999.9999 to 99,999.9999
134	W-axis movement	moveW	Set/Get	-99,999.9999 to 99,999.9999
135	R-axis movement	moveR	Set/Get	-99,999.9999 to 99,999.9999
136	Current X-axis movement	currentPosX	Set/Get	-99,999.9999 to 99,999.9999
137	Current Y-axis movement	currentPosY	Set/Get	-99,999.9999 to 99,999.9999
138	Current θ-axis movement	currentPosTheta	Set/Get	-180 to 180
139	Current θ-axis (linear drive)	currentPosLinearTheta	Set/Get	-99,999.9999 to 99,999.9999
140	Current U-axis movement	currentPosU	Set/Get	-99,999.9999 to 99,999.9999
141	Current V-axis movement	currentPosV	Set/Get	-99,999.9999 to 99,999.9999
142	Current W-axis movement	currentPosW	Set/Get	-99,999.9999 to 99,999.9999
143	Current R-axis movement	currentPosR	Set/Get	-99,999.9999 to 99,999.9999
144	Origin X (Actual)	originX	Set/Get	-99,999.9999 to 99,999.9999
145	Origin Y (Actual)	originY	Set/Get	-99,999.9999 to 99,999.9999
146	Setting method of origin	originSetting	Set/Get	0: Pixel 1: Actual

3-12 Image Subtraction

The registered model image and measurement image are compared and only the different pixels are extracted and converted to an image.

Used in the Following Case

When you want to extract from the image only the parts that are to be inspected

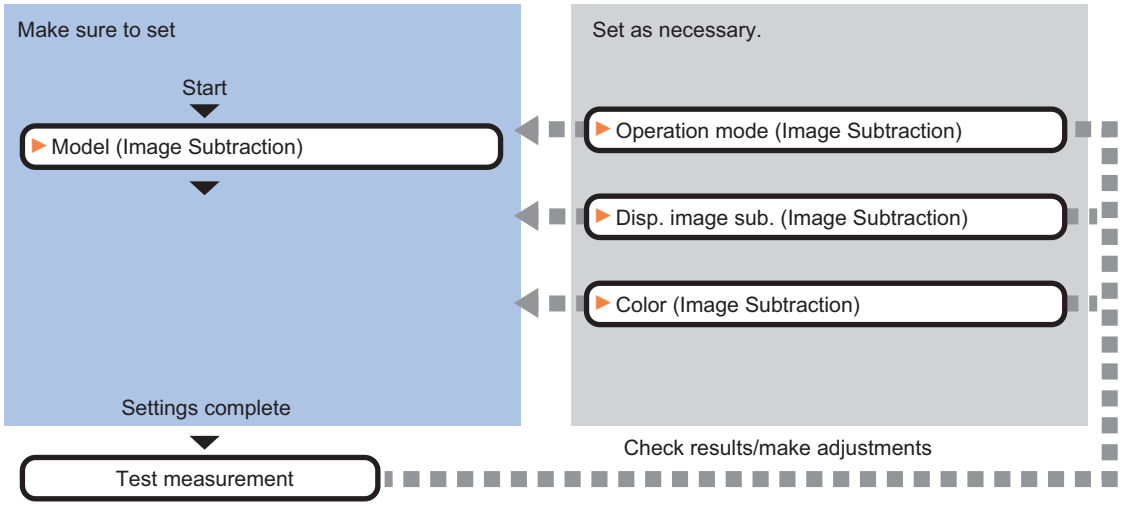


Important

- Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.
- Even if the image before the Image subtraction is a monochrome image, it becomes a color image after the Image subtraction.

3-12-1 Settings Flow (Image Subtraction)

Follow the steps below to set up difference extraction.



List of Image Subtraction Items

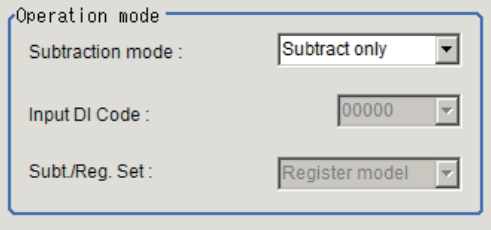
Item name	Description
Operation mode	This item sets the operation mode during measurement. Refer to *3-12-2 Operation Mode (Image Subtraction)* on page 3-66.
Model	This item registers model images. Refer to *3-12-3 Model (Image Subtraction)* on page 3-67.
Disp. image sub.	This item sets the method for extracting the difference images. Refer to *3-12-4 Disp. Image Sub. (Image Subtraction)* on page 3-68.
Color	This item sets the background color of the difference images. Refer to *3-12-5 Color (Image Subtraction)* on page 3-69.

3-12-2 Operation Mode (Image Subtraction)

Set how to switch model registration and difference extraction at the time of measurement.

1 In the Item Tab area, click [Operation mode].

2 Set each item in the "Operation mode" area.



Setting item	Setting value [Factory default]	Description
Subtraction mode	[Subtract only]	Always use the initially registered model image to perform difference extraction processing. The model is registered in the setting mode and difference extraction processing is always performed with respect to the captured measurement target image in the operation mode.
	DI Register	Check the DI input (4 to 0) during measurement processing and register the model only when the signal input corresponds to the pattern set under "Input DI Code". In all other cases, difference extraction processing is performed. A model image is captured and registered during operation, after which difference processing is performed.
	Subt./Reg.	Execution of model registration - difference extraction processing is switched every time measurement is performed. Select this option when performing second measurement using the logging image. The model image and measurement image can be read alternately, meaning that model registration - measurement can be performed offline.
Input DI Code	00000 to 11111 (binary numbers) [00000]	Set the DI input pattern you want to use for model registration. This option can be set only when "Subtraction mode" is set to "DII Register".
Subt./Reg. Set	• [Register model] • Subtract	Select whether to perform model registration or difference extraction when measurement is performed next time. This option can be set only when "Subtraction mode" is set to "Subt./Reg.".

Important

When the operation mode is Double Speed Multi-input mode or Non-stop Adjustment mode, "Subtraction mode: Subt./Reg." cannot be used.

3 Click [OK].

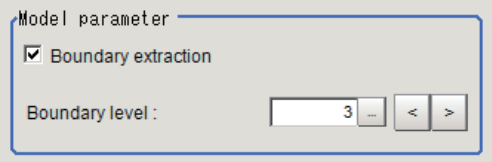
3-12-3 Model (Image Subtraction)

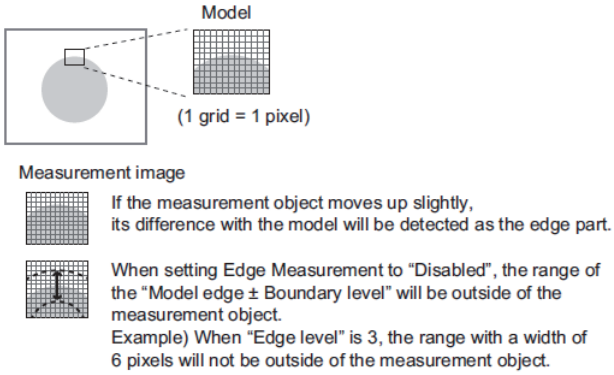
Register the region you want to compare, as a model.

Normally the background image (image not showing what you want to extract at the time of measurement) is registered as a model.

1 In the Item Tab area, click [Model].

2 In the "Model parameter" area, set model parameters.



Setting item	Setting value [Factory default]	Description
Boundary extraction	[Checked]	Under this method, the difference image is used directly. If the registered model and coated object can be captured at the exact same position, there is no offsetting of images and therefore noises will not generate due to difference extraction. In this case, more accurate measurement is possible when the difference image is used directly.
	Unchecked	Under this method, pixels corresponding to specified values are deleted from the outline of the extracted difference image. This option is set to remove noises resulting from offset images when the inspection object or camera has moved slightly. Since information of several pixels are deleted from the difference image, the measured coating width becomes smaller than the actual width. 
Boundary level	0 to 9 [3]	Set the degree of assimilation of variations around boundaries. Depending on the "Boundary inspection" value, the meaning is different.

3 Click [Edit].

4 Use the Drawing tools to set the model registration range.

5 Click [OK] in the Figure setting area.

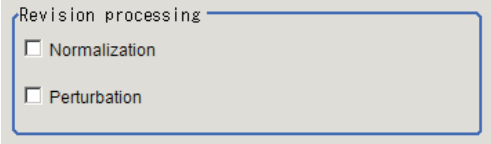
- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

3-12-4 Disp. Image Sub. (Image Subtraction)

Set the method for extracting the difference images. Set this option when the difference cannot be extracted correctly such as when there are a lot of noises.

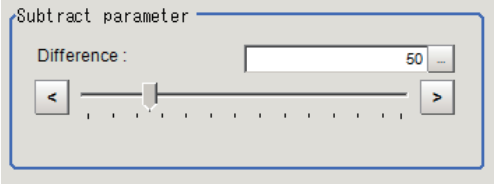
1 In the Item Tab area, click [Disp. image sub.].

2 Set each item in the "Revision processing" area.



Setting item	Setting value [Factory default]	Description
Normalization	• Checked • [Unchecked]	Select whether to perform normalization based on the brightness in the registered model. When "Checked" is selected, the density is adjusted before difference extraction, so that the difference extraction is not affected by changes in the total image brightness or the lighting fluctuations. When normalization is performed on the measured objects without patterns, the total image brightness is changed and the extraction does not work correctly.
Perturbation	• Checked • [Unchecked]	If you place a check here, in order to prevent mistaken detection of slight positional deviation of measurement objects as differences, corrections are made before difference extraction. However, this requires more processing time.

3 Set the difference judgement value in the "Subtract parameter" area.



Setting item	Setting value [Factory default]	Description
Difference	0 to 255 [50]	This sets the reference grayscale used when calculating differences between the model and the inspected object image. Pixels with a difference equal to or greater than Difference are converted to white and other pixels are converted to black, so that only defects are converted to white and measured.

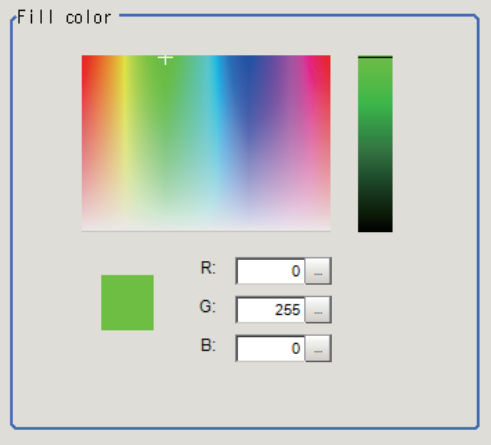
3-12-5 Color (Image Subtraction)

Set the background color of the difference image (color of the parts not recognized as differences).

Set this option if necessary, such as when the background color is similar to the color of the extraction object and the object is difficult to see.

1 In the Item Tab area, click [Color].

2 Specify the desired background color on the color chart.



3 Finely adjust the R, G and B if necessary.

Adjust either by adjusting on the color chart or by inputting numbers.

Setting item	Setting value [Factory default]	Description
R	0 to 255 [0]	Set a value for R (red).
G	0 to 255 [255]	Set a value for G (green).
B	0 to 255 [0]	Set a value for B (blue).

3-12-6 Key Points for Adjustment (Image Subtraction)

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the extraction is unstable

State	Parameter to be adjusted	Troubleshooting
Affected by lighting change	Disp. image sub.	Turn ON the normalization. The density is adjusted before difference extraction, so that the extraction is not affected by changes in the total image brightness or the lighting fluctuations.

● When the processing speed is slow

Parameter to be adjusted	Troubleshooting
Model	Make the area to register as the model as small as possible.
Disp. image sub.	Turn OFF the perturbation processing.

● When judgement is NG

State	Parameter to be adjusted	Troubleshooting
The judgement is NG (insufficient memory)	Model	Make the area to register as the model as small as possible.

3-12-7 Measurement Results for Which Output Is Possible (Image Subtraction)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result

3-12-8 External Reference Tables (Image Subtraction)

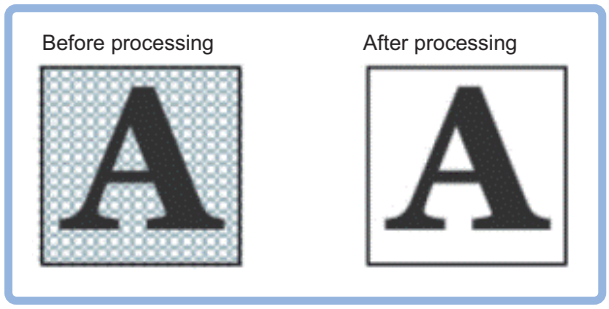
No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
120	Boundary inspection	boundaryInspection	Set/Get	0: OFF 1: ON
121	Boundary level	boundaryLevel	Set/Get	0 to 9
122	Normalization	normalization	Set/Get	0: OFF 1: ON
123	Perturbation	perturbation	Set/Get	0: OFF 1: ON
124	Difference	difference	Set/Get	0 to 255
125	Model Register Flag	modelRegister	Get only	0: OFF 1: ON
126	Fill color R	colorR	Set/Get	0 to 255
127	Fill color G	colorG	Set/Get	0 to 255
128	Fill color B	colorB	Set/Get	0 to 255
130	Measure mode	modekind	Set/Get	0: Normal mode 1: DI mode 2: Changing mode
131	DI Register	DIcode	Set/Get	0 to 31
132	Changing Mode	changingmodekind	Set/Get	0: Register model 1: Difference extract
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera

3-13 Advanced Filter

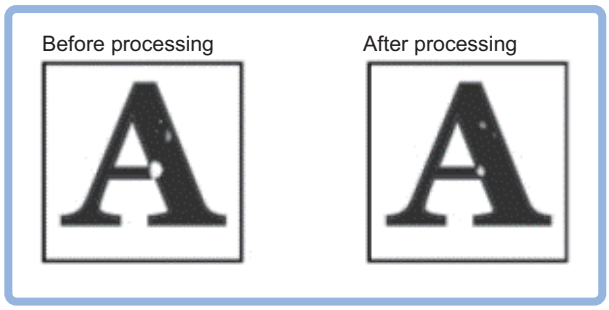
This function filters images acquired from the camera to facilitate measurement. With advanced filter, up to 16 image filter libraries such as “Filtering”, “Color/Gray Filter”, and “Background Suppression” can be set and used in a single processing item. By combining image filters, highly flexible filter processing can be performed, and custom filters can be used to create your own customized filtering.

Used in the Following Cases

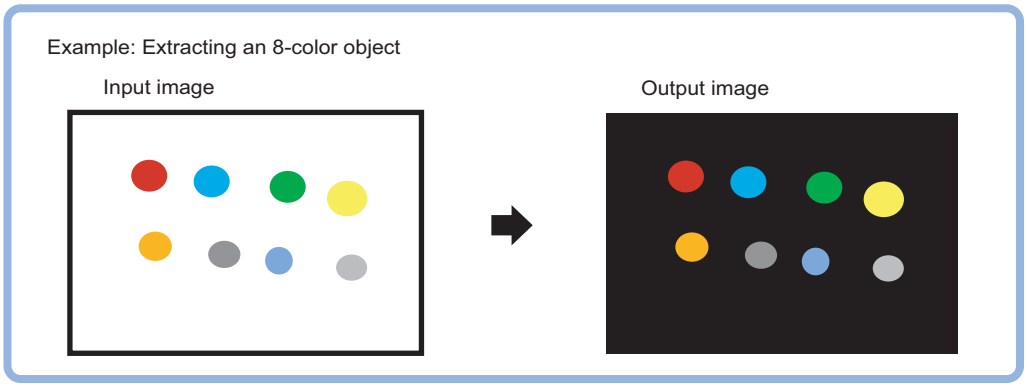
- Eliminating unwanted background images from the measurement target



- Removing noise, uneven color, and image non-uniformity



- Extracting only the measurement target

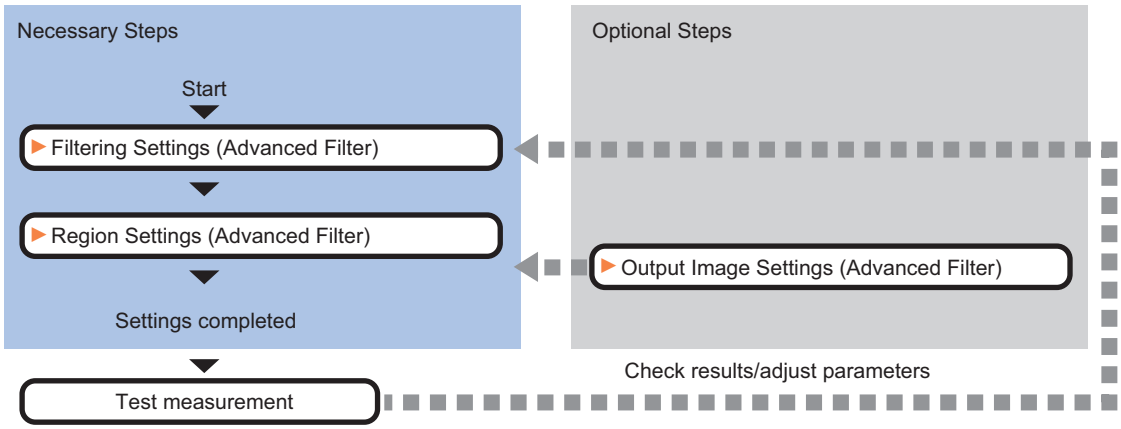


Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

3-13-1 Settings Flow (Advanced Filter)

Set up advanced filter settings according to the following steps.



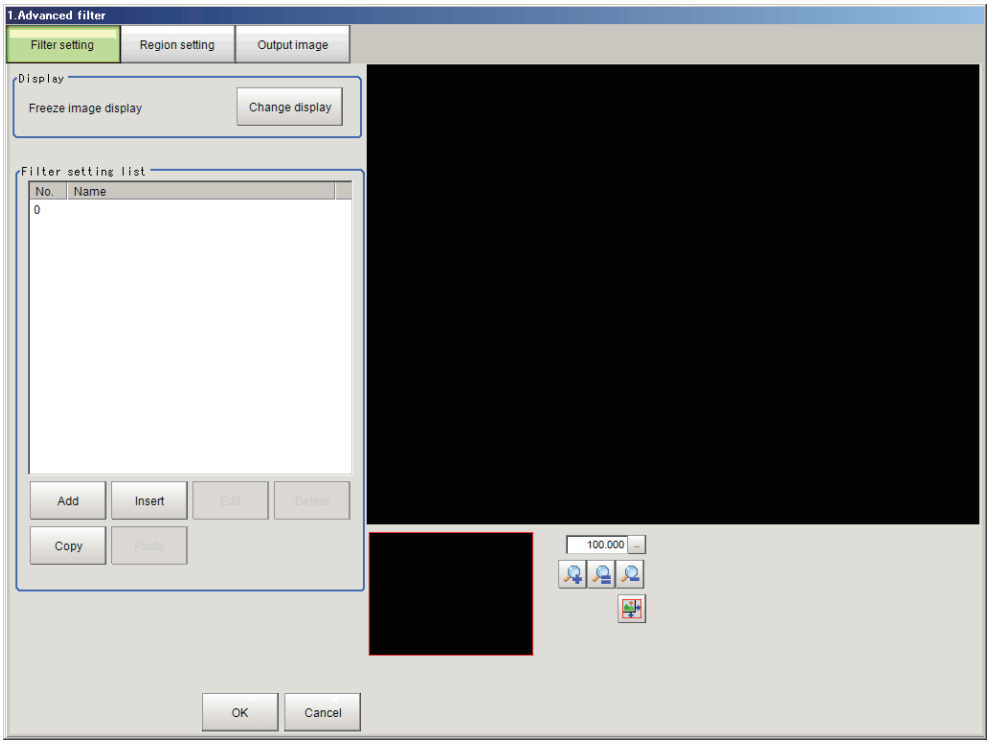
List of Advanced Filter Items

The following items can be set in advanced filter.

Item name	Description
Filter setting	This function filters the image acquired from the camera to make it easier to measure. The filtering method can be selected as appropriate for the image condition. Refer to *3-13-2 Filtering Settings (Advanced Filter)* on page 3-74.
Region setting	Use this function to set, as the measurement area, the area on the image that you want to filter. By narrowing the measurement region (as opposed to measuring the entire input image), this function allows you to shorten the processing time. Refer to *3-13-3 Region Settings (Advanced Filter)* on page 3-116.
Output image	Use this item to change the output image settings. These settings specify the image that is output as the measurement result. The image set as the output image can be used as the measurement image on other processing units of the measurement flow. Refer to *3-13-4 Output Image Settings (Advanced Filter)* on page 3-117.

3-13-2 Filtering Settings (Advanced Filter)

This function filters the image acquired from the camera to make it easier to measure. The filtering method can be selected as appropriate for the image condition.



Adding a Filter

Image filtering methods can be added by selecting filters from the filter list.

Additional Information

Up to 16 filters can be added to the filter settings list.

1. In the Item Tab area, click [Filter setting].
2. Click [Change display] in the display area and select the camera image type.
   The image display area changes.

Setting item	Setting value [Factory default]	Description
Display	• Through image • [Freeze image]	Set the camera image type that is displayed in the setting screen. • Through image display Continuously acquires the most recent image from the camera. • Freeze image display Displays the image acquired in the previous measurement.

● Adding/Inserting Filters Selected from the List

To add a new filter, select the filter from the list and add.

1 Click [Add] in the filter setting list area.

If you want to insert a filter in a position selected in the list, click [Insert].

The “Select filter” screen appears.

2 In the “Select filter” screen, select the filter details that you want to add.

Setting item	Description
Weak smoothing	Filter for monochrome images. Smoothing processing is down while leaving edges. Refer to *Changing the Filter Settings* on page 3-83.
Strong smoothing	Same function as the strong smoothing filter in the “Filtering” processing item. Smoothes the image to reduce unevenness. Refer to *Changing the Filter Settings* on page 3-83.
Guided Filter	Filter for monochrome images. Smoothing processing is down while leaving edges. Refer to *Changing the Guided Filter Settings* on page 3-84.
Dilate	Same function as the dilate filter in the “Filtering” processing item. Dilates bright areas to reduce dark noise. Refer to *Changing the Filter Settings* on page 3-83.
Erosion	Same function as the erosion filter in the “Filtering” processing item. Contracts bright areas to reduce bright noise. Refer to *Changing the Filter Settings* on page 3-83.
Median	Same function as the median filter in the “Filtering” processing item. Reduces unevenness while maintaining the outline. Refer to *Changing the Filter Settings* on page 3-83.
Extract edges	Same function as the edge extraction filter in the “Filtering” processing item. Extracts edges (bright-dark) in the image. Refer to *Changing the Filter Settings* on page 3-83.
Extract horizontal edges	Same function as the extract horizontal edges filter in the “Filtering” processing item. Extracts horizontal edges (bright-dark) in the image. Refer to *Changing the Filter Settings* on page 3-83.
Extract vertical edges	Same function as the extract vertical edges filter in the “Filtering” processing item. Extracts vertical edges (bright-dark) in the image. Refer to *Changing the Filter Settings* on page 3-83.
Enhance edges	Same function as the enhance edges filter in the “Filtering” processing item. Enhances bright-dark edges in the image. Refer to *Changing the Filter Settings* on page 3-83.
Prewitt	Edge filter similar to the extract edges filter in the “Filtering” processing item. Suppresses noise and extracts edges (bright-dark) in the image. Refer to *Changing the Edge Filter Settings* on page 3-85.
LoG Filter	Filter for monochrome images. This is a linear filter combining the functions of Smoothing and Edge detection, which can process stronger noise compared to the conventional edge detection filter. Refer to *Changing the LoG Filter Settings* on page 3-86.
Roberts	Edge filter similar to the extract edges filter in the “Filtering” processing item. Suppresses noise and extracts diagonal edges (bright-dark) in the image. Refer to *Changing the Edge Filter Settings* on page 3-85.

Setting item	Description
Laplacian	Edge filter similar to the extract edges filter in the “Filtering” processing item. Uniformly extracts edges (bright-dark) in the image. Refer to *Changing the Edge Filter Settings* on page 3-85.
Background Suppression	Same function as the background suppression filter in the “Background Suppression” processing item. Parts of the image that are outside the specified bright-dark range are treated as background and suppressed. Refer to *Changing the Background Suppression Filter Settings.* on page 3-87.
Brightness Correct Filter	Filter for monochrome images. Same function as the brightness correct filter in the “Filtering” processing item. Corrects the effects of lighting as well as properties of the object of measurement such as material and shape. Refer to *Changing the Brightness Correct Filter Settings (Monochrome Images Only)* on page 3-89.
Emphasis Unevenness	Filter for monochrome images. This filter generates image with the high brightness contrast from an input image and emphasizes unevenness. Refer to *Changing the Emphasis Unevenness Filter Settings* on page 3-90.
Stripes Removal Filter II	Filter for monochrome images. Same function as the stripes removal filter in the “Stripes Removal Filter II” processing item. Removes a striped background. Refer to *Changing the Stripes Removal Filter II Settings (Monochrome Images Only)* on page 3-91.
Emphasis Defect	Filter for monochrome images. This filter emphasizes defect by comparing the pixels at the center with those of the surrounding area. Refer to *Changing the Emphasize Defect Filter Settings* on page 3-96.
Emphasis Line Defect	Filter for monochrome images. The filter emphasizes line defects of low brightness. Refer to *Changing the Emphasize Line Defect filter settings* on page 3-98.
Emphasis Circle Defect	Filter for monochrome images. This filter emphasizes circular defects of low brightness. Refer to *Changing the Emphasize Circle Defect filter settings* on page 3-99.
Labeling Filter	Filter that binarizes the image based on the same extraction conditions as the Labeling processing item. Refer to *Changing the Labeling Filter Settings* on page 3-100.
Custom Linear Filter	Linear filter that allows you to set custom filter coefficients. You can set a filter count, mask size, offset, and other parameters for filtering. Refer to *Changing the Custom Linear Filter Settings* on page 3-106.
Custom Rank Filter	Rank filter that allows you to set custom filter coefficients. You can set a filter count, mask size, processing method, and other parameters for filtering. Refer to *Changing the Custom Linear Filter Settings* on page 3-106.
Image operation	Filter that converts the image by calculating pixel values. Refer to *Changing the Image Operation Filter Settings* on page 3-108.
2 images operation	Filter that converts the image by calculating the paired pixel values of two images. Refer to *Changing the 2 Images Operation Settings* on page 3-110.

Setting item	Description
Binary filter	Filter for monochrome images. Binarizes the image. Refer to *Changing the Binary Filter Settings (Monochrome Images Only)* on page 3-111.
Color gray filter	Filter for color images. Same function as Color Gray filter in the “Color Gray filter” processing item. Converts color images to monochrome. Refer to *Changing the Color Gray Filter Settings (Color Images Only)* on page 3-112.
Extract Color Filter	Filter for color images. Same function as the extract color filter in the “Extract Color Filter” processing item. Extracts color from color images. Refer to *Changing the Extract Color Filter Settings (Color Images Only)* on page 3-113.
Anti-Color Shading	Filter for color images. Same function as the Anti Color Shading filter in the “Anti Color Shading” processing item. Removes uneven color in the image. Refer to *Changing the Anti-Color Shading Filter Settings (Color Images Only)* on page 3-115.

3 Click [OK].

The filter is added to the end of list in the filter setting list area.

When [Insert] is clicked to add the filter, the filter is added to the selected position in the list.

4 Select the filter in the list in the filter setting list area.

5 Click [Edit].

The filter edit screen appears.

Refer to *Changing the Filter Settings* on page 3-79.

● Adding a copy of an already-set filter

To use the filter settings of a filter that has already been set in the list in the filter setting list area, copy the settings and add the filter.

1 Select the filter that you want to copy in the list in the filter setting list area.

2 Click [Copy].

[Paste] is enabled.

3 Select the filter number where you want to insert the filter in the list in the filter setting list area.

4 Click [Paste].

The copied filter is inserted in the list in the filter setting list area.

Deleting a Filter

You can delete a filter that has been added to the filter list.

1 Select the filter that you want to delete in the list in the filter setting list area.

2 Click [Delete].

The deletion confirmation screen appears.

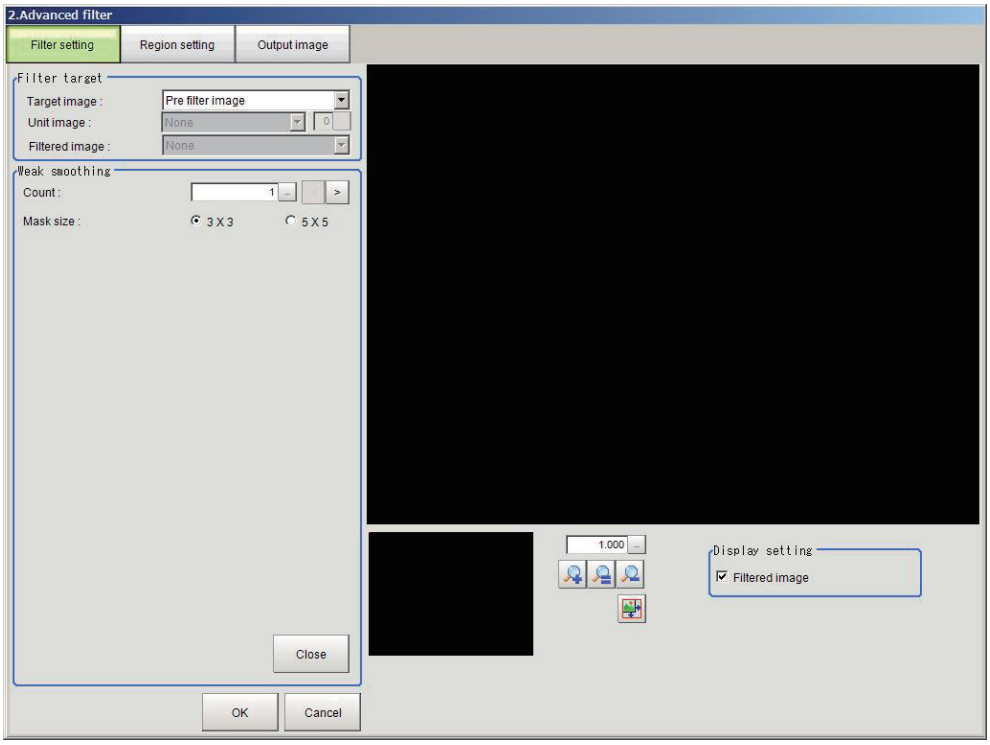
3 Click [OK] in the deletion confirmation screen.

The selected filter is deleted from the filter setting list.

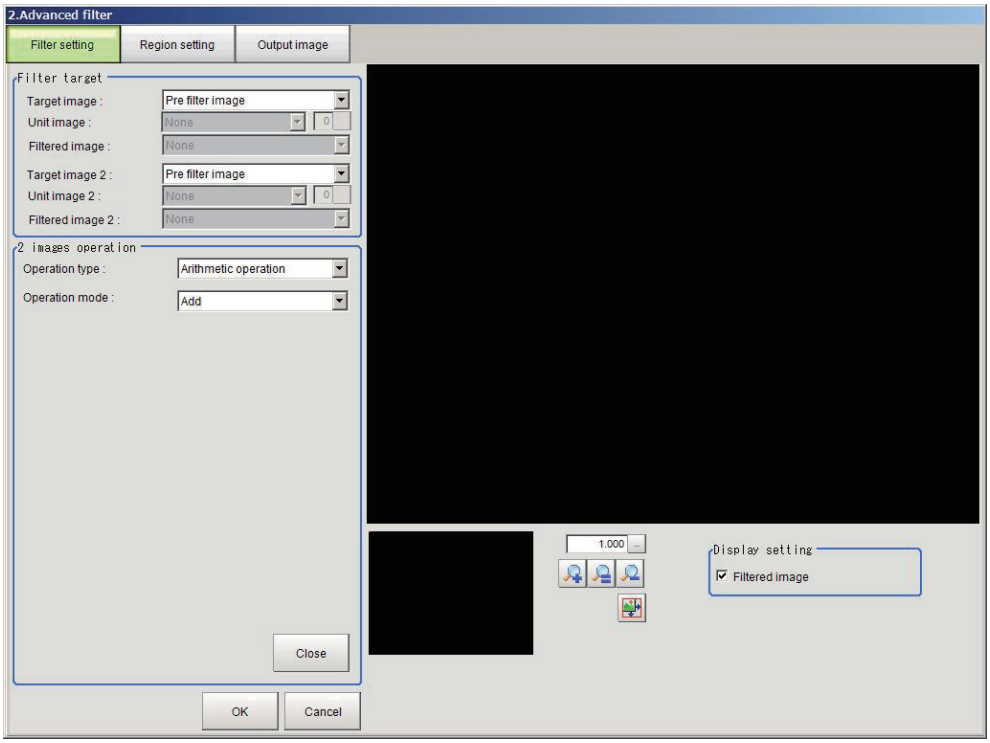
Changing the Filter Settings

You can change the settings of an added filter. The setting screen that appears varies depending on the filter.

- Normal filter setting screen



- 2 images operation filter setting screen



1 Select the filter whose settings you want to change in the list in the filter setting list area.

2 Click [Edit].
The filter edit screen appears.

3 Specify a value for each item in the filter edit screen.

● Setting items for filters other than 2 images operation

Setting item	Setting value [Factory default]	Description
Target image	• Measure image • [Pre filter image] • Other unit image • Filtered image	Set the image that is filtered in “Target image”. • Measure image Filters the measurement image for the processing unit. • Pre filter image Filters the previously processed image. • Other unit image Filters a processing unit image held by another processing unit. • Filtered image Filters the filtered image of the specified filter number in the filter setting list.
Unit image	• [None] • 0 to 9,999	This can be set when “Other unit image” is selected for “Target image”. Set the processing unit that holds the image used as the target image. A processing unit of an image input processing item or image conversion processing item can be selected. If the selected processing unit does not hold an image, invalid image occurs and a black image is displayed.
Unit image number	0 to 3 [0]	This can be set when “Other unit image” is selected for “Target image”. Set the image number of the image that is used as the target image. If the processing unit does not hold the image of the set image number, invalid image occurs and a black image is displayed.
Filtered image	• [None] • 0 to 14	This can be set when “Filtered image” is selected for “Target image”. Set the processing unit that holds the image used as the target image. A processing unit that performed processing prior to the current processing unit can be selected.

● Setting Items for 2 Images Operation Filter

Setting item	Setting value [Factory default]	Description
Target image 2	• Measure image • [Pre filter image] • Other unit image • Filtered image	This can be set when “2 images operation filter” is selected in “Filter Setting”. As target image 2, set the image that is used with the target image in the operation. The setting values that can be selected are the same as for “Target image”.
Unit image 2	• [None] • 0 to 9,999	This can be set when “Filter Setting” is “2 images operation filter” and “Processing unit image” is selected for “Target image 2”. Set the processing unit that holds the image used as target image 2. A processing unit of an image input processing item or image conversion processing item can be selected. If the selected processing unit does not hold an image, invalid image occurs and a black image is displayed.

Setting item	Setting value [Factory default]	Description
Unit image number 2	0 to 3 [0]	This can be set when “Filter Setting” is “2 images operation filter” and “Other unit image” is selected for “Target image 2”. Set the image number of the image that is used as target image 2. If the processing unit does not hold the image of the set image number, invalid image occurs and a black image is displayed.
Filtered image 2	• [None] • 0 to 14	This can be set when “Filter Setting” is “2 images operation filter” and “Filtered image” is selected for “Target image 2”. Set the processing unit that holds the image used as target image 2. A processing unit that performed processing prior to the current processing unit can be selected.
Operation type	• [Arithmetic operation] • Bit operation	Select the type of operation for 2 “Images Operation Filter”.
Operation mode	• [Add] • Subtraction • Subtraction (Absolute) • Multiplication • Multiplication (Normalization) • Average • Maximum • Minimum	This setting becomes valid if “Arithmetic operation” is selected for “Operation type”. The pixel values of two images are calculated in Operation mode and the result is used as the pixel values after conversion.
Bit operation mode	• [AND] • OR • XOR • NAND • NOR • XNOR	This setting becomes valid if “Bit operation” is selected for “Operation type”. The pixel values of two images are calculated in Bit operation mode and the result is used as the pixel values after conversion.

Additional Information

The Output coordinates (Before/After scroll and Calibration ON/OF) of the measurement unit for the image after performing 2 images operation are calculated with the image selected in "Target image" of 2 images operation as standard.

Example:
Image operation in Operation mode

Target image

230	20	100
64	128	196
150	50	1

Target image1

30	10	50
120	240	60
100	150	200

Add

255	30	150
184	255	255
250	200	201

Subtraction

200	10	50
1	1	136
50	1	1

When exceed 255, outputs 255.

Subtraction (Absolute)

200	10	50
56	112	136
50	100	199

Multipication

255	200	255
255	255	255
255	255	200

When less than 1, outputs 1.

Multipication (Normaliztion)

57	1	41
63	255	97
124	62	1

Average

130	15	75
92	184	128
125	100	101

For Multipication (Normaliztion), normalizes the maximum pixel values of result within the measurement region to 255.

Maximum

230	20	100
120	240	196
150	150	200

Minimum

30	10	50
64	128	60
100	50	1

Rounds after the decimal point of result.

Example:
Image operation in Bit operation mode

Target image

230	20	100
64	128	196
150	50	1

Target image1

255	255	255
1	1	1
255	255	255

AND

230	20	100
1	1	1
150	50	1

OR

255	255	255
65	129	197
255	255	255

XOR

230	20	100
190	126	58
150	50	1

NAND

25	235	155
255	255	255
105	205	254

NOR

1	1	1
190	126	58
1	1	1

XNOR

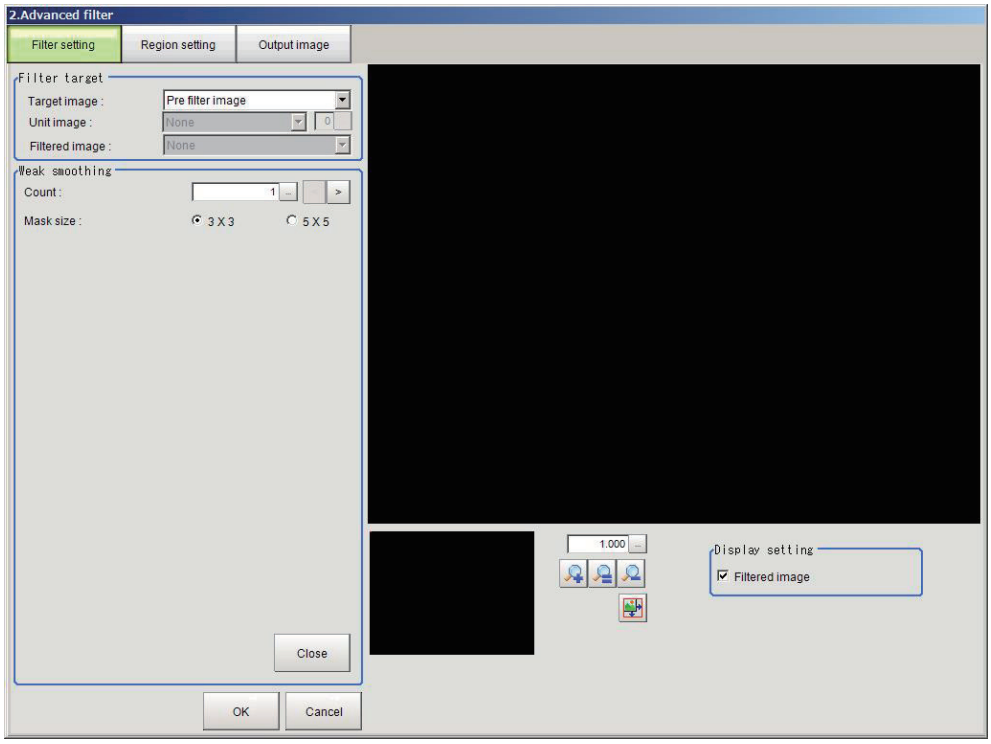
25	235	155
65	129	197
105	205	254

Changing the Filter Settings

The same filter settings as in the “Filtering” processing item can be changed.

The following setting screen appears if the “Weak smoothing”, “Strong smoothing”, “Dilate”, “Erosion”, “Median”, “Extract edges”, “Extract horizontal edges”, “Extract vertical edges”, or “Enhance edges” filter settings are edited.

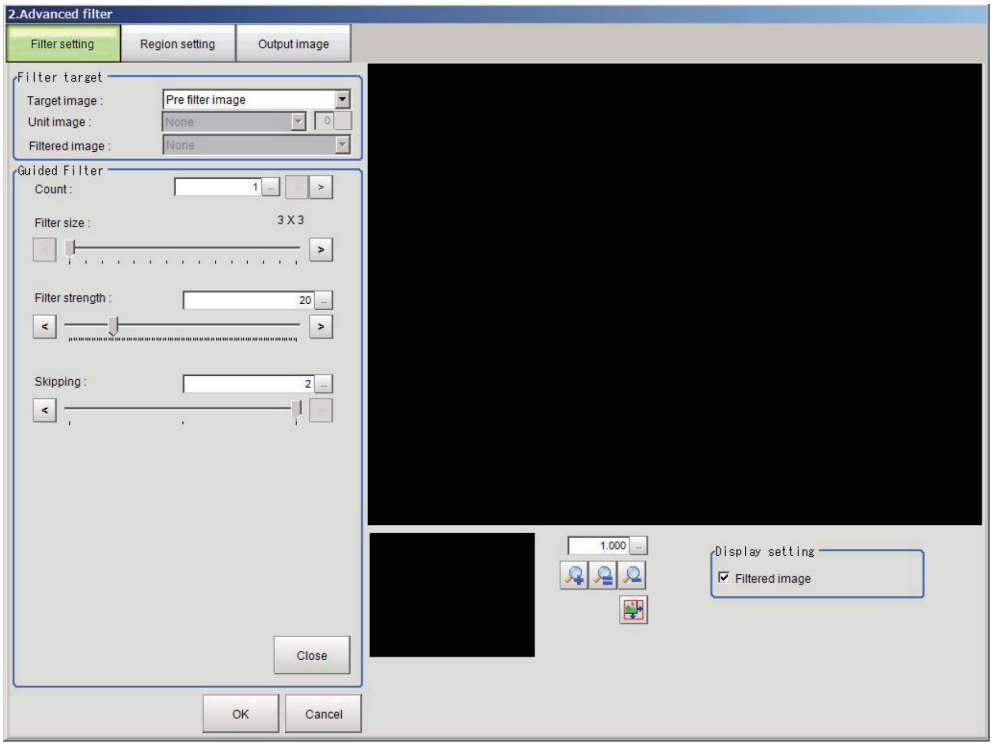
Refer to *Filtering Options and Examples* on page 3-11.



Setting item	Setting value [Factory default]	Description
Count	1 to 9 [1]	Set the number of times the filter is applied.
Mask size	• [3×3] • 5×5	Set the mask size of the filter. If there are large variations in the brightness of peripheral pixels, increase the “Mask size” setting.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image

Changing the Guided Filter Settings

The Guided filter performs smoothing processing while leaving edges.

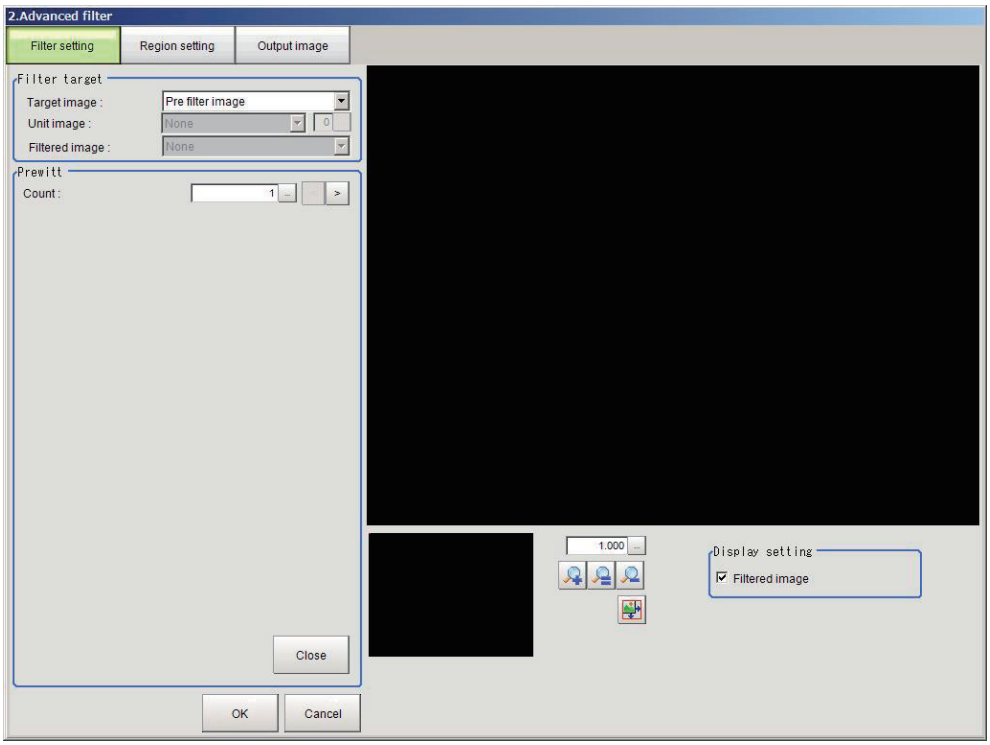


Setting item	Setting value [Factory default]	Description
Count	1 to 9 [1]	Sets the number of times to filter. The filter is applied for the number of times specified.
Filter size	3x3 to 31x31 [3x3]	Sets the filter size.
Filter strength	1 to 100 [20]	Sets the filter strength.
Skipping	0 to 2 [2]	Sets the skipping interval.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image.

Changing the Edge Filter Settings

Edge filter settings similar to the extract edges filter in the “Filtering” processing item can be changed.

The following setting screen appears if the “Prewitt”, “Roberts”, or “Laplacian” filter settings are edited.

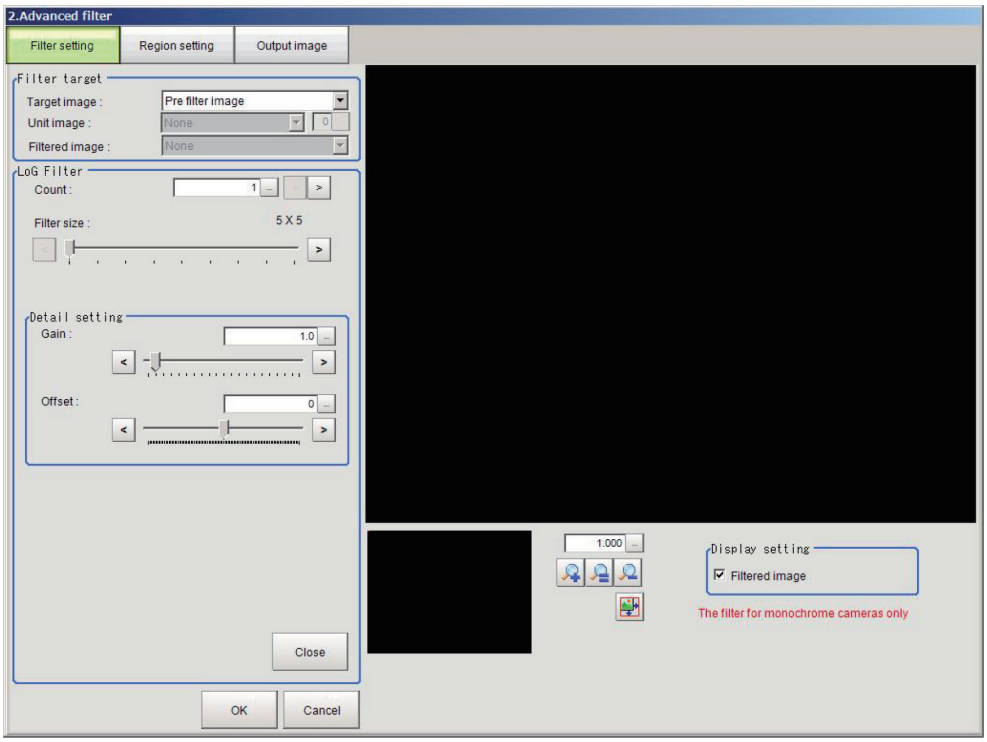


Setting item	Setting value [Factory default]	Description
Count	1 to 9 [1]	Set the number of times the filter is applied.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image

Changing the LoG Filter Settings

The LoG filter is a type of edge emphasis filter.

This is a linear filter combining the functions of Smoothing and Edge detection, which can process stronger noise compared to the conventional edge detection filter.

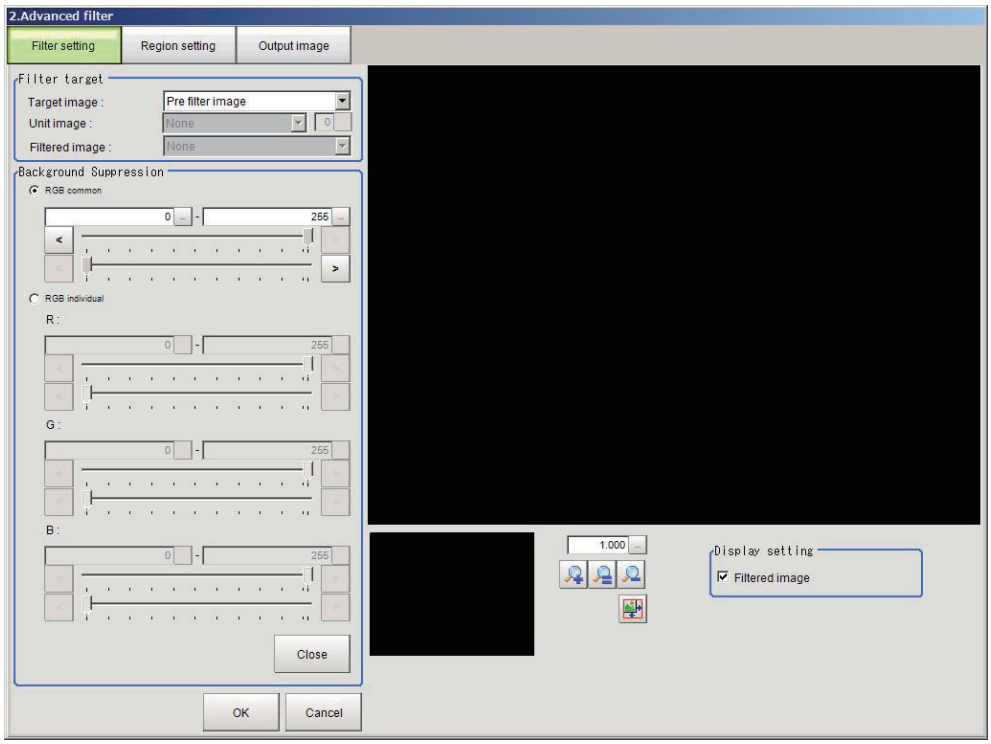


Setting item	Setting value [Factory default]	Description
Count	1 to 9 [1]	Sets the number of times to filter. The filter is applied for the number of times specified.
Filter size	5x5 to 21x21 [5x5]	Sets the filter size.
Gain	0.1 to 20.0 [1.0]	Sets the gain.
Offset	-255 to 255 [0]	Sets the offset.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image.

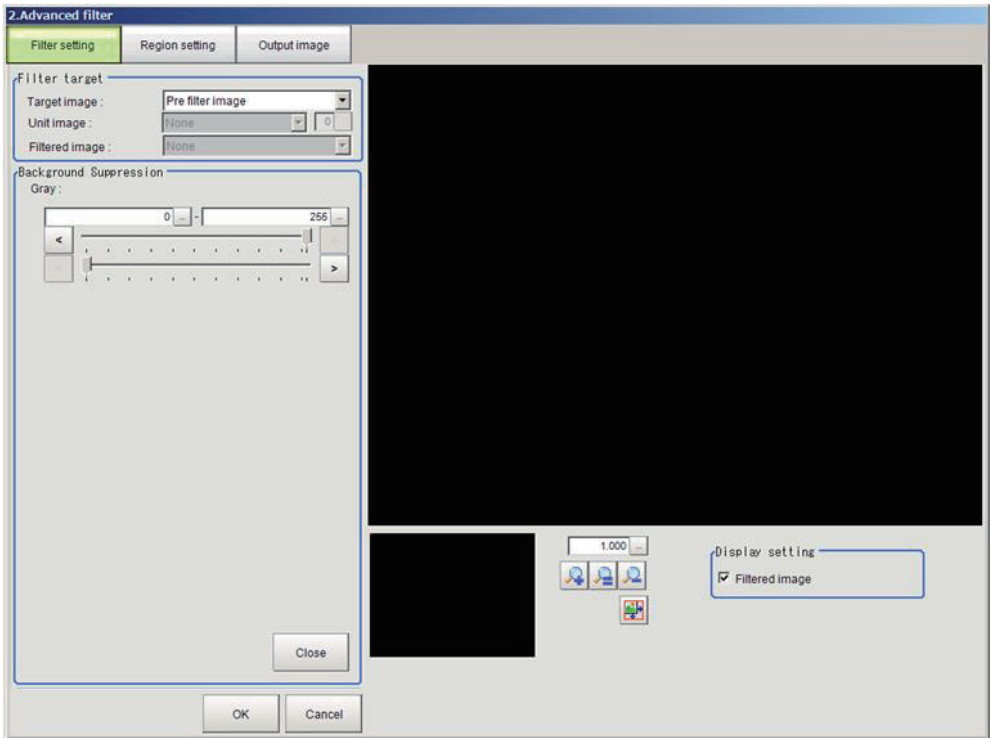
● Changing the Background Suppression Filter Settings.

The same filter settings as in the “Background Suppression” processing item can be changed.

- Color images



- Monochrome images



- Color images

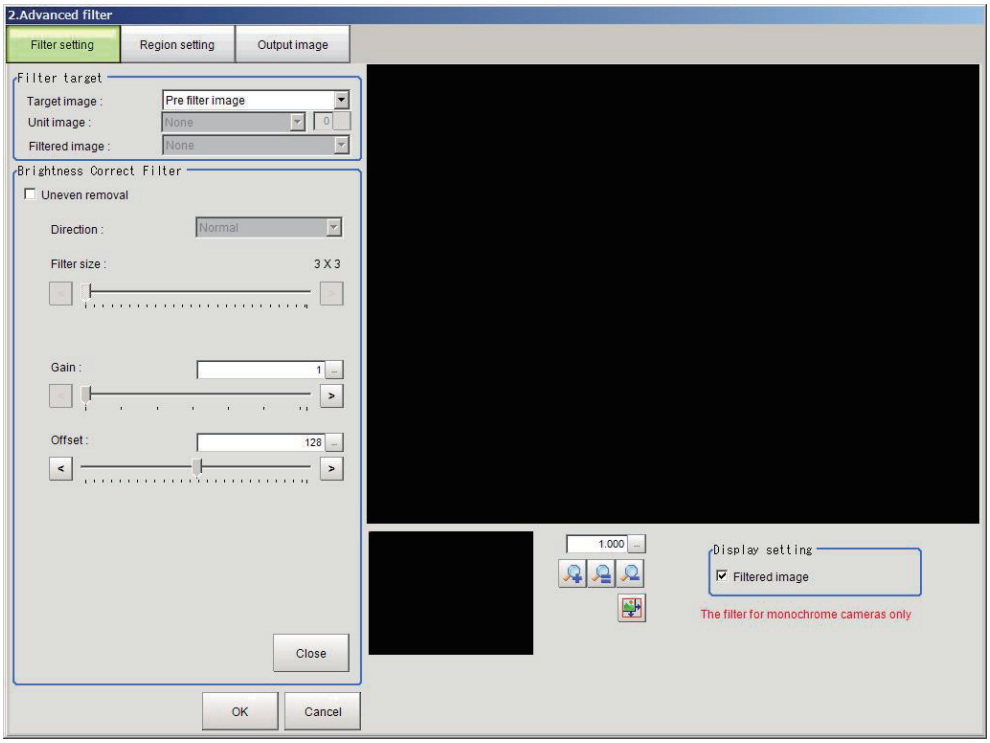
Setting item	Setting value [Factory default]	Description
RGB common/ RGB individual	• [RGB common] • RGB individual	Select whether the RGB upper limit and lower limit values are set to RGB common or RGB individual.
RGB common	[0] to [255]	Enabled when “RGB common” is selected in “RGB common / RGB individual”. Set the upper and lower limit values of the background suppression level. The same limits will be used for all RGB colors. The set range from the lower limit value to the upper limit value is converted to 256 gradation levels.
RGB individual	[0] to [255]	Enabled when “RGB individual” is selected in “RGB common / RGB individual”. Set the upper and lower limit values of the background suppression level for each RGB color. The set range from the lower limit value to the upper limit value is converted to 256 gradation levels.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image

- Monochrome images

Setting item	Setting value [Factory default]	Description
Gray	[0] to [255]	Set the upper and lower limit values of the density. The set range from the lower limit value to the upper limit value is converted to 256 gradation levels.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image

● Changing the Brightness Correct Filter Settings (Monochrome Images Only)

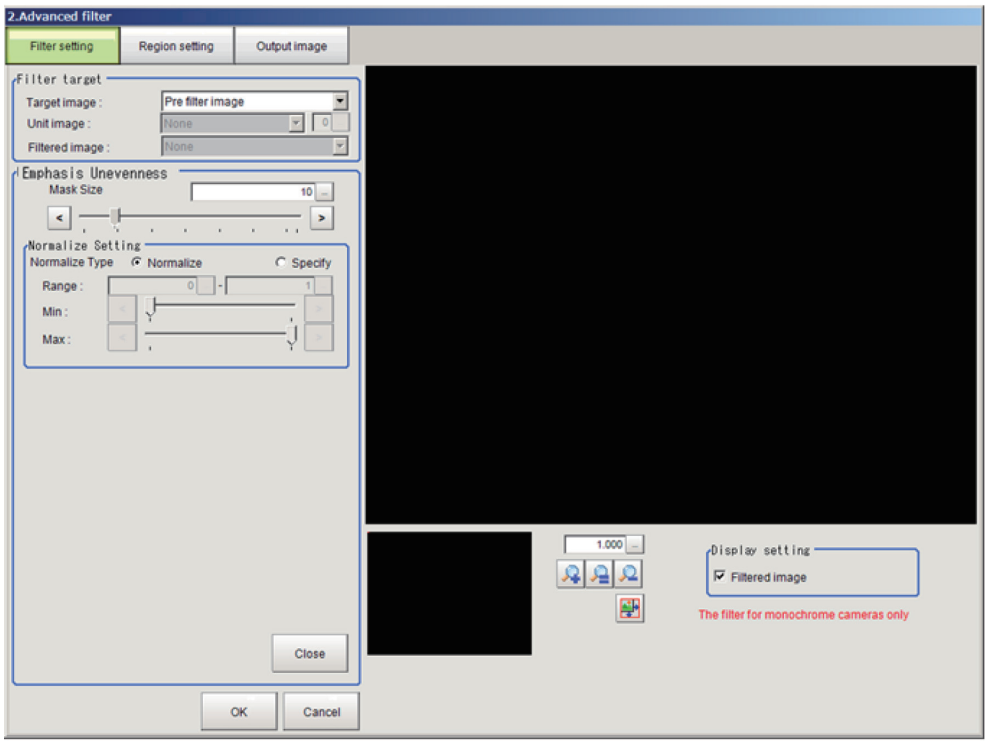
The same filter settings as in the “Brightness Correct Filter” processing item can be changed.



Setting item	Setting value [Factory default]	Description
Uneven removal	• Checked • [Unchecked]	To remove dark/light unevenness when brightness correction is performed, select the “Uneven removal” checkbox.
Filter direction	• [Normal] • Vertical • Horizontal	This can be set when the “Uneven removal” checkbox is selected. Set the direction of filtering of the image. Set the direction that is perpendicular to the direction of the changes in darkness and lightness of the unevenness.
Filter size	3×3 to 255×255 [3×3]	This can be set when the “Uneven removal” checkbox is selected. Set an odd value for the size of the filter mask. If the size of the unevenness is large, increase the “Mask size” setting.
Gain	1 to 63 [1]	Adjust the contrast of the filtered image. To increase the contrast, set a larger value for the “Gain”.
Offset	0 to 255 [128]	Adjust the brightness of the filtered image. To make the image brighter, increase the “Offset” setting.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image

Changing the Emphasis Unevenness Filter Settings

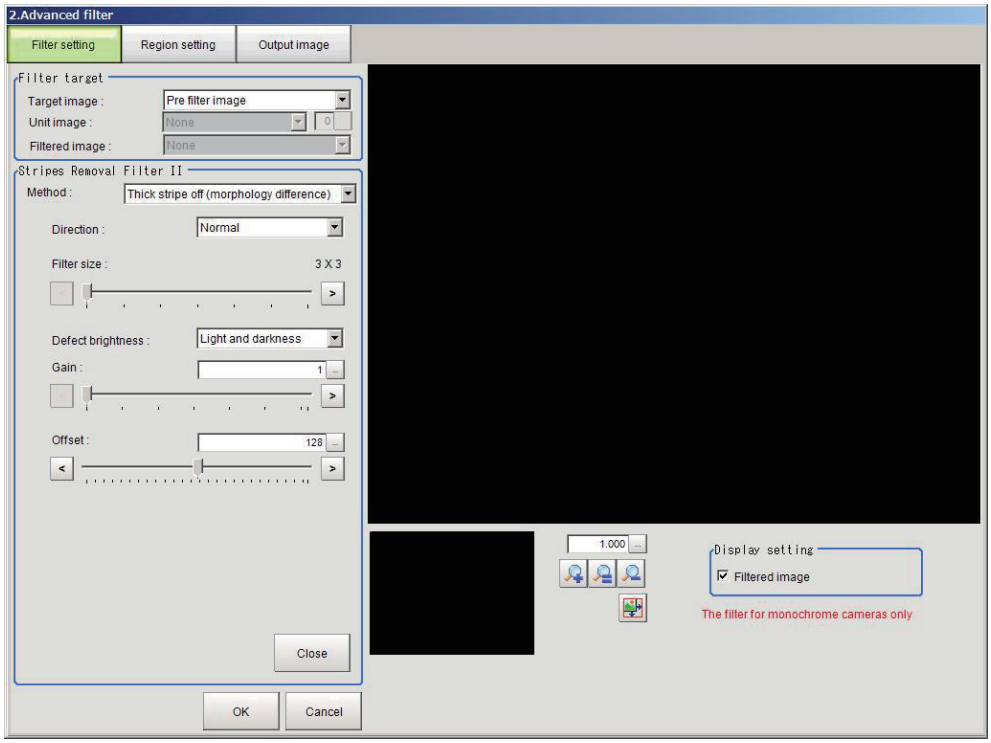
Changing the Emphasis Unevenness Filter settings.



Setting item	Setting value [Factory default]	Description
Mask Size	1 to 64 [10]	Sets the mask size for the region.
Normalize type	• [Normalize] • Specify	Sets the normalization type. Normalize: Normalization is done based on the max. and the min. values in the image. Specify: Normalization is done based on the specified change bounds.
Range (Min.)	• [Min. value of specified Mask Size] Up to “Change bounds Max. -1”.	Sets the minimum value for Change bounds. Only enabled when "Specify" is selected for [Normalize type].
Range (Max.)	• [Max. value of specified Mask Size] Up to “Change bounds Min. +1”.	Sets the maximum value for Change bounds. Only enabled when "Specify" is selected for [Normalize type].
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image.

● Changing the Stripes Removal Filter II Settings (Monochrome Images Only)

The same filter settings as in the “Stripes Removal Filter II” processing item can be changed.



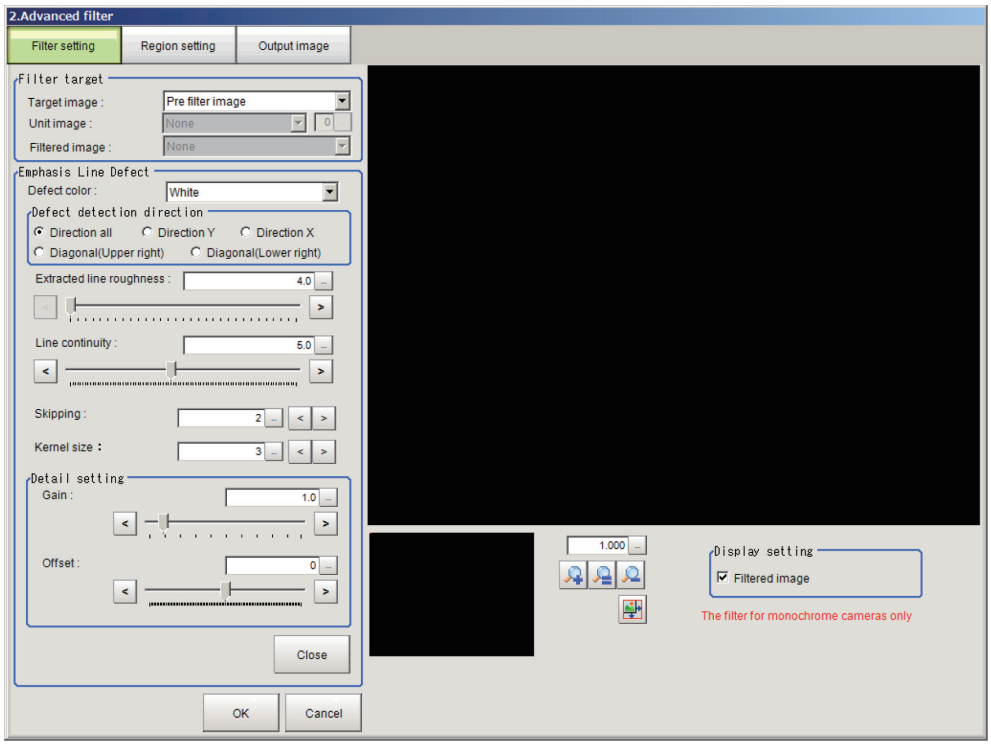
Setting item	Setting value [Factory default]	Description
Method	• [Thick stripe off (morphology difference)] • Pinstripe off (morphology)	Set the correction method. • Thick stripe off (morphology difference) Set the filter size based on the size of expected defects. The striped pattern is removed accordingly. • Pinstripe off (morphology) Set the filter size based on the width of the stripes. The striped pattern is removed accordingly.
Direction	• [Normal] • Vertical • Horizontal • Upper right • Lower right	Set the direction of filtering of the image. Set the direction that is perpendicular to the direction of the changes in darkness and lightness of the stripes.
Filter size	3×3 to 63×63 [3×3]	Set an odd value for the size of the filter for stripes and defects. • Thick stripe off (morphology difference) Set a “Filter size” larger than the size of the stripes and defects that you want to detect. • Pinstripe off (morphology) Set a “Filter size” larger than the width of the stripes that you want to detect.
Defect brightness	• [Light and darkness] • Light • Dark	This can be set when “Thick stripe off (morphology difference)” is selected in “Correction method”. Set a brightness for the background of defects that you want to detect. To detect both white defects and black defects, set “Light and darkness”.
Stripe brightness	• [Light and darkness] • Light • Dark	This can be set when “Pinstripe off (morphology)” is selected in “Correction method”. Set the brightness of the stripes you want to suppress. When the stripes are brighter than the background, set “Light”.

Setting item	Setting value [Factory default]	Description
Gain	1 to 63 [1]	This can be set when “Thick stripe off (morphology difference)” is selected in “Correction method”. Adjust the contrast of the filtered image. To increase the contrast, set a larger value for the “Gain”.
Offset	0 to 255 [128]	This can be set when “Thick stripe off (morphology difference)” is selected in “Correction method”. Adjust the brightness of the filtered image. To make the image brighter, increase the “Offset” setting.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image

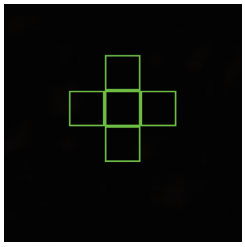
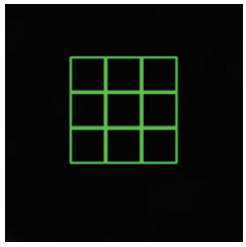
● Changing the Emphasis Defect Filter Settings

The defect is emphasized by comparing the pixels at the center with those of the surrounding area.

Changing the Emphasis Defect filter settings.



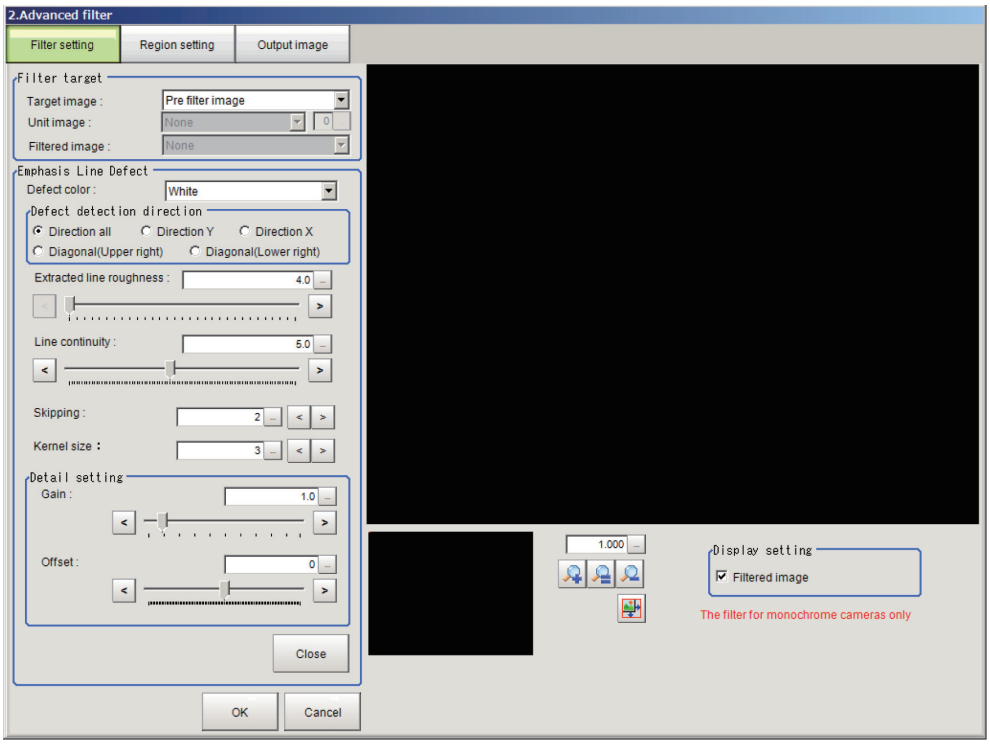
Setting Item	Setting value [Factory default]	Description
Detect color	• White • Black • [Black and White]	White: Select this value to detect defects that look lighter than the background. Black: Select this value to detect defects that look darker than the background. Black and White: Select this value when the brightness of defects is not known.

Setting Item	Setting value [Factory default]	Description
Mode	• [Cross] • Square	Sets the filter's processing mode. Cross: Square:  
Size	1 to 32 [10]	Sets the size of the mask.
Sampling interval	0 to 32 [0]	Sets the mask interval.
Noise reduction	• [OFF] • ON	ON: Noise reduction function will be turned on.
Noise level	0 to 128 [0]	Specifies the degree to which noise is removed. Only enabled when [Noise reduction] is enabled.
Gain	0.1to 20.0 [1.0]	Sets the gain.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image.
Profile display	• [Checked] • Unchecked	Checked: Displays the image profile.

● Changing the Emphasis Line Defect Filter Settings

The Emphasize Line Defect filter emphasizes line defects of low brightness.

Changing the Emphasis Line Defect filter settings.

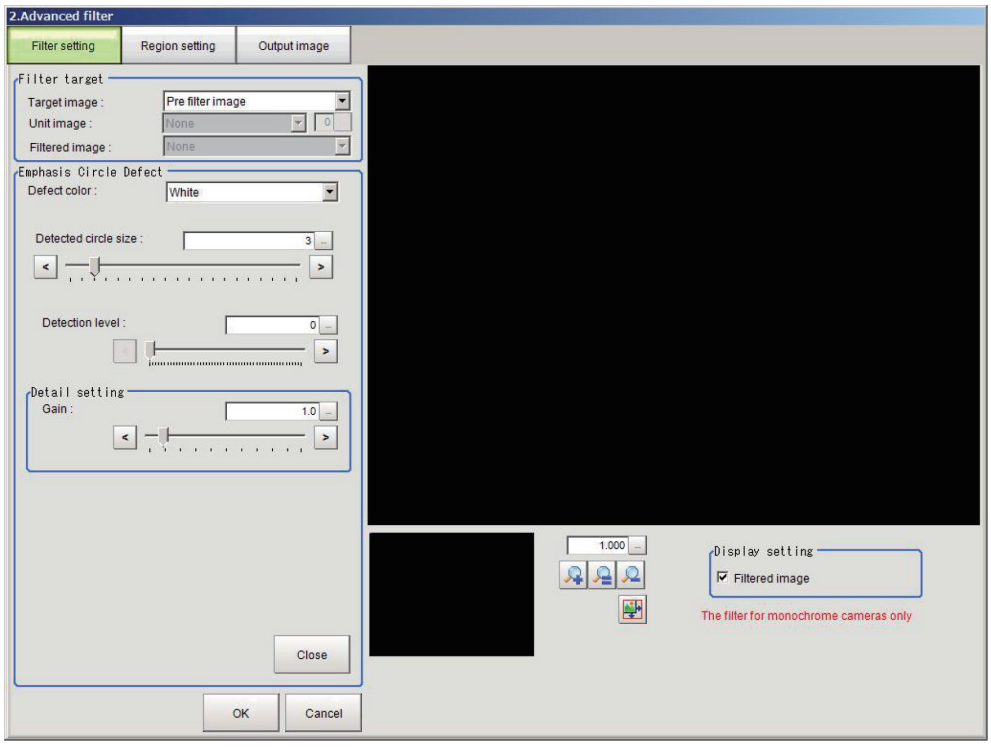


Setting Item	Setting value [Factory default]	Description
Defect color	• Black • [White]	Sets the color of defects to detect. Black: Select this value to detect defects that look darker than the background. White: Select this value to detect defects that look lighter than the background.
Defect detection direction	[Direction all] Direction Y Direction X Diagonal (Upper right) Diagonal (Lower right)	Sets the detecting defect direction.
Extracted line roughness	40 to 100 [40]	Sets the roughness of the line extracted by the filter.
Line continuity	1.0 to 10.0 [5.0]	Sets the continuity of the line extracted by the filter.
Skipping	0 to 4 [2]	Sets the Skipping number for the image. Zero means no skip.
Kernel size	2 to 5 [3]	Sets the mask size.
Gain	0.1 to 10.0 [1.0]	Sets the Gain.
Offset	-255 to 255 [0]	Sets the offset.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image.

● Changing the Emphasis Circle Defect Filter Settings

The Emphasis Circle Defect filter emphasizes circular defects of low brightness.

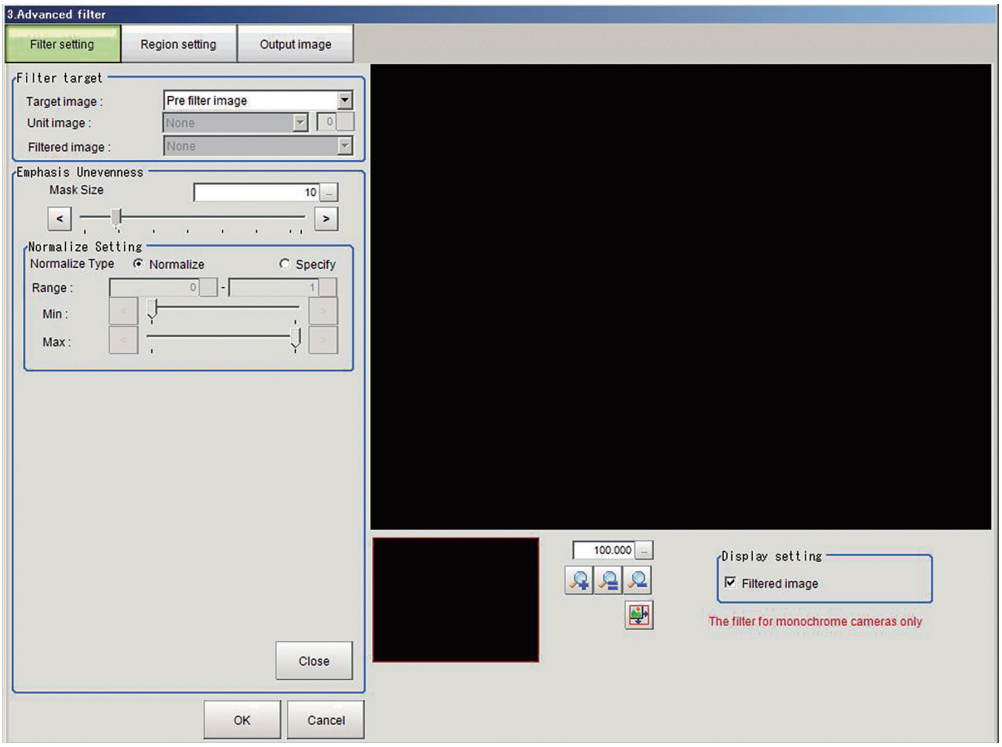
Changing the Emphasis Circle Defect filter settings.



Setting Item	Setting value [Factory default]	Description
Defect color	• [White] • Black	Sets the color of defects to detect. White: Select this value to detect defects that look lighter than the background. Black: Select this value to detect defects that look darker than the background.
Detected circle size	1 to 20 [3]	Sets the circle size to detect.
Detection level	0 to 255 [0]	Sets the threshold level to detect.
Gain	0.1to 10.0 [1.0]	Sets the gain.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image.

● Changing the Emphasize Unevenness Filter settings

Changing the Emphasize Unevenness Filter settings.



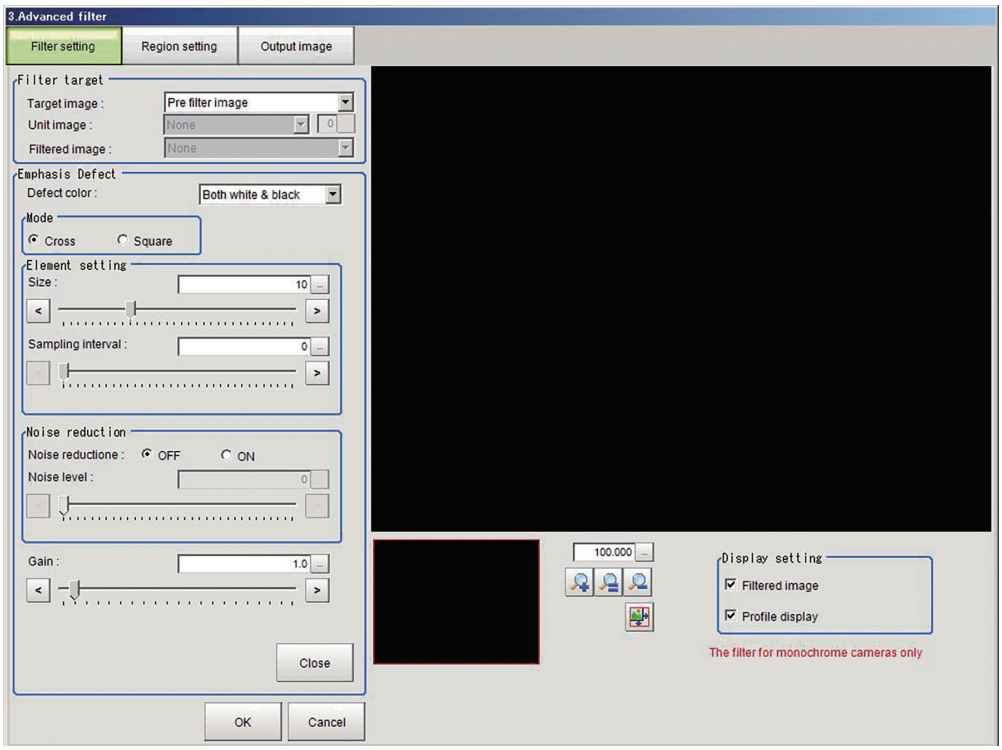
Setting item	Setting value [Factory default]	Description
Mask size	1 to 64 [10]	Sets the mask size for the region.
Normalize Type	• [Normalize] • Specify	Sets the normalization method. Normalize: Normalize using Max. and Min. values for current image. Specify: Normalize with the specified conversion range.
Range (Min.)	0 to 999999998 [0]	Sets the minimum value for Change bounds. A value up to the "Change bounds Max. -1" can be set. Only enabled when "Specify" is selected for [Normalize type].

Setting item	Setting value [Factory default]	Description
Range (Max.)	0 to 999999999 [999999999]	Sets the Maximum value for Change bounds. A value from "Change bounds Min.+1" can be set. Only enabled when "Specify" is selected for [Normalize type].
Filtered image	Pre-filtered image [Filtered image]	Check this to display the filtered image.

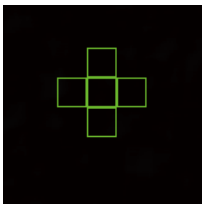
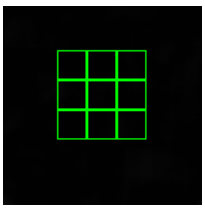
● Changing the Emphasize Defect Filter Settings

The defect is emphasized by comparing the pixels at the center with those of the surrounding area.

Changing the Emphasize Defect filter settings.



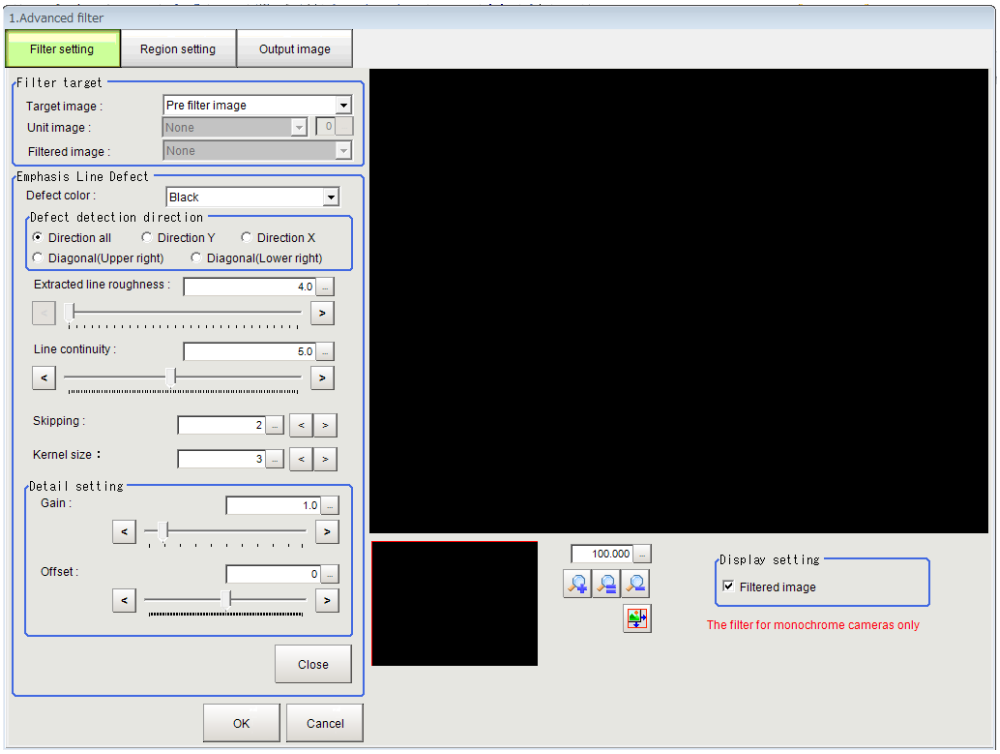
Setting item	Setting value [Factory default]	Description
Defect color	• White • Black • [Black and White]	White: Select this value to detect defects that look lighter than the background. Black: Select this value to detect defects that look darker than the background. Black and White Select this value when the brightness of defects is not known.

Setting item	Setting value [Factory default]	Description
Mode	[4-neighbor] 8-neighbor	Sets the filter's processing mode. 4-neighbor  8-neighbor 
Size	1 to 32 [10]	Sets the size of the defect to detect. The higher this value, the higher the defect detection rate for large defects. Unit of measure is pixels.
Sampling interval	0 to 32 [0]	Sets the sampling interval for comparing elements. The smaller this value, the greater the defect detection performance, but the slower the processing speed. Unit of measure is pixels.
Noise cut	[OFF] ON	Turn Noise cut ON or OFF.
Noise level	0 to 128 [0]	Specify the degree to which noise is removed. Only enabled when [Noise cut] is enabled.
Gain	0.1 to 20.0 [1.0]	Set the Gain.
Filtered image	Pre-filtered image [Filtered image]	Check this to display the filtered image.

Changing the Emphasize Line Defect filter settings

The Emphasize Line Defect filter is a filter that emphasizes line defects of low brightness.

Changing the Emphasize Line Defect filter settings.



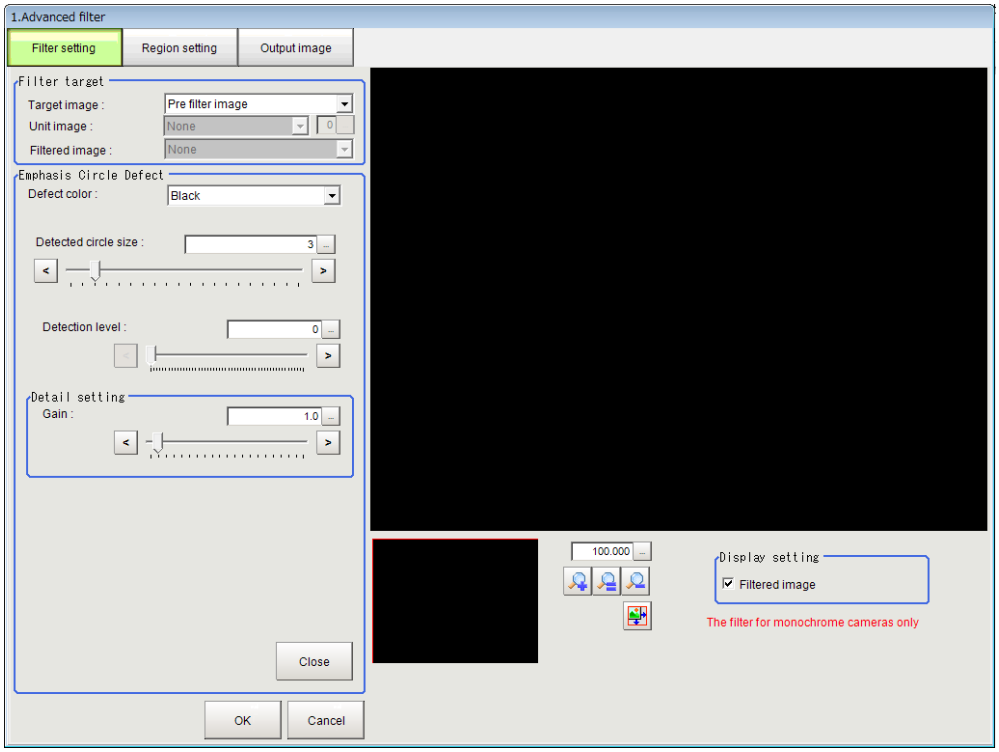
Setting item	Setting value [Factory default]	Description
Defect color	• [Black] • White	Black: Select this value to detect defects that look darker than the background. White: Select this value to detect defects that look lighter than the background.
Defect detection direction		
Direction all	• [Checked] • Unchecked	Check this to detect defects in all directions.
Direction X	• Checked • [Unchecked]	Check this to detect defects in a horizontal (X) direction.
Direction Y	• Checked • [Unchecked]	Check this to detect defects in a vertical (Y) direction.
Diagonal (Lower right)	• Checked • [Unchecked]	Check this to detect defects in a diagonal (Ascending to the right) direction.
Diagonal (Lower right)	• Checked • [Unchecked]	Check this to detect defects in a diagonal (Descending to the right) direction.
Extracted line roughness	4 to 10 [4]	Sets the granularity level of the line extracted by the filter.
Line continuity	1.0 to 10.0 [5.0]	Sets the size of the line extracted by the filter.
Skipping	0 to 4 [2]	Sets the Skipping number for the image.
Kernel size	2 to 5 [3]	Sets the matrix expansion size in columns and rows.

Setting item	Setting value [Factory default]	Description
Gain	0.1 to 10.0 [1.0]	Sets the Gain.
Offset	-255 to 255 [0]	Sets the offset.
Filtered image	Pre-filtered image [Filtered image]	Check this to display the filtered image.

● Changing the Emphasize Circle Defect filter settings

The Circle Defect Filter is a filter that emphasizes circular defects of low brightness.

Changing the Emphasize Circle Defect filter settings.

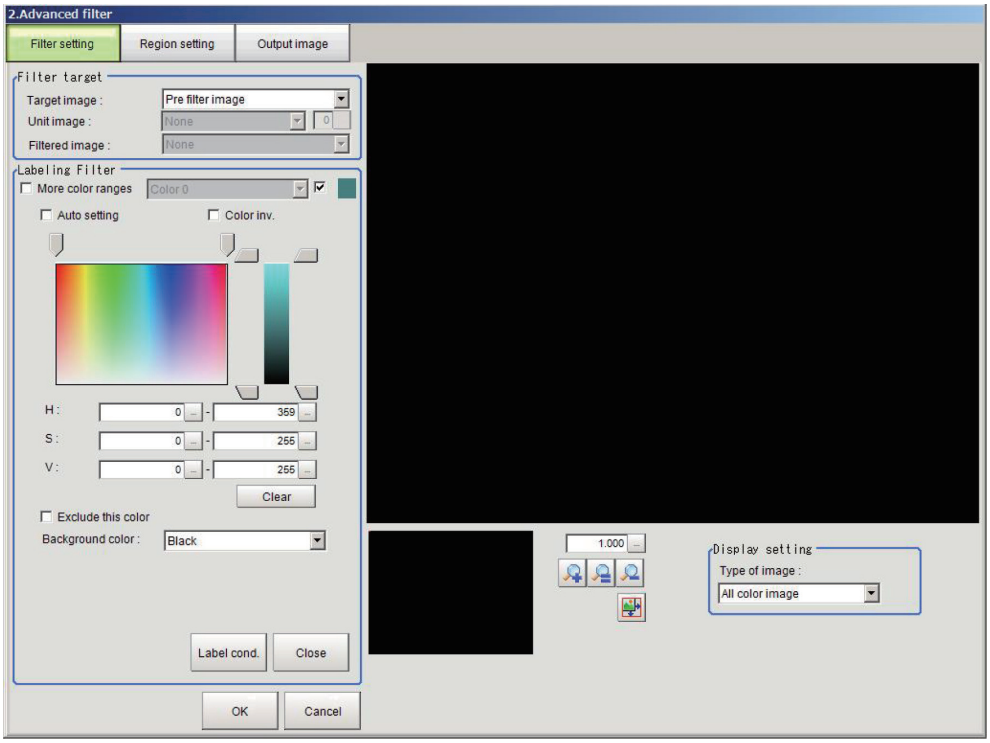


Setting item	Setting value [Factory default]	Description
Defect color	• [Black] • White	Black: Select this value to detect defects that look darker than the background. White: Select this value to detect defects that look lighter than the background.
Detected circle size	0 to 19 [2]	Sets the Skipping number for the image. 0 is No skipping.
Gain	0.1 to 10.0 [1.0]	Sets the Gain.
Detection level	0 to 255 [0]	Sets the Detection level.
Filtered image	Pre-filtered image [Filtered image]	Check this to display the filtered image.

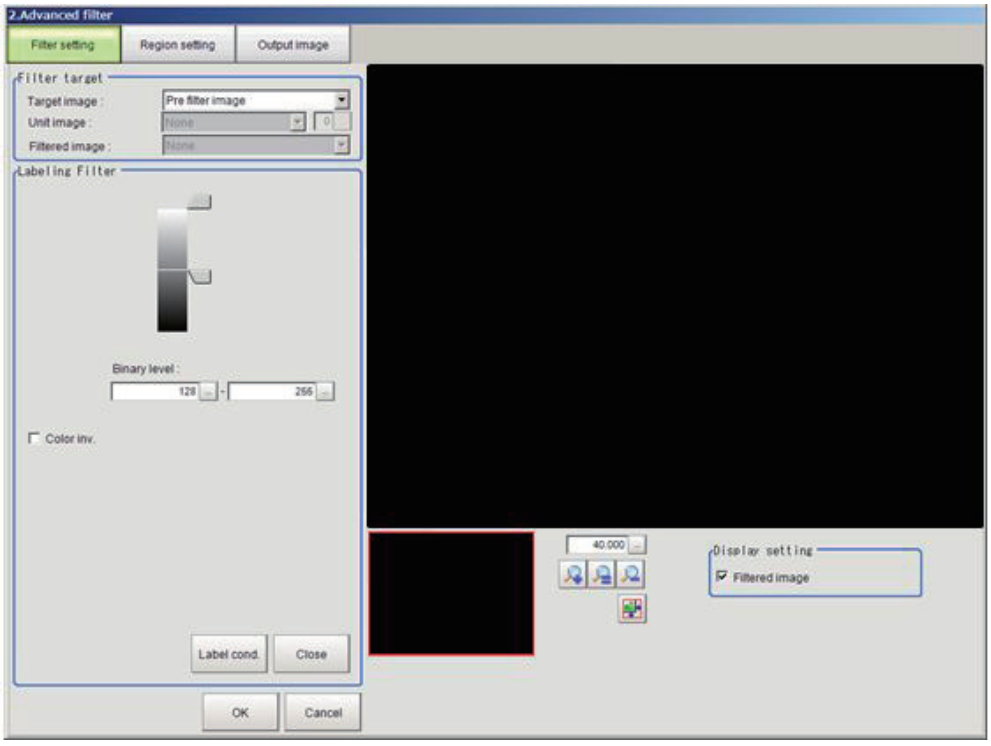
Changing the Labeling Filter Settings

You can change the settings of the filter that binarizes the image using the same extraction conditions as the “Labeling” processing item.

- Color extraction settings screen for color images



- Binarization settings screen for monochrome images



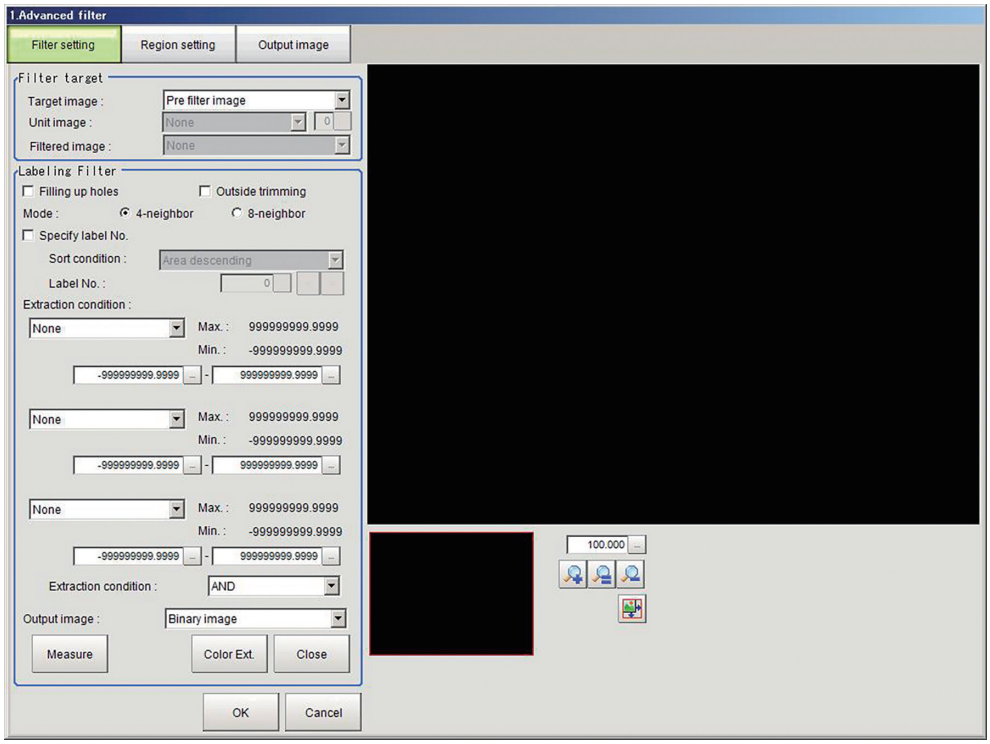
- Setting items in the [Color Ext.] (color extraction) settings screen for color images

Setting item	Setting value [Factory default]	Description
More color ranges	• Checked • [Unchecked]	To extract multiple colors, select the “More color ranges” checkbox.
Color extraction range	Color 0 to Color 7 [Color 0]	This can be set when the “More color ranges” checkbox is selected. Set the color ranges to be extracted.
Select	• [Checked] • Unchecked	This can be set when the “More color ranges” checkbox is selected. Select the “Select” checkbox to extract color using a color extraction range selected in “Color extraction range”.
Auto setting	• Checked • [Unchecked]	Select the “Auto setting” checkbox to set a color specified in an image as a color to be measured.
Color inv.	• Checked • [Unchecked]	To measure colors other than a specified color, select the “Color inv.” checkbox.
H	[0] to [359]	Set the hue (difference in hue).
S	[0] to [255]	Set the saturation (difference in saturation).
V	[0] to [255]	Set the vividness (difference in vividness).
Clear button	---	The colors set in H/S/V will be restored to the default when clicking.[Clear].
Exclude this color	• Checked • [Unchecked]	To exclude a selected color extraction range from the extracted colors, select “Exclude this color”.
Background color	• [Black] • White • Red • Green • Blue	Set the color used to cover background color parts other than the color to be extracted. When “Color selected image” is selected in “Display”, the background color can be set for each selected color. When “All color image” is selected in “Display”, background color parts are covered with the background color of Color 0.
Type of image	• Measurement image • [All color image] • Color selected image • Binary image	Set the image that you want to display in the settings screen.

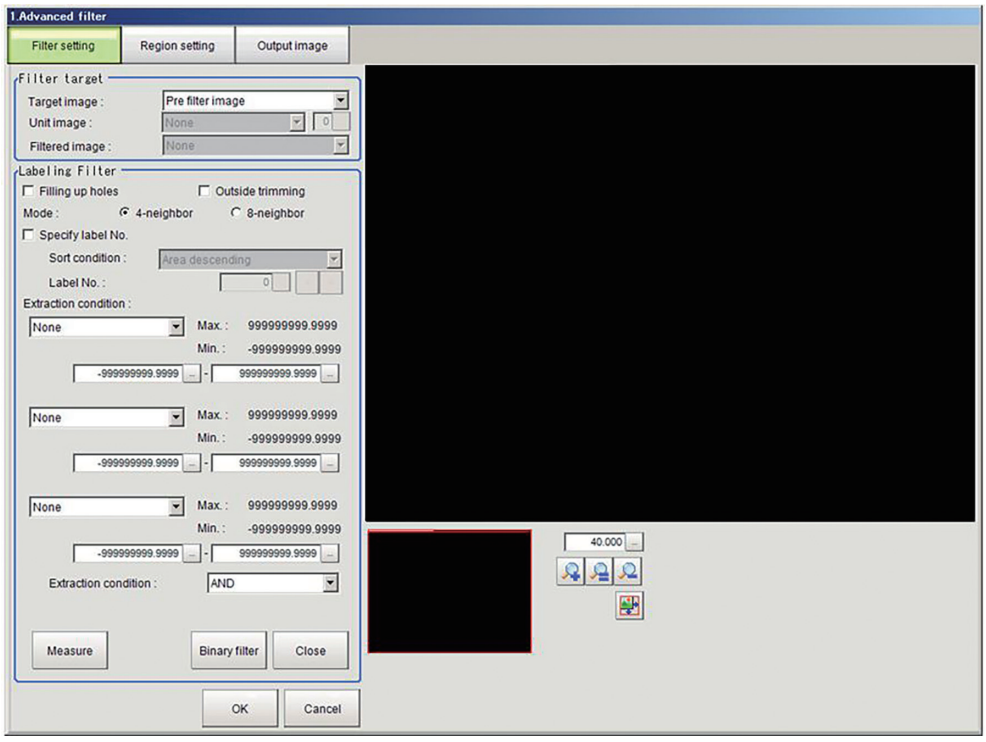
- Setting Items in the Binarization Settings Screen for Monochrome Images

Setting item	Setting value [Factory default]	Description
Binary level	0 to 255 [128] to [255]	Set the level for conversion of a 256 gradation grayscale image to a binary image. Set the “Binary level” so that the pixels of the measurement target are white.
Color inv.	• Checked • [Unchecked]	Select the “Color inv” checkbox to reverse black and white.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image

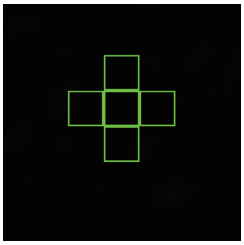
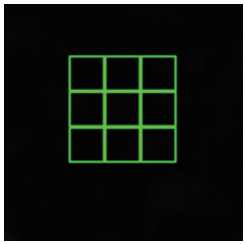
- Label condition settings screen for color images



- Label condition settings screen for monochrome images



Setting item	Setting value [Factory default]	Description
Filling up holes	• Checked • [Unchecked]	To fill the blank “donut hole” surrounded by the extracted color with the extracted color, select the “Filling up holes” checkbox.

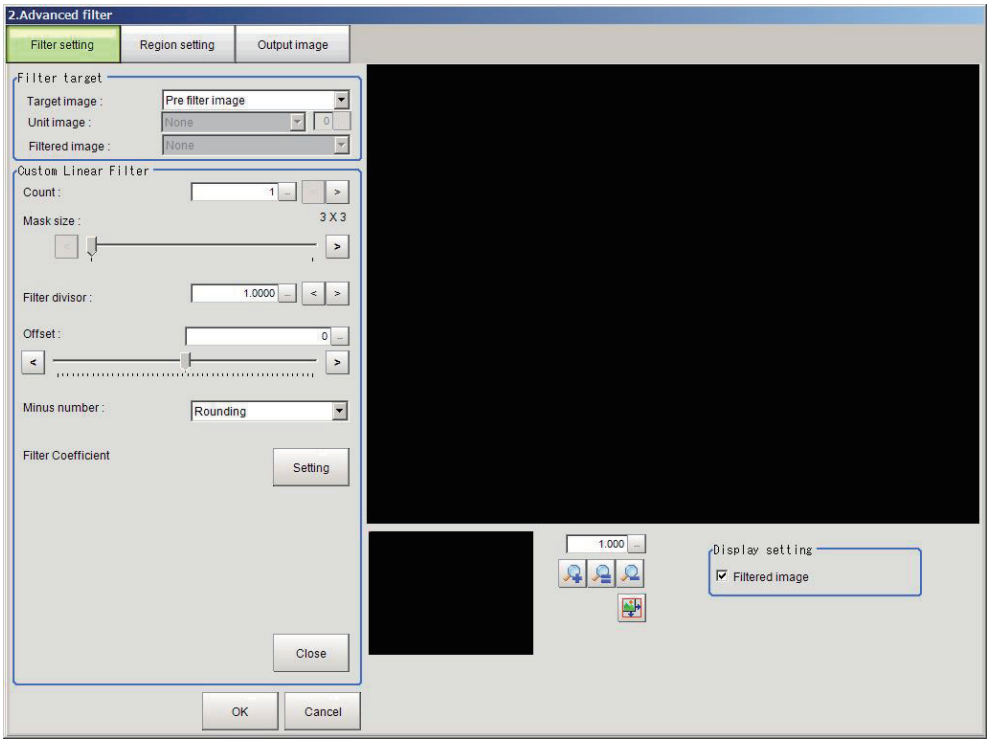
Setting item	Setting value [Factory default]	Description
Outside trimming	• Checked • [Unchecked]	If there is a part you do not want to measure in the place where the color is extracted inside the measurement region, select the “Outside trimming” checkbox.
Mode	• [Cross] • Square	Sets the filter's processing mode. Cross:  Square: 
Specify label No.	• Checked • [Unchecked]	To use only a specified label as the extraction target, select the “Specify label No.” checkbox.

Setting item	Setting value [Factory default]	Description
Sort condition	• Area ascending • [Area descending] • X ascending • X descending • Y ascending • Y descending • Elliptic major axis ascending • Elliptic major axis descending • Elliptic minor axis ascending • Elliptic minor axis descending • Elliptic ratio ascending • Elliptic ratio descending • Rectangle width ascending • Rectangle width descending • Rectangle height ascending • Rectangle height descending • Rectangle X1 ascending • Rectangle X1 descending • Rectangle Y1 ascending • Rectangle Y1 descending • Perimeter ascending • Perimeter descending • Circularity ascending • Circularity descending • Fit rect major axis ascending • Fit rect major axis descending • Fit rect minor axis ascending • Fit rect minor axis descending • Fit rect ratio ascending • Fit rect ratio descending • Inscribed circle X ascending • Inscribed circle X descending • Inscribed circle Y ascending • Inscribed circle Y descending • Inscribed circle R ascending • Inscribed circle R descending • Circum. circle X ascending • Circum. circle X descending • Circum. circle Y ascending • Circum. circle Y descending • Circum. circle R ascending • Circum. circle R descending • Number of holes ascending • Number of holes descending	This can be set when the [Specify label No.] check-box is selected. In order to specify a label, set the condition for sorting labels.
Label No.	0 to 2,499 [0]	This can be set when the [Specify label No.] check-box is selected. Set the number of the label to be specified.

Setting item	Setting value [Factory default]	Description
Extraction condition	• [None] • Area • X • Y • Elliptic major axis • Elliptic minor axis • Elliptic ratio • Rectangle width • Rectangle height • Rectangle X1 • Rectangle Y1 • Perimeter • Circularity • Fit rect major axis • Fit rect minor axis • Inscribed circle R • Circum. circle R • Number of holes	Set the conditions for extracting a label. Up to three extraction conditions can be set.
Extraction condition upper/lower limit	[-999,999,999.9999] to [999,999,999.9999]	Set the upper limit and lower limit of the condition for extracting a label.
Extraction condition setting	• [AND] • OR	Set the condition for combining extraction conditions. • AND Labels meeting all extraction conditions are extracted. • OR Labels meeting any one of the extraction conditions are extracted.
Output image	• [Binary image] • All color image	Appears when the settings are for a color image. Set the image that is output as the image filtered by the labeling filter.
[Measure] button		Clicking this performed the test measurement and updates the measurement values.
[Color Ext.]button		The button is available in color image setting. Clicking this switches to “Color extract” setting screen.
[Binary filter] button		This button is available in monochrome image setting. Clicking this switches to “Binary” setting screen.

Changing the Custom Linear Filter Settings

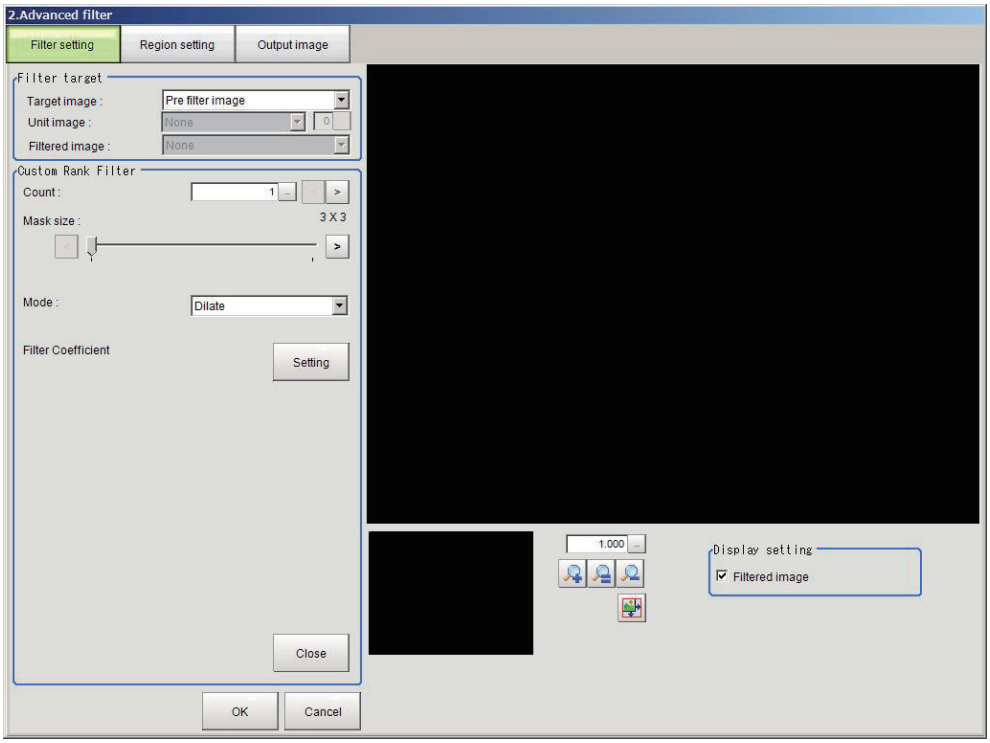
You can change the linear filter settings that allow you to set custom filter coefficients. To set the filter coefficients, click the “Setting” button.



Setting item	Setting value [Factory default]	Description
Count	1 to 9 [1]	Set the number of times the filter is applied.
Mask size	3×3 to 21×21 [3×3]	Set an odd value for the size of the filter mask. If there are large variations in the brightness of peripheral pixels, increase the “Mask size” setting.
Filter divisor	0.0001 to 99,999.9999 [1.0000]	Set the divisor for pixel values after masking. The value that results from dividing the result of masking by the “Filter divisor” and adding the offset is the filtered pixel value. Set together with the filter coefficients.
Offset	-255 to 255 [0]	Set the offset value for masked pixel values. The value that results from dividing the result of masking by the “Filter divisor” and adding the offset is the filtered pixel value.
Minus number	• [Rounding] • Absolute	Set the processing that takes place when filtering results in a negative pixel value. • Rounding Round the pixel value to 1. • Absolute Use the absolute value of the pixel value.
Set all	• Checked • [Unchecked]	To set all filter values at once, select the “Set all” checkbox.
Filter Coefficient	-128 to 127 [0]	For the coefficients for the pixel values in masking, set the number of coefficients that is equal to the mask size. Set together with the filter divisor.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image

● Changing the Custom Rank Filter Settings

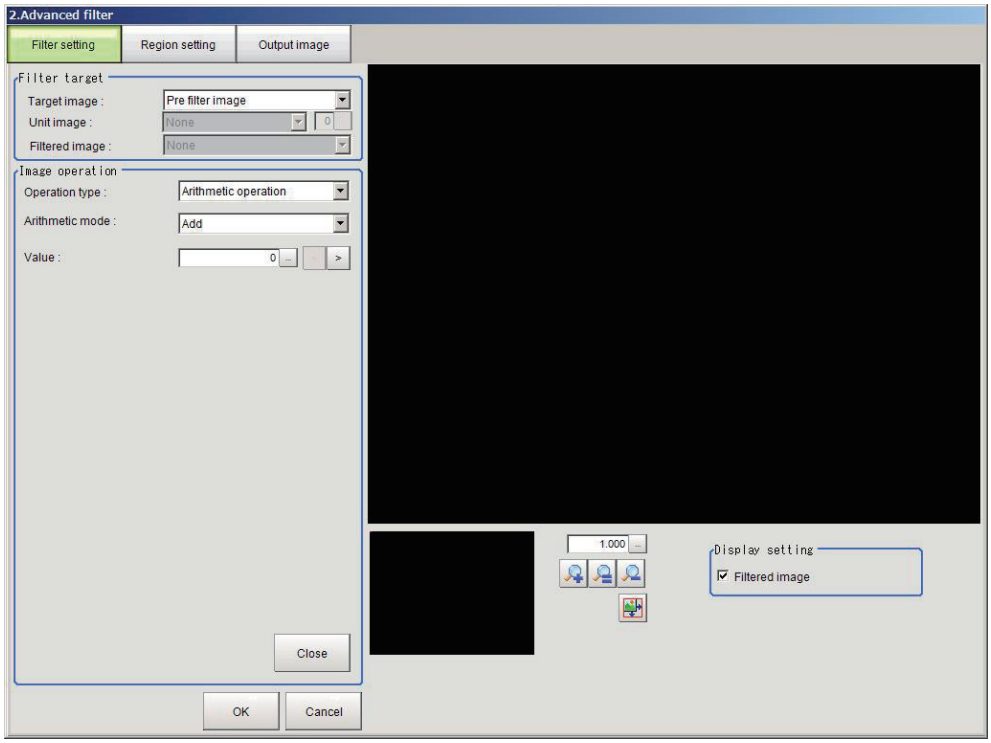
You can change the rank filter settings that allow you to set custom filter coefficients.



Setting item	Setting value [Factory default]	Description
Count	1 to 9 [1]	Set the number of times the filter is applied.
Mask size	3×3 to 21×21 [3×3]	Set an odd value for the size of the filter mask. If there are large variations in the brightness of peripheral pixels, increase the “Mask size” setting.
Mode	• [Dilate] • Erosion	Set the filter mode.
Batch setting	• Checked • [Unchecked]	When clicking [Setting], the "Filter Coefficient" setting dialog is displayed. To set all filter values at once, select the “Batch setting” checkbox.
Filter Coefficient	0 to 1 [1]	Set the dilate/erosion shape used for masking. Set a number of filter coefficients that is equal to the mask size.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image

Changing the Image Operation Filter Settings

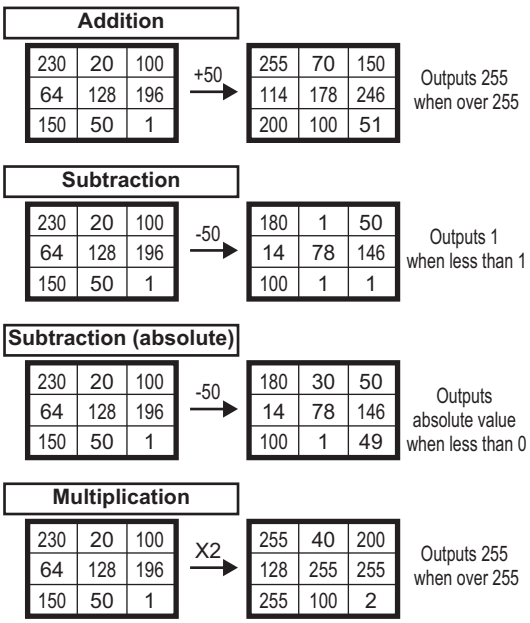
You can change the settings for the filter that converts the pixel values of an image.



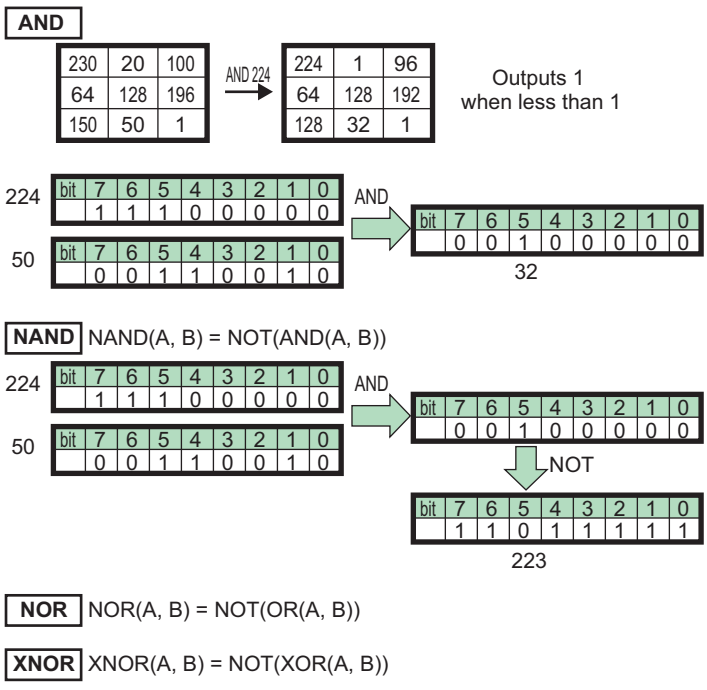
Setting item	Setting value [Factory default]	Description
Operation type	• [Arithmetic operation] • Bit operation • Bit shift • Change pixel value	Set the type of operation that is used for pixel calculation.
Arithmetic mode	• [Add] • Subtraction • Subtraction (absolute) • Multiplication	This can be set when “Arithmetic operation” is selected for “Operation type”. Set the operation method.
Value	0 to 255 [0]	This can be set when “Arithmetic operation” is selected for “Operation type”. Set the calculation value used to convert the pixel value. The result of the operation on the pixel value using the calculation value and the operation method of the operation mode is the converted pixel value.
Operation mode	• [NOT] • AND • OR • XOR • NAND • NOR • XNOR	This can be set when “Bit operation” is selected for “Operation type”. Set the operation method for bit operation.
Value	0 to 255 [0]	This can be set when “Bit operation” is selected for “Operation type”. Set the calculation value used to convert the pixel value. The result of the operation on the pixel value using the bit operation value and the operation method of the bit operation mode is the converted pixel value.

Setting item	Setting value [Factory default]	Description
Bit shift mode	• [Right bit shift] • Left bit shift	This can be set when “Bit shift” is selected for “Operation type”. Set the bit shift method. • Right bit shift Bit shift to the right. This makes the pixel values smaller and the image darker. • Left bit shift Bit shift to the left. This makes the pixel values larger and the image brighter.
Shift value	1 to 8 [1]	This can be set when “Bit shift” is selected for “Operation type”. Set the shift value used to convert the pixel values. The result of bit shifting of each pixel value according to the bit shift mode, and repeated the number of times set with the shift value, is the converted pixel value.
Change mode	• [Change inside bounds] • Change outside bounds	This can be set when “Change pixel value” is selected for “Operation type”. Set the method used to convert the pixel values. • Change inside bounds Pixel values inside the range set in “Change bounds” are converted using the “Change value”. • Change outside bounds Pixel values outside the range set in “Change bounds” are converted using the “Change value”.
Change value	1 to 255 [128]	This can be set when “Change pixel value” is selected for “Operation type”. Set the value used to convert the pixel values. The pixel values that are specified by the “Change mode” are converted to the value set in “Change value”.
Change bounds	[1] to [255]	This can be set when “Change pixel value” is selected for “Operation type”. Set the range of pixel values to be converted.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image

Example: Pixel calculation when arithmetical operations are performed

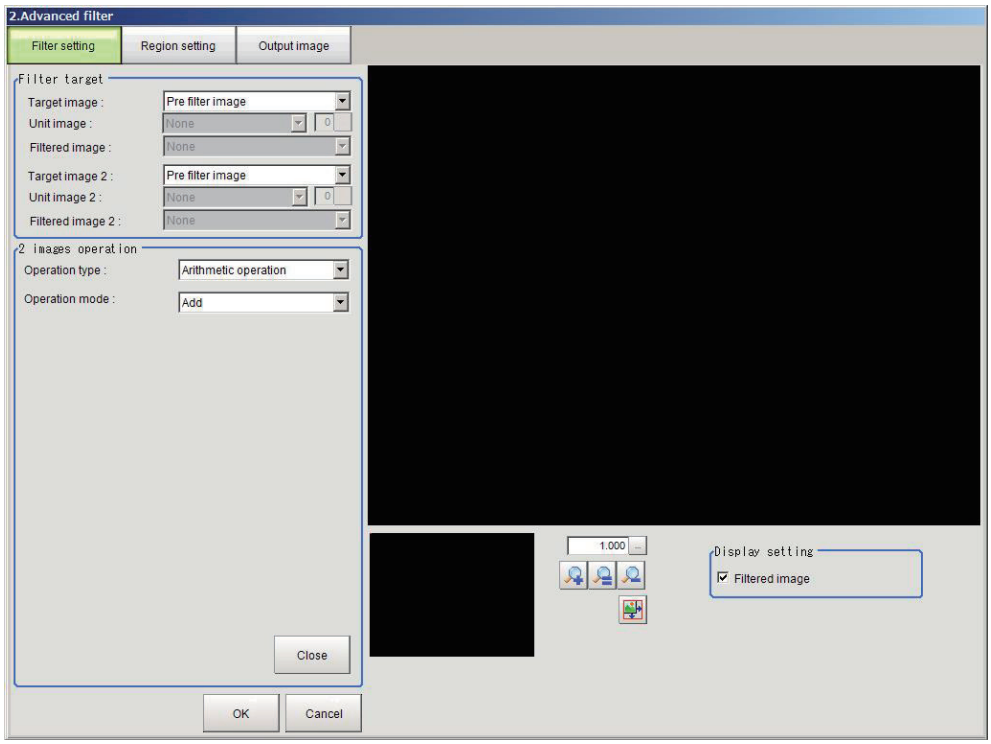


Example: Pixel calculation when bit operations are performed



Changing the 2 Images Operation Settings

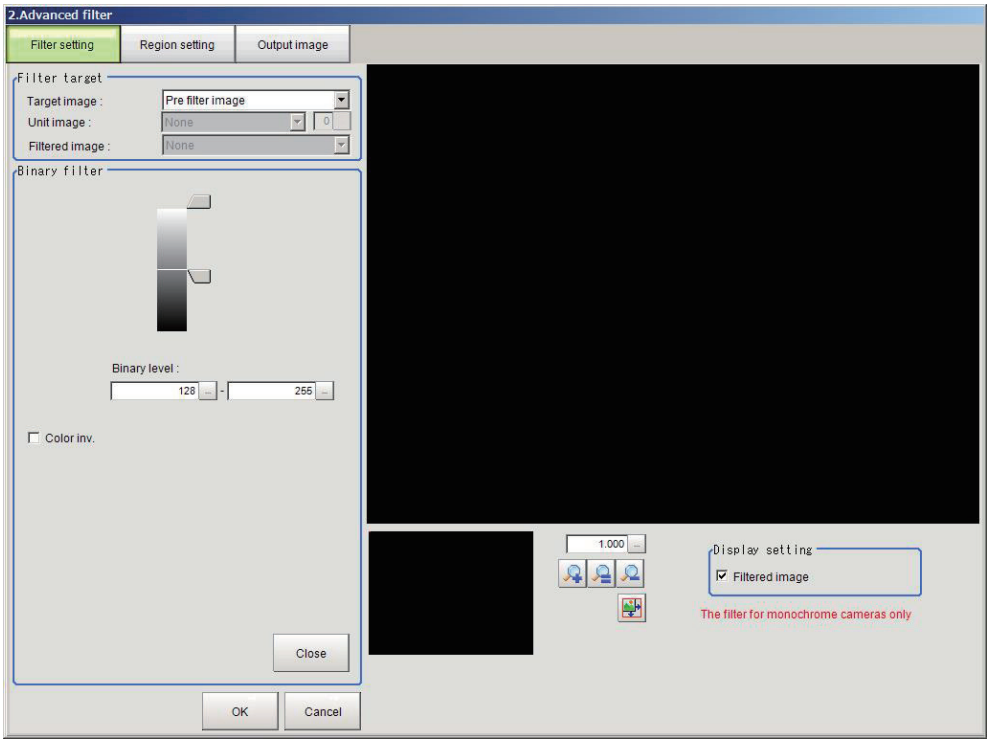
You can change the settings for the filter that operates on paired pixel values of two images.



Setting item	Setting value [Factory default]	Description
Operation type	• [Arithmetic operation] • Bit operation	Set the type of operation that is used for 2 images operation.
Operation mode	• [Add] • Subtraction • Subtraction (absolute) • Multiplication • Multiplication (Normalization) • Average • Maximum • Minimum	This can be set when “Arithmetic operation” is selected for “Operation type”. Set the operation method.
Operation mode	• [AND] • OR • XOR • NAND • NOR • XNOR	This can be set when “Bit operation” is selected for “Operation type”. Set the operation method for bit operation.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image

● Changing the Binary Filter Settings (Monochrome Images Only)

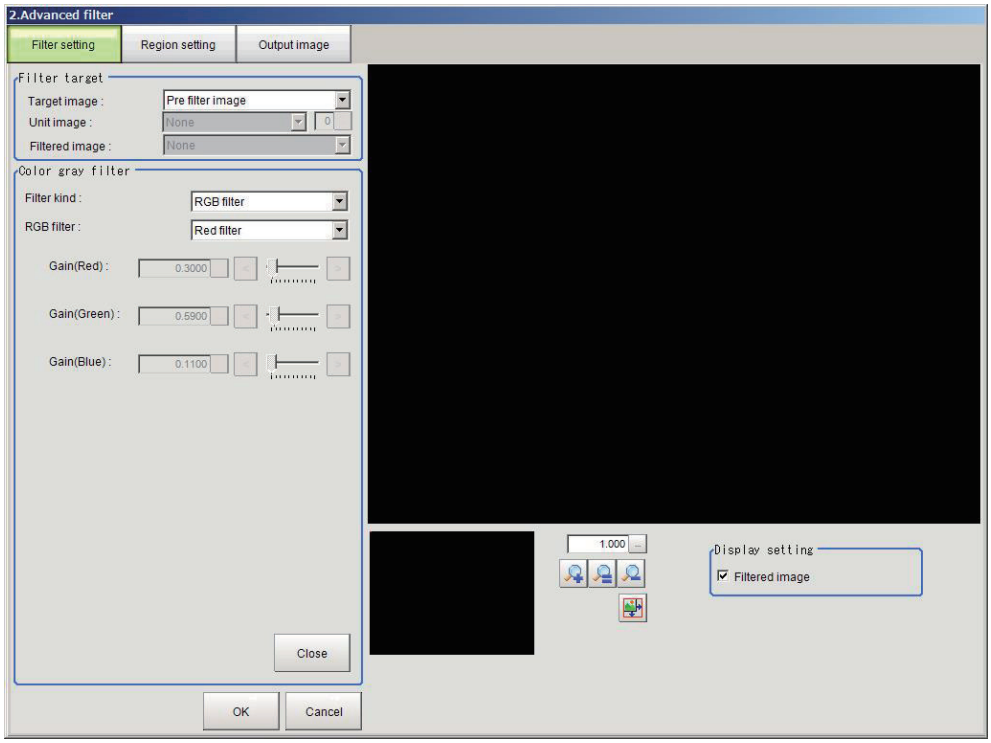
You can change the settings of the filter that binarizes images.



Setting item	Setting value [Factory default]	Description
Binary level	0 to 255 [128] to [255]	Set the level for conversion of a 256 gradation grayscale image to a binary image. Set the “Binary level” so that the pixels of the measurement target are white.
Color inv.	• Checked • [Unchecked]	Select the “Color inv.” checkbox to reverse black and white.
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image

Changing the Color Gray Filter Settings (Color Images Only)

The same filter settings as in the “Color Gray Filter” processing item can be changed.

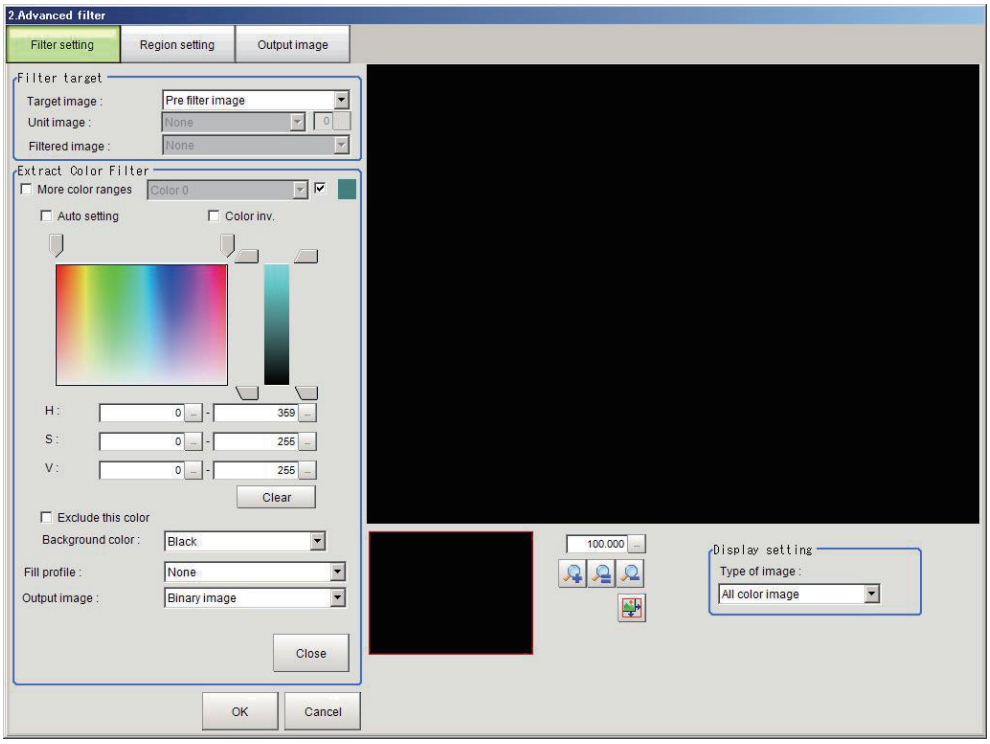


Setting item	Setting value [Factory default]	Description
Filter type	• [RGB filter] • HSV filter	Set the filter type. • RGB filter Set the color extraction range using R, G, B. • HSV filter Set the color extraction range using H, S, V.
RGB filter	• [Red filter] • Green filter • Blue filter • Magenta filter • Yellow filter • Brightness filter (R + G + B) • Brightness filter (R + 2G + B) • Custom filter	This can be set when “RGB filter” is selected for “Filter type”. Set the type of filter used as the Color Gray filter.
Gain (Red)	0.0001 to 9.9999 [0.3000]	This can be set when “Custom filter” is selected for “RGB filter”. Set the gain of R, G, B. To strengthen an RGB component, set a larger value for the gain of that component.
Gain (Green)	0.0001 to 9.9999 [0.5900]	
Gain (Blue)	0.0001 to 9.9999 [0.1100]	

Setting item	Setting value [Factory default]	Description
HSV filter	• Fast • [Fine]	This can be set when “HSV filter” is selected for “Filter type”. Set the type of filter used as the Color Gray filter. • Fast Set the color extraction range using standard hue only. • Fine Set the color extraction range in detail using standard hue, hue range, and color chroma.
Standard Hue	0 to 359 [0]	This can be set when “HSV filter” is selected for “Filter type”. Set the standard hue (tone). The greater the difference in hue from the standard hue (difference in tone), the smaller the density value.
Hue range	10 to 180 [90]	This can be set when “Fine” is selected for “HSV filter”. Set the hue (tone) range. The difference in hue is calculated using a hue range of 255 divisions centered on the “Standard Hue”. Hues outside the hue range have a density value of 0.
Color chroma	[0] to [255]	This can be set when “Fine” is selected for “HSV filter”. Set the upper and lower limits of the color chroma (saturation).
Filtered image	• [Checked] • Unchecked	Checked: Displays the filtered image

● Changing the Extract Color Filter Settings (Color Images Only)

The same filter settings as in the “Extract Color Filter” processing item can be changed.

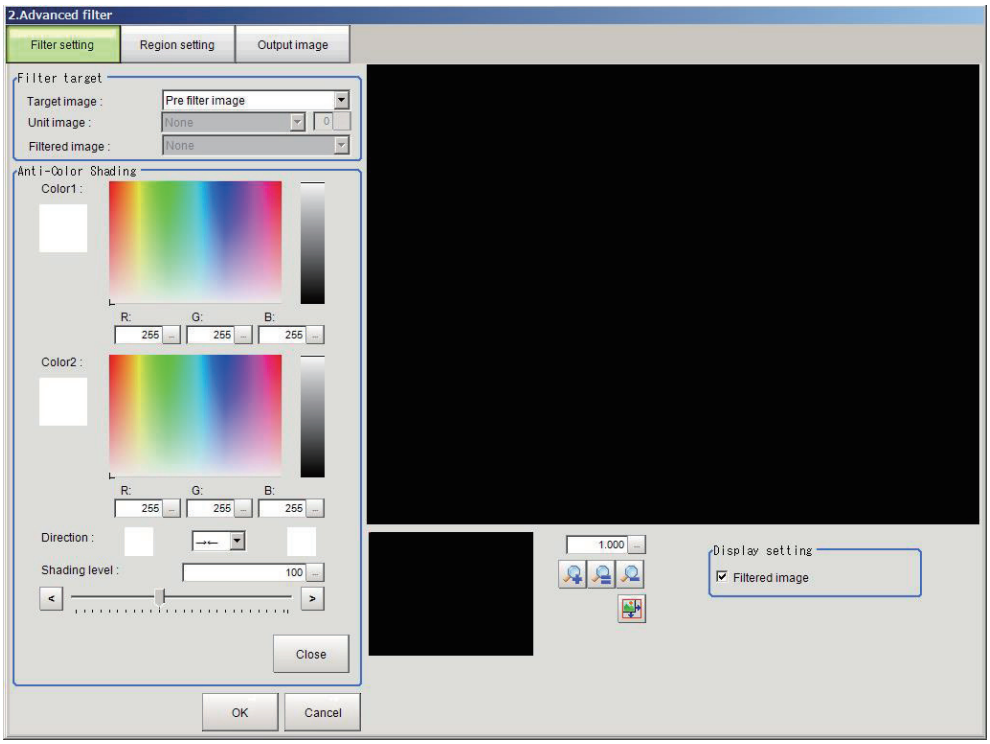


Setting item	Setting value [Factory default]	Description
More color ranges	• Checked • [Unchecked]	To extract multiple colors, select the “More color ranges” checkbox.

Setting item	Setting value [Factory default]	Description
Color extraction range	Color 0 to Color 7 [Color 0]	This can be set when the “More color ranges” checkbox is selected. Set the color ranges to be extracted.
Select	• [Checked] • Unchecked	This can be set when the “More color ranges” checkbox is selected. Select the “Select” checkbox to extract color using a color extraction range selected in “Color extraction range”.
Auto setting	• Checked • [Unchecked]	Select the “Auto setting” checkbox to set a color specified in an image as a color to be measured.
Color inv.	• Checked • [Unchecked]	To measure colors other than a specified color, select the “Color inv.” checkbox.
H	[0] to [359]	Set the hue (difference in hue).
S	[0] to [255]	Set the saturation (difference in saturation).
V	[0] to [255]	Set the vividness (difference in vividness).
Clear button	---	The colors set in H/S/V will be restored to the default when clicking [Clear].
Exclude this color	• Checked • [Unchecked]	To exclude a selected color extraction range from the extracted colors, select “Exclude this color”.
Background color	• [Black] • White • Red • Green • Blue	Set the color used to cover background color parts other than the color to be extracted. When “Color selected image” is selected in “Type of image”, the background color can be set for each selected color. When “All color image” is selected in “Type of image”, background color parts are covered with the background color of Color 0.
Fill profile	• [None] • Fill outline • Filling up holes	Set the fill method for filling a central blank part of an image. • None Do not fill central blank part. • Fill outline As the extracted color, measure the interval between the extract color start point and extract color end point in the direction of the X axis in the measurement region. Filling only takes place in the direction of the X axis, and thus this method is faster than “Filling up holes”. • Filling up holes Fill the blank “donut hole” surrounded by the extracted color with the extracted color
Output image	• [Binary image] • All color image	Set the image that is output after filtering by the Extract Color filter.
Type of image	• Measure image • [All color image] • Color selected image • Binary image	Set the image that you want to display in the settings screen.

● Changing the Anti-Color Shading Filter Settings (Color Images Only)

The same filter settings as in the “Anti-Color Shading” processing item can be changed.

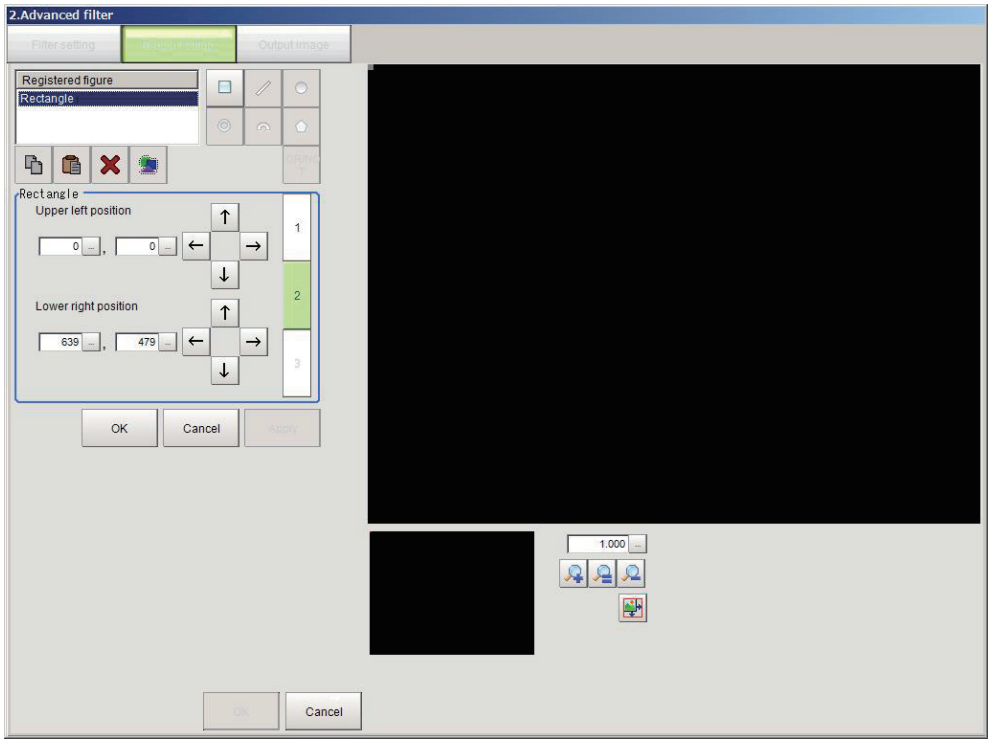


Setting item	Setting value [Factory default]	Description
Color 1 RGB	0 to 255 [255]	After the range is set, the two colors that are furthest apart in the set range are picked out.
Color 2 RGB	0 to 255 [255]	
Direction	• [→←] ◆→ ◆←	Set the conversion method used for Color 1 and Color 2. →←: Convert Color 1 and Color 2 to the middle color. →: Convert Color 1 to Color 2. ←: Convert Color 2 to Color 1.
Shading level	0 to 255 [100]	Set the level for suppressing color shading. To suppress shading, increase the “Shading level” setting.
Filtered image	• [Checked] • Unchecked	To display the original image, remove the checkmark from “Filtered image”.

3-13-3 Region Settings (Advanced Filter)

Use this setting to set, as the measurement area, the area on the image that you want to filter.

By narrowing the measurement region (as opposed to measuring the entire input image), this function allows you to shorten the processing time.

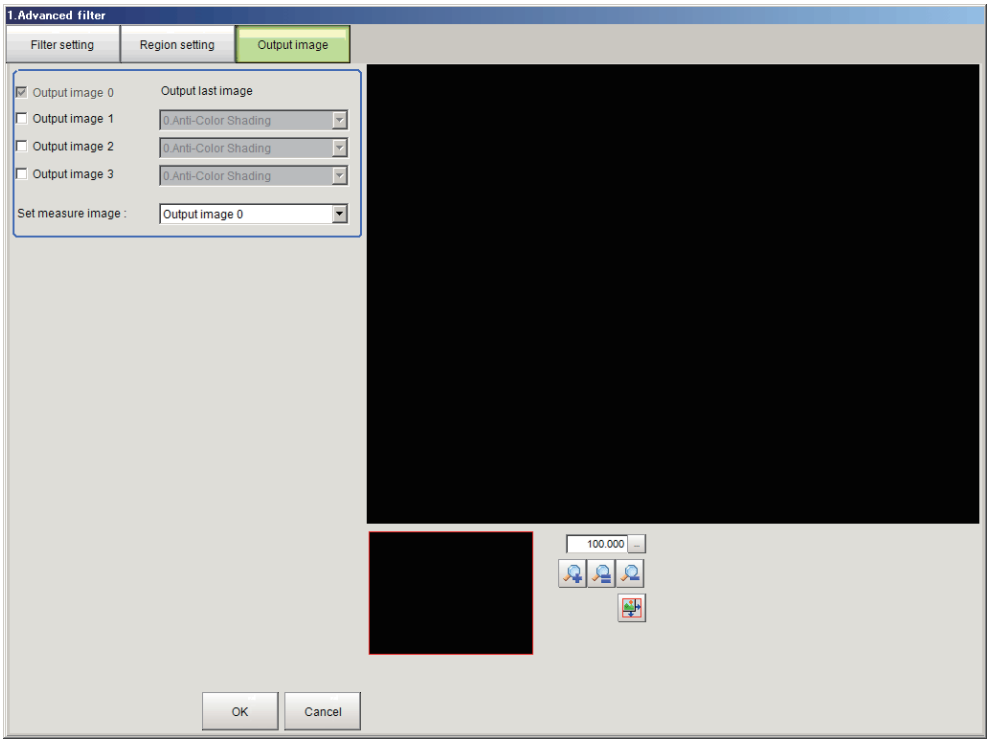


1. In the Item Tab area, click [Region setting].
2. Click [Edit].
3. Set the area to be filtered.
4. Click [OK] in the Figure setting area.
   - [OK]: Changes the settings and returns to the previous menu.
   - [Cancel]: Changes are discarded. Returns to the previous menu.
   - [Apply]: Updates the settings without leaving edit window.

3-13-4 Output Image Settings (Advanced Filter)

You can change the output image settings.

These settings specify the image that is output as the measurement result. The image set as the output image can be used as the measurement image on other processing units of the measurement flow.



Setting item	Setting value [Factory default]	Description
Output image 0	• [Checked] (fixed)	As the final image, set the image to which all added filters have been applied.
Output images 1 to 3	• Checked • [Unchecked]	Select to output an image filtered by a specific filter.
Output filters 1 to 3	• [None] • Filter No.	This can be set when one of the Output images 1 to 3 checkboxes is selected. Set the number of the filter used to filter the output image.
Set measure image	• [Output image 0] • Output image 1 • Output image 2 • Output image 3	From the output images, select the image to be used as the advanced filter image. The image specified with this setting can be used as the measurement image for measurement in processing units that follow the current processing unit.

3-13-5 Measurement Results for Which Output Is Possible (Advanced Filter)

The measurement results provided by advanced filter are shown below. The measurement results appear in the “Detail Result” area, and you can also use result output processing items to output the measurement results to an external device.

Refer to the “External Reference Tables” for the parameters that can be referenced, including measurement results.

Refer to *3-13-7 External Reference Tables (Advanced Filter)* on page 3-120.

Items Displayed in the Detail Result Area

The following measurement results are displayed in the “Detail result” area as text.

Displayed item	Description
Judge	Displays the judgement result for the processing unit.

Items Displayed in the Image Display Area

You can specify a sub-image number to display the next image in the image display area.

Sub image number	Description
0	The advanced filter image appears.
1	The image of output image 0 appears.
2	The image of output image 1 appears.
3	The image of output image 2 appears.
4	The image of output image 3 appears.
5	The measurement image appears.

Output of measurement results

There are no measurement results that can be output.

3-13-6 Key Points for Test Measurement and Adjustment (Advanced Filter)

You can adjust the parameters while you perform test measurements and check the measurement results to increase the measurement precision and speed.

Select the adjustment method by considering the following point.

Check the measurement results that can be displayed and output in “Measurement Results for Which Output is Possible”.

Refer to *3-13-5 Measurement Results for Which Output Is Possible (Advanced Filter)* on page 3-118.

Additional Information

When you perform test measurement, the display of the details and image are updated according to the measurement results.

Adjusting the Processing Speed of Measurements

You can use the following methods to improve the measurement processing speed.

● When the processing speed is slow

Parameter to be adjusted	Description
Region setting Refer to *3-13-3 Region Settings (Advanced Filter)* on page 3-116	If the measurement region is large, excessive time may be required for measurement processing. Set as small a measurement region as possible.

Notes on Advanced Filter

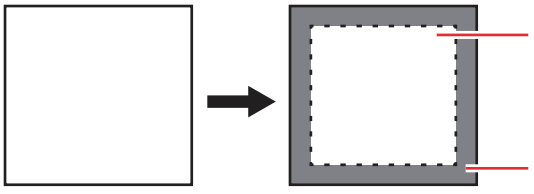
If Advanced Filter is applied to the image, the area around the image frame will become unstable.

When a [Filtering] processing item has been set in the scene, ensure that measurement ranges, etc. set for other processing items are not included in the area around the image frame.

The width not included in the measurement range will vary depending on the mask size settings.

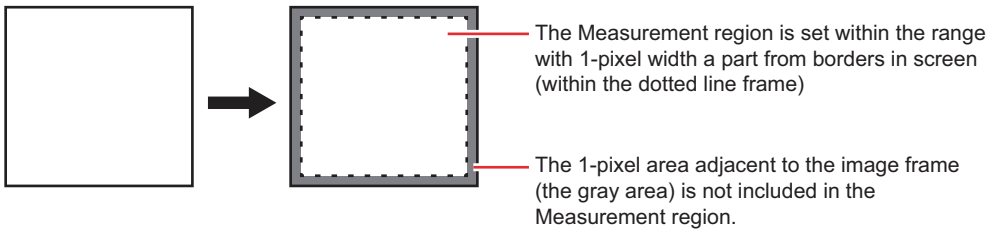
- Mask size: 5 × 5

  Make settings so that a width around the image frame equal to 2 pixels is not included in the measurement range.



- Mask size: 3 × 3

  Make settings so that a width around the image frame equal to 1 pixels is not included in the measurement range.

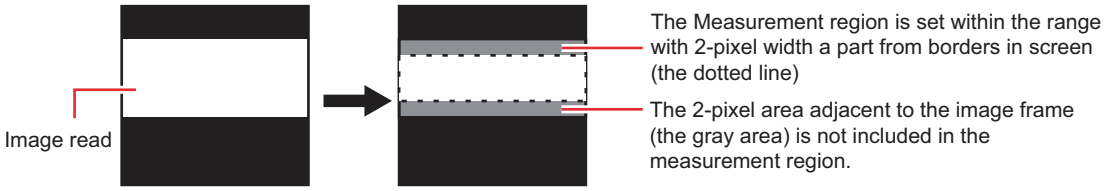


● When a partial scan is used to limit the load range

Set so as not to include the image loading range surroundings.

The width that will not be included in the measurement range is the same as the above.

(In the following figure, mask size:5 × 5).



3-13-7 External Reference Tables (Advanced Filter)

By specifying a number, you can access the following data from processing items that support processing unit data setting/acquisition, and from control commands.

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement(unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error(image format mismatch) -11: Error(unregistered model) -12: Error(insufficient memory) -20: Error(other errors)
120	No. of filters	filterNum	Set/Get	0 to 16
121	Set measure image	destImageNo	Set/Get	0 to 3
131	Output image 1	imageOutput1	Set/Get	0: Not output 1: Output
132	Output image 2	imageOutput2	Set/Get	0: Not output 1: Output
133	Output image 3	imageOutput3	Set/Get	0: Not output 1: Output
135	Output image 1 No.	imageOutNo1	Set/Get	0 to 15
136	Output image 2 No.	imageOutNo2	Set/Get	0 to 15
137	Output image 3 No.	imageOutNo3	Set/Get	0 to 15

No.	Data Name	Ident	Set/Get	Data range
140	Target image type	targetKind00	Set/Get	0: Measurement image 1: Pre filter image 2: Other unit image 3: Filtered image
141	Target image type	targetKind01	Set/Get	0: Measurement image 1: Pre filter image 2: Other unit image 3: Filtered image
. . .	. . .	. . .	. . .	. . .
155	Target image type	targetKind15	Set/Get	0: Measurement image 1: Pre filter image 2: Other unit image 3: Filtered image
160	Target Unit	targetUnit00	Set/Get	-1 to 9,999
161	Target Unit	targetUnit01	Set/Get	-1 to 9,999
. . .	. . .	. . .	. . .	. . .
175	Target Unit	targetUnit15	Set/Get	-1 to 9,999
180	Target Filtering No.	targetNo00	Set/Get	-1 to 15
181	Target Filtering No.	targetNo01	Set/Get	-1 to 15
. . .	. . .	. . .	. . .	. . .
195	Target Filtering No.	targetNo15	Set/Get	-1 to 15

No.	Data Name	Ident	Set/Get	Data range
200	Filter type	filterKind00	Set/Get	0: None 1: Weak smoothing 2: Strong smoothing 3: Dilate 4: Erosion 5: Median 6: Extract edges 7: Extract horizontal edges 8: Extract vertical edges 9: Enhance edges 10: Prewitt 11: Roberts 12: Laplacian 13: Background Suppression 14: Brightness Correct Filter 15: Stripes Removal Filter II 16: Labeling Filter 17: Custom Linear Filter 18: Custom Rank Filter 19: Image operation 20: 2 images operation 21: Binary filter 22: Color gray filter 23: Extract Color Filter 24: Anti-Color Shading 25: Emphasis Defect 26: Emphasis Unevenness 27: Emphasis Line Defect 28: Emphasis Circle Defect 29: LoG Filter 30: Guided Filter

No.	Data Name	Ident	Set/Get	Data range
201	Filter type	filterKind01	Set/Get	0: None 1: Weak smoothing 2: Strong smoothing 3: Dilate 4: Erosion 5: Median 6: Extract edges 7: Extract horizontal edges 8: Extract vertical edges 9: Enhance edges 10: Prewitt 11: Roberts 12: Laplacian 13: Background Suppression 14: Brightness Correct Filter 15: Stripes Removal Filter II 16: Labeling Filter 17: Custom Linear Filter 18: Custom Rank Filter 19: Image operation 20: 2 images operation 21: Binary filter 22: Color gray filter 23: Extract Color Filter 24: Anti-Color Shading 25: Emphasis Defect 26: Emphasis Unevenness 27: Emphasis Line Defect 28: Emphasis Circle Defect 29: LoG Filter 30: Guided Filter
. . .	. . .	. . .	. . .	. . .

No.	Data Name	Ident	Set/Get	Data range
215	Filter type	filterKind15	Set/Get	0: None 1: Weak smoothing 2: Strong smoothing 3: Dilate 4: Erosion 5: Median 6: Extract edges 7: Extract horizontal edges 8: Extract vertical edges 9: Enhance edges 10: Prewitt 11: Roberts 12: Laplacian 13: Background Suppression 14: Brightness Correct Filter 15: Stripes Removal Filter II 16: Labeling Filter 17: Custom Linear Filter 18: Custom Rank Filter 19: Image operation 20: 2 images operation 21: Binary filter 22: Color gray filter 23: Extract Color Filter 24: Anti-Color Shading 25: Emphasis Defect 26: Emphasis Unevenness 27: Emphasis Line Defect 28: Emphasis Circle Defect 29: LoG Filter 30: Guided Filter
220	Target Image No.	unitImage00	Set/Get	0 to 3
221	Target Image No.	unitImage01	Set/Get	0 to 3
. . .	. . .	. . .	. . .	. . .
235	Target Image No.	unitImage15	Set/Get	0 to 3
10200	Background Suppression Mode	00_Halation_colorMode	Set/Get	0: RGB common 1: RGB individual
10201	Lower limit of RGB common	00_Halation_lowCommon	Set/Get	0 to 255
10202	Upper limit of RGB common	00_Halation_uppCommon	Set/Get	0 to 255
10203	Lower limit R of RGB individual	00_Halation_lowRed	Set/Get	0 to 255
10204	Upper limit R of RGB individual	00_Halation_uppRed	Set/Get	0 to 255
10205	Lower limit G of RGB individual	00_Halation_lowGreen	Set/Get	0 to 255

No.	Data Name	Ident	Set/Get	Data range
10206	Upper limit G of RGB individual	00_Halation_uppGreen	Set/Get	0 to 255
10207	Lower limit B of RGB individual	00_Halation_lowBlue	Set/Get	0 to 255
10208	Upper limit B of RGB individual	00_Halation_uppBlue	Set/Get	0 to 255
10209	Lower limit of Gray	00_Halation_lowGray	Set/Get	0 to 255
10210	Upper limit of Gray	00_Halation_uppGray	Set/Get	0 to 255
10211	Filtered image	00_Halation_halationImage	Set/Get	0: Original image 1: Filtered image
10300	Uneven removal	00_Shading_unevenRemove	Set/Get	0: OFF 1: ON
10301	Filter direction	00_Shading_direction	Set/Get	0: H&V 1: Horizontal 2: Vertical
10302	Filter size(Odd)	00_Shading_filterSize	Set/Get	3 to 255
10303	Gain	00_Shading_gain	Set/Get	1 to 63
10304	Offset	00_Shading_offset	Set/Get	0 to 255
10305	Filtered image	00_Shading_shadingImage	Set/Get	0: Original image 1: Filtered image
10400	Method	00_Rank2_correctMethod	Set/Get	0: Thick stripe off (morphology difference) 1: Pinstripe off (morphology)
10401	Filter direction	00_Rank2_direction	Set/Get	0: H&V 1: Horizontal 2: Vertical 3: Diagonal (upper right) 4: Diagonal (lower right)
10402	Filter size(Odd)	00_Rank2_filterSize	Set/Get	3 to 63
10403	Brightness	00_Rank2_defectBright	Set/Get	0: Light and Dark 1: Light 2: Dark
10404	Gain	00_Rank2_gain	Set/Get	1 to 63
10405	Offset	00_Rank2_offset	Set/Get	0 to 255
10406	Filtered image	00_Rank2_rank2Image	Set/Get	0: Original image 1: Filtered image
10500	Color inv.	00_Labeling_invert	Set/Get	0: OFF 1: ON
10501	Upper limit of the binary level	00_Labeling_upperLevel	Set/Get	0 to 255
10502	Lower limit of the binary level	00_Labeling_lowerLevel	Set/Get	0 to 255
10503	Outside trimming	00_Labeling_cutOut	Set/Get	0: OFF 1: ON
10504	Filling up holes	00_Labeling_holePlug	Set/Get	0: OFF 1: ON
10505	Specify label No.	00_Labeling_labelSelect	Set/Get	0: All 1: Specify No.
10506	Label No.	00_Labeling_labelNo	Set/Get	0 to 2,499
10507	Extraction condition	00_Labeling_extOperant	Set/Get	0: AND 1: OR

No.	Data Name	Ident	Set/Get	Data range
10508	Label maximum	00_Labeling_maxLabel-Num	Set/Get	1 to 9,999
10509	Sort condition	00_Labeling_sortMode	Set/Get	0 to 43
10510	Output image	00_Labeling_outputIm-age	Set/Get	0: Binary image 1: Extract image
10511	Multiple selections	00_Labeling_multiSelect	Set/Get	0: Multiselect NG 1: MultiSelect OK
10512	ImageKind	00_Labeling_imageKind	Set/Get	0: Measurement image 1: All color image 2: Selection color image 3: Binary image
10520+N (N:0 to 7)	Color	00_Labeling_flag	Set/Get	0: Not used 1: Used
10530+N (N:0 to 7)	Flag for OR/NOT	00_Labeling_orNo	Set/Get	0: OR 1: NOT
10540+N (N:0 to 7)	Min. color difference	00_Labeling_lowH	Set/Get	0 to 359
10550+N (N:0 to 7)	Max. color difference	00_Labeling_uppH	Set/Get	0 to 359
10560+N (N:0 to 7)	Min. saturation	00_Labeling_lowS	Set/Get	0 to 255
10570+N (N:0 to 7)	Max. saturation	00_Labeling_uppS	Set/Get	0 to 255
10580+N (N:0 to 7)	Min. brightness	00_Labeling_lowV	Set/Get	0 to 255
10590+N (N:0 to 7)	Max. brightness	00_Labeling_uppV	Set/Get	0 to 255
10600	No. of extraction condi-tions	00_Labeling_extNum	Set/Get	1 to 8
10610+N (N:0 to 7)	Judgement condition	00_Labeling_extKind	Set/Get	0 to 17
10630+N (N:0 to 7)	Lower limit for judge condition	00_Labeling_extMin	Set/Get	-999,999,999.9999 to 999,999,999.9999
10650+N (N:0 to 7)	Upper limit for judge condition	00_Labeling_extMax	Set/Get	-999,999,999.9999 to 999,999,999.9999
10660+N (N:0 to 7)	Background color	00_Labeling_back-ground	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
10668	Filtered image	00_Labeling_labelingIm-age	Set/Get	0: Original image 1: Filtered image

No.	Data Name	Ident	Set/Get	Data range
10675	Mode	00_Labeling_neighborhoodMode	Set/Get	0: 4-neighbor 1: 8-neighbor
10700	Count	00_CustomLine_count	Set/Get	1 to 9
10701	Mask Size	00_CustomLine_maskSize	Set/Get	0: 3×3 1: 5×5 2: 7×7 3: 9×9 4: 11×11 5: 13×13 6: 15×15 7: 17×17 8: 19×19 9: 21×21
10702	Filter divisor	00_CustomLine_div	Set/Get	0.0001 to 99,999.9999
10703	Offset	00_CustomLine_offset	Set/Get	-255 to 255
10704	Minus number	00_CustomLine_kind	Set/Get	0: Rounding 1: Absolute
10710+N (N:0 to 440)	Filter Coefficient	00_CustomLine_coef	Set/Get	-128 to 127
11151	Filtered image	00_CustomLine_customLineImage	Set/Get	0: Original image 1: Filtered image
11201	Mask Size	00_CustomRank_maskSize	Set/Get	0: 3×3 1: 5×5 2: 7×7 3: 9×9 4: 11×11 5: 13×13 6: 15×15 7: 17×17 8: 19×19 9: 21×21
11202	Mode	00_CustomRank_kind	Set/Get	0: Dilate 1: Erosion
11210+N (N:0 to 440)	Filter Coefficient	00_CustomRank_coef	Set/Get	0 to 1
11651	Filtered image	00_CustomRank_customRankImage	Set/Get	0: Original image 1: Filtered image
11700	Operation type	00_Calc_kind	Set/Get	0: Arithmetic operation 1: Bit operation 2: Bit shift 3: Change pixel value
11701	Arithmetic mode	00_Calc_calcMode	Set/Get	0: Add 1: Subtraction 2: Subtraction (Absolute) 3: Multipication
11702	Arithmetic	00_Calc_calcValue	Set/Get	0 to 255

No.	Data Name	Ident	Set/Get	Data range
11703	Operation mode	00_Calc_bitMode	Set/Get	0: NOT 1: AND 2: OR 3: XOR 4: NAND 5: NOR 6: XNOR
11704	Value	00_Calc_bitValue	Set/Get	0 to 255
11705	Bit shift mode	00_Calc_shiftMode	Set/Get	0: Right Bit shift 1: Left Bit shift
11706	Shift value	00_Calc_shiftValue	Set/Get	1 to 8
11707	Change mode	00_Calc_transMode	Set/Get	0: Change inside bounds 1: Change outside bounds
11708	Change value	00_Calc_transValue	Set/Get	1 to 255
11709	Lower limit of Change bounds	00_Calc_transLow	Set/Get	1 to 255
11710	Upper limit of Change bounds	00_Calc_transUpp	Set/Get	1 to 255
11711	Filtered image	00_Calc_calcImage	Set/Get	0: Original image 1: Filtered image
11800	Operation type	00_MultiImg_kind	Set/Get	0: Arithmetic operation 1: Bit operation
11801	Target Image type	00_MultiImg_target-Kind2	Set/Get	0: Measure image 1: Pre filter image 2: Other unit image 3: Filtered image
11802	Unit	00_MultiImg_targetUnit2	Set/Get	-1 to 9,999
11803	Target No.	00_MultiImg_targetNo2	Set/Get	-1 to 15
11804	Operation mode	00_MultiImg_calcMode	Set/Get	0: Add 1: Subtraction 2: Subtraction (Absolute) 3: Multipication 4: Multipication (Normaliztion) 5: Average 6: Maximum 7: Minimum
11805	bitOperation mode	00_MultiImg_bitMode	Set/Get	0: AND 1: OR 2: XOR 3: NAND 4: NOR 5: XNOR
11806	Unit Image No.	00_MultiImg_unitIm-age2	Set/Get	0 to 3
11807	Filtered image	00_MultiImg_mul-tiImgImage	Set/Get	0: Original image 1: Filtered image
11900	Color inv.	00_Binary_invert	Set/Get	0: OFF 1: ON
11901	Upper limit of the binary level	00_Binary_upper	Set/Get	0 to 255

No.	Data Name	Ident	Set/Get	Data range
11902	Lower limit of the binary level	00_Binary_lower	Set/Get	0 to 255
11903	Filtered image	00_Binary_binaryImage	Set/Get	0: Original image 1: Filtered image
12000	Sub-Filter type	00_ColorGray_kind	Set/Get	0: RGB filter 1: HSV filter
12001	Sub-RGB filter	00_ColorGray_kind-Color	Set/Get	0: Red filter 1: Green filter 2: Blue filter 3: Cyan filter 4: Magenta filter 5: Yellow filter 6: Brightness filter (R+G+B) 7: Brightness filter (R+2G+B) 8: Custom filter
12002	Sub-Gain(Red)	00_ColorGray_gain0	Set/Get	0.0001 to 9.9999
12003	Sub-Gain(Green)	00_ColorGray_gain1	Set/Get	0.0001 to 9.9999
12004	Sub-Gain(Blue)	00_ColorGray_gain2	Set/Get	0.0001 to 9.9999
12005	Sub-HSV filter	00_ColorGray_kindColorGray	Set/Get	0: Fast 1: Fine
12006	Sub-Standard Hue	00_ColorGray_standardH	Set/Get	0 to 359
12007	Sub-Hue range	00_ColorGray_hueRange	Set/Get	10 to 180
12008	Sub-Upper Limit for Saturation	00_ColorGray_upperS	Set/Get	0 to 255
12009	Sub-Lower Limit for Saturation	00_ColorGray_lowerS	Set/Get	0 to 255
12010	Filtered image	00_ColorGray_colorGrayImage	Set/Get	0: Original image 1: Filtered image
12100	Fill profile	00_ColorExt_fill	Set/Get	0: OFF 1: Fill profile 2: Filling up holes
12101	Inverse presence	00_ColorExt_invert	Set/Get	0: OFF 1: ON
12102	Image type	00_ColorExt_imageKind	Set/Get	0 to 3
12103	Multiple selections	00_ColorExt_multiSelect	Set/Get	0: Multiselect NG 1: MultiSelect OK
12104	Output image	00_ColorExt_outputImage	Set/Get	0: Binary image 1: All color image
12110+N (N:0 to 7)	Usage flag	00_ColorExt_flag	Set/Get	0: Not used 1: Used
12118+N (N:0 to 7)	Flag for OR/NOT	00_ColorExt_orNo	Set/Get	0: OR 1: NOT
12126+N (N:0 to 7)	Min. color difference	00_ColorExt_lowH	Set/Get	0 to 359
12134+N (N:0 to 7)	Max. color difference	00_ColorExt_uppH	Set/Get	0 to 359

No.	Data Name	Ident	Set/Get	Data range
12142+N (N:0 to 7)	Min. saturation	00_ColorExt_lowS	Set/Get	0 to 255
12150+N (N:0 to 7)	Max. saturation	00_ColorExt_uppS	Set/Get	0 to 255
12158+N (N:0 to 7)	Min. brightness	00_ColorExt_lowV	Set/Get	0 to 255
12166+N (N:0 to 7)	Max. brightness	00_ColorExt_uppV	Set/Get	0 to 255
12174+N (N:0 to 7)	Background color	00_ColorExt_background	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
12200	Colour 1R	00_Even_colorR1	Set/Get	0 to 255
12201	Colour 1G	00_Even_colorG1	Set/Get	0 to 255
12202	Colour 1B	00_Even_colorB1	Set/Get	0 to 255
12203	Colour 2R	00_Even_colorR2	Set/Get	0 to 255
12204	Colour 2G	00_Even_colorG2	Set/Get	0 to 255
12205	Colour 2B	00_Even_colorB2	Set/Get	0 to 255
12212	Shading level	00_Even_evenLevel	Set/Get	0 to 255
12213	Direction	00_Even_mode	Set/Get	0: →← 1: → 2: ←
12214	Filtered image	00_Even_evenImage	Set/Get	0 to 1
12400	Defect color	00_Defect_filterType	Set/Get	1: White 2: Black 3: Black and White
12401	Mode	00_Defect_mode	Set/Get	0: Cross 1: Square
12403	Size	00_Defect_maskRadius	Set/Get	1 to 32
12404	Sampling interval	00_Defect_maskSpace	Set/Get	0 to 32
12405	Noise reduction	00_Defect_noise	Set/Get	0: OFF 1: ON
12406	Noise level	00_Defect_noiseLevel	Set/Get	0 to 128
12407	Gain	00_Defect_gain_double	Set/Get	0.1 to 20
12408	Filtered image	00_Defect_highContrastImage	Set/Get	0: Image prior to transfer 1: Image after transfer
12409	MouseX	00_Defect_mouseX	Set/Get	0 to 9,999
12410	MouseY	00_Defect_mouseY	Set/Get	0 to 9,999
12411	Profile display	00_Defect_profile	Set/Get	0: OFF 1: ON
12500	Mask Size	00_EvenEmpha_maskSize	Set/Get	1 to 64
12501	Normalize Method	00_EvenEmpha_nor	Set/Get	0: Normalization 1: Specified Value
12507	Range Min	00_EvenEmpha_lower	Set/Get	0 to 999,999,998
12508	Range Max	00_EvenEmpha_upper	Set/Get	1 to 999,999,999

No.	Data Name	Ident	Set/Get	Data range
12509	Filtered image	00_EvenEmpha_image	Set/Get	0: Original image 1: Filtered image
12600	Defect color	00_LineDetector_filterType	Set/Get	0: Black only 1: White only
12601	Direction	00_LineDetector_direction	Set/Get	0: Derection all 1: DirectionX 2: DirectionY 3: Diagonal (Upper right) 4: Diagonal (Lower right)
12605	Graininess level	00_LineDetector_extractionLevel	Set/Get	4.0 to 10.0
12606	Line size	00_LineDetector_lineSize	Set/Get	1 to 10
12607	Skipping	00_LineDetector_thinningNum	Set/Get	0 to 4
12608	Gain	00_LineDetector_gain	Set/Get	0.1 to 10.0
12609	Offset	00_LineDetector_offset	Set/Get	-255 to 255
12610	Filtered image	00_LineDetector_image	Set/Get	0: Original image 1: Filtered image
12611	Kernel size	00_LineDetector_filtKernelSize	Set/Get	2 to 5
12700	Defect color	00_CircleDetector_filterType	Set/Get	0: Black only 1: White only
12701	Skipping	00_CircleDetector_thinningNum	Set/Get	1 to 20
12702	Gain	00_CircleDetector_gain	Set/Get	0.1 to 10.0
12703	Detection level	00_CircleDetector_offset	Set/Get	0 to 255
12704	Filtered image	00_CircleDetector_image	Set/Get	0: Original image 1: Filtered image
12800	Count	00_Log_count	Set/Get	1 to 9
12801	Filter size	00_Log_filterSize	Set/Get	1 to 9
12803	Gain	00_Log_gain	Set/Get	0.1 to 20.0
12804	Offset	00_Log_offset	Set/Get	-255 to 255
12805	Filtered image	00_Log_image	Set/Get	0: Original image 1: Filtered image
12900	Count	00_Guided_count	Set/Get	1 to 9
12901	Filter size	00_Guided_filterSize	Set/Get	0 to 14
12902	Filter strength	00_Guided_filterStrength	Set/Get	1 to 100
12903	Skipping	00_Guided_thinningNum	Set/Get	0 to 2
12906	Filtered image	00_Guided_image	Set/Get	0: Original image 1: Filtered image
13000	Mask Size	00_WeekSmooth_maskSize	Set/Get	0:3X3 1:5X5
13001	Count	00_WeekSmooth_count	Set/Get	1 to 9
13002	Filtered image	00_WeekSmooth_weeksmoothImage	Set/Get	0: Original image 1: Filtered image
13100	Mask Size	00_StrongSmooth_maskSize	Set/Get	0: 3X3 1: 5X5

No.	Data Name	Ident	Set/Get	Data range
13101	Count	00_Strong-Smooth_count	Set/Get	1 to 9
13102	Filtered image	00_StrongSmooth_image	Set/Get	0: Original image 1: Filtered image
13200	Mask Size	00_Dilate_maskSize	Set/Get	0: 3×3 1: 5×5
13201	Count	00_Dilate_count	Set/Get	1 to 9
13202	Filtered image	00_Dilate_dilateImage	Set/Get	0: Original image 1: Filtered image
13300	Mask Size	00_Erosion_maskSize	Set/Get	0: 3×3 1: 5×5
13301	Count	00_Erosion_count	Set/Get	1 to 9
13302	Filtered image	00_Erosion_erosionImage	Set/Get	0: Original image 1: Filtered image
13400	Mask Size	00_Median_maskSize	Set/Get	0: 3×3 1: 5×5
13401	Count	00_Median_count	Set/Get	1 to 9
13402	Filtered image	00_Median_medianImage	Set/Get	0: Original image 1: Filtered image
13500	Mask Size	00_ExtractEdges_maskSize	Set/Get	0: 3×3 1: 5×5
13501	Count	00_ExtractEdges_count	Set/Get	1 to 9
13502	Filtered image	00_ExtractEdges_image	Set/Get	0: Original image 1: Filtered image
13600	Mask Size	00_ExtractHorizonEdges_maskSize	Set/Get	0: 3×3 1: 5×5
13601	Count	00_ExtractHorizonEdges_count	Set/Get	1 to 9
13602	Filtered image	00_ExtractHorizonEdges_image	Set/Get	0: Original image 1: Filtered image
13700	Mask Size	00_ExtractVerticalEdges_maskS	Set/Get	0: 3×3 1: 5×5
13701	Count	00_ExtractVerticalEdges_count	Set/Get	1 to 9
13702	Filtered image	00_ExtractVerticalEdges_image	Set/Get	0: Original image 1: Filtered image
13800	Mask Size	00_EdgeEmphasis_maskSize	Set/Get	0: 3×3 1: 5×5
13801	Count	00_EdgeEmphasis_count	Set/Get	1 to 9
13802	Filtered image	00_EdgeEmphasis_image	Set/Get	0: Original image 1: Filtered image
13900	Count	00_Prewitt_count	Set/Get	1 to 9
13901	Filtered image	00_Prewitt_prewittImage	Set/Get	0: Original image 1: Filtered image
14000	Count	00_Roberts_count	Set/Get	1 to 9
14001	Filtered image	00_Roberts_robertsImage	Set/Get	0: Original image 1: Filtered image
14100	Count	00_Laplacian_count	Set/Get	1 to 9
14101	Filtered image	00_Laplacian_laplacianImage	Set/Get	0: Original image 1: Filtered image

No.	Data Name	Ident	Set/Get	Data range
15200	Background Suppression Mode	01_Halation_colorMode	Set/Get	0: RGB common 1: RGB individual
15201	Lower limit of RGB common	01_Halation_lowCommon	Set/Get	0 to 255
15202	Upper limit of RGB common	01_Halation_uppCommon	Set/Get	0 to 255
15203	Lower limit R of RGB individual	01_Halation_lowRed	Set/Get	0 to 255
15204	Upper limit R of RGB individual	01_Halation_uppRed	Set/Get	0 to 255
15205	Lower limit G of RGB individual	01_Halation_lowGreen	Set/Get	0 to 255
15206	Upper limit G of RGB individual	01_Halation_uppGreen	Set/Get	0 to 255
15207	Lower limit B of RGB individual	01_Halation_lowBlue	Set/Get	0 to 255
15208	Upper limit B of RGB individual	01_Halation_uppBlue	Set/Get	0 to 255
15209	Lower limit of Gray	01_Halation_lowGray	Set/Get	0 to 255
15210	Upper limit of Gray	01_Halation_uppGray	Set/Get	0 to 255
15211	Filtered image	01_Halation_halationImage	Set/Get	0: Original image 1: Filtered image
15300	Uneven removal	01_Shading_unevenRemove	Set/Get	0: OFF 1: ON
15301	Filter direction	01_Shading_direction	Set/Get	0: H&V 1: Horizontal 2: Vertical
15302	Filter size(Odd)	01_Shading_filterSize	Set/Get	3 to 255
15303	Gain	01_Shading_gain	Set/Get	1 to 63
15304	Offset	01_Shading_offset	Set/Get	0 to 255
15305	Filtered image	01_Shading_shadingImage	Set/Get	0: Original image 1: Filtered image
15400	Method	01_Rank2_correctMethod	Set/Get	0: Thick stripe off (morphology difference) 1: Pinstripe off (morphology)
15401	Filter direction	01_Rank2_direction	Set/Get	0: H&V 1: Horizontal 2: Vertical 3: Diagonal (upper right) 4: Diagonal (lower right)
15402	Filter size(Odd)	01_Rank2_filterSize	Set/Get	3 to 63
15403	Brightness	01_Rank2_defectBright	Set/Get	0: Light and Dark 1: Light 2: Dark
15404	Gain	01_Rank2_gain	Set/Get	1 to 63
15405	Offset	01_Rank2_offset	Set/Get	0 to 255
15406	Filtered image	01_Rank2_rank2Image	Set/Get	0: Original image 1: Filtered image
15500	Color inv.	01_Labeling_invert	Set/Get	0: OFF 1: ON
15501	Upper limit of the binary level	01_Labeling_upperLevel	Set/Get	0 to 255

No.	Data Name	Ident	Set/Get	Data range
15502	Lower limit of the binary level	01_Labeling_lowerLevel	Set/Get	0 to 255
15503	Outside trimming	01_Labeling_cutOut	Set/Get	0: OFF 1: ON
15504	Filling up holes	01_Labeling_holePlug	Set/Get	0: OFF 1: ON
15505	Specify label No.	01_Labeling_labelSelect	Set/Get	0: All 1: Specify No.
15506	Label No.	01_Labeling_labelNo	Set/Get	0 to 2,499
15507	Extraction condition	01_Labeling_extOperant	Set/Get	0: AND 1: OR
15508	Label maximum	01_Labeling_maxLabelNum	Set/Get	1 to 9,999
15509	Sort condition	01_Labeling_sortMode	Set/Get	0 to 43
15510	Output image	01_Labeling_outputImage	Set/Get	0: Binary image 1: Extract image
15511	Multiple selections	01_Labeling_multiSelect	Set/Get	0: Multiselect NG 1: MultiSelect OK
15512	ImageKind	01_Labeling_imageKind	Set/Get	0: Measurement image 1: All color image 2: Selection color image 3: Binary image
15520	Color	01_Labeling_flag	Set/Get	0: Not used 1: Used
15530	Flag for OR/NOT	01_Labeling_orNo	Set/Get	0: OR 1: NOT
15540	Min. color difference	01_Labeling_lowH	Set/Get	0 to 359
15550	Max. color difference	01_Labeling_uppH	Set/Get	0 to 359
15560	Min. saturation	01_Labeling_lowS	Set/Get	0 to 255
15570	Max. saturation	01_Labeling_uppS	Set/Get	0 to 255
15580	Min. brightness	01_Labeling_lowV	Set/Get	0 to 255
15590	Max. brightness	01_Labeling_uppV	Set/Get	0 to 255
15600	No. of extraction conditions	01_Labeling_extNum	Set/Get	1 to 8
15610	Judgement condition	01_Labeling_extKind	Set/Get	0 to 17
15630	Lower limit for judge condition	01_Labeling_extMin	Set/Get	-999,999,999.9999 to 999,999,999.9999
15650	Upper limit for judge condition	01_Labeling_extMax	Set/Get	-999,999,999.9999 to 999,999,999.9999
15660	Background color	01_Labeling_background	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
15668	Filtered image	01_Labeling_labelingImage	Set/Get	0: Original image 1: Filtered image
15675	Mode	01_Labeling_neighborhoodMode	Set/Get	0: 4-neighbor 1: 8-neighbor
15700	Count	01_CustomLine_count	Set/Get	1 to 9

No.	Data Name	Ident	Set/Get	Data range
15701	Mask Size	01_CustomLine_mask-Size	Set/Get	0: 3×3 1: 5×5 2: 7×7 3: 9×9 4: 11×11 5: 13×13 6: 15×15 7: 17×17 8: 19×19 9: 21×21
15702	Filter divisor	01_CustomLine_div	Set/Get	0.0001 to 99,999.9999
15703	Offset	01_CustomLine_offset	Set/Get	-255 to 255
15704	Minus number	01_CustomLine_kind	Set/Get	0: Rounding 1: Absolute
15710+N (N:0 to 440)	Filter Coefficient	01_CustomLine_coef	Set/Get	-128 to 127
16151	Filtered image	01_CustomLine_customLineImage	Set/Get	0: Original image 1: Filtered image
16201	Mask Size	01_CustomRank_mask-Size	Set/Get	0: 3×3 1: 5×5 2: 7×7 3: 9×9 4: 11×11 5: 13×13 6: 15×15 7: 17×17 8: 19×19 9: 21×21
16202	Mode	01_CustomRank_kind	Set/Get	0: Dilate 1: Erosion
16210+N (N:0 to 440)	Filter Coefficient	01_CustomRank_coef	Set/Get	0 to 1
16651	Filtered image	01_CustomRank_customRankImage	Set/Get	0: Original image 1: Filtered image
16700	Operation type	01_Calc_kind	Set/Get	0: Arithmetic operation 1: Bit operation 2: Bit shift 3: Change pixel value
16701	Arithmetic mode	01_Calc_calcMode	Set/Get	0: Add 1: Subtraction 2: Subtraction(Absolute) 3: Multipication
16702	Arithmetic	01_Calc_calcValue	Set/Get	0 to 255

No.	Data Name	Ident	Set/Get	Data range
16703	Operation mode	01_Calc_bitMode	Set/Get	0: NOT 1: AND 2: OR 3: XOR 4: NAND 5: NOR 6: XNOR
16704	Value	01_Calc_bitValue	Set/Get	0 to 255
16705	Bit shift mode	01_Calc_shiftMode	Set/Get	0: Right Bit shift 1: Left Bit shift
16706	Shift value	01_Calc_shiftValue	Set/Get	1 to 8
16707	Change mode	01_Calc_transMode	Set/Get	0: Change inside bounds 1: Change outside bounds
16708	Change value	01_Calc_transValue	Set/Get	1 to 255
16709	Lower limit of Change bounds	01_Calc_transLow	Set/Get	1 to 255
16710	Upper limit of Change bounds	01_Calc_transUpp	Set/Get	1 to 255
16711	Filtered image	01_Calc_calcImage	Set/Get	0: Original image 1: Filtered image
16800	Operation type	01_MultiImg_kind	Set/Get	0: Arithmetic operation 1: Bit operation
16801	Target Image type	01_MultiImg_target-Kind2	Set/Get	0: Measure image 1: Pre filter image 2: Other unit image 3: Filtered image
16802	Unit	01_MultiImg_targetUnit2	Set/Get	-1 to 9,999
16803	Target No.	01_MultiImg_targetNo2	Set/Get	-1 to 15
16804	Operation mode	01_MultiImg_calcMode	Set/Get	0: Add 1: Subtraction 2: Subtraction(Absolute) 3: Multipication 4: Multipication(Normaliztion) 5: Average 6: Maximum 7: Minimum
16805	bitOperation mode	01_MultiImg_bitMode	Set/Get	0: AND 1: OR 2: XOR 3: NAND 4: NOR 5: XNOR
16806	Unit Image No.	01_MultiImg_unitIm-age2	Set/Get	0 to 3
16807	Filtered image	01_MultiImg_mul-tiImgImage	Set/Get	0: Original image 1: Filtered image
16900	Color inv.	01_Binary_invert	Set/Get	0: OFF 1: ON
16901	Upper limit of the binary level	01_Binary_upper	Set/Get	0 to 255

No.	Data Name	Ident	Set/Get	Data range
16902	Lower limit of the binary level	01_Binary_lower	Set/Get	0 to 255
16903	Filtered image	01_Binary_binaryImage	Set/Get	0: Original image 1: Filtered image
17000	Sub-Filter type	01_ColorGray_kind	Set/Get	0: RGB filter 1: HSV filter
17001	Sub-RGB filter	01_ColorGray_kind-Color	Set/Get	0: Red filter 1: Green filter 2: Blue filter 3: Cyan filter 4: Magenta filter 5: Yellow filter 6: Brightness filter (R+G+B) 7: Brightness filter (R+2G+B) 8: Custom filter
17002	Sub-Gain(Red)	01_ColorGray_gain0	Set/Get	0.0001 to 9.9999
17003	Sub-Gain(Green)	01_ColorGray_gain1	Set/Get	0.0001 to 9.9999
17004	Sub-Gain(Blue)	01_ColorGray_gain2	Set/Get	0.0001 to 9.9999
17005	Sub-HSV filter	01_ColorGray_kindColorGray	Set/Get	0: Fast 1: Fine
17006	Sub-Standard Hue	01_ColorGray_standardH	Set/Get	0 to 359
17007	Sub-Hue range	01_ColorGray_hueRange	Set/Get	10 to 180
17008	Sub-Upper Limit for Saturation	01_ColorGray_upperS	Set/Get	0 to 255
17009	Sub-Lower Limit for Saturation	01_ColorGray_lowerS	Set/Get	0 to 255
17010	Filtered image	01_ColorGray_colorGrayImage	Set/Get	0: Original image 1: Filtered image
17100	Fill profile	01_ColorExt_fill	Set/Get	0: OFF 1: Fill profile 2: Filling up holes
17101	Inverse presence	01_ColorExt_invert	Set/Get	0: OFF 1: ON
17102	Image type	01_ColorExt_imageKind	Set/Get	0 to 3
17103	Multiple selections	01_ColorExt_multiSelect	Set/Get	0: Multiselect NG 1: MultiSelect OK
17104	Output image	01_ColorExt_outputImage	Set/Get	0: Binary image 1: All color image
17110	Usage flag	01_ColorExt_flag	Set/Get	0: Not used 1: Used
17118	Flag for OR/NOT	01_ColorExt_orNo	Set/Get	0: OR 1: NOT
17126	Min. color difference	01_ColorExt_lowH	Set/Get	0 to 359
17134	Max. color difference	01_ColorExt_uppH	Set/Get	0 to 359
17142	Min. saturation	01_ColorExt_lowS	Set/Get	0 to 255
17150	Max. saturation	01_ColorExt_uppS	Set/Get	0 to 255
17158	Min. brightness	01_ColorExt_lowV	Set/Get	0 to 255
17166	Max. brightness	01_ColorExt_uppV	Set/Get	0 to 255

No.	Data Name	Ident	Set/Get	Data range
17174	Background color	01_ColorExt_background	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
17200	Colour 1R	01_Even_colorR1	Set/Get	0 to 255
17201	Colour 1G	01_Even_colorG1	Set/Get	0 to 255
17202	Colour 1B	01_Even_colorB1	Set/Get	0 to 255
17203	Colour 2R	01_Even_colorR2	Set/Get	0 to 255
17204	Colour 2G	01_Even_colorG2	Set/Get	0 to 255
17205	Colour 2B	01_Even_colorB2	Set/Get	0 to 255
17212	Shading level	01_Even_evenLevel	Set/Get	0 to 255
17213	Direction	01_Even_mode	Set/Get	0: →← 1: → 2: ←
17214	Filtered image	01_Even_evenImage	Set/Get	0 to 1
17400	Defect color	01_Defect_filterType	Set/Get	1: White 2: Black 3: Black and White
17401	Mode	01_Defect_mode	Set/Get	0: Cross 1: Square
17403	Size	01_Defect_maskRadius	Set/Get	1 to 32
17404	Sampling interval	01_Defect_maskSpace	Set/Get	0 to 32
17405	Noise reduction	01_Defect_noise	Set/Get	0: OFF 1: ON
17406	Noise level	01_Defect_noiseLevel	Set/Get	0 to 128
17407	Gain	01_Defect_gain_double	Set/Get	0.1 to 20
17408	Filtered image	01_Defect_highContrastImage	Set/Get	0: Image prior to transfer 1: Image after transfer
17409	MouseX	01_Defect_mouseX	Set/Get	0 to 9,999
17410	MouseY	01_Defect_mouseY	Set/Get	0 to 9,999
17411	Profile display	01_Defect_profile	Set/Get	0: OFF 1: ON
17500	Mask Size	01_EvenEmpha_maskSize	Set/Get	1 to 64
17501	Normalize Method	01_EvenEmpha_nor	Set/Get	0: Normalization 1: Specified Value
17507	Range Min	01_EvenEmpha_lower	Set/Get	0 to 999,999,998
17508	Range Max	01_EvenEmpha_upper	Set/Get	1 to 999,999,999
17509	Filtered image	01_EvenEmpha_image	Set/Get	0: Original image 1: Filtered image
17600	Defect color	01_LineDetector_filterType	Set/Get	0: Black only 1: White only
17601	Direction	01_LineDetector_direction	Set/Get	0: Derection all 1: DirectionX 2: DirectionY 3: Diagonal (Upper right) 4: Diagonal (Lower right)
17605	Graininess level	01_LineDetector_extractionLevel	Set/Get	4.0 to 10.0

No.	Data Name	Ident	Set/Get	Data range
17606	Line size	01_LineDetector_lineSize	Set/Get	1 to 10
17607	Skipping	01_LineDetector_thinningNum	Set/Get	0 to 4
17608	Gain	01_LineDetector_gain	Set/Get	0.1 to 10.0
17609	Offset	01_LineDetector_offset	Set/Get	-255 to 255
17610	Filtered image	01_LineDetector_image	Set/Get	0: Original image 1: Filtered image
17611	Kernel size	01_LineDetector_filtKernelSize	Set/Get	2 to 5
17700	Defect color	01_CircleDetector_filterType	Set/Get	0: Black only 1: White only
17701	Skipping	01_CircleDetector_thinningNum	Set/Get	1 to 20
17702	Gain	01_CircleDetector_gain	Set/Get	0.1 to 10.0
17703	Detection level	01_CircleDetector_offset	Set/Get	0 to 255
17704	Filtered image	01_CircleDetector_image	Set/Get	0: Original image 1: Filtered image
17800	Count	01_Log_count	Set/Get	1 to 9
17801	Filter size	01_Log_filterSize	Set/Get	1 to 9
17803	Gain	01_Log_gain	Set/Get	0.1 to 20.0
17804	Offset	01_Log_offset	Set/Get	-255 to 255
17805	Filtered image	01_Log_image	Set/Get	0: Original image 1: Filtered image
17900	Count	01_Guided_count	Set/Get	1 to 9
17901	Filter size	01_Guided_filterSize	Set/Get	0 to 14
17902	Filter strength	01_Guided_filterStrength	Set/Get	1 to 100
17903	Skipping	01_Guided_thinningNum	Set/Get	0 to 2
17906	Filtered image	01_Guided_image	Set/Get	0: Original image 1: Filtered image
18000	Mask Size	01_WeekSmooth_maskSize	Set/Get	0: 3×3 1: 5×5
18001	Count	01_WeekSmooth_count	Set/Get	1 to 9
18002	Filtered image	01_WeekSmooth_weeksmoothImage	Set/Get	0: Original image 1: Filtered image
18100	Mask Size	01_StrongSmooth_maskSize	Set/Get	0: 3×3 1: 5×5
18101	Count	01_StrongSmooth_count	Set/Get	1 to 9
18102	Filtered image	01_StrongSmooth_image	Set/Get	0: Original image 1: Filtered image
18200	Mask Size	01_Dilate_maskSize	Set/Get	0: 3×3 1: 5×5
18201	Count	01_Dilate_count	Set/Get	1 to 9
18202	Filtered image	01_Dilate_dilateImage	Set/Get	0: Original image 1: Filtered image
18300	Mask Size	01_Erosion_maskSize	Set/Get	0: 3×3 1: 5×5
18301	Count	01_Erosion_count	Set/Get	1 to 9

No.	Data Name	Ident	Set/Get	Data range
18302	Filtered image	01_Erosion_erosionImage	Set/Get	0: Original image 1: Filtered image
18400	Mask Size	01_Median_maskSize	Set/Get	0: 3×3 1: 5×5
18401	Count	01_Median_count	Set/Get	1 to 9
18402	Filtered image	01_Median_medianImage	Set/Get	0: Original image 1: Filtered image
18500	Mask Size	01_ExtractEdges_maskSize	Set/Get	0: 3×3 1: 5×5
18501	Count	01_ExtractEdges_count	Set/Get	1 to 9
18502	Filtered image	01_ExtractEdges_image	Set/Get	0: Original image 1: Filtered image
18600	Mask Size	01_ExtractHorizonEdges_maskSize	Set/Get	0: 3×3 1: 5×5
18601	Count	01_ExtractHorizonEdges_count	Set/Get	1 to 9
18602	Filtered image	01_ExtractHorizonEdges_image	Set/Get	0: Original image 1: Filtered image
18700	Mask Size	01_ExtractVerticalEdges_maskS	Set/Get	0: 3×3 1: 5×5
18701	Count	01_ExtractVerticalEdges_count	Set/Get	1 to 9
18702	Filtered image	01_ExtractVerticalEdges_image	Set/Get	0: Original image 1: Filtered image
18800	Mask Size	01_EdgeEmphasis_maskSize	Set/Get	0: 3×3 1: 5×5
18801	Count	01_EdgeEmphasis_count	Set/Get	1 to 9
18802	Filtered image	01_EdgeEmphasis_image	Set/Get	0: Original image 1: Filtered image
18900	Count	01_Prewitt_count	Set/Get	1 to 9
18901	Filtered image	01_Prewitt_prewittImage	Set/Get	0: Original image 1: Filtered image
19000	Count	01_Roberts_count	Set/Get	1 to 9
19001	Filtered image	01_Roberts_robertsImage	Set/Get	0: Original image 1: Filtered image
19100	Count	01_Laplacian_count	Set/Get	1 to 9
19101	Filtered image	01_Laplacian_laplacianImage	Set/Get	0: Original image 1: Filtered image
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85200	Background Suppression Mode	15_Halation_colorMode	Set/Get	0: RGB common 1: RGB individual
85201	Lower limit of RGB common	15_Halation_lowCommon	Set/Get	0 to 255
85202	Upper limit of RGB common	15_Halation_uppCommon	Set/Get	0 to 255
85203	Lower limit R of RGB individual	15_Halation_lowRed	Set/Get	0 to 255
85204	Upper limit R of RGB individual	15_Halation_uppRed	Set/Get	0 to 255

No.	Data Name	Ident	Set/Get	Data range
85205	Lower limit G of RGB individual	15_Halation_lowGreen	Set/Get	0 to 255
85206	Upper limit G of RGB individual	15_Halation_uppGreen	Set/Get	0 to 255
85207	Lower limit B of RGB individual	15_Halation_lowBlue	Set/Get	0 to 255
85208	Upper limit B of RGB individual	15_Halation_uppBlue	Set/Get	0 to 255
85209	Lower limit of Gray	15_Halation_lowGray	Set/Get	0 to 255
85210	Upper limit of Gray	15_Halation_uppGray	Set/Get	0 to 255
85211	Filtered image	15_Halation_halationImage	Set/Get	0: Original image 1: Filtered image
85300	Uneven removal	15_Shading_unevenRemove	Set/Get	0: OFF 1: ON
85301	Filter direction	15_Shading_direction	Set/Get	0: H&V 1: Horizontal 2: Vertical
85302	Filter size(Odd)	15_Shading_filterSize	Set/Get	3 to 255
85303	Gain	15_Shading_gain	Set/Get	1 to 63
85304	Offset	15_Shading_offset	Set/Get	0 to 255
85305	Filtered image	15_Shading_shadingImage	Set/Get	0: Original image 1: Filtered image
85400	Method	15_Rank2_correctMethod	Set/Get	0: Thick stripe off (morphology difference) 1: Pinstripe off (morphology)
85401	Filter direction	15_Rank2_direction	Set/Get	0: H&V 1: Horizontal 2: Vertical 3: Diagonal (upper right) 4: Diagonal (lower right)
85402	Filter size(Odd)	15_Rank2_filterSize	Set/Get	3 to 63
85403	Brightness	15_Rank2_defectBright	Set/Get	0: Light and Dark 1: Light 2: Dark
85404	Gain	15_Rank2_gain	Set/Get	1 to 63
85405	Offset	15_Rank2_offset	Set/Get	0 to 255
85406	Filtered image	15_Rank2_rank2Image	Set/Get	0: Original image 1: Filtered image
85500	Color inv.	15_Labeling_invert	Set/Get	0: OFF 1: ON
85501	Upper limit of the binary level	15_Labeling_upperLevel	Set/Get	0 to 255
85502	Lower limit of the binary level	15_Labeling_lowerLevel	Set/Get	0 to 255
85503	Outside trimming	15_Labeling_cutOut	Set/Get	0: OFF 1: ON
85504	Filling up holes	15_Labeling_holePlug	Set/Get	0: OFF 1: ON
85505	Specify label No.	15_Labeling_labelSelect	Set/Get	0: All 1: Specify No.
85506	Label No.	15_Labeling_labelNo	Set/Get	0 to 2,499

No.	Data Name	Ident	Set/Get	Data range
85507	Extraction condition	15_Labeling_extOperant	Set/Get	0: AND 1: OR
85508	Label maximum	15_Labeling_maxLabelNum	Set/Get	1 to 9,999
85509	Sort condition	15_Labeling_sortMode	Set/Get	0 to 43
85510	Output image	15_Labeling_outputImage	Set/Get	0: Binary image 1: Extract image
85511	Multiple selections	15_Labeling_multiSelect	Set/Get	0: Multiselect NG 1: MultiSelect OK
85512	ImageKind	15_Labeling_imageKind	Set/Get	0: Measurement image 1: All color image 2: Selection color image 3: Binary image
85520+N (N:0 to 7)	Color	15_Labeling_flag	Set/Get	0: Not used 1: Used
85530+N (N:0 to 7)	Flag for OR/NOT	15_Labeling_orNo	Set/Get	0: OR 1: NOT
85540+N (N:0 to 7)	Min. color difference	15_Labeling_lowH	Set/Get	0 to 359
85550+N (N:0 to 7)	Max. color difference	15_Labeling_uppH	Set/Get	0 to 359
85560+N (N:0 to 7)	Min. saturation	15_Labeling_lowS	Set/Get	0 to 255
85570+N (N:0 to 7)	Max. saturation	15_Labeling_uppS	Set/Get	0 to 255
85580+N (N:0 to 7)	Min. brightness	15_Labeling_lowV	Set/Get	0 to 255
85590+N (N:0 to 7)	Max. brightness	15_Labeling_uppV	Set/Get	0 to 255
85600	No. of extraction conditions	15_Labeling_extNum	Set/Get	1 to 8
85610	Judgement condition	15_Labeling_extKind	Set/Get	0 to 17
85630	Lower limit for judge condition	15_Labeling_extMin	Set/Get	-999,999,999.9999 to 999,999,999.9999
85650	Upper limit for judge condition	15_Labeling_extMax	Set/Get	-999,999,999.9999 to 999,999,999.9999
85660	Background color	15_Labeling_background	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
85668	Filtered image	15_Labeling_labelingImage	Set/Get	0: Original image 1: Filtered image
85675	Mode	15_Labeling_neighborhoodMode	Set/Get	0: 4-neighbor 1: 8-neighbor

No.	Data Name	Ident	Set/Get	Data range
85700	Count	15_CustomLine_count	Set/Get	1 to 9
85701	Mask Size	15_CustomLine_mask-Size	Set/Get	0: 3×3 1: 5×5 2: 7×7 3: 9×9 4: 11×11 5: 13×13 6: 15×15 7: 17×17 8: 19×19 9: 21×21
85702	Filter divisor	15_CustomLine_div	Set/Get	0.0001 to 99,999.9999
85703	Offset	15_CustomLine_offset	Set/Get	-255 to 255
85704	Minus number	15_CustomLine_kind	Set/Get	0: Rounding 1: Absolute
85710+N (N:0 to 440)	Filter Coefficient	15_CustomLine_coef	Set/Get	-128 to 127
86151	Filtered image	15_CustomLine_customLineImage	Set/Get	0: Original image 1: Filtered image
86201	Mask Size	15_CustomRank_mask-Size	Set/Get	0: 3×3 1: 5×5 2: 7×7 3: 9×9 4: 11×11 5: 13×13 6: 15×15 7: 17×17 8: 19×19 9: 21×21
86202	Mode	15_CustomRank_kind	Set/Get	0: Dilate 1: Erosion
86210+N (N:0 to 440)	Filter Coefficient	15_CustomRank_coef	Set/Get	0 to 1
86651	Filtered image	15_CustomRank_customRankImage	Set/Get	0: Original image 1: Filtered image
86700	Operation type	15_Calc_kind	Set/Get	0: Arithmetic operation 1: Bit operation 2: Bit shift 3: Change pixel value
86701	Arithmetic mode	15_Calc_calcMode	Set/Get	0: Add 1: Subtraction 2: Subtraction (Absolute) 3: Multipication
86702	Arithmetic	15_Calc_calcValue	Set/Get	0 to 255

No.	Data Name	Ident	Set/Get	Data range
86703	Operation mode	15_Calc_bitMode	Set/Get	0: NOT 1: AND 2: OR 3: XOR 4: NAND 5: NOR 6: XNOR
86704	Value	15_Calc_bitValue	Set/Get	0 to 255
86705	Bit shift mode	15_Calc_shiftMode	Set/Get	0: Right Bit shift 1: Left Bit shift
86706	Shift value	15_Calc_shiftValue	Set/Get	1 to 8
86707	Change mode	15_Calc_transMode	Set/Get	0: Change inside bounds 1: Change outside bounds
86708	Change value	15_Calc_transValue	Set/Get	1 to 255
86709	Lower limit of Change bounds	15_Calc_transLow	Set/Get	1 to 255
86710	Upper limit of Change bounds	15_Calc_transUpp	Set/Get	1 to 255
86711	Filtered image	15_Calc_calcImage	Set/Get	0: Original image 1: Filtered image
86800	Operation type	15_MultiImg_kind	Set/Get	0: Arithmetic operation 1: Bit operation
86801	Target Image type	15_MultiImg_target-Kind2	Set/Get	0: Measure image 1: Pre filter image 2: Other unit image 3: Filtered image
86802	Unit	15_MultiImg_targetUnit2	Set/Get	-1 to 9,999
86803	Target No.	15_MultiImg_targetNo2	Set/Get	-1 to 15
86804	Operation mode	15_MultiImg_calcMode	Set/Get	0: Add 1: Subtraction 2: Subtraction (Absolute) 3: Multipication 4: Multipication (Normaliztion) 5: Average 6: Maximum 7: Minimum
86805	bitOperation mode	15_MultiImg_bitMode	Set/Get	0: AND 1: OR 2: XOR 3: NAND 4: NOR 5: XNOR
86806	Unit Image No.	15_MultiImg_unitIm-age2	Set/Get	0 to 3
86807	Filtered image	15_MultiImg_mul-tiImgImage	Set/Get	0: Original image 1: Filtered image
86900	Color inv.	15_Binary_invert	Set/Get	0: OFF 1: ON
86901	Upper limit of the binary level	15_Binary_upper	Set/Get	0 to 255

No.	Data Name	Ident	Set/Get	Data range
86902	Lower limit of the binary level	15_Binary_lower	Set/Get	0 to 255
86903	Filtered image	15_Binary_binaryImage	Set/Get	0: Original image 1: Filtered image
87000	Sub-Filter type	15_ColorGray_kind	Set/Get	0: RGB filter 1: HSV filter
87001	Sub-RGB filter	15_ColorGray_kind-Color	Set/Get	0: Red filter 1: Green filter 2: Blue filter 3: Cyan filter 4: Magenta filter 5: Yellow filter 6: Brightness filter (R+G+B) 7: Brightness filter (R+2G+B) 8: Custom filter
87002	Sub-Gain(Red)	15_ColorGray_gain0	Set/Get	0.0001 to 9.9999
87003	Sub-Gain(Green)	15_ColorGray_gain1	Set/Get	0.0001 to 9.9999
87004	Sub-Gain(Blue)	15_ColorGray_gain2	Set/Get	0.0001 to 9.9999
87005	Sub-HSV filter	15_ColorGray_kindColorGray	Set/Get	0: Fast 1: Fine
87006	Sub-Standard Hue	15_ColorGray_standardH	Set/Get	0 to 359
87007	Sub-Hue range	15_ColorGray_hueRange	Set/Get	10 to 180
87008	Sub-Upper Limit for Saturation	15_ColorGray_upperS	Set/Get	0 to 255
87009	Sub-Lower Limit for Saturation	15_ColorGray_lowerS	Set/Get	0 to 255
87010	Filtered image	15_ColorGray_colorGrayImage	Set/Get	0: Original image 1: Filtered image
87100	Fill profile	15_ColorExt_fill	Set/Get	0: OFF 1: Fill profile 2: Filling up holes
87101	Inverse presence	15_ColorExt_invert	Set/Get	0: OFF 1: ON
87102	Image type	15_ColorExt_imageKind	Set/Get	0 to 3
87103	Multiple selections	15_ColorExt_multiSelect	Set/Get	0: Multiselect NG 1: MultiSelect OK
87104	Output image	15_ColorExt_outputImage	Set/Get	0: Binary image 1: All color image
87110	Usage flag	15_ColorExt_flag	Set/Get	0: Not used 1: Used
87118	Flag for OR/NOT	15_ColorExt_orNo	Set/Get	0: OR 1: NOT
87126	Min. color difference	15_ColorExt_lowH	Set/Get	0 to 359
87134	Max. color difference	15_ColorExt_uppH	Set/Get	0 to 359
87142	Min. saturation	15_ColorExt_lowS	Set/Get	0 to 255
87150	Max. saturation	15_ColorExt_uppS	Set/Get	0 to 255
87158	Min. brightness	15_ColorExt_lowV	Set/Get	0 to 255
87166	Max. brightness	15_ColorExt_uppV	Set/Get	0 to 255

No.	Data Name	Ident	Set/Get	Data range
87174	Background color	15_ColorExt_background	Set/Get	0: Black 1: White 2: Red 3: Green 4: Blue
87200	Colour 1R	15_Even_colorR1	Set/Get	0 to 255
87201	Colour 1G	15_Even_colorG1	Set/Get	0 to 255
87202	Colour 1B	15_Even_colorB1	Set/Get	0 to 255
87203	Colour 2R	15_Even_colorR2	Set/Get	0 to 255
87204	Colour 2G	15_Even_colorG2	Set/Get	0 to 255
87205	Colour 2B	15_Even_colorB2	Set/Get	0 to 255
87212	Shading level	15_Even_evenLevel	Set/Get	0 to 255
87213	Direction	15_Even_mode	Set/Get	0: →← 1: → 2: ←
87214	Filtered image	15_Even_evenImage	Set/Get	0 to 1
87400	Defect color	15_Defect_filterType	Set/Get	1: White 2: Black 3: Black and White
87401	Mode	15_Defect_mode	Set/Get	0: Cross 1: Square
87403	Size	15_Defect_maskRadius	Set/Get	1 to 32
87404	Sampling interval	15_Defect_maskSpace	Set/Get	0 to 32
87405	Noise reduction	15_Defect_noise	Set/Get	0: OFF 1: ON
87406	Noise level	15_Defect_noiseLevel	Set/Get	0 to 128
87407	Gain	15_Defect_gain_double	Set/Get	0.1 to 20
87408	Filtered image	15_Defect_highContrastImage	Set/Get	0: Image prior to transfer 1: Image after transfer
87409	MouseX	15_Defect_mouseX	Set/Get	0 to 9,999
87410	MouseY	15_Defect_mouseY	Set/Get	0 to 9,999
87411	Profile display	15_Defect_profile	Set/Get	0: OFF 1: ON
87500	Mask Size	15_EvenEmpha_maskSize	Set/Get	1 to 64
87501	Normalize Method	15_EvenEmpha_nor	Set/Get	0: Normalization 1: Specified Value
87507	Range Min	15_EvenEmpha_lower	Set/Get	0 to 999,999,998
87508	Range Max	15_EvenEmpha_upper	Set/Get	1 to 999,999,999
87509	Filtered image	15_EvenEmpha_image	Set/Get	0: Original image 1: Filtered image
87600	Defect color	15_LineDetector_filterType	Set/Get	0: Black only 1: White only
87601	Direction	15_LineDetector_direction	Set/Get	0: Derection all 1: DirectionX 2: DirectionY 3: Diagonal (Upper right) 4: Diagonal (Lower right)
87605	Graininess level	15_LineDetector_extractionLevel	Set/Get	4.0 to 10.0

No.	Data Name	Ident	Set/Get	Data range
87606	Line size	15_LineDetector_lineSize	Set/Get	1 to 10
87607	Skipping	15_LineDetector_thinningNum	Set/Get	0 to 4
87608	Gain	15_LineDetector_gain	Set/Get	0.1 to 10.0
87609	Offset	15_LineDetector_offset	Set/Get	-255 to 255
87610	Filtered image	15_LineDetector_image	Set/Get	0: Original image 1: Filtered image
87611	Kernel size	15_LineDetector_filtKernelSize	Set/Get	2 to 5
87700	Defect color	15_CircleDetector_filterType	Set/Get	0: Black only 1: White only
87701	Skipping	15_CircleDetector_thinningNum	Set/Get	1 to 20
87702	Gain	15_CircleDetector_gain	Set/Get	0.1 to 10.0
87703	Detection level	15_CircleDetector_offset	Set/Get	0 to 255
87704	Filtered image	15_CircleDetector_image	Set/Get	0: Original image 1: Filtered image
87800	Count	15_Log_count	Set/Get	1 to 9
87801	Filter size	15_Log_filterSize	Set/Get	1 to 9
87803	Gain	15_Log_gain	Set/Get	0.1 to 20.0
87804	Offset	15_Log_offset	Set/Get	-255 to 255
87805	Filtered image	15_Log_image	Set/Get	0: Original image 1: Filtered image
87900	Count	15_Guided_count	Set/Get	1 to 9
87901	Filter size	15_Guided_filterSize	Set/Get	0 to 14
87902	Filter strength	15_Guided_filterStrength	Set/Get	1 to 100
87903	Skipping	15_Guided_thinningNum	Set/Get	0 to 2
87906	Filtered imag	15_Guided_image	Set/Get	0: Original image 1: Filtered image
88000	Mask Size	15_WeekSmooth_maskSize	Set/Get	0:3×3 1:5×5
88001	Count	15_WeekSmooth_count	Set/Get	1 to 9
88002	Filtered image	15_WeekSmooth_weeksmoothImage	Set/Get	0: Original image 1: Filtered image
88100	Mask Size	15_StrongSmooth_maskSize	Set/Get	0: 3×3 1: 5×5
88101	Count	15_StrongSmooth_count	Set/Get	1 to 9
88102	Filtered image	15_StrongSmooth_image	Set/Get	0: Original image 1: Filtered image
88200	Mask Size	15_Dilate_maskSize	Set/Get	0: 3×3 1: 5×5
88201	Count	15_Dilate_count	Set/Get	1 to 9
88202	Filtered image	15_Dilate_dilateImage	Set/Get	0: Original image 1: Filtered image
88300	Mask Size	15_Erosion_maskSize	Set/Get	0: 3×3 1: 5×5
88301	Count	15_Erosion_count	Set/Get	1 to 9

No.	Data Name	Ident	Set/Get	Data range
88302	Filtered image	15_Erosion_erosionImage	Set/Get	0: Original image 1: Filtered image
88400	Mask Size	15_Median_maskSize	Set/Get	0: 3×3 1: 5×5
88401	Count	15_Median_count	Set/Get	1 to 9
88402	Filtered image	15_Median_medianImage	Set/Get	0: Original image 1: Filtered image
88500	Mask Size	15_ExtractEdges_maskSize	Set/Get	0: 3×3 1: 5×5
88501	Count	15_ExtractEdges_count	Set/Get	1 to 9
88502	Filtered image	15_ExtractEdges_image	Set/Get	0: Original image 1: Filtered image
88600	Mask Size	15_ExtractHorizonEdges_maskSize	Set/Get	0: 3×3 1: 5×5
88601	Count	15_ExtractHorizonEdges_count	Set/Get	1 to 9
88602	Filtered image	15_ExtractHorizonEdges_image	Set/Get	0: Original image 1: Filtered image
88700	Mask Size	15_ExtractVerticalEdges_maskS	Set/Get	0: 3×3 1: 5×5
88701	Count	15_ExtractVerticalEdges_count	Set/Get	1 to 9
88702	Filtered image	15_ExtractVerticalEdges_image	Set/Get	0: Original image 1: Filtered image
88800	Mask Size	15_EdgeEmphasis_maskSize	Set/Get	0: 3×3 1: 5×5
88801	Count	15_EdgeEmphasis_count	Set/Get	1 to 9
88802	Filtered image	15_EdgeEmphasis_image	Set/Get	0: Original image 1: Filtered image
88900	Count	15_Prewitt_count	Set/Get	1 to 9
88901	Filtered image	15_Prewitt_prewittImage	Set/Get	0: Original image 1: Filtered image
89000	Count	15_Roberts_count	Set/Get	1 to 9
89001	Filtered image	15_Roberts_robertsImage	Set/Get	0: Original image 1: Filtered image
89100	Count	15_Laplacian_count	Set/Get	1 to 9
89101	Filtered image	15_Laplacian_laplacianImage	Set/Get	0: Original image 1: Filtered image
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

3-14 Panorama

This processing item can not be used in the FHV series.

Images from multiple cameras are combined into one image.

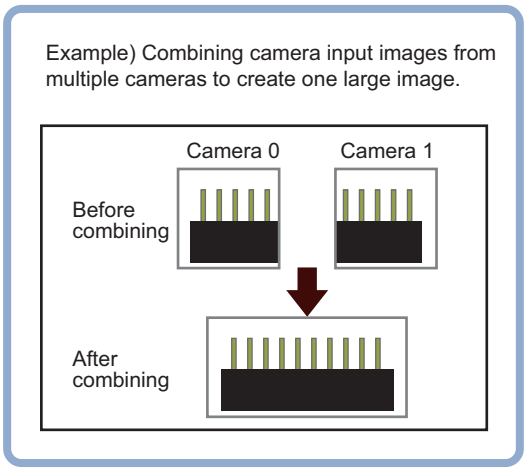
Pay attention to the characteristics of images to compensate the image positions and angles when combining them. Therefore, users can acquire precise combined images without strictly designing the camera placing positions.

Intelligent Compact Digital Camera, FZ-SQ□□□□ cannot be used.

With panorama, only camera images of the same type can be input.

Used in the Following Case

To combine the input images from multiple cameras

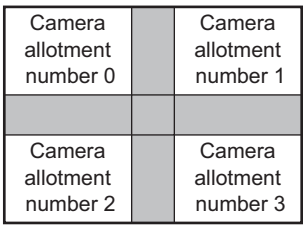
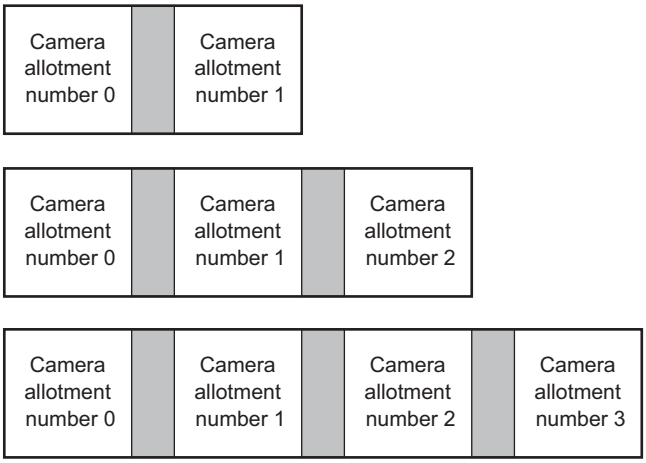


Important

- The first processing after the sensor controller is started may take longer than the second and subsequent processing even though the same image is measured.
- To save an image converted into a panorama, use the image convert logging processing item.

Camera arrangement

There are two camera arrangement methods. Either can be selected.

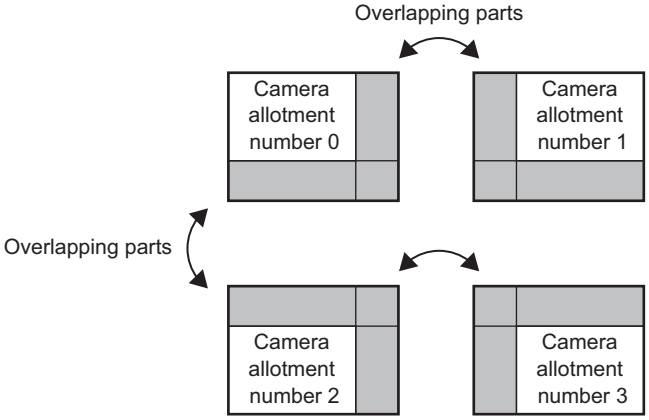
Item	Description
two line	Placement combining two images vertically and two images horizontally. One pattern. 
one line	Placement combining images arranged horizontally. Three patterns: two images, three images, and four images. 

Camera installation and image combination method

● Camera arrangement (two line)

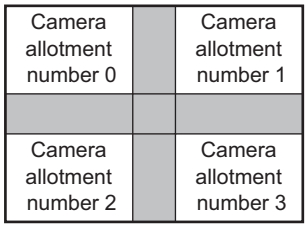
1 Set the camera arrangement.

Determine how the cameras should be placed so that the fields of vision of adjacent cameras, whose camera numbers are each assigned to a camera allotment number, overlap each other vertically and horizontally by at least 1/4.



2 Adjust the image positions.

Use the Offset X and Y buttons on the setting screen to align the overlapping parts of the adjacent images that are being combined.



3 Combine the images.

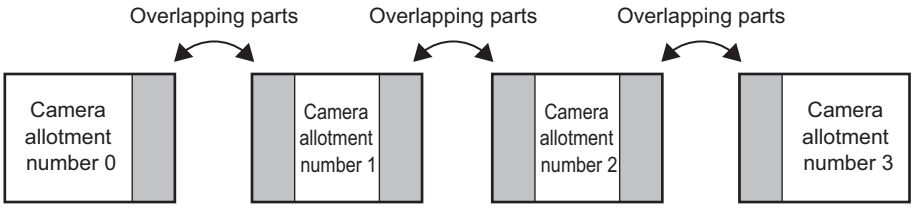
Click the Combine button on the setting screen.

● Camera arrangement (one line)

1 Set the camera arrangement.

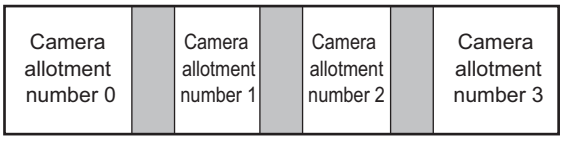
This layout is explained using the example of combining four images.

Determine how the cameras should be placed so that the fields of vision of adjacent cameras, whose camera numbers are each assigned to a camera allotment number, overlap each other vertically and horizontally by at least 1/4.



2 Adjust the image positions.

Use the Offset X and Y buttons on the setting screen to align the overlapping parts of the adjacent images that are being combined.



3 Combine the images.

Click the Combine button on the setting screen.

3-14-1 Camera Arrangement (Panorama)

Set the camera placement.

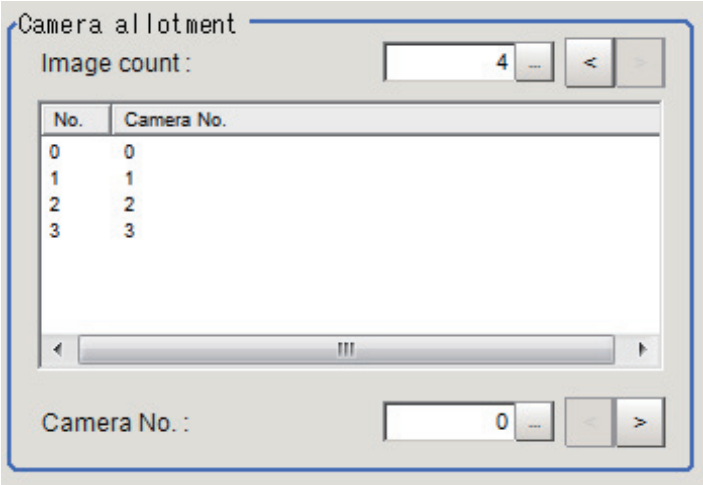
1 In the Item Tab area, click [Arrangement].

2 In the "Display" area, click [Change display] to switch between camera image types.

The displayed contents of the Image Display area will be switched.

Setting item	Set value [Factory default]	Description
Display	Through	The latest image is always input from the camera and displayed.
	[Freeze]	The image that was scanned in the immediately preceding measurement is displayed.

3 Set the image count in the camera allotment display area.



When the number of images is set, camera allotment numbers automatically appear based on the set number of images.

Setting item	Setting [factory default]	Description
Number of images	• [2] • 3 • 4	Specify the number of images that are combined. 2: Combine the images of camera allotment numbers 0 and 1. 3: Combine the images of camera allotment numbers 0, 1, and 2. 4: Combine the images of camera allotment numbers 0, 1, 2, and 3.

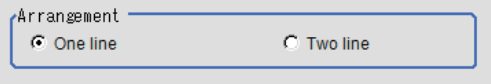
4 Set a camera number for each camera allotment number.

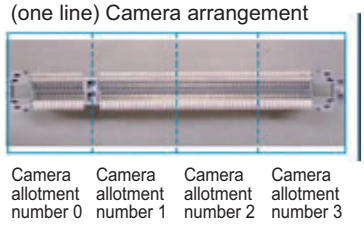
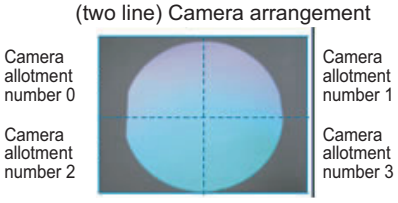
The camera allotment numbers indicate the positions where the cameras are placed in the camera arrangement, and are fixed.

Assign the desired camera number to the camera allotment number.

Setting item	Setting [factory default]	Description
Camera number	Camera allotment number 0 • 0 to 7 [0] Camera allotment number 1 • 0 to 7 [1] Camera allotment number 2 • 0 to 7 [2] Camera allotment number 3 • 0 to 7 [3]	Set the desired camera number for the camera allotment number.

5 Set the camera arrangement.



Setting item	Set value [Factory default]	Description
Arrangement	• [One line] • Two line	Set the camera image placement. The camera allotment numbers are placed as shown below, and are fixed. (one line) Camera arrangement  (two line) Camera arrangement 

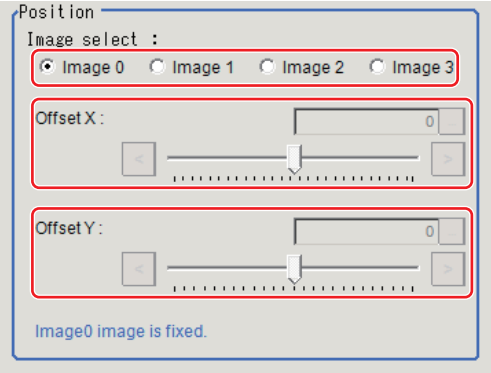
Important

- If the configuration of the connected camera is changed, the measurement result is NG (incompatible image). Press the initialize button and re-do the settings.
- Do not set [Camera Image Input] or [Camera Image Input HDR] after [Panorama].

3-14-2 Image Combination (Panorama)

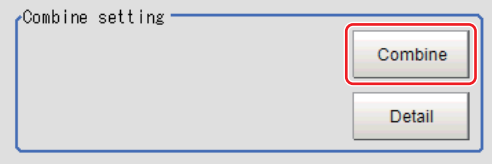
Set the image combination method.

1. In the "Item Tab" area, click [Combine].
2. Set each item in the "Position" area.



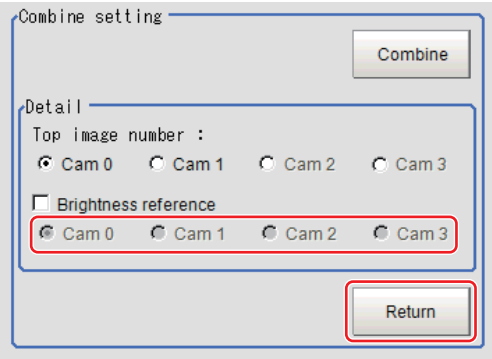
Setting item	Set value [Factory default]	Description
Image select	• [Image 0] • Image 1 • Image 2 • Image 3	Select the camera allotment number of the position to be adjusted. Camera allotment number 0 is fixed. Adjust camera allotment numbers 1 and higher to move to the positions that you want to combine. The camera allotment numbers that can be selected depend on the number of images of the camera arrangement.
Offset X	0.3 megapixel CCD cameras: -640 to 640 [0] 2 megapixel CCD cameras: -1600 to 1600 [0] 5 megapixel CCD cameras: -2448 to 2448 [0] 0.3 megapixel CMOS cameras: -640 to 640 [0] 2 megapixel CMOS cameras: -2040 to 2040 [0] 4 megapixel CMOS cameras: -2040 to 2040 [0]	Adjust the selected camera image in the X direction.
Offset Y	0.3 megapixel CCD cameras: -480 to 480 [0] 2 megapixel CCD cameras: -1200 to 1200 [0] 5 megapixel CCD cameras: -2048 to 2048 [0] 0.3 megapixel CMOS cameras: -480 to 480 [0] 2 megapixel CMOS cameras: -1088 to 1088 [0] 4 megapixel CMOS cameras: -2048 to 2048 [0]	Adjust the selected camera image in the Y direction.

3 In the "Combine setting" area, set the combination method.



Setting item	Description
Combine	This option combines images panoramically so that the detected feature points (same location on the object as positioned differently on the different images) line up with each other in the combined image.

4 Set details as necessary.



Setting item	Set value [Factory default]	Description
Top image number	• [Cam 0] • Cam 1 • Cam 2 • Cam 3	Select the number of the camera image to be displayed on top. The selected number order changes the order of the images.
Brightness reference	• Checked • [Unchecked]	Place a check here where there is brightness variation among the camera images.
	[Cam 0] Cam 1 Cam 2 Cam 3	Set the number of the camera to be used as reference for brightness compensation. The brightness of the selected camera image is used as reference to adjust the brightness of the other cameras.

- Restoring settings to their initial states
  Clicking [Initialize] restores settings to their initial states.

5 Make the drawing settings as necessary.

Setting item	Set value [Factory default]	Description
Image frame	• [Checked] • Unchecked	Set whether to display the image frame.
Matching points	• [Checked] • Unchecked	Set whether to display feature points.

3-14-3 Key Points for Test Measurement and Adjustment (Panorama)

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image number	Explanation of image to be displayed
0	Post-combination image

Key Points for Adjustment

Select the adjustment method referring to the following points.

● If grid point combination fails

State	Parameter to be adjusted	Troubleshooting
The width of the overlapping portion of images is small	Offset X, Offset Y	Set the offset so that one-fourth of each image overlaps with each other. Set the camera so that the one-fourth of the field of views between cameras overlaps with each other.
Overlapping part of images has no characteristics	Input image	Use characteristic images when setting it.

3-14-4 Measurement Results for Which Output Is Possible (Panorama)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result

3-14-5 External Reference Tables (Panorama)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)

4

Support Inspection and Measurement

This chapter explains how to set calculations and how to get or view data.

4-1 Unit Macro

This processing item can not be used in the FHV series.

User's original measurement processing can be performed.

Unit macros are convenient if you want to build a new measurement processing by combining filters and measurement processing's, create a complex display that cannot be realized with the result display processing items, or write original text in the detail text display.

Used in the Following Case

- Processing performed by multiple processing items such as looping and branching can be consolidated into one.

  Example) Perform search processing after carrying out filter processing multiple times
  - Using a flow: Combine filtering, calculation, Set Unit Data and search.
  - Using unit macros: Add filtering and search to a flow and define a processing where search measurement processing is performed after carrying out filter processing multiple times.

  A flow can be made simpler using unit macros.

Important

Unit Macros cannot be edited by remote operation.

For the specifications of the Unit Macro, and for details on Unit Macro settings, refer to the following:

For details, refer to *Description of the Setting Screen of the "Unit Macro" Processing Item and How to Configure Settings* in the *Vision System FH/FZ5 Series Macro Customize Functions Programming Manual* (Cat. No. Z367).

4-2 Unit Calculation Macro

This processing item can not be used in the FHV series.

You can perform calculations, as well as setting/acquiring.

This function is convenient when the user wants to calculate a value using an original calculation formula or change the set value or system data of a processing item.

Used in the Following Case

- Calculations that use multiple processing items including looping and conditional branch can be consolidated into one.

  Example) When you want to use a different calculation formula depending on the condition

  - Using a flow: Realized by combining Conditional Branch and Calculation.
  - Using unit calculation macro: Define in a unit calculation macro processing item a calculation processing that uses a calculation formula appropriate for each condition.

  A flow can be made simpler using unit calculation macro.
- A set of multiple processing items can be consolidated into one processing when, for example, changing the settings of multiple processing depending on the condition.

  Example) When you want to change the labeling extraction condition depending on the sorting result

  - Using a flow: Realized by combining Conditional Branch, Calculation and Set Unit Data.
  - Using unit calculation macro: Register a reference variable representing the labeling extraction conditions and define a processing that assigns a value to the variable according to each condition.

  A flow can be made simpler using unit calculation macro.

For the specifications of the Unit Calculation Macro, and for details on Unit Calculation Macro settings, refer to the following:

For details, refer to *Description of the Setting Screen of the "Unit Calculation Macro" Processing Item and How to Configure Settings* in the *Vision System FH/FZ5 Series Macro Customize Functions Programming Manual* (Cat. No. Z367).

4-2-1 External Reference Tables (Unit Calculation Macro)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5+N (N: 0 to 31)	Calculation result	resultData	Set/Get	-

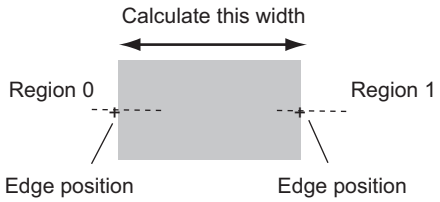
No.	Data Name	Ident	Set/Get	Data range
37+N (N: 0 to 31)	Judgement result	resultJudge	Set/Get	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG

4-3 Calculation

Used in the Following Case

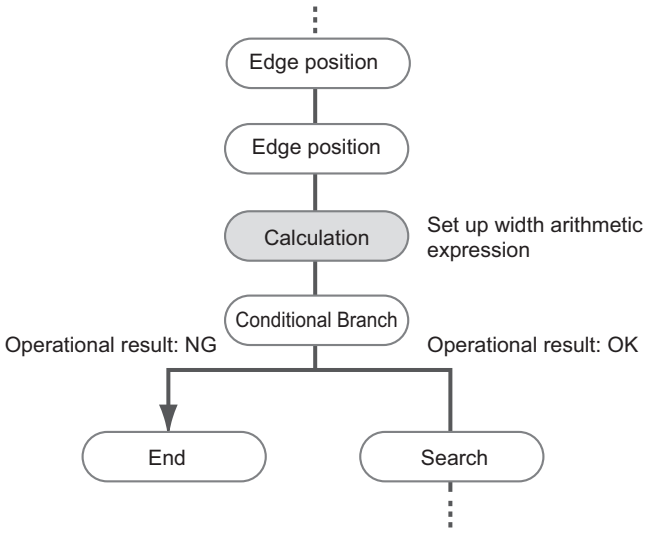
- When changing the inspection details through use of calculation results

Example) Calculating the width of the measurement object Width calculation can be performed by first calculating two edge positions and setting up the arithmetic expression which is used to calculate the edge position difference.



Width = the edge position of Area 0 – the edge position of Area 1

By combining Calculation and Conditional Branch, the following measurement contents can be changed based on the operational result.



- When performing calculation by using the calculation results of other processing units.

4-3-1 Settings (Calculation)

Up to 32 expressions "Calculation 0" to "Calculation 31" can be set up in one single unit.

When you need more than 32 expression, use more than one processing unit.

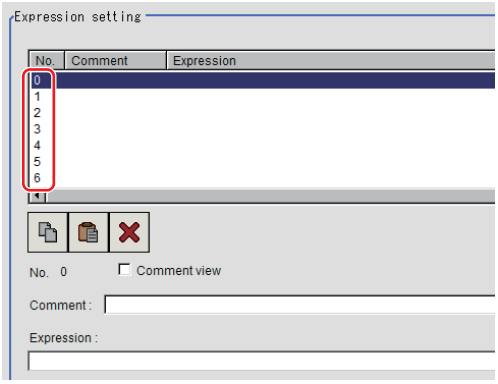
Additional Information

Calculation results cannot be output to external devices when you only set up expressions. When calculation results are output to external devices, set processing items related to results output in units after "Expression" with flow editing. Refer to *Output result* on page 6-1.

1 In the Item Tab area, click [Setting].

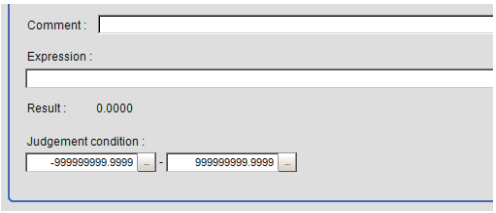
2 Click the "No." for setting up the expression from the list in the "Expression setting" area

The number selected will be displayed below the list.



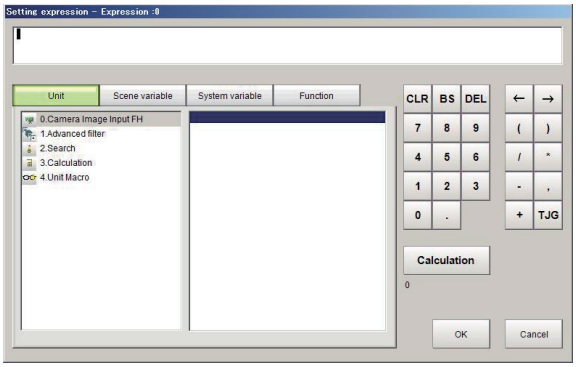
3 Click [...] for the Expression.

The Setting Expression window is displayed.



4 Set up the expression.

According to processing units or variables, items that can be set in expressions are displayed. Selecting and clicking an item adds it to the expression.
Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12.



5 Click [Calculation] after setting an expression to check the validity of it.

When executing it, the results will be displayed under the [Calculation] button. If errors exist, “Error of the expression” message appears in red under the [Calculation] button.

Additional Information

If an error message is displayed, please check the following points.

- Unit value, numbers, function or TJG settings should be just before or just behind operator.
- Operators and commas "," should not be placed at the start or end of an expression.
- Operators cannot be input continuously.
- TJG/Unit value/Functions cannot be input continuously.
- The left and right parentheses "( )" should be used together.
- Please ensure that the function argument is set.

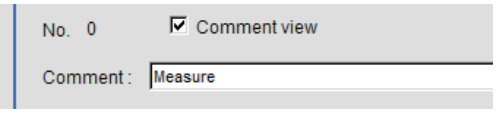
6 After setting the expression, click [OK].

The value of ”Now result" is updated when the expression is confirmed.

7 Click [...] for "Comment" and input an explanation of the expression as necessary.

Multilingual is supported. For details, refer to 3-2-2 Inputting Text in the *Vision System FH/FHV/FZ5 Series User’s Manual (Cat. No. Z365)*.

8 To display comments in the "Detail result display" area, check "Comment view".



9 Set up the judgement upper limit and the judgement lower limit for "Judgement condition".

Setting item	Set value	Description
Judgement condition	-999999999.9999 to 999999999.9999	This is a judgement condition for the expression. Set upper and lower limits for judging as OK.

10 Repeat the Steps 2 to 8 and set up the expression.

4-3-2 Output Parameters (Calculation)

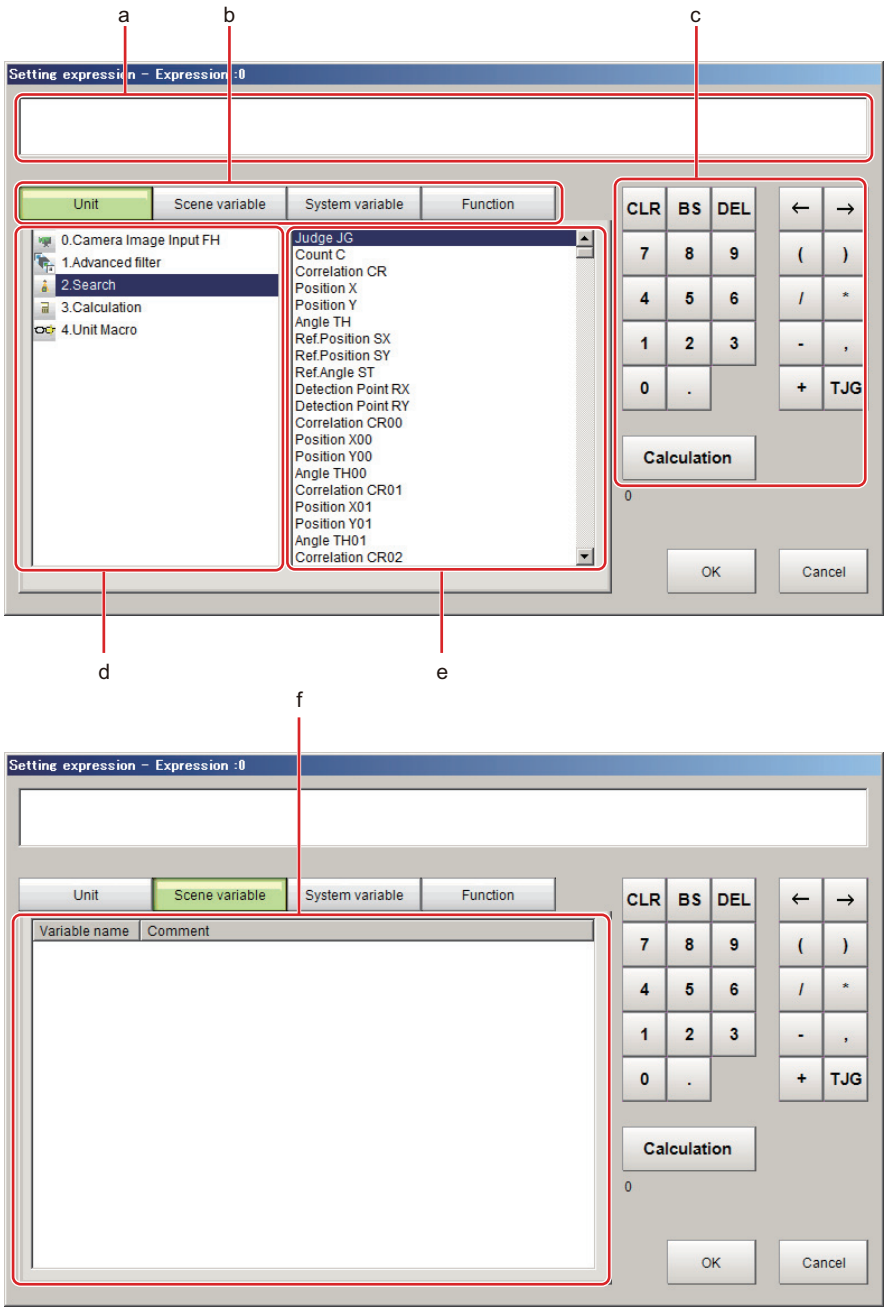
Specifies whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

1 Click [Output parameter] in the Item Tab area.

2 Choose whether or not to reflect this in the scene overall judgement in "Reflect to overall judgement" area.

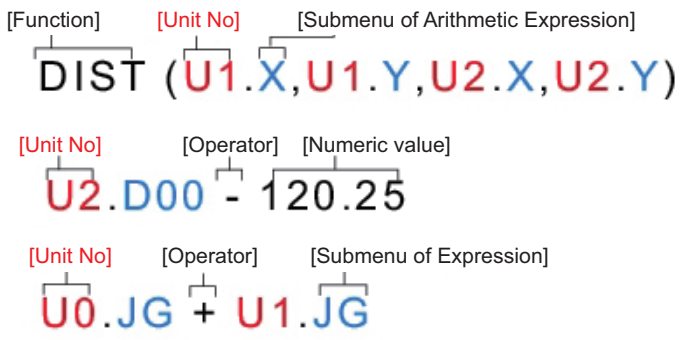
Setting item	Set value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

4-3-3 Layout of Setting Expression Window



a) Expression Display Area

This area is for setting expressions. The expressions are displayed in the following manner.



b) Unit/Variable Tab

Tabs for selecting input objects for expressions: [Unit], [Scene], [System], and [Function].

The Expression Setting window varies depending on the selected object.

Unit tab: Measurement flow display area and data area

Scene variable tab: Scene variable list area

System variable tab: System variable list area

Function tab: Function list area

c) General Button Area

These common buttons are required for editing expressions. Numbers and operators can be input here.

Button	Type	Description
CLR	-	Deletes input contents in the expression display area.
BS	-	Deletes the item immediately before the cursor in the expression display area.
DEL	-	Deletes the item immediately follow the cursor in the expression display area.
0 to 9	Numerical number	Numbers will be displayed at the cursor position in the expression display area. The number range that can be set up is from -999999999.9999 to 999999999.9999.
.	Symbol	A dot "." will be displayed at the cursor position in the expression display area.
←	Movement	The cursor in the expression display area moves one space to the left.
→	Movement	The cursor in the expression display area moves one space to the right.
(	Symbol	Used to set off the numerical expression. Used in pairs with ")".
)	Symbol	Used to set off the numerical expression. Used in pairs with "(".
/	Operator	Indicates division for real numbers.
*	Operator	Indicates multiplication.
-	Operator	Indicates subtraction.
,	Symbol	A comma "," will be displayed at the cursor position in the expression display area.
+	Operator	Indicates addition.
TJG	-	Acquires the overall judgement result for all units ahead of the unit number in which an expression has been set. Refer to *5-1-2 Conditional Branch Settings Examples* on page 5-5.
CALCULATION	-	Executes the expression input in the Expression display area.

d) Measurement flow display area (Unit tab)

Displayed when the Unit tab is selected.

The number and name of the processing unit in the current scene are displayed. When selecting a processing unit, available data for the expression will be listed in the data list area.

Refer to *4-3-6 Measurement Results for Which Output Is Possible (Calculation)* on page 4-19.

e) Data list area (Unit tab)

Displayed when the Unit tab is selected.

Data that is available for the expression of a processing unit selected in the Measurement flow display area is displayed. Clicking data to input can enter it to the expression in the Expression display area.

Refer to *4-3-6 Measurement Results for Which Output Is Possible (Calculation)* on page 4-19.

f) Scene variable list area (Scene tab)

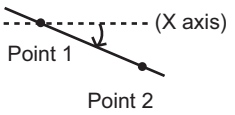
Displays Scene variables to be used. Clicking Scene variables to input can enter it to the expression in the Expression display area.

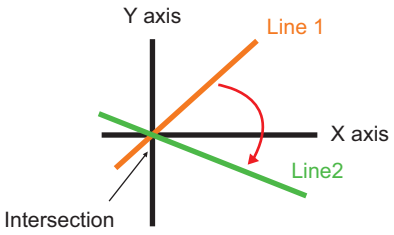
g) System variable list area (System tab)

Displays System variables to be used. Clicking System variables to input can enter it to the expression in the Expression display area.

h) Function list area (Function tab)

Displays functions to be used. Clicking functions to input can enter it to the expression in the Expression display area.

Function	Description
SIN (equation)	Calculates the sine. The result will be returned within the range of -1 to 1. Indicates the angle designated in the numerical expression in degrees.
COS (equation)	Calculates the cosine. The result will be returned within the range of -1 to 1. Indicates the angle designated in the numerical expression in degrees.
ATAN (Y-axis component, X-axis component)	Calculates the arc tangent of the Y-axis component/X-axis component. The result will be returned in radians within the range of $-\pi$ and π. (Example) For calculation of the angle between the X axis and the straight line that joins the centers of gravity of region 0 and region 1. ATAN (R1.Y-R0.Y, R1.X-R0.X) When both operands equal 0, calculation will return a result of 0 and OK will display.
AND (operand 1, operand 2)	Calculates the logical product. When one of two operands is 0, calculation will return a result of 0, and for all other cases, will return a result of -1.
OR (operand 1, operand 2)	Calculates the logical sum. When both operands are 0, calculation will return a result of 0 and for all other cases, will return a result of -1.
NOT (operand)	Calculates the logical NOT. When the operands equal 0, calculation will return a result of -1 and for all other cases, will return a result of 0 be returned.
ABS (operand)	Calculates the absolute value.
MAX (operand 1, operand 2)	The larger of 2 operands will be returned.
MIN (operand 1, operand 2)	The smaller of 2 operands will be returned.
MOD (dividend, divisor)	Calculates the remainder when dividing the dividend with the divisor. To calculate the remainder, if the number being used is a real number, round off the portion after the decimal point of the real number and then execute the calculation. The result is the remainder after division of the integer. (Example) MOD (13.4) Result: 1 (the remainder when dividing 13 by 4) MOD (25.68,6.99) Result: 5 (the remainder when dividing 26 by 7)
SQRT (operand)	Calculates the square root. When the operand is a negative number, calculation will return a result of 0. Judgement will be NG.
ANGL (Y-axis component, X-axis component)	Calculates the angle made by straight line that connects 2 points (center of gravity/center of model). Calculates the angle relative to the X axis. The result will be returned within the range of -180 to 180. (Example) When calculating the angle produced by the straight lines that join the gravity of Area 0 and that Area 1 ANGL (R1.Y-R0.Y, R1.X-R0.X)  When both the two operands are equal to 0, “0” will be returned, and the judge will become NG.

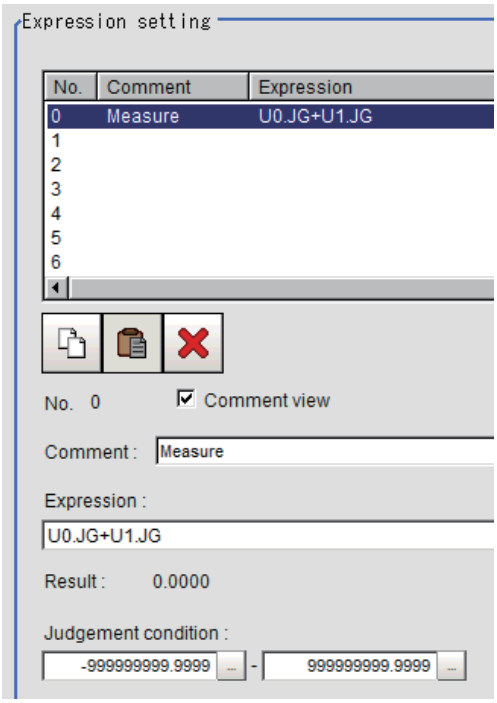
Function	Description
ANGL (first linear coefficient A, first linear coefficient B, first linear coefficient C, second linear coefficient A, second linear coefficient B, second linear coefficient C)	Calculate the angle of Line 1 and Line 2 in the part that does not go across the Y axis. The same angle can be obtained from both Line 1 and Line 2.  (Example) Use line data at scan edge position 1 and scan edge position 2 to obtain the angle formed by the two lines ANGL (U1.A, U1.B, U1.C, U2.A, U2.B,U2.C)
DIST (X-coordinate of first point, Y-coordinate of first point, X-coordinate of second point, Y-coordinate of second point)	Calculates the distance between 2 points (center of gravity/center of model). (Example) When calculating the distance between the gravity of Area 0 and that of Area 1. DIST (R0.X,R0.Y,R1.X,R1.Y) The following calculation will be performed internally. $\sqrt{(R1.X-R0.X)^2 + (R1.Y-R0.Y)^2}$
DIST (Linear coefficient A, linear coefficient B, linear coefficient C, X coordinate, Y coordinate)	A line and a point are specified to obtain the vertical distance between the line and point. (Example) Obtain the distance between the linear regression at scan edge position 1 and edge position 2 DIST (U1.A, U1.B, U1.C, U2.X, U2.Y)
X (first linear coefficient A, first linear coefficient B, first linear coefficient C, second linear coefficient A, second linear coefficient B, second linear coefficient C)	Calculates intersection (X coordinate) of data for 2 lines (Example) Obtain the X coordinate of the intersection between the lines at scan edge position 1 and scan edge position 2 X (U1.A,U1.B,U1.C,U2.A,U2.B,U2.C)
Y (first linear coefficient A, first linear coefficient B, first linear coefficient C, second linear coefficient A, second linear coefficient B, second linear coefficient C)	Calculates intersection (Y coordinate) of data for 2 lines (Example) Obtain the Y coordinate of the intersection between the lines at scan edge position 1 and scan edge position 2 Y (U1.A,U1.B,U1.C,U2.A,U2.B,U2.C)

4-3-4 Expression Usage Examples

Perform Judgement by Combining Unit Judgement Results

- **Example: Perform judgement by combining the judgement results of unit 0 and unit 1**

  If a judgement of OK for both unit 0 and unit 1 is achieved, a judgement of OK for the calculation will be achieved.



Step1: The sum of the judgement results (U0.JG, U1.JG) for unit 0 and unit 1 is set up in the expression.

The sum of adding the judgement value (1: OK/-1: NG) based on the unit 0 judgement conditions and the judgement value (1: OK/-1: NG) based on the unit 1 judgement conditions is displayed in "Result".

Step2: The expression result of step 1 is judged based on judgement upper and lower limits.

When "2" is set for both the judgement upper and lower limits, the calculation judgement of OK is achieved when both units 0 and 1 are judged as OK.

Judgement results of unit 0 (Judgement value)	Judgement results of unit 1 (Judgement value)	Expression result (Summation results of judgement values for units 0 and 1)	Judgement result of expression
OK (1)	OK (1)	2	OK
NG (-1)	OK (1)	0	NG
OK (1)	NG (-1)	0	NG
NG (-1)	NG (-1)		NG

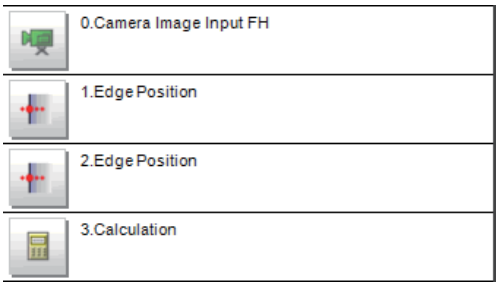
Using Values of Other Expressions

Up to 32 expressions can be set in 1 expression unit.

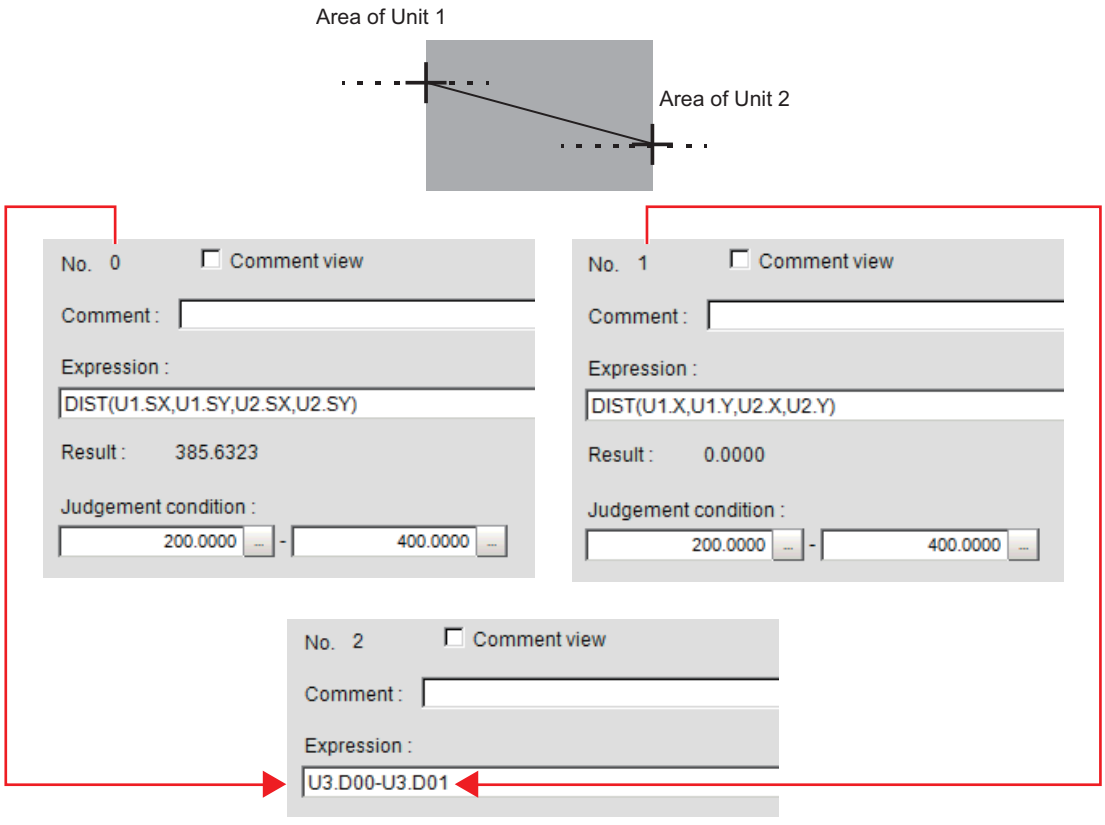
The value of other expressions set within the same unit can also be used.

Since expression results obtained by the expression are displayed as D00 to D31 and judgement results of expression are displayed as J00 to J31, this is set to "U3.D00" (results of expression 0 set for processing item [Calculation] of unit number "3") using "unit number calculation results".

For the following scene settings:



- **Example: Calculate the reference position distance and measurement results distance for the edge position and output the difference between the two.**



Substitute the operational results of Expression 0 (DO0) and Expression 1 (DO1)

Set expressions in the following manner.

- Calculation 0: DIST (U1.SX, U1.SY, U2.SX, U2.SY)

  This expression is used to calculate the distance between the reference positions of unit 1 and unit 2.

  The function "DIST" calculates the distance between 2 points.
- Calculation 1: DIST (U1.X,U1.Y,U2.X,U2.Y)

  This expression is used to calculate the distance between the measurement positions of unit 1 and unit 2.

  The function "DIST" calculates the distance between 2 points.
- Calculation 2: U3.D01-U3.D00

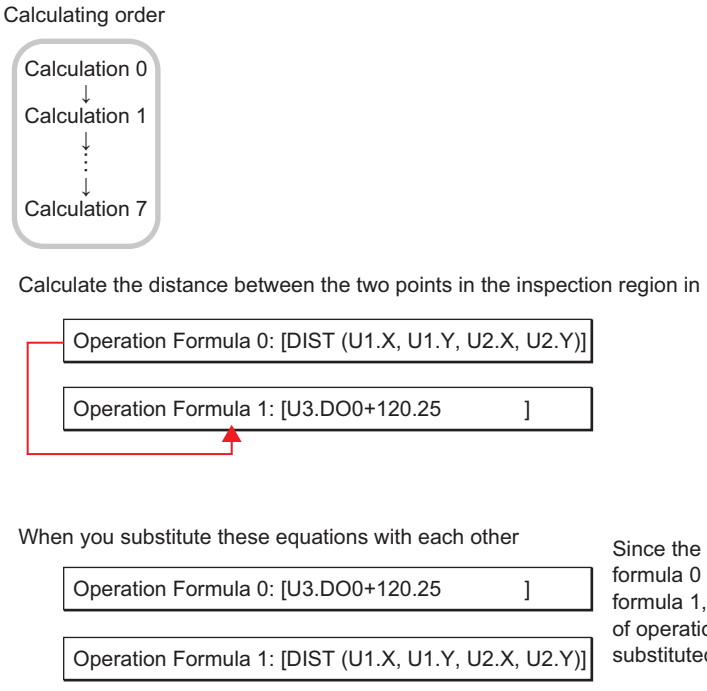
  (Unit 3: Calculation [Calculation 1] - Unit 3: Calculation [Calculation 0])

  This equation is used to calculate the difference between results of Calculation 1 and Calculation 0 in unit 3 (in this example, Operation).

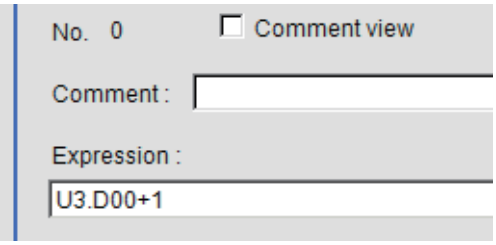
Additional Information

Calculating order of expressions

An expression using the results of other expressions must be set with an expression number that is higher than that of the substituted expression. A number smaller than the number of the substituted expression, previous expression is set, results of the substituted expression will be inserted.



Counting Number of Measurements



The measurement count is counted by adding "1" to each calculation number 0.

Additional Information

- When expression results are cleared or the power is turned off, U3.D00 will return to "0" and the measurement counts will also be reset.
- When resetting the measurement counts per a certain count in a measurement processing, use processing unit data setting for it.

4-3-5 Key Points for Test Measurement and Adjustment (Calculation)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Expression 0 to 31	Expression result of Expression 0 to 31

4-3-6 Measurement Results for Which Output Is Possible (Calculation)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	Judgement result
Data 0 to 31	D00 to 31	Expression result of expression 0 to 31
Judge 0 to 31	J00 to 31	Expression result of expression 0 to 31

4-3-7 External Reference Tables (Calculation)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
170	Number of Expression	dataNum	Set/Get	8 to 32
1000+N (N: 0 to 31)	Expression result of Expression	resultData	Set/Get	-999,999,999.9999 to 999,999,999.9999
1100+N (N: 0 to 31)	Judgement result of Expression	resultJudge	Set/Get	0: Unmeasured 1: OK -1: NG
1200+N (N: 0 to 31)	Upper limit for judgement	upperCalc	Set/Get	-999,999,999.9999 to 999,999,999.9999
1300+N (N: 0 to 31)	Lower limit for judgement	lowerCalc	Set/Get	-999,999,999.9999 to 999,999,999.9999
1400+N (N: 0 to 31)	Expressions	setupData	Set/Get	Exp. character string
1500+N (N: 0 to 31)	Expressions comment	comment	Set/Get	Character string
1600+N (N: 0 to 31)	Comment view	commentView	Set/Get	0: OFF 1: ON

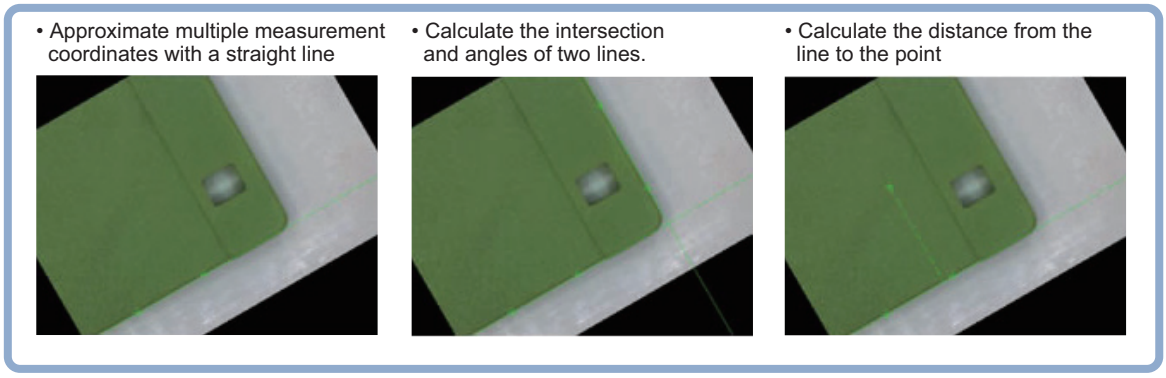
4-4 Line Regression

Calculates the line that generates the shortest total distance from multiple measurement coordinates (Line Regression).

It can also calculate the intersection and angle between two lines and the distance between a line and a point.

Used in the Following Case

For computing a line and for calculating the intersection and distance of lines



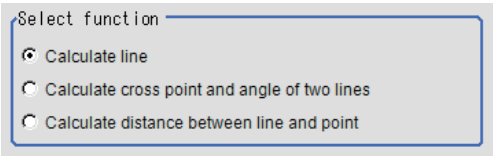
Important

Do not set processing units that perform affine transformations such as position compensation between Line Regression and a unit that inputs for Line Regression.

4-4-1 Function Selection (Line Regression)

Functions are selected depending on application.

1. In the Item Tab area, click [Select function].
2. Select a function in the "Select function" area.

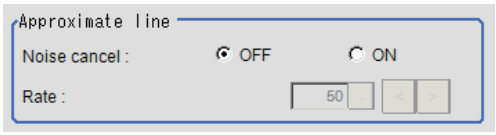


Setting item	Set value [Factory default]	Description
Select function	• [Calculate line]	Calculates a straight line providing the shortest distance from multiple points (Line Regression). Set the Line 0 tab.
	• Calculate cross point and angle of two lines	Calculates the intersection and angle between 2 Line Regressions. Set the Line 0 tab and Line 1 tab. The angle is measured from Line 0 to Line 1 in clockwise order.
	• Calculate distance between line and point	Calculates the distance between a Line Regression and a point. Set the Line 0 and Point tab.

4-4-2 Line 0 (Line Regression)

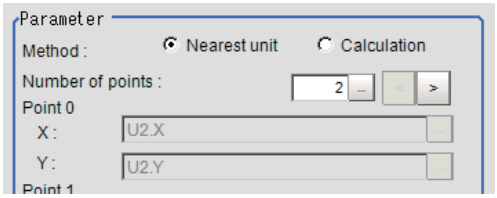
1 In the Item Tab area, click [Line 0].

2 Set it to remove noise points when calculating lines.



Setting item	Set value [Factory default]	Description
Noise cancel	• [OFF] • ON	When a check is placed at [ON], an approximate line is found by excluding the points with large deviation among the measured points.
Rate	0 to 100 [50]	Specify the ratio (%) of the points that are removed as noise.

3 Set each item in the "Parameter" area.



Setting item	Set value [Factory default]	Description
Method	• [Nearest unit] • Calculation	Nearest unit: Calculated from data of several continuous coordinate measurement units that were just performed. The number of units referenced is indicated by the Number of points. If a unit where coordinate measurement is not performed is included in Nearest unit, calculation will not be performed properly and measurement will be NG. Calculation: Calculated from expression set up. Refer to *When Calculation is Selected* on page 4-22.
Number of points	[2] to 8	Set up the number of coordinate points used for calculation.

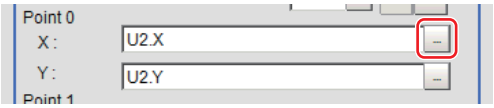
4 Click [OK].

When Calculation is Selected

1 Click [...] for the expression and set the expression.

The Setting Expression window is displayed.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12.



2 After setting up the expression, click [OK].

The expression is confirmed.

4-4-3 Line 1 (Line Regression)

"Line 1" is only valid if "Calculate cross point and angle of two lines" is selected in Select function.

- The set up method is the same as for [Line 0].
  Refer to *4-4-2 Line 0 (Line Regression)* on page 4-22.

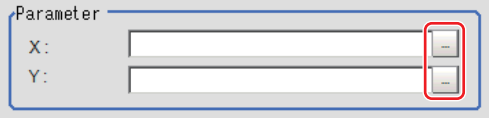
4-4-4 Point (Line Regression)

"Point" is only valid if "Calculate distance between line and point" is selected in "Select function".

1 Click [Point] in the Item Tab area.

2 Click [...] for the expression and set the expression.

The Setting Expression window is displayed.



3 After setting up the expression, click [OK].

The expression is confirmed.

4-4-5 Key Points for Test Measurement and Adjustment (Line Regression)

The following content can be confirmed in the "Detail result" area using text.

Displayed items	Description
Judge	Judgement result
Line parameter 0 A	Parameter A of line 0
Line parameter 0 B	Parameter B of line 0
Line parameter 0 C	Parameter C of line 0
Line parameter 1 A	Parameter A of line 1 (only displayed when calculating the intersection of 2 lines)
Line parameter 1 B	Parameter B of line 1 (only displayed when calculating the intersection of 2 lines)
Line parameter 1 C	Parameter C of line 1 (only displayed when calculating the intersection of two lines)
Cross point X	X coordinate of intersection (only displayed when calculating the intersection of two lines or calculating the distance between a line and a point)
Cross point Y	Y coordinate of intersection (only displayed when calculating the intersection of two lines or calculating the distance between a line and a point)
Angle	Angle between two lines (only displayed when calculating the intersection of two lines)
Point X	X coordinate of input point (only displayed when calculating the distance between a line and a point)
Point Y	Y coordinate of input point (only displayed when calculating the distance between a line and a point)
Distance	Distance between line 0 and an input point (only displayed when calculating the distance between a line and a point)

4-4-6 Measurement Results for Which Output Is Possible (Line Regression)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	Judge
Line Param. 0	A	Parameter A of line 0
Line Param. 0	B	Parameter B of line 0
Line Param. 0	C	Parameter C of line 0
Line Param. 1	A1	Parameter A of line 1
Line Param. 1	B1	Parameter B of line 1
Line Param. 1	C1	Parameter C of line 1
Cross point X	CX	X coordinate of intersection
Cross point Y	CY	Y coordinate of intersection
Angle	TH	Angle between two lines
Point X	PX	X coordinate of input point
Point Y	PY	Y coordinate of input point
Distance	DS	Distance between line 0 and input point

4-4-7 External Reference Tables (Line Regression)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Line Param.0 A	paramA	Get only	-99,999.9999 to 99,999.9999
6	Line Param.0 B	paramB	Get only	-99,999.9999 to 99,999.9999
7	Line Param.0 C	paramC	Get only	-99,999.9999 to 99,999.9999
8	Line Param.1 A	paramA1	Get only	-99,999.9999 to 99,999.9999
9	Line Param.1 B	paramB1	Get only	-99,999.9999 to 99,999.9999
10	Line Param.1 C	paramC1	Get only	-99,999.9999 to 99,999.9999
11	Cross point X	crossX	Get only	-99,999.9999 to 99,999.9999
12	Cross point Y	crossY	Get only	-99,999.9999 to 99,999.9999
13	Angle	angle	Get only	0 to 180
14	Point X	pointX	Get only	-99,999.9999 to 99,999.9999
15	Point Y	pointY	Get only	-99,999.9999 to 99,999.9999
16	Distance	distance	Get only	0 to 99,999.9999
101	Output Coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON

No.	Data Name	Ident	Set/Get	Data range
120	Function type	functionType	Set/Get	0: Calculate line 1: Calculate cross point and angle of two lines 2: Calculate distance between line and point
121	Noise cancel 0	noiseCancel0	Set/Get	0: Noise cancel OFF 1: Noise cancel ON
122	Noise cancel 1	noiseCancel1	Set/Get	0: Noise cancel OFF 1: Noise cancel ON
123	Number of points 0	pointNum0	Set/Get	2 to 8
124	Number of points 1	pointNum1	Set/Get	2 to 8
125	Method 0	method0	Set/Get	0: Nearest unit 1: Expression
126	Method 1	method1	Set/Get	0: Nearest unit 1: Expression
130	Expressions (Line0 Point0 coordinate X)	setupData0	Set/Get	Exp. character string
131	Expressions (Line0 Point0 coordinate Y)	setupData1	Set/Get	Exp. character string
132	Expressions (Line0 Point1 coordinate X)	setupData2	Set/Get	Exp. character string
133	Expressions (Line0 Point1 coordinate Y)	setupData3	Set/Get	Exp. character string
134	Expressions (Line0 Point2 coordinate X)	setupData4	Set/Get	Exp. character string
135	Expressions (Line0 Point2 coordinate Y)	setupData5	Set/Get	Exp. character string
136	Expressions (Line0 Point3 coordinate X)	setupData6	Set/Get	Exp. character string
137	Expressions (Line0 Point3 coordinate Y)	setupData7	Set/Get	Exp. character string
138	Expressions (Line0 Point4 coordinate X)	setupData8	Set/Get	Exp. character string
139	Expressions (Line0 Point4 coordinate Y)	setupData9	Set/Get	Exp. character string
140	Expressions (Line0 Point5 coordinate X)	setupData10	Set/Get	Exp. character string
141	Expressions (Line0 Point5 coordinate Y)	setupData11	Set/Get	Exp. character string
142	Expressions (Line0 Point6 coordinate X)	setupData12	Set/Get	Exp. character string
143	Expressions (Line0 Point6 coordinate Y)	setupData13	Set/Get	Exp. character string
144	Expressions (Line0 Point7 coordinate X)	setupData14	Set/Get	Exp. character string
145	Expressions (Line0 Point7 coordinate Y)	setupData15	Set/Get	Exp. character string
146	Expressions (Line1 Point0 coordinate X)	setupData16	Set/Get	Exp. character string
147	Expressions (Line1 Point0 coordinate Y)	setupData17	Set/Get	Exp. character string
148	Expressions (Line1 Point1 coordinate X)	setupData18	Set/Get	Exp. character string
149	Expressions (Line1 Point1 coordinate Y)	setupData19	Set/Get	Exp. character string

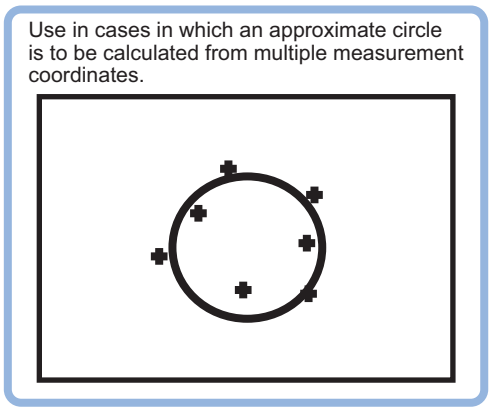
No.	Data Name	Ident	Set/Get	Data range
150	Expressions (Line1 Point2 coordinate X)	setupData20	Set/Get	Exp. character string
151	Expressions (Line1 Point2 coordinate Y)	setupData21	Set/Get	Exp. character string
152	Expressions (Line1 Point3 coordinate X)	setupData22	Set/Get	Exp. character string
153	Expressions (Line1 Point3 coordinate Y)	setupData23	Set/Get	Exp. character string
154	Expressions (Line1 Point4 coordinate X)	setupData24	Set/Get	Exp. character string
155	Expressions (Line1 Point4 coordinate Y)	setupData25	Set/Get	Exp. character string
156	Expressions (Line1 Point5 coordinate X)	setupData26	Set/Get	Exp. character string
157	Expressions (Line1 Point5 coordinate Y)	setupData27	Set/Get	Exp. character string
158	Expressions (Line1 Point6 coordinate X)	setupData28	Set/Get	Exp. character string
159	Expressions (Line1 Point6 coordinate Y)	setupData29	Set/Get	Exp. character string
160	Expressions (Line1 Point7 coordinate X)	setupData30	Set/Get	Exp. character string
161	Expressions (Line1 Point7 coordinate Y)	setupData31	Set/Get	Exp. character string
162	Expressions (Point coordinate X)	setupData32	Set/Get	Exp. character string
163	Expressions (Point coordinate Y)	setupData33	Set/Get	Exp. character string
164	Rate0	fncRate0	Set/Get	0 to 100
165	Rate1	fncRate1	Set/Get	0 to 100

4-5 Circle Regression

Calculates the circle that generates the shortest total distance from multiple measurement coordinates (Circle Regression).

Used in the Following Case

This is used when calculating the center and radius of a circle.

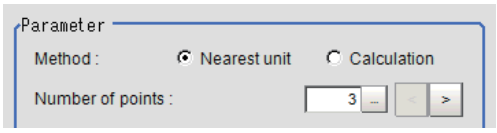


Important

Do not set processing units that perform affine transformations such as position compensation between Circle Regression and a unit that inputs for Circle Regression.

4-5-1 Parameter Settings (Circle Regression)

1 Set each item in the "Parameter" area.



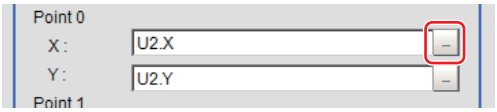
Setting item	Set value [Factory default]	Description
Method	• [Nearest unit] • Calculation	Nearest unit: calculated from the unit data of several continuous coordinates that were just measured. The number of units referenced is indicated by the Number of points. If a unit where coordinate measurement is not performed is included in Nearest unit, calculation will not be performed properly and measurement will be NG. Calculation: Calculated from expression set up. Refer to *When Calculation is Selected* on page 4-22.
Number of points	[3] to 8	Set up the number of coordinate points used for calculation.

2 Click [OK].

When Calculation is Selected

1 Click [...] for the expression and set the expression.

The Setting Expression window is displayed.



2 After setting up the expression, click [OK].

The expression is confirmed.

4-5-2 Key Points for Test Measurement and Adjustment (Circle Regression)

The following content can be confirmed in the "Detail result" area using text.

Displayed items	Description
Judge	Judgement result
Central X	Central X
Central Y	Central Y
Radius R	Radius

4-5-3 Measurement Results for Which Output Is Possible (Circle Regression)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judgement	JG	Judge
Center Axis	X	Center Axis X
Center Axis	Y	Center Axis Y
Radius	R	Radius

4-5-4 External Reference Tables (Circle Regression)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Central X	paramX	Get only	-99,999.9999 to 99,999.9999
6	Central Y	paramY	Get only	-99,999.9999 to 99,999.9999
7	Radius	paramR	Get only	0 to 99,999.9999
101	Output Coordinates	outputCoordinate	Set/Get	0: After scroll 1: Before scroll
102	Calibration	calibration	Set/Get	0: OFF 1: ON
121	Number of points	pointNum	Set/Get	3 to 8
122	Method	method	Set/Get	0: Nearest unit 1: Expression
130	Expressions (Point0 coordinate X)	setupData0	Set/Get	Exp. character string
131	Expressions (Point0 coordinate Y)	setupData1	Set/Get	Exp. character string
132	Expressions (Point1 coordinate X)	setupData2	Set/Get	Exp. character string
133	Expressions (Point1 coordinate Y)	setupData3	Set/Get	Exp. character string
134	Expressions (Point2 coordinate X)	setupData4	Set/Get	Exp. character string
135	Expressions (Point2 coordinate Y)	setupData5	Set/Get	Exp. character string
136	Expressions (Point3 coordinate X)	setupData6	Set/Get	Exp. character string
137	Expressions (Point3 coordinate Y)	setupData7	Set/Get	Exp. character string
138	Expressions (Point4 coordinate X)	setupData8	Set/Get	Exp. character string
139	Expressions (Point4 coordinate Y)	setupData9	Set/Get	Exp. character string
140	Expressions (Point5 coordinate X)	setupData10	Set/Get	Exp. character string
141	Expressions (Point5 coordinate Y)	setupData11	Set/Get	Exp. character string
142	Expressions (Point6 coordinate X)	setupData12	Set/Get	Exp. character string
143	Expressions (Point6 coordinate Y)	setupData13	Set/Get	Exp. character string
144	Expressions (Point7 coordinate X)	setupData14	Set/Get	Exp. character string
145	Expressions (Point7 coordinate Y)	setupData15	Set/Get	Exp. character string

4-6 Precise Calibration

This corrects for camera tilt, and also corrects image distortion caused by the camera lens. Also, by setting the calibration, the measurement result can be converted and output as actual dimensions.

A calibration parameter that corrects the X and Y coordinates is generated in this processing item. There is no correction for angle, area, line and distance.

Make sure to set 5 or more actual coordinates when you perform Precise Calibration.

Calibration is also available for camera image input and the calibration data from just prior to the unit referencing calibration data becomes effective.

Used in the Following Case

- Processing a trapezoidal image shot tilted to make it easier to inspect
- Processing an image that has lens distortion to make it easier to inspect
- Setting calibration for an image in which there is lens distortion or trapezoidal distortion

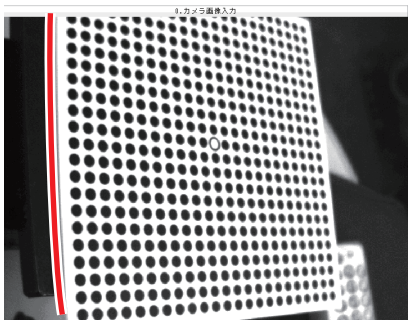
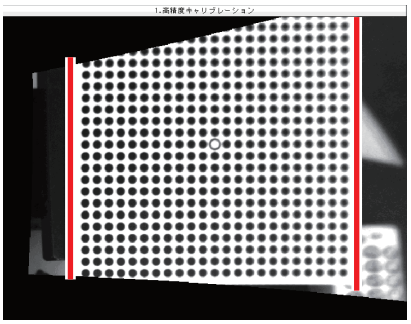


Image before conversion

- Shooting the target from a diagonal (trapezoidal distortion)
- Lens distortion occurs in the corners of the image.



After application of precise calibration

- Correcting the image to be from directly in front (removing trapezoidal distortion)
- Lens distortion removal

Additional Information

A square-matrix calibration plate pattern (Pattern) printed by the Calibration Plate Print Tool (refer to: *the Calibration Plate Print Tool in the Vision Sensor FH Series Operation Manual for Sysmac Studio* (Cat. No. Z343-E1)) can be used in this processing item.
The accuracy of the calibration will be affected by the accuracy of the Calibration Plate. If the Pattern is printed on paper, the quality of the paper and/or degree of print jitter also affects the accuracy of the calibration.
If sub-pixel level accuracy is required,use OMRON pattern plate (FZD-CAL 3D Calibration Tool).

Important

- If these processing items are performed for an image for which other processing items are also being performed, the correction may not be performed correctly. Always perform these processing items immediately after image input from the camera.
- Please make sure the points taught for calibration are distributed evenly on the screen. If they are distributed unevenly, the correction may not be performed properly.
- About limits on the number of precise calibration used
  For the FZ5-L3□□/6□□ series models, the number of precise calibration processing items that can be used in the same scene group is limited according to the camera in use. Do not exceed this limitation. In the case of the FH series/FZ5-800 series/FZ5-1100 series/FZ5-1200 series, the number of processing items is not limited and can be registered as long as there is sufficient free memory.
  If the amount of used memory increases and the amount of free memory becomes insufficient, it may cause errors in operation mode switching or in adding Processing Units into the measurement flow. Please check the memory consumption when you create scenes.

Type of sensor controller	0.3 megapixel camera	Intelligent Compact Digital Camera	2 megapixel camera	5 megapixel camera	0.3 megapixel camera (FH)	2 megapixel camera (FH)	4 megapixel camera (FH)
FZ5-L35□ FZ5-6□□	30	28	7	2	---	---	---

4-6-1 Calibration (Precise Calibration)

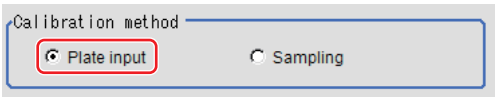
Set the input image conversion method (calibration parameters). This only calculates the parameters used in calibration. The actual correction is performed from the image correction tab.

Setting with the Pattern Plate

The parameters are calculated automatically by shooting the Omron pattern plate (FZD-CAL 3D Calibration tool).

1 In the Item Tab area, click [Calibration settings].

2 In the "Calibration method" area, select "Plate input".



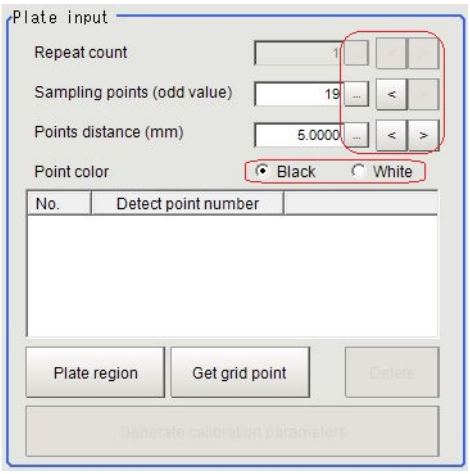
Setting item	Set value [Factory default]	Description
Calibration method	• [Plate input] • Sampling	Set the calibration parameter setting method.

3 In the "Display" area, click [Change display] to switch between camera image types.

The displayed contents of the image display area will be switched.

Setting item	Set value [Factory default]	Description
Display	Through image display	The latest image is always input from the camera and displayed.
	[Freeze image]	The image that was scanned in the immediately preceding measurement is displayed.

4 Shoot the pattern plate and set each item.



Setting item	Set value [Factory default]	Description
Repeat count	1 to 10 [1]	Shooting the plate multiple times enables detection with grid points stabilized even for images with high noise levels. Set the number of repetitions.
Sampling points	1.0000 to 1000.0000 [5.0000]	Set the point string count for the pattern plate.
Points distance	1 to 1000 [5]	Set the point interval for the pattern plate. The unit is in millimeters (mm).
Point color	• [Black] • White	Set the color of the circle marks on the pattern plate.

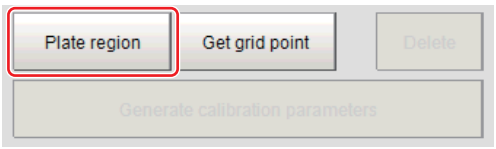
5 Set the plate region as necessary.

The default value setting is for the entire screen.

Additional Information

- Grid point extraction may fail if anything other than the pattern plate appears in the image. Specify the plate region in this case.
- Grid point extraction may fail if a circle mark on the pattern plate appears incomplete or unclear. Exclude the problem circle mark from the plate region in this case.
- Grid point extraction may fail if the brightness difference between white and black regions on the pattern plate is small, or if there is variation in brightness. Adjust the lighting or camera settings in this case.

Click [Plate region].



Use the drawing tools to specify the pattern plate range.

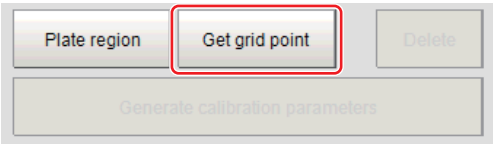
Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

The pattern plate range is registered.

6 Click [Get grid point].

The grid points gotten are listed in the Plate input area.



Additional Information

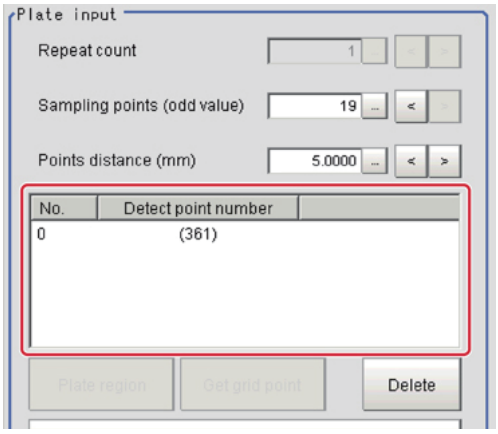
When the plate is small relative to the field of view, the plate is moved and the grid point is extracted multiple times. By selecting a through image and repeating Operations 4-6, the information can be scanned in for plates laid out at different positions.

7 Delete grid points as necessary.

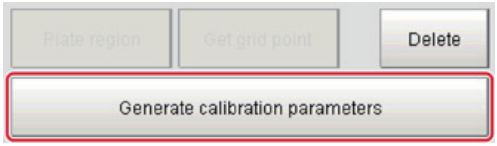
Important

- After generating calibration parameters, if you delete grid points or change settings, the calibration parameters are deleted. In this case, it is necessary to generate new calibration parameters.
- The deleted grid points are deleted from the list.

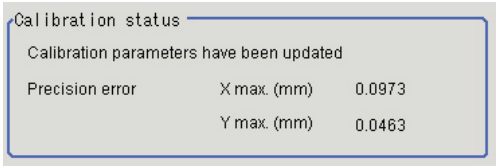
Set the grid points to be deleted from the list. Click [Delete].



8 Click [Generate calibration parameters].



The calibration parameters will be generated.



Setting Calibration through Sampling Measurement (Sampling)

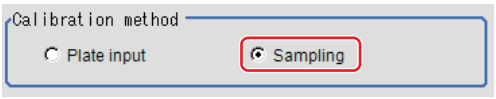
This is a method for setting calibration based on measurement results.

Calibration parameters are calculated automatically when a registered model is searched and the actual coordinates for that position entered.

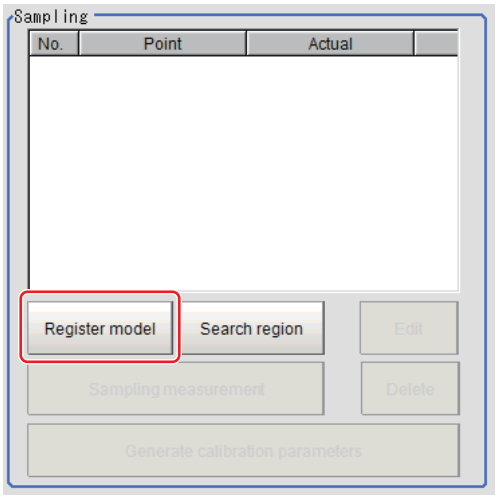
For actual coordinate input, input as at least two straight lines that make up straight lines parallel with the X and Y coordinates. Also, input at least 3 points for each straight line.

1 In the Item Tab area, click [Calibration settings].

2 In the "Calibration method" area, select "Sampling".



3 In the "Sampling" area, click [Register model].



4 Use the Drawing tools to register the model.

5 Adjust the search region as necessary.

The default value setting is for the entire screen.

Click [Search region].

Use the drawing tools to specify the measurement region.

Click [OK] in the Figure setting area.

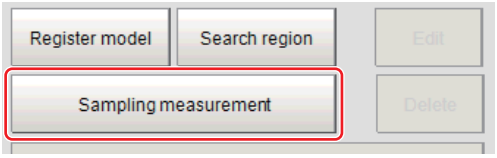
- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

The area in which to perform filtering is registered.

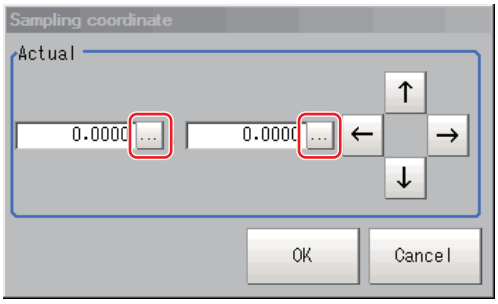
6 Click [Sampling measurement].

Measurement is performed.

The search result (cross-shaped cursor) is displayed in the image display area, and the Sampling Coordinate window is displayed.



7 In the sampling coordinate window, enter the X and Y values.



8 Click [OK].

Point coordinates and actual coordinates are registered in the "Sampling" area.

9 Move the measurement object and repeat the Steps 3 to 8.

10 Edit or delete coordinates as necessary.

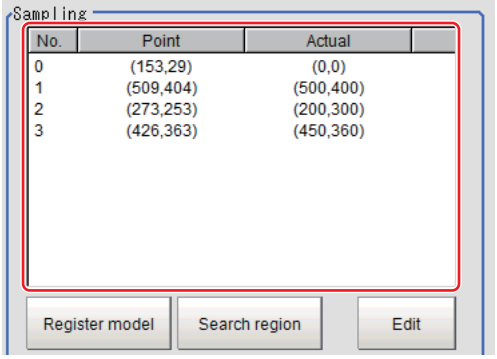
Important

- After generating calibration parameters, if you edit or delete coordinates, the calibration parameters are updated.
- The deleted coordinates are deleted from the list.

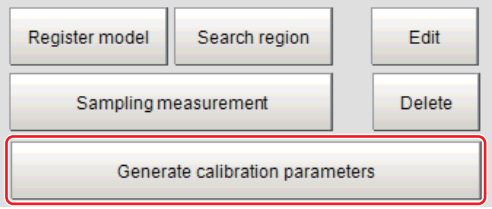
Set the grid points to be edited or deleted from the list.

Click [Edit] or [Delete].

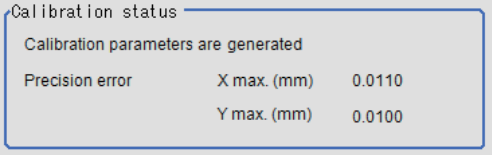
If you clicked [Edit], execute Step 7



11 Click [Generate calibration parameters].



The calibration parameters will be generated.



Additional Information

- If the precision of input grid points is poor, parameter generation may fail. Set again so that the grid points are shown clearly.
- The precision error is a yardstick for calibration, not a guarantee of actual precision.

4-6-2 Height Adjustment (Precise Calibration)

Even if the plane height is different for calibration and for measurement, adjust so that the correct coordinates can be corrected for.

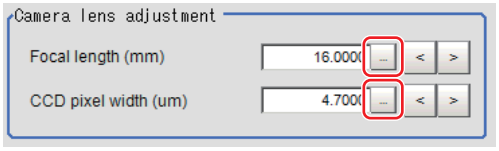
Important

- The height adjustment is only valid when the camera is facing the measurement object level. If the camera is tilted, it may be impossible to correct the image accurately.
- The results of height adjustment are not applied to image correction.

1 In the Item Tab area, click [Height adjustment].

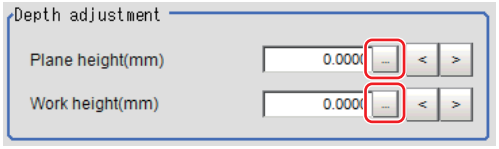
2 Select "ON" in the Height adjustment area.

3 Input the numeric values in the Camera lens adjustment area.



Setting item	Set value [Factory default]	Description
Focal length	3.0000 to 200.0000 [16]	Input the focal distance of the camera used for shooting in mm.
CCD pixel width	1.0000 to 15.0000 [4.7]	Set the camera pixel size. Input in µm.

4 Input the numeric values in the Depth adjustment area.



Setting item	Set value [Factory default]	Description
Plane height	-100.0000 to 100.0000 [0.0000]	Input the plate height in mm.
Work height	-100.0000 to 100.0000 [0.0000]	Input the measurement object height in mm.

Important

For the depth adjustment, input the height from the reference surface where the work is placed. Set the plate height and the work height from the reference surface.

4-6-3 Image Correction (Precise Calibration)

Execute actual image correction based on the parameters generated with the [Calibration settings] tab.

1. In the Item Tab area, click [Image correction].
2. Select "ON" in the Correction settings area.

   When the calibration parameters generation is complete, the corrected image is displayed according to the settings.

Important

- If the grid points were distributed unevenly when the parameters were created, the image may not be corrected properly.
- When the image correction function is ON, only the left-hand coordinate system is supported when entering X and Y on the Sampling Coordinate window. If X and Y are entered in the right-hand coordinate system, the image is not converted normally.

4-6-4 Measurement Results for Which Output Is Possible (Precise Calibration)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result

4-6-5 External Reference Tables (Precise Calibration)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Calibration method	settingMethod	Set/Get	0: Sampling 1: Pattern board
121	Correction setting	correctSetting	Set/Get	0: Not display filtered image 1: Display filtered image
180	Row count (odd value)	col	Set/Get	5 to 19
181	Column count (odd value)	row	Set/Get	5 to 19
182	Points distance [mm]	interval	Set/Get	1 to 1,000
183	Repeat count	loop	Set/Get	1 to 10
184	Point color	pointColor	Set/Get	0: Black 1: White
240	Lens focus [mm]	phisical_focus	Set/Get	3 to 200
241	CCD1 pixel size [um]	ccd_pix_size	Set/Get	1 to 15
242	Plate height [mm]	plate_Height	Set/Get	-100 to 100
243	Work height [mm]	work_Height	Set/Get	-100 to 100
244	Depth setting	useDepth	Set/Get	0: OFF 1: ON
260	Error/Max. X	maxX	Get only	-1 to 1
261	Error/Max. Y	maxY	Get only	-1 to 1
6002	Format	cameraColor	Set/Get	1: monochrome camera 2: color camera

4-7 User Data

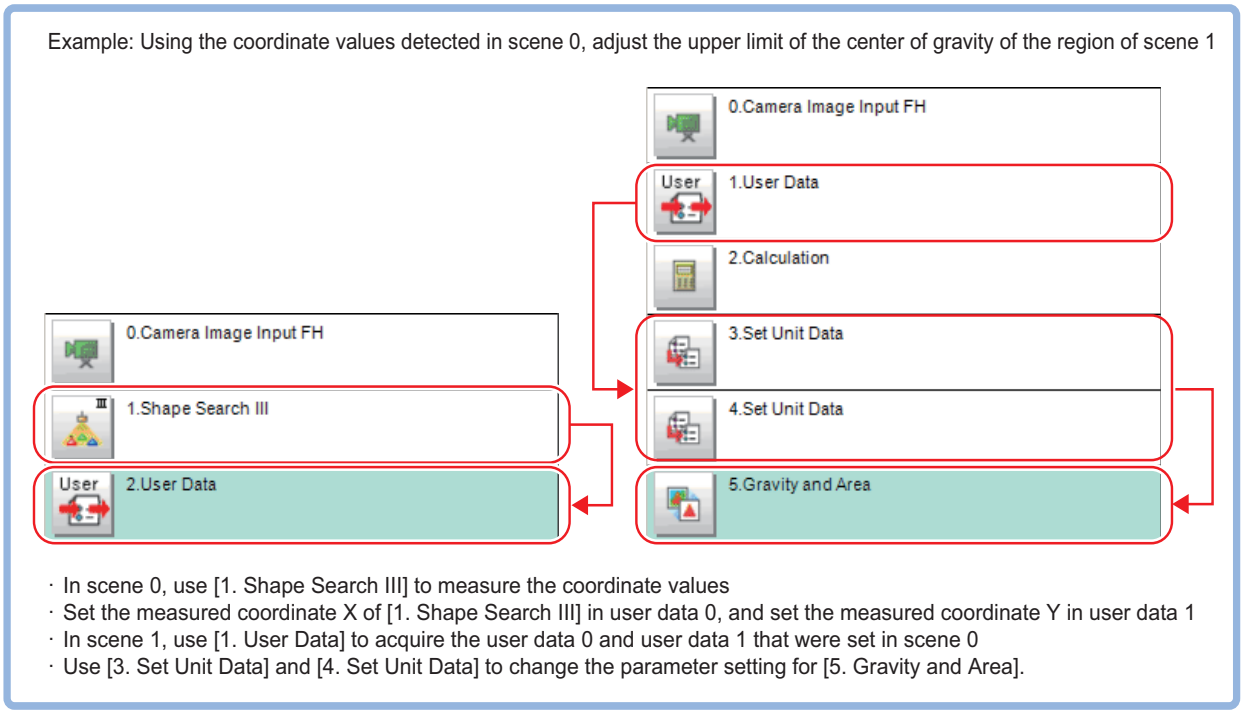
This processing item can not be used in the FHV series.

User data is data that can be shared by scenes in the sensor controller. User data values are stored as system data, and the same user data can be accessed from different scenes. User data processing items can be used to set and acquire user data. If you want to set default values or comments in user data, use the User Data Tool in addition to the user data processing items.

For details on the communication commands, refer to *Using User Data Tool [How to Set User Data]* in *Section 4 Using Tools* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

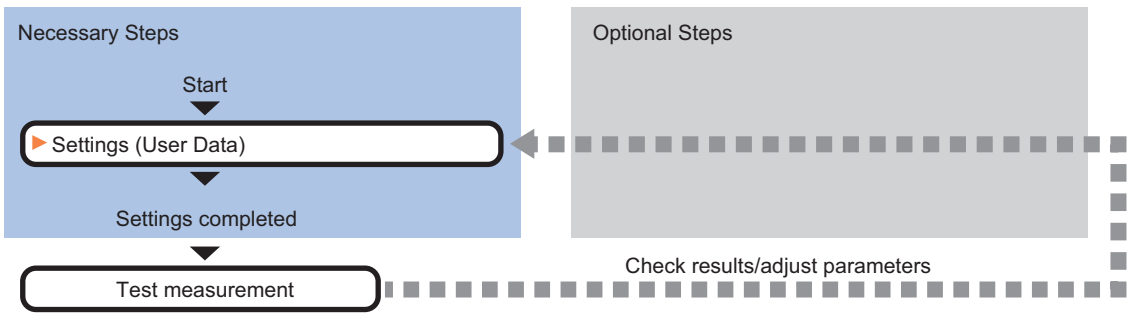
Used in the Following Case

When you want to share any set data among multiple processing units



4-7-1 Settings Flow (User Data)

Set up user data according to the following steps.



List of User Data Items

The following items can be set in user data.

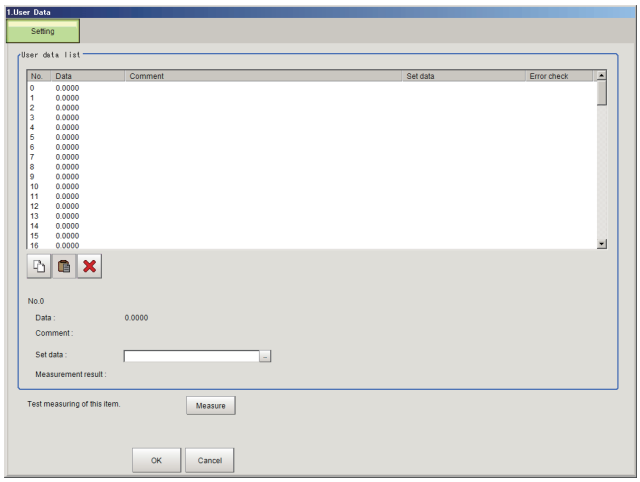
Item name	Description
Setting	Set the values and calculation expressions to be set as user data. The number of user data items that can be used is 100. Refer to *4-7-2 Settings (User Data)* on page 4-41.

4-7-2 Settings (User Data)

Set the values and calculation expressions to be set as user data. The number of user data items that can be used is 100.

1 In the Item Tab area, click [Setting].

2 In the User Data List area, select the calculation expression to be set as user data.



3 In the User Data List area, click [...] next to the setting data.

4 Set the calculation expression.

5 When you have finished setting the calculation expression, click [OK].

The entered calculation expression is finalized.

Additional Information

- If the calculation expression in the setting data is invalid when the setting screen is opened, an “Setting error in the set data.” message will appear. The error symbol “E” will also appear in the error check field. Correct the calculation expression for which “E” appears. The error message will not clear until there are no “E” symbols.
- If you do not set a calculation expression, you can acquire the raw values of the corresponding user data number as measurement results. If you set a calculation expression, you can acquire as measurement results the user data values with the calculation results applied.

4-7-3 Key Points for Test Measurement and Adjustment (User Data)

You can adjust the parameters while you perform test measurements and check the measurement results to increase the measurement precision and speed.

Select the adjustment method by considering the following point.

Check the measurement results that can be displayed and output in “Measurement Results for Which Output Is Possible”.

Additional Information

When you perform test measurement, the display of the details and image are updated according to the measurement results.

Items Displayed in the Detail Result Area

The following measurement results are displayed in the “Detail result” area as text.

Displayed item	Description
Judge	Displays the judgement result for the processing unit.

Items Displayed in the Image Display Area

You can specify a sub-image number to display the next image in the image display area.

Sub image number	Description
0	The measurement image appears.

4-7-4 Measurement Results For Which Output Is Possible (User Data)

The measurement results provided by user data are shown below. The measurement results appear in the “Detail Result” area, and you can also use result output processing items to output the measurement results to an external device.

Refer to the “External Reference Tables” for the parameters that can be referenced, including measurement results.

Refer to *4-7-5 External Reference Tables (User Data)* on page 4-43.

Measurement item	Character string	Description
Judge	JG	The judgement result for the processing unit
Setting data 00 to Setting data 99	DT00 to DT99	Values of user data 00 to User data 99

Additional Information

When a calculation expression is not set in the setting data, the raw values of the user data can be acquired as measurement results. When a calculation expression is set, you can acquire as measurement results the user data values with the calculation results applied.

4-7-5 External Reference Tables (User Data)

By specifying a number, you can access the following data from processing items that support processing unit data setting/acquisition, and from control commands.

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
200+N (N: 0 to 99)	Data	setupData	Set/Get	Exp. character string
1000+N (N: 0 to 99)	Calculation result	resultData	Get only	-999,999,999.9999 to 999,999,999.9999

4-8 Set Unit Data

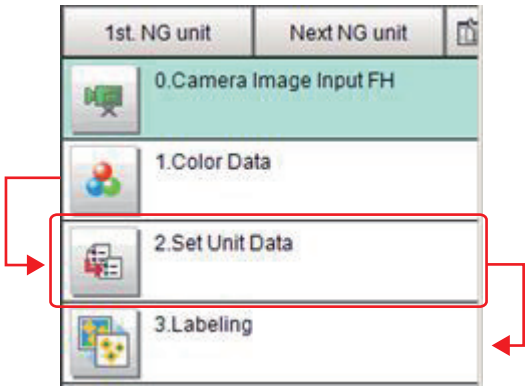
This processing item can not be used in the FHV series.

Changes the parameters for processing performed thereafter within the measurement flow.

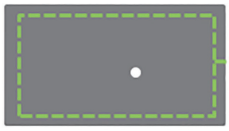
Used in the Following Case

When rewriting processing unit data during measurement

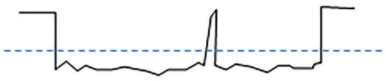
Example) Adjust the search range based on the size of measurement object.



- Measure average density of measurement objects with [1. Color average/differential].
- Adjust lower limit of Binary level for [3. Labeling] based on the above measurement results (monochrome camera only).



Substrate average density value



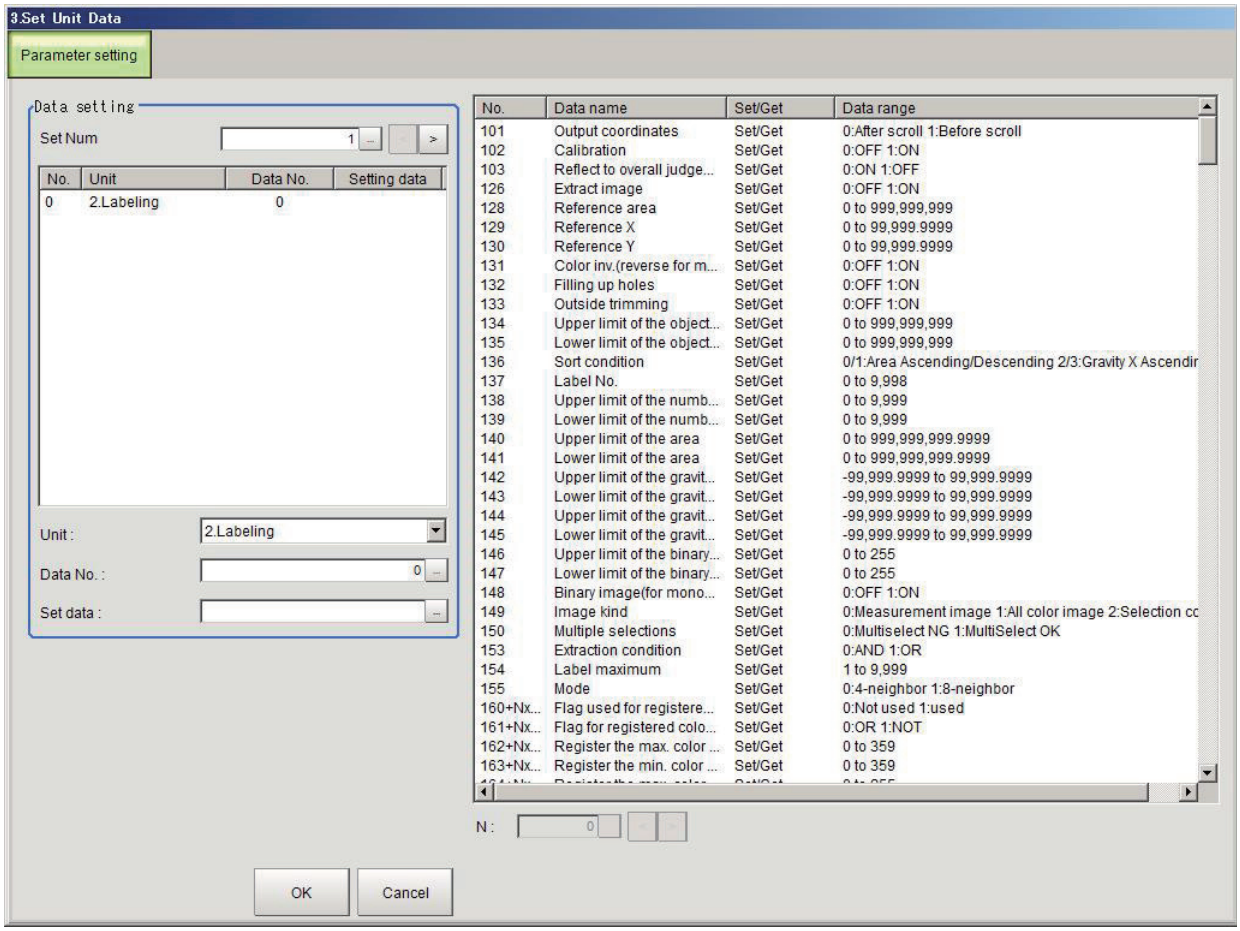
Use the average density value + difference as the binary level lower limit (monochrome camera only)

4-8-1 Parameter Settings (Set Unit Data)

Multiple processing unit data within the measurement flow are changed to set data.

Important

- Only numeric data can be used for the processing unit data setting.
- To set character string data, use the macro customize functions.
- Data expressed as "*** Character String" or "*** Characters" in the data range in the data list are character string data.



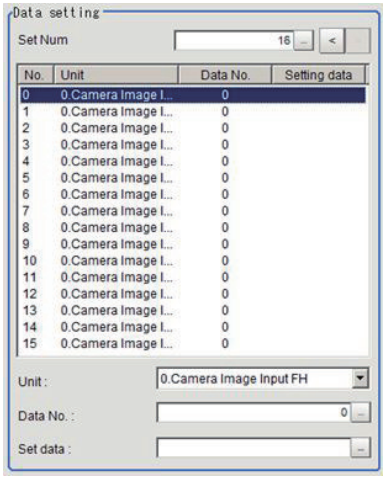
1 In the "Data setting" area, specify the "Set Num" for data items to change.

Up to 16 can be set in "Set Num". As increase or decrease the "Set Num", the display data in the data setting area is also increased or decreased.

Important

Regarding items hidden by adjusting "Set Num", data setting for processing units are not performed. However, set data is maintained. However, set data is maintained. Accordingly, if adjusting the "Set Num" for re-display, the maintained data will be displayed. Check details of data.

Data displayed in the "Data setting" area is the data no, target unit, target data no., and set data.



2 Click the data no. in the "Data setting" area.

3 In "Unit", select the processing unit to change.

Selecting this will change the data list display.

Data to display in the data list is external reference data no, data name, set/get, and data range.

Additionally, data to display differs depending on processing items.

For more details, refer to External Reference Table for each processing item.

4 Click the line for the data displayed in the data list, and set the target data number for the target to write.

Alternatively, click [...] for [Data No.] and set the target data number to rewrite.

The designated data No. will be different depending on the processing item.

For more details, refer to External Reference Table for each processing item.

5 In "Data setting", overwrite details are set up using an expression.

Reference: *4-3-3 Layout of Setting Expression Window* on page 4-12

6 Click [OK].

The settings are finalized.

4-8-2 Key Points for Test Measurement and Adjustment (Set Processing Unit Data)

The following content is displayed in the "Detail result" area as text.

Values set in [No. of settings] for processing unit 0 to 15, data no. 0 to 15, and settings data 0 to 15 are displayed.

Displayed items	Description
Judge	Judgement result
Processing unit 0 to 15	Data No. 0 to 15 target unit number
Data no. 0 to 15	Data No. 0 to 15 target unit target data number
Setting data 0 to 15	Calculation result of setup data (formula) for data no. 0 to 15

4-8-3 Measurement Results for Which Output Is Possible (Set Unit Data)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Latest processing unit judgement result
Processing unit 0 to 15	DT0 to 15	Calculation result of setup data (formula) for data no. 0 to 15

4-8-4 External Reference Tables (Set Unit Data)

No.	Data Name	Set/Get	Data range
0	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (Image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Data	Get only	-999999999.9999 to 999999999.9999
120	Unit	Set/Get	0 to 9999
121	Data No.	Set/Get	0 to 99999
122	Expressions	Set/Get	Expression character string
220	No. of settings	Set/Get	1 to 16
321+Nx1 (N=0 to 15)	Target unit	Set/Get	0 to 9999
421+Nx1 (N=0 to 15)	Target data	Set/Get	0 to 99999
521+Nx1 (N=0 to 15)	Expressions	Set/Get	Expression character string

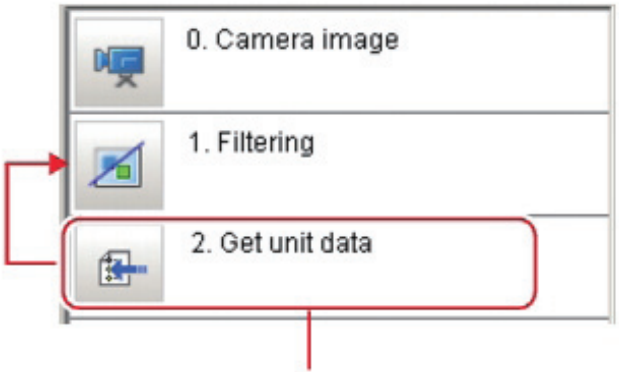
4-9 Get Unit Data

This processing item can not be used in the FHV series.

Used in the Following Case

When you want to acquire processing unit data while measuring

Example) Acquire the background removing level in filtering before measurement.

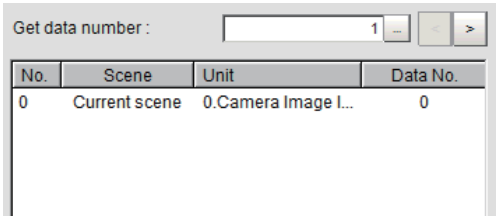


Object Unit: [Filtering]
Acquired data: “129” (lower limit of the background removing level)

4-9-1 Parameter Settings (Get Unit Data)

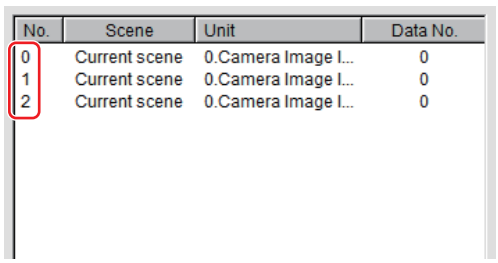
1 In the "Data setting" area, click the "Get data number" [...] or [>] to set the number of target data.

The data number, data name, and data range that can be used in the target units are displayed on the right side.



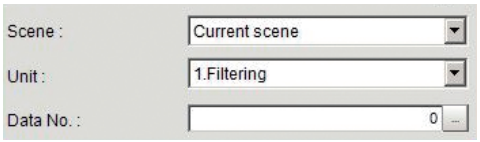
2 From the list, click the "No." of the data for which you are setting the acquisition target.

The No. selected will be displayed below the list.



3 Click [▼] for "Scene" and specify the scene number of the desired processing unit.

For more details, refer to External Reference Tables for each processing item.



4 Click [▼] for "Unit" and specify the desired unit.

5 Click [...] for "Data No." and specify the desired data No.

The designated data No. will be different depending on the processing item.

For more details, refer to External Reference Tables for each processing item.

Important

- Only numeric data can be obtained for the processing unit data acquisition.
- To get character string data, use the macro customize functions.
- Those items whose data range are described as "Character String" in the external reference data list are character string data.

Additional Information

- Clicking the desired data on the list enters the "Data No." of the clicked position.

- If ">" of "N" at the bottom of the list is clicked, the "Data No." with the N value of the number taken into account can be set.

6 Click [OK].

The settings are finalized.

4-9-2 Measurement Results for Which Output Is Possible (Get Unit Data)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Data 00 to 15	DT00 to DT15	The values in the data 00 to 15

4-9-3 External Reference Tables (Get Unit Data)

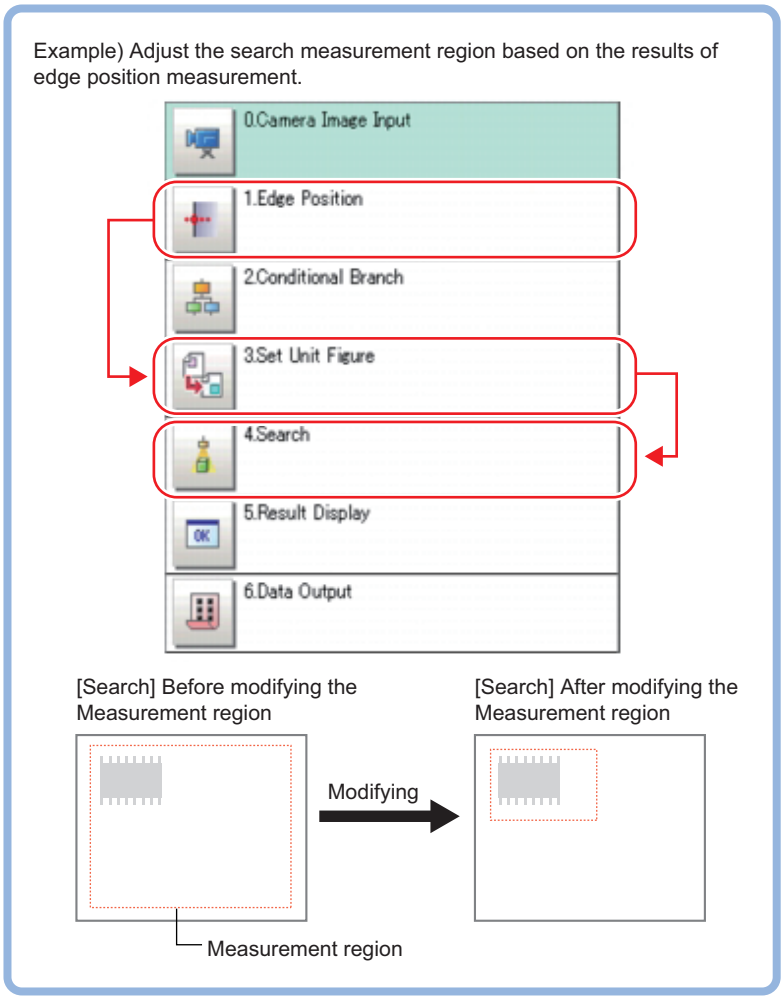
No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5+N (N: 0 to 15)	Data	getData	Get only	-999,999,999.9999 to 999,999,999.9999
220	Get data number	GetNum	Set/Get	1 to 16
221+N (N: 0 to 15)	Scene	targetSceneNo	Set/Get	-1 to 9,999
321+N (N: 0 to 15)	Unit	targetUnitNo	Set/Get	0 to 9,999
421+N (N: 0 to 15)	Data No.	targetDataNo	Set/Get	0 to 99,999

4-10 Set Unit Figure

This processing item can not be used in the FHV series.

Used in the Following Case

When changing the measurement area based on the measurement results



Important

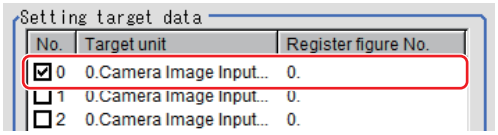
Do not insert "Input image" processing items or "Compensate image" processing items between the "Set Unit Figure" and the target processing unit.The processing unit figure may go out. The processing unit figure may go out.
Refer to *Section 1 Input image* and *Section 3 Compensate image*.

4-10-1 Parameter Settings (Set Unit Figure)

Up to 8 figures can be set for each set unit figure.

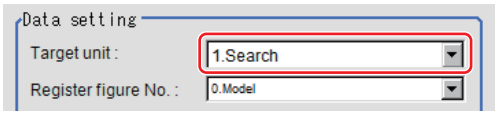
To set multiple figures for one target unit, set different register figure Nos.

1 Click the target unit in the "Setting target data" area and check the No. column.



2 In the "Data setting" area, click the [Target unit] [▼] to select the target unit.

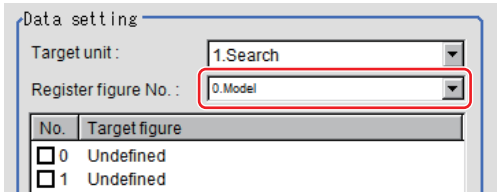
The target unit name in the "Setting target data" area is also reflected automatically.



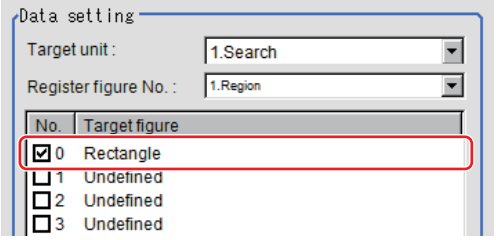
3 In the "Data setting" area, click the [Register figure No.] [▼] to select the figure to be registered.

Target figures included in the selected figure are displayed.

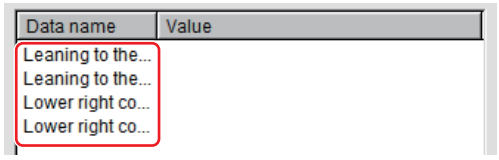
The registered figure name in the "Setting target data" area is also reflected automatically.



4 Click the target figure whose data you want to set and check the No. column.



5 Click the name of the data that you want to rewrite.



6 Click [Edit] to set up the overwrite details using an expression.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12.

7 Click [OK].

An area is displayed on the image based on settings.

4-10-2 Key Points for Test Measurement and Adjustment (Set Unit Figure)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgment result
Setting target data 0	Judgment result
Setting target data 1	Judgment result
Setting target data 2	Judgment result
Setting target data 3	Judgment result
Setting target data 4	Judgment result
Setting target data 5	Judgment result
Setting target data 6	Judgment result

Key Points for Adjustment

Select the adjustment method referring to the following point.

- Judgement will be NG.

Parameter to be adjusted	Troubleshooting
Setting parameters for figures	• Check if the values entered for the setting figure are correct. If the setting figure is a rectangle, check that coordinates are specified in the order from top-left (X, Y) to bottom-right (X, Y). To refer to the measurement coordinates X and Y from other units, the set order may be the top-right coordinates (X, Y) to bottom-left coordinates (X, Y). If the setting figure is a circle, check that no negative value is specified as the radius. • Check that anything other than images are not included in the set figure. • Check that figure size limit of the setting target is not exceeded.

4-10-3 Measurement Results for Which Output Is Possible (Set Unit Figure)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	The latest processing unit judgement result
Number of data items	DNO	Number of data items setup
Data 0	DT0	Calculation result of setup data 0
Data 1	DT1	Calculation result of setup data 1
Data 2	DT2	Calculation result of setup data 2
Data 3	DT3	Calculation result of setup data 3
Data 4	DT4	Calculation result of setup data 4
Data 5	DT5	Calculation result of setup data 5
Data 6	DT6	Calculation result of setup data 6
Data 7	DT7	Calculation result of setup data 7
Data 8	DT8	Calculation result of setup data 8
Data 9	DT9	Calculation result of setup data 9
Data 10	DT10	Calculation result of setup data 10
Data 11	DT11	Calculation result of setup data 11
Data 12	DT12	Calculation result of setup data 12
Data 13	DT13	Calculation result of setup data 13
Data 14	DT14	Calculation result of setup data 14
Data 15	DT15	Calculation result of setup data 15
Data 16	DT16	Calculation result of setup data 16
Data 17	DT17	Calculation result of setup data 17
Data 18	DT18	Calculation result of setup data 18
Data 19	DT19	Calculation result of setup data 19

4-10-4 External Reference Tables (Set Unit Figure)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5+N (N: 0 to 19)	First flag target unit's first flag target figure's Data0 to Data19	DT	Get only	-999,999,999.9999 to 999,999,999.9999
25	First flag target unit's first flag target figure's Number of setting data items	DNO	Get only	0 to 20
100+Nx10 (N: 0 to 7)	Flag of target unit	targetUnitCheck_	Set/Get	0: OFF 1: ON
101+Nx10 (N: 0 to 7)	Target unit No.	targetUnitNo_	Set/Get	0 to 9,999
102+Nx10 (N: 0 to 7)	Target figure No.	registFigureNo_	Set/Get	0 to 1,000
200	Flag of target unit 0's target figure0	figureCheck00	Set/Get	0: OFF 1: ON
201	Flag of target unit 0's target figure1	figureCheck01	Set/Get	0: OFF 1: ON
202	Flag of target unit 0's target figure2	figureCheck02	Set/Get	0: OFF 1: ON
203	Flag of target unit 0's target figure3	figureCheck03	Set/Get	0: OFF 1: ON
204	Flag of target unit 0's target figure4	figureCheck04	Set/Get	0: OFF 1: ON
205	Flag of target unit 0's target figure5	figureCheck05	Set/Get	0: OFF 1: ON
206	Flag of target unit 0's target figure6	figureCheck06	Set/Get	0: OFF 1: ON
207	Flag of target unit 0's target figure7	figureCheck07	Set/Get	0: OFF 1: ON
210	Flag of target unit 1's target figure 0	figureCheck10	Set/Get	0: OFF 1: ON
211	Flag of target unit 1's target figure 1	figureCheck11	Set/Get	0: OFF 1: ON
212	Flag of target unit 1's target figure 2	figureCheck12	Set/Get	0: OFF 1: ON
213	Flag of target unit 1's target figure 3	figureCheck13	Set/Get	0: OFF 1: ON
214	Flag of target unit 1's target figure 4	figureCheck14	Set/Get	0: OFF 1: ON

No.	Data Name	Ident	Set/Get	Data range
215	Flag of target unit 1's target figure 5	figureCheck15	Set/Get	0: OFF 1: ON
216	Flag of target unit 1's target figure 6	figureCheck16	Set/Get	0: OFF 1: ON
217	Flag of target unit 1's target figure 7	figureCheck17	Set/Get	0: OFF 1: ON
. . .	. . .	. . .	. . .	. . .
270	Flag of target unit 7's target figure 0	figureCheck70	Set/Get	0: OFF 1: ON
271	Flag of target unit 7's target figure 1	figureCheck71	Set/Get	0: OFF 1: ON
272	Flag of target unit 7's target figure 2	figureCheck72	Set/Get	0: OFF 1: ON
273	Flag of target unit 7's target figure 3	figureCheck73	Set/Get	0: OFF 1: ON
274	Flag of target unit 7's target figure 4	figureCheck74	Set/Get	0: OFF 1: ON
275	Flag of target unit 7's target figure 5	figureCheck75	Set/Get	0: OFF 1: ON
276	Flag of target unit 7's target figure 6	figureCheck76	Set/Get	0: OFF 1: ON
277	Flag of target unit 7's target figure 7	figureCheck77	Set/Get	0: OFF 1: ON
300	Now select target unit	unitIndex	Set/Get	0 to 7
303	Current unit Figure No.	targetFigureNo	Set/Get	0 to 7
310+N (N: 0 to 7)	Now select target unit's target figure's flag	figureCheck	Set/Get	0: OFF 1: ON
1000+N (N: 0 to 19)	Target unit0's target figure0's Data	data00_	Get only	-999,999,999.9999 to 999,999,999.9999
1100+N (N: 0 to 19)	Target unit0's target figure1's Data	data01_	Get only	-999,999,999.9999 to 999,999,999.9999
1200+N (N: 0 to 19)	Target unit0's target figure2's Data	data02_	Get only	-999,999,999.9999 to 999,999,999.9999
1300+N (N: 0 to 19)	Target unit0's target figure3's Data	data03_	Get only	-999,999,999.9999 to 999,999,999.9999
1400+N (N: 0 to 19)	Target unit0's target figure4's Data	data04_	Get only	-999,999,999.9999 to 999,999,999.9999
1500+N (N: 0 to 19)	Target unit0's target figure5's Data	data05_	Get only	-999,999,999.9999 to 999,999,999.9999
1600+N (N: 0 to 19)	Target unit0's target figure6's Data	data06_	Get only	-999,999,999.9999 to 999,999,999.9999
1700+N (N: 0 to 19)	Target unit0's target figure7's Data	data07_	Get only	-999,999,999.9999 to 999,999,999.9999
2000+N (N: 0 to 19)	Target unit1's target figure0's Data	data10_	Get only	-999,999,999.9999 to 999,999,999.9999
2100+N (N: 0 to 19)	Target unit1's target figure1's Data	data11_	Get only	-999,999,999.9999 to 999,999,999.9999

No.	Data Name	Ident	Set/Get	Data range
2200+N (N: 0 to 19)	Target unit1's target figure2's Data	data12_	Get only	-999,999,999.9999 to 999,999,999.9999
2300+N (N: 0 to 19)	Target unit1's target figure3's Data	data13_	Get only	-999,999,999.9999 to 999,999,999.9999
2400+N (N: 0 to 19)	Target unit1's target figure4's Data	data14_	Get only	-999,999,999.9999 to 999,999,999.9999
2500+N (N: 0 to 19)	Target unit1's target figure5's Data	data15_	Get only	-999,999,999.9999 to 999,999,999.9999
2600+N (N: 0 to 19)	Target unit1's target figure6's Data	data16_	Get only	-999,999,999.9999 to 999,999,999.9999
2700+N (N: 0 to 19)	Target unit1's target figure7's Data	data17_	Get only	-999,999,999.9999 to 999,999,999.9999
. . .	. . .	. . .	. . .	. . .
8000+N (N: 0 to 19)	Target unit7's target figure0's Data	data70_	Get only	-999,999,999.9999 to 999,999,999.9999
8100+N (N: 0 to 19)	Target unit7's target figure1's Data	data71_	Get only	-999,999,999.9999 to 999,999,999.9999
8200+N (N: 0 to 19)	Target unit7's target figure2's Data	data72_	Get only	-999,999,999.9999 to 999,999,999.9999
8300+N (N: 0 to 19)	Target unit7's target figure3's Data	data73_	Get only	-999,999,999.9999 to 999,999,999.9999
8400+N (N: 0 to 19)	Target unit7's target figure4's Data	data74_	Get only	-999,999,999.9999 to 999,999,999.9999
8500+N (N: 0 to 19)	Target unit7's target figure5's Data	data75_	Get only	-999,999,999.9999 to 999,999,999.9999
8600+N (N: 0 to 19)	Target unit7's target figure6's Data	data76_	Get only	-999,999,999.9999 to 999,999,999.9999
8700+N (N: 0 to 19)	Target unit7's target figure7's Data	data77_	Get only	-999,999,999.9999 to 999,999,999.9999
10000+N (N: 0 to 19)	Target unit0's target figure0's setting data	setupData00_	Set/Get	-999,999,999.9999 to 999,999,999.9999
10100+N (N: 0 to 19)	Target unit0's target figure1's setting data	setupData01_	Set/Get	-999,999,999.9999 to 999,999,999.9999
10200+N (N: 0 to 19)	Target unit0's target figure2's setting data	setupData02_	Set/Get	-999,999,999.9999 to 999,999,999.9999
10300+N (N: 0 to 19)	Target unit0's target figure3's setting data	setupData03_	Set/Get	-999,999,999.9999 to 999,999,999.9999
10400+N (N: 0 to 19)	Target unit0's target figure4's setting data	setupData04_	Set/Get	-999,999,999.9999 to 999,999,999.9999
10500+N (N: 0 to 19)	Target unit0's target figure5's setting data	setupData05_	Set/Get	-999,999,999.9999 to 999,999,999.9999
10600+N (N: 0 to 19)	Target unit0's target figure6's setting data	setupData06_	Set/Get	-999,999,999.9999 to 999,999,999.9999
10700+N (N: 0 to 19)	Target unit0's target figure7's setting data	setupData07_	Set/Get	-999,999,999.9999 to 999,999,999.9999
11000+N (N: 0 to 19)	Target unit1's target figure0's setting data	setupData10_	Set/Get	-999,999,999.9999 to 999,999,999.9999

No.	Data Name	Ident	Set/Get	Data range
11100+N (N: 0 to 19)	Target unit1's target figure1's setting data	setupData11_	Set/Get	-999,999,999.9999 to 999,999,999.9999
11200+N (N: 0 to 19)	Target unit1's target figure2's setting data	setupData12_	Set/Get	-999,999,999.9999 to 999,999,999.9999
11300+N (N: 0 to 19)	Target unit1's target figure3's setting data	setupData13_	Set/Get	-999,999,999.9999 to 999,999,999.9999
11400+N (N: 0 to 19)	Target unit1's target figure4's setting data	setupData14_	Set/Get	-999,999,999.9999 to 999,999,999.9999
11500+N (N: 0 to 19)	Target unit1's target figure5's setting data	setupData15_	Set/Get	-999,999,999.9999 to 999,999,999.9999
11600+N (N: 0 to 19)	Target unit1's target figure6's setting data	setupData16_	Set/Get	-999,999,999.9999 to 999,999,999.9999
11700+N (N: 0 to 19)	Target unit1's target figure7's setting data	setupData17_	Set/Get	-999,999,999.9999 to 999,999,999.9999
. . .	. . .	. . .	. . .	. . .
17000+N (N: 0 to 19)	Target unit7's target figure0's setting data	setupData70_	Set/Get	-999,999,999.9999 to 999,999,999.9999
17100+N (N: 0 to 19)	Target unit7's target figure1's setting data	setupData71_	Set/Get	-999,999,999.9999 to 999,999,999.9999
17200+N (N: 0 to 19)	Target unit7's target figure2's setting data	setupData72_	Set/Get	-999,999,999.9999 to 999,999,999.9999
17300+N (N: 0 to 19)	Target unit7's target figure3's setting data	setupData73_	Set/Get	-999,999,999.9999 to 999,999,999.9999
17400+N (N: 0 to 19)	Target unit7's target figure4's setting data	setupData74_	Set/Get	-999,999,999.9999 to 999,999,999.9999
17500+N (N: 0 to 19)	Target unit7's target figure5's setting data	setupData75_	Set/Get	-999,999,999.9999 to 999,999,999.9999
17600+N (N: 0 to 19)	Target unit7's target figure6's setting data	setupData76_	Set/Get	-999,999,999.9999 to 999,999,999.9999
17700+N (N: 0 to 19)	Target unit7's target figure7's setting data	setupData77_	Set/Get	-999,999,999.9999 to 999,999,999.9999

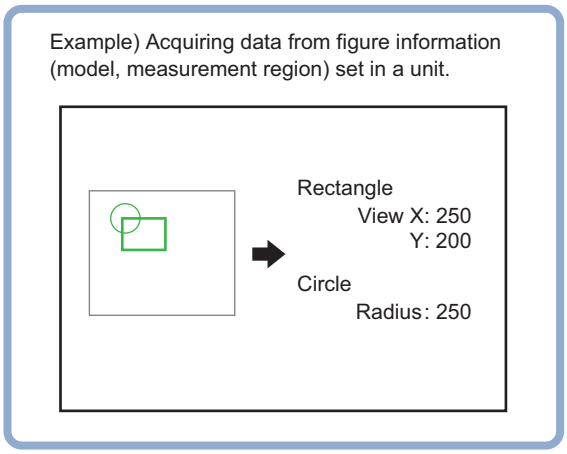
4-11 Get Unit Figure

This processing item can not be used in the FHV series.

Acquires and displays figures drawn by other processing units.

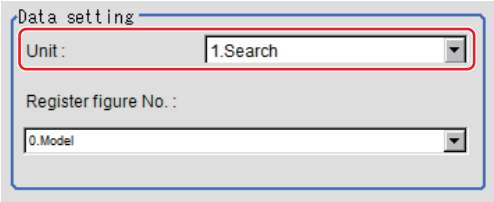
Used in the Following Case

When you want to acquire data such as coordinates from figure information



4-11-1 Parameter Settings (Get Unit Figure)

1 In the "Data setting" area, click the [Unit] [▼] to set the number of the registered figure you want to acquire.



2 Click [▼] for [Resister figure No.] and specify Register figure No. you would like to acquire.

4-11-2 Key Points for Test Measurement and Adjustment (Get Unit Figure)

The following content can be confirmed in the "Detail result" area using text.

Displayed items	Description
Judge	Judgement result
Target unit	Target unit which acquired figure
Register figure No.	Acquired figure number

4-11-3 Measurement Results for Which Output Is Possible (Get Unit Figure)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	The latest processing unit judgement result
Number of figures	NUM	Number of figures acquired
Size of figures	SIZ	Size of figures acquired (number of bytes)
Figure N type (N = 0 to 9)	FNT	Type of figure N 0x0000→Undefined 0x0001→Point 0x0002→Line 0x0004→Wide line 0x0008→Rectangle 0x0010→Ellipse 0x0020→Circle 0x0040→Wide circle 0x0080→Arc 0x0100→Wide arc 0x0200→Polygon Set to 0 if no figures are acquired.
Figure N mode (N = 0 to 9)	FNM	Figure N drawing mode 0: OR 1: NOT Set to 0 if no figures are acquired.
Figure N data 00 to 20 (N = 0 to 9)	FND 00 to FND 20	Data 0 to 20 of figure N • For points 0: X coordinate 1: Y coordinate • For lines 0: X coordinate for first point 1: Y coordinate for first point 2: X coordinate for second point 3: Y coordinate for second point • For wide lines 0: X coordinate for first point 1: Y coordinate for first point 2: X coordinate for second point 3: Y coordinate for second point 4: Width • For rectangles 0: X coordinate for upper left point 1: Y coordinate for upper left point 2: X coordinate for lower right point 3: Y coordinate for lower right point

Measurement items	Character string	Description
Figure N data 00 to 20 (N = 0 to 9)	FND 00 to FND 20	• For ellipses 0: X coordinate for center point 1: Y coordinate for center point 2: Radius in X direction 3: Radius in Y direction • For circles 0: X coordinate for center point 1: Y coordinate for center point 2: Radius • For wide circles 0: X coordinate for center point 1: Y coordinate for center point 2: Radius 3: Width • For arcs 0: X coordinate for center point 1: Y coordinate for center point 2: Radius 3: Start angle of arc 4: End angle of arc • For wide arcs 0: X coordinate for center point 1: Y coordinate for center point 2: Radius 3: Start angle of arc 4: End angle of arc 5: Width • For polygons 0: Number of vertexes 1: X coordinate for vertex 0 2: Y coordinate for vertex 0 3: X coordinate for vertex 1 4: Y coordinate for vertex 1 5: X coordinate for vertex 2 6: Y coordinate for vertex 2 : : 19: X coordinate for vertex 9 20: Y coordinate for vertex 9 Set to 0 if disabled or no figures are acquired.

4-11-4 External Reference Tables (Get Unit Figure)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mis-match) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
1	Number of figures	num	Get only	Number of figures acquired
2	Size of figures	size	Get only	Size of figures acquired
120	Target processing unit No.	unitNo	Set/Get	0 to 9,999
121	Target figure No.	figureNo	Set/Get	0 to 1,000
1000	Figure 0 type	F0T	Get only	Figure 0 type 0x0000 → Undefined 0x0001 → Point 0x0002 → Line 0x0004 → Wide line 0x0008 → Rectangle 0x0010 → Ellipse 0x0020 → Circle 0x0040 → Wide circle 0x0080 → Arc 0x0100 → Wide arc 0x0200 → Polygon Set to 0 if no figures are acquired.
1001	Figure 0 drawing mode	F0M	Get only	Figure 0 drawing mode
1002+N (N: 0 to 20)	Figure 0 data	F0D	Get only	Figure 0 data: 0 to 20 The amount of valid data differs with data type. Set to 0 if disabled or no figures are acquired.
1100	Figure 1 type	F1T	Get only	Figure 1 type 0x0000 → Undefined 0x0001 → Point 0x0002 → Line 0x0004 → Wide line 0x0008 → Rectangle 0x0010 → Ellipse 0x0020 → Circle 0x0040 → Wide circle 0x0080 → Arc 0x0100 → Wide arc 0x0200 → Polygon Set to 0 if no figures are acquired.
1101	Figure 1 drawing mode	F1M	Get only	Figure 1 drawing mode
1102+N (N: 0 to 20)	Figure 1 data	F1D	Get only	Figure 1 data: 0 to 20 The amount of valid data differs with data type. Set to 0 if disabled or no figures are acquired.

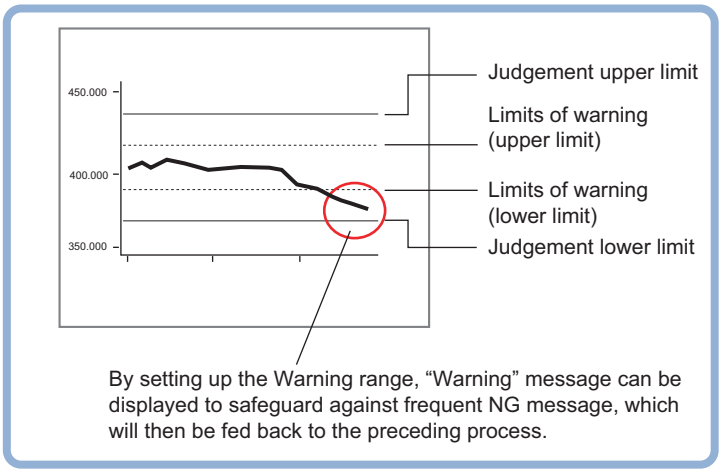
No.	Data Name	Ident	Set/Get	Data range
. . .	. . .	. . .	. . .	. . .
1900	Figure 9 type	F9T	Get only	Figure 9 type 0x0000 → Undefined 0x0001 → Point 0x0002 → Line 0x0004 → Wide line 0x0008 → Rectangle 0x0010 → Ellipse 0x0020 → Circle 0x0040 → Wide circle 0x0080 → Arc 0x0100 → Wide arc 0x0200 → Polygon Set to 0 if no figures are acquired.
1901	Figure 9 drawing mode	F9M	Get only	Figure 9 drawing mode
1902+N (N: 0 to 20)	Figure 9 data	F9D	Get only	Figure 9 data: 0 to 20 The amount of valid data differs with data type. Set to 0 if disabled or no figures are acquired.

4-12 Trend Monitor

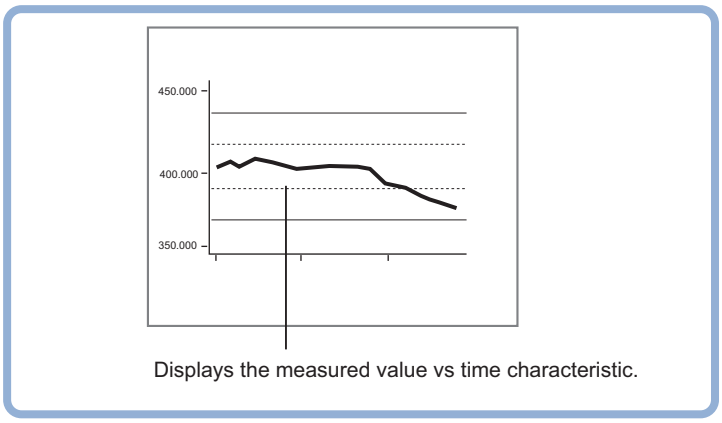
Enables the history of the measurement results to be displayed on the monitor.

Used in the Following Case

- When you want to prevent repeated occurrences of failed product



- When you want to analyze the cause of NG



List of Trend Monitor Items

Item name	Description
Measurement	Select the measurement value to be displayed on the trend monitor. Refer to *4-12-1 Measurement Value (Trend Monitor)* on page 4-65.
Display range	Specify the display range. You can scroll the display range of a graph up and down or zoom in/out. Refer to *4-12-2 Display Range (Trend Monitor)* on page 4-66.
Judgement	Set the conditions for deciding when measurement results are judged as OK, and set the warning range for issuing a caution before there are many NG occurrences. Refer to *4-12-3 Judgement (Trend Monitor)* on page 4-68.
History display	Display measurement history. Refer to *4-12-4 Measurement History Display (Trend Monitor)* on page 4-70.

Item name	Description
Data save	Save the measurement results recorded in the trend monitor to the external memory device, i.e. USB memory. Refer to *4-12-5 Data Save (Trend Monitor)* on page 4-72.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Specify whether to reflect the judgement result to the overall judgement of the scene. Refer to *4-12-6 Output Parameters (Trend Monitor)* on page 4-73.

4-12-1 Measurement Value (Trend Monitor)

Select the measurement value to be viewed on the trend monitor.

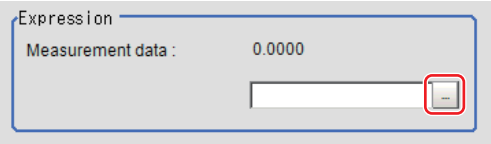
One item can be displayed for each trend monitor unit.

1 Click [Measurement] in the Item Tab area.

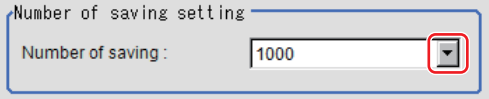
2 In the "Expression" area, click [...] in "Measurement data", and measurement values to be monitored are set up using an expression.

The Setting Expression window is displayed.

Select a unit number processed before [Trend Monitor]. Even if the unit number after [Trend Monitor] is selected, the graph will not display.



3 Set up number of items to save as necessary.



Setting item	Set value	Description
Number of saving	• [1000] • 5000 • 10000 • 50000 • 100000	Set the number of measurement values to save. A maximum of 5000 items can be displayed on the main screen. Measurements that exceed 5000 items are displayed using toggling of pages.

Important

- Trade offs between number of items saved and the sensor controller performance include the following.
- There is a difference in amount of memory used of approximately 2 MB between 1000 items and 100000 items.
  Please confirm the amount of memory remaining prior to performing set up.

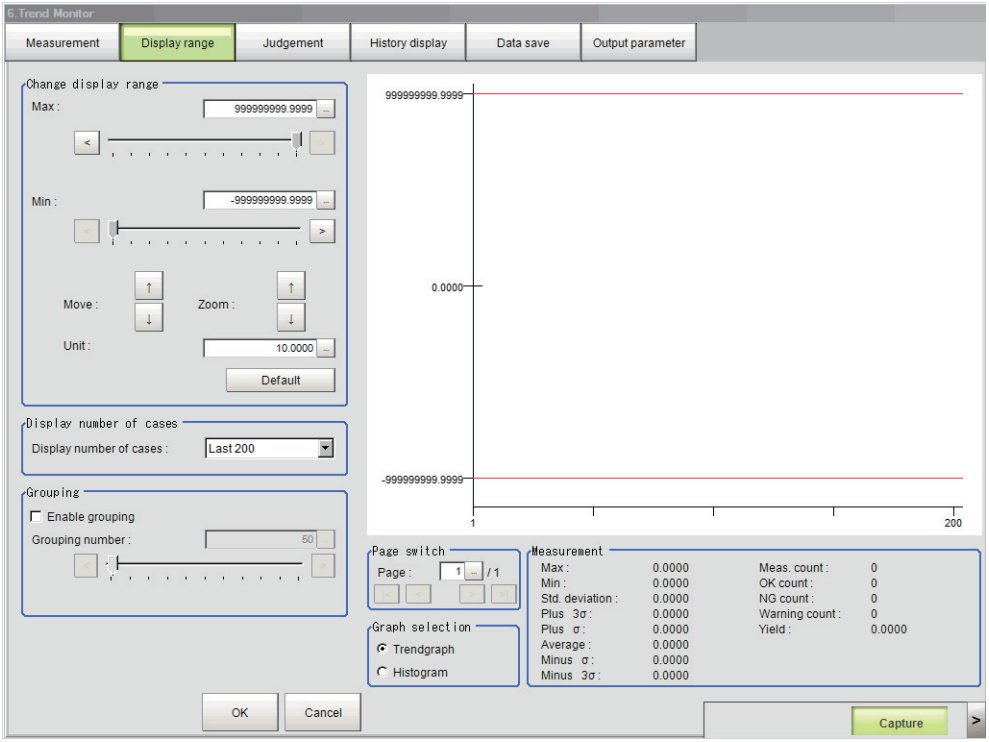
4-12-2 Display Range (Trend Monitor)

If what you want to see is not on the screen, scroll the graph up and down or zoom in/out.

Also, items displayed horizontally can be toggled.

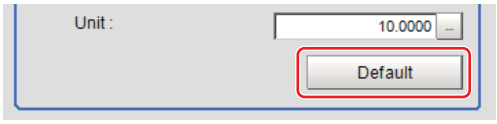
1 In the Item Tab area, click [Display range].

A graph is displayed in the "Image Display" area.



Additional Information

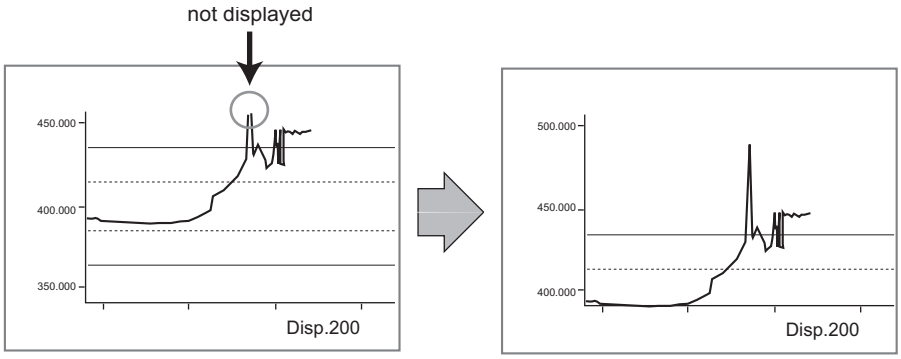
If the window is entered after measurement is performed a few times and [Default] is clicked on, a display range suitable for these measurement values is automatically set.



Setting item		Set value [Factory default]	Description
Change display range	Max	-999999999.9999 to 999999999.9999	Sets the upper (highest value) and lower (lowest value) sections of the graph.
	Min		
	Move	↑ ↓	Moves up and down the graph itself.
	Zoom	↑ ↓	Zooms the graph itself in and out.
	Unit	1 to 1000000.0000	Sets the amount of variation generated when the up/down buttons for moving or zooming in/out are pushed.
	Default	---	If several measurements have already been made, an optimal display range is automatically set based on the measurement results.

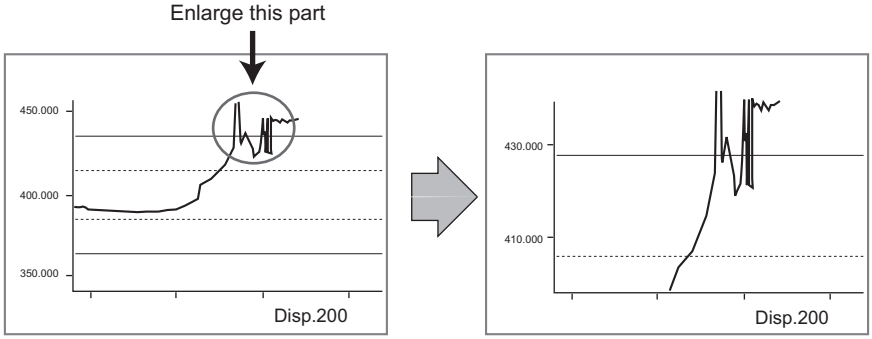
Setting item	Set value [Factory default]	Description
Display number of cases	• [Last 200] • Last 1000 • Last 5000 • Last 10000 • Last 50000 • Last 100000	Select the number of items displayed in the horizontal direction on the graph.
Enable grouping	• [Checked] • Unchecked	Draws a rectangle that shows the maximum and minimum of measurement data for every set number of items. This enables viewing the maximum and minimum in a section at a glance.
	0 to 5000 [50]	Sets the number of items that can be grouped.

● Move

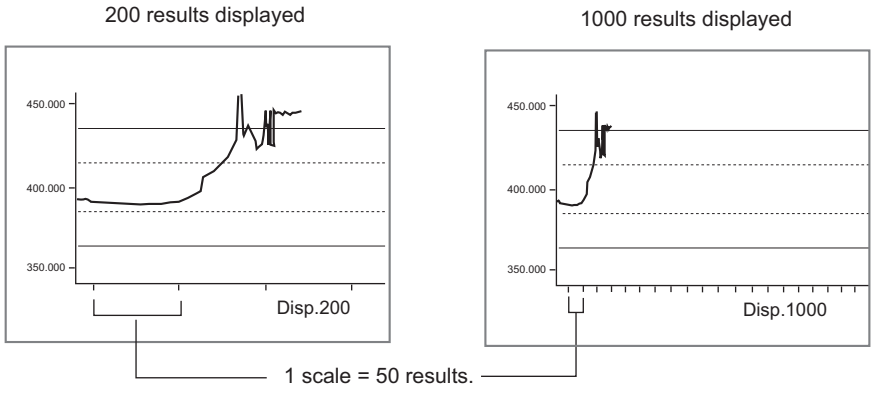


● Zoom

Example: Enlarging a part where measurement results were unstable

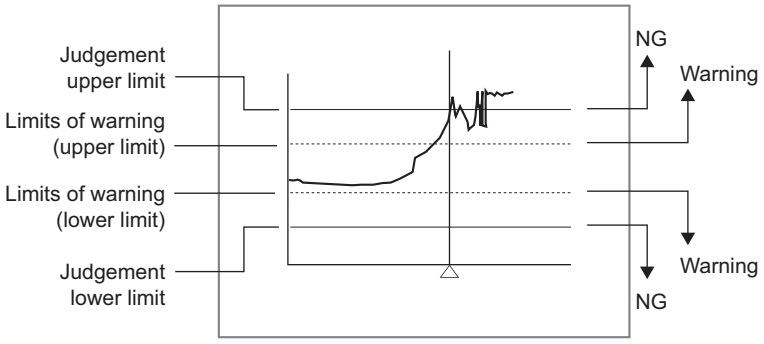


● Horizontal



4-12-3 Judgement (Trend Monitor)

Sets the warning range for prompting caution before large numbers of NGs occur as well as OK/NG judgement conditions.

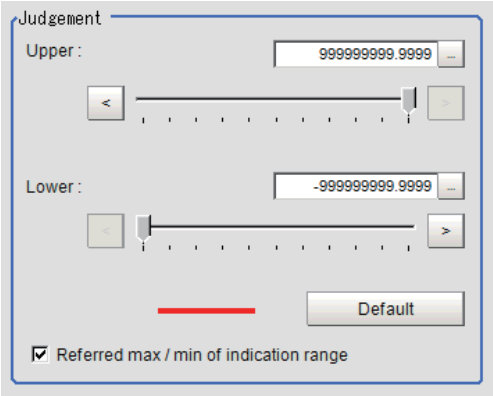


Additional Information

When a warning occurs, the message "Limits of Warning" is displayed on the screen.
Notification that an alarm has occurred can also be output to external devices if output-related processing units such as "Parallel Judgement Output" are used to set an arithmetic expression to output measurement results (warnings) from the trend monitor.

1 In the Item Tab area, click [Judgement].

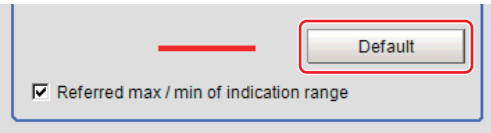
2 Set up the judgement condition.



Setting item	Set value [Factory default]	Description
Upper	-999999999.9999 to 999999999.9999	Specify the range where the measurement result is judged to be OK.
Lower	-999999999.9999 to 999999999.9999	
Referred max / min of indication range	• [Checked] • Unchecked	When checked, the judgement range that can be set with the upper and lower values becomes the same as the max. and min. values set in [Display range].

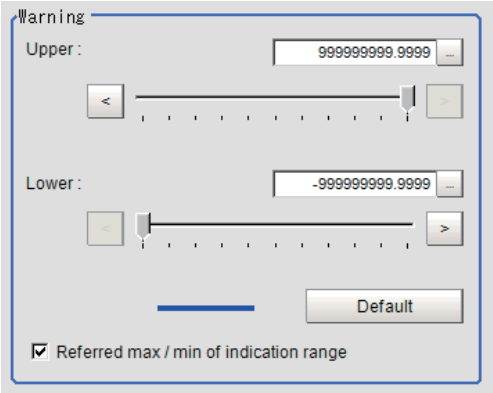
Additional Information

If the window is entered after measurement is performed a few times and [Default] is clicked on, optimal judgement conditions including maximum and minimum measurement values are automatically set.



3 In the "Warning" area, specify values for "Upper" and "Lower".

The setup method is the same as the setup method for the "Judgement" area.



Setting item	Set value [Factory default]	Description
Upper	-999999999.9999 to [999999999.9999]	Specify the warning range for encouraging caution before frequent occurrence of NGs.
Lower	[-999999999.9999] to 999999999.9999	
Referred max / min of indication range	• [Checked] • Unchecked	When checked, the judgement range that can be set with the upper and lower values becomes the same as the max. and min. values set in [Display range].

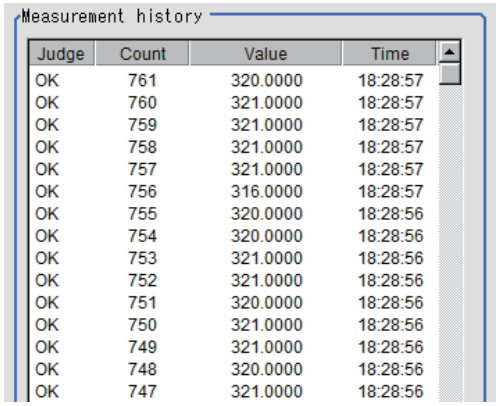
4-12-4 Measurement History Display (Trend Monitor)

Displays measurement history.

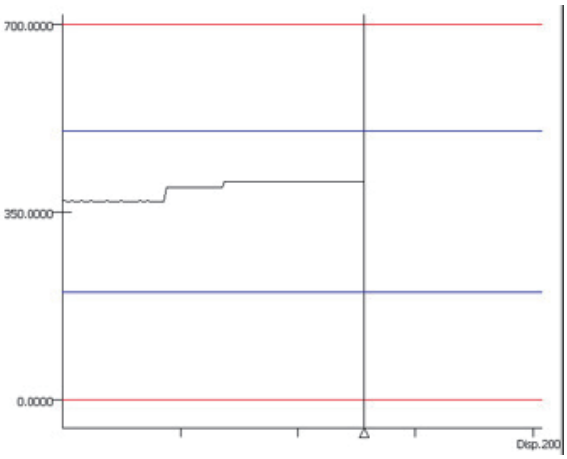
1 Click [History display] in the Item Tab area.

2 Click judgement displayed in the "Measurement history" area.

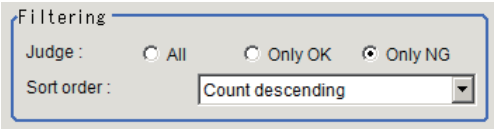
The measurement values and time are displayed.



In the Image Display area, longitudinal lines displayed at NG positions in the graph show where NG have occurred.

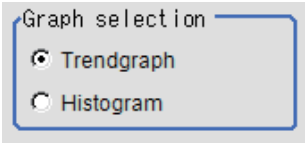


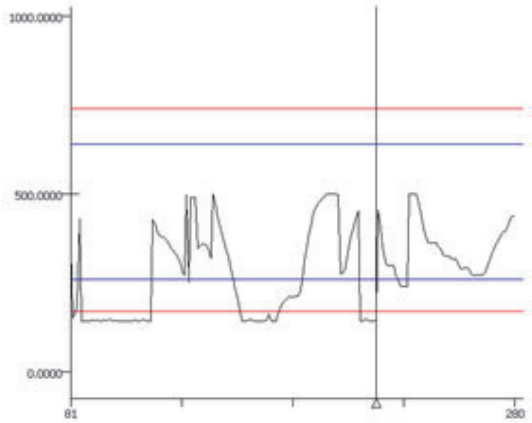
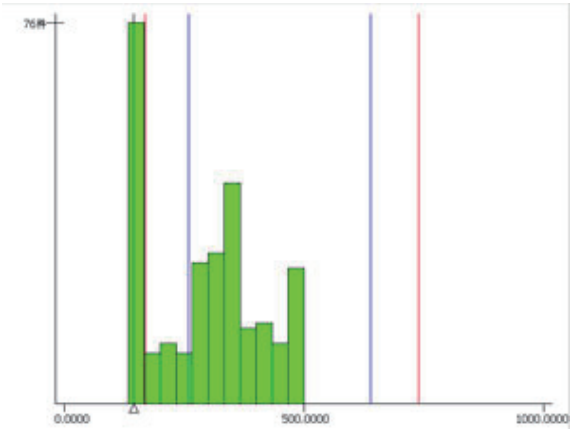
3 Set up a filter as necessary.



Setting item	Set value [Factory default]	Description
Judge	• All • Only OK • [Only NG]	Sets the judgement results that are displayed.
Sort order	• Count ascending • [Count descending] • Value ascending • Value descending	Sets the sort order for the judgement results to display.

4 Sets up a display graph as necessary.

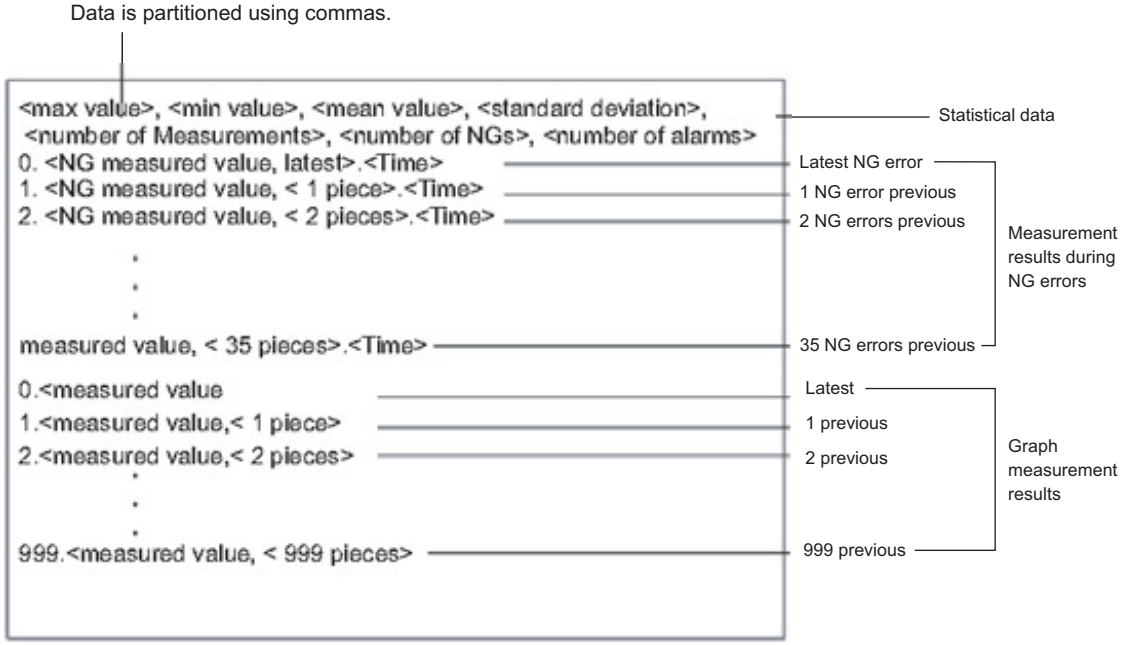


Setting item	Set value [Factory default]	Description
Graph selection	• [Trendgraph]	The vertical direction shows measurement values and horizontal direction shows number of items. This is convenient for showing time elapse and changes in measurement. 
	• Histogram	The vertical direction shows number of items and horizontal direction shows measurement values. This is convenient for showing distribution. 

4-12-5 Data Save (Trend Monitor)

The measurement results recorded in the trend monitor can be saved in a USB memory stick or SD card (for FH series). Since the data is saved in CSV format, it can be edited on the PC.

The data to be saved includes all the statistical data, the value and time stamp when NG occurs (up to 36 items) and the measurement result on the graph (up to 1000 items). Up to 100000 items of measurement results can be saved in extended format. The format is as follows.



Important

Insert a USB memory stick or SD memory card before saving data.
For information on the position of the USB connector and SD card memory, refer to *Vision System FH/FHV/FZ5 series Hardware Setup Manual* (Cat. No. Z366) or Instruction sheet.

1 In the Item Tab area, click [Data save].

2 Specify format in the "Save setting" area.

- Standard format

Line	Text	Description	
1	<Maximum>, <Minimum>, <Average>, <Deviation>, <Count>, <NG count>, <Warning count>	Statistical data	
2			
3	0, <NG measured value, latest>, <Time>	Last NG	Measurement results when NG occurs (Max: 36 items)
4	1, <Last 1 NG measurement>, <Time>	Last 1 NG	
5	2, <Last 2 NG measurement>, <Time>	Last 2 NG	
:	:	:	
38	35, <Last 35 NG measurement>, <Time>	Last 35 NG	
39			
40	0, <measured value, latest>	Last	Measurement result (Max: 1000 items)
41	1, <Last 1 measurement>	Last 1	
42	2, <Last 2 measurement>	Last 2	
:	:	:	
1039	999, <Last 999 measurement>	Last 999	

• Extended format

Line	Text	Description	
1	<Maximum>, <Minimum>, <Deviation>, <Plus 3σ>, <Plus σ>, <Average>, <Minus σ>, <Minus 3σ>, <Count>, <OK count>, <NG count>, <Warning count>, <Yield>	Statistical data	
2			
3	0, <judgement result, latest>, <measured value, latest>, <Time>	Last	Measurement result (Max: 100000 items)
4	1, <Last 1 judgement result>, <Last 1 Measurement>, <Time>	Last 1	
5	2, <Last 2 judgement result>, <Last 2 Measurement>, <Time>	Last 2	
:	:	:	
100002	99999, <Last 99999 judgement result>, <Last 99999 Measurement>, <Time>	Last 99999	

Additional Information

The default for the file name is the data save date (example: 0410.csv). If it is half-width alpha-numeric characters, it can be changed arbitrarily.

3 In the "Save setting" area, click [Save].

Data is saved to a USB memory stick or SD Memory Card.

4-12-6 Output Parameters (Trend Monitor)

Specifies whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

1 Click [Output parameter] in the Item Tab area.

2 Choose whether or not to reflect this in the scene overall judgement in "Reflect to overall judgement" area.

Setting item	Set value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgment results of this processing unit is reflected in the scene overall judgement.

4-12-7 Key Points for Test Measurement and Adjustment (Trend Monitor)

The following content can be confirmed in the "Detail result" area using text.

Displayed items	Description
Judge	Judgement result
Measurement	Latest measured value
Max	Max. measurement value during recording period
Mini	Min. measurement value during recording period
Standard deviation	Sample standard deviation for measurement values during recording period
Plus 3σ	Average of measurement values during period recorded + standard deviation values × 3
Plus σ	Average of measurement values during period recorded + standard deviation values
Average	Average value for measurement values during recording period
Minus σ	Average of measurement values during period recorded - standard deviation values
Minus 3σ	Average of measurement values during period recorded - standard deviation values × 3
Measurement count	Measure count since the beginning of measurement
OK count	Number of measurements since starting to make measurements - NG count in number of measurements
NG count	Number of NG occurrences within the measurement count
Warning count	Warning count within the measurement count
Yield	OK count in number of measurements / Number of measurements since starting to make measurements

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image number	Explanation of image to be displayed
0	Trend graph
1	Histogram

4-12-8 Measurement Results for Which Output Is Possible (Trend Monitor)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Measurement	DT	Latest measured value
Warning	WN	Existence of warning occurrence
Maximum	MX	Max. measurement value during recording period
Minimum	MN	Min. measurement value during recording period
Deviation	DV	Sample standard deviation for measurement values during recording period
Plus 3σ	AP3	Average of measurement values during period recorded + standard deviation values × 3
Plus σ	AP1	Average of measurement values during period recorded + standard deviation values
Average	AV	Average value for measurement values during recording period
Minus σ	AM1	Average of measurement values during period recorded - standard deviation values
Minus 3σ	AM3	Average of measurement values during period recorded - standard deviation values × 3
Measurement count	MC	Measure count since the beginning of measurement
OK count	OC	Number of measurements since starting to make measurements - NG count in number of measurements
NG count	NC	Number of NG occurrences within the measurement count
Warning count	WC	Warning count within the measurement count
Yield	YD	OK count in number of measurements / Number of measurements since starting to make measurements

Important

If the total measurement value data exceeds -1.0 × 10^11 to 1.0 × 10^11, the measurement will be disabled (NG).
Regularly clear the measurement values so that the total measurement value data stays within the range.

4-12-9 External Reference Tables (Trend Monitor)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Measurement	measurement	Get only	-999,999,999.9999 to 999,999,999.9999
6	Warning	warning	Get only	0: OFF 1: ON
7	Maximum	max	Get only	-999,999,999.9999 to 999,999,999.9999
8	Minimum	min	Get only	-999,999,999.9999 to 999,999,999.9999
9	Average	average	Get only	-999,999,999.9999 to 999,999,999.9999
10	Deviation	deviation	Get only	-999,999,999.9999 to 999,999,999.9999
11	Count	measureCount	Get only	0 to 999,999,999
12	NG count	ngCount	Get only	0 to 999,999,999
13	Warning count	warnCount	Get only	0 to 999,999,999
14	Average plus + 3σ	avePlus3Sigma	Get only	-999,999,999.9999 to 999,999,999.9999
15	Average plus +σ	avePlusSigma	Get only	-999,999,999.9999 to 999,999,999.9999
16	Average minus -σ	aveMinusSigma	Get only	-999,999,999.9999 to 999,999,999.9999
17	Average minus -3σ	aveMinus3Sigma	Get only	-999,999,999.9999 to 999,999,999.9999
18	OK count	okCount	Get only	0 to 999,999,999
19	yield	yield	Get only	0 to 1
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Expression	expression	Set/Get	Exp. character string
121	Upper limit of the judgement	upperJudge	Set/Get	-999,999,999.9999 to 999,999,999.9999
122	Lower limit of the judgement	lowerJudge	Set/Get	-999,999,999.9999 to 999,999,999.9999
123	Warning upper limit	upperWarn	Set/Get	-999,999,999.9999 to 999,999,999.9999
124	Warning lower limit	lowerWarn	Set/Get	-999,999,999.9999 to 999,999,999.9999
125	Upper limit of the display range	maxVertical	Set/Get	-999,999,999.9999 to 999,999,999.9999
126	Lower limit of the display range	minVertical	Set/Get	-999,999,999.9999 to 999,999,999.9999
127	Amount of change to display range	unitVertical	Set/Get	1 to 1,000,000

No.	Data Name	Ident	Set/Get	Data range
128	Display number of cases	horizontal	Set/Get	0: Display 200 results 1: Display 1,000 results 2: Display 5,000 results 3: Display 10,000 results 4: Display 50,000 results 5: Display 100,000 results
129	Grouping	grouping	Set/Get	0: OFF 1: ON
130	Grouping count	groupingCount	Set/Get	2 to 100,000
131	Max. save count	maxSaveCount	Set/Get	0: Last 1,000 1: Last 5,000 2: Last 10,000 3: Last 50,000 4: Last 100,000

4-13 Image Logging

This is used when saving measurement images to on-board memory, RAMDisk or USB memory.

This enables preparation of logging conditions using an expression and is more flexible than the system image logging conditions settings.

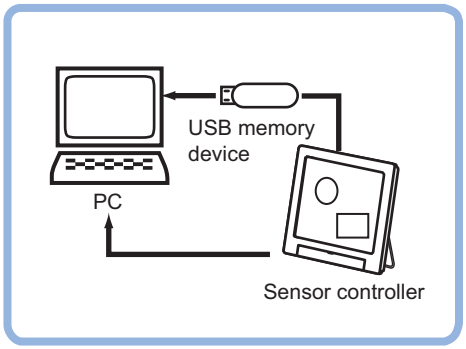
However, the settings of this unit are enabled if "None" is set on the [Image logging] in [Logging setting] of [System] menu.

For details, refer to *Chapter 3 Logging Measurement Values and Measurement Images instruction* in the *Vision Sensor FH/FHV/FZ5 Series Vision System User's Manual* (Z365).

If settings that perform image logging for multiple units during measurement are executed, the last settings executed are enabled.

Used in the Following Case

This is used when saving logging images under specific conditions.



Important

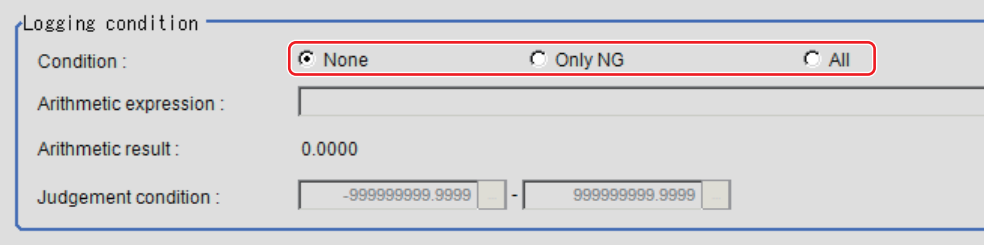
- If several image logging units are set in the flow, saving is performed based on the last image logging conditions executed.
- When [Multiple image logging] in [Logging setting] of [System] is [ON], refer to the followings.
  - All of the transfered images will be saved according to [Image logging] setting.
  - Latest images that exceed Sensor Controller memory size will be deleted because all of the transfered images will be saved temporarily.
- When [Save to memory + FTP Server] is selected for destination, specify the destination folder name and prefix of the image logging file using only single-byte alphanumeric characters and numbers.

4-13-1 Logging Conditions (Image Logging)

Indicate the image to perform logging for. If 4 cameras are connected, image logging is performed for 4 cameras each time.

1 Click [Logging condition] in the Item Tab area.

2 Set the logging conditions.



Setting item	Set value [Factory default]	Description
Condition	• [None]	No images are saved.
	• Only NG	Saves images only if an NG occurs. If an NG occurs downstream from the image logging processing unit, image logging is not performed. Insert image logging as close to the end of the scene as possible
	• All	All measured images are saved.

3 When "Only NG" is selected, click [...] to set up the expression.

The Setting Expression window is displayed.

4 After setting up the expression, click [OK].

The expression is confirmed.

5 Set up the judgement upper limit and the judgement lower limit for "Judgement condition".

Setting item	Set value [Factory default]	Description
Judgement condition	-999999999.9999 to 999999999.9999	This is a judgement condition for the expression. Set upper and lower limits for judging as OK.

4-13-2 Save Destination (Image Logging)

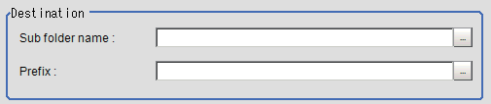
Additional Information

The save file name is the prefix and measurement ID.
Refer to *4-15-2 Output Format (Data Logging)* on page 4-91.

1 Click [Destination] in the Item Tab area.

2 Set the logging images save destination.

Enabled when "Save to memory + file" is selected as the save destination in the system image logging settings.

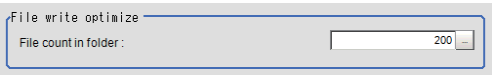


Setting item	Set value [Factory default]	Description
Sub folder name	---	Designates sub folder names. Creates a sub folder in the save destination in system logging settings. (Max: 32 characters) The following characters cannot be set. \ / : * ? " < > |
Prefix	---	Sets the prefix for the save file name. (Max: 31 characters) The set character string is added at the beginning of the name of the save file. If the system logging settings designate a prefix, the file name is set to [prefix designated by image logging] + [prefix designated by system logging settings] + image logging file name.

3 Set the File count in folder, if necessary.

Saving a large number of files in the [Save Destination] sub-folder does degrade performance and visibility.

Therefore, you can create more folders within sub-folders to prevent performance and visibility loss.



Setting item	Set value [Factory default]	Description
File count in folder	0 to 999 [200]	• Set the upper limit for the number of files in folders automatically generated in the [Save Destination] folder. The number of files is not the number of files stored in the automatically generated folder but the total number of generated image files. • The name of the folder to be automatically generated will be the same as that of the first image logging file to be stored in that folder. Furthermore, if 0 is specified, folders are not automatically generated.

Additional Information

When the number of files in the folder is other than 0, in the following cases, the number of files saved in the folder generated in the sub-folder may be less than the number of files in the folder.

- When you execute the Clear measurement result function from the main screen menu, folders are automatically generated in the sub-folder regardless of the setting of the number of files in the folder.

  For details, refer to *Clearing Measurement Results* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
- When folder distribution is set in [Logging setting] of [System setting], folders are automatically generated in the sub-folder according to the total number of generated image files.

  For details, refer to *Logging Conditions* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

Important

- If conditional branching is used, the number of files saved may vary from the specified number.
- If the operation mode is [Double Speed Multi-input mode], images taken by odd-numbered measurements are stored in a file different from one containing images taken by even-numbered measurements.
- If the operation mode is [Non-stop adjustment mode], the number of files in the folder may vary from the specified number before and after non-stop adjustment.

4-13-3 Key Points for Test Measurement and Adjustment (Image Logging)

The following content can be confirmed in the "Detail result" area using text.

Displayed items	Description
Judge	Judgment result
Expression	Calculation result of conditional expression

4-13-4 Measurement Results for Which Output Is Possible (Image Logging)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgment result
Data	D00	Conditional expression data
Judge	J00	Conditional expression Judgment

4-13-5 External Reference Tables (Image Logging)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Calculation result	measurement	Get only	-99,999.9999 to 99,999.9999
6	Judgement result	judgment	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
120	Logging condition	imageLogging	Set/Get	0: None 1: Only NG 2: All
121	Judge expression	expression	Set/Get	Exp. character string
122	Upper limit of conditions calculation	upperJudge	Set/Get	-999,999,999.9999 to 999,999,999.9999
123	Lower limit of conditions calculation	lowerJudge	Set/Get	-999,999,999.9999 to 999,999,999.9999
124	Sub directory name	saveDirectorySub	Set/Get	Character string
125	Prefix	prefix	Set/Get	Character string
130	Files in folder	fileCount	Set/Get	0 to 999

4-14 Image Conversion Logging

This processing item is used to save a measurement processing image in RAM Disk or USB memory.

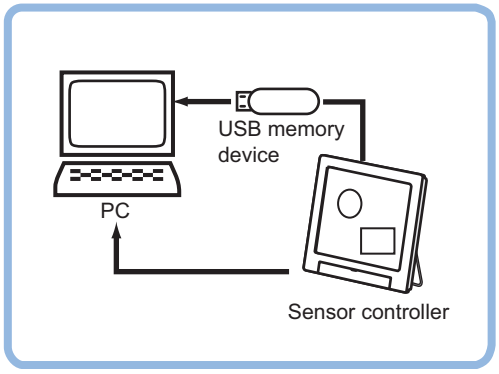
This enables preparation of logging conditions using an expression and is more flexible than the system image logging conditions settings.

The save range within the image can be specified in rectangle and the image save format (BMP or JPG) can be specified.

Used in the Following Case

This is used when saving measurement images under specific conditions.

The measurement image is saved when Image conversion logging is registered in the flow. Filtering and position compensation are also reflected.



Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

4-14-1 Save Condition (Image Conversion Logging)

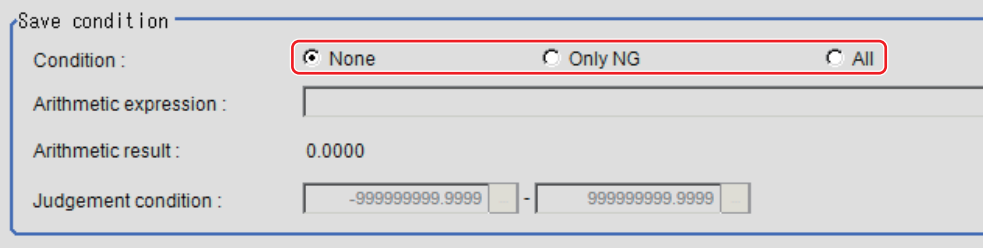
Indicate the image to perform logging for.

Important

- Only one image per processing unit can be saved in image conversion logging.
  Note, however, that multiple images can be saved if more than one processing unit is set up in the flow.
- Even if you set [Multiple image image logging] to [ON] in [Logging setting] of [System], only one image will be saved.
- Image in this function means an inputted image when Image Conversion Logging function is performed.

1 Click [Save condition] in the Item Tab area.

2 Set save conditions.



Setting item	Set value [Factory default]	Description
Condition	• [None]	No images are saved.
	• Only NG	Saves the images only if an NG occurs. If an NG occurs down-stream from the image conversion logging processing unit, image conversion logging is not performed. Judgement uses the measurement value at the point in time when measure-ment processing is executed for image convert logging.
	• All	All measured images are saved.

3 When [Only NG] is selected, click [...] to set up the expression.

The Setting Expression window is displayed.

4 Logging conditions are set using an expression.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12.

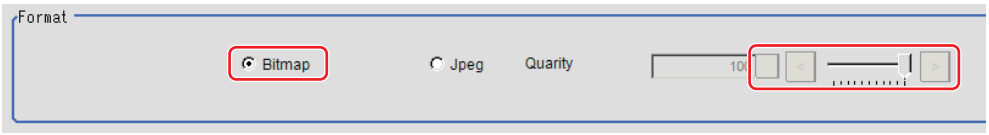
5 After setting up the expression, click [OK].

The expression is confirmed.

6 Set up the judgement upper limit and the judgement lower limit for Judgement.

Setting item	Set value [Factory default]	Description
Judgement condition	-999999999.9999 to 999999999.9999	This is a judgement condition for the expression. Set upper and lower limits for judging as OK.

7 In the Format area, set save format.



Setting item	Set value [Factory default]	Description
Format	• [Bitmap] • Jpeg	Select the image format to be saved.
Quality	0 to 100 [100]	Specify the quality of the Jpeg image to be saved.

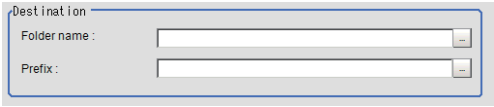
4-14-2 Destination (Image Conversion Logging)

Additional Information

The save file name is the prefix, measurement ID and extension.

Refer to *4-15-2 Output Format (Data Logging)* on page 4-91.

1 Set the logging images save destination.



Setting item	Set value [Factory default]	Description
Folder name	---	Specify the name of the folder to which the image is to be saved. (Max: 32 characters) The following characters cannot be set. \ / : * ? " < > |
Prefix	---	Sets the prefix for the save file name. (Max: 32 characters) The set character string is added at the beginning of the name of the save file. Any prefix specified in the system's logging setting will be ignored.

2 Set the number of files in the folder, if necessary.

Saving a large number of files in the [Save Destination] sub-folder does degrade performance and visibility.

Therefore, you can create more folders within sub-folders to prevent performance and visibility loss.

Setting item	Set value [Factory default]	Description
File count in folder	0 to 999 [200]	• Set the upper limit for the number of files in folders automatically generated in the [Save Destination] folder. The number of files is not the number of files stored in the automatically generated folder but the total number of generated image files. • The name of the folder to be automatically generated will be the same as that of the first image logging file to be stored in that folder. Furthermore, if 0 is specified, folders are not automatically generated.

Additional Information

When the number of files in the folder is other than 0, in the following cases, the number of files saved in the folder generated in the sub-folder may be less than the number of files in the folder.

- When you execute the Clear measurement result function from the main screen menu, folders are automatically generated in the sub-folder regardless of the setting of the number of files in the folder.

  For details, refer to *Clearing Measurement Results* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).
- When folder distribution is set in [Logging setting] of [System setting], folders are automatically generated in the sub-folder according to the total number of generated image files.

  For details, refer to *Logging Conditions* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

Important

- If the operation mode is [Double Speed Multi-input mode], images taken by odd-numbered measurements are stored in a file different from one containing images taken by even-numbered measurements.
- If the operation mode is [Non-stop adjustment mode], the number of files in the folder may vary from the specified number before and after non-stop adjustment.

4-14-3 Area Setting (Image Conversion Logging)

Specify the range of images to be logged.

1. In the Item Tab area, click [Area Setting].
2. Use the drawing tools to specify the Image Conversion Logging range.
3. Click [OK] in the Figure setting area.
   - [OK]: Changes the settings and returns to the previous menu.
   - [Cancel]: Changes are discarded. Returns to the previous menu.
   - [Apply]: Updates the settings without leaving edit window.

   The range in which to perform logging is registered.

4-14-4 Key Points for Test Measurement and Adjustment (Image Conversion Logging)

The following content can be confirmed in the "Detail result" area using text.

Displayed item	Description
Judge	Judgement result
Expression	Calculation result of conditional expression

4-14-5 Measurement Results for Which Output Is Possible (Image Conversion Logging)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgment result
Data	D00	Conditional expression data
Judge	J00	Conditional expression judgment

4-14-6 External Reference Tables (Image Conversion Logging)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Data (Conditional expression)	measurement	Get only	-999,999,999.9999 to 999,999,999.9999
6	Arithmetic judge (Conditional expression)	judgment	Get only	0: Unmeasured 1: OK -1: NG
120	Save condition	imageSaveMode	Set/Get	0: None 1: Only NG 2: All
121	Judge expression	expression	Set/Get	Exp. character string
122	Upper limit for judge condition	upperJudge	Set/Get	-999,999,999.9999 to 999,999,999.9999
123	Lower limit for judge condition	lowerJudge	Set/Get	-999,999,999.9999 to 999,999,999.9999
124	Save directory name	saveFolder	Set/Get	Character string
125	Prefix	prefix	Set/Get	Character string
130	Files in folder	fileCount	Set/Get	0 to 999
131	Image format	imageFormat	Set/Get	0: Bitmap 1: Jpeg
132	Jpeg quality	jpegQuality	Set/Get	0 to 100
90000	figure0 Count	figArea0_count	Set/Get	1
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update

4-15 Data Logging

This processing item can not be used in the FHV series.

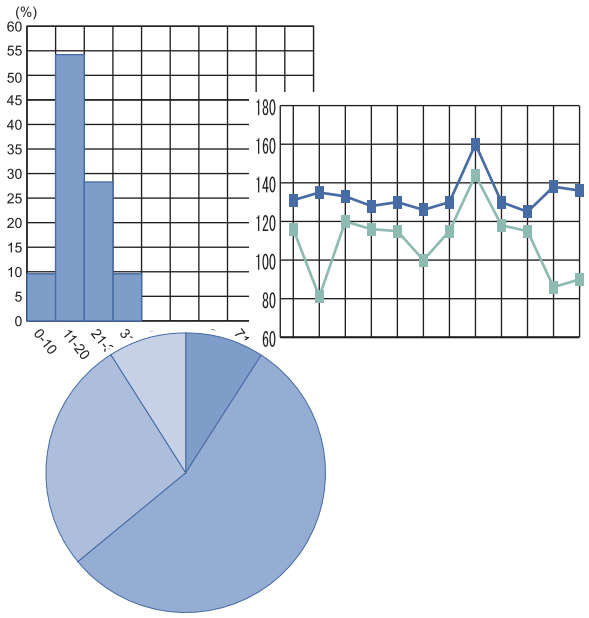
This is used to save measurement data in storage or USB memory.

Used in the Following Case

When performing analysis using measurement data

Logging is performed for measurement results and these are read into an external device such as a PC.

Example: Analysis using spreadsheet program statistical processing



Important

- If you prefer to use the Data Logging processing item, click [System settings] - [Other] - [Logging setting] - [Data Logging] and configure the logging conditions.
- Insert data logging as close to the end of the flow as possible. If "Only NG" is selected in logging timing conditions and an NG occurs after the data logging processing unit, it will not be logged.
- Setting data logging settings to save [Image logging] makes simultaneous confirmation of measurement data and image data convenient.
  For details, refer to *Chapter 3 Performing Test Measurement/Starting Operation - Useful Functions for Operation - Logging Measurement Values and Measurement Images - Setting Logging Conditions [Logging Setting]* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4-15-1 Settings (Data Logging)

Indicate the data to perform logging for. Logging can be performed for up to 8 data using one "Data logging" processing item.

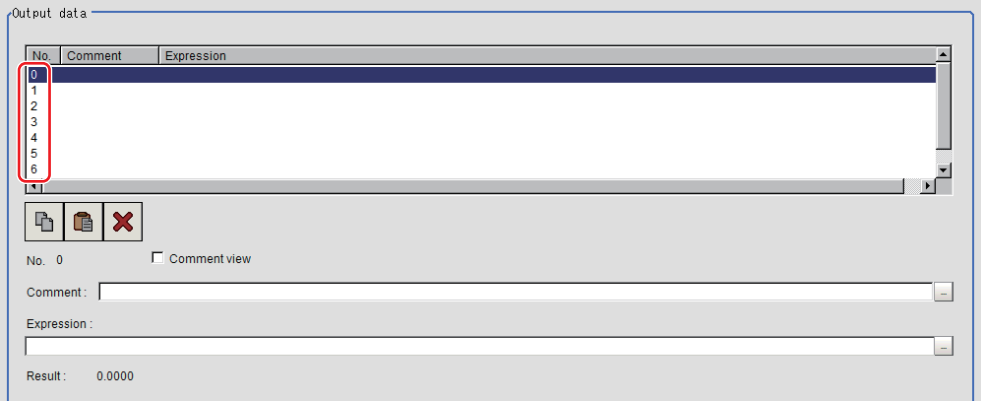
Additional Information

If you want to perform logging for 9 or more data using one record
Refer to *4-15-3 Additional Explanation (Data Logging)* on page 4-93.

1 In the Item Tab area, click [Setting].

2 In the list, click the output No. for which the expression is to be set.

The selected output No. is displayed under the list.



3 Click [...] for the expression and set the data to be logged with the expression.

The Setting Expression window is displayed.

4 Input "Comment" as necessary.

Multilingual is also supported. For details, refer to *3-2-2 Inputting Text in the Vision System FH/FHV/FZ5 Series User's Manual (Cat. No. Z365)*.

5 To display comments in the "Detail result display" area, check "Comment view".

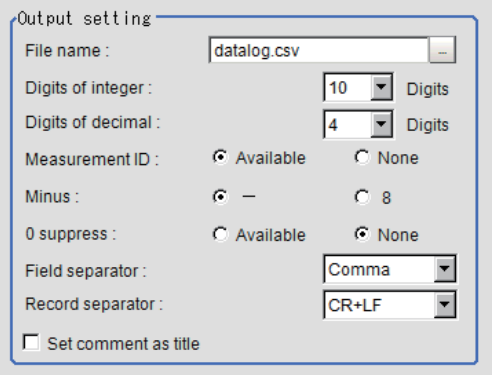
6 Repeat steps 2 to 5 and set up the output contents for each output number.

4-15-2 Output Format (Data Logging)

Sets the output format for logging data.

1 In the Item Tab area, click [Output format].

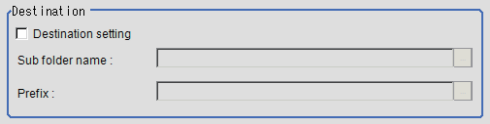
2 Set up each item as necessary.



Setting item	Set value [Factory default]	Description
File name	datalog.csv	Half-width alphanumeric characters are used for File name. (Max: 128 characters) Set the folder name and file name such that they are no more than 255 characters combined.
Digits of Integer	1 to [10]	Specify the digits of the integer part including the sign. For positive numbers, the plus sign is not output. Example Setting: 4 digits, Data: -5619 -999 is output.
Digits of Decimal	0 to [4]	Specify the number of output digits in the decimal part. Decimals are rounded up and output. When 0 is selected, the decimal digits will be rounded off.
Measurement ID	• [Available] • None	Select whether to output the measurement ID at the head of the output data. Measurement ID : measurement time YYYY-MM-DD_HH-MM-SS-XXXX (YYYY: Calendar, MM: Month, DD: Day, HH: Hour, MM: Minute, SS: Second, XXXX: Millisecond and Line number.) Example Measurement time: 11:10:25.500 AM, December 24, 2007 and Line 0, the measurement ID is "2007-12-24_11-10-25-5000". Since the file name of the logging image also includes the same measurement ID, confirmation of the measurement data and image data can be performed with the measurement ID.
Minus	• [-] • 8	Select what is displayed in the sign column for a negative number.

Setting item	Set value [Factory default]	Description
0 suppress	• Available • [None]	Select the method for adjusting when there is a blank to the left of the output data. Available: Insert 0 into the blank digit space. None: Insert a space in the location with no character. Example When integer section setting: 5 digits, decimal section setting: 3 digits, data is 100.000 Available: 00100.000 None: _100.000 (_ represents a space)
Field separator	• OFF • [Comma] • Tab • Space • CR+LF	Select the separator for output data.
Record separator	• OFF • Comma • Tab • Space • [CR+LF]	Select the separator each time data is output.
Set comment as title	• [Unchecked] • Checked	Place a check here to output comments as the titles on the first line of the data logging file.

3 If necessary, set the save destination of the logging data.



Setting item	Setting value [Factory default]	Description
Destination setting	• Checked • [Unchecked]	Place a check here to set the destination and prefix.
Sub folder name	---	Sets sub folder names. Creates a sub folder in the save destination in system logging settings. (Max: 32 characters) The following characters cannot be set. \ / : * ? " < > ?
Prefix	---	Sets the prefix for the save file name. (Max: 32 characters) The set character string is added at the beginning of the name of the save file. The following characters cannot be set. \ / : * ? " < > ?

Additional Information

- The actual data output is in the ASCII format with the following type of header added.

  Measurement ID, Data1 Data N + delimiter

  Measurement ID : measurement time YYYY-MM-DD_HH-MM-SS-XXXX

  (YYYY: Calendar, MM: Month, DD: Day, HH: Hour, MM: Minute, SS: Second, XXXX: Millisecond and Line number.)

  Example

  Measurement time: 11:10:25.500 AM, December 24, 2007 and Line 0, the measurement ID is "2007-12-24_11-10-25-5000".
- Logging timing and saving destination
  For details, refer to *Chapter 3 Performing Test Measurement/Starting Operation Useful Functions for Operation Logging Measurement Values and Measurement Images* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

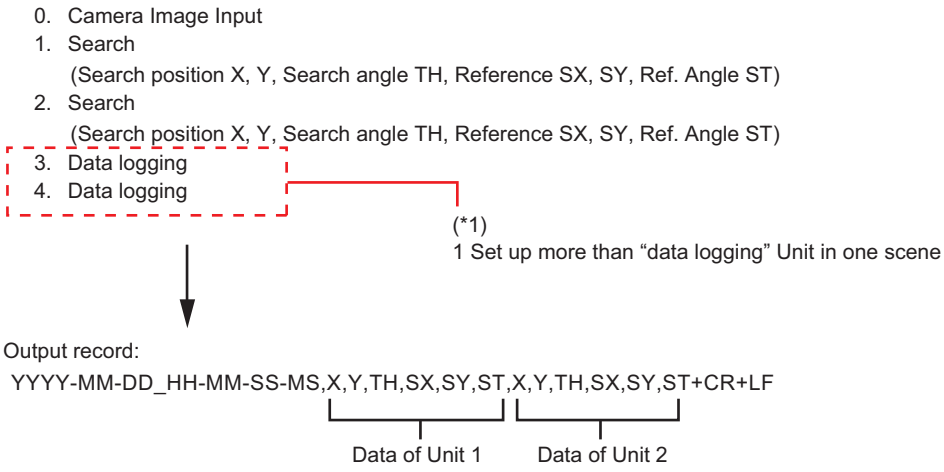
4-15-3 Additional Explanation (Data Logging)

When 9 or More Data Items Are Output as One Record

Up to 8 Value can be output with one [Data Logging] Processing Item. When 9 or more data items are to be output as 1 record, perform settings in the following manner.

- Registers two or more [Data Logging] units in one scene. (*1)
- Set [File name] of [Data Logging] so that it is identical. (*2)
- This prepares set up to attach "Record separator (CR+LF)" to the end of all data output. (*3)

● Example) When outputting the coordinate data for 12 points acquired in two "Search" of measurements performed on substrate arrangement in 1 record.



Unit 3 [Data logging] setting details		Unit 4 [Data logging] setting details		Remarks
<Condition setting>		<Condition setting>		
Output Destination (File name)	datalog.csv	Output Destination (File name)	datalog.csv	(*2) Make the path and file name the same.
Integer	8	Integer	8	
Decimal	3	Decimal	3	
Measurement ID	ON	Measurement ID	OFF	
Minus	-	Minus	-	
0 suppress	OFF	0 suppress	OFF	
Field separator	Comma	Field separator	Comma	
Record separator	Comma	Record separator	CR+LF	(*3) Set "Record separator (CR+LF)" in unit 4 which contains the last data
<Output data>		<Output data>		
Calculation 0. U1.X (Search position X) Calculation 1. U1.Y (Search position Y) Calculation 2. U1.TH (Angle θ) Calculation 3. U1.SX (reference X) Calculation 4. U1.SX (reference Y) Calculation 5. U1.ST (Reference angle θ) Calculation 6. U2.X (Search position X) Calculation 7. U2.Y (Search position Y)		Calculation 0. U2.TH (Search angle θ) Calculation 1. U2.SX (reference X) Calculation 2. U2.SY (reference Y) Calculation 3. U2.ST (Reference angle θ)		The data not included in Unit 3 will be output as Calculation 0 to 3 in Unit 4
127 + N (N = 0 to 7)		Comment		Character string
135 + N (N = 0 to 7)		Expression		Expression character string
143		Output destination file name		Character string
144		Sub folder name		Character string
145		Prefix		Character string
146		Specifying destination		0: Not specified 1: Specified

4-15-4 Measurement Results for Which Output Is Possible (Data Logging)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement item	Character string	Description
Judge	JG	Judgement result
Result of Expression 0 - Result of Expression 7	D00 to D07	Expression result of expression 0 to Expression result of expression 7

4-15-5 External Reference Tables (Data Logging)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5+N (N: 0 to 7)	Result of Expression	resultData	Get only	Calculation results of expressions
120	Measurement ID	measID	Set/Get	0: OFF 1: ON
121	Integer	integerDigit	Set/Get	1 to 10
122	Decimal	decimalDigit	Set/Get	0: 0 1: 1 2: 2 3: 3 4: 4
123	Minus	minusNum	Set/Get	0: - 1: 8
124	Field separator	fieldSeparator	Set/Get	0: OFF 1: Comma 2: Tab 3: Space 4: CR+LF
125	Record separator	recordSeparator	Set/Get	0: OFF 1: Comma 2: Tab 3: Space 4: CR+LF
126	0 suppress	zeroSuppress	Set/Get	0: OFF 1: ON
127+N (N: 0 to 7)	Comment	comment	Set/Get	Character string
135+N (N: 0 to 7)	Expressions	setupData	Set/Get	Exp. character string
143	File name	fileName	Set/Get	Character string
144	Sub directory name	saveDirectory	Set/Get	Character string
145	Prefix	prefix	Set/Get	Character string
146	Destination setting	destinationSet	Set/Get	0: Not setting 1: Setting
147	Title output flag	titleOutputFlag	Set/Get	0: OFF 1: ON
150+N (N: 0 to 7)	Comment view	commentView	Set/Get	0: OFF 1: ON

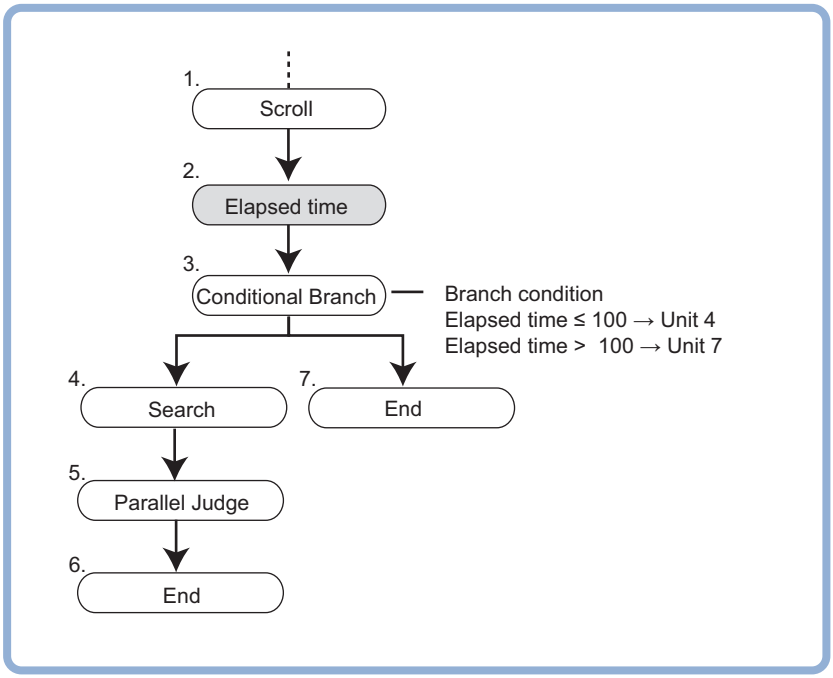
4-16 Elapsed Time

Calculate the elapsed time in milliseconds after the measurement starts.

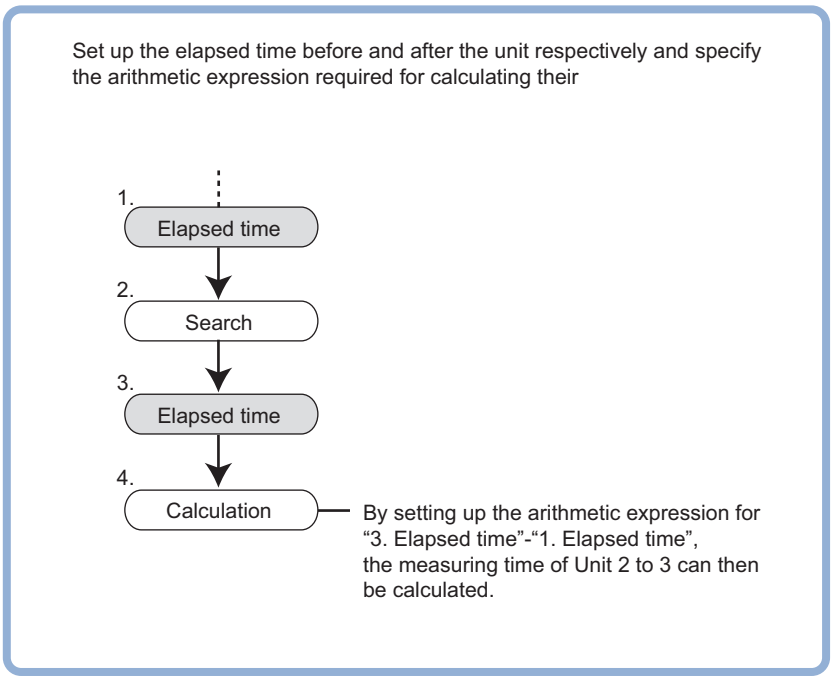
You can add this processing item to a scene and setup is not required.

Used in the Following Case

- When combining with the conditional branch for stopping measurement after the specified processing time has elapsed.

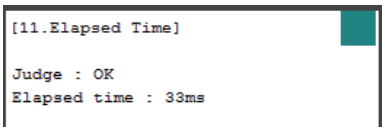


- When calculating the processing execution time of a unit



Additional Information

Time elapse can be confirmed on the main screen "Detail result" area.



4-16-1 Measurement Results for Which Output Is Possible (Elapsed Time)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Latest processing unit judgement result
Elapsed Time	TM	Elapsed time from start of measurement (ms)

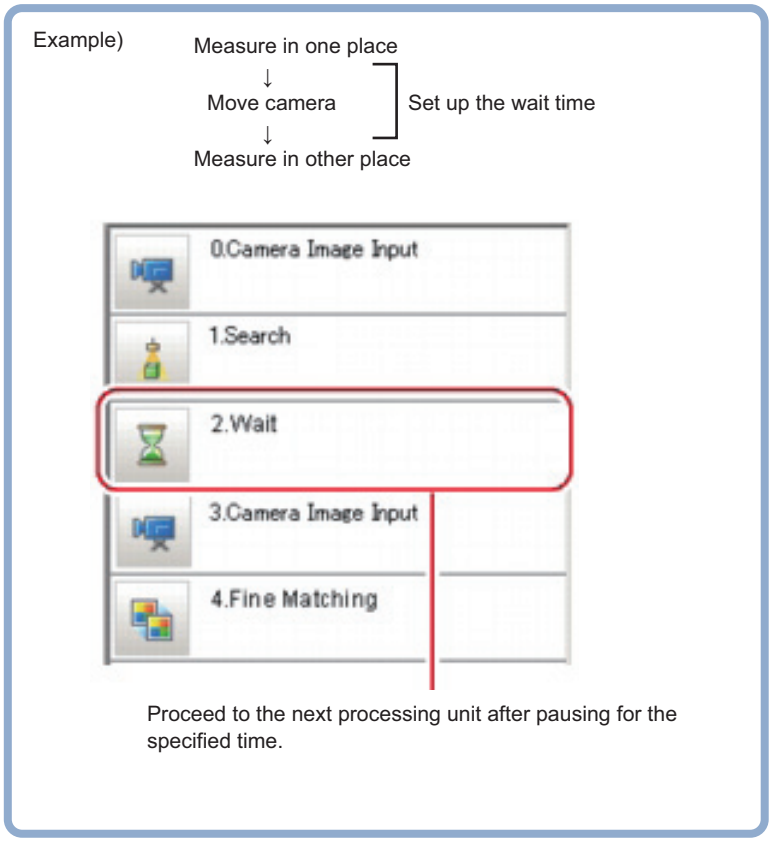
4-16-2 External Reference Tables (Elapsed Time)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error(unregistered model) -12: Error(insufficient memory) -20: Error(other errors)
5	Elapsed Time	elapsedTime	Get only	0 to 999,999 [ms]

4-17 Wait

Used in the Following Case

When pausing the measurement flow and setting processing in standby for a specific period of time



4-17-1 Settings (Wait)

1 Set the temporary stop time for flow in the "Waiting time" area.

Please specify the time in ms.

This can be set to a range of 0 to 9999.

2 Click [OK].

The settings are finalized.

4-17-2 External Reference Table (Wait)

No.	Data Name	Ident	Set/Get	Data range
120	Waiting time	waitingTime	Set/Get	0 to 9,999 [ms]

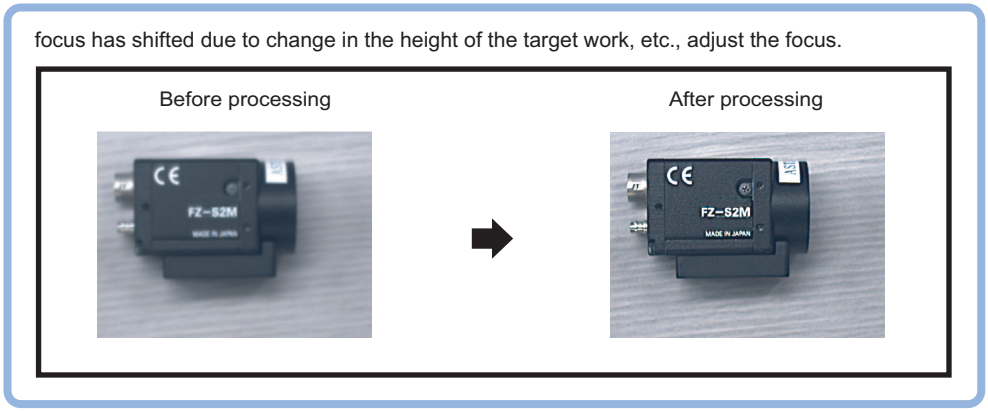
4-18 Focus

This processing item can not be used in the FHV series.

This function helps you bring the camera into focus.

Used in the Following Case

Use this function to make adjustments so as to facilitate inspection of input images that tend to become out of focus.



Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

4-18-1 Measurement Parameters (Focus)

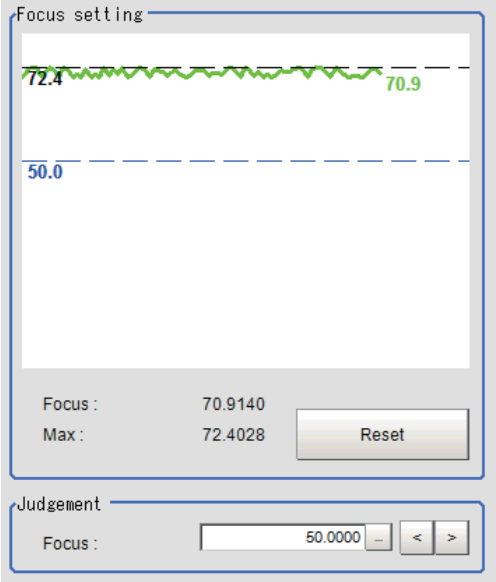
Measurement parameters can be changed as needed to address unstable focus values.

1. In the Item Tab area, click [Measurement].
2. In the "Display" area, click [Change display] to switch between camera image types.
   (Re-measurement images are not shown on the setting window.)

Setting item	Set value	Description
ON	Through	The latest image is always input from the camera and displayed.
	Freeze	The image that was scanned in the immediately preceding measurement is displayed.

3 Set the focus value.

The focus value is displayed chronologically in real time in the graph area.



4 Set up the judgement condition.

Setting item	Set value [Factory default]	Description
Focus	0.0000 to 255.0000 [50.0000]	This item specifies the judgement value for focus.

4-18-2 Region Setting (Focus)

Set the range of focus adjustment.

1 In the Item Tab area, click [Region setting].

2 Click [Edit].

The figure setting area is displayed.

3 Specify the range of focus adjustment.

The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

4-18-3 Output Parameters (Focus)

Specifies whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

1 Click [Output parameter] in the Item Tab area.

2 Choose whether or not to reflect this in the scene overall judgement in "Reflect to overall judgement" area.

Setting item	Set value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgment results of this processing unit is reflected in the scene overall judgement.

4-18-4 Key Points for Test Measurement and Adjustment (Focus)

Displayed items	Description
Judge	Judgement result
Focus	Focus value

4-18-5 External Reference Tables (Focus)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
1	Focus value	focusValue	Get only	-
2	Focus Max.	focusValueMax	Get only	-
3	History of focus	recentFocusValue	Get only	-
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Focus Min.	lowerFocus	Set/Get	0.0 to 255.0
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
90000	figure0 Count	figArea0_count	Set/Get	0 to 8
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR 1: NOT
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90018	figure0 Ellipse Center Position X	figArea0_fig0_ellipse_CX	Set/Get	-99,999 to 99,999
90019	figure0 Ellipse Center Position Y	figArea0_fig0_ellipse_CY	Set/Get	-99,999 to 99,999
90020	figure0 Ellipse RadiusX	figArea0_fig0_ellipse_RX	Set/Get	1 to 99,999
90021	figure0 Ellipse RadiusY	figArea0_fig0_ellipse_RY	Set/Get	1 to 99,999
90025	figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90040	figure0 Polygon Point Count	figArea0_fig0_polygon_count	Set/Get	3 to 10
90041	figure0 Polygon Point1 Position X	figArea0_fig0_polygon_x0	Set/Get	-99,999 to 99,999
90042	figure0 Polygon Point1 Position Y	figArea0_fig0_polygon_y0	Set/Get	-99,999 to 99,999
90043	figure0 Polygon Point2 Position X	figArea0_fig0_polygon_x1	Set/Get	-99,999 to 99,999
90044	figure0 Polygon Point2 Position Y	figArea0_fig0_polygon_y1	Set/Get	-99,999 to 99,999
90045	figure0 Polygon Point3 Position X	figArea0_fig0_polygon_x2	Set/Get	-99,999 to 99,999
90046	figure0 Polygon Point3 Position Y	figArea0_fig0_polygon_y2	Set/Get	-99,999 to 99,999
90047	figure0 Polygon Point4 Position X	figArea0_fig0_polygon_x3	Set/Get	-99,999 to 99,999
90048	figure0 Polygon Point4 Position Y	figArea0_fig0_polygon_y3	Set/Get	-99,999 to 99,999
90049	figure0 Polygon Point5 Position X	figArea0_fig0_polygon_x4	Set/Get	-99,999 to 99,999
90050	figure0 Polygon Point5 Position Y	figArea0_fig0_polygon_y4	Set/Get	-99,999 to 99,999
90051	figure0 Polygon Point6 Position X	figArea0_fig0_polygon_x5	Set/Get	-99,999 to 99,999
90052	figure0 Polygon Point6 Position Y	figArea0_fig0_polygon_y5	Set/Get	-99,999 to 99,999
90053	figure0 Polygon Point7 Position X	figArea0_fig0_polygon_x6	Set/Get	-99,999 to 99,999
90054	figure0 Polygon Point7 Position Y	figArea0_fig0_polygon_y6	Set/Get	-99,999 to 99,999
90055	figure0 Polygon Point8 Position X	figArea0_fig0_polygon_x7	Set/Get	-99,999 to 99,999
90056	figure0 Polygon Point8 Position Y	figArea0_fig0_polygon_y7	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90057	figure0 Polygon Point9 Position X	figArea0_fig0_polygon_x8	Set/Get	-99,999 to 99,999
90058	figure0 Polygon Point9 Position Y	figArea0_fig0_polygon_y8	Set/Get	-99,999 to 99,999
90059	figure0 Polygon Point10 Position X	figArea0_fig0_polygon_x9	Set/Get	-99,999 to 99,999
90060	figure0 Polygon Point10 Position Y	figArea0_fig0_polygon_y9	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update
90101	figure1 Type	figArea0_fig1_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
90102	figure1 mode	figArea0_fig1_mode	Set/Get	0: OR 1: NOT
90114	figure1 Rectangle Upper left position X	figArea0_fig1_box_X0	Set/Get	-99,999 to 99,999
90115	figure1 Rectangle Upper left position Y	figArea0_fig1_box_Y0	Set/Get	-99,999 to 99,999
90116	figure1 Rectangle Lower right position X	figArea0_fig1_box_X1	Set/Get	-99,999 to 99,999
90117	figure1 Rectangle Lower right position Y	figArea0_fig1_box_Y1	Set/Get	-99,999 to 99,999
90118	figure1 Ellipse Center Position X	figArea0_fig1_ellipse_CX	Set/Get	-99,999 to 99,999
90119	figure1 Ellipse Center Position Y	figArea0_fig1_ellipse_CY	Set/Get	-99,999 to 99,999
90120	figure1 Ellipse RadiusX	figArea0_fig1_ellipse_RX	Set/Get	1 to 99,999
90121	figure1 Ellipse RadiusY	figArea0_fig1_ellipse_RY	Set/Get	1 to 99,999
90125	figure1 Circumference Center Position X	figArea0_fig1_circleW_X	Set/Get	-99,999 to 99,999
90126	figure1 Circumference Center Position Y	figArea0_fig1_circleW_Y	Set/Get	-99,999 to 99,999
90127	figure1 Circumference Radius	figArea0_fig1_circleW_R	Set/Get	0 to 99,999
90128	figure1 Circumference Width	figArea0_fig1_circleW_W	Set/Get	0 to 99,999
90140	figure1 Polygon Point Count	figArea0_fig1_polygon_count	Set/Get	3 to 10
90141	figure1 Polygon Point1 Position X	figArea0_fig1_polygon_x0	Set/Get	-99,999 to 99,999
90142	figure1 Polygon Point1 Position Y	figArea0_fig1_polygon_y0	Set/Get	-99,999 to 99,999
90143	figure1 Polygon Point2 Position X	figArea0_fig1_polygon_x1	Set/Get	-99,999 to 99,999
90144	figure1 Polygon Point2 Position Y	figArea0_fig1_polygon_y1	Set/Get	-99,999 to 99,999
90145	figure1 Polygon Point3 Position X	figArea0_fig1_polygon_x2	Set/Get	-99,999 to 99,999
90146	figure1 Polygon Point3 Position Y	figArea0_fig1_polygon_y2	Set/Get	-99,999 to 99,999
90147	figure1 Polygon Point4 Position X	figArea0_fig1_polygon_x3	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90148	figure1 Polygon Point4 Position Y	figArea0_fig1_polygon_y3	Set/Get	-99,999 to 99,999
90149	figure1 Polygon Point5 Position X	figArea0_fig1_polygon_x4	Set/Get	-99,999 to 99,999
90150	figure1 Polygon Point5 Position Y	figArea0_fig1_polygon_y4	Set/Get	-99,999 to 99,999
90151	figure1 Polygon Point6 Position X	figArea0_fig1_polygon_x5	Set/Get	-99,999 to 99,999
90152	figure1 Polygon Point6 Position Y	figArea0_fig1_polygon_y5	Set/Get	-99,999 to 99,999
90153	figure1 Polygon Point7 Position X	figArea0_fig1_polygon_x6	Set/Get	-99,999 to 99,999
90154	figure1 Polygon Point7 Position Y	figArea0_fig1_polygon_y6	Set/Get	-99,999 to 99,999
90155	figure1 Polygon Point8 Position X	figArea0_fig1_polygon_x7	Set/Get	-99,999 to 99,999
90156	figure1 Polygon Point8 Position Y	figArea0_fig1_polygon_y7	Set/Get	-99,999 to 99,999
90157	figure1 Polygon Point9 Position X	figArea0_fig1_polygon_x8	Set/Get	-99,999 to 99,999
90158	figure1 Polygon Point9 Position Y	figArea0_fig1_polygon_y8	Set/Get	-99,999 to 99,999
90159	figure1 Polygon Point10 Position X	figArea0_fig1_polygon_x9	Set/Get	-99,999 to 99,999
90160	figure1 Polygon Point10 Position Y	figArea0_fig1_polygon_y9	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
90701	figure7 Type	figArea0_fig7_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
90702	figure7 mode	figArea0_fig7_mode	Set/Get	0: OR 1: NOT
90714	figure7 Rectangle Upper left position X	figArea0_fig7_box_X0	Set/Get	-99,999 to 99,999
90715	figure7 Rectangle Upper left position Y	figArea0_fig7_box_Y0	Set/Get	-99,999 to 99,999
90716	figure7 Rectangle Lower right position X	figArea0_fig7_box_X1	Set/Get	-99,999 to 99,999
90717	figure7 Rectangle Lower right position Y	figArea0_fig7_box_Y1	Set/Get	-99,999 to 99,999
90718	figure7 Ellipse Center Position X	figArea0_fig7_ellipse_CX	Set/Get	-99,999 to 99,999
90719	figure7 Ellipse Center Position Y	figArea0_fig7_ellipse_CY	Set/Get	-99,999 to 99,999
90720	figure7 Ellipse RadiusX	figArea0_fig7_ellipse_RX	Set/Get	1 to 99,999
90721	figure7 Ellipse RadiusY	figArea0_fig7_ellipse_RY	Set/Get	1 to 99,999
90725	figure7 Circumference Center Position X	figArea0_fig7_circleW_X	Set/Get	-99,999 to 99,999
90726	figure7 Circumference Center Position Y	figArea0_fig7_circleW_Y	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90727	figure7 Circumference Radius	figArea0_fig7_circleW_R	Set/Get	0 to 99,999
90728	figure7 Circumference Width	figArea0_fig7_circleW_W	Set/Get	0 to 99,999
90740	figure7 Polygon Point Count	figArea0_fig7_polygon_count	Set/Get	3 to 10
90741	figure7 Polygon Point1 Position X	figArea0_fig7_polygon_x0	Set/Get	-99,999 to 99,999
90742	figure7 Polygon Point1 Position Y	figArea0_fig7_polygon_y0	Set/Get	-99,999 to 99,999
90743	figure7 Polygon Point2 Position X	figArea0_fig7_polygon_x1	Set/Get	-99,999 to 99,999
90744	figure7 Polygon Point2 Position Y	figArea0_fig7_polygon_y1	Set/Get	-99,999 to 99,999
90745	figure7 Polygon Point3 Position X	figArea0_fig7_polygon_x2	Set/Get	-99,999 to 99,999
90746	figure7 Polygon Point3 Position Y	figArea0_fig7_polygon_y2	Set/Get	-99,999 to 99,999
90747	figure7 Polygon Point4 Position X	figArea0_fig7_polygon_x3	Set/Get	-99,999 to 99,999
90748	figure7 Polygon Point4 Position Y	figArea0_fig7_polygon_y3	Set/Get	-99,999 to 99,999
90749	figure7 Polygon Point5 Position X	figArea0_fig7_polygon_x4	Set/Get	-99,999 to 99,999
90750	figure7 Polygon Point5 Position Y	figArea0_fig7_polygon_y4	Set/Get	-99,999 to 99,999
90751	figure7 Polygon Point6 Position X	figArea0_fig7_polygon_x5	Set/Get	-99,999 to 99,999
90752	figure7 Polygon Point6 Position Y	figArea0_fig7_polygon_y5	Set/Get	-99,999 to 99,999
90753	figure7 Polygon Point7 Position X	figArea0_fig7_polygon_x6	Set/Get	-99,999 to 99,999
90754	figure7 Polygon Point7 Position Y	figArea0_fig7_polygon_y6	Set/Get	-99,999 to 99,999
90755	figure7 Polygon Point8 Position X	figArea0_fig7_polygon_x7	Set/Get	-99,999 to 99,999
90756	figure7 Polygon Point8 Position Y	figArea0_fig7_polygon_y7	Set/Get	-99,999 to 99,999
90757	figure7 Polygon Point9 Position X	figArea0_fig7_polygon_x8	Set/Get	-99,999 to 99,999
90758	figure7 Polygon Point9 Position Y	figArea0_fig7_polygon_y8	Set/Get	-99,999 to 99,999
90759	figure7 Polygon Point10 Position X	figArea0_fig7_polygon_x9	Set/Get	-99,999 to 99,999
90760	figure7 Polygon Point10 Position Y	figArea0_fig7_polygon_y9	Set/Get	-99,999 to 99,999

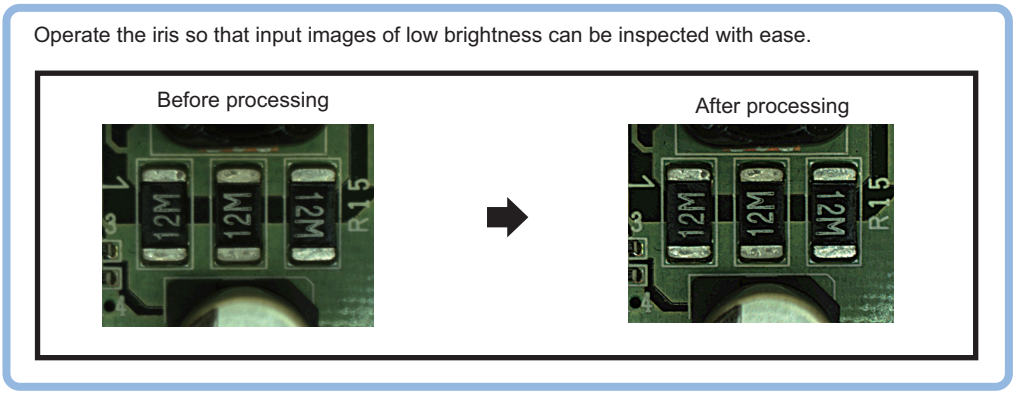
4-19 Iris

This processing item can not be used in the FHV series.

This function assists the aperture operation to adjust the amount of light taken in by the camera according to the change in illumination intensity.

Used in the Following Case

When brightness at the measurement site changes:



Important

Processing is different for color images and monochrome images. If the camera type, color camera, or monochrome camera, was changed from a previous setup, a reset of some settings may be needed.

4-19-1 Measurement Parameters (Iris)

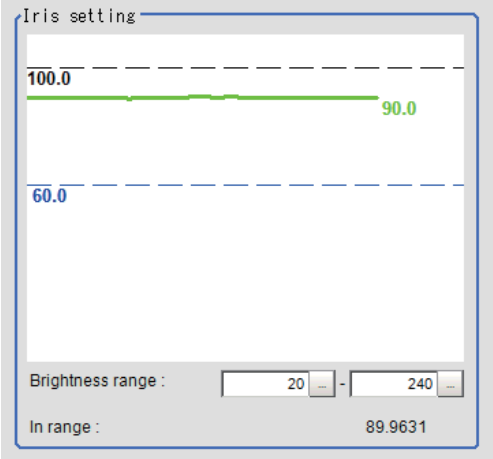
Adjust the amount of light taken in through the lens. Change the measurement parameter as necessary.

1. In the Item Tab area, click [Measurement].
2. In the "Display" area, click [Change display] to switch between camera image types.
   (Re-measurement images are not shown on the setting window.)

Setting item	Set value	Description
Display	Through	The latest image is always input from the camera and displayed.
	Freeze	The image that was scanned in the immediately preceding measurement is displayed.

3 Set the valid brightness range.

The valid pixels are displayed chronologically in real time in the graph area.



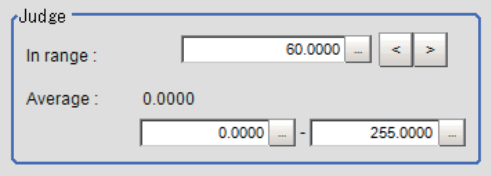
Setting item		Set value [Factory default]	Description
Brightness range	Upper limit	0 to 255 [240]	Set the range used to determine whether or not the brightness of pixels is valid.
	Lower limit	0 to 255 [20]	

4 Set up the judgement condition.

- For color cameras:

Setting item		Set value [Factory default]	Description
In range		0.0000 to 100.0000 [60.0000]	Set the minimum number of pixels to be made valid. Valid pixels indicate the percentage (%)of pixels inside the valid brightness range in the region.
R average	Upper limit	0 to 255 [255.000]	Set the R, G and B ranges to be made valid.
	Lower limit	0 to 255 [0.000]	
G average	Upper limit	0 to 255 [255.000]	
	Lower limit	0 to 255 [0.000]	
B average	Upper limit	0 to 255 [255.000]	
	Lower limit	0 to 255 [0.000]	

- For monochrome cameras:



Setting item		Set value [Factory default]	Description
In range		0.0000 to 100.0000 [60.0000]	Set the minimum number of pixels to be made valid. Valid pixels indicate the percentage (%)of pixels inside the valid brightness range in the region.
Average	Upper limit	0 to 255 [255.000]	Set the average brightness range to be made valid.
	Lower limit	0 to 255 [0.000]	

4-19-2 Region Setting (Iris)

Set the range of iris adjustment.

1 In the Item Tab area, click [Region setting].

2 Click [Edit].

The figure setting area is displayed.

3 Specify the range of iris adjustment.

The rectangle covering the entire screen is set. Adjust the size and position of the rectangle.

4 Click [OK] in the Figure setting area.

- [OK]: Changes the settings and returns to the previous menu.
- [Cancel]: Changes are discarded. Returns to the previous menu.
- [Apply]: Updates the settings without leaving edit window.

4-19-3 Output Parameter (Iris)

Specifies whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

1 Click [Output parameter] in the Item Tab area.

2 Choose whether or not to reflect this in the scene overall judgement in "Reflect to overall judgement" area.

Setting item	Set value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

4-19-4 Key Points for Test Measurement and Adjustment (Iris)

Displayed items	Description
Judge	Judgement result
In range	Percentage inside the valid brightness range
R average	R average in the region
G average	G average in the region
B average	B average in the region

4-19-5 External Reference Tables (Iris)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
1	Count	count	Get only	0 to 100
2	Average	average	Get only	0 to 255
3	Average R component value	averageR	Get only	0 to 255
4	Average G component value	averageG	Get only	0 to 255
5	Average B component value	averageB	Get only	0 to 255
6	Recent count	recentCount	Get only	---
7	Recent average	recentAverage	Get only	---
8	Recent average R	recentAverageR	Get only	---
9	Recent average G	recentAverageG	Get only	---
10	Recent average B	recentAverageB	Get only	---
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Brightness range Min.	minBright	Set/Get	0 to 255
121	Brightness range Max.	maxBright	Set/Get	0 to 255
122	In range Min.	lowerCount	Set/Get	0 to 100
123	Average Min.	lowerAverage	Set/Get	0.0 to 255.0
124	Average Max.	upperAverage	Set/Get	0.0 to 255.0
125	R average Min.	lowerAverageR	Set/Get	0.0 to 255.0
126	R average Max.	upperAverageR	Set/Get	0.0 to 255.0
127	G average Min.	lowerAverageG	Set/Get	0.0 to 255.0
128	G average Max.	upperAverageG	Set/Get	0.0 to 255.0
129	B average Min.	lowerAverageB	Set/Get	0.0 to 255.0
130	B average Max.	upperAverageB	Set/Get	0.0 to 255.0
6002	Format	cameraColor	Set/Get	1: Monochrome camera 2: Color camera
90000	figure0 Count	figArea0_count	Set/Get	0 to 8

No.	Data Name	Ident	Set/Get	Data range
90001	figure0 Type	figArea0_fig0_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
90002	figure0 mode	figArea0_fig0_mode	Set/Get	0: OR 1: NOT
90014	figure0 Rectangle Upper left position X	figArea0_fig0_box_X0	Set/Get	-99,999 to 99,999
90015	figure0 Rectangle Upper left position Y	figArea0_fig0_box_Y0	Set/Get	-99,999 to 99,999
90016	figure0 Rectangle Lower right position X	figArea0_fig0_box_X1	Set/Get	-99,999 to 99,999
90017	figure0 Rectangle Lower right position Y	figArea0_fig0_box_Y1	Set/Get	-99,999 to 99,999
90018	figure0 Ellipse Center Position X	figArea0_fig0_ellipse_CX	Set/Get	-99,999 to 99,999
90019	figure0 Ellipse Center Position Y	figArea0_fig0_ellipse_CY	Set/Get	-99,999 to 99,999
90020	figure0 Ellipse RadiusX	figArea0_fig0_ellipse_RX	Set/Get	1 to 99,999
90021	figure0 Ellipse RadiusY	figArea0_fig0_ellipse_RY	Set/Get	1 to 99,999
90025	figure0 Circumference Center Position X	figArea0_fig0_circleW_X	Set/Get	-99,999 to 99,999
90026	figure0 Circumference Center Position Y	figArea0_fig0_circleW_Y	Set/Get	-99,999 to 99,999
90027	figure0 Circumference Radius	figArea0_fig0_circleW_R	Set/Get	0 to 99,999
90028	figure0 Circumference Width	figArea0_fig0_circleW_W	Set/Get	0 to 99,999
90040	figure0 Polygon Point Count	figArea0_fig0_polygon_count	Set/Get	3 to 10
90041	figure0 Polygon Point1 Position X	figArea0_fig0_polygon_x0	Set/Get	-99,999 to 99,999
90042	figure0 Polygon Point1 Position Y	figArea0_fig0_polygon_y0	Set/Get	-99,999 to 99,999
90043	figure0 Polygon Point2 Position X	figArea0_fig0_polygon_x1	Set/Get	-99,999 to 99,999
90044	figure0 Polygon Point2 Position Y	figArea0_fig0_polygon_y1	Set/Get	-99,999 to 99,999
90045	figure0 Polygon Point3 Position X	figArea0_fig0_polygon_x2	Set/Get	-99,999 to 99,999
90046	figure0 Polygon Point3 Position Y	figArea0_fig0_polygon_y2	Set/Get	-99,999 to 99,999
90047	figure0 Polygon Point4 Position X	figArea0_fig0_polygon_x3	Set/Get	-99,999 to 99,999
90048	figure0 Polygon Point4 Position Y	figArea0_fig0_polygon_y3	Set/Get	-99,999 to 99,999
90049	figure0 Polygon Point5 Position X	figArea0_fig0_polygon_x4	Set/Get	-99,999 to 99,999
90050	figure0 Polygon Point5 Position Y	figArea0_fig0_polygon_y4	Set/Get	-99,999 to 99,999
90051	figure0 Polygon Point6 Position X	figArea0_fig0_polygon_x5	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90052	figure0 Polygon Point6 Position Y	figArea0_fig0_polygon_y5	Set/Get	-99,999 to 99,999
90053	figure0 Polygon Point7 Position X	figArea0_fig0_polygon_x6	Set/Get	-99,999 to 99,999
90054	figure0 Polygon Point7 Position Y	figArea0_fig0_polygon_y6	Set/Get	-99,999 to 99,999
90055	figure0 Polygon Point8 Position X	figArea0_fig0_polygon_x7	Set/Get	-99,999 to 99,999
90056	figure0 Polygon Point8 Position Y	figArea0_fig0_polygon_y7	Set/Get	-99,999 to 99,999
90057	figure0 Polygon Point9 Position X	figArea0_fig0_polygon_x8	Set/Get	-99,999 to 99,999
90058	figure0 Polygon Point9 Position Y	figArea0_fig0_polygon_y8	Set/Get	-99,999 to 99,999
90059	figure0 Polygon Point10 Position X	figArea0_fig0_polygon_x9	Set/Get	-99,999 to 99,999
90060	figure0 Polygon Point10 Position Y	figArea0_fig0_polygon_y9	Set/Get	-99,999 to 99,999
90099	figure0 Update	figArea0_update	Set only	1: Update
90101	figure1 Type	figArea0_fig1_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
90102	figure1 mode	figArea0_fig1_mode	Set/Get	0: OR 1: NOT
90114	figure1 Rectangle Upper left position X	figArea0_fig1_box_X0	Set/Get	-99,999 to 99,999
90115	figure1 Rectangle Upper left position Y	figArea0_fig1_box_Y0	Set/Get	-99,999 to 99,999
90116	figure1 Rectangle Lower right position X	figArea0_fig1_box_X1	Set/Get	-99,999 to 99,999
90117	figure1 Rectangle Lower right position Y	figArea0_fig1_box_Y1	Set/Get	-99,999 to 99,999
90118	figure1 Ellipse Center Position X	figArea0_fig1_ellipse_CX	Set/Get	-99,999 to 99,999
90119	figure1 Ellipse Center Position Y	figArea0_fig1_ellipse_CY	Set/Get	-99,999 to 99,999
90120	figure1 Ellipse RadiusX	figArea0_fig1_ellipse_RX	Set/Get	1 to 99,999
90121	figure1 Ellipse RadiusY	figArea0_fig1_ellipse_RY	Set/Get	1 to 99,999
90125	figure1 Circumference Center Position X	figArea0_fig1_circleW_X	Set/Get	-99,999 to 99,999
90126	figure1 Circumference Center Position Y	figArea0_fig1_circleW_Y	Set/Get	-99,999 to 99,999
90127	figure1 Circumference Radius	figArea0_fig1_circleW_R	Set/Get	0 to 99,999
90128	figure1 Circumference Width	figArea0_fig1_circleW_W	Set/Get	0 to 99,999
90140	figure1 Polygon Point Count	figArea0_fig1_polygon_count	Set/Get	3 to 10
90141	figure1 Polygon Point1 Position X	figArea0_fig1_polygon_x0	Set/Get	-99,999 to 99,999
90142	figure1 Polygon Point1 Position Y	figArea0_fig1_polygon_y0	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90143	figure1 Polygon Point2 Position X	figArea0_fig1_polygon_x1	Set/Get	-99,999 to 99,999
90144	figure1 Polygon Point2 Position Y	figArea0_fig1_polygon_y1	Set/Get	-99,999 to 99,999
90145	figure1 Polygon Point3 Position X	figArea0_fig1_polygon_x2	Set/Get	-99,999 to 99,999
90146	figure1 Polygon Point3 Position Y	figArea0_fig1_polygon_y2	Set/Get	-99,999 to 99,999
90147	figure1 Polygon Point4 Position X	figArea0_fig1_polygon_x3	Set/Get	-99,999 to 99,999
90148	figure1 Polygon Point4 Position Y	figArea0_fig1_polygon_y3	Set/Get	-99,999 to 99,999
90149	figure1 Polygon Point5 Position X	figArea0_fig1_polygon_x4	Set/Get	-99,999 to 99,999
90150	figure1 Polygon Point5 Position Y	figArea0_fig1_polygon_y4	Set/Get	-99,999 to 99,999
90151	figure1 Polygon Point6 Position X	figArea0_fig1_polygon_x5	Set/Get	-99,999 to 99,999
90152	figure1 Polygon Point6 Position Y	figArea0_fig1_polygon_y5	Set/Get	-99,999 to 99,999
90153	figure1 Polygon Point7 Position X	figArea0_fig1_polygon_x6	Set/Get	-99,999 to 99,999
90154	figure1 Polygon Point7 Position Y	figArea0_fig1_polygon_y6	Set/Get	-99,999 to 99,999
90155	figure1 Polygon Point8 Position X	figArea0_fig1_polygon_x7	Set/Get	-99,999 to 99,999
90156	figure1 Polygon Point8 Position Y	figArea0_fig1_polygon_y7	Set/Get	-99,999 to 99,999
90157	figure1 Polygon Point9 Position X	figArea0_fig1_polygon_x8	Set/Get	-99,999 to 99,999
90158	figure1 Polygon Point9 Position Y	figArea0_fig1_polygon_y8	Set/Get	-99,999 to 99,999
90159	figure1 Polygon Point10 Position X	figArea0_fig1_polygon_x9	Set/Get	-99,999 to 99,999
90160	figure1 Polygon Point10 Position Y	figArea0_fig1_polygon_y9	Set/Get	-99,999 to 99,999
. . .	. . .	. . .	. . .	. . .
90701	figure7 Type	figArea0_fig7_type	Set/Get	8: Rectangle 16: Ellipse 64: Circumference 512: Polygon
90702	figure7 mode	figArea0_fig7_mode	Set/Get	0: OR 1: NOT
90714	figure7 Rectangle Upper left position X	figArea0_fig7_box_X0	Set/Get	-99,999 to 99,999
90715	figure7 Rectangle Upper left position Y	figArea0_fig7_box_Y0	Set/Get	-99,999 to 99,999
90716	figure7 Rectangle Lower right position X	figArea0_fig7_box_X1	Set/Get	-99,999 to 99,999
90717	figure7 Rectangle Lower right position Y	figArea0_fig7_box_Y1	Set/Get	-99,999 to 99,999
90718	figure7 Ellipse Center Position X	figArea0_fig7_ellipse_CX	Set/Get	-99,999 to 99,999

No.	Data Name	Ident	Set/Get	Data range
90719	figure7 Ellipse Center Position Y	figArea0_fig7_ellipse_CY	Set/Get	-99,999 to 99,999
90720	figure7 Ellipse RadiusX	figArea0_fig7_ellipse_RX	Set/Get	1 to 99,999
90721	figure7 Ellipse RadiusY	figArea0_fig7_ellipse_RY	Set/Get	1 to 99,999
90725	figure7 Circumference Center Position X	figArea0_fig7_circleW_X	Set/Get	-99,999 to 99,999
90726	figure7 Circumference Center Position Y	figArea0_fig7_circleW_Y	Set/Get	-99,999 to 99,999
90727	figure7 Circumference Radius	figArea0_fig7_circleW_R	Set/Get	0 to 99,999
90728	figure7 Circumference Width	figArea0_fig7_circleW_W	Set/Get	0 to 99,999
90740	figure7 Polygon Point Count	figArea0_fig7_polygon_count	Set/Get	3 to 10
90741	figure7 Polygon Point1 Position X	figArea0_fig7_polygon_x0	Set/Get	-99,999 to 99,999
90742	figure7 Polygon Point1 Position Y	figArea0_fig7_polygon_y0	Set/Get	-99,999 to 99,999
90743	figure7 Polygon Point2 Position X	figArea0_fig7_polygon_x1	Set/Get	-99,999 to 99,999
90744	figure7 Polygon Point2 Position Y	figArea0_fig7_polygon_y1	Set/Get	-99,999 to 99,999
90745	figure7 Polygon Point3 Position X	figArea0_fig7_polygon_x2	Set/Get	-99,999 to 99,999
90746	figure7 Polygon Point3 Position Y	figArea0_fig7_polygon_y2	Set/Get	-99,999 to 99,999
90747	figure7 Polygon Point4 Position X	figArea0_fig7_polygon_x3	Set/Get	-99,999 to 99,999
90748	figure7 Polygon Point4 Position Y	figArea0_fig7_polygon_y3	Set/Get	-99,999 to 99,999
90749	figure7 Polygon Point5 Position X	figArea0_fig7_polygon_x4	Set/Get	-99,999 to 99,999
90750	figure7 Polygon Point5 Position Y	figArea0_fig7_polygon_y4	Set/Get	-99,999 to 99,999
90751	figure7 Polygon Point6 Position X	figArea0_fig7_polygon_x5	Set/Get	-99,999 to 99,999
90752	figure7 Polygon Point6 Position Y	figArea0_fig7_polygon_y5	Set/Get	-99,999 to 99,999
90753	figure7 Polygon Point7 Position X	figArea0_fig7_polygon_x6	Set/Get	-99,999 to 99,999
90754	figure7 Polygon Point7 Position Y	figArea0_fig7_polygon_y6	Set/Get	-99,999 to 99,999
90755	figure7 Polygon Point8 Position X	figArea0_fig7_polygon_x7	Set/Get	-99,999 to 99,999
90756	figure7 Polygon Point8 Position Y	figArea0_fig7_polygon_y7	Set/Get	-99,999 to 99,999
90757	figure7 Polygon Point9 Position X	figArea0_fig7_polygon_x8	Set/Get	-99,999 to 99,999
90758	figure7 Polygon Point9 Position Y	figArea0_fig7_polygon_y8	Set/Get	-99,999 to 99,999
90759	figure7 Polygon Point10 Position X	figArea0_fig7_polygon_x9	Set/Get	-99,999 to 99,999
90760	figure7 Polygon Point10 Position Y	figArea0_fig7_polygon_y9	Set/Get	-99,999 to 99,999

4-20 Parallelize

This processing item is used exclusively for the FH/FHV/FZ5-8□□/FZ5-11□□/FZ5-12□□.

The measurement time can be reduced by dividing one part of the measurement flow to two or more tasks and doing each one in parallel.

Measurement processing of the processing unit can be done in parallel when the operation mode's parallel processing is ON. When parallel processing is OFF, measurement processing of the processing unit is processed in series according to the execution order of the measurement flow.

You can add this processing item to a scene and setup is not required. Place it at the beginning of the process that you want to run in parallel.

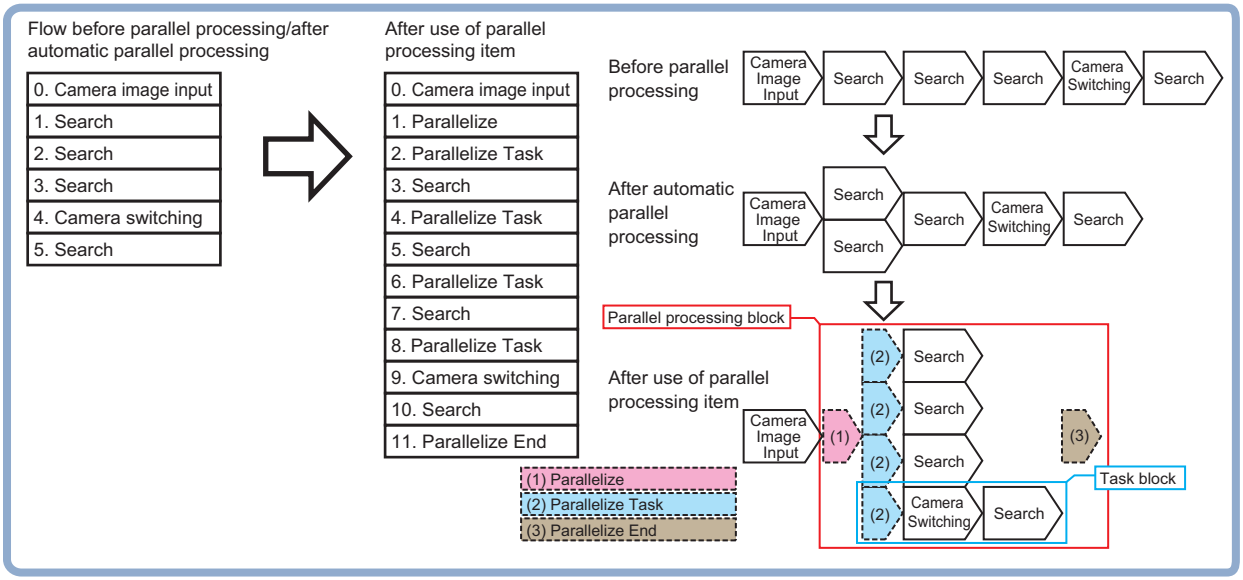
Parallel processing, parallel processing tasks, and parallel processing end cannot be used separately. Make sure to use them together as a set.

For details, refer to *Parallel Processing* in *Chapter 6 Changing the System Environment* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

Used in the Following Case

When you want to reduce the overall processing time when there are multiple measurement processing items in the measurement flow

Example) Reducing the overall processing time, instead of performing series processing, by processing multiple searches in parallel.



Processing units can be executed in parallel by properly combining parallel processing, parallel processing tasks, and parallel processing end.

4-21 Parallelize Task

This processing item is used exclusively for the FH/FHV/FZ5-8□□/FZ5-11□□/FZ5-12□□.

The measurement time can be reduced by dividing one part of the measurement flow to two or more tasks and doing each one in parallel.

Measurement processing of the processing unit can be done in parallel when the operation mode's parallel processing is ON. When parallel processing is OFF, measurement processing of the processing unit is processed in series according to the execution order of the measurement flow.

You can add this processing item to a scene and setup is not required. Place this right before the process you want to perform in parallel, between the parallel processing item and parallel processing end processing item.

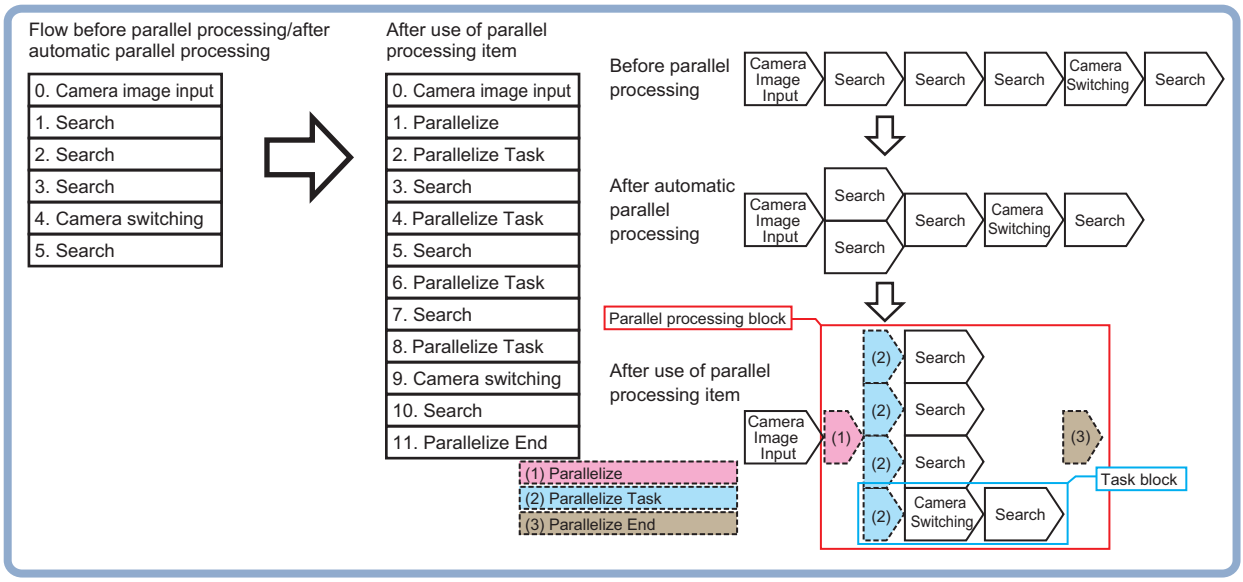
Parallel processing, parallel processing tasks, and parallel processing end cannot be used separately. Make sure to use them together as a set.

For details, refer to *Parallel Processing* in *Chapter 6 Changing the System Environment* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

Used in the Following Case

When you want to reduce the overall processing time when there are multiple measurement processing items in the measurement flow

Example) Reducing the overall processing time, instead of performing series processing, by processing multiple searches in parallel.



Processing units can be executed in parallel by properly combining parallel processing, parallel processing tasks, and parallel processing end.

4-22 Statistics

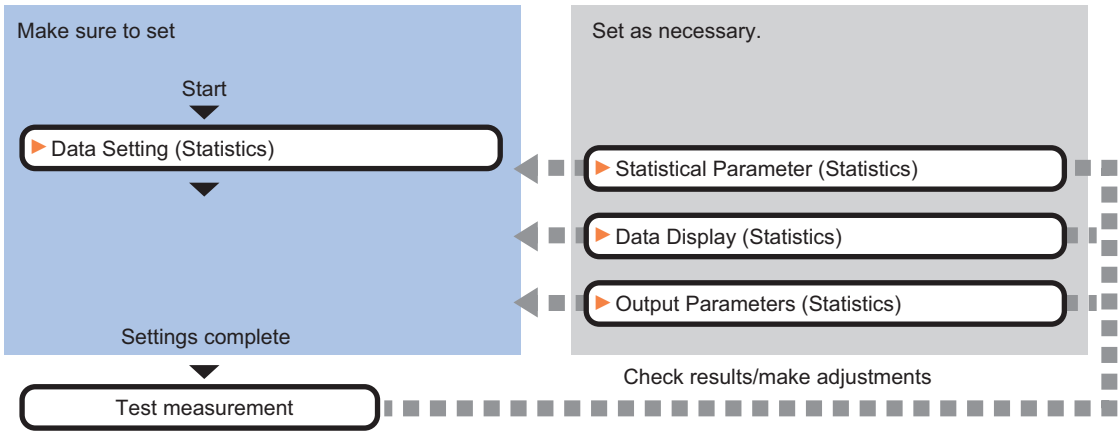
To reduce measurement variation of a given measurement processing item, multiple measurement results are stored in the processing item and the average value is calculated at a specified timing. Up to 8 target data per processing item can be set.

Used in the Following Case

When you want to use an average of multiple measurement results as the measurement value because the work is vibrating

4-22-1 Settings Flow (Statistics)

Set up statistical processing according to the following flow.



List of Statistics Items

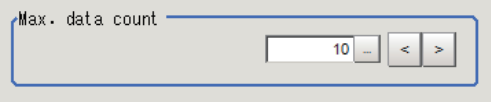
Item name	Description
Statistical parameter	Set the number of data to be stored as well as processing timing. Refer to *4-22-2 Statistical Parameters (Statistics)* on page 4-117.
Data setting	Set the data to be processed using a calculation formula. Refer to *4-22-3 Data Setting (Statistics)* on page 4-118.
Data display	Set up for checking of stored data using a graph. Refer to *4-22-4 Data Display (Statistics)* on page 4-119.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Refer to *4-22-5 Output Parameters (Statistics)* on page 4-120.

4-22-2 Statistical Parameters (Statistics)

Set the number of data to be stored as well as processing timing. The greater the number of data held, the less the measurement variation becomes.

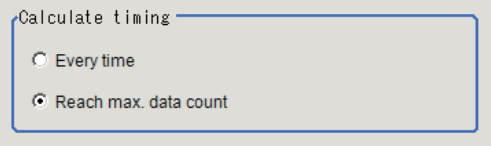
1 Click [Statistical parameter] in the Item Tab area.

2 Set the maximum number of data to be saved in the "Max. data count" area.



Setting item	Setting value [Factory default]	Description
Max. data count	1 to 100 [10]	Set the number of stored data to be saved to one processing target data.

3 Set the timing of statistical processing in the "Calculate timing" area.



Setting item	Setting value [Factory default]	Description
Calculate timing	• Every time • [Reach max. data count]	Select the timing when to perform the data processing. After the average value is calculated, the stored data is cleared. Each time: The average value of data stored per measurement is calculated. Only when the number of data matches the maximum: The average value is calculated when storing the number of data set in the maximum number of saves.

4 Click [OK].

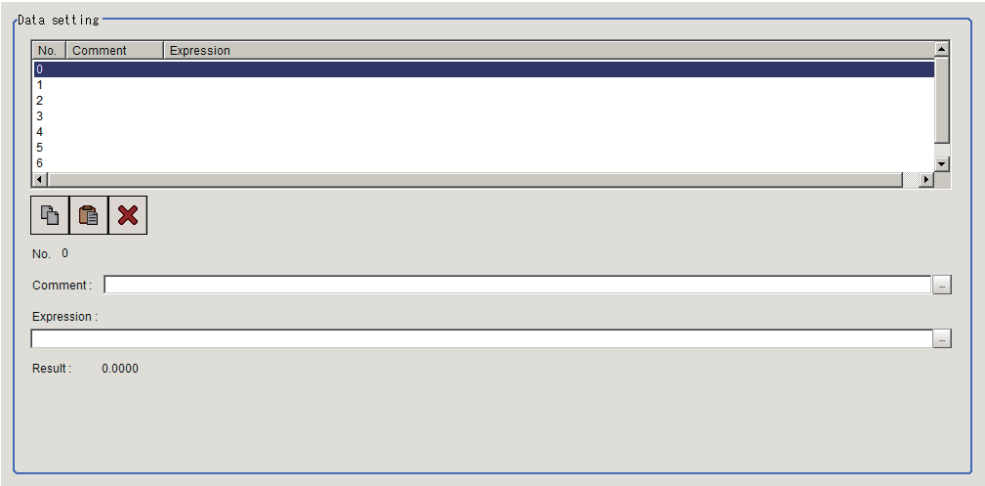
4-22-3 Data Setting (Statistics)

Set the target data using a calculation formula. Up to 8 data can be set.

1 In the Item Tab area, click [Data setting].

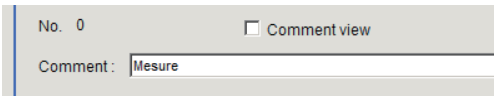
2 In the "Data setting" area, specify each item.

Up to 8 data can be set.



Setting item	Setting value [Factory default]	Description
Comment	-	Set a comment explaining the expression to be applied to the data to be processed. Multilingual is also supported. For details, refer to *3-2-2 Inputting Text in the Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).
Expression	-	Set the expression to be applied to the data to be processed.

3 To display comments in the "Detail result display" area, check "Comment view".

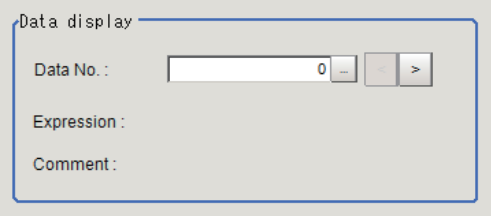


4-22-4 Data Display (Statistics)

Set up for checking of stored data using a graph. Also, set the judgement range while checking the graph. Data outside the judgement range will not be processed.

1 In the Item Tab area, click [Data display].

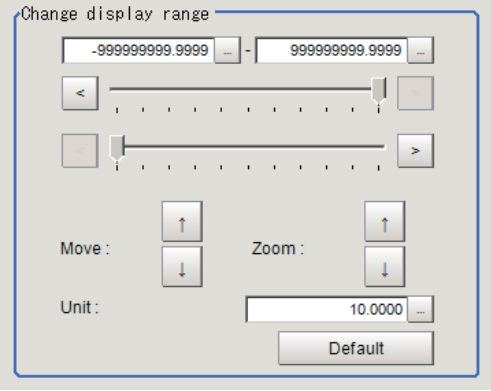
2 In the "Data display" area, set the data number to be used as the target of [Data setting].



Setting item	Setting value [Factory default]	Description
Data No.	0 to 7 [0]	Set the data number to be used as the target of data setting.
Expression	-	Set data of the expression corresponding to the data number is displayed.
Comment	-	Set data of the comment corresponding to the data number is displayed.

3 In the "Change display range" area, set the upper and lower limit values of graph display range.

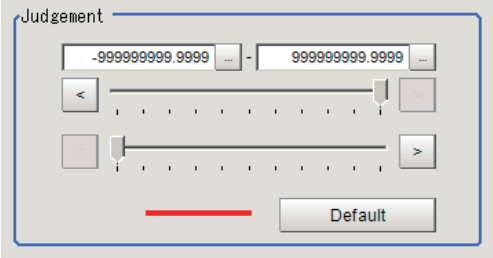
If the window is entered after measurement is performed a few times and [Default] is clicked, a display range suitable for these measurement values is automatically set.



Setting item	Setting value [Factory default]	Description
Upper and lower limit values of the graph display range	-999999999.9999 to 999999999.9999	Set the upper and lower limit values of the display range of the graph corresponding to the data number.
Unit	1.0000 to 1000000.0000 [10.0000]	Set how much the value will change when the Move or Zoom arrow button is clicked.

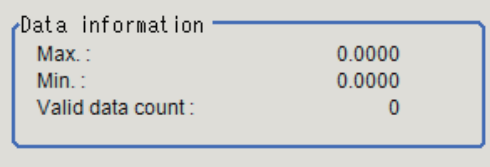
4 In the "Judgement" area, set the upper and lower limit values of set data judgement range.

If the window is entered after measurement is performed a few times and [Default] is clicked, a judgement range suitable for these measurement values is automatically set.



Setting item	Setting value [Factory default]	Description
Upper and lower limit values of the judgement range	-999999999.9999 to 999999999.9999	Set the upper and lower limit values of the judgement range corresponding to the data number.

5 The value reflecting the setting changes appears in the "Data information" area.



4-22-5 Output Parameters (Statistics)

Select how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

1 Click [Output parameter] in the Item Tab area.

2 Select the "Reflect to overall judgement".

Setting item	Setting value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Specify whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

4-22-6 Key Points for Test Measurement and Adjustment (Statistics)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Calculated time	Stored number of times
Statistical result 0	The average value of data 0
Statistical result 1	The average value of data 1
Statistical result 2	The average value of data 2
Statistical result 3	The average value of data 3
Statistical result 4	The average value of data 4
Statistical result 5	The average value of data 5
Statistical result 6	The average value of data 6
Statistical result 7	The average value of data 7

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are false

State	Parameter to be adjusted	Troubleshooting
Not all data is included in the calculation	Data display	Data outside the judgement range will not be processed. If any necessary data is outside the judgement range, set the judgement range again.
The measurement result remains 0.0	Statistical parameter	If the calculation timing is "Only when the maximum number of data is reached," the measurement result remains 0.0 while the number of measurements is yet to reach the maximum number saved. Change the calculation timing on the statistical parameter tab to "Every time," and the measurement result will be calculated every time.

● When the graph displays are false

State	Parameter to be adjusted	Troubleshooting
A graph showing a flat line appears even when the value is changing.	Data display	Change the graph display range to an appropriate range. If the initial values remain unchanged, the display range is too wide and the graph will show a flat line. Perform measurement at least twice, and then click the default range button on the data display tab.

4-22-7 Measurement Results for Which Output Is Possible (Statistics)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Calculated time	CT	Stored number of times
Statistic value N (N = 0 to 7)	DTN (N = 0 to 7)	Average value 0 to 7
Valid data N (N = 0 to 7)	OCN (N = 0 to 7)	Number of valid stored data 0 to 7
Maximum N (N = 0 to 7)	MXN (N = 0 to 7)	Stored data maximum value 0 to 7
Minimum N (N = 0 to 7)	MNN (N = 0 to 7)	Stored data minimum value 0 to 7

4-22-8 External Reference Tables (Statistics)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Measure count	dataCount	Get only	0 to 100
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Max. data count	saveDataNum	Set/Get	1 to 100
121	Data No.	dataNo	Set/Get	0 to 7
122	Calculate timing	calcTiming	Set/Get	0 to 1
131+Nx10 (N: 0 to 7)	Data expression	dataExpression	Set/Get	Exp. character string
132+Nx10 (N: 0 to 7)	Upper limit of the judgement	upperJudge	Set/Get	-999,999,999.9999 to 999,999,999.9999
133+Nx10 (N: 0 to 7)	Lower limit of the judgement	lowerJudge	Set/Get	-999,999,999.9999 to 999,999,999.9999
134+Nx10 (N: 0 to 7)	Upper limit of the display range	maxVertical	Set/Get	-999,999,999.9999 to 999,999,999.9999
135+Nx10 (N: 0 to 7)	Lower limit of the display range	minVertical	Set/Get	-999,999,999.9999 to 999,999,999.9999
136+Nx10 (N: 0 to 7)	Amount of change to display range	unitVertical	Set/Get	1.0000 to 1,000,000.0000
137+Nx10 (N: 0 to 7)	Measurement	resultValue	Get only	-999,999,999.9999 to 999,999,999.9999

No.	Data Name	Ident	Set/Get	Data range
138+Nx10 (N: 0 to 7)	Expressions comment	comment	Set/Get	Character string
300+N (N: 0 to 7)	Comment view	commentView	Set/Get	0: OFF 1: ON
1000+Nx10 (N: 0 to 7)	Statistic value	resultData	Get only	-999,999,999.9999 to 999,999,999.9999
1001+Nx10 (N: 0 to 7)	Valid data number	resultDataNum	Get only	0 to 100
1002+Nx10 (N: 0 to 7)	Maximum	saveDataMax	Get only	-999,999,999.9999 to 999,999,999.9999
1003+Nx10 (N: 0 to 7)	Minimum	saveDataMin	Get only	-999,999,999.9999 to 999,999,999.9999
10000+N (N: 0 to 99)	data 0 saving data	saveDataA	Get only	-999,999,999.9999 to 999,999,999.9999
11000+N (N: 0 to 99)	data 1 saving data	saveDataB	Get only	-999,999,999.9999 to 999,999,999.9999
12000+N (N: 0 to 99)	data 2 saving data	saveDataC	Get only	-999,999,999.9999 to 999,999,999.9999
13000+N (N: 0 to 99)	data 3 saving data	saveDataD	Get only	-999,999,999.9999 to 999,999,999.9999
14000+N (N: 0 to 99)	data 4 saving data	saveDataE	Get only	-999,999,999.9999 to 999,999,999.9999
15000+N (N: 0 to 99)	data 5 saving data	saveDataF	Get only	-999,999,999.9999 to 999,999,999.9999
16000+N (N: 0 to 99)	data 6 saving data	saveDataG	Get only	-999,999,999.9999 to 999,999,999.9999
17000+N (N: 0 to 99)	data 7 saving data	saveDataH	Get only	-999,999,999.9999 to 999,999,999.9999

4-23 Calibration Data Reference

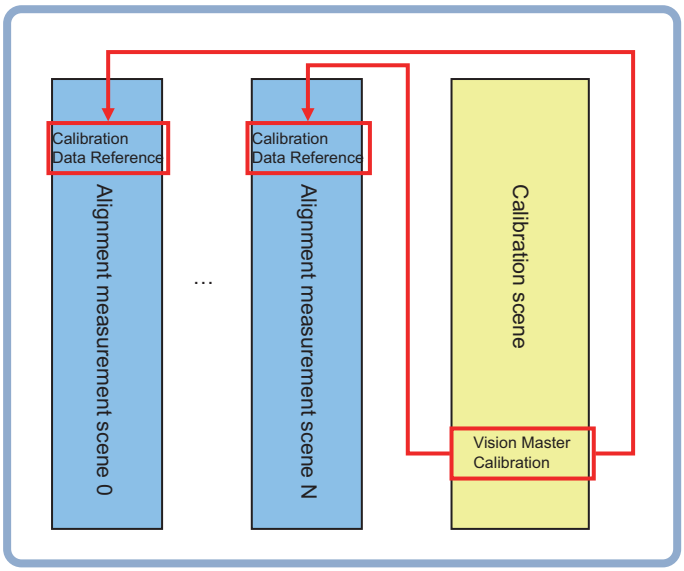
Calibration data and distortion compensation data held under other processing items can be referenced.

Referenced data will be used to perform coordinate conversion processing and distortion compensation processing on measurement results after this processing unit.

As for distortion compensation processing, you can select not only "Compensate measurement result," but also "Compensate measurement image".

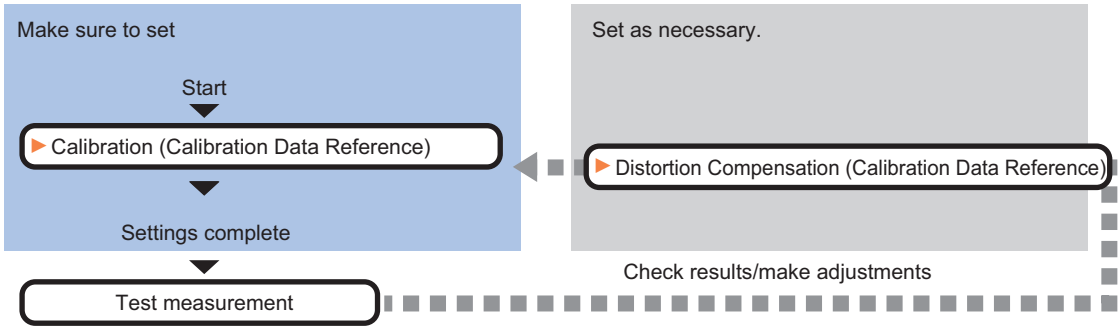
Used in the Following Case

When you want to position the FPD panel



4-23-1 Settings Flow (Calibration Data Reference)

Calibration reference can be set up as follows.



List of Calibration Data Reference Items

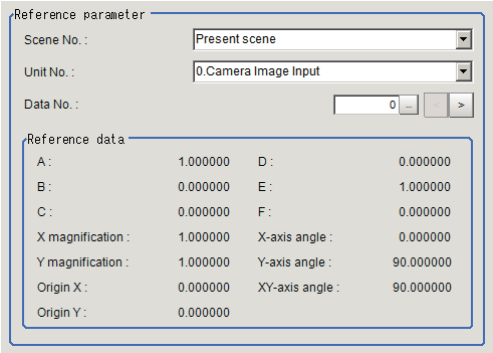
Item name	Description
Calibration	Select the processing unit which holds calibration data. Data can be referenced not only from the current scene, but also from other scenes. Refer to *4-23-3 Distortion Correction (Calibration Data Reference)* on page 4-126.
Distortion correction	Select the processing unit in which the distortion compensation data to be referenced is held. Data can be referenced not only from the current scene, but also from other scenes. One of the two compensation methods, namely image correction and measurement value correction, can be selected. Refer to *4-23-3 Distortion Correction (Calibration Data Reference)* on page 4-126.

4-23-2 Calibration (Calibration Data Reference)

Select the processing unit in which the calibration data to be referenced is held.

1 In the Item Tab area, click [Calibration].

2 Select the reference scene No., reference unit No., and reference data No.



Item name	Description
Scene No.	Select the scene number to be referenced to obtain calibration data.
Unit No.	Select the unit number to be referenced to obtain calibration data. Units that can be referenced include camera image input, camera image input FH, camera image input HDR, camera image input HDR Lite, image master calibration, PLC master calibration, camera calibration and precise calibration.
Data No.	Select the position of the calibration data to be referenced among the data held in the unit to be referenced.
Reference data	Display the referenced calibration data. This display is updated when the reference scene number is changed, reference unit number is changed, or reference calibration data number is changed. If "None" is selected, the initial value is displayed. • Affine transformation parameter (A to F): Value (up to the sixth decimal place) • XY magnification: Value (up to the sixth decimal place) • Origin XY: Value (up to the sixth decimal place) • X axis angle, Y axis angle, XY angle: Value (up to the sixth decimal place)

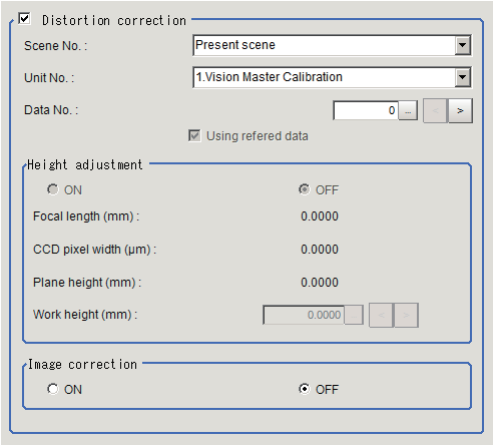
Important

When the data referenced as a parameter by Calibration and the data referenced as a parameter by Distortion correction differs, specify data for Calibration Reference using an image that has already had Distortion correction applied.

4-23-3 Distortion Correction (Calibration Data Reference)

Select the processing unit in which the distortion compensation data to be referenced is held.

1. In the Item Tab area, click [Distortion correction].
2. Place a check at [Distortion correction] and select the reference scene number and reference unit number.



Item name	Description
Distortion correction	Place a check at [Distortion correction] if one of the conditions below is met: • Vision master calibration was performed with "Trapezoidal distortion" or "Lens distortion" selected under [Distortion correction setting]. • Precise calibration was performed with the correction settings turned "ON" on the [Image correction] tab.
Scene No.	Select the number of the scene to be referenced to obtain distortion compensation data.
Unit No.	Select the number of the unit to be referenced to obtain distortion compensation data. A high-precision calibration unit or image master calibration unit can be referenced.
Data No.	0 to 7 This item can be specified only when an image master calibration unit is selected for reference.
Using referred data	Initial value Checked
Height adjustment	Select "ON" to perform height adjustment using the reference data. Initial value OFF
Image correction	Select "ON" to perform image correction. Initial value OFF

Important

- When image correction is OFF, coordinate distortion compensation process is executed only for coordinate values.
- Note that no distortion compensation process is executed for other feature quantities such as an area.

4-23-4 Key Points for Test Measurement and Adjustment (Calibration Data Reference)

The following content is displayed in the "Detail result" area as text.

Setting item	Description
Judge	Judge
A	Affine transformation parameter A
B	Affine transformation parameter B
C	Affine transformation parameter C
D	Affine transformation parameter D
E	Affine transformation parameter E
F	Affine transformation parameter F
X magnification	X magnification.
Y magnification	Y magnification.
Origin X	Origin X.
Origin Y	Origin Y.
X axis angle	X axis angle.
Y axis angle	Y axis angle.
XY axis angle	XY axis angle.

4-23-5 Measurement Results for Which Output Is Possible (Calibration Data Reference)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Setting item	Character string	Description
Judge	JG	Judge

4-23-6 External Reference Tables (Calibration Data Reference)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
5	A	calibParamA	Get only	-
6	B	calibParamB	Get only	-
7	C	calibParamC	Get only	-
8	D	calibParamD	Get only	-
9	E	calibParamE	Get only	-
10	F	calibParamF	Get only	-
11	X magnification	scaleX	Get only	-
12	Y magnification	scaleY	Get only	-
13	Origin X	centerX	Get only	-
14	Origin Y	centerY	Get only	-
15	X-axis angle	angleX	Get only	
16	Y-axis angle	angleY	Get only	
17	XY-axis angle	angleXY	Get only	
18	Lens focus [mm]	phisicalFocus	Get only	5.0000 to 100.0000
19	CCD1 pixel size [um]	ccdPixSize	Get only	3.4500 to 7.4000
20	Plate height [mm]	plateHeight	Get only	-100.0000 to 100.0000
21	Depth setting	useDepth	Get only	0: OFF 1: ON
22	Image correction setting	correctSetting	Get only	0: OFF 1: ON
23	Work height [mm]	work_height	Get only	-100.0000 to 100.0000
120	Scene No. (Calibration)	sceneNo	Set/Get	-1: Refer to present scene 0 to 9,999: Refer to scene No.
121	Unit No. (Calibration)	unitNo	Set/Get	-1: No reference 0 to 9,999: Refer to unit No.
122	Data No. (Calibration)	dataNo	Set/Get	0 to 7: Refer to data No.
123	Scene No. (Distortion correction)	sceneNoCorrect	Set/Get	-1: Refer to present scene 0 to 9,999: Refer to scene No.
124	Unit No. (Distortion correction)	unitNoCorrect	Set/Get	-1: No reference 0 to 9,999: Refer to unit No.
125	Distortion correction setting	distortionCorrect	Set/Get	0: OFF 1: ON
126	Depth setting without reference	useDepthRenew	Set/Get	0: OFF 1: ON
127	Using referred data	referenceSetting	Set/Get	0: OFF 1: ON
128	Image correction setting without reference	correctSettingRenew	Set/Get	0: OFF 1: ON
129	Work height without reference	work_heightRenew	Set/Get	-100.0000 to 100.0000
130	Data No. (Distortion correction)	dataNoCorrect	Set/Get	0 to 7: Refer to data No.

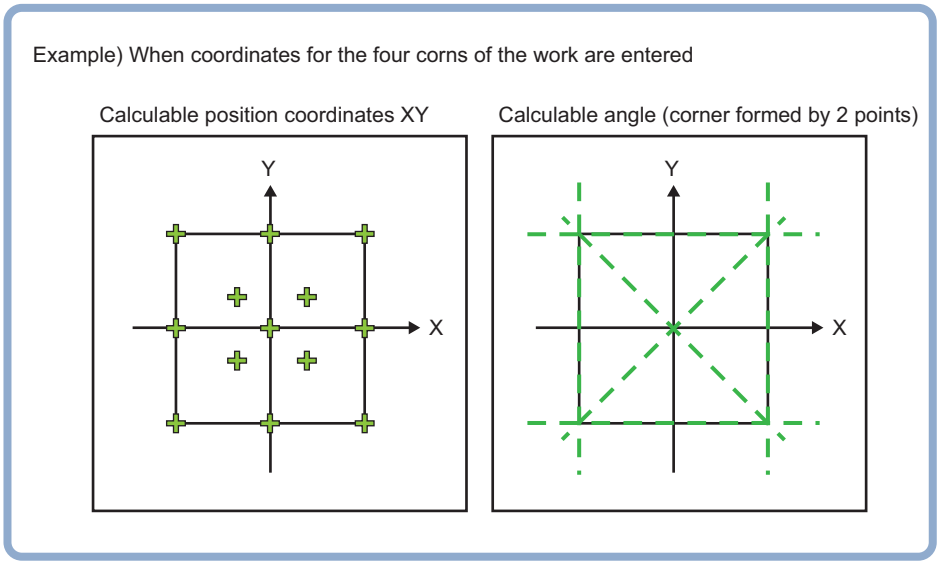
4-24 Position Data Calculation

Calculates position data and angle data used in the Position Data Calculation based on the measurement results of multiple processing items. Up to 4 measurement results can be used for the calculation.

It lets users easily calculate "The angle of a line between 2 points" and "the center point of two points" that are often used in alignment applications.

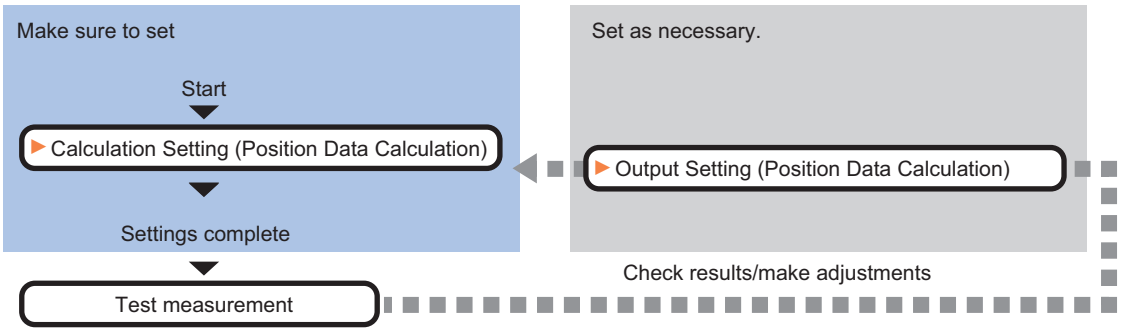
Used in the Following Case

When you want to position the FPD panel



4-24-1 Settings Flow (Position Data Calculation)

The position/angle calculation should be set up with the following procedure.



List of Position Data Calculation Items

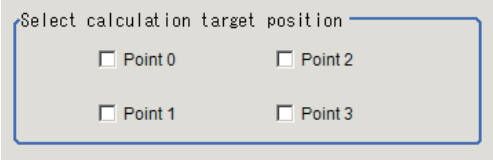
Item name	Description
Calculation setting	Set the data to be processed using a calculation formula. Up to 4 data can be set. The position data to be output is calculated by calculating the average of the position data of the points selected in "Calculation target position selection". The angle data to be output is calculated using the method selected in "Angle calculation method selection". Refer to *4-24-2 Calculation Setting (Position Data Calculation)* on page 4-130.
Output setting	This item can be changed if necessary. Normally, the factory default value will be used. Select whether to reflect the judgement result to the overall judgement of the scene. Refer to *4-24-3 Output Setting (Position Data Calculation)* on page 4-132.

4-24-2 Calculation Setting (Position Data Calculation)

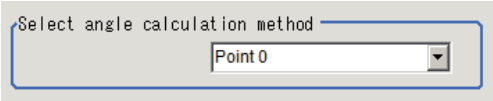
Calculates position data and angle data used in the axis movement amount calculation based on the measurement results of multiple processing items.

1 In the Item Tab area, click [Calculation setting].

2 In the "Select calculation target position" area, select points to be used in the position calculation.



3 Select the angle calculation method in the "Select angle calculation method" area. Angle data is calculated using the selected method and the result is output.



Setting item	Setting value [Factory default]	Description
Select angle calculation method	• Points 0-3 • Line (point0-point1) • Line (point0-point2) • Line (point0-point3) • Line (point1-point0) • Line (point1-point2) • Line (point1-point3) • Line (point2-point0) • Line (point2-point1) • Line (point2-point3) • Line (point3-point0) • Line (point3-point1) • Line (point3-point2)	Select the method for calculating the angle. Line (point0-point1) indicates an angle created by connecting Point 0 and Point 1.

Additional Information

- As for the calculation of the angle formed by points,
  "Line (point0--point1)" and "Line (point1-point0)" output different angles. Use the suitable one.

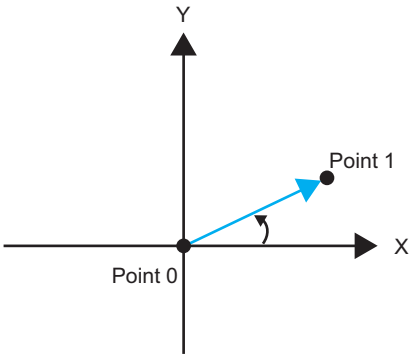


Fig. 1 angle of a side line formed by Point 0 – 1

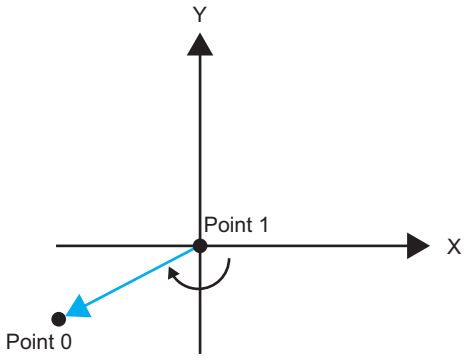


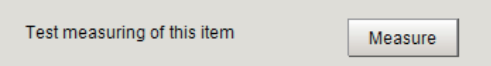
Fig. 2 angle of a side line formed by Point 1 – 0

- As for data necessary for the calculation,
  the points X and Y for the points checked for position data calculation must not be empty. The angle data is as shown in the table in the next page.

Data necessary for angle data (○: data needed to be entered)								
Angle calculation method selection	Point 0		Point 1		Point 2		Point 3	
	Position XY	Angle	Position XY	Angle	Position XY	Angle	Position XY	Angle
Point 0		○						
Point 1				○				
Point 2						○		
Point 3								○
Side line formed by Points 0-1	○		○					
Side line formed by Points 0-2	○				○			
Side line formed by Points 0-3	○						○	
Side line formed by Points 1-0	○		○					
Side line formed by Points 1-2			○		○			
Side line formed by Points 1-3			○				○	
Side line formed by Points 2-0	○				○			
Side line formed by Points 2-1			○		○			
Side line formed by Points 2-3					○		○	
Side line formed by Points 3-0	○						○	
Side line formed by Points 3-1			○				○	
Side line formed by Points 3-2					○		○	

4 Set the position information of Points 0 to 3 as needed.

5 If the setting has been changed, click [Measure] to check the calculation result.



6 Set up the judgement condition.

Setting item	Setting value [Factory default]	Description
Calculate position X	-99999.9999 to 99999.9999	Specify the range of X-axis calculation positions that is judged to be OK.
Calculate position Y	-99999.9999 to 99999.9999	Specify the range of Y-axis calculation positions that is judged to be OK.
Calculate angle	-180.0000 to 180.0000	Specify the range of calculation angles that is judged to be OK.

4-24-3 Output Setting (Position Data Calculation)

Specifies whether or not the judgement results of this processing unit is reflected in the overall judgement.

1 Click [Output setting] in the Item Tab area.

2 Choose whether or not to reflect the judgement result in the scene overall judgement in "Reflect to overall judgement" area.

Setting item	Setting value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Specify whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

4-24-4 Key Points for Test Measurement and Adjustment (Position Data Calculation)

The following content is displayed in the "Detail result" area as text.

Setting item	Description
Judge	Judge
Calculation position X	Calculation position X
Calculation position Y	Calculation position Y
Calculation angle	Calculation angle

4-24-5 Measurement Results for Which Output Is Possible (Position Data Calculation)

The following values can be output using processing items related to the "output result" processing item. It is also possible to reference measurement values from expressions and other processing units.

Setting item	Character string	Description
Judge	JG	Judge
Calculation position X	X	Calculation position X
Calculation position Y	Y	Calculation position Y
Calculation angle	TH	Calculation angle
Calculation angle (Point 0)	TH0	Calculation angle for Point 0
Calculation angle (Point 1)	TH1	Calculation angle for Point 1
Calculation angle (Point 2)	TH2	Calculation angle for Point 2
Calculation angle (Point 3)	TH3	Calculation angle for Point 3
Calculation angle (Point 0-1)	TH01	Angle created by connecting Point 0-1.
Calculation angle (Point 0-2)	TH02	Angle created by connecting Point 0-2.
Calculation angle (Point 0-3)	TH03	Angle created by connecting Point 0-3.
Calculation angle (Point 1-0)	TH10	Angle created by connecting Point 1-0.
Calculation angle (Point 1-2)	TH12	Angle created by connecting Point 1-2.
Calculation angle (Point 1-3)	TH13	Angle created by connecting Point 1-3.
Calculation angle (Point 2-0)	TH20	Angle created by connecting Point 2-0.
Calculation angle (Point 2-1)	TH21	Angle created by connecting Point 2-1.
Calculation angle (Point 2-3)	TH23	Angle created by connecting Point 2-3.
Calculation angle (Point 3-0)	TH30	Angle created by connecting Point 3-0.
Calculation angle (Point 3-1)	TH31	Angle created by connecting Point 3-1.
Calculation angle (Point 3-2)	TH32	Angle created by connecting Point 3-2.

4-24-6 External Reference Tables (Position Data Calculation)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
5	Calculate position X	positionX	Get only	-99,999.9999 to 99,999.9999
6	Calculate position Y	positionY	Get only	-99,999.9999 to 99,999.9999
7	Calculate angle	angle	Get only	-180.0000 to 360.0000
8	Calculate angle (point 0)	angle0	Get only	-180.0000 to 360.0000
9	Calculate angle (point 1)	angle1	Get only	-180.0000 to 360.0000
10	Calculate angle (point 2)	angle2	Get only	-180.0000 to 360.0000
11	Calculate angle (point 3)	angle3	Get only	-180.0000 to 360.0000
12	Calculate angle (point0-point1)	angle4	Get only	-180.0000 to 360.0000
13	Calculate angle (point0-point2)	angle5	Get only	-180.0000 to 360.0000
14	Calculate angle (point0-point3)	angle6	Get only	-180.0000 to 360.0000

No.	Data Name	Ident	Set/Get	Data range
15	Calculate angle (point1-point0)	angle7	Get only	-180.0000 to 360.0000
16	Calculate angle (point1-point2)	angle8	Get only	-180.0000 to 360.0000
17	Calculate angle (point1-point3)	angle9	Get only	-180.0000 to 360.0000
18	Calculate angle (point2-point0)	angle10	Get only	-180.0000 to 360.0000
19	Calculate angle (point2-point1)	angle11	Get only	-180.0000 to 360.0000
20	Calculate angle (point2-point3)	angle12	Get only	-180.0000 to 360.0000
21	Calculate angle (point3-point0)	angle13	Get only	-180.0000 to 360.0000
22	Calculate angle (point3-point1)	angle14	Get only	-180.0000 to 360.0000
23	Calculate angle (point3-point2)	angle15	Get only	-180.0000 to 360.0000
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Position calculation method: point 0	positionCalcType1	Set/Get	0: NOT checked 1: Checked
121	Position calculation method: point 1	positionCalcType2	Set/Get	0: NOT checked 1: Checked
122	Position calculation method: point 2	positionCalcType3	Set/Get	0: NOT checked 1: Checked
123	Position calculation method: point 3	positionCalcType4	Set/Get	0: NOT checked 1: Checked
124	Calculate angle target of angle 0	angleCalcType	Set/Get	0: Point 0 1: Point 1 2: Point 2 3: Point 3 4: Line (point0-point1) 5: Line (point0-point2) 6: Line (point0-point3) 7: Line (point1-point0) 8: Line (point1-point2) 9: Line (point1-point3) 10: Line (point2-point0) 11: Line (point2-point1) 12: Line (point2-point3) 13: Line (point3-point0) 14: Line (point3-point1) 15: Line (point3-point2)
125	Upper limit of calculate position X	upperX	Set/Get	-99,999.9999 to 99,999.9999
126	Lower limit of calculate position X	lowerX	Set/Get	-99,999.9999 to 99,999.9999
127	Upper limit of calculate position Y	upperY	Set/Get	-99,999.9999 to 99,999.9999
128	Lower limit of calculate position Y	lowerY	Set/Get	-99,999.9999 to 99,999.9999
129	Upper limit of calculate angle	upperAngle	Set/Get	-180.0000 to 360.0000
130	Lower limit of calculate angle	lowerAngle	Set/Get	-180.0000 to 360.0000

No.	Data Name	Ident	Set/Get	Data range
131	Point 0: X	expPositionX1	Set/Get	Exp. character string
132	Point 0: Y	expPositionY1	Set/Get	Exp. character string
133	Point 0: Angle	expAngle1	Set/Get	Exp. character string
141	Point 1: X	expPositionX2	Set/Get	Exp. character string
142	Point 1: Y	expPositionY2	Set/Get	Exp. character string
143	Point 1: Angle	expAngle2	Set/Get	Exp. character string
151	Point 2: X	expPositionX3	Set/Get	Exp. character string
152	Point 2: Y	expPositionY3	Set/Get	Exp. character string
153	Point 2: Angle	expAngle3	Set/Get	Exp. character string
161	Point 3: X	expPositionX4	Set/Get	Exp. character string
162	Point 3: Y	expPositionY4	Set/Get	Exp. character string
163	Point 3: Angle	expAngle4	Set/Get	Exp. character string
164	Calculate angle target of angle 1	angleCalcType1	Set/Get	0: Point 0 1: Point 1 2: Point 2 3: Point 3 4: Line (point0-point1) 5: Line (point0-point2) 6: Line (point0-point3) 7: Line (point1-point0) 8: Line (point1-point2) 9: Line (point1-point3) 10: Line (point2-point0) 11: Line (point2-point1) 12: Line (point2-point3) 13: Line (point3-point0) 14: Line (point3-point1) 15: Line (point3-point2)
165	Calculate average of 2 angles or not	isTwoAngleAverage	Set/Get	0: Calculate angle of angle 0 1: Calculate average of 2 angles
166	Angle range	angleRange	Set/Get	0: $-180^\circ < \theta \leq 180^\circ$ 1: $0^\circ \leq \theta < 360^\circ$

4-25 Robot Data

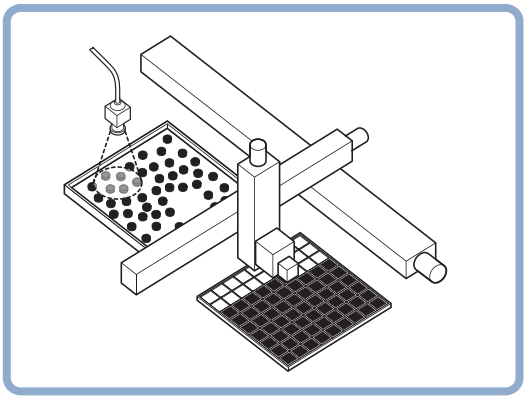
Sets and stores data related to robots.

This processing item is required when using the following processing items in an equipment environment containing robots.

- Vision master calibration
- PLC master calibration
- Calibration Data Reference
- Transfer Position Data
- Calc Axis Move
- Calc Axis Move by Multipoint

Used in the Following Case

When setting parameters for robots to be used and the rotation polarity
Example: palletizing of electronic parts



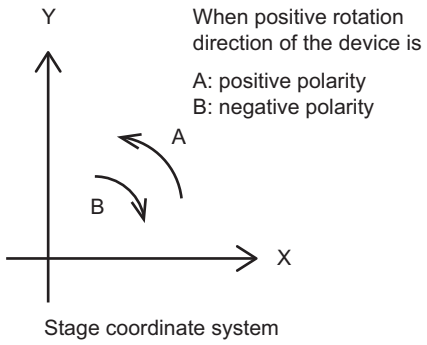
4-25-1 Data Setting (Robot Data)

Set data based on the specification of the robot.

1 In the Item Tab area, click [Data setting].

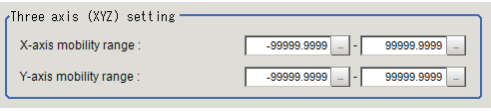
2 Select the type of the robot in the "Robot setting" area.

Selecting "four axis (XYZR) robot" will enable you to select the rotation polarity.

Setting item	Setting value [Factory default]	Description
Robot type	• [Three axis (XYZ)] • Four axis (XYZR) • Six axis (XYZWPR)	Select the type of the robot to be used.
Rotation polarity	• [Positive] • Negative	Select the rotation direction defined in the equipment is positive or negative compared to the rotation direction in the robot coordinate system. Positive: From the X axis to Y axis Negative: From the Y axis to X axis 

● 3-axis (XYZ) robot

1 Selecting "Three axis (XYZ)" will display the "Three axis (XYZ) setting" area.



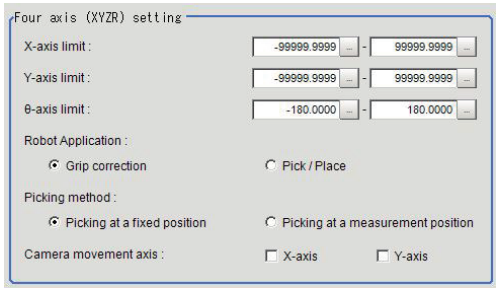
2 Click [...] in X-axis limit in the Three axis (XYZ) setting area to set the upper and lower limit values.

3 Likewise click [...] in Y-axis limit to set the upper and lower limit values.

Setting item	Setting value [Factory default]	Description
X-axis limit	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the X axis movement range. Units of the coordinate system set in calibration is used.
Y-axis limit	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the Y axis movement range. Units of the coordinate system set in calibration is used.

● 4-axis (XYZR) robot

1 Selecting "Four axis (XYZR)" will display the "Four axis (XYZR) setting" area.



2 Click [...] in X-axis limit in the "Four axis (XYZR) setting" area to set the upper and lower limit values.

3 Likewise click [...] in Y-axis limit to set the upper and lower limit values.

4 Likewise click [...] in θ-axis limit to set the upper and lower limit values.

5 Select the application from "Robot Application".

6 Select the control method for the robot from the "Picking method".

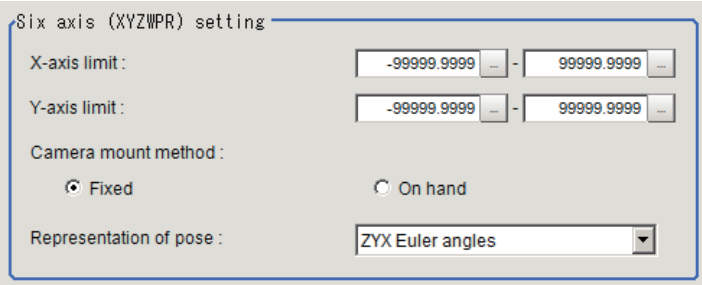
7 If the camera is moved, select the axis to which the camera is attached from Camera movement axis.

Setting item	Setting value [Factory default]	Description
X-axis limit	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the X axis movement range. Units of the coordinate system set in calibration are used.
Y-axis limit	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the Y axis movement range. Units of the coordinate system set in calibration are used.
θ-axis limit	-180.0000 to 180.0000 [-180.0000] to [180.0000]	Set the upper and lower limit values for the θ axis angle range. The unit is degree.
Robot Application	• [Grip correction] • Pick/Place	Set the robot application. • Grip correction: Measures an image of the gripped workpiece and calculate an amount of deviation from the reference position. • Pick/Place: Move the robot hand to a pick/place position measured by the image.

Setting item		Setting value [Factory default]	Description
Picking method		• Picking at a fixed position • Picking at a measurement position	Select the robot control method. The robot control settings change depending on at which phase position alignment is performed from "the work-piece grasping phase" to "movement phase". (1) Go to a fixed position to pick up an object If the robot is controlled using the Sensor Controller measurement result, so that the robot can go to the same position every time during workpiece to pick up an object and place it on a specific position after grasping the object, select this. This is some kind of palletizing application. Specifically speaking, in this setting, the same calculation as the XYθ stage is used. (2) Go to the measurement position of workpiece to pick up an object If the robot is controlled so that the robot goes to grasp the workpiece and then places it on a specific position after grasping it using the measurement result of this vision sensor every time, select this. This is some kind of depalletizing application. Specifically speaking, in this setting, the same calculation as the θXY stage is used.
Camera movement axis			
	X-axis	• Checked • [Unchecked]	Enable this setting if the camera moves instead of the robot axis. If this is disabled, calculation for movement amount and so on is performed on the premises that the stage moves.
	Y-axis	• Checked • [Unchecked]	

● 6-axis (XYZWPR) robot

1 Selecting “Six axis (XYZWPR)” will display the “Six axis (XYZWPR) setting” area.



2 Click [...] in X-axis limit in the “Six axis (XYZWPR) setting” area to set the upper and lower limit values.

3 Likewise click [...] in Y-axis limit to set the upper and lower limit values.

4 Select the camera mount method from the “Camera mount method”.

5 Select the robot posture from “Representation of pose”.

Setting item	Setting value [Factory default]	Description
X-axis limit	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the X axis movement range. Units of the coordinate system set in calibration are used.
Y-axis limit	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the Y axis movement range. Units of the coordinate system set in calibration are used.
Camera mount method	[Fixed] On hand	Select the camera mount method. When “Grip correction” is selected in the “Robot application”, “Fixed” is only its option.
Representation of pose	[ZYX Euler angles] ZYZ Euler angles	Set the robot posture. Which option to select depends on the robot manufacturer you use.

4-25-2 Measurement Results for Which Output Is Possible (Robot Data)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result

4-25-3 External Reference Tables (Robot Data)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
120	Robot type	machineType	Set/Get	0: Three axis (XYZ) robot 1: Four axis (XYZR) robot 2: Six axis (XYZWPR) robot
121	Rotation polarity	rotationPolarValue	Set/Get	-1: Negative 1: Positive
122	Picking method	robotControlType	Set/Get	0: Picking at a fixed position 1: Picking at a measurement position
123	Camera movement axis X-axis	cameraMoveAxisX	Set/Get	0: Camera moving axis X is not used. 1: Camera moving axis X is used.
124	Camera movement axis Y-axis	cameraMoveAxisY	Set/Get	0: Camera moving axis Y is not used. 1: Camera moving axis Y is used.
125	Camera mount method	cameraMount	Set/Get	0: Fixed 1: On hand
126	Robot application	robotApplicationMode	Set/Get	0: Grip correction 1: Pick/Place
130	Lower limit of X-axis movement	lowerMoveX	Set/Get	-99,999.9999 to 99,999.9999
131	Upper limit of X-axis movement	upperMoveX	Set/Get	-99,999.9999 to 99,999.9999
132	Lower limit of Y-axis movement	lowerMoveY	Set/Get	-99,999.9999 to 99,999.9999
133	Upper limit of Y-axis movement	upperMoveY	Set/Get	-99,999.9999 to 99,999.9999
134	Lower limit of θ-axis movement	lowerMoveTheta	Set/Get	-180 to 180
135	Upper limit of θ-axis movement	upperMoveTheta	Set/Get	-180 to 180
150	Six axis (XYZWPR) representation of pose	poseRotationType	Set/Get	0: ZYX Euler angles 1: ZYZ Euler angles

4-26 Vision Master Calibration

This processing item is specifically provided for calibration between the camera coordination system and the control equipment coordinate system.

This processing item automatically calculates the entire axis movement amount of the control equipment necessary for calibration.

For that reason, it possible to perform accurate calibration more easily than previously.

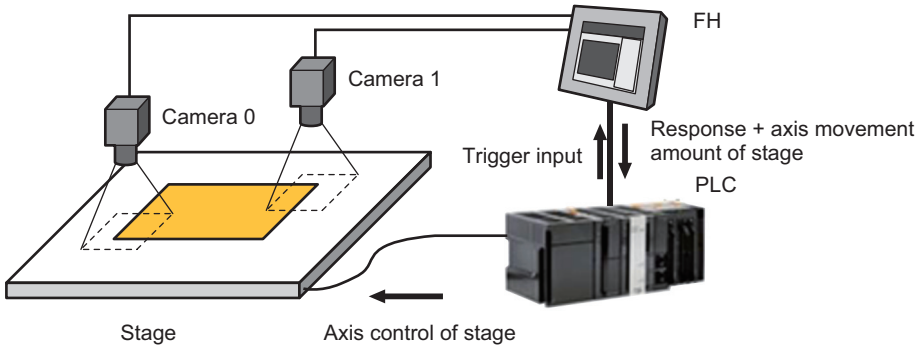
Important

- The calibration data created with this processing item is referred to using [Calibration Data Reference].
  Unlike other calibration-related processing items, note that this processing item cannot use the calibration data on its own.
- This function refers to the processing item having external device information for axis movement calculation, e.g. Stage Data or Robot Data. If you change those data, setting contents of this function will be changed. In this case, needs to check those data.

Used in the Following Case

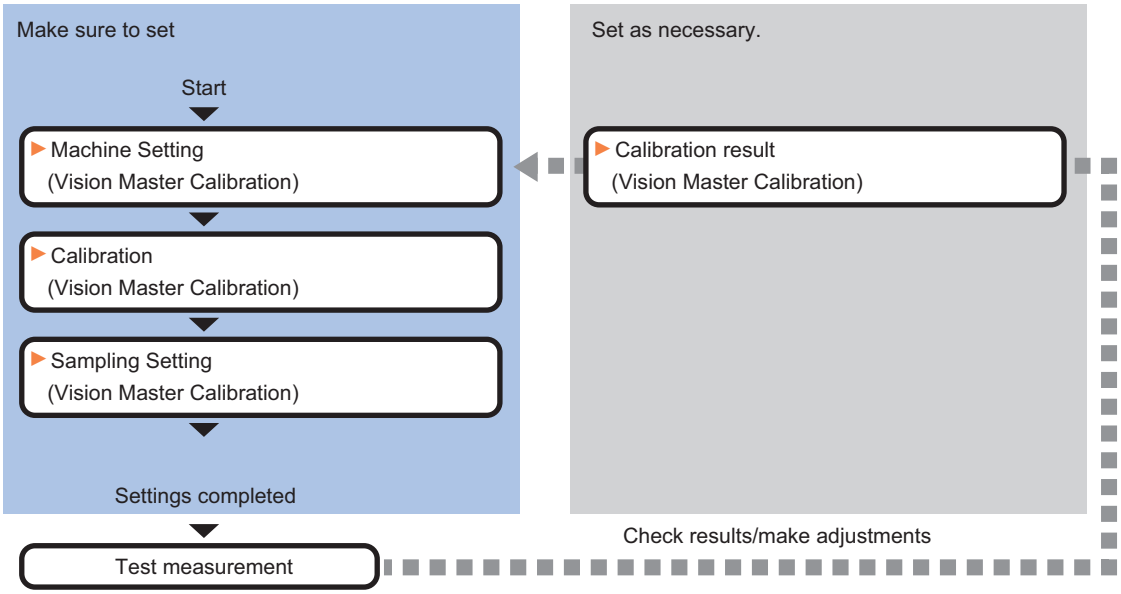
When you want to position the FPD panel

FH/FZ5 calculates the axis movement amount of stages required for calibration, and outputs it to PLC.



4-26-1 Settings Flow (Vision Master Calibration)

Set the image master calibration with the following steps.



List of Vision Master Calibration Items

Item name	Description
Machine setting	Select a processing item (stage data or robot data) under which external device information needed for calculation of axis movement amount is held. Refer to *4-26-2 Machine Setting (Vision Master Calibration)* on page 4-144.
Calibration	This item sets data related to calibration. Sets the number of calibration data to be created and the measurement processing items to be used for sampling in the arithmetic expression. Also sets the output method for the calculated axis movement amount. Refer to *4-26-3 Calibration (Vision Master Calibration)* on page 4-145.
Sampling setting	This item sets data related to sampling. Also makes the sampling settings for the initial calibration and this calibration. Refer to *4-26-4 Sampling Setting (Vision Master Calibration)* on page 4-149.
Calibration result	This item confirms the calibration data you created. The calibration data can be adjusted directly using the Edit function. It is also possible to confirm the sampling data used for the calculation. Refer to *4-26-5 Calibration Result (Vision Master Calibration)* on page 4-160.

4-26-2 Machine Setting (Vision Master Calibration)

Select a processing unit (stage data or robot data) under which external device information needed for calculation of axis movement amount is held.

Important

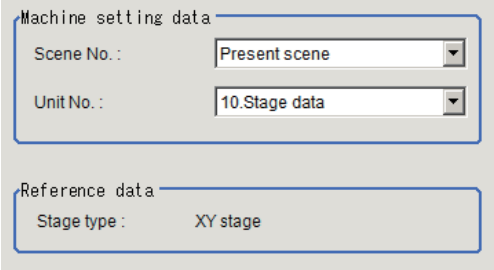
[Vision Master Calibration] refers to [Stage Data] or [Robot Data]. Be sure to register [Stage Data] or [Robot Data] with a given scene.

1 In the Item Tab area, click [Machine setting].

2 Select the processing unit that retains information on external device.

Information of the selected processing unit is displayed in the reference data display area.

Displayed contents vary depending on selected type of Robot or Stage.



Setting item	Setting value [Factory default]	Description
Scene No.	[Present scene] Scenes 0 to 127	Select a scene number including a processing item (stage data or robot data) in which external device information needed for calculation of axis movement amount is held.
Unit No.	---	From among the referenced scene numbers, select a processing item (stage data or robot data) in which external device information needed for calculation of axis movement amount is held.
Reference data	---	Display the settings of "Stage" or "Robot" processing item.

Additional Information

If the number of scenes is increased using the scene group conversion tool, the maximum value that can be selected in "Scene No." changes.

4-26-3 Calibration (Vision Master Calibration)

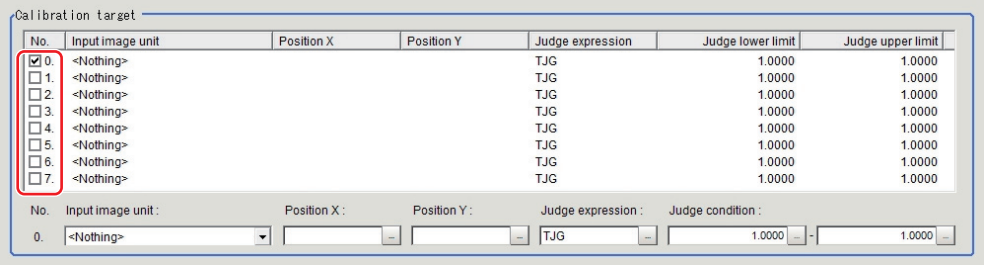
This item sets data related to calibration. Sets the number of calibration data to be created and the measurement processing items to be used for sampling in the arithmetic expression. Also sets the output method for the calculated axis movement amount.

Displayed contents vary depending on selected type of Robot or Stage.

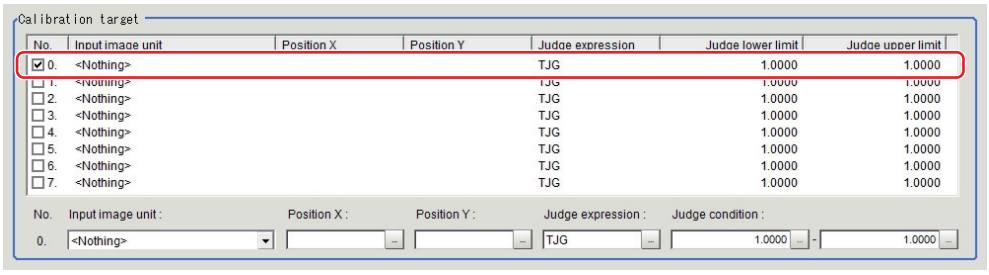
1 In the Item Tab area, click [Calibration].

2 Check the calibration data items to set.

Calibration data is created for the checked numbers.



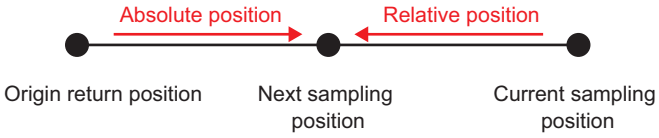
3 Select the line of the calibration data that you want to set.



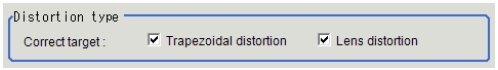
4 Set each item in the "Calibration target" area.

Setting item	Setting value [Factory default]	Description
Input image unit	[<Nothing>]	Select an image input unit to be used for sampling measurement.
Position X	-	Set the arithmetic expression that obtains camera coordinate X used for sampling.
Position Y	-	Set the arithmetic expression that obtains camera coordinate Y used for sampling.
Judge expression	[TJG]	Set the arithmetic expression to determine whether sampling was successful or not. If calibration fails with the initial value TJG, set the unit judgement JG of the processing unit from which positions X and Y are referred.
Judge condition	-999999999.9999 to 999999999.9999 [1.0000] to [1.0000]	Set the upper and lower limit values to determine whether sampling was successful or not. If TJG or JG is set to the judgement expression, use the initial values.

5 Select the output method for movement amount in the movement output method area.

Setting item	Setting value [Factory default]	Description
movement output method	• [Absolute position] • Relative position	Select the calculation method for the axis movement amount output to the external device next time. The movement amount output method affects the "Next movement amount" that can be obtained by calculation. The setting must be changed according to the specifications of the control equipment used. • Absolute position It always outputs the axis movement amount from the origin return position (0 axis movement amount) to the next sampling position. • Relative position Outputs the axis movement amount from the current sampling position to the next sampling position. 

6 Select whether or not to output distortion compensation parameters in the Distortion type area.



Setting item	Setting value [Factory default]	Description
Trapezoidal distortion	• [Checked] • Unchecked	Select whether or not to output trapezoidal compensation parameters set for each data.
Lens distortion	• [Checked] • Unchecked	Select whether or not to output lens distortion compensation parameters set for each data.

Additional Information

Distortion compensation function is not applied for X, Y, Xθ, Yθ, θX and θY Stages. Therefore measurement accuracy may be decreased if the optic axis is not straight to the surface on which a workpiece is placed. Set the camera optic axis perpendicular to the surface on which a workpiece is located, including move axis.

Important

Limit on the number of calibration data when distortion compensation is turned on

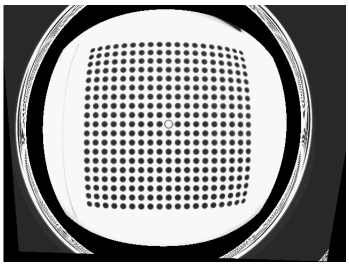
For the FZ5-L3□□/6□□ series models, the number of distortion compensation calibration data (when compensation for either trapezoidal distortion or lens distortion has been specified) that can be used in the same scene group is limited according to the camera in use. Do not exceed this limitation. You can delete created distortion compensation data by redoing calibration with both settings unselected. In the case of the FH series/FZ5-800 series/FZ5-1100 series/FZ5-1200 series, the number of processing items is not limited and can be registered as long as there is sufficient free memory.
If the increasing memory consumption caused insufficient available memory, it may cause errors in operation mode switching or in adding Processing Units into the measurement flow. Please check the memory consumption when you create scenes.

Type of controller	0.3 megapixel camera	Intelligent Compact Digital Camera	2 megapixel camera	5 megapixel camera	0.3 megapixel camera (FH)	2 megapixel camera (FH)	4 megapixel camera (FH)
FZ5-L35□ Or FZ5-6□□	30	28	7	2	---	---	---

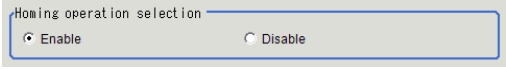
- Distortion compensation function

  Since the compensation algorithm in this processing item is as same as one in the high-precision calibration processing item, sampling points are going to be biased toward the center of the screen. Therefore an image is not compensated correctly when the effective range of the field of view is extremely narrowed.
  Widen the effective range of the field of view so that sampling points are located in the entire screen and perform calibration again.

  If the effective range of the field of view is extremely narrow, a circular virtual image shown below may appear.



7 Select [Enable] or [Disable] in Homing operation selection area.



Setting Item	Setting value [factory default]	Description
Homing operation selection	• [Enable] • Disable	Select [Enable] or [Disable] during sampling. Enable: Outputs the Homing operation output flag. Disable: Not output the Homing operation output flag, then turns OFF it constantly.

- Homing operation selection

  Selecting [Enable] for the Homing operation selection turns the Homing operation output flag to ON and forces the Homing operation to be done from the PLC when switching the Sampling movement type.

  Specifically, the FH/FZ Sensor Controller will turn on the Homing operation output flag when switching between the translation sampling and the rotational movement sampling, and vice-versa. This can reduce the effect of positional shifting due to backlash associated with the movement of the conveyor or stage.

  If a highly precise stage, or conveyor is being used, or the effect of backlash can be mitigated by some other means, you can select [Disable] for this function.

- Example for Homing operation output

  For example for Homing operation output depending on sampling settings, refer to the following table.

- Sampling method: All at once

Sampling processing	Output flag (Homing operating selection: Enable)	Output flag (Homing operating selection: Disable)
Output after reference position sampling	OFF	OFF
Output of first translation position 1 sampling	OFF	OFF
Output of first translation position 2 sampling	ON	OFF
Output of first rotation moving position 1 sampling	ON	OFF
Output of translation position 1 sampling	OFF	OFF
Output of translation position 2 sampling	OFF	OFF
Output of translation position 3 sampling	ON	OFF
Output of rotation moving position 1 sampling	OFF	OFF
Output of rotation moving position 2 sampling	ON	OFF

- Sampling method: One by one

Sampling processing	Output flag (Homing operating selection: Enable)	Output flag (Homing operating selection: Disable)
Output after reference position sampling	OFF	OFF
Output of first translation position 1 sampling	OFF	OFF
Output of first translation position 2 sampling	ON	OFF
Output of first rotation moving position 1 sampling	ON	OFF
Output after reference position sampling	OFF	OFF
Output of translation position 1 sampling	OFF	OFF
Output of translation position 2 sampling	OFF	OFF
Output of translation position 3 sampling	ON	OFF
Output of rotation moving position 1 sampling	OFF	OFF
Output of rotation moving position 2 sampling	ON	OFF

Additional Information

- A moving amount after Homing operation is output when Homing operation selection is [Enable] after calibration is complete. If [Disable] is selected, the moving amount from the current position to the next position is output.
- If a failure occurs while Vision master calibration is performed:

  Homing operation selection: Enable

  => The moving amount is output as 0 after turning the Homing operation flag ON.

  Homing operation selection: Disable

  => The moving amount is output as 0 without any change in the Homing operation flag.

4-26-4 Sampling Setting (Vision Master Calibration)

This item sets data related to sampling.

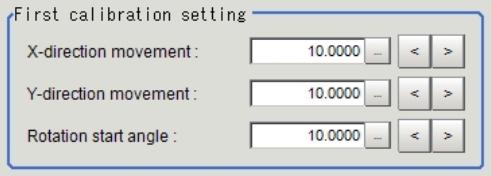
Also makes the sampling settings for the initial calibration and this calibration.

Displayed contents vary depending on selected type of Robot or Stage.

1 In the Item Tab area, click [Sampling Setting].

2 In the First calibration setting area, specify each item.

example: XYθ stage selected.



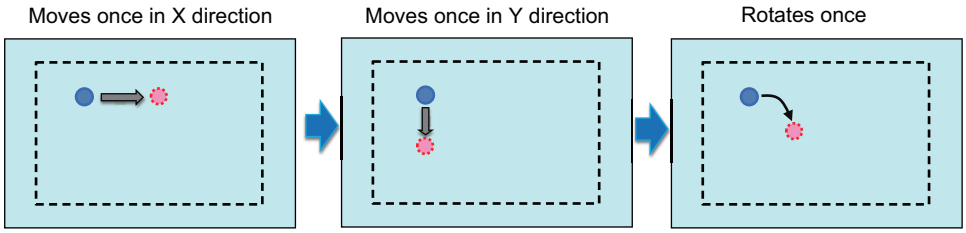
Setting item	Setting value [Factory default]	Description
X-direction movement	-99999.9999 to 99999.9999 [10.0000]	Set the X axis movement amount in the in first calibration.
Y-direction movement	-99999.9999 to 99999.9999 [10.0000]	Sets the Y axis movement amount in the first calibration.
Rotation start angle	-180.0000 to 180.0000 [10.0000]	Set the rotation movement start angle in the first calibration.

Additional Information

When you select X, Y, Xθ, Yθ, θX or θY Stage, non-existent axis will be grayed out and you cannot set it.
Only existing axis can be set.

- About the First calibration

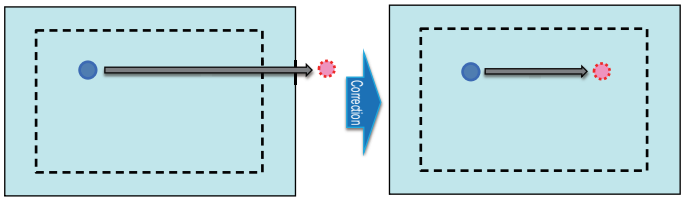
  The First calibration collects and calculates calibration data to find the movement range for the Precise calibration.



Additional Information

If the sampling for the First calibration fails, sampling will be executed again with the movement amount and angle values reduced by 50%.

If a measurement position for sampling is out of the range of field of camera view due to large first movement amount, such movement amount and movement angle are automatically corrected to perform the sampling again.



3 Setting each item in the Precise calibration setting area

There are two sampling methods here.

One by one: Calibration data up to eight are measured one by one.

All at once: Calibration data up to eight are measured at once.

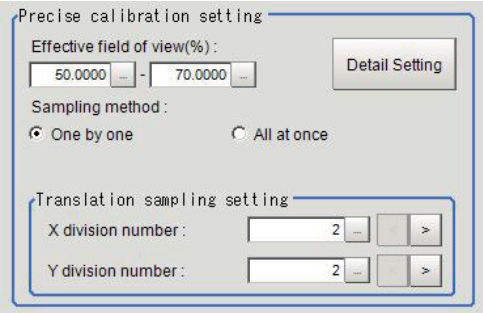
- [One by one] in [Sampling method]
  Since the field of view for sampling is calculated per calibration data, the sampling measurement range becomes wider than [All at once].
- All at once:
  Since the all calibration data is generated at once, so the calibration data is generated faster than the [One by one]

Additional Information

- This calibration can be [NG] (failed) when inapplicable measurement processing unit data is [NG]. In this case, change the judgment expression in [Calibration target] area. Set the unit judgment [JG] for the measurement processing unit that measures a sampling target to each judgment expression of calibration data. By this, this calibration is processed successfully even if a measuring processing unit whose data is not this sampling target is judged as NG.
  For details, refer to *4-26-4 Sampling Setting (Vision Master Calibration)* on page 4-149.
- In some case, appropriate measurement processing units are not set for each calibration data. In this case, check the error detection value and maxim.
- um error detection value and adjust calibration.
  For details, refer to *Error detection values* on page 4-162.

(1)

- When you select the XY or X(Y) stages in Stage Data function.
- When you select 3-axis robot in Robot Data function.



Setting item	Setting value [Factory default]	Description
Effective field of view(%)	Lower limit: 1 to 100 [50]	Sets the effective range of the field of view for the image input unit.
	Upper limit: 1 to 100 [70]	
Sampling method	• [One by one] • All at once	Selects the sampling method for the calibration data creation: one by one or all at once.

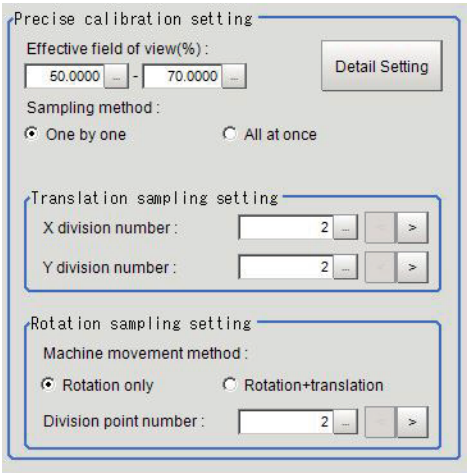
Setting item		Setting value [Factory default]	Description
Translation sampling setting		---	Translation sampling performs a sampling by moving a stage parallel to an X axis or Y axis. It consists of a row parallel to the X axis and a column parallel to the Y axis and an intersection of them will be the sampling point.
	X division number	2 to 10 [2]	Sets the number of lines divided during translation sampling in this calibration.
	Y division number	2 to 10 [2]	Sets the number of columns divided during translation sampling in this calibration.

Additional Information

When you select X(Y) Stage and set X axis as movement axis, only [Y division number] can be applied. In this case, [X division number] is grayed out. When you select Y axis to the movement axis, [Y division number] is grayed out.

(2)

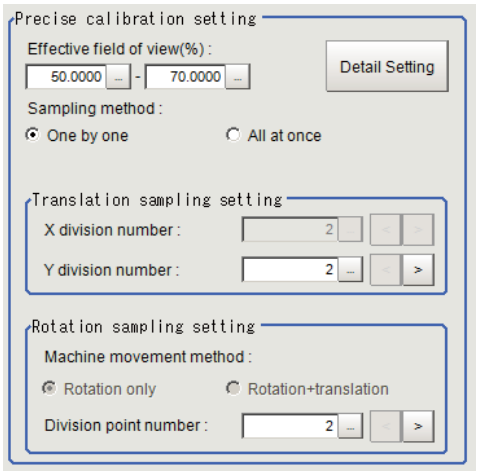
- When you select the XYθ, θXY, UVW or UVWR stages in Stage Data function.
- When you select 4-axis robot in Robot Data function.



Setting item	Setting value [Factory default]	Description
Effective field of view(%)	Lower limit: 1 to 100 [50]	Sets the effective range of the field of view for the image input unit.
	Upper limit: 1 to 100 [70]	
Sampling method	• [One by one] • All at once	Selects the sampling method for the calibration data creation: one by one or all at once.
Translation sampling setting	-	Translation sampling performs a sampling by moving a stage parallel to an X axis or Y axis. It consists of a row parallel to the X axis and a column parallel to the Y axis and an intersection of them will be the sampling point.

Setting item		Setting value [Factory default]	Description
	X division number	2 to 10 [2]	Sets the number of lines divided during translation sampling in this calibration.
	Y division number	2 to 10 [2]	Sets the number of columns divided during translation sampling in this calibration. When data are selected one by one, Measuring Processing Unit of data not targeted for sampling may be NG.
Rotation sampling setting		-	-
	Machine moving method	• [Rotation only] • Rotation+translation	Sets the external device movement method for rotational sampling in this calibration. This setting is grayed out and is not applied when you select [All at once].
	Division point number	2 to 100 [2]	Sets the number of division points for rotational sampling in this calibration.

(3) When you select the Xθ (Yθ) or θX (θY) in Stage Data function.



Setting item		Setting value [Factory default]	Description
Effective field of view (%)		Lower limit: 1 to 100 [50]	Sets the effective range of the field of view for the image input unit.
		Upper limit: 1 to 100 [70]	
Sampling method		• [One by one] • All at once	Selects the sampling method for the calibration data creation: one by one or all at once.
Translation sampling setting			Translation sampling performs a sampling by moving a stage parallel to an X axis or Y axis. It consists of a row parallel to the X axis and a column parallel to the Y axis and an intersection of them will be the sampling point.
	X division number	2 to 10 [2]	Sets the number of lines divided during translation sampling in this calibration.
	Y division number	2 to 10 [2]	Sets the number of columns divided during translation sampling in this calibration.
Rotation sampling setting			
	Division point number	2 to 100 [2]	Sets the number of division points for rotational sampling in this calibration.

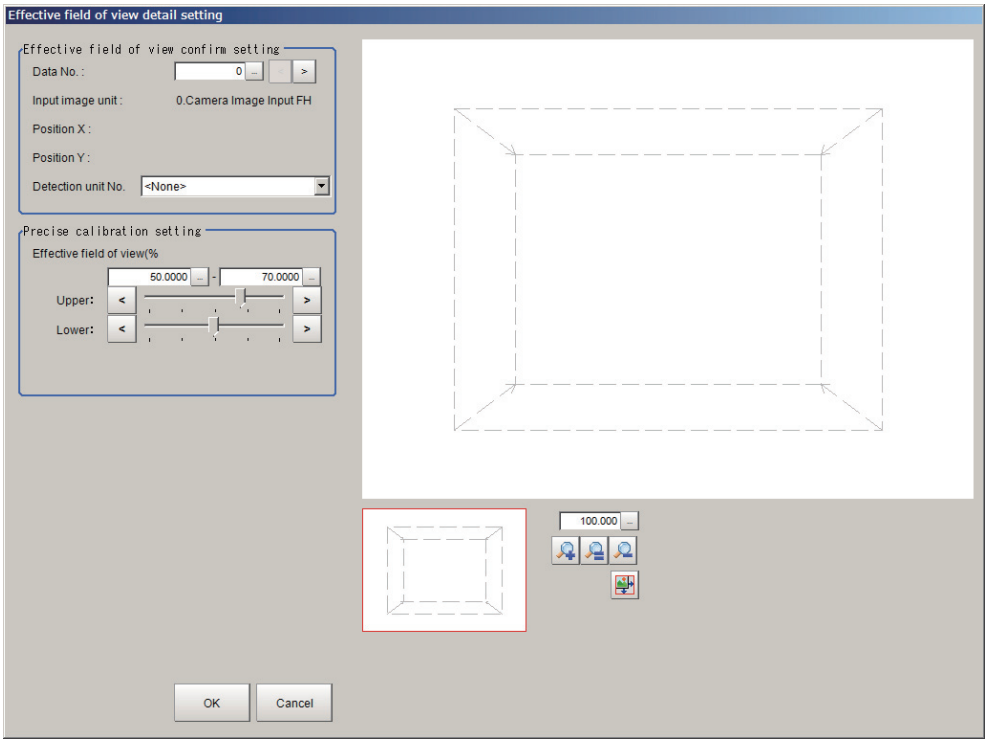
Additional Information

When you select Xθ(Yθ) or θX(θY) Stage and set X axis as movement axis, only [Y division number] can be applied. In this case, [X division number] is grayed out. When you select Y axis to the movement axis, [Y division number] is grayed out.

4 Checking whether or not the effective field of view [%] set above is properly set.

When clicking the [Detail Setting] in the Precise calibration area, the following Effective field of view detail setting window is displayed.

In the Image display area, an image for the Effective field of view confirm target", set by the Data No., is displayed. When <None> is displayed in the Detection unit No., the Effective field of view range is displayed with gray broken line as below.



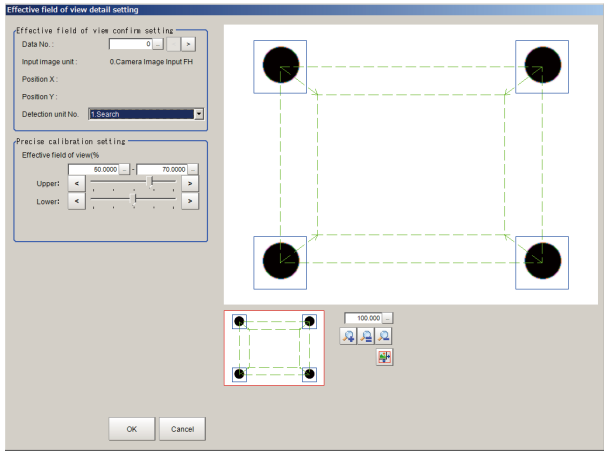
At the dialog startup

Setting item		Setting value [Factory default]		Description
Effective field of view confirm setting				
	Data No.	0 to 7 [0]		Sets the Effective field of view confirm target data.
	Input image unit.			Displays the Input image unit set by the Data No.
	Position X/Y			Displays the position X/Y of data set by the Data No.
	Detection unit No.	[<None>] to 9999		Sets the Detection unit for the Effective field of view confirm target. The detection points and model frame for the input image unit will be displayed. The detection points are overlapped on four vertexes of the effective field of view.
Precise calibration setting				
	Effective field of view (%)	Upper	1 to 100 [70]	Sets the effective field of view (%).
		Lower	1 to 100 [50]	

Display example:

(1) Effective field of view confirm range target: Set a detection unit (in the case where the position of the model frame is within the range of the image field of view.

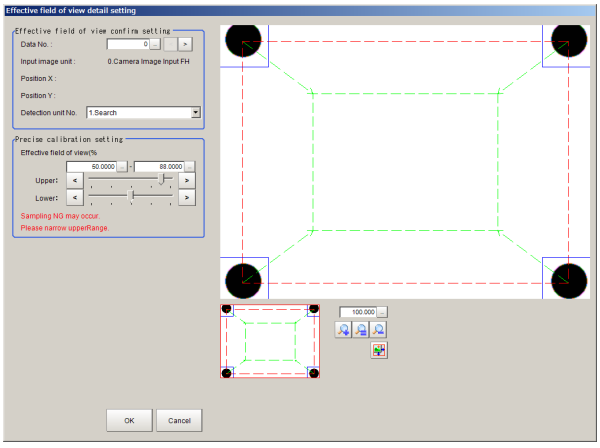
The Upper and Lower values are displayed with green broken lines. The Upper and Lower limit values are displayed with green broken lines. Those values are also connected with green broken lines. The detection position and the model frame are displayed with solid lines.



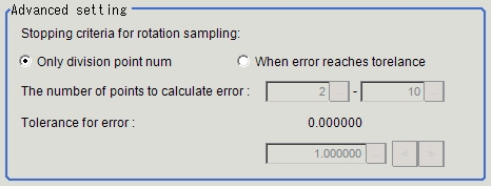
(2) Effective field of view range confirm target: Set a detection unit (in the case where the position of the model frame is out of the range of the image field of view.).

When the model frame is out of the range of the image field of view, the Upper limit value the Effective field of view Upper limit value is displayed with red broken lines.

In the Precise calibration setting area, the following warning message is displayed: “Sampling NG may occur. Please narrow upperRange.”



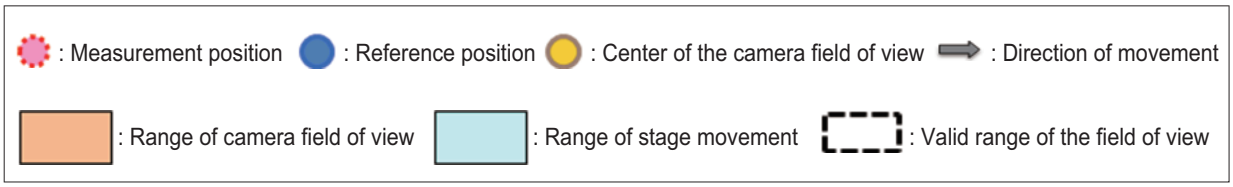
5 If necessary, set each item in the Advanced setting area.



Setting item	Setting value [Factory default]	Description
Stopping criteria for rotation sampling	• [Only division point num] • When error reaches tolerance	Select the end condition for rotational movement in this calibration.
The number of points to calculate error	2 to 100 [2] to [10]	[Stopping criteria for rotation sampling], calculates error within the range of [The number of points to calculate error].
Tolerance for error	0 to 99999.999999 [1.000000]	Specify the upper limit value for the error detection.

The movement amount necessary for sampling measurement

Movement amount necessary for sampling measurement is calculated using the number of divided lines (N) and the number divided lines (M).

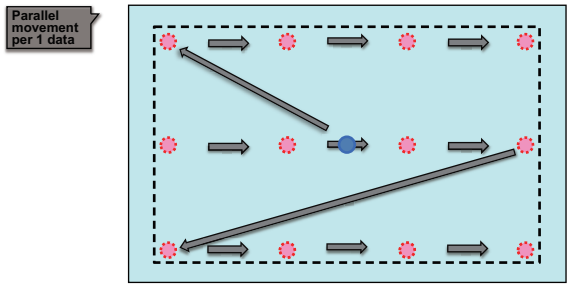


Number of movement points = N × M

Number of movement times = The number of data items checked in [Calibration target].

When the translation sampling by one data is executed.

- The sampling is performed per camera used.
- The sampling moving amount is calculated by the number of movement points in translation sampling settings and the effective view range of camera, so that it becomes the maximum moving range.
- The reference position is the axis position of the center of the field of view.

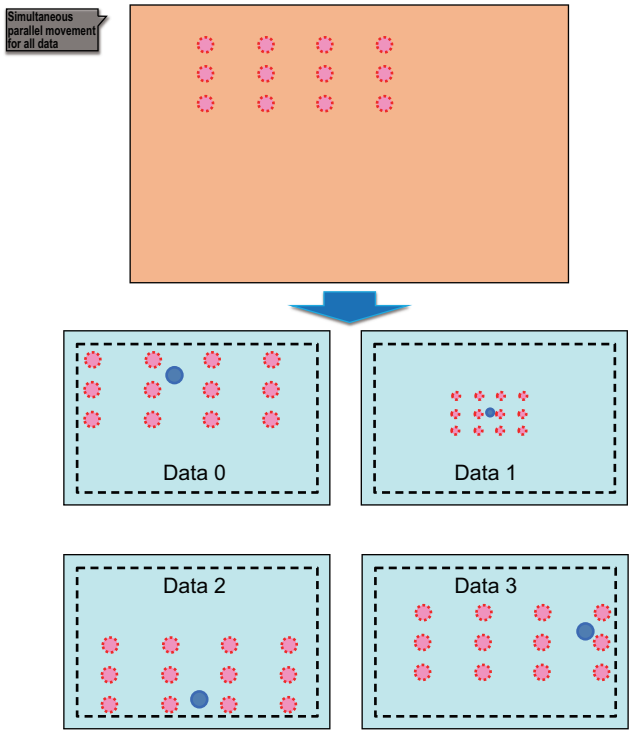


Number of movement points = N × M

Number of movement times = 1

When the translation sampling at [All at once] is selected.

- Samples all data at once movement.
- The sampling moving range is calculated by the number of movement points in the translation sampling setting and the effective field of view range in the first calibration, so that it becomes the maximum moving range.
- Note that the motion is different from the "one by one" sampling method setting.
- The reference position will be the axis position at the calibration initiated.



When simultaneous sampling for all data is set, sampling of all data is executed in one movement.

Movement range of sampling is automatically calculated to find a range that allows the largest movement within available view range including all sampling data.

Movement order is determined based on the actual coordinate system.

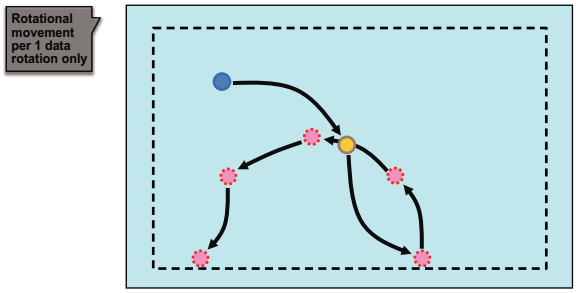
The movement is different from the case when sampling is executed for each data one by one. Reference position will be the axis position at start of calibration.

Number of movement points = Division points

Number of movement times = Number of calibration data set in [Calibration] area.

When the Rotational movement per 1 data rotation only.

- The sampling is performed per camera used.
- First, moves to the center of the field of view because the accuracy of the camera image is high in center.
- The sampling moving amount is calculated by the number of movement points in rotation sampling setting and the effective view range of camera, so that it becomes the maximum moving range.
- The reference position is the axis position of the center of the field of view.

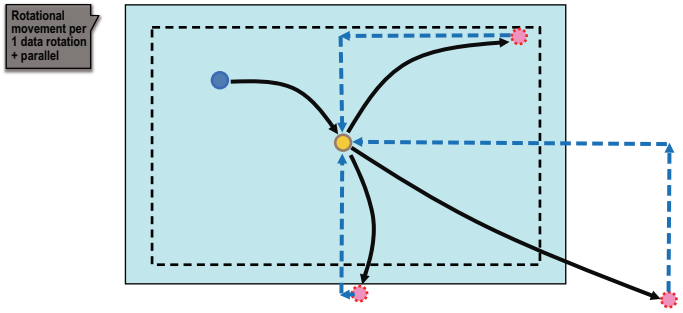


Number of movement points = Division points

Number of movement times = Number of calibration data items set in [Calibration] area.

When you executes [One by one] in Rotation movement + Translation

- The sampling is performed per camera used.
- In the case of the translation + rotation movement sampling, the translation sampling is performed after performing the rotation movement sampling and moving to the axis position of the center of the field of view.
- The sampling moving amount is calculated by the number of movement points set in the translation sampling setting and the rotation sampling setting and the effective view range of camera, so that it will be the maximum moving range.
- The reference position is the axis position of the center of the field of view.

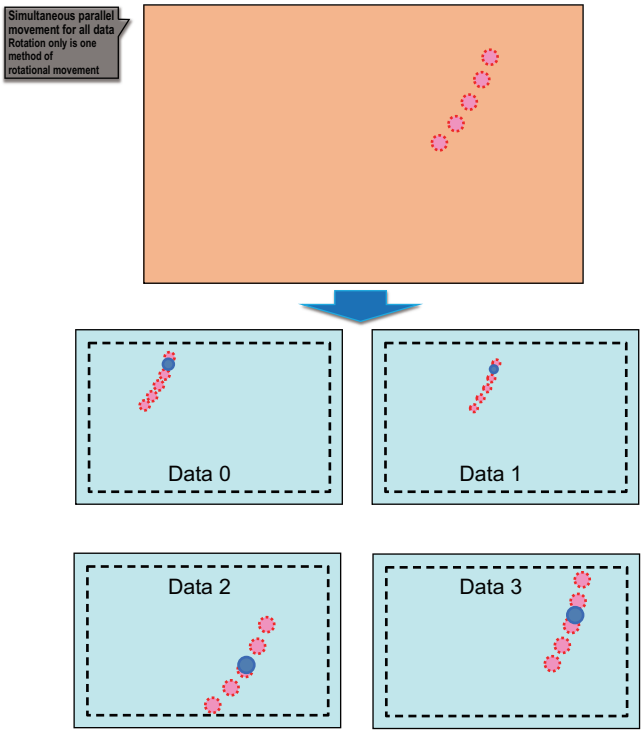


Number of movement points = Division points

Number of movement times = 1

When you select [All at once] on the Rotation movement sampling.

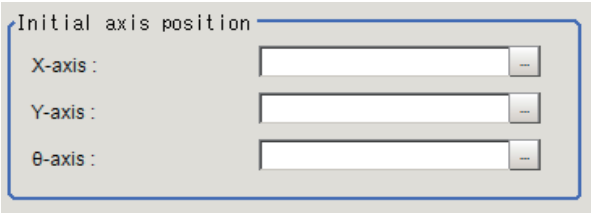
- Samples all data at once movement.
- The sampling moving range is automatically calculated by the number of movement points set in the rotation sampling setting and the effective field of view range of camera, so that it becomes the maximum moving range.
- The reference position is the axis position of the center of the field of view.



6 In the Initial axis position area, specify the starting axis position of each axis with expressions.

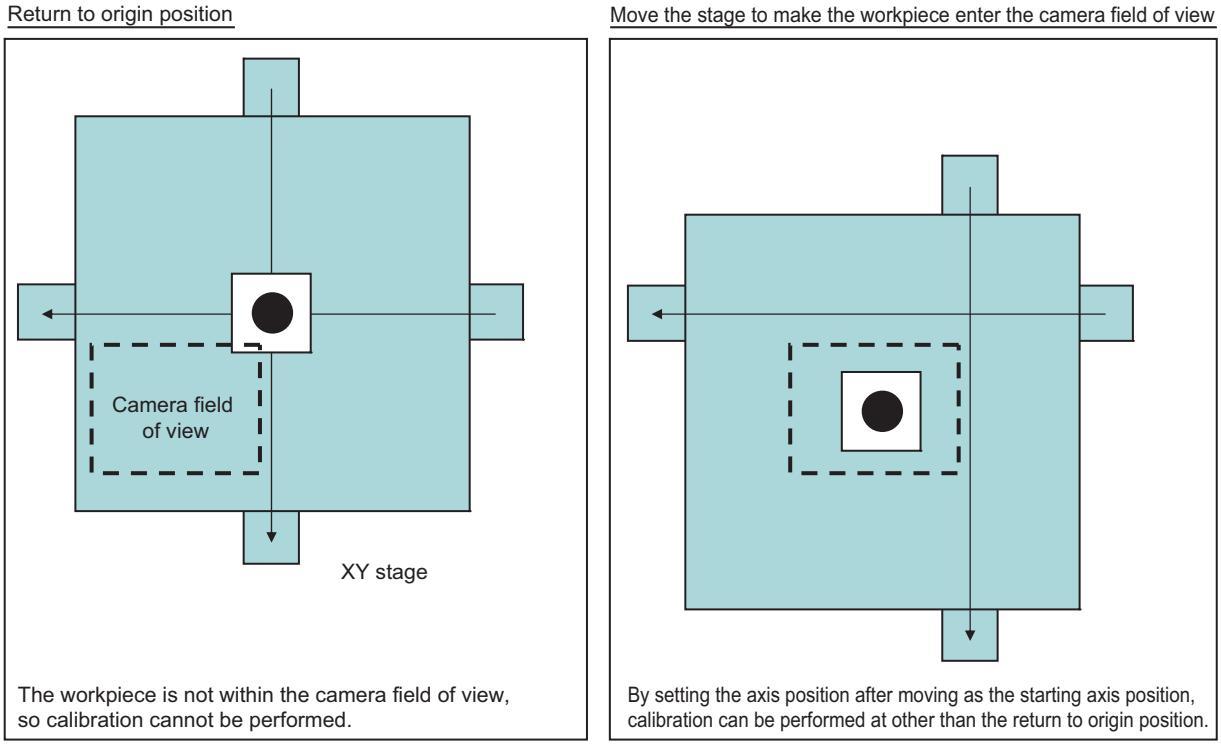
The axis position setting menu changes depending on the settings of the processing unit selected in Unit No. in the "Machine setting data" area. If the workpiece used for sampling is not within the camera field of view in the return to origin position (all axes in 0,0 position), set the axis position after moving as the starting axis position.

Example: When XYθ stage is selected in the stage data



- Usage example

  When the workpiece used for sampling is not within the camera field of view in the return to origin position (axis movement amount 0)



7 In the Final axis position area, set the axis positions for each axis when the calibration is completed.

Set each axis position by the radio button to calculate the movement when the calibration is completed or failed.

Setting item	Setting value [Factory default]	Description
Final axis position*1	• [The same as initial axis po] • Axis origin	The same as initial axis po: When the calibration is completed or failed, calculate the movement amount by setting the next movement position as the same axis position at the calibration start position. Axis origin: When the calibration is completed or failed, calculate the movement amount by setting the next movement position as the axis origin.

*1. In the compatible mode, [Axis origin] is the default.

4-26-5 Calibration Result (Vision Master Calibration)

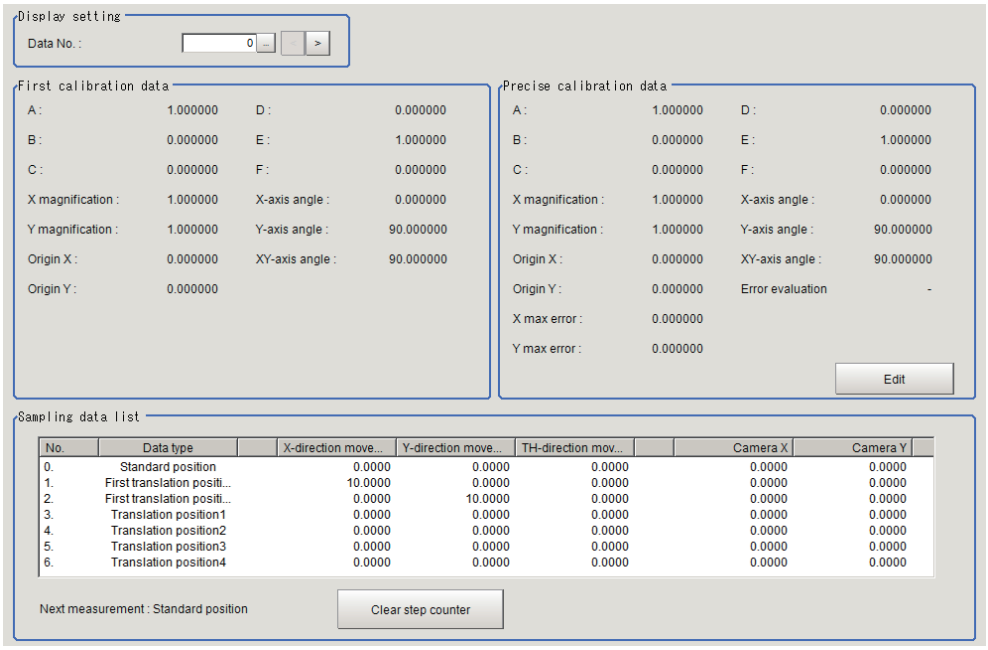
Confirm calibration data generated. Using the Edit function can finely tune calibration data as necessary.

It is also possible to confirm the sampling data used for the calculation.

Displayed contents vary depending on selected type of Robot or Stage.

1 In the Item Tab area, click [Calibration result].

2 Check calibration data generated.



Setting item		Setting value [Factory default]	Description
Display setting	Data No.	0 to 7 [0]	Sets the calibration data number displaying the calculation results.

Item		Description
First calibration data		Displays details of the first calibration parameter.
Precise calibration data		Displays details of the calibration data.
	A to F	Displays details about the calibration parameters. Clicking [Edit enable] will let you change the numbers for A to F. If any number has been changed, the message "This data has been edited" appears at the left of [Edit enable].
	X magnification	Indicates a magnification of X-axis direction for the coordinate system after calibration.
	Y magnification	Indicates a magnification of Y-axis direction for the coordinate system after calibration.
	X-axis angle	Indicates an angle between X-axis of the camera coordinate system and X-axis of the coordinate system after calibration.
	Y-axis angle	Indicates an angle between X-axis of the camera coordinate system and Y-axis of the coordinate system after calibration.
	Origin X	Indicates an origin X of the coordinate system after calibration.
	Origin Y	Indicates an origin Y of the coordinate system after calibration.
	XY-axis angle	Indicates an angle between X-axis and Y-axis of the coordinate system after calibration.
	Error evolution	Maximum distance value calculated by reference position and sampling result. When no θ-axis is in a stage, "-" is displayed because the calculation is impossible.
	X max error	Maximum displacement of X-axis direction between a sampling position coordinate and a position coordinate calculated by calibration. When no X-axis is in a stage, "-" is displayed because the calculation is impossible.
	Y max error	Maximum displacement of Y-axis direction between a sampling position coordinate and a position coordinate calculated by calibration. When no Y-axis is in a stage, "-" is displayed because the calculation is impossible.
Sampling data list		Displays sampling data used for generating the calibration parameters. The data are movement amounts in X/Y/θ directions from the reference position and the camera coordinate. The reference position of No.0 is an axis position at the first calibration started. When "one by one" is selected, the reference position is reset before each calibration performed. when Xθ, Yθ, θX, θY, X or Y stage is selected, a value for non-existing axis direction is always 0.
[Clear step counter] button		Sends back the next measurement target to the reference position and restarts calibration from the beginning.

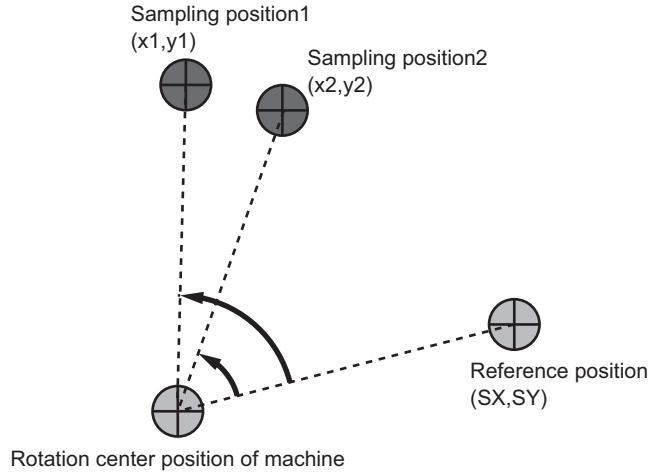
● Error detection values

This value is for confirming the accuracy of calibration result.
Output the error detection values when a Stage has θ-axis.

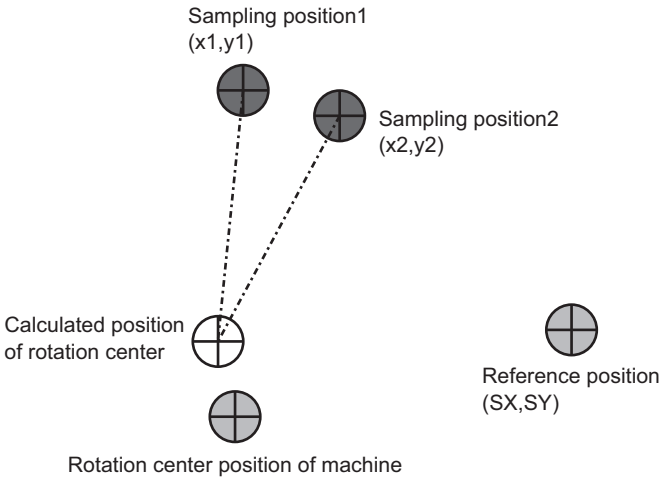
This value is calculated by using “calibration data in Vision master calibration” and “measurement results in rotation movement sampling”.
If a problem in magnification, axis angle, or center position of rotation exists, the value will be high.

In the followings, describe the calculation method in the case where the number of times for sampling is 2 as an example.

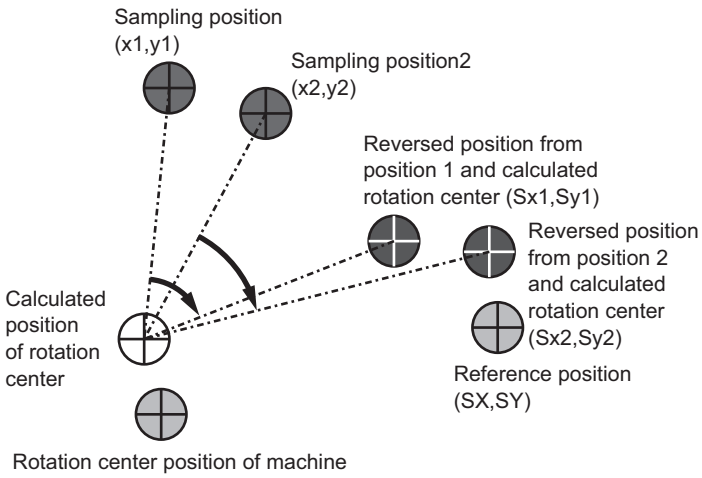
(1) Perform the rotation sampling based on sampling settings. A reference position varies depending on the sampling method.



(2) Calculate the rotation center position using the sampling results.

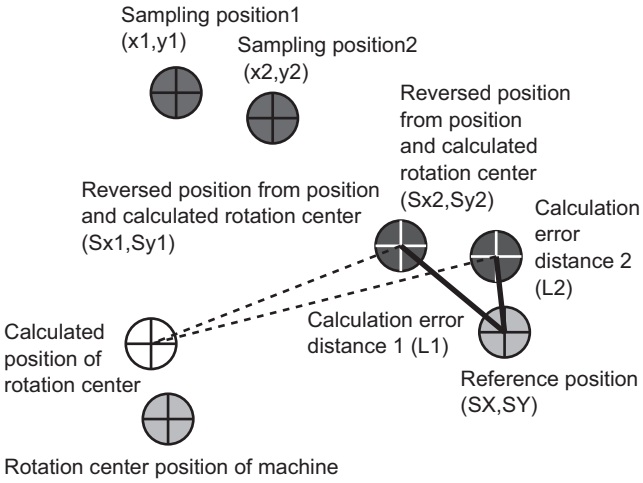


(3) Calculate the reversed rotation positions from the calculated rotation center position per each position sampled.



(4) Calculate the absolute distance between the reference position and the reverse rotation positions.

(5) Define a maximum value of X coordinate side as X maximum error detection value. Y coordinate side is same as X coordinate side.



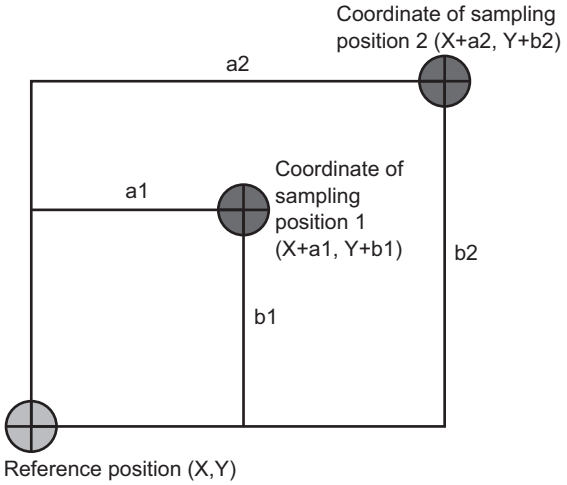
Maximum error detection values

This value is for confirming the accuracy of calibration result.
Output X and Y maximum error detection values when a Stage has X- or Y-axis.

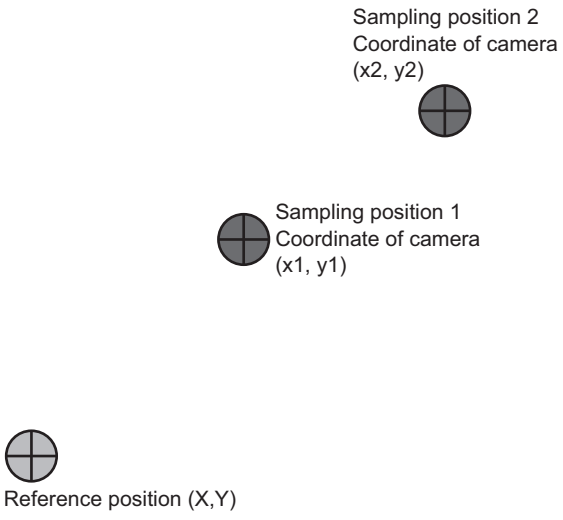
X/Y maximum error detection values are calculated by using “calibration data in Vision master calibration” and “measurement results in translation sampling”.

If a problem in magnification, axis angle, or center position of rotation exists, the value will be high.

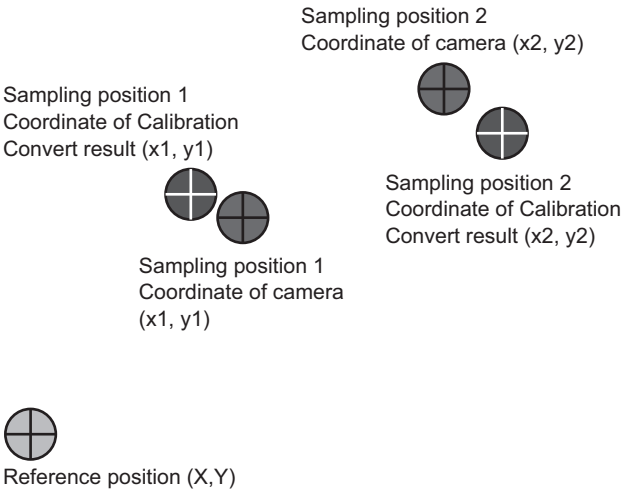
(1) Perform the translation sampling based on sampling settings. A reference position varies depending on the sampling method.



(2) Perform sampling measurement.



(3) Perform a calibration according to sampling results and convert the sampling position to the real coordinate.

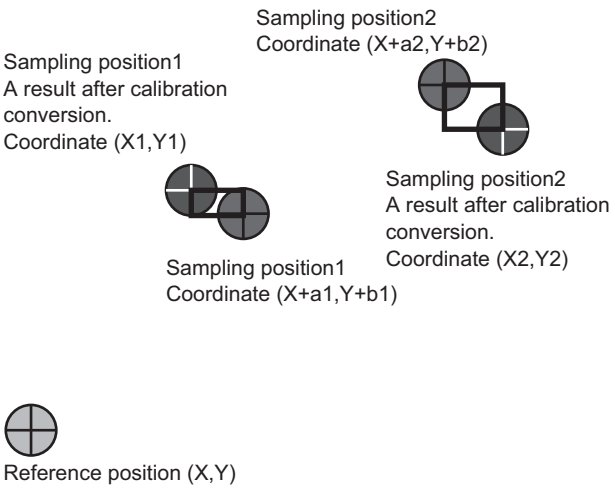


(4) Obtain absolute values for differences between the calibration conversion results and the coordinate of sampling positions.

(5) Define the maximum value of X coordinate side as X max error, and the maximum value of Y coordinate side as Y max error.

X max error is given the more larger value of [X+a1-X1] or [X+a2-X2].

Y max error is given the more larger value of [Y+b1-Y1] or [Y+a2-Y2].



● Causes and countermeasures when Error detection value and Maximum error detection value are large.

If Error detection value or Maximum error detection value are bigger than the required accuracy of application, refer to the following table.

The error value may be large when the sampling measurement failed. In this case, check whether the measurement judgement is OK.

In addition, the error values vary depending on Stage, Robot, setting condition or loading condition. In this case, check the operation conditions.

Maximum error value of X(Y)	Error detection value	Causes and countermeasures
Large	Large	The accuracy of magnification, axis angle, or center position of rotation is sometimes insufficient. Check whether all the sampling measurements have been succeeded. Check that the setting contents for Robot or Stage have matched the data of Robot or Stage being used. Review the setting contents for the rotation movement sampling and the translation sampling based on the sampling measurement results. Check the results for the rotation movement sampling and the translation sampling. Refer to *4-35-1 Data Setting (Stage Data)* on page 4-260. Refer to *4-26-4 Sampling Setting (Vision Master Calibration)* on page 4-149. Refer to *4-26-5 Calibration Result (Vision Master Calibration)* on page 4-160.
Small	Large	In some cases, the accuracy of the rotation center position may be insufficient. Check whether all the sampling measurements have been succeeded. Check that the setting contents for Robot or Stage have matched the data of Robot or Stage being used. Check the results for the rotation movement sampling. Refer to *4-35-1 Data Setting (Stage Data)* on page 4-260. Refer to *4-26-4 Sampling Setting (Vision Master Calibration)* on page 4-149. Refer to *4-26-5 Calibration Result (Vision Master Calibration)* on page 4-160.

4-26-6 Key Points for Test Measurement and Adjustment (Vision Master Calibration)

The following content is displayed in the "Detail result" area as text.

Displayed item	Description
Judge	Judgment result
Next measurement	Next measurement target
NG cause	Displayed only when Judgment is NG -1: Setting NG -2: Sequence NG -3: Mobility NG -4: Calibration NG -5: Evaluation NG -6: Sampling NG -7: Effective field of view range NG -100: Other NG

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image.	Explanation of image to be displayed
0	Measurement image + calibration progress status display
1	Measurement image only

Key Points for Adjustment

Select the adjustment method referring to the following points.

● While executing calibration

State	Parameter to adjust	Troubleshooting
Unit judgment NG occurred during calibration	Refer to the write sentence.	Confirm the "NG cause" appears in the detail result display and perform appropriate countermeasures. • Setting NG The processing item setting is not correct. Check if the settings are correct including the processing items being referred to. • Sequence NG Measurement is executed regardless of whether calibration has been completed. Be sure that no measurement is performed when the calibration completion flag is 1. • Mobility NG The axis movement range is not correct. Check if the stage data being referred to and the movement range of the robot data are correct. • Calibration NG Calibration data calculation has failed. Check if the camera coordinates in the sampling data list in the Calculation Result Confirmation Tab are set correctly. If any data is set incorrectly, the processing items used in measurement may not be set properly. Check that the settings are correct. • Evaluation NG If the end condition of the rotational sampling is "The error detection value is lower than the setting value," the error detection value is not lower than the setting value when the upper limit values for the number of measurement points are measured. Adjust the overall flow setting, for example, by using the average of multiple measurement results to improve the measurement accuracy. • Sampling NG The sampling measurement has failed. Adjust the setting data so that the processing items used in the measurement is not NG. If it still continues to occur, the judgement formula and condition may not be set correctly. Check that the settings are correct. • Effective field of view range NG The model frame exceeds the effective field of view range. Adjust the upper limit of model frame so that the effective field of view range will be within the proper range.
To start all over again	Calculation result confirmation	Click Clear step counter or execute the measurement result clearing.

● Other

State	Parameter to adjust	Troubleshooting
It cannot be selected because the reference unit No. is <none>.	Machine setting	Check if the reference scene number is selected correctly. Check if stage data processing items or robot data processing items are registered in the selected reference scene.
The reference unit number does not change during flow editing.	Machine setting	The system is designed this way. While a scene other than the current scene is referenced, the reference unit number does not change according to the editing of the flow. Change the flow so that the current scene will be referenced, or set the reference unit number again.

4-26-7 Measurement Results for Which Output Is Possible (Vision Master Calibration)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from other processing units like expressions.

Measurement items	Character string	Description
Judge	JG	Judgement result
Origin return flag	ORIF	Origin return output flag
Calibration end flag	ENDF	Calibration completion output flag
Next X axis movement	NMX	Next X axis movement amount
Next Y axis movement	NMY	Next Y axis movement amount
Next θ axis movement	NMT	Next θ axis angle movement amount
Next θ axis (Linear Drive) movement	NML	Next θ axis linear movement amount
Next U axis movement	NMU	Next U axis movement amount
Next V axis movement	NMV	Next V axis movement amount
Next W axis movement	NMW	Next W axis movement amount
Next R axis movement	NMR	Next R axis movement amount
NG cause	CNG	NG cause -1: Setting NG -2: Sequence NG -3: Mobility NG -4: Calibration NG -5: Evaluation NG -6: Sampling NG -7: Effective field of view range NG -100: Other NG
Error evaluation value X	EX	Error evaluation value X
Error detection value Y	EY	Error detection value Y

4-26-8 External Reference Tables (Vision Master Calibration)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
6	Origin return flag	calibOrignFlag	Get only	0: Do not execute the homing operation before moving to the next sampling position. 1: Please execute the homing operation before moving to the next sampling position.
7	Calibration end flag	calibEndFlag	Get only	0: Calibration incomplete (Please move to the next sampling position.) 1: Calibration complete
8	Error evaluation X	errorX	Get only	0 to 99,999.9999
9	Error evaluation Y	errorY	Get only	0 to 99,999.9999
10	Next X-axis Movement	nextMoveX	Get only	-
11	Next Y-axis Movement	nextMoveY	Get only	-
12	Next θ-axis Movement	nextMoveTheta	Get only	-
13	Next θ-axis (Linear Drive) Movement	nextMoveLinearTheta	Get only	-
14	Next U-axis Movement	nextMoveU	Get only	-
15	Next V-axis Movement	nextMoveV	Get only	-
16	Next W-axis Movement	nextMoveW	Get only	-
17	Next R-axis Movement	nextMoveR	Get only	-
18	Next Calibration Operation	calibStepKind	Get only	-
19	Calibration step No.	calibStepNo	Get only	-
20	NG cause	errorCode	Get only	-1: Setting NG -2: Sequence NG -3: Mobility NG -4: Calibration NG -5: Evaluation NG -6: Sampling NG -7: Effective field of view NG -100: Other NG
21	Data no.	dataNo	Get only	-
23	Next Yaw-axis movement	nextMoveYaw	Get only	-
24	Next Pitch-axis movement	nextMovePitch	Get only	-
25	Next Roll-axis movement	nextMoveRoll	Get only	-
123	Scene No.	sceneNo	Set/Get	-1: Current scene referred 0 to 9,999: Pointed scene referred
124	Unit No.	unitNo	Set/Get	-1: No reference 0 to 9,999: Pointed unit referred
128	movement output method	axisCalcType	Set/Get	0: Absolute position 1: Relative position
129	Upper limit of error evaluation X	upperErrorX	Set/Get	0 to 99,999.9999

No.	Data Name	Ident	Set/Get	Data range
130	Upper limit of error evaluation Y	upperErrorY	Set/Get	0 to 99,999.9999
137	First calibration movement X	moveX	Set/Get	-99,999.9999 to 99,999.9999
138	First calibration movement Y	moveY	Set/Get	-99,999.9999 to 99,999.9999
139	First calibration rotation start angle	StartAngle	Set/Get	-180.0000 to 180.0000
141	Sampling method	samplingType	Set/Get	0: One by one 1: All at once
142	X division number	paraRowNum	Set/Get	2 to 10
143	Y division number	paraColNum	Set/Get	2 to 10
144	Division point number	rotDivideNum	Set/Get	2 to 100
145	Machine movement method	rotMovementType	Set/Get	0: Rotation only 1: Rotation + translation
146	Homing operation selection	orignFlagEnable	Set/Get	0: Disable 1: Enable
150	Calibration start X-axis position	currentPosX	Set/Get	Exp. character string
151	Calibration start Y-axis position	currentPosY	Set/Get	Exp. character string
152	Calibration start θ-axis angle position	currentPosTheta	Set/Get	Exp. character string
153	Calibration start θ-axis (linear drive) position	currentPosLinearTheta	Set/Get	Exp. character string
154	Calibration start U-axis position	currentPosU	Set/Get	Exp. character string
155	Calibration start V-axis position	currentPosV	Set/Get	Exp. character string
156	Calibration start W-axis position	currentPosW	Set/Get	Exp. character string
157	Calibration start R-axis position	currentPosR	Set/Get	Exp. character string
158	Making flag of trapezoidal distortion correction parameter	trapezoidalCorrectFlag	Set/Get	0: No 1: Yes
159	Making flag of lens distortion correction parameter	distortionCorrectFlag	Set/Get	0: No 1: Yes
160	Stopping criteria for rotation sampling	rotEndCondition	Set/Get	0: Only division point num 1: When error reaches tolerance
161	Min number of points to calculate error	errorCalMin	Set/Get	2 to 100
162	Max number of points to calculate error	errorCalMax	Set/Get	2 to 100
163	Upper limit of rotation center error evaluation	maxErrorCenter	Set/Get	0.000000 to 99,999.999999
164	Lower of effective field of view	lowerRange	Set/Get	1 to 100
165	Upper of effective field of view	upperRange	Set/Get	1 to 100
166	Final axis position	endPosFlag	Set/Get	0: The same as initial axis position 1: Axis origin
168	Display data No.	dispDataNo	Set/Get	0 to 7

No.	Data Name	Ident	Set/Get	Data range
170	Calibration start Yaw-axis position	currentPosYaw	Set/Get	Exp. character string
171	Calibration start Pitch-axis position	currentPosPitch	Set/Get	Exp. character string
172	Calibration start Roll-axis position	currentPosRoll	Set/Get	Exp. character string
200+Nx10 (N: 0 to 7)	Calibration target flag	exeFlag	Set/Get	0: No 1: Yes
201+Nx10 (N: 0 to 7)	Position X	expCameraX	Set/Get	Exp. character string
202+Nx10 (N: 0 to 7)	Position Y	expCameraY	Set/Get	Exp. character string
203+Nx10 (N: 0 to 7)	Sampling judge expression	expJudgeSampling	Set/Get	Exp. character string
204+Nx10 (N: 0 to 7)	Sampling judge lower	upperJudgeSampling	Set/Get	-999,999,999.9999 to 999,999,999.9999
205+Nx10 (N: 0 to 7)	Sampling judge upper	lowerJudgeSampling	Set/Get	-999,999,999.9999 to 999,999,999.9999
206+Nx10 (N: 0 to 7)	Input image no.	imageUnitNo	Set/Get	-1: No reference 0 to 9,999: Input Image unit referred
207+Nx10 (N: 0 to 7)	Detection unit No.	unitNoDetection	Set/Get	-1: No reference 0 to 9,999: Detection unit refered
5009	Clear step counter	clearStepCounter	Set only	1: Clear
11301+Nx1000 (N: 0 to 7)	First calibration parameter A	calibParamFirstA_	Get only	-99,999.999999 to 99,999.999999
11302+Nx1000 (N: 0 to 7)	First calibration parameter B	calibParamFirstB_	Get only	-99,999.999999 to 99,999.999999
11303+Nx1000 (N: 0 to 7)	First calibration parameter C	calibParamFirstC_	Get only	-99,999.999999 to 99,999.999999
11304+Nx1000 (N: 0 to 7)	First calibration parameter D	calibParamFirstD_	Get only	-99,999.999999 to 99,999.999999
11305+Nx1000 (N: 0 to 7)	First calibration parameter E	calibParamFirstE_	Get only	-99,999.999999 to 99,999.999999
11306+Nx1000 (N: 0 to 7)	First calibration parameter F	calibParamFirstF_	Get only	-99,999.999999 to 99,999.999999
11307+Nx1000 (N: 0 to 7)	First X magnification	firstScaleX_	Get only	---
11308+Nx1000 (N: 0 to 7)	First Y magnification	firstScaleY_	Get only	---
11309+Nx1000 (N: 0 to 7)	First origin X	firstCenterX_	Get only	---
11310+Nx1000 (N: 0 to 7)	First origin Y	firstCenterY_	Get only	---

No.	Data Name	Ident	Set/Get	Data range
11311+Nx1000 (N: 0 to 7)	First X-axis angle	firstAngleX_	Get only	-
11312+Nx1000 (N: 0 to 7)	First Y-axis angle	firstAngleY_	Get only	-
11313+Nx1000 (N: 0 to 7)	First XY-axis angle	firstAngleXY_	Get only	-
14001+Nx1000 (N: 0 to 7)	Calibration parameter A	calibParamA_	Set/Get	-99,999.999999 to 99,999.999999
14002+Nx1000 (N: 0 to 7)	Calibration parameter B	calibParamB_	Set/Get	-99,999.999999 to 99,999.999999
14003+Nx1000 (N: 0 to 7)	Calibration parameter C	calibParamC_	Set/Get	-99,999.999999 to 99,999.999999
14004+Nx1000 (N: 0 to 7)	Calibration parameter D	calibParamD_	Set/Get	-99,999.999999 to 99,999.999999
14005+Nx1000 (N: 0 to 7)	Calibration parameter E	calibParamE_	Set/Get	-99,999.999999 to 99,999.999999
14006+Nx1000 (N: 0 to 7)	Calibration parameter F	calibParamF_	Set/Get	-99,999.999999 to 99,999.999999
14007+Nx1000 (N: 0 to 7)	X magnification	scaleX_	Get only	-
14008+Nx1000 (N: 0 to 7)	Y magnification	scaleY_	Get only	-
14009+Nx1000 (N: 0 to 7)	Origin X	centerX_	Get only	-
14010+Nx1000 (N: 0 to 7)	Origin Y	centerY_	Get only	-
14011+Nx1000 (N: 0 to 7)	X-axis angle	angleX_	Get only	-
14012+Nx1000 (N: 0 to 7)	Y-axis angle	angleY_	Get only	-
14013+Nx1000 (N: 0 to 7)	XY-axis angle	angleXY_	Get only	-
14016+Nx1000 (N: 0 to 7)	Error evaluation	errorCenter_	Get only	-
14017+Nx1000 (N: 0 to 7)	X max error	maxDeflectionX_	Get only	-

No.	Data Name	Ident	Set/Get	Data range
14018+Nx1000 (N: 0 to 7)	Y max error	maxDeflectionY_	Get only	-
14019+Nx1000 (N: 0 to 7)	Sampling number of X max error	maxDeflectionNumX_	Get only	0 to 204
14020+Nx1000 (N: 0 to 7)	Sampling number of Y max error	maxDeflectionNumY_	Get only	0 to 204

4-27 PLC Master Calibration

This processing item can not be used in the FHV series.

This processing item is specifically provided for calibration between the camera coordination system and the control equipment coordination system.

In this processing item, the axis movement amount of the control equipment necessary for calibration can be set freely.

If how to move the calibration mark has already been determined and it cannot be changed, use this processing item. If it can be changed, we recommend you to use [Vision master calibration].

Important

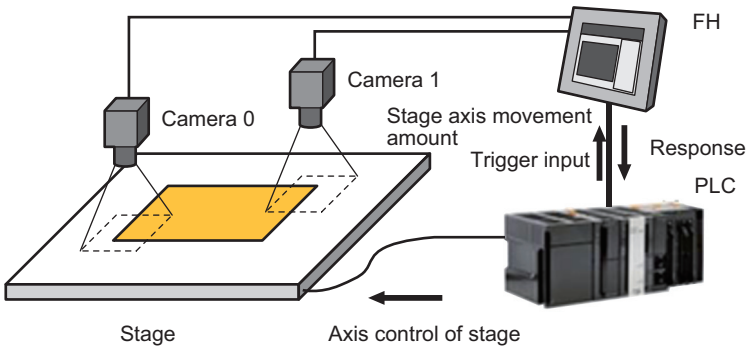
- The calibration data created with this processing item can be referred from [Calibration Data Reference].

  Unlike other calibration-related processing items, note that this processing item cannot use the calibration data on its own.
- This function refers processing items, e.g. Stage Data or Robot Data, having external device information required the calculation of movement distance. If you change those items, setting contents of PLC Master Calibration will change. Rechecking settings is required.

Used in the Following Case

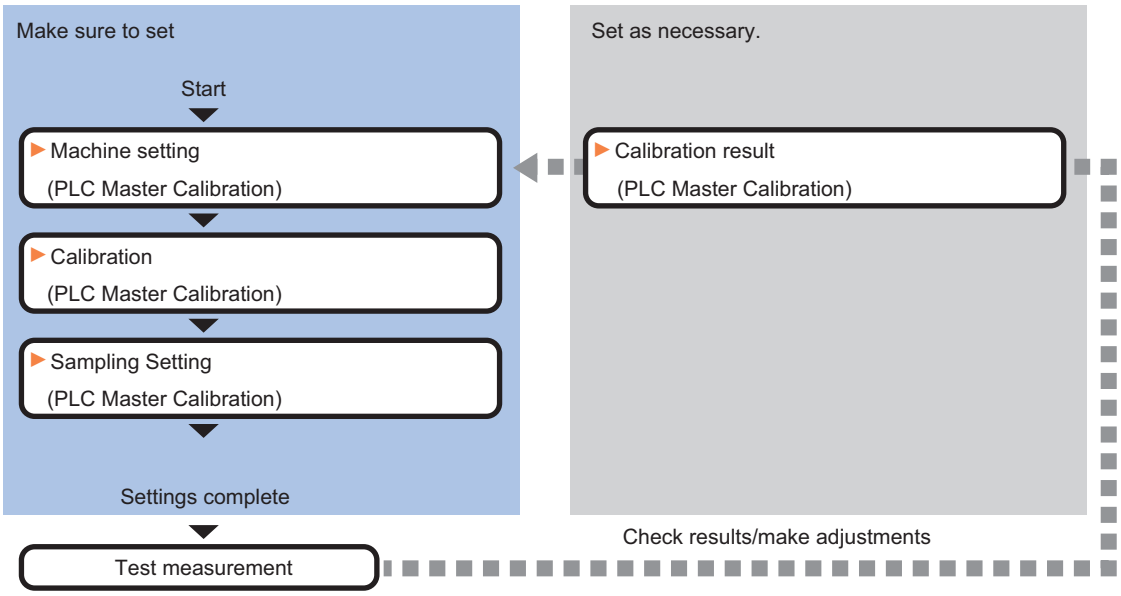
When you want to position the FPD panel

PLC calculates the axis movement amount of stages required for calibration, and sets it to FH/FZ5.



4-27-1 Settings Flow (PLC Master Calibration)

Set the PLC master calibration with the following steps.



4-27-2 List of PLC Master Calibration Items

Item name	Description
Machine setting	Select a processing item (stage data or robot data) under which external device information needed for calculation of axis movement amount is held. Refer to *4-27-3 Machine Setting (PLC Master Calibration)* on page 4-176.
Calibration	This item sets data related to calibration. Sets the number of calibration data to be created and the measurement processing items to be used for sampling in the arithmetic expression. Refer to *4-27-4 Calibration (PLC Master Calibration)* on page 4-176.
Sampling setting	This item sets data related to sampling. Set the number of samplings and the actual coordinate positions for each sampling. Refer to *4-27-5 Sampling Setting (PLC Master Calibration)* on page 4-178.
Calibration result	The created calibration data is displayed in this item. The calibration data can be adjusted directly using the Edit function. It is also possible to confirm the sampling data used for the calculation. Refer to *4-27-6 Calibration Result (PLC Master Calibration)* on page 4-179.

4-27-3 Machine Setting (PLC Master Calibration)

Select a processing item (stage data or robot data) under which external device information needed for calculation of axis movement amount is held.

Important

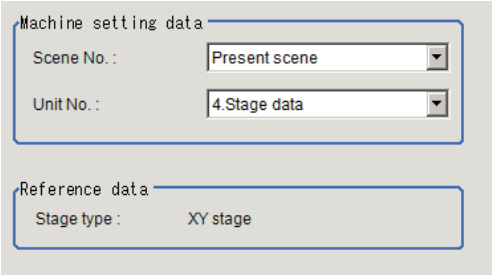
[PLC Master Calibration] refers to [Stage Data] or [Robot Data]. Be sure to register [Stage Data] or [Robot Data] with a given scene.

1 In the Item Tab area, click [Machine setting].

2 Select the processing unit that retains information on external device.

Information of the selected processing unit is displayed in the reference data display area.

Displayed contents may change depending on selected type of Robot or Stage.



Setting item	Setting value [Factory default]	Description
Scene No.	[Present scene] Scenes 0 to 127	Select a scene number (stage data or robot data) under which external device information needed for calculation of axis movement amount is held.
Unit No.	---	From among the referenced scene numbers, select a processing item (stage data or robot data) under which external device information needed for calculation of axis movement amount is held.
Reference data	---	Display the settings of "Stage" or "Robot" processing item.

Additional Information

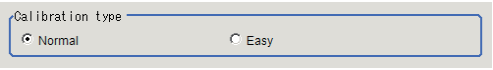
If the number of scenes is increased using the scene group conversion tool, the maximum value that can be selected in "Scene No." changes.

4-27-4 Calibration (PLC Master Calibration)

This item sets data related to calibration. Sets the number of calibration data to be created and the measurement processing items to be used for sampling in the arithmetic expression. Also sets the output method for the calculated axis movement amount.

1 In the Item Tab area, click [Calibration].

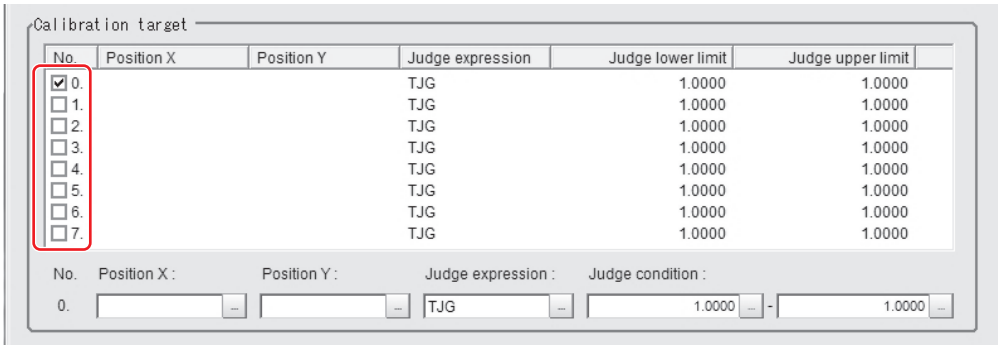
2 Select the calibration method in the "Calibration type" area.



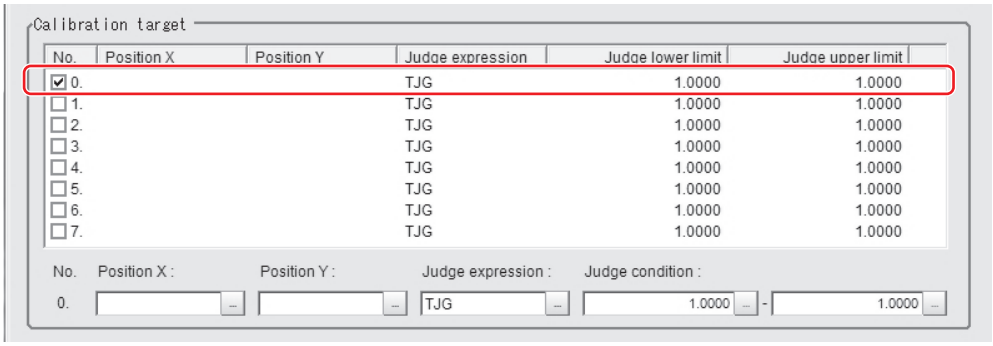
Setting item	Setting value [Factory default]	Description
Calibration type	[Normal]	Perform calibration by combining the "measurement command" and "set unit data command" from the control equipment (PLC).
	Easy	Perform calibration by using the "measurement command" only.

3 Check the calibration data items that you want to set.

Calibration data is created for the checked numbers.



4 Select the line of the calibration data that you want to set.



5 Set each item in the "Calibration target" area.

Setting item	Setting value [Factory default]	Description
Position X	---	Set the arithmetic expression that obtains camera coordinate X used for sampling.
Position Y	---	Set the arithmetic expression that obtains camera coordinate Y used for sampling.
Judge expression	---	Set the arithmetic expression to determine whether sampling was successful or not. If calibration fails during the initial value TJG, set the unit judgement JG of the processing unit from which positions X and Y are referred.
Judge condition	-999999999.9999 to 999999999.9999 [1.0000] to [1.0000]	Set the upper and lower limit values to determine whether sampling was successful or not. If TJG or JG is set to the judgement expression, use the initial values.

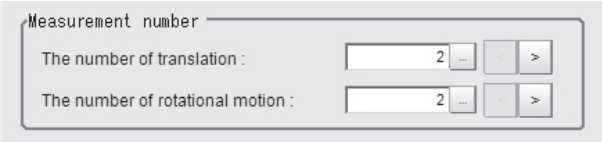
4-27-5 Sampling Setting (PLC Master Calibration)

This item sets data related to sampling.

Set the number of samplings and the actual coordinate positions for each sampling.
Displayed contents may change depending on selected type of Robot or Stage.

1 In the Item Tab area, click [Sampling setting].

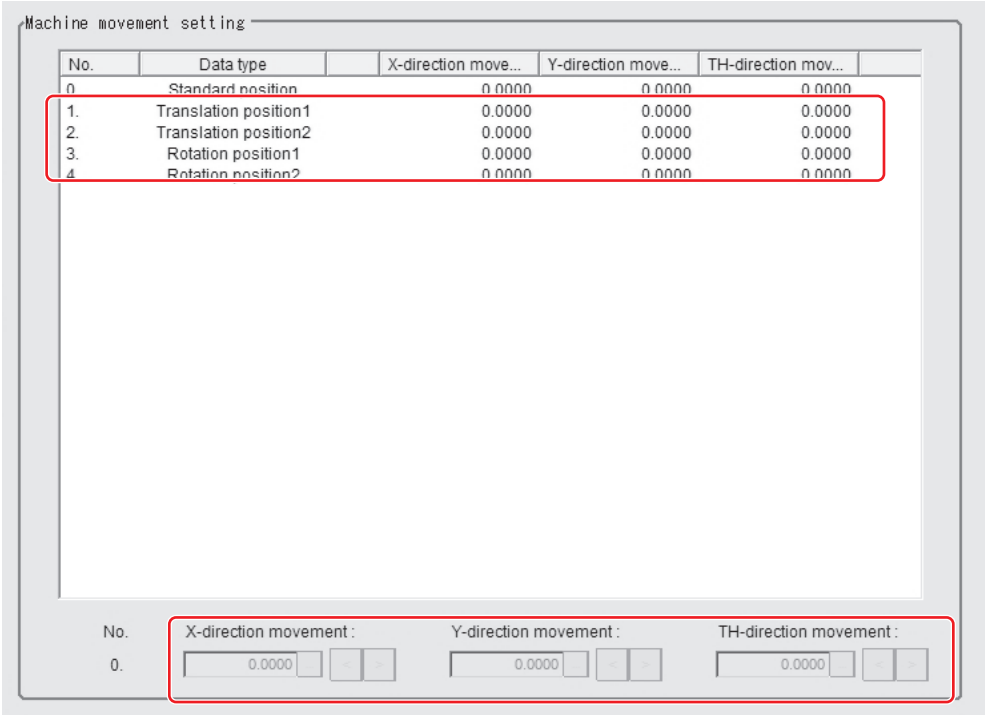
2 Set each item in the Measurement number area.



Setting item	Setting value [Factory default]	Description
The number of translation	2 to 100 [2]	Set the number of samplings performed by moving the calibration work in parallel.
The number of rotation motion	2 to 100 [2]	Set the number of samplings performed by rotating the calibration work.

3 Set the value for parallel or rotational movement in the Machine movement setting area.

Select the item you want to set in the list and set the movement amount from the reference position.



Setting item	Setting value [Factory default]	Description
X-direction movement	-99999.9999 to 99999.9999 [0.0000]	Set the X axis movement amount from the reference position.
Y-direction movement	-99999.9999 to 99999.9999 [0.0000]	Set the Y axis movement amount from the reference position.
TH-direction movement	-180.0000 to 180.0000 [0.0000]	Set the θ axis movement amount from the reference position.

Additional Information

When the selected stage is the X stage, Y stage, Xθ stage, Yθ stage, θX stage, or θY stage, non-existing axis will be greyed out and cannot be changed.
Non-existing axial direction is not displayed.

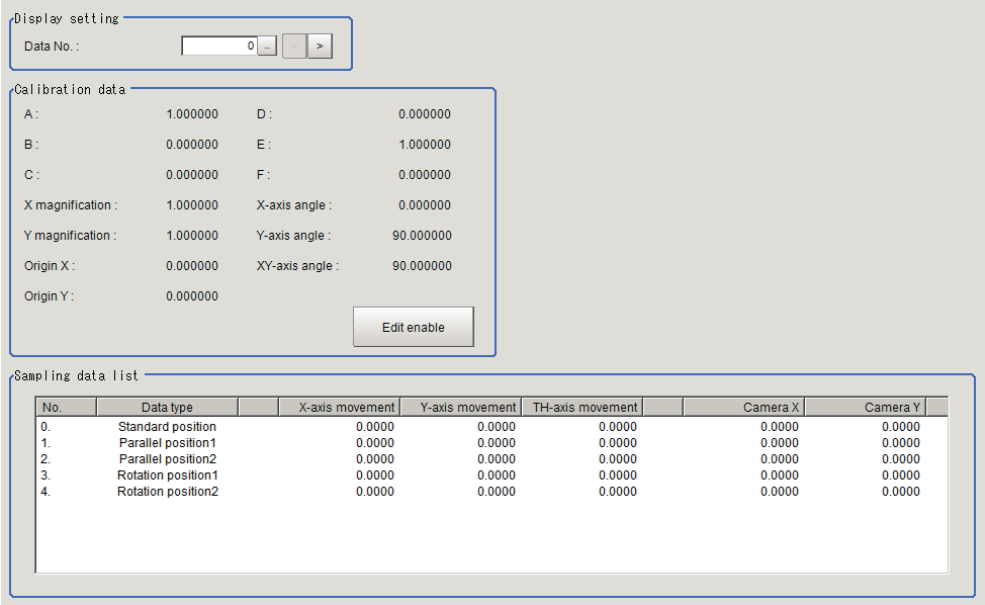
4-27-6 Calibration Result (PLC Master Calibration)

The created calibration data is displayed in this item. The calibration data can be adjusted directly using the Edit function.

It is also possible to confirm the sampling data used for the calculation.

1 In the Item Tab area, click [Calibration result].

2 This item confirms the calibration data you created.



Setting item		Setting value [Factory default]	Description
Display setting	Display setting Data No.	0 to 7 [0]	Sets the calibration data number that displayed the calculation results.

Item	Description
Calibration data	Displays details about the calibration parameters. Clicking [Enable direct edit] will let you change the numbers for A to F. If any number has been changed, the message "This data has been directly edited" appears at the left of [Enable direct edit].
Sampling data list	Displays sampling data used for creating the calibration parameters. Normally, non-existing axis value will be 0 when Xθ, Yθ, θX, θY. X or Y stage is selected.

4-27-7 Key Points for Test Measurement and Adjustment (PLC Master Calibration)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgment result
Calibration method	Calibration method

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image.	Explanation of image to be displayed
0	Measurement image + calibration progress status
1	Measurement image only

Key Points for Adjustment

Select the adjustment method referring to the following points.

● While executing calibration

State	Parameter to be adjusted	Troubleshooting
Unit judgement NG occurred during calibration	Refer "Troubleshooting"	Confirm the "NG cause" appears in the detail result display and perform appropriate countermeasures. • Setting NG The processing item setting is not correct. Check if the settings are correct including the processing items being referred to. • Sequence NG Measurement is executed regardless of whether calibration has been completed. Do not execute the measurement with the Next Calibration type is selected 3 (Calibration is completed) in the external reference table. • Calibration calculation NG Calibration data calculation has failed. Check if the camera coordinates in the sampling data list in the Calculation Result Confirmation Tab are set correctly. If any data is set incorrectly, the processing items used in measurement may not be set properly. Check that the settings are correct. • Sampling NG The sampling measurement has failed. Adjust the setting data so that the processing items used in the measurement is not NG. If it still continues to occur, the judgement formula and condition may not be set correctly. Check if the settings are correct or not.
To start all over again	---	Execute the clear measurement result or external reference data #5009 "Clear step counter".

● Other

State	Parameter to be adjusted	Troubleshooting
It cannot be selected because the reference unit No. is <none>.	Machine setting	Check if the reference scene number is selected correctly. Check if stage data processing items or robot data processing items are registered in the selected reference scene.
The reference unit number does not change during flow editing.	Machine setting	The system is designed this way. While a scene other than the current scene is referenced, the reference unit number does not change according to the editing of the flow. Change the flow so that the current scene will be referenced, or set the reference unit number again.

4-27-8 Measurement Results for Which Output Is Possible (PLC Master Calibration)

The following values can be output using processing items related to results output. It is also possible to refer to measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgment result
NG cause	CNG	NG cause -1: Setting NG -2: Sequence NG -3: Mobility NG -4: Calibration NG -5: Evaluation NG -6: Sampling NG -100: Other NG

4-27-9 External Reference Tables (PLC Master Calibration)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
18	Next Calibration Operation	calibStepKind	Get only	0: Standard position 1: Translation position 2: Rotation position 3: Calibration completed
19	Calibration step No.	calibStepNo	Get only	-
20	NG cause	errorCode	Get only	-1: Setting NG -2: Sequence NG -3: Mobility NG -4: Calibration NG -5: Evaluation NG -6: Sampling NG -100: Other NG
120	Calibration target flag	exeCalibrationFlag	Set/Get	0: Not process 1: Process
121	The number of translations :	paraDataNum	Set/Get	2 to 100
122	The number of rotational motion	rotDataNum	Set/Get	2 to 100
123	Scene No.	sceneNo	Set/Get	-1: Current scene refered 0 to 9,999: Pointed scene refered
124	Unit No.	unitNo	Set/Get	-1: No reference 0 to 9,999: Pointed unit refered
125	Calibration type	calibrationType	Set/Get	0: Normal 1: Easy
200+Nx10 (N: 0 to 7)	Calibration target flag of data	exeFlag	Set/Get	0: No 1: Yes
201+Nx10 (N: 0 to 7)	Position X of data	expCameraX	Set/Get	Exp. character string
202+Nx10 (N: 0 to 7)	Position Y of data	expCameraY	Set/Get	Exp. character string
203+Nx10 (N: 0 to 7)	Judge expression of data	expJudgeSampling	Set/Get	Exp. character string
204+Nx10 (N: 0 to 7)	Upper limit of judge condition of data	upperJudgeSampling	Set/Get	-999,999,999.9999 to 999,999,999.9999
205+Nx10 (N: 0 to 7)	Lower limit of judge condition of data	lowerJudgeSampling	Set/Get	-999,999,999.9999 to 999,999,999.9999
1000+Nx10 (N: 0 to 99)	X-direction movement of parallel position No.	paraDistanceX	Set/Get	-99,999.9999 to 99,999.9999
1001+Nx10 (N: 0 to 99)	Y-direction movement of parallel position No.	paraDistanceY	Set/Get	-99,999.9999 to 99,999.9999
2000+Nx10 (N: 0 to 99)	X-direction movement of rotation position No.	rotDistanceX	Set/Get	-99,999.9999 to 99,999.9999
2001+Nx10 (N: 0 to 99)	Y-direction movement of rotation position No.	rotDistanceY	Set/Get	-99,999.9999 to 99,999.9999
2002+Nx10 (N: 0 to 99)	TH-direction movement of rotation position No.	rotTheta	Set/Get	-180.0000 to 180.0000
5000	Calibration start/end	startCalibration	Set only	0: Calibration end 1: Calibration start

No.	Data Name	Ident	Set/Get	Data range
5001	Set calibration target	setCalibrationTarget	Set only	Each bit of setting data corresponds to data numbers 0 to 7 0: Do not execute calibration 1: Execute calibration
5002*1	Set standard position	setStandardPosition	Set only	1: Execute
5003	Set parallel position	setParallelPosition	Set only	1 to 100
5004	Set rotation position	setRotationPosition	Set only	1 to 100
5005*1	Calculate calibration data	calcCalibrationData	Set only	1: Execute
5006*1	Calculate deflection data	calcDeflectionData	Set only	1: Execute
5007*1	Clear sampling data	clearSamplingData	Set only	1: Execute
5009*1	Clear step counter	clearStepCounter	Set only	1: Execute
14000+Nx1000 (N: 0 to 7)	Deflection of data	deflection_	Get only	-
14001+Nx1000 (N: 0 to 7)	Calibration parameter A of data	calibParamA_	Set/Get	-99,999.999999 to 99,999.999999
14002+Nx1000 (N: 0 to 7)	Calibration parameter B of data	calibParamB_	Set/Get	-99,999.999999 to 99,999.999999
14003+Nx1000 (N: 0 to 7)	Calibration parameter C of data	calibParamC_	Set/Get	-99,999.999999 to 99,999.999999
14004+Nx1000 (N: 0 to 7)	Calibration parameter D of data	calibParamD_	Set/Get	-99,999.999999 to 99,999.999999
14005+Nx1000 (N: 0 to 7)	Calibration parameter E of data	calibParamE_	Set/Get	-99,999.999999 to 99,999.999999
14006+Nx1000 (N: 0 to 7)	Calibration parameter F of data	calibParamF_	Set/Get	-99,999.999999 to 99,999.999999
14007+Nx1000 (N: 0 to 7)	X magnification of data	scaleX_	Get only	-
14008+Nx1000 (N: 0 to 7)	Y magnification of data	scaleY_	Get only	-
14009+Nx1000 (N: 0 to 7)	Origin X of data	centerX_	Get only	-
14010+Nx1000 (N: 0 to 7)	Origin Y of data	centerY_	Get only	-
14011+Nx1000 (N: 0 to 7))	X-axis angle of data	angleX_	Get only	-
14012+Nx1000 (N: 0 to 7)	Y-axis angle of data	angleY_	Get only	-
14013+Nx1000 (N: 0 to 7)	XY-axis angle of data	angleXY_	Get only	-

*1. When you set the external reference data and execute an applicable Processing unit, make sure that the Processing unit belongs to the Scene currently being executed.

4-28 Transfer Position Data

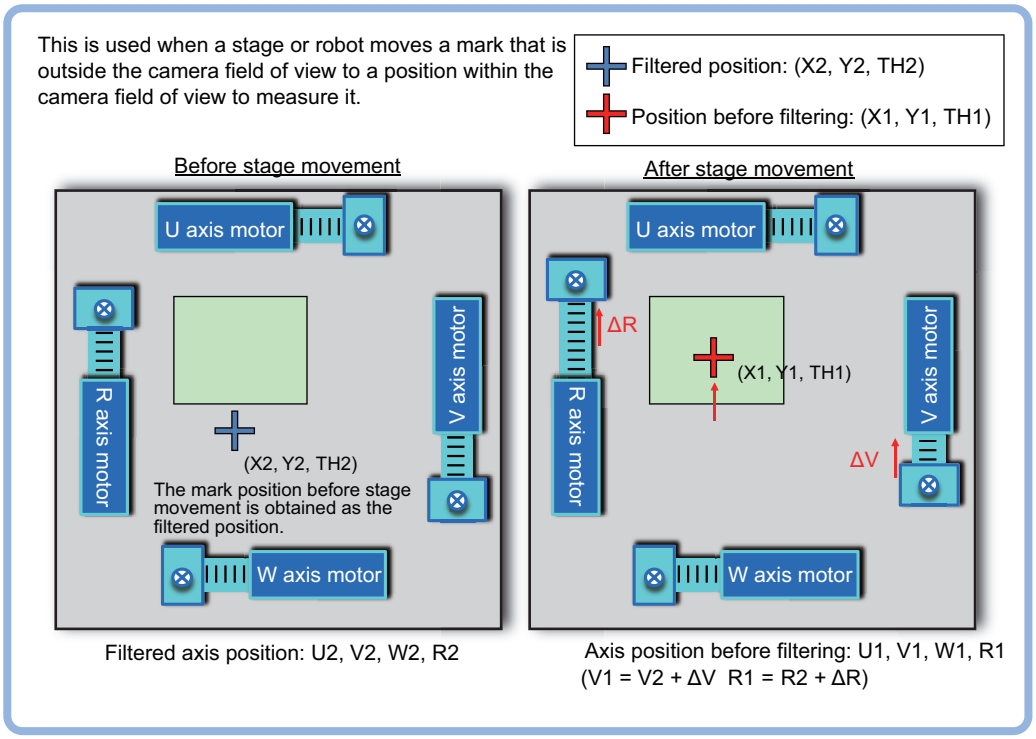
Calculates the post movement position/angle data when each axis of a stage or robot is moved for a given distance. Use this when you want to measure the stage after moving a given distance and obtain the pre-movement position/angle data.

At least 2 or 3 measurement points are needed to calculate axis movement amounts. Axis movement amounts can usually be stably calculated by installing a camera at each measurement point and measuring 4 or 5 measurement points.

The basic approach is to calculate movement amounts at high precision with the same number of cameras as there are measurement points. But it is also possible to measure multiple measurement points contained in a single camera's field of view.

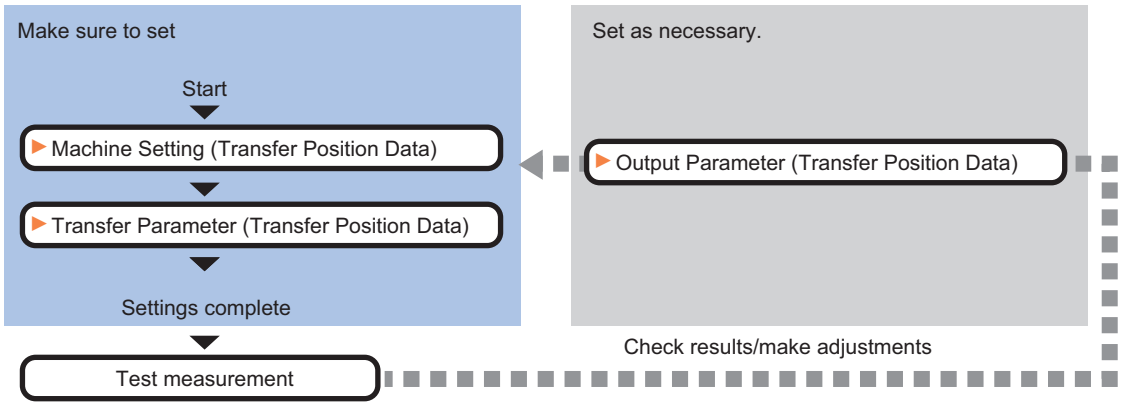
Used in the Following Case

When you want to position the FPD panel



4-28-1 Settings Flow (Transfer Position Data)

The position/angle conversion should be set up with the following procedure.



Item list of Transfer Position Data

Item name	Description
Machine setting	Select a processing item (stage data or robot data) under which external device information needed for calculation of axis movement amount is held. Refer to *4-28-2 Machine Setting (Transfer Position Data)* on page 4-186.
Transfer parameter	The item sets data related to conversion. Sets a calculation formula using the pre-conversion position and axis position and post-conversion axis position. Refer to *4-28-3 Transfer Parameter (Transfer Position Data)* on page 4-187.
Output parameter	Select whether or not the judgement results of this processing unit is reflected in the scene overall judgement. Refer to *4-28-4 Output Parameter (Transfer Position Data)* on page 4-191.

4-28-2 Machine Setting (Transfer Position Data)

Select a processing item (stage data or robot data) under which external device information needed for calculation of axis movement amount is held.

Important

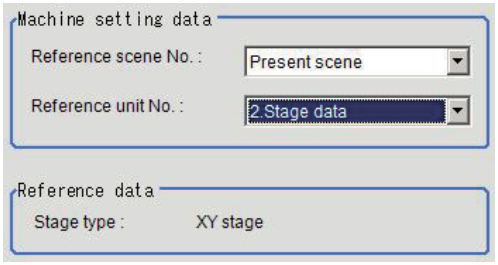
[Transfer Position Data] refers to [Stage Data] or [Robot Data]. Be sure to register [Stage Data] or [Robot Data] in the referenced scene.

1 In the Item Tab area, click [Machine setting].

2 Select the processing unit that retains information on external device.

Information of the selected processing unit is displayed in the reference data display area.

Displayed contents may change depending on the selection type; Robot, or Stage in Stage Data or Robot Data.



Setting item	Setting value [Factory default]	Description
Reference scene No.	[Present scene] Scenes 0 to 127	Select a scene number (stage data or robot data) under which external device information needed for calculation of axis movement amount is held.
Reference unit No.	----	From among the referenced scene numbers, select a processing item (stage data or robot data) under which external device information needed for calculation of axis movement amount is held.
Reference data	----	Display the settings of "Stage" or "Robot" processing item.

Additional Information

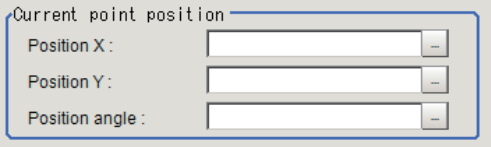
If the number of scenes is increased using the scene group conversion tool, the maximum value that can be selected in "Reference scene No." changes.

4-28-3 Transfer Parameter (Transfer Position Data)

The item sets data related to conversion. Sets a calculation formula using the pre-conversion position and axis position and post-conversion axis position.

1 Click [Transfer parameter] in the Item Tab area.

2 Set each item in the Current point position area.

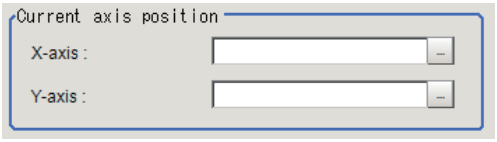


Setting item	Setting value [Factory default]	Description
Position X	-	Set the calculation formula that obtains the position X of the conversion target.
Position Y	-	Set the calculation formula that obtains the position Y of the conversion target.
Position angle	-	Set the calculation formula that obtains the angle of the conversion target. To convert positions X and Y only, set 0 as the angle.

3 Set each item in the Current axis position area before conversion.

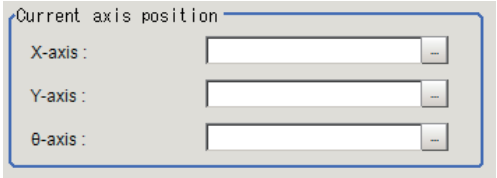
Set how far each axis moved from the origin return state (all axes are at the origin point) when [Current angle] is measured.

- If the stage type of the reference data is the XY stage or the robot type is 3-axis robot



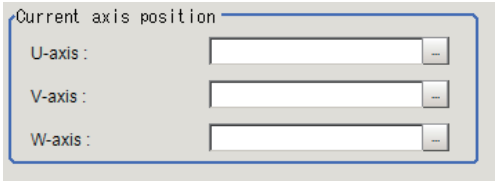
Setting item	Setting value [Factory default]	Description
X-axis	-	Set how far the X axis position moved from the origin.
Y-axis	-	Set how far the Y axis position moved from the origin.

- If the stage type of the reference data is the XYθ stage, θXY stage or the robot type is 4-axis robot



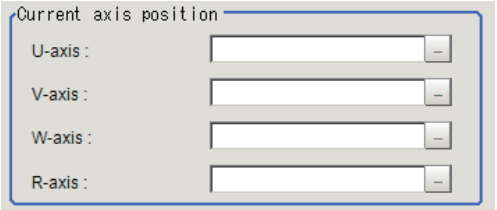
Setting item	Setting value [Factory default]	Description
X-axis	-	Set how far the X axis position moved from the origin.
Y-axis	-	Set how far the Y axis position moved from the origin.
θ-axis	-	Set how far the θ axis position moved from the origin.

- If the stage type of the reference data is the UVW stage



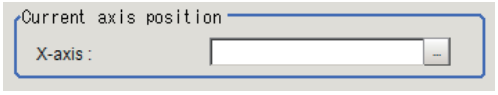
Setting item	Setting value [Factory default]	Description
U-axis	-	Set how far the U axis position moved from the origin.
V-axis	-	Set how far the V axis position moved from the origin.
W-axis	-	Set how far the W axis position moved from the origin.

- If the stage type of the reference data is the UVWR stage



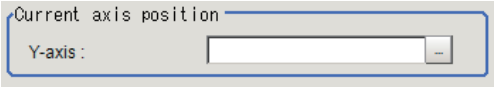
Setting item	Setting value [Factory default]	Description
U-axis	-	Set how far the U axis position moved from the origin.
V-axis	-	Set how far the V axis position moved from the origin.
W-axis	-	Set how far the W axis position moved from the origin.
R-axis	-	Set how far the R axis position moved from the origin.

- Selects X-axis as movement axis when X(Y) Stage is set in reference data.



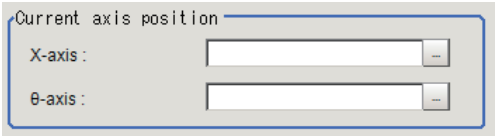
Setting item	Setting value [Factory default]	Description
X-axis	-	Set the measurement distance of X-axis from homign operation.

- Selects Y-axis as movement axis when X(Y) Stage is set in reference data.



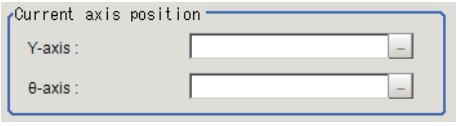
Setting item	Setting value [Factory default]	Description
Y-axis	-	Set the measurement distance of Y-axis from homign operation.

- Selects X-axis as movement axis when Xθ(Yθ) or θX(θY) Stage are set in reference data.



Setting item	Setting value [Factory default]	Description
X-axis	-	Set the measurement distance of X-axis from homing operation.
θ-axis	-	Set the measurement distance of θ-axis from homing operation.

- Selects Y-axis as movement axis when Xθ(Yθ) or θX(θY) Stage are set in reference data.

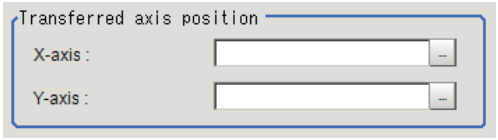


Setting item	Setting value [Factory default]	Description
Y-axis	-	Set the measurement distance of Y-axis from homing operation.
θ-axis	-	Set the measurement distance of θ-axis from homing operation.

4 Set each item in the Transferred axis position area.

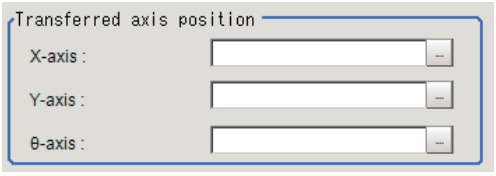
Set how far each axis in the "Post-correction position/angle" moved from the origin return state (all axes are at the origin point).

- If the stage type of the reference data is the XY stage or the robot type is 3-axis robot



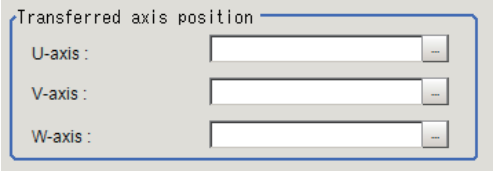
Setting item	Setting value [Factory default]	Description
X-axis	-	Set how far the X axis position moved from the origin.
Y-axis	-	Set how far the Y axis position moved from the origin.

- If the stage type of the reference data is the XYθ stage, θXY stage or the robot type is 4-axis robot



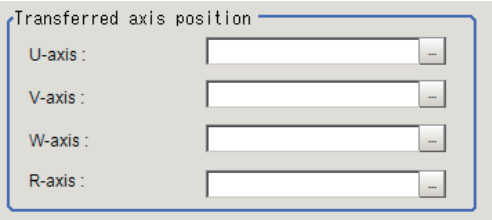
Setting item	Setting value [Factory default]	Description
X-axis	-	Set how far the X axis position moved from the origin.
Y-axis	-	Set how far the Y axis position moved from the origin.
θ-axis	-	Set how far the θ axis position moved from the origin.

- If the stage type of the reference data is the UVW stage



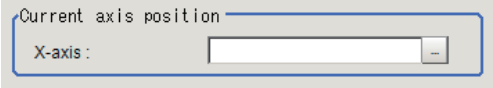
Setting item	Setting value [Factory default]	Description
U-axis	-	Set how far the U axis position moved from the origin.
V-axis	-	Set how far the V axis position moved from the origin.
W-axis	-	Set how far the W axis position moved from the origin.

- If the stage type of the reference data is the UVWR stage



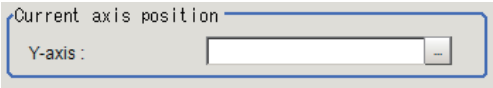
Setting item	Setting value [Factory default]	Description
U-axis	-	Set how far the U axis position moved from the origin.
V-axis	-	Set how far the V axis position moved from the origin.
W-axis	-	Set how far the W axis position moved from the origin.
R-axis	-	Set how far the R axis position moved from the origin.

- Selects X-axis as movement axis when X(Y) Stage is set in reference data.



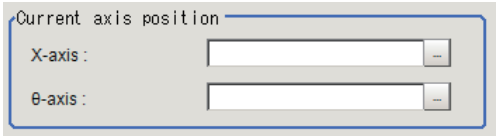
Setting item	Setting value [Factory default]	Description
X-axis	-	Set the measurement distance of X-axis from homing operation.

- Selects Y-axis as movement axis when X(Y) Stage is set in reference data.



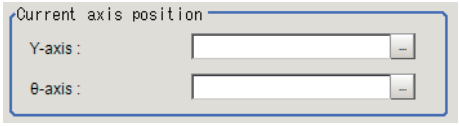
Setting item	Setting value [Factory default]	Description
Y-axis	-	Set the measurement distance of Y-axis from homing operation.

- Selects X-axis as movement axis when Xθ(Yθ) or θX(θY) Stage are set in reference data.



Setting item	Setting value [Factory default]	Description
X-axis	-	Set the measurement distance of X-axis from homing operation.
θ-axis	-	Set the measurement distance of θ-axis from homing operation.

- Selects Y-axis as movement axis when Xθ(Yθ) or θX(θY) Stage are set in reference data.



Setting item	Setting value [Factory default]	Description
Y-axis	-	Set the measurement distance of Y-axis from homing operation.
θ-axis	-	Set the measurement distance of θ-axis from homing operation.

5 Click [Measure] to check the measurement results.

6 Set the judgement condition.

Additional Information

The values beside each item are measurement results of the displayed image. Take these values into consideration to determine the upper and lower limit values.

Setting item	Setting value	Description
Transferred position X	-99999.9999 to 99999.9999	Specify the range of X-axis conversion that is judged to be OK.
Transferred position Y	-99999.9999 to 99999.9999	Specify the range of Y-axis conversion that is judged to be OK.
Transferred angle	-180.0000 to 180.0000	Specify the range of angle conversion that is judged to be OK.

4-28-4 Output Parameter (Transfer Position Data)

Select whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

1 Click [Output parameter] in the Item Tab area.

2 Choose whether or not to reflect the judgement result in the scene overall judgement in "Reflect to overall judgement" area.

Setting item	Setting value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Specify whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

4-28-5 Key Points for Test Measurement and Adjustment (Transfer Position Data)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgment result
Transferred position X	Displays the position X of the post-conversion measurement data.
Transferred position Y	Displays the position Y of the post-conversion measurement data.
Transferred angle	Displays the angle of the post-conversion measurement data.

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image.	Explanation of image to be displayed
0	Measurement image

Key Points for Adjustment

Select the adjustment method referring to the following points.

State	Parameter to be adjusted	Troubleshooting
Judgment was NG.	Calculation setting	The arithmetic expression may be empty. Set the correct arithmetic expression.
It cannot be selected because the reference unit No. is <none>.	Machine setting	Check if the reference scene number is selected correctly. Check if stage data processing items or robot data processing items are registered in the selected reference scene.
The reference unit number does not follow during flow editing.	Machine setting	The system is designed this way. While a scene other than the current scene is referenced, the reference unit number does not change according to the editing of the flow. Change the flow so that the current scene will be referenced, or set the reference unit number again.

4-28-6 Measurement Results for Which Output Is Possible (Transfer Position Data)

The following values can be output using processing items related to results output. It is also possible to refer to measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgment result
Transferred position X	X	Post-conversion position X
Transferred position Y	Y	Post-conversion position Y
Transferred angle	TH	Post-conversion angle

4-28-7 External Reference Tables (Transfer Position Data)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
5	Transferred position X	destPositionX	Get only	-
6	Transferred position Y	destPositionY	Get only	-
7	Transferred angle	destAngle	Get only	-
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Reference scene No.	sceneNo	Set/Get	-1: Current scene refered 0 to 9,999: Pointed scene refered
121	Reference unit No.	unitNo	Set/Get	-1: No reference 0 to 9,999: Pointed unit refered
122	Current position X	srcPositionX	Set/Get	Exp. character string
123	Current position Y	srcPositionY	Set/Get	Exp. character string
124	Current angle	srcAngle	Set/Get	Exp. character string
130	Current X-axis	srcAxisX	Set/Get	Exp. character string
131	Current Y-axis	srcAxisY	Set/Get	Exp. character string
132	Current θ-axis (angle)	srcAxisAngle	Set/Get	Exp. character string
133	Current θ-axis (linear drive)	srcAxisTheta	Set/Get	Exp. character string
134	Current U-axis	srcAxisU	Set/Get	Exp. character string
135	Current V-axis	srcAxisV	Set/Get	Exp. character string
136	Current W-axis	srcAxisW	Set/Get	Exp. character string
137	Current R-axis	srcAxisR	Set/Get	Exp. character string
140	Transferred X-axis	destAxisX	Set/Get	Exp. character string
141	Transferred Y-axis	destAxisY	Set/Get	Exp. character string
142	Transferred θ-axis (angle)	destAxisAngle	Set/Get	Exp. character string
143	Transferred θ-axis (linear drive)	destAxisTheta	Set/Get	Exp. character string
144	Transferred U-axis	destAxisU	Set/Get	Exp. character string
145	Transferred V-axis	destAxisV	Set/Get	Exp. character string
146	Transferred W-axis	destAxisW	Set/Get	Exp. character string
147	Transferred R-axis	destAxisR	Set/Get	Exp. character string
150	Upper limit of transferred position X	upperDestPosX	Set/Get	-99,999.9999 to 99,999.9999
151	Lower limit of transferred position X	lowerDestPosX	Set/Get	-99,999.9999 to 99,999.9999
152	Upper limit of transferred position Y	upperDestPosY	Set/Get	-99,999.9999 to 99,999.9999
153	Lower limit of transferred position Y	lowerDestPosY	Set/Get	-99,999.9999 to 99,999.9999
154	Upper limit of transferred angle	upperDestAngle	Set/Get	-180.0000 to 180.0000
155	Lower limit of transferred angle	lowerDestAngle	Set/Get	-180.0000 to 180.0000
160	Current Yaw-axis	srcAxisYaw	Set/Get	Exp. character string
161	Current Pitch-axis	srcAxisPitch	Set/Get	Exp. character string
162	Current Roll-axis	srcAxisRoll	Set/Get	Exp. character string
170	Transferred Yaw-axis	destAxisYaw	Set/Get	Exp. character string
171	Transferred Pitch-axis	destAxisPitch	Set/Get	Exp. character string

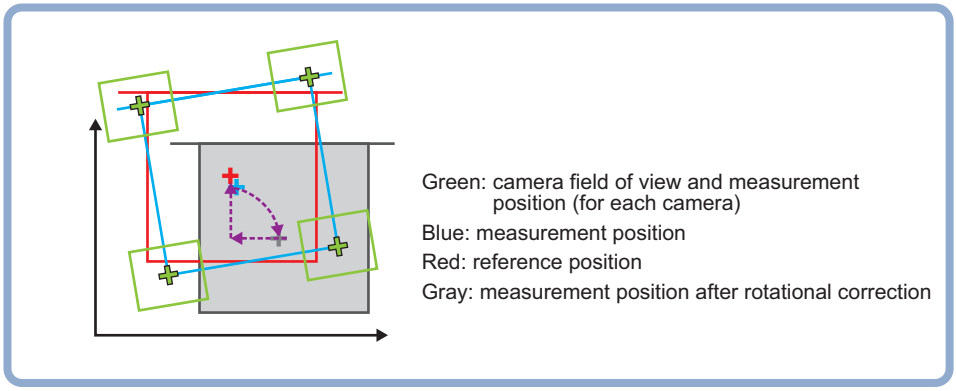
No.	Data Name	Ident	Set/Get	Data range
172	Transferred Roll-axis	destAxisRoll	Set/Get	Exp. character string

4-29 Calc Axis Move

Calculate the movement amount of each axis of the external device necessary to adjust the measurement position and angle to the reference position and angle. Set the measurement position/angle and reference position/angle using an arithmetic expression.

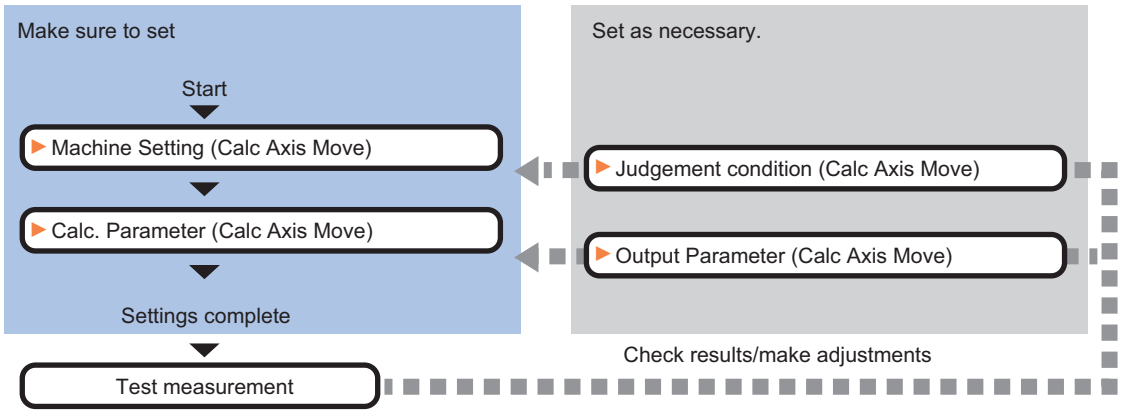
Used in the Following Case

When you want to position the FPD panel



4-29-1 Settings Flow (Calc Axis Move)

Set the axis movement amount calculation following the procedure below.



List of Calc Axis Move Items

Item name	Description
Machine setting	Select a processing item (stage data or robot data) under which external device information needed for calculation of axis movement amount is held. Refer to *4-29-2 Machine Setting (Calc Axis Move)* on page 4-196.
Calc. parameter	Set the reference position/angle and measurement position/angle using an arithmetic expression. If multiple cameras are used, the setting data can be created easily by using the position/angle calculation processing items. Refer to *4-29-3 Calc. Parameter (Calc Axis Move)* on page 4-197.
Judgement condition	This item specifies the judgement condition for measurement results. Refer to *4-29-4 Judgement Condition (Calc Axis Move)* on page 4-201.
Output parameter	This item can be changed if necessary. Set whether or not the judgement results of this processing unit is reflected in the scene overall judgement. Refer to *4-29-5 Output Parameter (Calc Axis Move)* on page 4-202.

4-29-2 Machine Setting (Calc Axis Move)

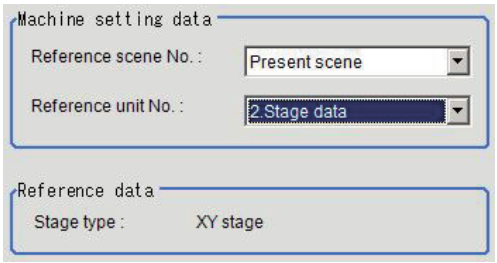
Select a processing item (stage data or robot data) under which external device information needed for calculation of axis movement amount is held.

1 In the Item Tab area, click [Machine setting].

2 Select the reference scene No. and reference unit No.

Information of the selected processing unit is displayed in the reference data display area.

Displayed contents differ depending on selected type of Robot or Stage.



Setting item	Setting value [Factory default]	Description
Reference scene No.	[Present scene] Scenes 0 to 127	Select a scene number (stage data or robot data) under which external device information needed for calculation of axis movement amount is held.
Reference unit No.	-	From among the referenced scene numbers, select a processing item (stage data or robot data) under which external device information needed for calculation of axis movement amount is held.
Reference data	----	Display the settings of "Stage" or "Robot" processing item.

Additional Information

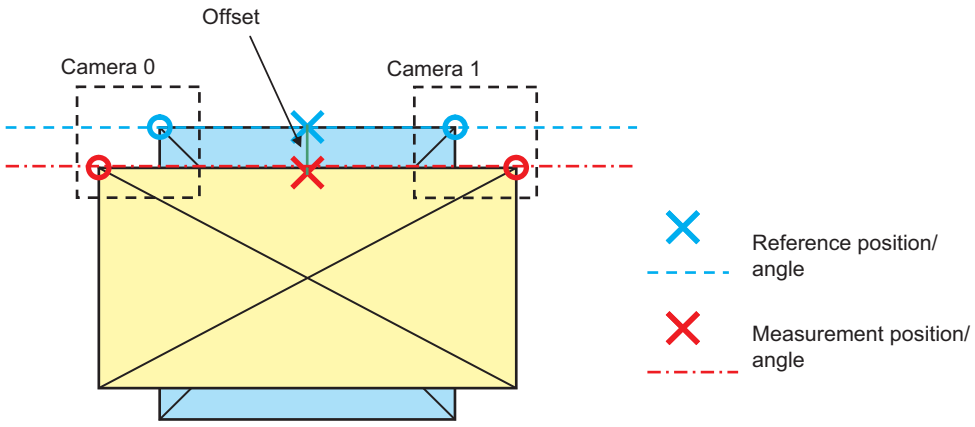
If the number of scenes is increased using the scene group conversion tool, the maximum value that can be selected in "Reference scene No." changes.

4-29-3 Calc. Parameter (Calc Axis Move)

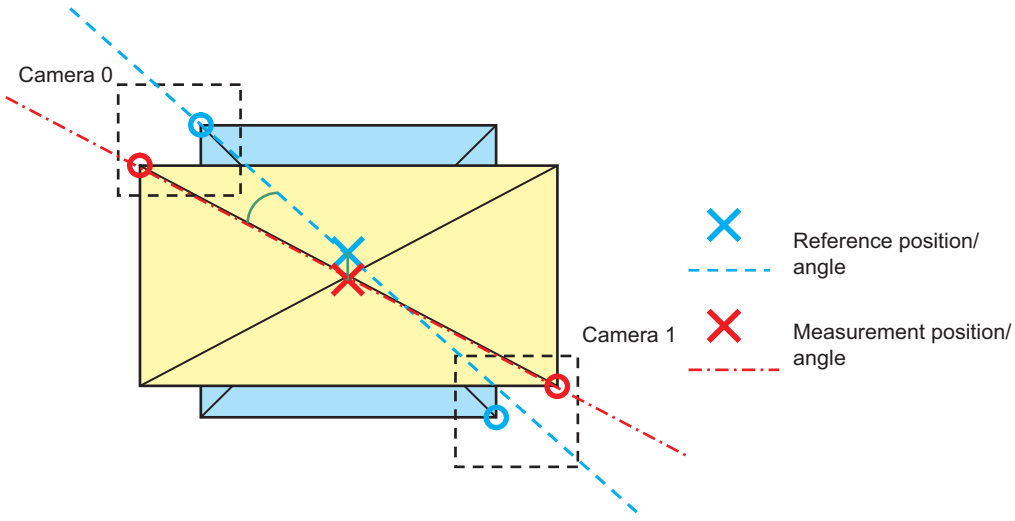
Set the reference position/angle and measurement position/angle using an arithmetic expression. If multiple cameras are used, the setting data can be created easily by using the position/angle calculation processing items.

In case there is a difference between the reference position/angle and the measurement position/angle, you can compensate it by setting the offset. Example1 shows the application to align the center of a couple of sheets which have the different size. In this case, a precise alignment can be realized by setting the vertical offset as below. In example2, the angular offset is necessary in addition.

Example 1) When an offset in the vertical direction is required

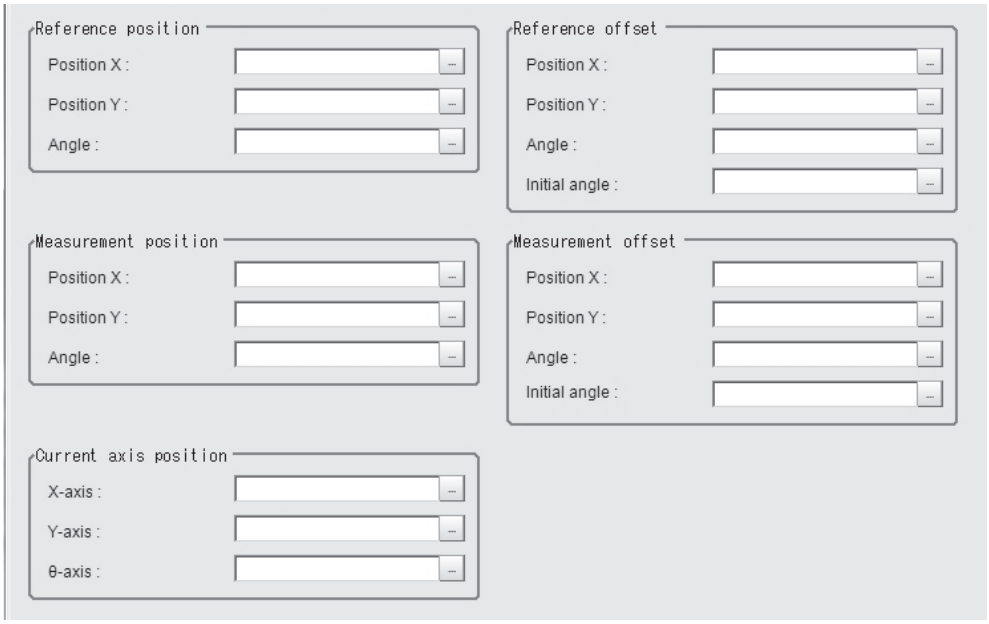


Example 2) When offsets in the vertical direction and angle direction are required



1 Click [Calc. parameter] in the Item Tab area.

2 Set each parameters using arithmetic expressions.



If no reference data is selected

The following parameters are displayed in this menu based on the stage type.

Displayed content		Not selected	XY	XYθ	θXY	UVW	UVWR	X(Y)	Xθ(Yθ)	θX(θY)	3 axes	4 axes
Reference setting												
	Position X	○	○	○	○	○	○	○	○	○	○	○
	Position Y	○	○	○	○	○	○	○	○	○	○	○
	Angle	○	×	○	○	○	○	×	○	○	×	○
Measure setting												
	Position X	○	○	○	○	○	○	○	○	○	○	○
	Position Y	○	○	○	○	○	○	○	○	○	○	○
	Angle	○	×	○	○	○	○	×	○	○	×	○
Reference offset setting												
	Position X	○	○	○	○	○	○	○	○	○	○	○
	Position Y	○	○	○	○	○	○	○	○	○	○	○
	Angle	○	×	○	○	○	○	×	○	○	×	○
	Initial angle	○	×	○	○	○	○	×	○	○	×	○
Measure offset setting												
	Position X	○	○	○	○	○	○	○	○	○	○	○
	Position Y	○	○	○	○	○	○	○	○	○	○	○
	Angle	○	×	○	○	○	○	×	○	○	×	○
	Initial angle	○	×	○	○	○	○	×	○	○	×	○
Current axis position												
	X-axis	×	○	○	○	×	×	○ (X-axis is selected as the Movement axis)	○ (X-axis is selected as the Movement axis)	○ (X-axis is selected as the Movement axis)	○	○
	Y-axis	×	○	○	○	×	×	○ (Y-axis is selected as the Movement axis)	○ (Y-axis is selected as the Movement axis)	○ (Y-axis is selected as the Movement axis)	○	○
	θ-axis	×	×	○	○	×	×	×	○	○	×	○
	U-axis	×	×	×	×	○	○	×	×	×	×	×
	V-axis	×	×	×	×	○	○	×	×	×	×	×
	W-axis	×	×	×	×	○	○	×	×	×	×	×
	R-axis	×	×	×	×	×	○	×	×	×	×	×

○: Show, ×: Hide

Initial angle

Initial angle is an angle when the offset amount is calculated.

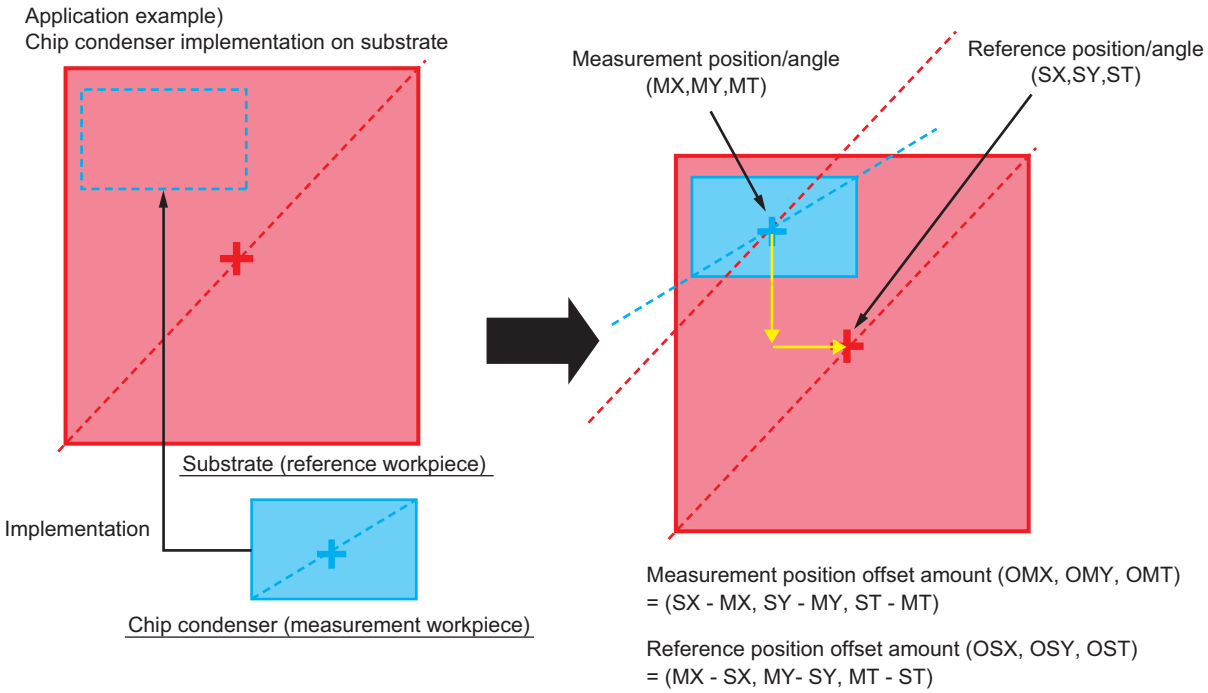
Example) Positioning of a ceramic chip by using the angle of the diagonal line and the center position.

Definition of symbol in the following figure

- Measurement position/angle of when the offset amount is calculated (MX, MY, MT)
- Reference position/angle when the offset amount is calculated (SX, SY, ST)
- Offset amount of measurement position/angle (OMX, OMY, OMT)
- Offset amount of the reference position/angle (OSX, OSY, OST)

Setting contents for "Measurement position offset setting" of the Calc Axis Move

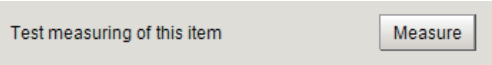
- Position X : OMX = SX - MX
- Position Y : OMY = SY - MY
- Angle : OMT = ST - MT
- Angle at the definition time : MT



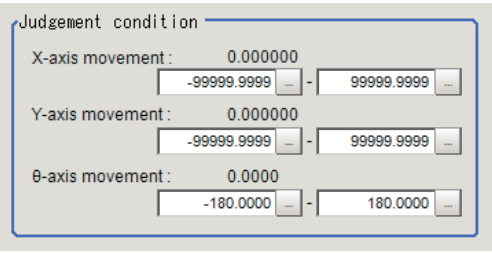
4-29-4 Judgement Condition (Calc Axis Move)

This item specifies the judgement condition for measurement results.

1 When the setting has been changed, click [Measure] to verify whether measurements can be made correctly.



2 In the "Judgement condition" area, set each item.



If the reference data is the XYθ stage

The following parameters are displayed in this menu based on the stage type.

Displayed content	Not selected	XY	XYθ	θXY	UVW	UVWR	X(Y)	Xθ(Yθ)	θX(θY)	3 axes	4 axes
X axis movement amount Judgement upper/ lower limit values	○	○	○	○	×	×	○	○	○	○	○
Y axis movement amount Judgement upper/ lower limit values	○	○	○	○	×	×	○	○	○	○	○
θ axis angle movement amount Judgement upper/ lower limit values	○	×	○ (θ axis direct drive)	○ (θ axis direct drive)	×	×	×	○ (θ axis direct drive)	○ (θ axis direct drive)	×	○
θ axis linear movement amount Judgement upper/ lower limit values	×	×	○ (θ axis linear drive)	○ (θ axis linear drive)	×	×	×	○ (θ axis linear drive)	○ (θ axis linear drive)	×	×
U axis movement amount Judgement upper/ lower limit values	×	×	×	×	○	○	×	×	×	×	×
V axis movement amount Judgement upper/ lower limit values	×	×	×	×	○	○	×	×	×	×	×
W axis movement amount Judgement upper/ lower limit values	×	×	×	×	○	○	×	×	×	×	×
R axis movement amount Judgement upper/ lower limit values	×	×	×	×	×	○	×	×	×	×	×

○: Show, ×: Hide

4-29-5 Output Parameter (Calc Axis Move)

Set how to treat the coordinates to be output to the external device as measurement results. This item can be changed if necessary. Normally, the factory default value will be used.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Setting value [Factory default]	Description	
Reflect to overall judgement	• [ON] • OFF	Select to reflect this function's judgment result to Scene's Overall judgment.	
Output type	• [Relative position] • Absolute position	Relative position:	Calculates the movement amount form the current axis position.
		Absolute position:	Calculates the movement amount from the homing operation position.

4-29-6 Key Points for Test Measurement and Adjustment (Calc Axis Move)

The following results are displayed.

Displayed item	Character string	Description
Judgement	JG	Judgement result
Position X difference	DX	Position X difference
Position Y difference	DY	Position Y difference
Angle difference	DT	Angle difference
Measurement X	X	Measurement X
Measurement Y	Y	Measurement Y
Measure angle	TH	Angle θ
Reference X	SX	Reference X
Reference Y	SY	Reference Y
Reference angle	ST	Reference angle θ
X axis movement	MX	X axis movement amount*1
Y axis movement	MY	Y axis movement amount *1
θ axis angle movement	MT	θ axis angle movement amount *1
θ axis linear movement	ML	θ axis movement amount *1
U axis movement	MU	U axis movement amount *1
V axis movement	MV	V axis movement amount *1
W axis movement	MW	W axis movement amount *1
R axis movement	MR	R axis movement amount *1

*1. The following parameters are displayed in this menu based on the stage type.

Displayed content	XY	XYθ	θXY	UVW	UVWR	X(Y)	Xθ(Yθ)	θX(θY)	3 axes	4 axes
X axis movement	○	○	○	×	×	○	○	○	○	○
Y axis movement	○	○	○	×	×	○	○	○	○	○

Displayed content	XY	XYθ	θXY	UVW	UVWR	X(Y)	Xθ(Yθ)	θX(θY)	3 axes	4 axes
θ axis angle movement	×	○ (θ axis direct drive)	○ (θ axis direct drive)	×	×	×	○ (θ axis direct drive)	○ (θ axis direct drive)	×	○
θ axis linear movement	×	○ (θ axis linear drive)	○ (θ axis linear drive)	×	×	×	○ (θ axis linear drive)	○ (θ axis linear drive)	×	×
U axis movement	×	×	×	○	○	×	×	×	×	×
V axis movement	×	×	×	○	○	×	×	×	×	×
W axis movement	×	×	×	○	○	×	×	×	×	×
R axis movement	×	×	×	×	○	×	×	×	×	×

○: Show, ×: Hide

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are false

State	Parameter to be adjusted	Troubleshooting
The sign of the measurement result (positive/negative) output is opposite.	-	The reference position/angle and measurement position/angle may be set in reverse. The axis movement amount calculates the movement amount from the measurement position/angle to the reference position/angle.

● Other

State	Parameter to be adjusted	Troubleshooting
The reference unit number is <"None"> and cannot be selected.	Machine setting	Check if the reference scene number is selected correctly. Check if stage data processing items or robot data processing items are registered in the selected reference scene.
The reference unit number does not follow during flow editing.	Machine setting	The system is designed this way. While a scene other than the current scene is referenced, the reference unit number does not change according to the editing of the flow. Change the flow so that it refers to from the current scene or set the reference unit number again.

4-29-7 Measurement Results for Which Output Is Possible (Calc Axis Move)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Displayed item	Character string	Description
Judge	JG	Judgement result
Position X difference	DX	Position X difference
Position Y difference	DY	Position Y difference
Angle difference	DT	Angle difference
Measurement position X	X	Measurement position X
Measurement position Y	Y	Measurement position Y
Measure angle	TH	Angle θ
Reference X	SX	Reference X
Reference Y	SY	Reference Y
Reference angle	ST	Reference angle θ
X axis movement	MX	X axis movement amount *1
Y axis movement	MY	Y axis movement amount *1
θ axis angle movement	MT	θ axis angle movement amount *1
θ axis linear movement	ML	θ axis linear movement amount *1
U axis movement	MU	U axis movement amount *1
V axis movement	MV	V axis movement amount *1
W axis movement	MW	W axis movement amount *1
R axis movement	MR	R axis movement amount *1

*1. The following parameters are displayed in this menu based on the stage type.

Output contents	XY	XYθ	θXY	UVW	UVWR	X(Y)	Xθ(Yθ)	θX(θY)	3 axes	4 axes
X axis movement	○	○	○	×	×	○	○	○	○	○
Y axis movement	○	○	○	×	×	○	○	○	○	○
θ axis angle movement	×	○ (θ axis direct drive)	○ (θ axis direct drive)	×	×	×	○ (θ axis direct drive)	○ (θ axis direct drive)	×	○
θ axis liner drive	×	○ (θ axis linear drive)	○ (θ axis linear drive)	×	×	×	○ (θ axis linear drive)	○ (θ axis linear drive)	×	×
U axis movement	×	×	×	○	○	×	×	×	×	×
V axis movement	×	×	×	○	○	×	×	×	×	×
W axis movement	×	×	×	○	○	×	×	×	×	×
R axis movement	×	×	×	×	○	×	×	×	×	×

○: Output, ×: Do not output

4-29-8 External Reference Tables (Calc Axis Move)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
5	X-axis movement	moveX	Get only	-
6	Y-axis movement	moveY	Get only	-
7	θ-axis movement	moveTheta	Get only	-180.0000 to 180.0000
8	θ-axis (linear drive)	moveLinearTheta	Get only	-
9	U-axis movement	moveU	Get only	-
10	V-axis movement	moveV	Get only	-
11	W-axis movement	moveW	Get only	-
12	R-axis movement	moveR	Get only	-
13	Reference X	standardPosX	Get only	-
14	Reference Y	standardPosY	Get only	-
15	Reference angle	standardAngle	Get only	-
16	Measurement X	measurePosX	Get only	-
17	Measurement Y	measurePosY	Get only	-
18	Measurement angle	measureAngle	Get only	-
19	Position X difference	diffX	Get only	-
20	Position Y difference	diffY	Get only	-
21	Angle difference	diffTheta	Get only	-
22	Yaw-axis movement	moveYaw	Get only	-
23	Pitch-axis movement	movePitch	Get only	-
24	Roll-axis movement	moveRoll	Get only	-
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Reference scene No.	sceneNo	Set/Get	-1: Current scene refered 0 to 9999: Pointed scene refered
121	Reference unit No.	unitNo	Set/Get	-1: No reference 0 to 9999: Pointed unit refered
130	Reference X (Movement end point)	expStdX	Set/Get	Exp. character string
131	Reference Y (Movement end point)	expStdY	Set/Get	Exp. character string
132	Reference angle (Movement end point)	expStdAngle	Set/Get	Exp. character string
133	Measurement X (Movement start point)	expMeasX	Set/Get	Exp. character string
134	Measurement Y (Movement start point)	expMeasY	Set/Get	Exp. character string
135	Measurement angle (Movement start point)	expMeasAngle	Set/Get	Exp. character string
140	Reference X offset	expOffsetStdX	Set/Get	Exp. character string
141	Reference Y offset	expOffsetStdY	Set/Get	Exp. character string
142	Reference angle offset	expOffsetStdAngle	Set/Get	Exp. character string
143	Measurement X offset	expOffsetMeasX	Set/Get	Exp. character string
144	Measurement Y offset	expOffsetMeasY	Set/Get	Exp. character string
145	Measurement angle offset	expOffsetMeasAngle	Set/Get	Exp. character string
146	Initial angle (Reference position)	expInitialStdAngle	Set/Get	Exp. character string

No.	Data Name	Ident	Set/Get	Data range
147	Initial angle (Measurement position)	expInitialMeasAngle	Set/Get	Exp. character string
150	Current X-axis movement (Movement start point)	currentPosX	Set/Get	Exp. character string
151	Current Y-axis movement (Movement start point)	currentPosY	Set/Get	Exp. character string
152	Current θ-axis movement (Movement start point)	currentPosTheta	Set/Get	Exp. character string
153	Current θ-axis (linear drive) (Movement start point)	currentPosLinearTheta	Set/Get	Exp. character string
154	Current U-axis movement (Movement start point)	currentPosU	Set/Get	Exp. character string
155	Current V-axis movement (Movement start point)	currentPosV	Set/Get	Exp. character string
156	Current W-axis movement (Movement start point)	currentPosW	Set/Get	Exp. character string
157	Current R-axis movement (Movement start point)	currentPosR	Set/Get	Exp. character string
160	Upper limit of X-axis movement	upperMoveX	Set/Get	-99,999.9999 to 99,999.9999
161	Lower limit of X-axis movement	lowerMoveX	Set/Get	-99,999.9999 to 99,999.9999
162	Upper limit of Y-axis movement	upperMoveY	Set/Get	-99,999.9999 to 99,999.9999
163	Lower limit of Y-axis movement	lowerMoveY	Set/Get	-99,999.9999 to 99,999.9999
164	Upper limit of θ-axis movement	upperMoveTheta	Set/Get	-180.0000 to 180.0000
165	Lower limit of θ-axis movement	lowerMoveTheta	Set/Get	-180.0000 to 180.0000
166	Upper limit of θ-axis (linear drive)	upperMoveLinearTheta	Set/Get	-99,999.9999 to 99,999.9999
167	Lower limit of θ-axis (linear drive)	lowerMoveLinearTheta	Set/Get	-99,999.9999 to 99,999.9999
168	Upper limit of U-axis movement	upperMoveU	Set/Get	-99,999.9999 to 99,999.9999
169	Lower limit of U-axis movement	lowerMoveU	Set/Get	-99,999.9999 to 99,999.9999
170	Upper limit of V-axis movement	upperMoveV	Set/Get	-99,999.9999 to 99,999.9999
171	Lower limit of V-axis movement	lowerMoveV	Set/Get	-99,999.9999 to 99,999.9999
172	Upper limit of W-axis movement	upperMoveW	Set/Get	-99,999.9999 to 99,999.9999
173	Lower limit of W-axis movement	lowerMoveW	Set/Get	-99,999.9999 to 99,999.9999
174	Upper limit of R-axis movement	upperMoveR	Set/Get	-99,999.9999 to 99,999.9999

No.	Data Name	Ident	Set/Get	Data range
175	Lower limit of R-axis movement	lowerMoveR	Set/Get	-99,999.9999 to 99,999.9999
176	Output type	outputType	Set/Get	0: Relative position 1: Absolute position
190	Current Yaw-axis movement (Movement start point)	currentPosYaw	Set/Get	Exp. character string
191	Current Pitch-axis movement (Movement start point)	currentPosPitch	Set/Get	Exp. character string
192	Current Roll-axis movement (Movement start point)	currentPosRoll	Set/Get	Exp. character string
193	Upper limit of Yaw-axis movement	upperMoveYaw	Set/Get	-180.0000 to 180.0000
194	Lower limit of Yaw-axis movement	lowerMoveYaw	Set/Get	-180.0000 to 180.0000
195	Upper limit of Pitch-axis movement	upperMovePitch	Set/Get	-180.0000 to 180.0000
196	Lower limit of Pitch-axis movement	lowerMovePitch	Set/Get	-180.0000 to 180.0000
197	Upper limit of Roll-axis movement	upperMoveRoll	Set/Get	-180.0000 to 180.0000
198	Lower limit of Roll-axis movement	lowerMoveRoll	Set/Get	-180.0000 to 180.0000

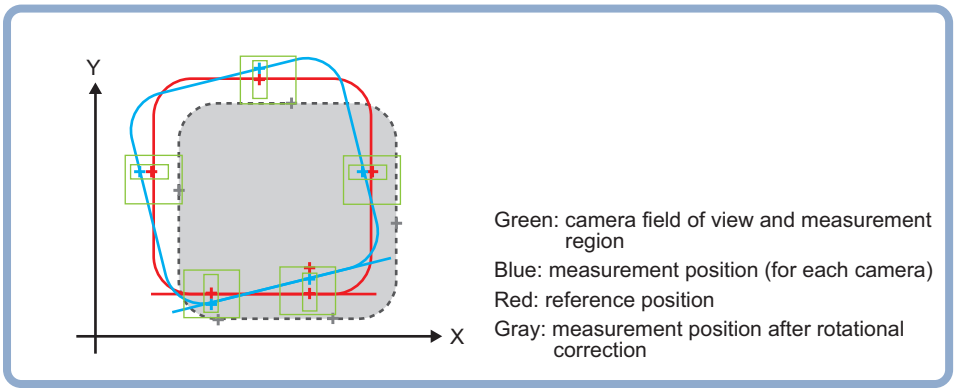
4-30 Calc Axis Move by Multipoint

Calculate the movement amount of each axis of the external device necessary to adjust the measurement position to the reference position. Set the measurement position and reference position using an arithmetic expression.

At least 2 or 3 measurement points are needed to calculate axis movement amounts. Axis movement amounts can usually be stably calculated by installing a camera at each measurement point and measuring 4 or 5 measurement points. The basic approach is to calculate movement amounts at high precision with the same number of cameras as there are measurement points. But it is also possible to measure multiple measurement points contained in a single camera's field of view.

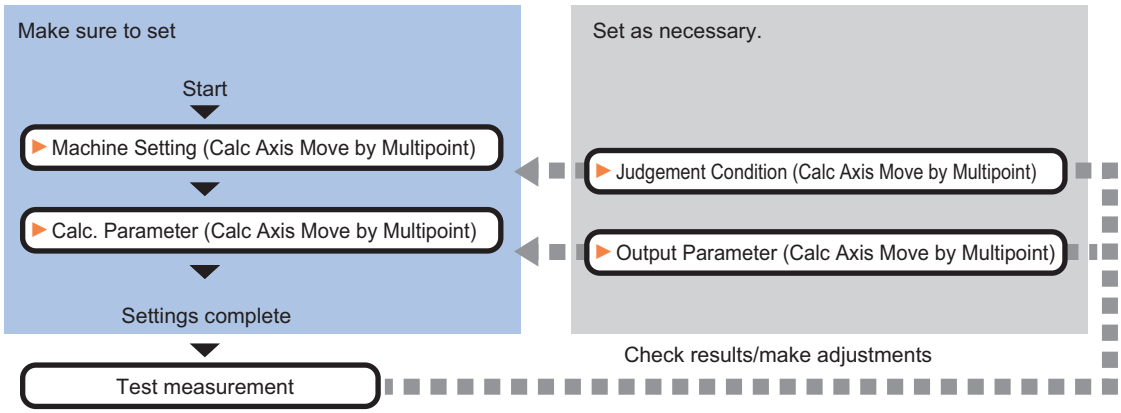
Used in the Following Case

When you want to position the FPD panel



4-30-1 Settings Flow (Calc Axis Move by Multipoint)

Set the axis movement amount calculation following the procedure below.



List of Calc Axis Move by Multipoint Items

Item name	Description
Machine setting	Select the processing items (stage or robot data) containing information about external device necessary to calculate the axis movement amount. Refer to *4-30-2 Machine Setting (Calc Axis Move by Multipoint)* on page 4-209.
Calc. parameter	Set the reference position and measurement position using an arithmetic expression. Refer to *4-30-3 Calc. Parameter (Calc Axis Move by Multipoint)* on page 4-210.
Judgement condition	This item specifies the judgement condition for measurement results. Refer to *4-30-4 Judgement Condition (Calc Axis Move by Multipoint)* on page 4-215.
Output parameter	This item can be changed if necessary. Set whether or not the judgement results of this processing unit is reflected in the scene overall judgement. Refer to *4-30-5 Output Parameter (Calc Axis Move by Multipoint)* on page 4-216.

4-30-2 Machine Setting (Calc Axis Move by Multipoint)

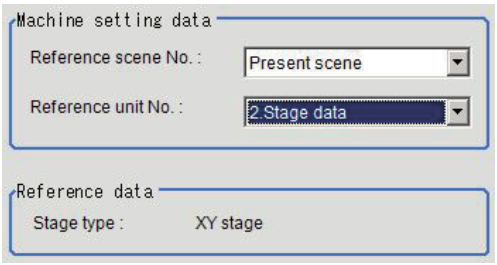
Select a processing item (stage data or robot data) under which external device information needed for calculation of axis movement amount is held.

1 In the Item Tab area, click [Machine setting].

2 Select the reference scene No. and reference unit No.

Information of the selected processing unit is displayed in the reference data display area.

Displayed contents differs depending on selected type of robot or stage.



Setting item	Setting value [Factory default]	Description
Reference scene No.	[Present scene] Scenes 0 to 127	Select a scene number (stage data or robot data) under which external device information needed for calculation of axis movement amount is held.
Reference unit No.	---	From among the referenced scene numbers, select a processing item (stage data or robot data) under which external device information needed for calculation of axis movement amount is held.
Reference data	---	Display the settings of "Stage" or "Robot" processing item.

Additional Information

If the number of scenes is increased using the scene group conversion tool, the maximum value that can be selected in "Reference scene No." changes.

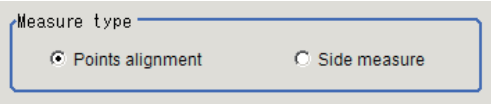
4-30-3 Calc. Parameter (Calc Axis Move by Multipoint)

Set the reference position and measurement position using an arithmetic expression.

The displayed parameters differ depending on the selected stage type.

1 Click [Calc. parameter] in the Item Tab area.

2 Select the measurement method in the "Measure type" area.

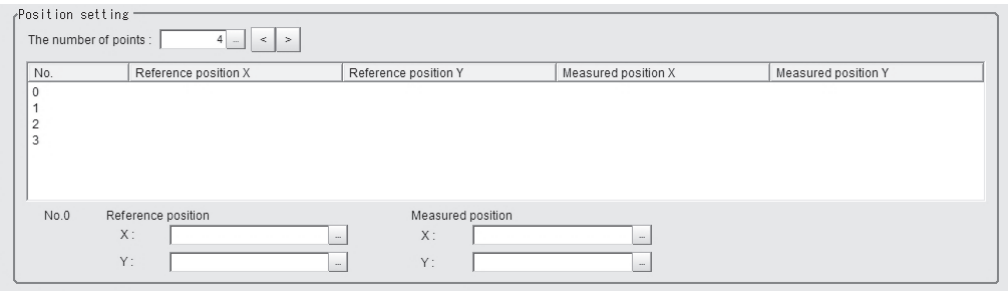


Setting item	Setting value [Factory default]	Description
Measure type	• [Points alignment] • Side measure	Select the measurement method for the maximum error in the judgement condition. • Points alignment Calculate the movement amount from the measurement position to the reference position based on the support position information. It is suitable when distances between all points should be within a specified value. • Side measure Alignment method based on the edges of the work-piece. This method could be used when "No alignment mark" or "Workpiece angle cannot be measured" exists.

Points alignments

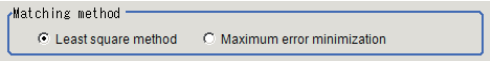
Use the procedure below to measure position and angle by detecting a point you want to position on the object to measure. The movement amount of each axis is calculated from the measurement results. Use a measurement processing item such as Search (which outputs the measured XY coordinates) for point measurement. A measurement processing item that outputs measured XY coordinates for each measurement point must be registered and used in the measurement flow.

1 Set the reference position and measurement position in the "Position setting" area.

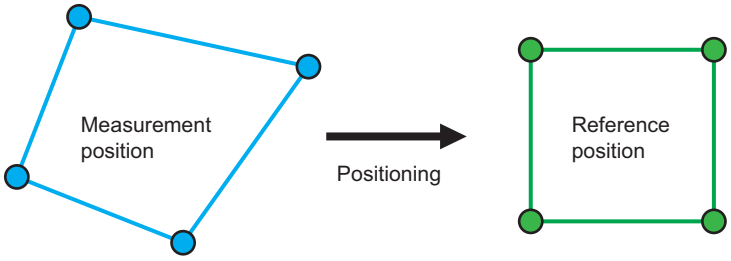


Setting item	Setting value [Factory default]	Description
The number of points	2 to 8 [4]	Set the number of points
Reference position X	[-]	Set the X coordinate of the reference position.
Reference position Y	[-]	Set the Y coordinate of the reference position.
Measured position X	[-]	Set the X coordinate of the measurement position.
Measured position Y	[-]	Set the Y coordinate of the measurement position.

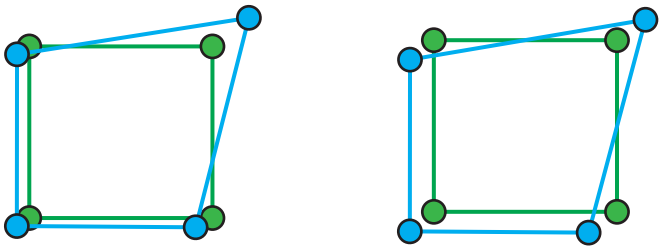
2 Set each item in the "Matching method" area.



Setting item	Setting value [Factory default]	Description
Matching method	• [Least square method] • Maximum error minimization	• Least square method Execute positioning as sum of squares of errors in all points (*) become the minimum. • Maximum error minimization Execute positioning as the maximum value of the errors in all points (*) become the minimum. * Errors in all points ... Distance between the reference position and the measurement position



Positioning result image



Least square method

The sum of squares of errors become the minimum.
Reduces effects of noise point.

Maximum error minimization

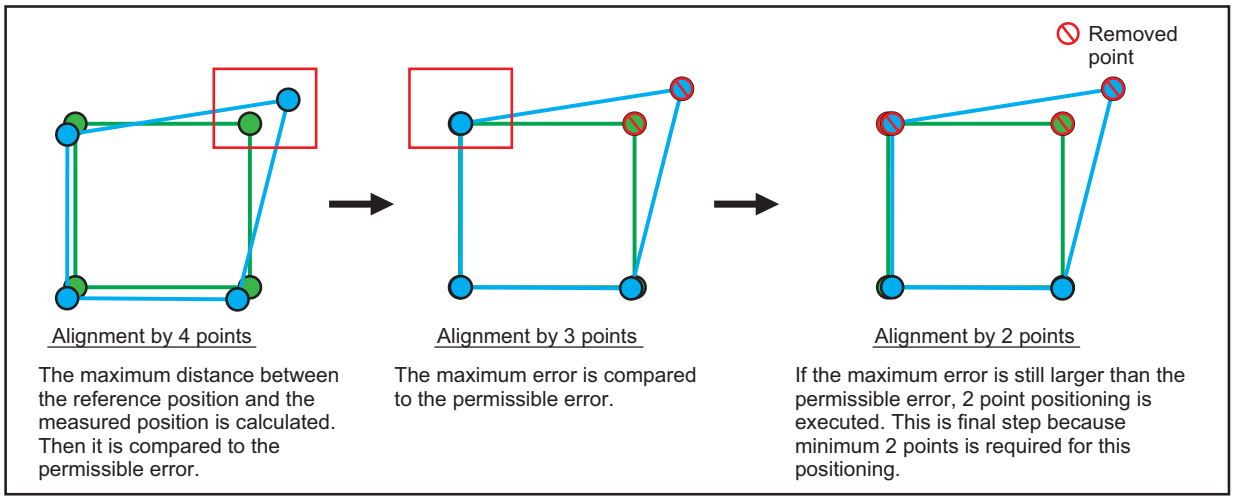
The maximum value of errors of all points become the minimum.
Points with extremely large errors are not generated.

3 Set the noise reduction method in the "Noise removal Setting" area.

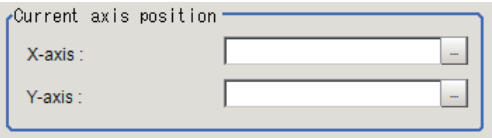
Setting item	Setting value [Factory default]	Description
Required point number for calc	2 to 8 [4]	This means the available mark number after the noise point removal. For example, when you need minimum 3 points for positioning and set 4 as a number of points in "Position setting" area, maximum 1 point could be removed as a noise.
Error tolerance	0 to 99999.9999 [0.0000]	Set allowable error (distance of measurement position and reference position) is set. Calibrate by removing the noise points repeatedly until the required minimum number of points is reached. If you set the Error tolerance to 0.0000, all of the points are calculated and the result with the smallest error value is output.

The noise removal flow is explained by using a sample case that the required minimum points is 2 points, and that the allowable error is 10.0.

Flow of noise removal



4 Set the current axis position.



Set the axis position of an external device.

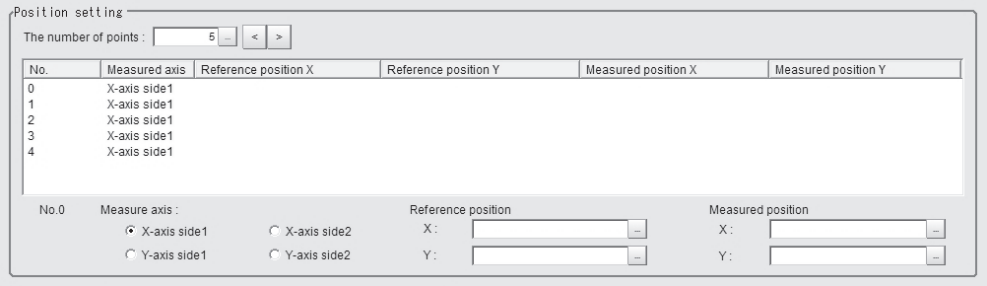
Additional Information

Only specified movement axis or exist axial direction are applied to set in the case of X, Y, Xθ, Yθ, θX and θY stages. Not exist axial direction is not displayed.

Side measurement

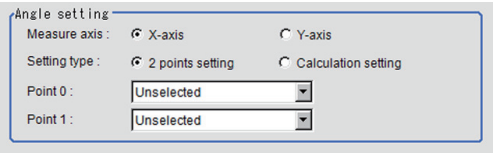
Use the procedure below to measure position and angle by detecting the edges of the sides of a rectangular or square object to measure. Set at least two of the measurement points so as to measure the same side. Use the Edge Position processing item for edge measurement. For each measurement point, the Edge Position processing item must be registered and used in the measurement flow. The movement amount may not be calculated correctly if you use a processing item other than the Edge Position processing item.

1 Set a number of points, Measured axis, reference position, and Measured position in the "Position setting" area.



Setting item	Setting value [Factory default]	Description
The number of points	3 to 8 [5]	Used to set the number of locations to measure in the four sides.
Measured axis	• [X-axis side 1] • X-axis side 2 • Y-axis side 1 • Y-axis side 2	Set the measurement axis. The measurement axis must be set to the actual coordinate axis that is parallel to the direction of the measurement region of the Edge Position processing item used for measurement.
Reference position X	---	Set the X coordinate of the reference position.
Reference position Y	---	Set the Y coordinate of the reference position.
Measured position X	---	Set the X coordinate of the measurement position.
Measured position Y	---	Set the Y coordinate of the measurement position.

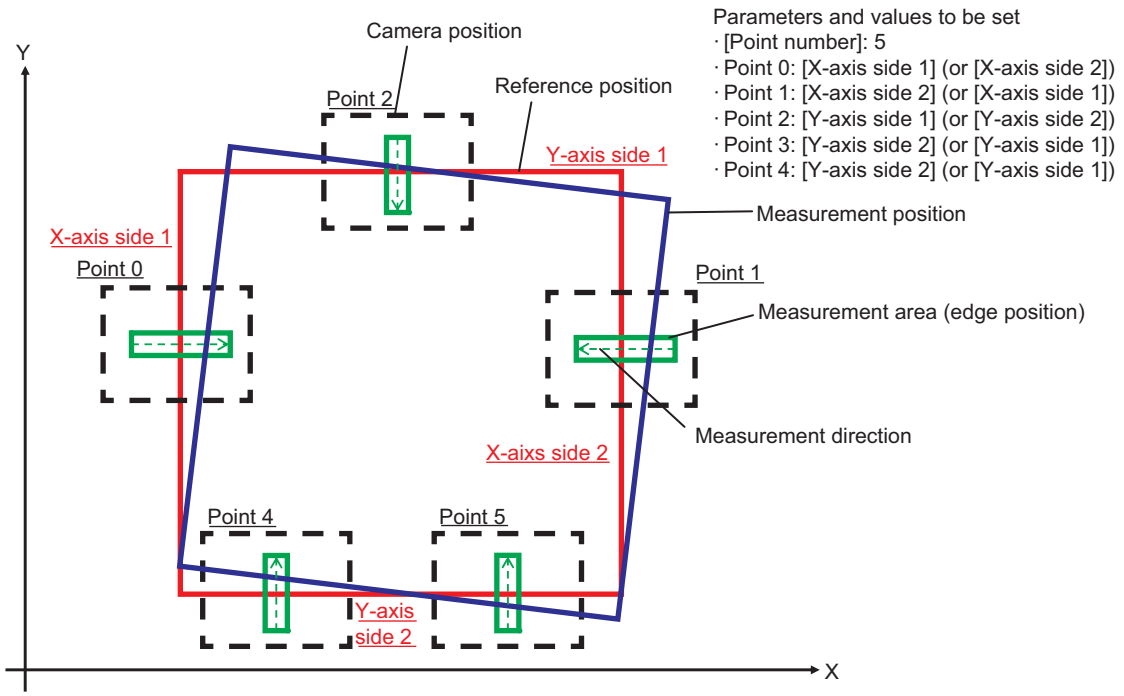
2 In "Angle setting" area, specify the measurement axis and setting type.



Setting item	Setting value [Factory default]	Description
Measure axis	• [X-axis] • Y-axis	Used to set the measurement axis used for angle calculation. This setting item is enabled when [2 points setting] is specified for the method.
Setting type	• [2 points setting] • Calculation setting	Set the method for angle specification. • 2 points setting: A method in which the measurement axis used for angle calculation is set by specifying two points on the same side. • Calculation setting: A method in which the reference angle and measurement angle are each set by a calculation expression.

Setting item	Setting value [Factory default]	Description
Point 0	---	This setting is enabled when [2 points setting] is selected. Select each of the two points among the points set in the position setting area. The two points selected must be measurement points used to measure the same side.
Point 1	---	
Reference angle	---	This setting is enabled when [Calculation setting] is selected. Used to set the reference angle and measurement angle by calculation expressions.
Measured angle	---	

Example: When measuring edge positions at five points on the sides



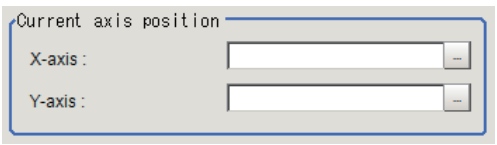
Important

Use the Edge Position processing item for edge measurement. The movement amount will not be calculated correctly if you use a processing item other than Edge Position.

Additional Information

For measurement regions of two locations on one edge used for angle calculations, the precision with which the angle is calculated increases in proportion to the interval between measurement regions.

3 Set the current axis position.
Set the axis position of external device.



Additional Information

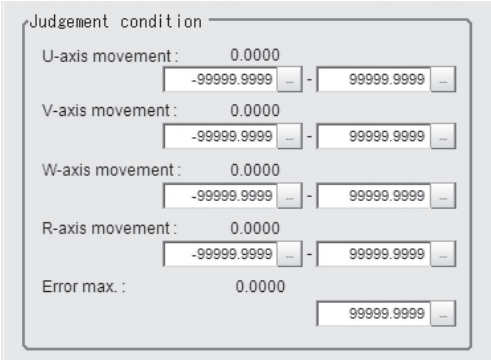
Only specified movement axis or exist axial direction are applied to set in the case of X, Y, Xθ, Yθ, θX and θY stages. Not exist axial direction is not displayed.

4-30-4 Judgement Condition (Calc Axis Move by Multipoint)

This item specifies the condition for measurement results.

1 In the Item Tab area, click [Judgement condition].

2 In the "Judgement condition" area, set each item.



If the reference data is the UVWR stage

Setting item	Setting value [Factory default]	Description
X/Y-axis movement	[-99999.9999] to [99999.9999]	Used to set upper and lower limit values for the movement amount in the axis direction. The axes that can be set will vary according to the processing item containing the external device information specified by [Machine setting].
Error max.	0 to 99999.9999 [99999.9999]	This setting is enabled when [Measure type] in the [Calc. parameter] tab is set to [Points alignment]. It is used to set the upper and lower limit values for the difference between the points at which the difference between the reference position and measurement position is a maximum.

The following parameters are displayed in this menu based on the stage type.

Displayed content	Not selected	XY	XYθ	θXY	UVW	UVWR	X(Y)	Xθ(Yθ)	θX(θY)	3 axes	4 axes
X axis movement amount Judgement upper/ lower limit values	○	○	○	○	×	×	○	○	○	○	○
Y axis movement amount Judgement upper/ lower limit values	○	○	○	○	×	×	○	○	○	○	○
θ axis angle movement amount Judgement upper/ lower limit values	○	×	○*1	○*1	×	×	×	○*1	○*1	×	○
θ axis linear movement amount Judgement upper/ lower limit values	×	×	○*2	○*2	×	×	×	○*2	○*2	×	×
U axis movement amount Judgement upper/ lower limit values	×	×	×	×	○	○	×	×	×	×	×

Displayed content	Not selected	XY	XYθ	θXY	UVW	UVWR	X(Y)	Xθ(Yθ)	θX(θY)	3 axes	4 axes
V axis movement amount Judgement upper/ lower limit values	×	×	×	×	○	○	×	×	×	×	×
W axis movement amount Judgement upper/ lower limit values	×	×	×	×	○	○	×	×	×	×	×
R axis movement amount Judgement upper/ lower limit values	×	×	×	×	×	○	×	×	×	×	×

*1. Displayed only when the θ axis type is direct drive.

*2. Displayed only when the θ axis type is linear drive.

○: Show, ×: Hide

4-30-5 Output Parameter (Calc Axis Move by Multipoint)

Set how the coordinates output to external equipment as measurement results are treated. Change this item as needed. Normally, the factory default value will be used.

1 Click [Output parameter] in the Item Tab area.

2 Specify each of the following items.

Setting item	Setting value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Specify whether or not the judgement results of this processing unit is reflected in the scene overall judgement.
Output type	• [Opposite moving] • Absolute moving	Opposite moving: Calculates the movement amount from the current axis position. Absolute moving: Calculates the movement amount from the origin.

4-30-6 Key Points for Test Measurement and Adjustment (Calc Axis Move by Multipoint)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgment result
X axis movement	X axis movement amount
Y axis movement	Y axis movement amount
θ axis angle movement	θ axis angle movement amount *1
θ axis movement	θ axis linear movement amount *1
U axis movement	U axis movement amount
V axis movement	V axis movement amount
W axis movement	W axis movement amount
R axis movement	R axis movement amount
Position X difference	Position X difference
Position Y difference	Position Y difference
Angle difference	Angle difference
Maximum error	Maximum error

*1. The displayed contents differ depending on the stage type.

Output contents	XY	XYθ	θXY	UVW	UVWR	X(Y)	Xθ(Yθ)	θX(θY)	3 axes	4 axes
θ axis angle movement amount	×	○ (θ axis direct drive)	○ (θ axis direct drive)			×	○ (θ axis direct drive)	○ (θ axis direct drive)		○
θ axis linear movement amount	×	○ (θ axis linear drive)	○ (θ axis linear drive)	×	×	×	○ (θ axis linear drive)	○ (θ axis linear drive)	×	×

○: Show, ×: Hide

Key Points for Adjustment

Select the adjustment method referring to the following points.

● When the measurement results are false

State	Parameter to be adjusted	Troubleshooting
The sign of the measurement result (positive/negative) that has been output is opposite.	---	The reference position and measurement position may be set in reverse. The axis movement amount calculates the movement amount from the measurement position to the reference position.

● Other

State	Parameter to be adjusted	Troubleshooting
The reference unit number is <"None"> and cannot be selected.	Machine setting	Check if the reference scene number is selected correctly. Check if stage data processing items or robot data processing items are registered in the selected reference scene.
The reference unit number does not follow during flow editing.	Machine setting	The system is designed this way. While a scene other than the current scene is referenced, the reference unit number does not change according to the editing of the flow. Change the flow so that the current scene will be referenced, or set the reference unit number again.

4-30-7 Measurement Results for Which Output Is Possible (Calc Axis Move by Multipoint)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Displayed item	Character string	Description
Judge	JG	Judgment result
X axis movement	MX	X axis movement amount
Y axis movement	MY	Y axis movement amount
θ axis angle movement	MT	θ axis angle movement amount *1
θ axis (linear drive)	ML	θ axis linear movement amount *1
U axis movement	MU	U axis movement amount
V axis movement	MV	V axis movement amount
W axis movement	MW	W axis movement amount
R axis movement	MR	R axis movement amount
Position X difference	DX	Position X difference
Position Y difference	DY	Position Y difference
Angle difference	DT	Angle difference
Error max.	MAXE	Maximum error
Error min.	MINE	Minimum error
Error ave.	AVEE	Average error
Number of removed points	RPN	Number of removed points

*1. The contents that can be output differ depending on the stage type.

Output contents	XY	XYθ	θXY	UVW	UVWR	X(Y)	Xθ(Yθ)	θX(θY)	3 axes	4 axes
θ axis angle movement amount	×	○ (θ axis direct drive)	○ (θ axis direct drive)			×	○ (θ axis direct drive)	○ (θ axis direct drive)		○
θ axis linear movement amount	×	○ (θ axis linear drive)	○ (θ axis linear drive)	×	×	×	○ (θ axis linear drive)	○ (θ axis linear drive)	×	×

○: Output, ×: Do not output

4-30-8 External Reference Tables (Calc Axis Move by Multipoint)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
5	X-axis movement	moveX	Get only	-
6	Y-axis movement	moveY	Get only	-
7	θ-axis movement	moveTheta	Get only	-180.0000 to 180.0000
8	θ-axis (linear drive)	moveLinearTheta	Get only	-
9	U-axis movement	moveU	Get only	-
10	V-axis movement	moveV	Get only	-
11	W-axis movement	moveW	Get only	-
12	R-axis movement	moveR	Get only	-
13	Position X difference	diffX	Get only	-
14	Position Y difference	diffY	Get only	-
15	Angle difference	diffTheta	Get only	-
16	Error max.	errorMax	Get only	-
17	Error min.	errorMin	Get only	-
18	Error ave.	errorAve	Get only	-
19	The number of removal points	removalPointNum	Get only	-
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Reference scene No.	sceneNo	Set/Get	-1: Current scene refered 0 to 9999: Pointed scene refered
121	Reference unit No.	unitNo	Set/Get	-1: No reference 0 to 9999: Pointed unit refered
122	Measure type	measureType	Set/Get	0: Side alignment 1: Points alignment
123	Expressions of reference angle	expSideStdAngle	Set/Get	Exp. character string
124	Expressions of measurement angle	expSideMeasAngle	Set/Get	Exp. character string
125	Measure axis of angle setting	angleAxis	Set/Get	0: X-axis 1: Y-axis
126	Setting type	angleMethod	Set/Get	0: 2 points setting 1: Calculation setting
127	Point 0	anglePoint0	Set/Get	-1: Unselected 0 to 7: No.0 to No.7
128	Point 1	anglePoint1	Set/Get	-1: Unselected 0 to 7: No.0 to No.7
129	Side alignment's point number	pointNumSide	Set/Get	3 to 8
130	Required number of points for calc.	pointNumMulti	Set/Get	2 to 8
131	Minimum required points	pointNumMin	Set/Get	2 to 8
132	Error tolerance	errorPermit	Set/Get	0 to 99,999.9999
133	Upper limit of error	upperError	Set/Get	0 to 99,999.9999
134	Matching method	matchingMethod	Set/Get	0: Least squares method 1: Maximum error minimization

No.	Data Name	Ident	Set/Get	Data range
150	Current X-axis movement	currentPosX	Set/Get	Exp. character string
151	Current Y-axis movement	currentPosY	Set/Get	Exp. character string
152	Current θ-axis movement	currentPosTheta	Set/Get	Exp. character string
153	Current θ-axis (linear drive)	currentPosLinearTheta	Set/Get	Exp. character string
154	Current U-axis movement	currentPosU	Set/Get	Exp. character string
155	Current V-axis movement	currentPosV	Set/Get	Exp. character string
156	Current W-axis movement	currentPosW	Set/Get	Exp. character string
157	Current R-axis movement	currentPosR	Set/Get	Exp. character string
160	Upper limit of X-axis movement	upperMoveX	Set/Get	-99,999.9999 to 99,999.9999
161	Lower limit of X-axis movement	lowerMoveX	Set/Get	-99,999.9999 to 99,999.9999
162	Upper limit of Y-axis movement	upperMoveY	Set/Get	-99,999.9999 to 99,999.9999
163	Lower limit of Y-axis movement	lowerMoveY	Set/Get	-99,999.9999 to 99,999.9999
164	Upper limit of θ-axis movement	upperMoveTheta	Set/Get	-180.0000 to 180.0000
165	Lower limit of θ-axis movement	lowerMoveTheta	Set/Get	-180.0000 to 180.0000
166	Upper limit of θ-axis (linear drive)	upperMoveLinearTheta	Set/Get	-99,999.9999 to 99,999.9999
167	Lower limit of θ-axis (linear drive)	lowerMoveLinearTheta	Set/Get	-99,999.9999 to 99,999.9999
168	Upper limit of U-axis movement	upperMoveU	Set/Get	-99,999.9999 to 99,999.9999
169	Lower limit of U-axis movement	lowerMoveU	Set/Get	-99,999.9999 to 99,999.9999
170	Upper limit of V-axis movement	upperMoveV	Set/Get	-99,999.9999 to 99,999.9999
171	Lower limit of V-axis movement	lowerMoveV	Set/Get	-99,999.9999 to 99,999.9999
172	Upper limit of W-axis movement	upperMoveW	Set/Get	-99,999.9999 to 99,999.9999
173	Lower limit of W-axis movement	lowerMoveW	Set/Get	-99,999.9999 to 99,999.9999
174	Upper limit of R-axis movement	upperMoveR	Set/Get	-99,999.9999 to 99,999.9999
175	Lower limit of R-axis movement	lowerMoveR	Set/Get	-99,999.9999 to 99,999.9999
176	Output type	outputType	Set/Get	0: Relative position 1: Absolute position
200+N (N: 0 to 7)	Expression N of reference position X	expStdX	Set/Get	Exp. character string
300+N (N: 0 to 7)	Expression N of reference position Y	expStdY	Set/Get	Exp. character string

No.	Data Name	Ident	Set/Get	Data range
400+N (N: 0 to 7)	Expression N of measurement position X	expMeasX	Set/Get	Exp. character string
500+N (N: 0 to 7)	Expression N of measurement position Y	expMeasY	Set/Get	Exp. character string
600+N (N: 0 to 7)	Measure axis	measAxis	Set/Get	0: X-axis side1 1: X-axis side2 2: Y-axis side1 3: Y-axis side2

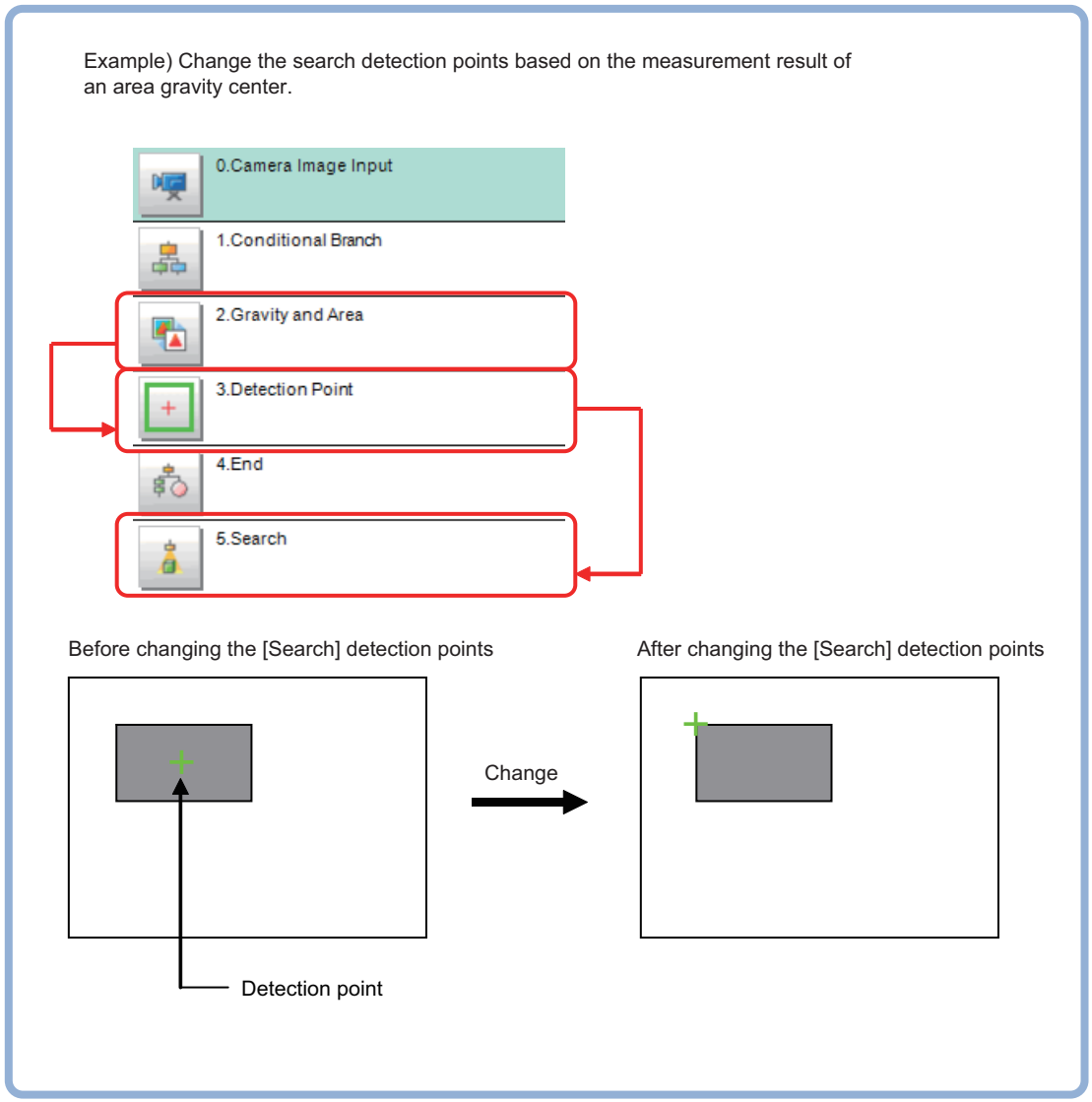
4-31 Detection Point

This processing item can not be used in the FHV series.

Obtains position/angle information by referring to the coordinate values measure with the Measurement Processing Unit. Measurement can be performed based on precise detection points and reference position data by making the Measurement Processing Unit with the detection point and reference position data refer to the Detection Point Processing Unit.

Used in the Following Case

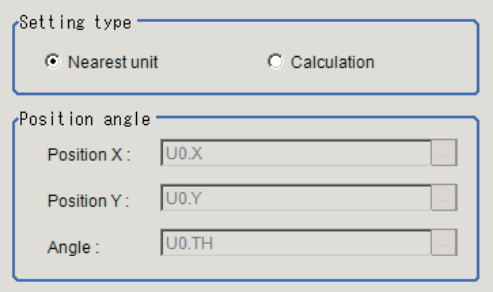
When using the measurement result of another Processing Unit as a detection point



4-31-1 Parameter Setting (Detection Point)

Set how to acquire position/angle data necessary to set detection points.

1 Select the setting method for detection points in the [Setting type] area.



Setting item	Setting value [Factory default]	Description
Setting type	[Nearest unit]	Calculate the position and angle used as the detection point from data in the previous Processing Unit. If the previous Processing Unit has not calculation strings X/Y, judgement in this Processing Unit will be NG during measurement.
	Calculation	Calculate the position and angle used as the detection point using the calculation formula. Selecting the arithmetic expression enables the "Position/Angle" area.

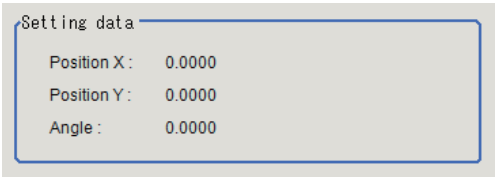
- When you choose [Calculation] as the setting method.

2 Set the position and angle used as the detection point in the [Position angle] are using the arithmetic expression.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12.

3 The position/angle values used as the detection point can be confirmed in the [Setting data] area.

The calculation result specified in the [Setting type] and [Position angle] areas is displayed. If the value is not updated, exit the setting screen once and display it again after executing the measurement.



4-31-2 Measurement Results for Which Output Is Possible (Detection Point)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Position X	X	X coordinate of the detection position to be retained
Position Y	Y	Y coordinate of the detection position to be retained
Angle	TH	Detection angle to be retained

4-31-3 External Reference Tables (Detection Point)

No.	Data Name	Ident	Set/Get	Data range
0	Judgement	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mis-match) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Position X	positionX	Get only	-99,999.9999 to 99,999.9999
6	Position Y	positionY	Get only	-99,999.9999 to 99,999.9999
7	Angle	angle	Get only	-180 to 180
120	Method	settingType	Set/Get	0: Nearest unit 1: Expression
121	Position X	setPosX	Set/Get	Exp. character string
122	Position Y	setPosY	Set/Get	Exp. character string
123	Angle	setPosTH	Set/Get	Exp. character string
124	Position X	resultPosX	Set/Get	-99,999.9999 to 99,999.9999
125	Position Y	resultPosY	Set/Get	-99,999.9999 to 99,999.9999
126	Angle	resultPosTH	Set/Get	-180 to 180

4-32 Manual Position Setting

This processing item can not be used in the FHV series.

Used in the Following Case

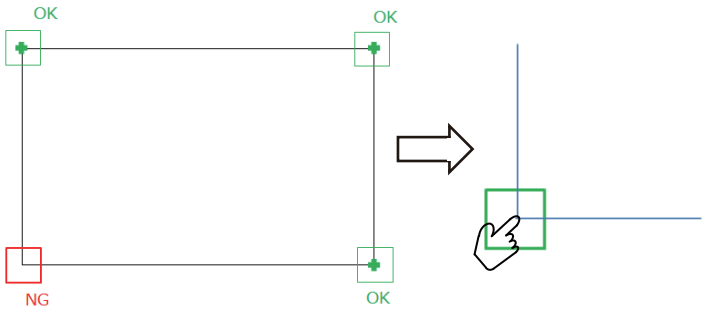
In the case where the measurement processing flow stopped due to failure in an alignment mark measurement:

When a measurement of alignment marks failed in a measurement unit such as Search, a user manually specifies the coordinates of alignment marks while watching the “Position setting” dialog. The outcome becomes the measurement result.

In the case where alignment marks were successfully detected, the measured coordinates will be the measurement result.

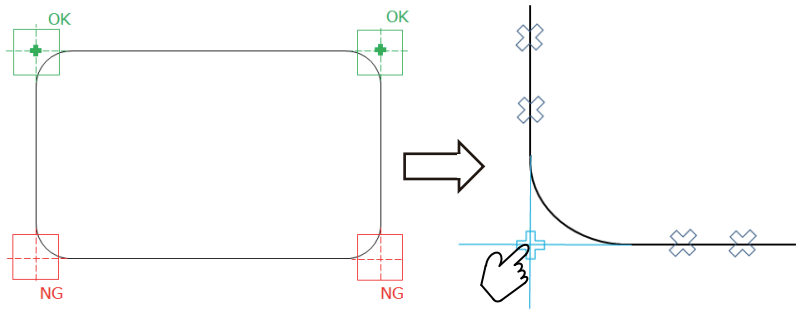
- **One point setting:**

  Manually specify positions.



- **Two-line intersection setting:**

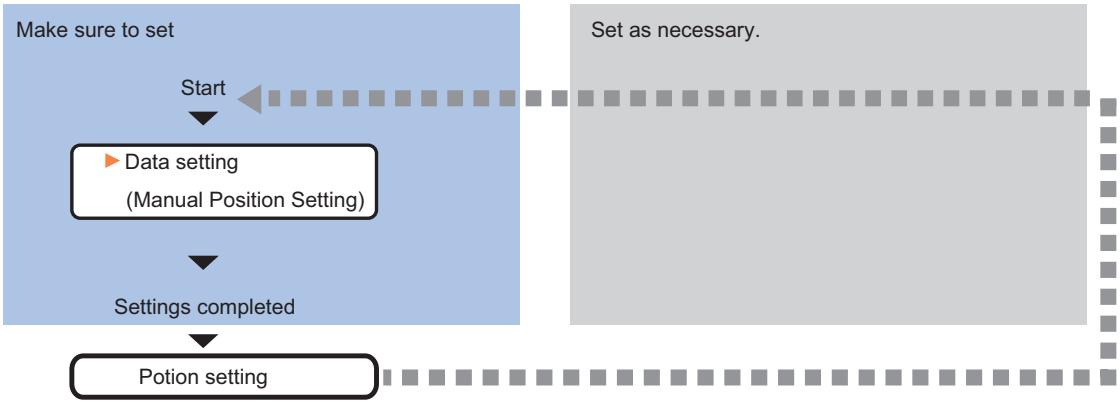
  Manually specify two lines and then specify the intersection.



Important

When the "Manual Position Setting" processing unit is set in the measurement flow, “Measurement initialization priority” at the startup setting performs an operation when the "Processing of redrawing on screen priority" is set up.

4-32-1 External Reference Tables (Manual Position Setting)



List of Manual Position Setting Items

Data setting dialog

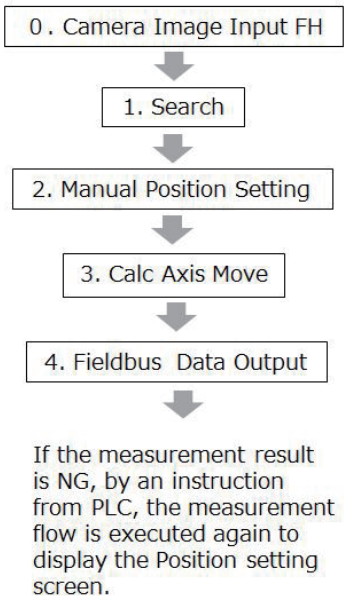
Item name	Description
Data setting	Sets target data for the Manual position setting.

Position setting dialog

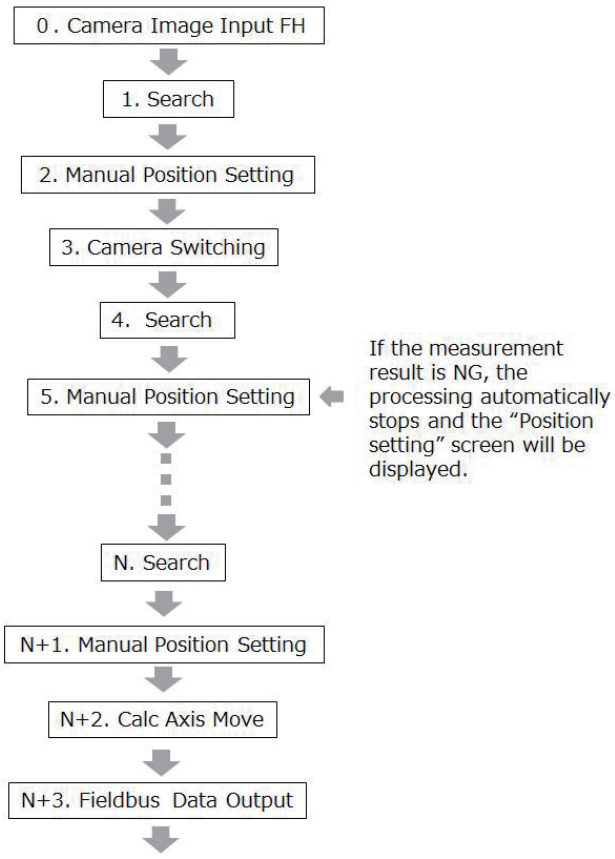
Item name	Description
Position setting	Manually specifies measured coordinates failed in measurement.

This processing unit can be utilized in the following two ways.

(a) Display the “Position setting” dialog by re-measurement.



(b) Display the “Position setting” dialog while a measurement flow is executed.



Display the “Position setting” dialog by re-measurement.

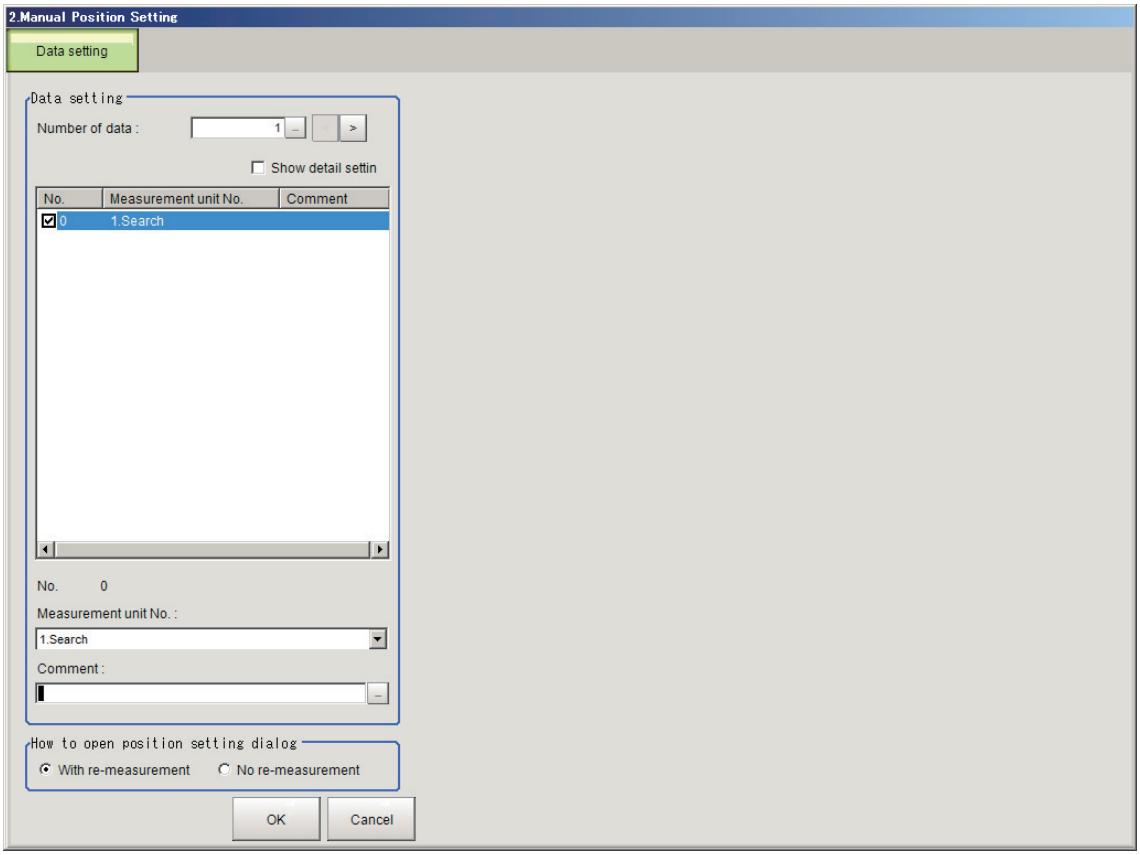
1. Place this processing unit just after an inspection/measurement processing unit such as Search. If there are multiple units then place this just after the last one.
2. After a series of processing flow is executed a processing unit such as Data output send measurement data to an upper device such as a PLC.
3. The upper device receives and checks the measurement data. If a position setting request flag were set, the device judges that the position setting is required again due to failure in measurement.
4. The upper device sends a measurement command to execute the measurement again.
5. Manually specify the alignment mark positions failed to measure on the “Position setting” dialog displayed.
6. This processing unit sets the input positions as measurement positions and turns off the position setting request flag.
7. A data processing unit recalculates movement amount based on the corrected measurement position. A processing unit such as Fieldbus data output sends the data to the upper device.

Display the “Position setting” dialog by re-measurement.

1. Place this processing unit just after an inspection/measurement processing unit such as Search. If there are multiple units then place this just after the last one.
2. When any inspection/processing unit placed before this processing unit failed to measure such as alignment marks, this processing unit interrupts the processing flow execution and displays the “Position setting” dialog.
3. Manually specify the alignment mark positions failed to measure on the “Position setting” dialog displayed.
4. The processing flow will be automatically restarted after setting the positions again.

4-32-2 Data Setting (Manual Position Setting)

In this dialog, register positions of inspection/measurement items set at “Measurement” such as Search. When a failure occurred in measurement, a model registered here is overlapped on a measurement image on the “Position setting” dialog popped up.

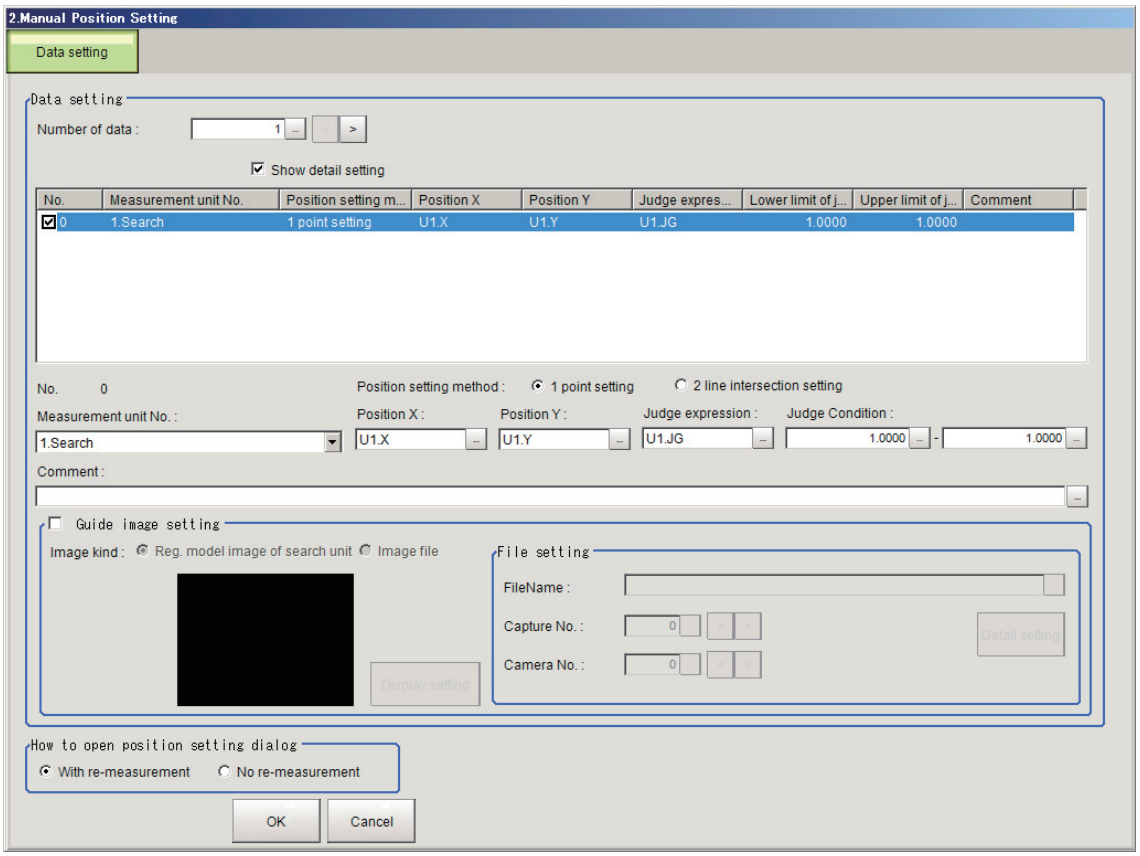


Setting item		Setting value [Factory default]	Description
Data setting			
	Number of data	1 to 100 [1]	Sets the number of target data for the Manual position setting.
	show detail setting	• Checked • [Unchecked]	Switches the detail setting and simplified setting. Checked: The detail setting dialog is displayed.
	Data list area		Displays the target data for the Manual position setting.
	No.		Displays the data number of the selection item in the data list.
	Measurement unit No.		Displays a measurement unit of the selection item in the data list. *1
	Comment	0 to 1000 characters [0]	Displays comments. Multilingual input is also available. For details, *refer to 3-2-2 Inputting Text in the Vision System FH/FHV/FZ5 series Users manual* (Z365).
	Measurement unit No.	[None]	Sets a measurement unit of the selection item in the data list.

Setting item	Setting value [Factory default]	Description
How to open position setting dialog	[With re-measurement]	After conditions set at the Data setting were mismatched, the Position dialog will be displayed by executing the measurement flow again. The measurement is suspended during displaying the dialog. The measurement is restarted after a user closes the dialog.
	No re-measurement	The Position setting dialog is automatically displayed in the measurement flow that conditions set at the Data setting were mismatched. The measurement is suspended during displaying the dialog. The measurement is restarted after a user closes the dialog.

*1. Such measurement processing units must be placed before this processing unit. If not, they will not be displayed.

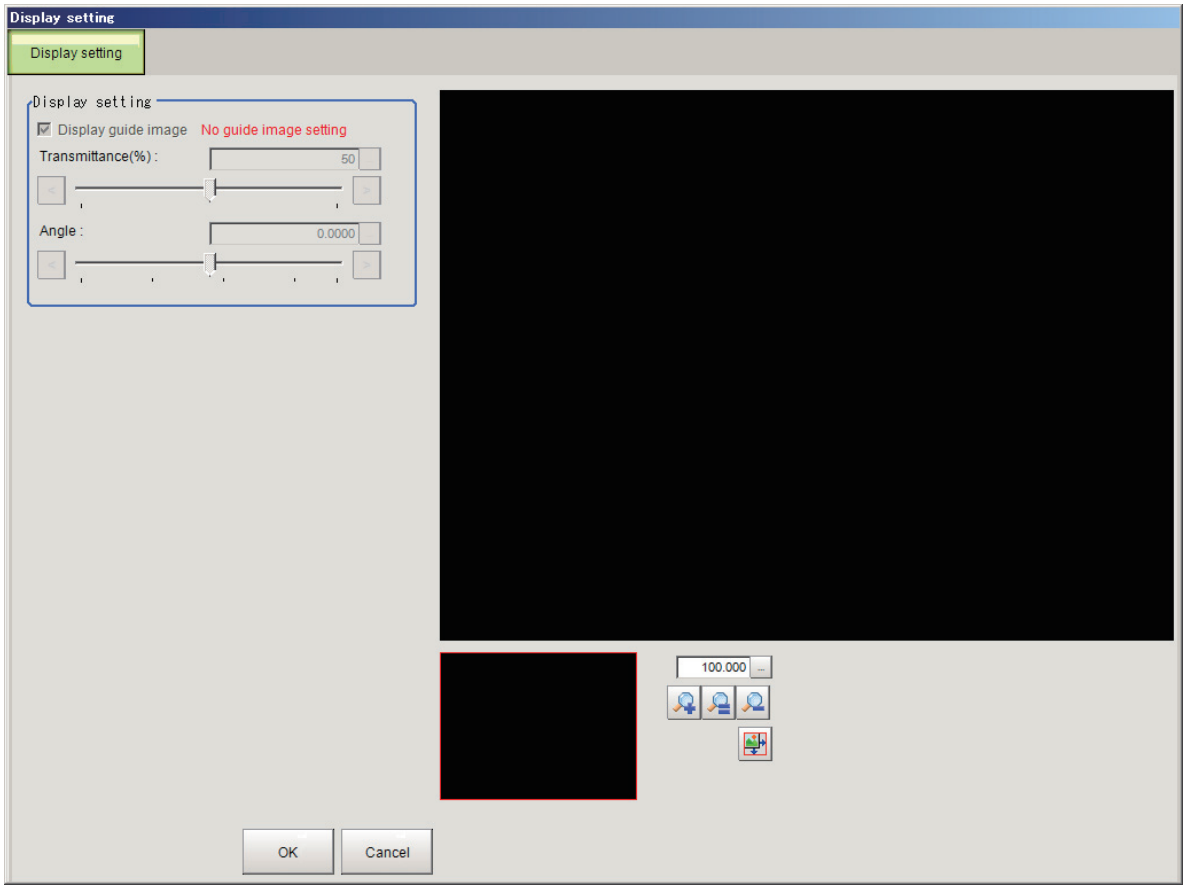
Detail setting dialog:



Setting item			Setting value [Factory default]	Description
Data setting				
	Number of data		1 to 100 [1]	Sets the number of target data for the Manual position setting.
	show detail setting		• Checked • [Unchecked]	Switches the detail setting and simplified setting. Checked: The detail setting dialog is displayed.
	Data list area			Displays the target data for the Manual position setting.
		No.		Displays the data number of the selection item in the data list.
		Measurement unit No.		Displays a measurement unit of the selection item in the data list. *1
		Position setting method		Displays how to set position.
		Position X		Displays the operation expression for the measurement position X.
		Position Y		Displays the operation expression for the measurement position Y.
		Judge expression		Displays the operation expression for NG judgement.
		Lower limit of judgment		Displays the range of the NG judgement expression.
		Upper limit of judgment		
		Comment	0 to 1000 characters [0]	Displays comments. Multilingual input is also available.
	No.			Displays the target data for the Manual position setting.
	Measurement unit No.			Displays a measurement unit of the selection item in the data list.
	Position setting method		• [1 point setting] • 2 line intersection setting	Sets how to set the position setting.
	Position X			Sets the operation expression of the position X becoming the setting base data.
	Position Y			Sets the operation expression of the position Y becoming the setting base data.
	Judge expression			Sets the judge expression for NG judgement.
	Judge Condition		-99999.9999 to 99999.9999 [-1.0000]	Sets the range for the NG judgment. The upper and lower values have same range and initial value.
	Comment		0 to 1000 Characters	Sets the comments for measurement units.
Guide image setting			• [Unchecked] • Checked	Sets whether or not to display a guide image in the “Position setting” dialog.
	Image kind		• [Reg. model image of search unit] • Image file	Sets a overlapped image.
	File setting			Sets a overlapped image.
		File name		Sets a file name.
		Capture No.	0 to 9999 [0]	Sets a capture number to be overlapped on a displayed image when the file selected in the “File name” is ifz, bfz, or jfz format.
		Camera No.	0 to 15 [0]	Sets a camera number to be overlapped on a displayed image when the file selected in the “File name” is ifz, bfz, or jfz format.
		Detail setting		This will be enabled when the “Image file” is selected in the “Image kind. The “Display range setting” dialog will be displayed.

*1. Such measurement processing units must be placed before this processing unit. If not, they will not be displayed.

4-32-3 Display Setting (Manual Position Setting)

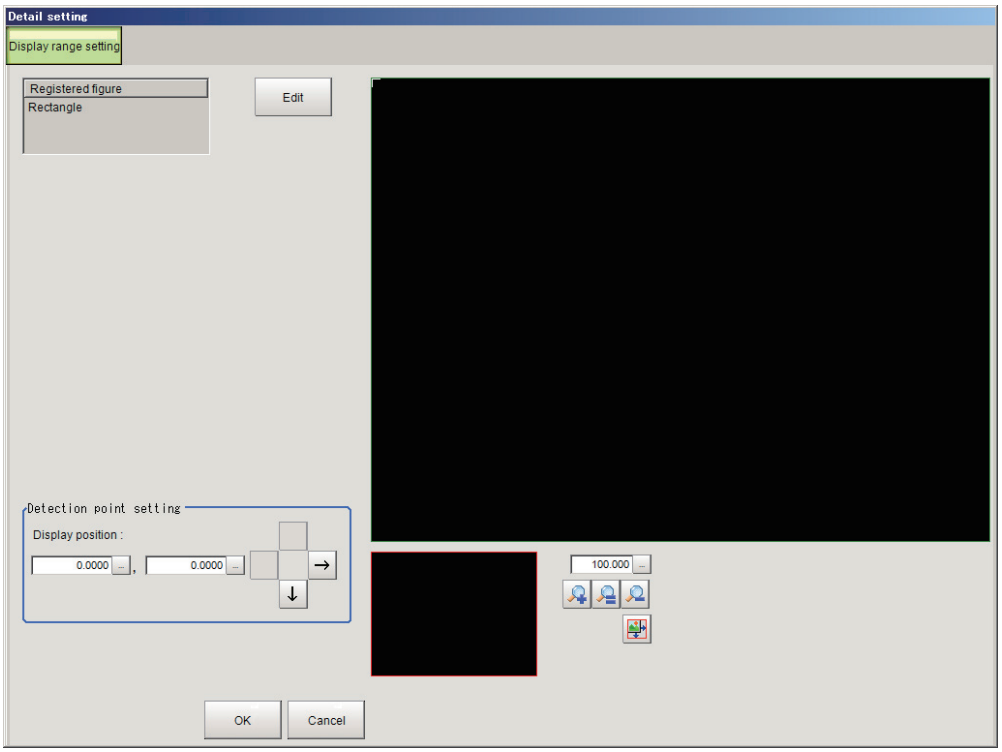


Setting item		Setting value [Factory default]	Description
Display setting			Sets how to display a guide image. Values set here will be the initial values in the Position setting dialog.
	Display guide image	• Unchecked • [Checked]	Sets whether or not to display the guide image.
	Transmittance [%]	0 to 100 [50]	Sets the transmittance for the guide image. As close to 100%, the guide image becomes transparent.
	Angle	-180.000 to 180.000 [0]	Sets the rotation angle of the guide image. The image rotates on the detected position.

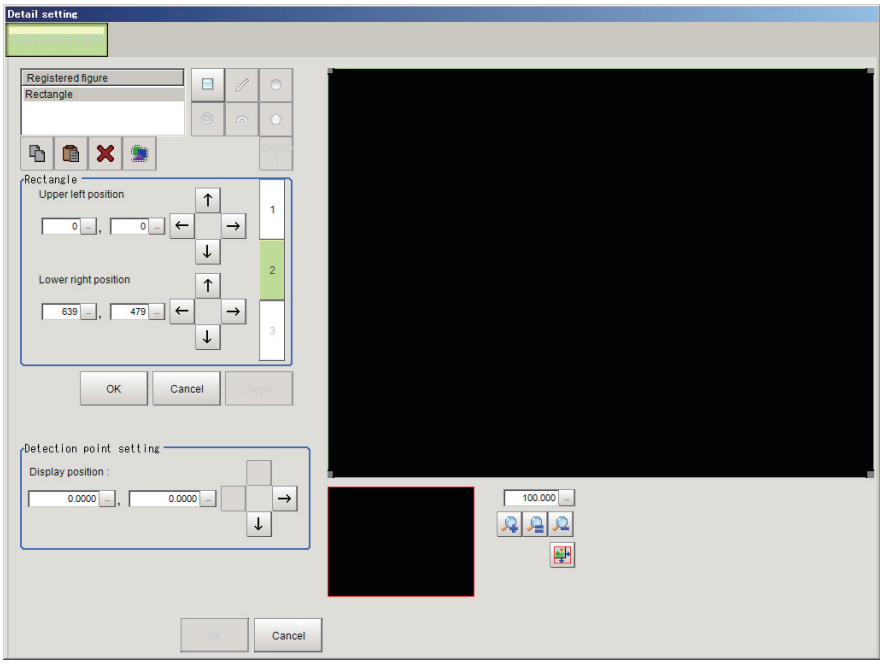
4-32-4 Detail Setting (Manual Position Setting)

In this dialog, perform the display setting for the guide image. Values set in this dialog are used as the initial values in the “Position setting” dialog. This dialog is enabled when the “Image file” is selected in the “Image kind”.

Initial screen:



When clicking [Edit]:

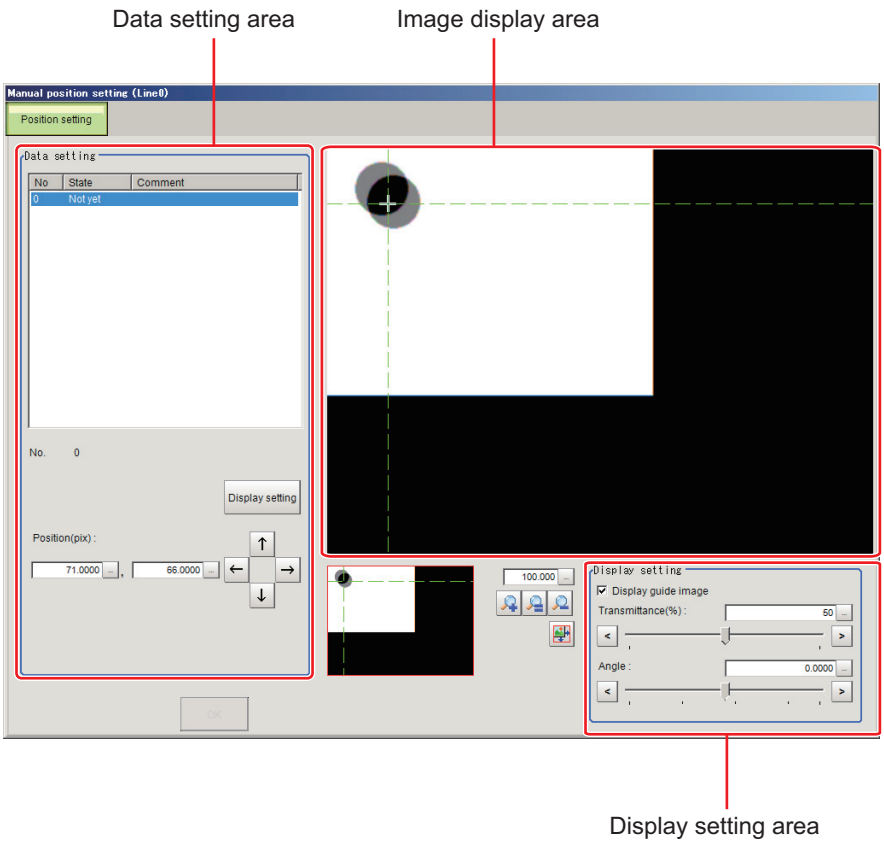


Setting item	Setting value [Factory default]	Description
Registered figure	[Full screen]	Sets the display range for the guide image. The figure is fixed to Rectangle.
Detection point setting	X: 0 to 99999 [0]	Sets the display position for the guide image.
	Y: 0 to 99999 [0]	

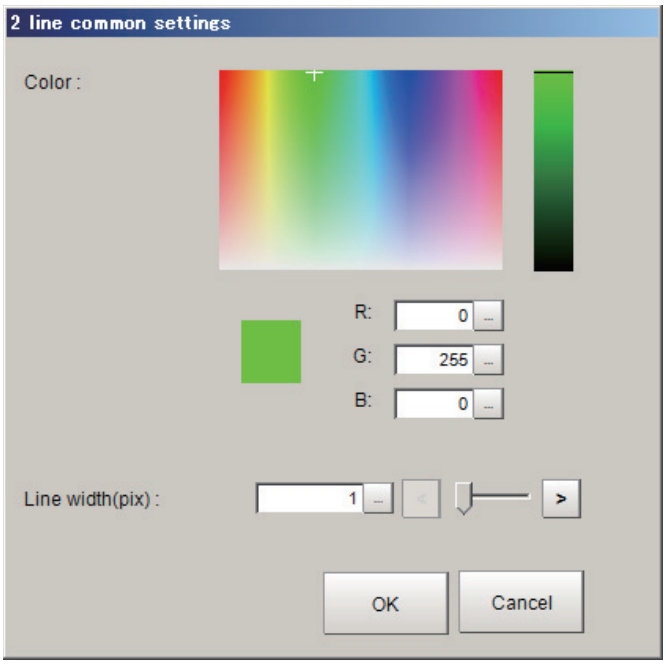
4-32-5 Position Setting Dialog (Manual Position Setting)

This dialog is displayed when a measurement processing unit such as Search is failed to measure alignment marks. Select a target data in the data list to perform the position setting.

1 Point Setting



- 2-line common settings:



1 The failed measurement points are displayed in the setting data list as “Not yet”. Click an item to set from the list.

When the “Display guide image” is selected, the guide image such as an alignment mark is overlapped on the displayed image in the image display area. \

2 When the position is correct, click the intersection on the display or input numerical values to set the position. If not correct, then click a correct position on the display or input numerical values to set it.

3 Repeat the step 1 to 2 until all “Not yet” items in the setting data list become “Done”.

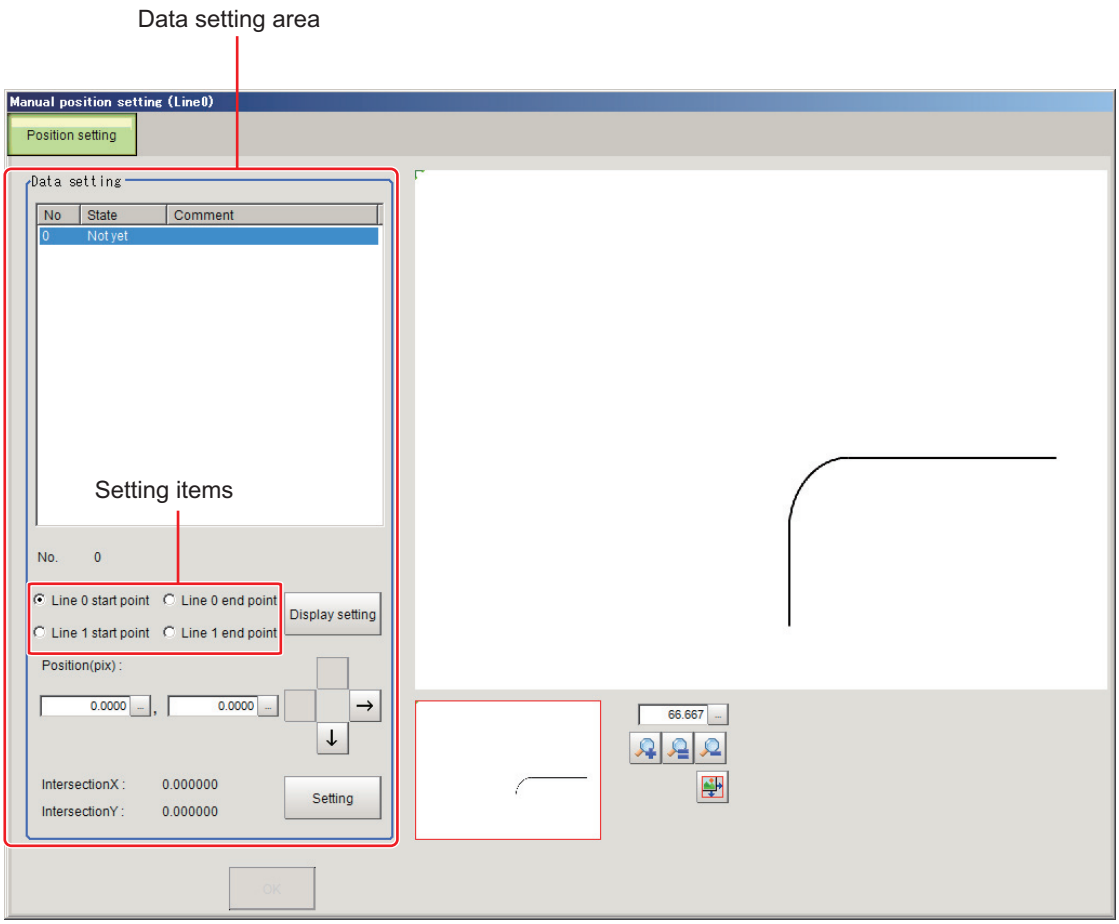
4 Click [OK] when all items become “Done”.

The dialog is closed and the measurement processing is restarted.

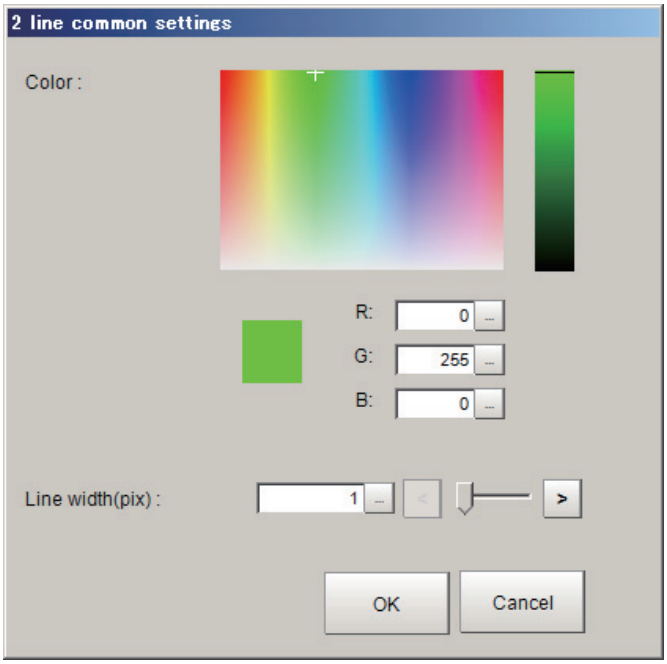
Setting item	Setting value [Factory default]	Description
Data setting		
Setting data list		Displays target data for the position setting.
No.		Data No.
State	• [Not yet] • Done	Displays the status for the measurement target.
Comment		
Position [pix]	0.0000 to 99999.9999	Sets the position. Unit: pixel
Display setting	R: [0] to 255 G: 0 to [255] B: [0] to 255 Line width [pix]: [1] to 10	Displays the 2 line common settings dialog when clicking. Sets the color and width of dotted lines that indicate the X/Y position to be set.

Setting item	Setting value [Factory default]	Description
Display setting		
Display guide image	• Checked • [Unchecked]	Sets whether or not to display a guide image overlapped on the displayed image. Unchecked: The guide image is not displayed.
Transmittance [%]	0 to 100 [Set in the “Data setting” dialog.]	Sets the transmittance for the guide image. As close to 100%, the guide image becomes transparent.
Angle	-180.000 to 180.000 [Set in the “Data setting” dialog.]	Sets the rotation angle of the guide image. The image rotates on the detected position.

2 line Intersection setting

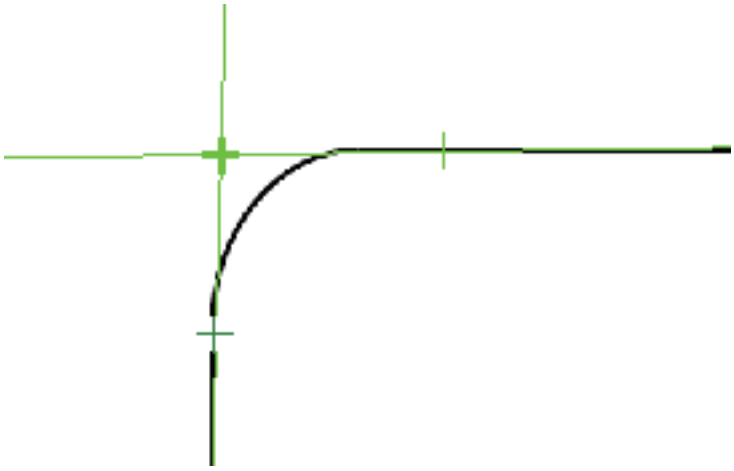


- 2-line common settings:



1 The failed measurement points are displayed in the setting data list as “Not yet”. Click an item to set from the list.

2 Click two points on each line of the measurement target to display the intersection position. Click the intersection on the display or input numerical values to set the position.



3 Repeat the step 1 to 2 until all “Not yet” items in the setting data list become “Done”.

4 Click [OK] when all items become “Done”.

The dialog is closed and the measurement processing is restarted.

Setting item	Setting value [Factory default]	Description
Data setting		
Setting data list		Displays target data for the position setting.
No.		Data No.
State	• [Not yet] • Done	Displays the status for the measurement target.
Comment		
Setting items		Specifies the start and end points of line 0 and 1 respectively.
Display setting	R: [0] to 255 G: 0 to [255] B: [0] to 255 Line width [pix]: [1] to 10	Displays the 2 line common settings dialog when clicking. Sets the color and width of dotted lines that indicate the X/Y position to be set.
Position [pix]	0.0000 to 99999.9999	Sets the position. Unit: pixel
Intersection X/Y		Displays the intersection position.
Setting		When clicking, the current intersection is updated as the setting.

4-32-6 Position Setting Dialog (Manual Position Setting)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
5	Position setting request flag	settingRequiredFlag	Get only	0: Not need position setting 1: Need position setting
6	Position setting complete flag	settingCompletedFlag	Get only	0: Not yet position setting 1: Position setting is completed.
120	Number of data	dataNum	Set/Get	1 to 100
121	How to open position setting dialog	displayKind	Set/Get	0: With re-measurement 1: No re-measurement
200	Show detail setting	detailSetting	Set/Get	0: OFF 1: ON
1001+Nx100 (N: 0 to 99)	Position X	positionX	Get only	-
1002+Nx100 (N: 0 to 99)	Position Y	positionY	Get only	-
1010+Nx100 (N: 0 to 99)	Setting ON/OFF	enableFlag	Set/Get	0: OFF 1: ON
1011+Nx100 (N: 0 to 99)	Measurement unit No.	measurementUnitNo	Set/Get	-1: No reference 0 to 9,999: Measurement unit referred
1012+Nx100 (N: 0 to 99)	Position X	expPositionX	Set/Get	Exp. Character string
1013+Nx100 (N: 0 to 99)	Position Y	expPositionY	Set/Get	Exp. Character string
1014+Nx100 (N: 0 to 99)	Judge expression	expJudge	Set/Get	Exp. Character string
1015+Nx100 (N: 0 to 99)	Lower limit of judgement	upperJudge	Set/Get	-999,999,999.9999 to 999,999,999.9999
1016+Nx100 (N: 0 to 99)	Lower limit of judgement	lowerJudge	Set/Get	-999,999,999.9999 to 999,999,999.9999
1017+Nx100 (N: 0 to 99)	Comment	comment	Set/Get	Character string
1018+Nx100 (N: 0 to 99)	Position setting method	posSettingType	Set/Get	0: One point setting 1: Two-line intersection setting
1019+Nx100 (N: 0 to 99)	Guide image Setting	imageGuideSetting	Set/Get	0: OFF 1: ON
1020+Nx100 (N: 0 to 99)	Guide image kind	imageGuideSetting-Type	Set/Get	0: Registered model image of search unit 1: Image file
1021+Nx100 (N: 0 to 99)	Image file path	imageFilePath	Set/Get	Character string
1022+Nx100 (N: 0 to 99)	Capture No.	captureNo	Set/Get	0 to 9,999
1023+Nx100 (N: 0 to 99)	Camera No.	cameraNo	Set/Get	0 to 15
1024+Nx100 (N: 0 to 99)	Detection point X	detectionPosX	Set/Get	0 to 99,999.9999
1025+Nx100 (N: 0 to 99)	Detection point Y	detectionPosY	Set/Get	0 to 99,999.9999
1026+Nx100 (N: 0 to 99)	Display guide image	imageGuideDisplay	Set/Get	0: OFF 1: ON

No.	Data name	Ident	Set/Get	Data range
1027+Nx100 (N: 0 to 99)	Transmittance (%)	transmittance	Set/Get	0 to 100
1028+Nx100 (N: 0 to 99)	Angle	angle	Set/Get	-180.0000 to 180.0000

4-33 Camera Calibration

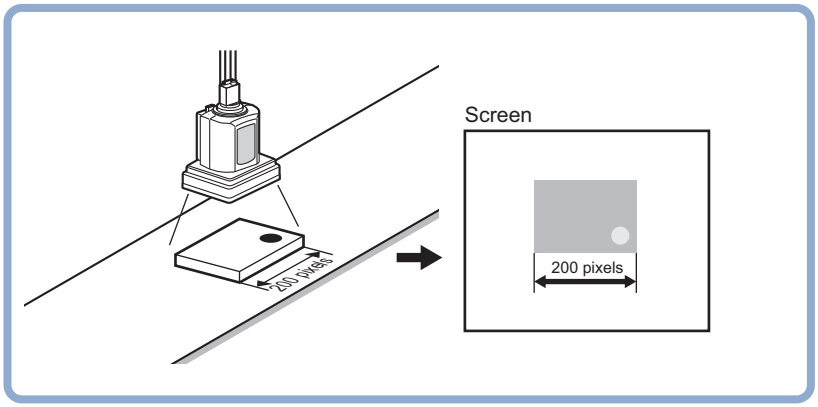
By setting the camera calibration, the measurement result can be converted and output as actual dimensions. It allows users to perform more flexible adjustment and edit using the measurement flow compared to the calibration function provided as the camera image input processing item.

- The sampling function can be used in combination with the Measurement Processing Unit in the measurement flow.
- Scaling can be calculated from the measured work width and actual work width.
- Generated calibration data can be adjusted or edited.

Used in the Following Case

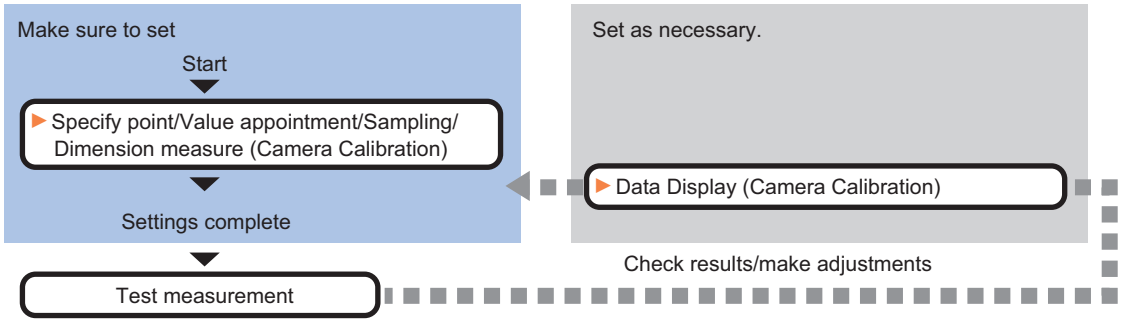
When you want to output the measurement result of a Processing Unit as actual dimensions

Example) When you want to output the measurement result of the Processing Unit as actual dimensions.



4-33-1 Settings Flow (Camera Calibration)

Set the camera calibration with the following steps.



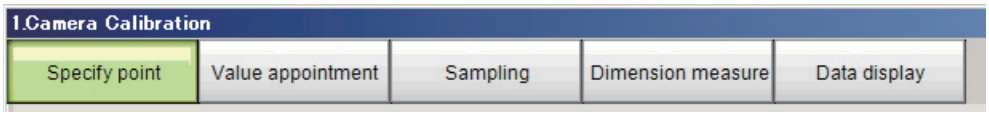
List of Camera Calibration Items

Item name	Description
Specify point	Set a given pixel to make the calibration setting. Calibration parameters are calculated automatically when actual coordinates of specified locations are set. Refer to *4-33-2 Specify point (Camera Calibration)* on page 4-243.
Value appointment	Set the magnification ratio as a numeric value to make the calibration setting. Refer to *4-33-3 Value Appointment (Camera Calibration)* on page 4-244.
Sampling	Make the calibration setting based on the measurement results. After measuring a position using the measurement processing items in the measurement flow, set the position as an actual coordinates to calculate calibration data. Refer to *4-33-4 Sampling (Camera Calibration)* on page 4-246.
Dimension measure	Make the calibration setting based on the measurement results. After measuring work width using the measurement processing items in the measurement flow, set the actual work width to calculate calibration data. Refer to *4-33-5 Dimension Measure (Camera Calibration)* on page 4-249.
Data display	Display the generated calibration data. The calibration data can be adjusted or edited as necessary. Refer to *4-33-6 Data Display (Camera Calibration)* on page 4-251.

4-33-2 Specify point (Camera Calibration)

Specify a given pixel to make the calibration setting. Calibration parameters can be calculated by setting the actual coordinates of specified locations. Up to 100 points can be set.

1 In the Item Tab area, click [Specify point].



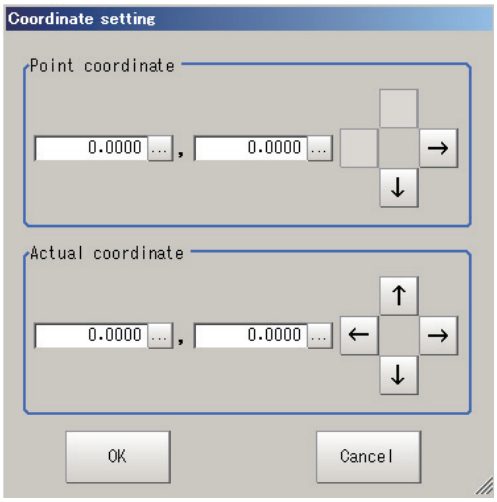
2 In the [Display] area, click [Change display] to select the camera image type.

Setting item	Setting value [Factory default]	Description
Display	Through image display	The latest image is always input from the camera and displayed.
	[Freeze image display]	The image that was scanned in the immediately preceding measurement is displayed.

3 Click the first point on the screen.

4 Set the actual coordinates for the specified point.

The actual coordinate input window is displayed.



Actual coordinate	Setting value [Factory default]
Point coordinate X, Y	0 to 9999.9999 [Point you clicked in the window]
Actual coordinate X, Y	-99999.9999 to 99999.9999 [0]

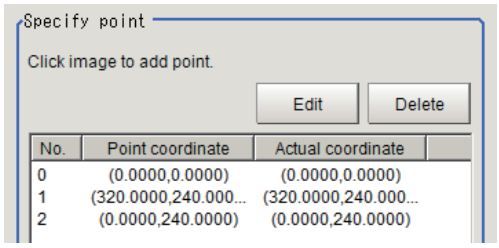
5 Set the 2nd, 3rd and subsequent points in the same way.

6 Edit or delete the coordinates as required.

Select the points to be edited or deleted from the list.

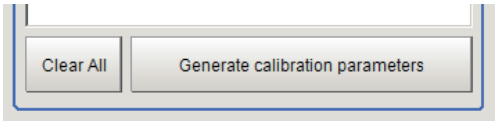
Click [Edit] or [Delete].

To delete all points, click [Clear All].



7 Click [Generate calibration parameters].

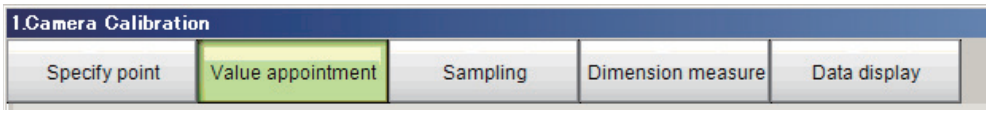
The calibration parameters will be generated.



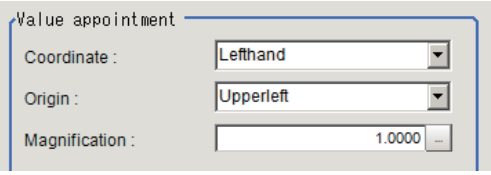
4-33-3 Value Appointment (Camera Calibration)

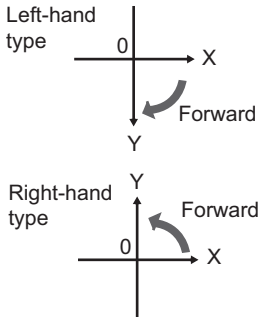
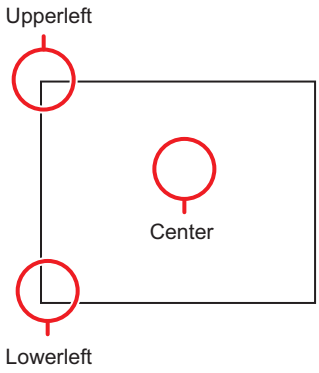
Set the magnification ratio as a numeric value to make the calibration setting.

1 In the Item Tab area, click [Value appointment].



2 Set the [Value appointment] area.



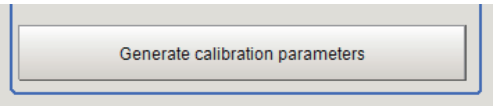
Setting item	Setting value [Factory default]	Description
Coordinate	• [Lefthand] • Righthand	Lefthand: Clockwise is forward when specifying the coordinates. Righthand: Counter-clockwise is forward when specifying the coordinates. 
Origin	• [Upperleft] • Lowerleft • Center • Specify point	Select where the origin of the actual coordinates will be. 
Magnification	0.0001 to 9.9999 [1.0000]	Specify the ratio of 1 pixel to the actual dimensions.

- If "Specify point" is selected for [Origin].

Setting item	Setting value [Factory default]	Description
Camera X and Y	-99999.9999 to 99999.9999 [0]	Set the camera coordinates for a given point. If the origin of the actual coordinates is included in the field of view, measure the origin position of the actual coordinates in advance and set them to the camera coordinates X and Y.
Changed X and Y	-99999.9999 to 99999.9999 [0]	Set the actual coordinate values set as the camera coordinates. If the origin position of the actual coordinates is set as the camera coordinates, set (0.0, 0.0).

3 Click [Generate calibration parameters].

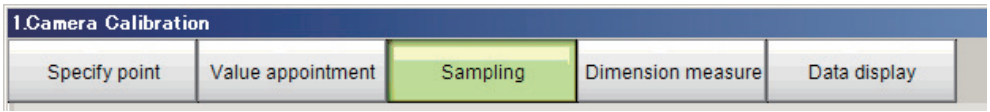
The calibration parameters will be generated.



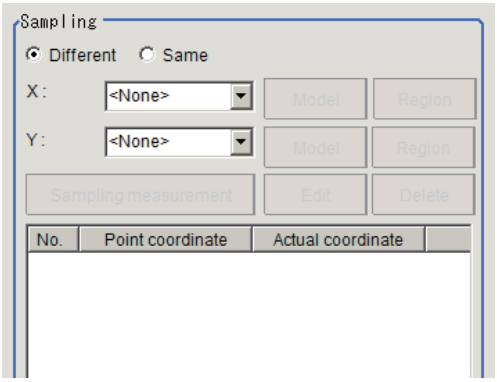
4-33-4 Sampling (Camera Calibration)

Make the calibration setting based on the measurement results. After measuring a position using the measurement processing items in the measurement flow, set the position as an actual coordinates to calculate calibration data.

1 In the Item Tab area, click [Sampling].



2 Set the [Sampling] area.



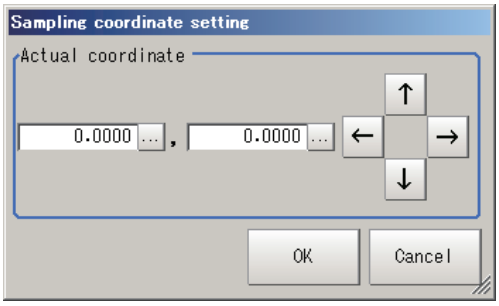
Setting item	Setting value [Factory default]	Description
XY specification method	• [Different] • Same	Different: Set X and Y individually. Same: Use the measurement results of the Processing Unit selected for X specification to specify Y.
X specification	• Processing Unit that can measure positions during the measurement flow. • [None]	Select the Processing Unit in the measurement flow used to sample the X coordinate.
Y specification	• Processing Unit that can measure positions during the measurement flow. • [None]	Select the Processing Unit in the measurement flow used to sample the Y coordinate. If "Same" is specified as the XY specification method, this cannot be selected.

3 Click [Model] and [Region] as needed to set sampling measurement conditions.

4 Click [Sampling measurement].

5 Set the actual coordinates for the specified point.

The actual coordinate input window is displayed.



Actual coordinate	Setting value [Factory default]
Actual coordinate X, Y	-99999.9999 to 99999.9999 [0]

The measurement result is added to the list.

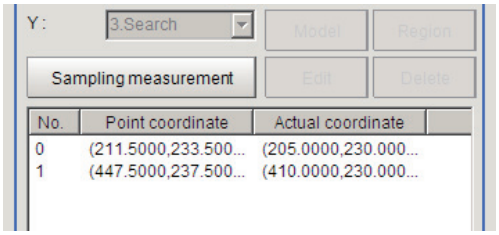
6 Set the 2nd, 3rd and subsequent points in the same way.

7 Edit or delete the coordinates as required.

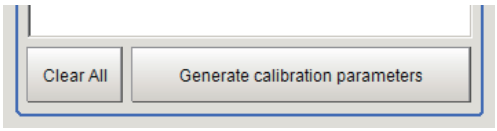
Select the points to be edited or deleted from the list.

Click [Edit] or [Delete].

To delete all points, click [Clear All].



8 Click [Generate calibration parameters].
The calibration parameters will be generated.



9 Changes display settings as needed.

Setting item	Setting value [Factory default]	Explanation
Display setting	• [Input image] • X unit image • Y unit image	Select the type of image to display in the Image display area. The display setting is valid only in the sampling tab screen.

Additional Information

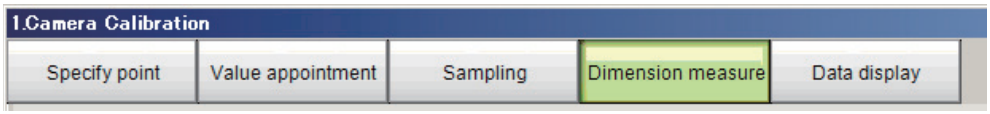
The following processing items can be used for two point measurement in sampling.

- Search
- EC Circle Search
- ECM Search
- Ec Corner
- Ec Cross
- Shape Search II
- Shape Search III
- Edge Position
- Scan Edge Position
- Gravity and Area
- Labeling

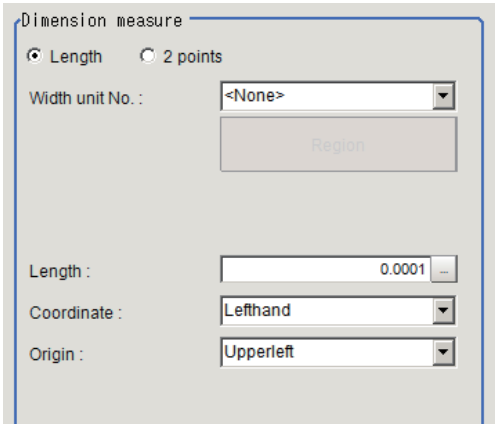
4-33-5 Dimension Measure (Camera Calibration)

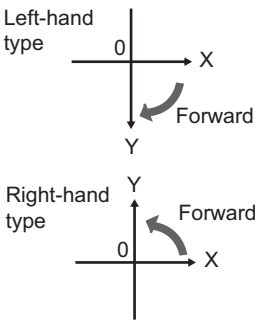
Make the calibration setting based on the measurement results. After measuring work width using the measurement processing items in the measurement flow, set the actual work width to calculate calibration data.

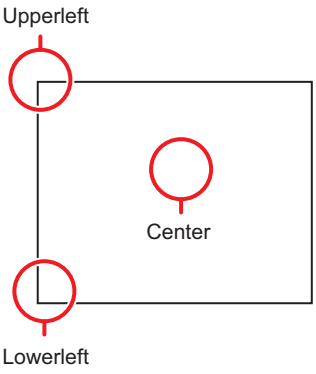
1 In the Item Tab area, click [Dimension measure].



2 Set the [Dimension measure] area.



Setting item	Setting value [Factory default]	Description
Dimension measure	• [Length] • 2 points	Length: Measures dimensions using the measurement results of the Processing Unit that measures the width. The width reference unit selection and area measurement buttons are displayed. 2 points: Measures dimensions using the measurement results of the processing unit that measures points. The select point reference units 1/2 and area measurement buttons are displayed.
Length	0.0001 to 99999.9999 [0.0001]	Set actual dimensions as the work dimensions.
Coordinate	• [Lefthand] • Righthand	Lefthand: Clockwise is forward when specifying the coordinates. Righthand: Counter-clockwise is forward when specifying the coordinates. 

Setting item	Setting value [Factory default]	Description
Origin	• [Upperleft] • Lowerleft • Center • Specify point	Select where the origin of the actual coordinates will be. 

- If "Length" is selected for [Dimension measure].

Setting item	Setting value [Factory default]	Description
Width unit No.	• Width reference unit in the measurement flow • [<None>]	Select the scan edge width processing unit in the current scene.

- If "2 points" is selected for [Dimension measure].

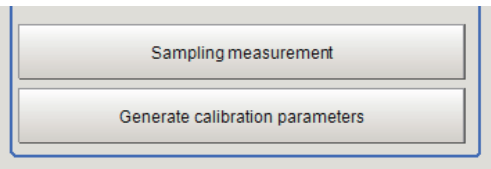
Setting item	Setting value [Factory default]	Description
Point 1 and 2 unit No.	• Point width measurement unit in the measurement flow • [<None>]	Select the processing unit that can perform point measurement in the current scene.

- If "Specify point" is selected for [Origin].

Setting item	Setting value [Factory default]	Description
Camera X and Y	-99999.9999 to 99999.9999 [0]	Set the camera coordinates for a given point. If the origin of the actual coordinates is included in the field of view, measure the origin position of the actual coordinates in advance and set them to the camera coordinates X and Y.
Changed X and Y	-99999.9999 to 99999.9999 [0]	Set the actual coordinate values set as the camera coordinates. If the origin position of the actual coordinates is set as the camera coordinates, set (0.0, 0.0).

3 Click [Region] as needed to set sampling measurement conditions.

4 Click [Sampling measurement].



5 Click [Generate calibration parameters].

The calibration parameters will be generated.

9 Changes display settings as needed.

Setting item	Setting value [Factory default]	Explanation
Display setting	• [Input image] • X unit image • Y unit image	Select the type of image to display in the Image display area. The display setting is valid only in the sampling tab screen.

Additional Information

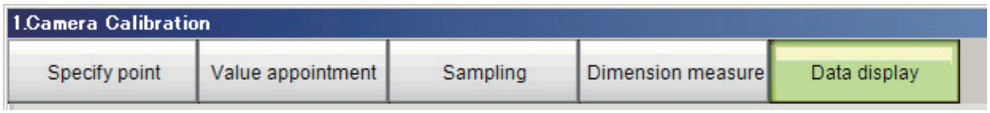
The following processing items can be used for two point measurement in sampling.

- Search
- EC Circle Search
- ECM Search
- Ec Corner
- Ec Cross
- Shape Search II
- Shape Search III
- Edge Position
- Scan Edge Position
- Gravity and Area
- Labeling

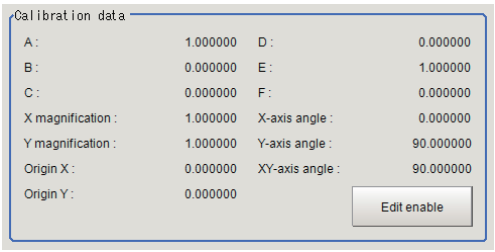
4-33-6 Data Display (Camera Calibration)

Display the generated calibration data. The calibration data can be adjusted or edited as necessary.

1 In the Item Tab area, click [Data display].



2 In the [Calibration data] area, confirm the calibration data.



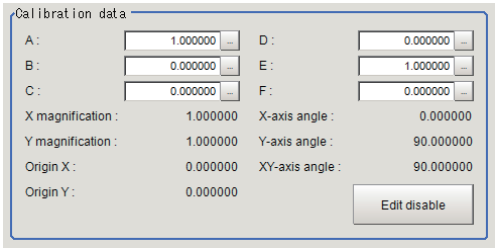
Item	Description
A	These are calibration conversion values. Camera coordinates are converted to actual coordinates based on these values. The conversion formulas for actual coordinates are as follows: (X, Y): Measurement point (camera coordinates), Unit: pix (X', Y'): Conversion point (actual coordinates) X' = A × X + B × Y + C Y' = D × X + E × Y + F
B	
C	
D	
E	
F	
X magnification	Magnification ratio for the X axis in the coordinate system after calibration
Y magnification	Magnification ratio for the Y axis in the coordinate system after calibration
Origin X	The origin X position in the coordinate system after calibration
Origin Y	The origin Y position in the coordinate system after calibration
X-axis angle	The X axis angle in the coordinate system after calibration
Y-axis angle	The Y axis angle in the coordinate system after calibration
XY-axis angle	Angle created by the X and Y axes in the coordinate system after calibration.

Edit the calibration result

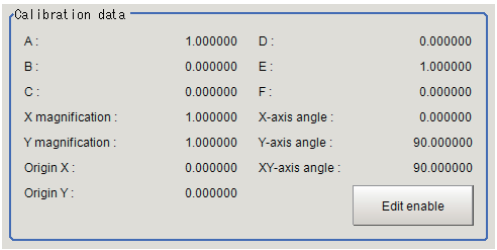
If, for example, you already know calibration parameters, you can directly edit the generated calibration parameters.

1 Click [Edit disable] in the [Calibration data] area.

This will enable you to edit calibration parameters A to F.



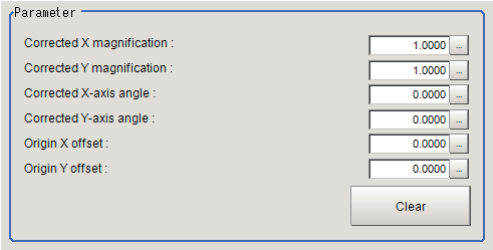
2 In the [Calibration data] area, confirm the modification made.



Compensate the calibration result

The calibration result can be compensated by setting the compensation amounts such as magnification ratios and offsets for the actual dimensions and actual coordinates.

1 Set the compensation values in the [Parameter] area.



Setting item	Setting value [Factory default]	Description
Corrected X/Y magnification	0.5000 to 1.5000 [1.0000]	Set the compensation amounts for the X axis ratio and Y axis ratio respectively.
Corrected X/Y-axis angle	-180.0000 to 180.0000 [0]	Set the compensation amounts for the X axis angle and Y axis angle respectively.
Origin X/Y offset	-9999.9999 to 9999.9999 [0]	Set the compensation amounts for the X and Y coordinates of the origin respectively.

2 In the [Calibration data] area, confirm the compensation result.

Additional Information

The following relational expressions can be made for calibration parameters and compensation values. Be careful about the relationships between the pre-compensation and post-compensation parameters when adjusting parameters.

Before adjustment: A1, B1, C1, D1, E1, F1

After adjustment: A2, B2, C2, D2, E2, F2

Compensation ratio X: KX, Compensation ratio Y: KY

Compensation angle X: θX, Compensation angle Y: θY

X origin offset setting: OX

Y origin offset setting: OY

- $A2 = KX \times (A1 \times \cos\theta X - D1 \times \sin\theta X)$
- $B2 = KY \times (B1 \times \cos\theta Y - E1 \times \sin\theta Y)$
- $C2 = C1 - OX$
- $D2 = KX \times (A1 \times \sin\theta X + D1 \times \cos\theta X)$
- $E2 = KY \times (B1 \times \sin\theta Y + E1 \times \cos\theta Y)$
- $F2 = F1 - OY$

4-33-7 Measurement Results for Which Output Is Possible (Camera Calibration)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result

4-33-8 External Reference Tables (Camera Calibration)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
5	A (corrected)	calibParamA	Get only	-
6	B (corrected)	calibParamB	Get only	-
7	C (corrected)	calibParamC	Get only	-
8	D (corrected)	calibParamD	Get only	-
9	E (corrected)	calibParamE	Get only	-
10	F (corrected)	calibParamF	Get only	-
11	X magnification (corrected)	scaleX	Get only	-
12	Y magnification (corrected)	scaleY	Get only	-
13	Origin X (corrected)	centerX	Get only	-
14	Origin Y (corrected)	centerY	Get only	-
15	X-axis angle (corrected)	angleX	Get only	-
16	Y-axis angle (corrected)	angleY	Get only	-
17	XY-axis angle (corrected)	angleXY	Get only	-
120	Point number (Point)	pointNum	Set/Get	0 to 100
121	Operating point No.	operatePointNo	Set/Get	-1 to 99
130	Coordinate (Value)	valCoordinate	Set/Get	0: Righthand 1: Lefthand
131	Origin (Value)	valOrigin	Set/Get	0: Upperleft 1: Lowerleft 2: Center 3: Point set
132	Magnification (Value)	valScale	Set/Get	0.0001 to 9.9999
134	Camera X (Value)	valCameraX	Set/Get	-99,999.9999 to 99,999.9999
135	Camera Y (Value)	valCameraY	Set/Get	-99,999.9999 to 99,999.9999
136	Transfered X (Value)	valTransX	Set/Get	-99,999.9999 to 99,999.9999
137	Transfered Y (Value)	valTransY	Set/Get	-99,999.9999 to 99,999.9999
140	Point number (Sampling)	samplingPointNum	Set/Get	0 to 100

No.	Data Name	Ident	Set/Get	Data range
141	Operating sampling No.	operateSamplingNo	Set/Get	-1 to 99
142	X unit No.	samplingUnitX	Set/Get	-1: No reference 0 to 9,999: Refer to unit No.
144	Y unit No.	samplingUnitY	Set/Get	-1: No reference 0 to 9,999: Refer to unit No.
147	Sampling mode	samplingMode	Set/Get	0: Difference 1: Same
148	Display setting (Sampling)	dispSettingSampling	Set/Get	0: Input image 1: X unit image 2: Y unit image
150	Coordinate (Dimension)	dimCoordinate	Set/Get	0: Righthand 1: Lefthand
151	Origin (Dimension)	dimOrigin	Set/Get	0: Upperleft 1: Lowerleft 2: Center 3: Point set
152	Length	dimLength	Set/Get	0.0001 to 99,999.9999
154	Camera X (Dimension)	dimCameraX	Set/Get	-99,999.9999 to 99,999.9999
155	Camera Y (Dimension)	dimCameraY	Set/Get	-99,999.9999 to 99,999.9999
156	Transfered X (Dimension)	dimTransX	Set/Get	-99,999.9999 to 99,999.9999
157	Transfered Y (Dimension)	dimTransY	Set/Get	-99,999.9999 to 99,999.9999
158	Width unit No.	dimWidthUnit	Set/Get	-1: No reference 0 to 9,999: Refer to unit No.
159	Point1 unit No.	dimPointUnit1	Set/Get	-1: No reference 0 to 9,999: Refer to unit No.
160	Point2 unit No.	dimPointUnit2	Set/Get	-1: No reference 0 to 9,999: Refer to unit No.
161	Dimension mode	dimMode	Set/Get	0: Width 1: 2 points
162	Display setting (Width)	dispSettingWidth	Set/Get	0: Input image 1: Width unit image
163	Display setting (Points)	dispSettingWidthPoint	Set/Get	0: Input image 1: Point1 unit image 2: Point2 unit image
170	A (uncorrected)	calibParamA_src	Set/Get	-999,999,999.999999 to 999,999,999.999999
171	B (uncorrected)	calibParamB_src	Set/Get	-999,999,999.999999 to 999,999,999.999999
172	C (uncorrected)	calibParamC_src	Set/Get	-999,999,999.999999 to 999,999,999.999999
173	D (uncorrected)	calibParamD_src	Set/Get	-999,999,999.999999 to 999,999,999.999999
174	E (uncorrected)	calibParamE_src	Set/Get	-999,999,999.999999 to 999,999,999.999999
175	F (uncorrected)	calibParamF_src	Set/Get	-999,999,999.999999 to 999,999,999.999999
176	X magnification (uncorrected)	scaleX_src	Get only	-

No.	Data Name	Ident	Set/Get	Data range
177	Y magnification (uncorrected)	scaleY_src	Get only	-
178	Origin X (uncorrected)	centerX_src	Get only	-
179	Origin Y (uncorrected)	centerY_src	Get only	-
180	X-axis angle (uncorrected)	angleX_src	Get only	-
181	Y-axis angle (uncorrected)	angleY_src	Get only	-
182	XY-axis angle (uncorrected)	angleXY_src	Get only	-
183	Corrected X magnification	correctScaleX	Set/Get	0.5000 to 1.5000
184	Corrected Y magnification	correctScaleY	Set/Get	0.5000 to 1.5000
185	Corrected X-axis angle	correctAngleX	Set/Get	-180.0000 to 180.0000
186	Corrected Y-axis angle	correctAngleY	Set/Get	-180.0000 to 180.0000
187	Origin X offset	correctCenterX	Set/Get	-9,999.9999 to 9,999.9999
188	Origin Y offset	correctCenterY	Set/Get	-9,999.9999 to 9,999.9999
200+N (N: 0 to 99)	camera X of specified point	pointCameraX_	Set/Get	0 to 99,999.9999
300+N (N: 0 to 99)	camera Y of specified point	pointCameraY_	Set/Get	0 to 99,999.9999
400+N (N: 0 to 99)	real X of specified point	pointRealX_	Set/Get	-99,999.9999 to 99,999.9999
500+N (N: 0 to 99)	real Y of specified point	pointRealY_	Set/Get	-99,999.9999 to 99,999.9999
600+N (N: 0 to 99)	camera X of sampling point	samplingPositionX_	Set/Get	0 to 99,999.9999
700+N (N: 0 to 99)	camera Y of sampling point	samplingPositionY_	Set/Get	0 to 99,999.9999
800+N (N: 0 to 99)	real X of sampling point	realPositionX_	Set/Get	-99,999.9999 to 99,999.9999
900+N (N: 0 to 99)	real Y of sampling point	realPositionY_	Set/Get	-99,999.9999 to 99,999.9999

4-34 Data Save

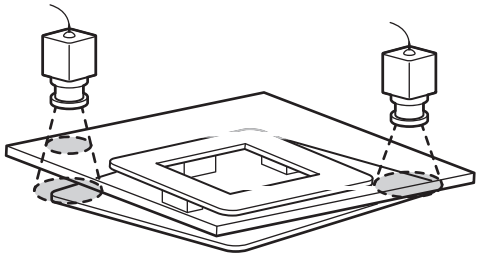
This processing item can not be used in the FHV series.

Set data that you want to manage or store in units of scenes in this processing item using a arithmetic expression.

The set data can be saved in the controller main unit or as scene data.

Used in the Following Case

If you want to store measurement values and count values even after powering off the controller



Use example)

- Calculate in a flow without using the reference position of measurement processing unit

→ Retains the calculated reference position.

- To use offset function in an axis movement amount calculation

→ Retains the offset value.

4-34-1 Setting (Data Save)

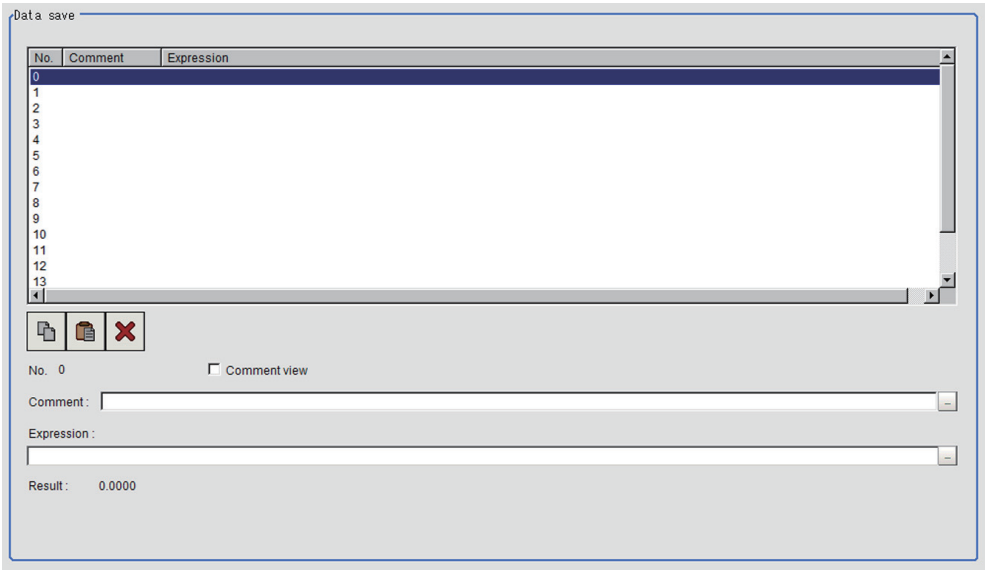
Set data retained in this processing item.

It can be set freely using expressions.

1 In the Item Tab area, click [Setting].

2 Set each item in the "Data save" area.

Up to 16 data can be saved.



Setting item	Setting value [Factory default]	Description
Comment	-	Set a comment that describes the expression for the data to be saved. Multilingual is also supported. For details, refer to *3-2-2 Inputting Text in the Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).
Expression	-	Set the expression of the data to be saved.

3 To display comments in the "Detail result display" area, check "Comment view".

4-34-2 Key Points for Test Measurement and Adjustment (Data Save)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Judge	Judgement result
Save data N (N = 0 to 15)	Stored data

Key Points for Adjustment

Select the adjustment method referring to the following points.

State	Parameter to be adjusted	Troubleshooting
Saved data is updated unintentionally.	-	Update can be controlled by setting the following flow. Example) 0. Camera image input 1. Input condition branching : N. Measurement completion N+1. Save data Control the DI signal so that it branches to saving data when updating saved data.

4-34-3 Measurement Results for Which Output Is Possible (Data Save)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Save data N (N = 0 to 15)	D00 to D15	Stored data

4-34-4 External Reference Tables (Data Save)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mis-match) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5+N (N: 0 to 15)	Expression result of expression	resultData	Get only	-999,999,999.9999 to 999,999,999.9999
120+N (N: 0 to 15)	Save data calculation	setupData	Set/Get	Exp. character string*1
136+N (N: 0 to 15)	Save Data	saveData	Set/Get	-999,999,999.9999 to 999,999,999.9999
168+N (N: 0 to 15)	Expressions comment	comment	Set/Get	Character string
200+N (N: 0 to 15)	Comment view	commentView	Set/Get	0: OFF 1: ON

*1. Numeric data can be set by the processing item of the processing unit data setting.

4-35 Stage Data

Stage data is a processing item that sets and preserves the data related to the stage of connecting to the Sensor controller. Set the data based on the specifications of the stage you are going to use.

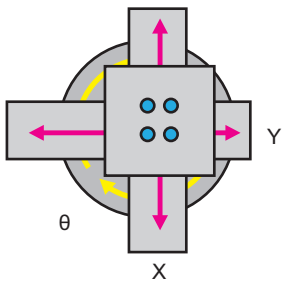
When using a processing item which operates stages like the ones below, or which uses stage data, refer to this processing item.

- Vision master calibration
- PLC master calibration
- Calibration Data Reference
- Transfer Position Data
- Calc Axis Move
- Calc Axis Move by Multipoint

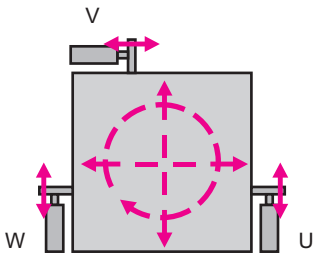
Used in the Following Case

When setting parameters for the stage type and the rotation polarity

Example) Set the type of stage to use.



θXY stage



UVW stage

4-35-1 Data Setting (Stage Data)

This item sets the stage type to be used and parameters. Select the stage you want to use and set the parameters according to the selected stage.

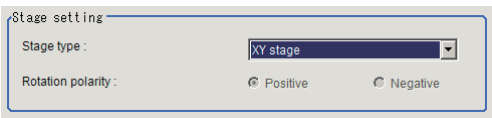
When operating a stage or using stage data, refer to this processing item from among the processing items.

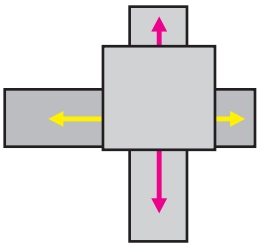
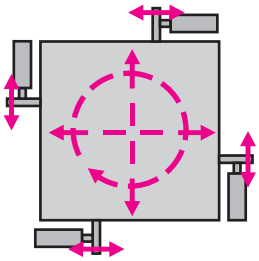
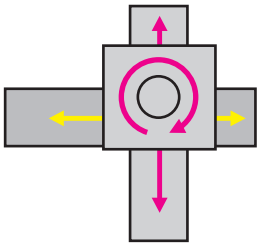
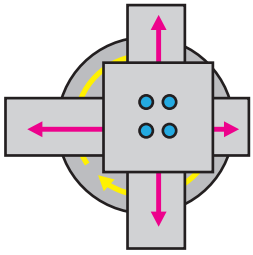
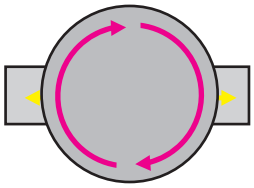
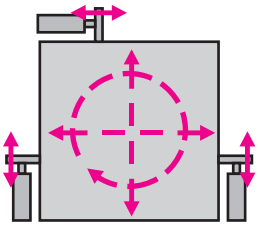
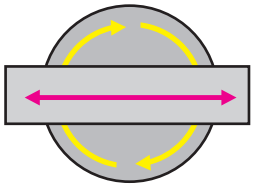
Selecting a Stage Type (Stage Data)

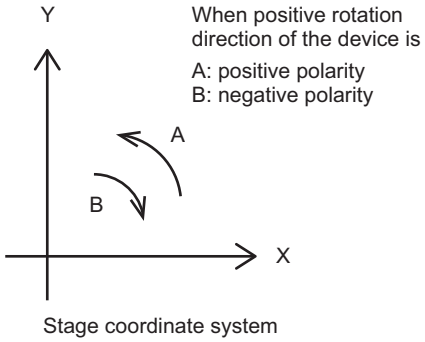
1 In the Stage setting area, click [▼] in the [Stage type], and select your desired stage.

Stages that can be used with this device are displayed.

2 If you select XYθ, θXY, Xθ(Yθ) or θX(θY) stage, the rotation polarity becomes selectable. Select the appropriate polarity.



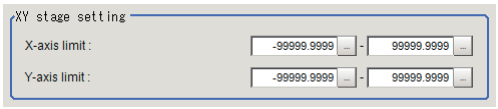
Setting item	Setting value [Factory default]	Description
Stage type	• [XY stage] • XYθ stage • θXY stage • UVW stage • UVWR stage • X(Y) stage • Xθ(Yθ) stage • θX(θY) stage	Usable "Stage types" are displayed. Select a stage. Usable "Stage types" are as follows: **XY stage**  **UVWR stage**  **XYθ stage**  **X(Y) stage**  When you select [X-axis] as measurement axis, [X-stage] is set. When you select [Y-axis] as measurement axis, [Y-stage] is set. **θXY stage**  **Xθ(Yθ) stage**  When you select [X-axis] as measurement axis, [Xθ-stage] is set. When you select [Y-axis] as measurement axis, [Yθ-stage] is set. **UVW stage**  **θX(θY) stage**  When you select [X-axis] as measurement axis, [θX-stage] is set. When you select [Y-axis] as measurement axis, [θY-stage] is set. When XY stage, UVW stage, UVRW stage or X(Y) stage is selected, the rotation polarity selection becomes disabled.

Setting item	Setting value [Factory default]	Description
Rotation polarity	• [Positive] • Negative	Select the rotation direction defined in the equipment is positive or negative compared to the rotation direction in the stage coordinate system. Polarities are as follows: Positive polarity/negative polarity 

Setting the Data for Each Stage (XY Stage)

You can set 2-axis stage, i.e. XY stage in this function.

1 If XY stage is selected, the XY stage setting area is displayed.



2 Click [...] in [X-axis limit] in the XY stage setting area to set the upper and lower limit values.

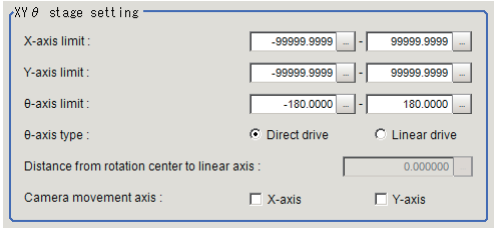
3 Likewise click [...] in [Y-axis limit] to set the upper and lower limit values.

Setting item	Setting value [Factory default]	Description
X-axis limit	99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the X axis movement range of the XY stage. Units of the coordinate system set in calibration is used.
Y-axis limit	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the Y axis movement range of the XY stage. Units of the coordinate system set in calibration is used.

Setting the Data for Each Stage (XYθ Stage and θXY Stage)

You can set 3-axis stage, i.e. XYθ stage and θXY stage in this function.

1 If XYθ stage or θXY stage is selected, the XYθ stage setting area is displayed.



2 Click [...] in [X-axis limit] in the XYθ stage setting area to set the upper and lower limit values.

3 Likewise click [...] in [Y-axis limit] to set the upper and lower limit values.

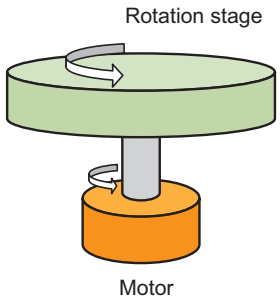
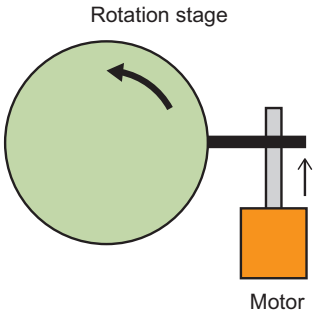
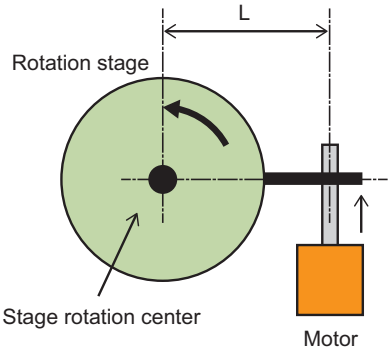
4 Likewise click [...] in [θ-axis limit] to set the upper and lower limit values.

5 Select the θ axis drive system from the [θ-axis type].

6 If linear drive is selected in the θ axis type, [Distance from rotation center to linear axis] can be set. Click [...] and set a numeric value.

7 If the camera is moved, select the axis to which the camera is attached from [Camera movement axis].

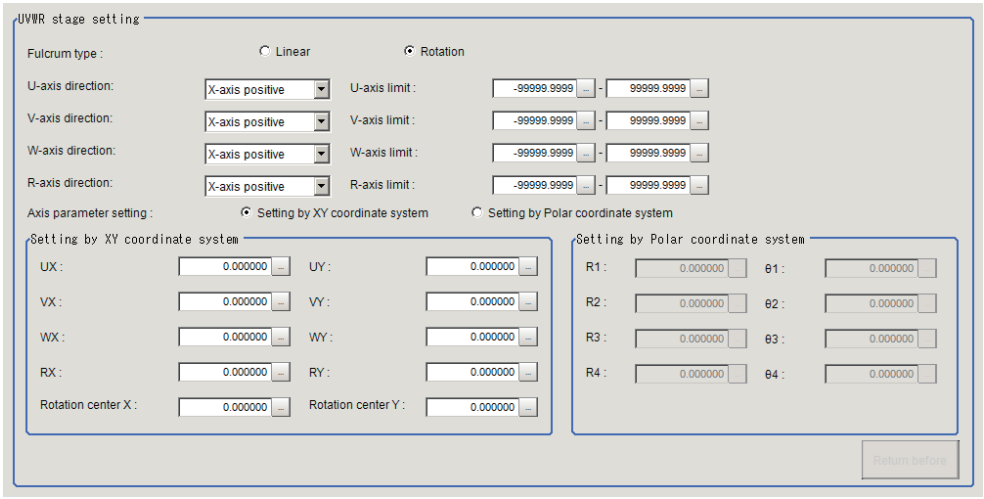
Setting item	Setting value [Factory default]	Description
X-axis limit	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the X axis movement range of the XYθ stage. Units of the coordinate system set in calibration is used.
Y-axis limit	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the Y axis movement range of the XYθ stage. Units of the coordinate system set in calibration is used.
θ-axis limit	-180.0000 to 180.0000 [-180.0000] to [180.0000]	Set the upper and lower limit values for the θ axis angle movement range of the XYθ stage. The unit is degree.

Setting item	Setting value [Factory default]	Description
θ axis type	• [Direct drive] • Linear drive	Select the θ axis drive type. Direct drive: A drive system which matches the θ axis rotation with the motor's axis of rotation.  Linear drive: A system which controls the θ axis rotation by linear movement. 
Distance from rotation center to linear axis	0.0000 to 99999.9999 [0.0000]	For the linear drive system, set the distance (L) from the stage rotation center to the linear axis. 
Camera movement axis		
X-axis	• Checked • [Unchecked]	Enable this setting if the camera moves instead of the stage axis. If this is disabled, calculation for movement amount and so on is performed on the premises that the stage moves.
Y-axis	• Checked • [Unchecked]	

Setting the Data for Each Stage (UVW Stage and UVWR Stage)

You can set 3-axis stage, i.e. UVW stage and 4-axis stage,i.e. UVWR stage in this function.

1 If UVW stage or UVWR stage is selected, the "UVW or UVWR stage specific settings" area is displayed.



2 Select the slider type from the [Fulcrum type].

3 Click [▼] in [U-axis direction], and set the axis direction of the U axis to either forward or backward with respect to the X axis or Y axis direction in the XY coordinate system that is parallel or perpendicular to each UVWR axis.

4 Click [...] in [U-axis limit] to set the upper and lower limit values.

5 Likewise, click [▼] in [V-axis direction], and set the axis direction of the V axis to either forward or backward with respect to the X axis or Y axis direction in the XY coordinate system that is parallel or perpendicular to each UVWR axis.

6 Click [...] in [V-axis limit] to set the upper and lower limit values.

7 Likewise, click [▼] in [W-axis direction], and set the axis direction of the W axis to either forward or backward with respect to the X axis or Y axis direction in the XY coordinate system that is parallel or perpendicular to each UVWR axis.

8 Click [...] in [W-axis limit] to set the upper and lower limit values.

9 Likewise, click [▼] in [R-axis direction], and set the axis direction of the R axis to either forward or backward with respect to the X axis or Y axis direction in the XY coordinate system that is parallel or perpendicular to each UVWR axis.

10 Click [...] in [R-axis limit] to set the upper and lower limit values.

11 From the [Axis parameter setting], set the pivot point parameter of each UVWR axis either by coordinate setting or direct setting.

12 The Setting by XY coordinate system area is enabled if [Setting by XY coordinate system] is selected in [Axis parameter setting].

13 Click [...] in [UX] in the Setting by XY coordinate system area to set a value.

14 Likewise, click [...] in [UY] in the Setting by XY coordinate system area to set a value for the U axis pivot point's Y coordinate in the return to origin status.

15 Likewise, click [...] in [VX] in the Setting by XY coordinate system area to set a value for the V axis pivot point's X coordinate in the return to origin status.

16 Likewise, click [...] in [VY] in the Setting by XY coordinate system area to set a value for the V axis pivot point's Y coordinate in the return to origin status.

17 Likewise, click [...] in [WX] in the Setting by XY coordinate system area to set a value for the W axis pivot point's X coordinate in the return to origin status.

18 Likewise, click [...] in [WY] in the Setting by XY coordinate system area to set a value for the W axis pivot point's Y coordinate in the return to origin status.

19 Likewise, click [...] in [RX] in the Setting by XY coordinate system area to set a value for the R axis pivot point's X coordinate in the return to origin status.

20 Likewise, click [...] in [RY] in the Setting by XY coordinate system area to set a value for the R axis pivot point's Y coordinate in the return to origin status.

21 Likewise, click [...] in [Rotation center X] in the Setting by XY coordinate system area to set a value for the rotation center's X coordinate in the return to origin status.

22 Likewise, click [...] in [Rotation center Y] in the Setting by XY coordinate system area to set a value for the rotation center's Y coordinate in the return to origin status.

23 The Setting by Polar coordinate system area is enabled if [Setting by Polar coordinate system] is selected in [Axis parameter setting].

24 Click [...] in [R1] in the Setting by Polar coordinate system area to set the distance between the U axis pivot point and rotation center in the return to origin status.

25 Likewise, click [...] in [R2] in the Setting by Polar coordinate system area to set the distance between the V axis pivot point and rotation center in the return to origin status.

26 Likewise, click [...] in [R3] in the Setting by Polar coordinate system area to set the distance between the W axis pivot point and rotation center in the return to origin status.

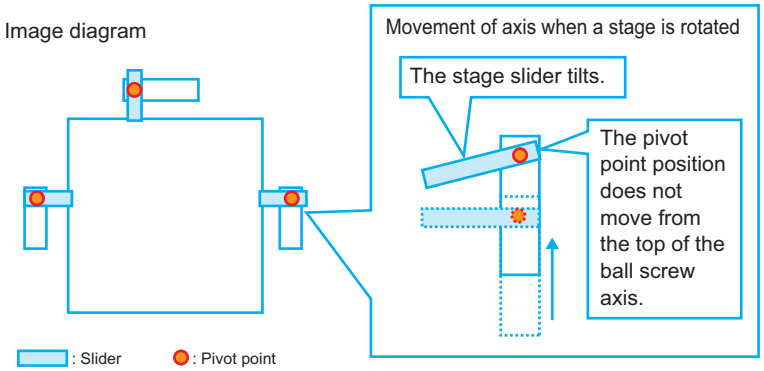
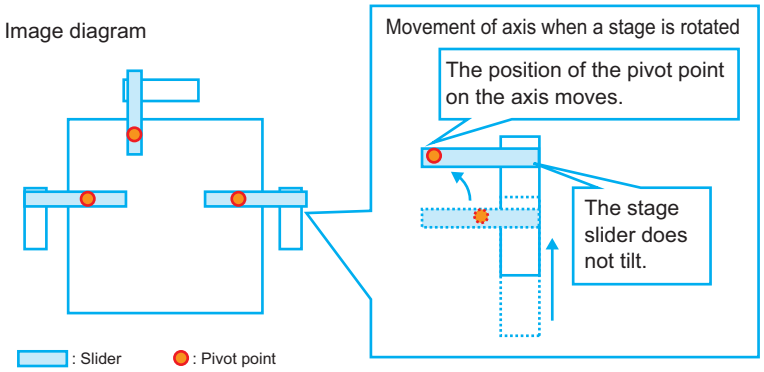
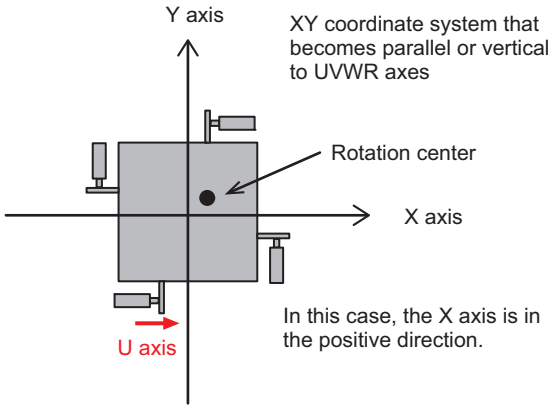
27 Likewise, click [...] in [R4] in the Setting by Polar coordinate system area to set the distance between the R axis pivot point and rotation center in the return to origin status.

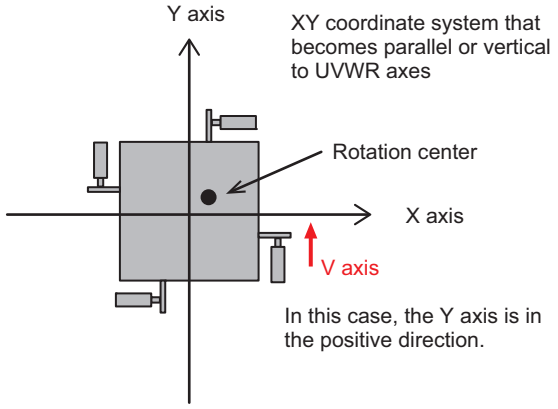
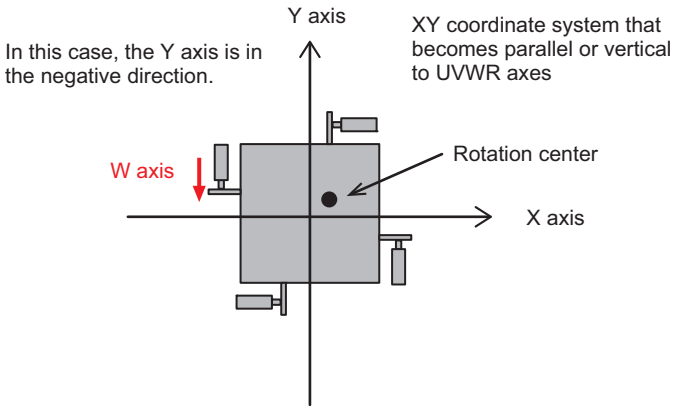
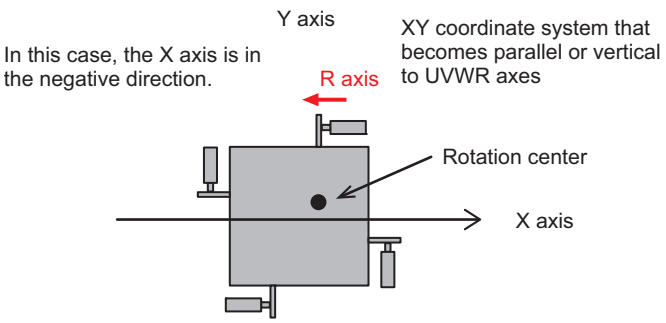
28 Likewise, click [...] in [θ1] in the Setting by Polar coordinate system area to set a value.

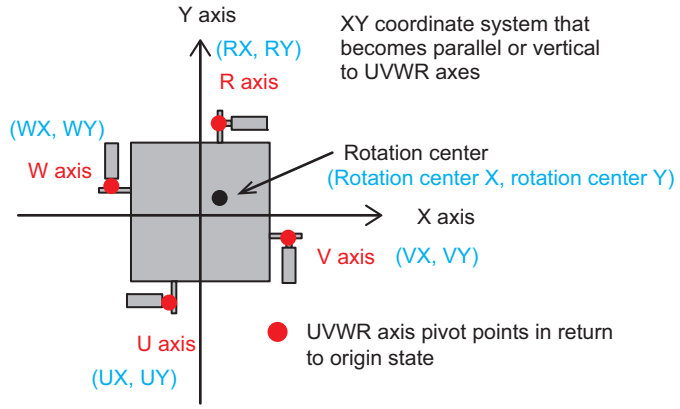
29 Likewise, click [...] in [θ2] in the Setting by Polar coordinate system area to set a value.

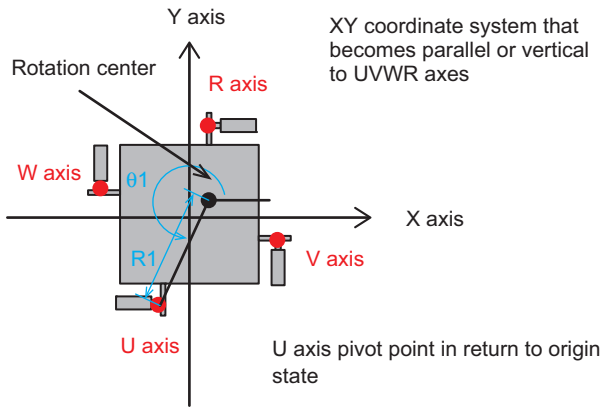
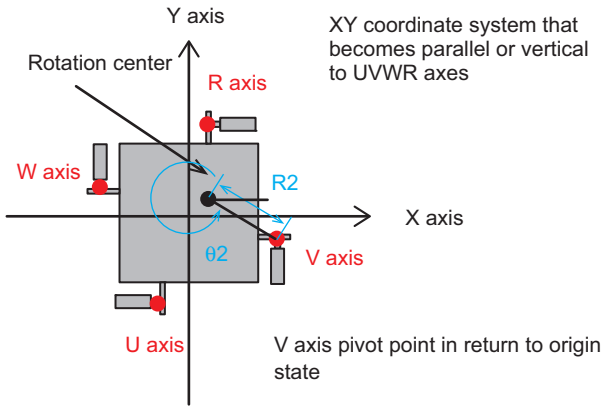
30 Likewise, click [...] in [θ3] in the Setting by Polar coordinate system area to set a value.

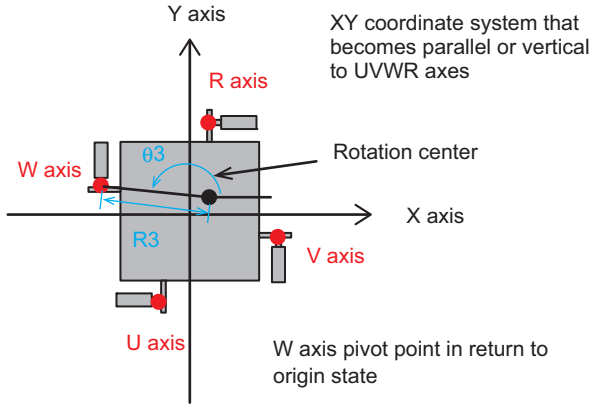
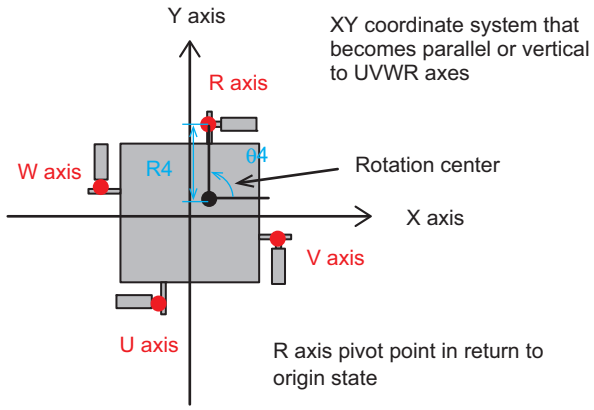
31 Likewise, click [...] in [θ4] in the Setting by Polar coordinate system area to set a value.

Setting item	Setting value [Factory default]	Description
Fulcrum type	• Linear • [Rotation]	Select the slider operation type when the stage is rotated. Linear  Rotation 
U-axis direction	• [X-axis positive] • X-axis negative • Y-axis positive • Y-axis negative	For the axis direction of the U axis, set the rotation center to the point of origin then set it to either forward or backward with respect to the X axis or Y axis direction in the XY coordinate system that is parallel or perpendicular to each UVWR axis. 
U-axis limit	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the U axis movement range. Units of the coordinate system set in calibration is used.

Setting item	Setting value [Factory default]	Description
V-axis direction	• [X-axis positive] • X-axis negative • Y-axis positive • Y-axis negative	Set the axis direction of the V axis to either forward or backward with respect to the X axis or Y axis direction in the XY coordinate system that is parallel or perpendicular to each UVWR axis. 
V-axis limit	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the V axis movement range. Units of the coordinate system set in calibration is used.
W-axis direction	• [X-axis positive] • X-axis negative • Y-axis positive • Y-axis negative	Set the axis direction of the W axis to either forward or backward with respect to the X axis or Y axis direction in the XY coordinate system that is parallel or perpendicular to each UVWR axis. 
W-axis limit	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the W axis movement range. Units of the coordinate system set in calibration is used.
R-axis direction	• [X-axis positive] • X-axis negative • Y-axis positive • Y-axis negative	Set the axis direction of the R axis to either forward or backward with respect to the X axis or Y axis direction in the XY coordinate system that is parallel or perpendicular to each UVWR axis. 

Setting item	Setting value [Factory default]	Description
R-axis limit	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	Set the upper and lower limit values for the R axis movement range. Units of the coordinate system set in calibration is used.
Axis parameter setting	• [Setting by XY coordinate system] • Setting by Polar coordinate system	Select the pivot point parameter of each UVWR axis either by coordinate setting or direct setting.
UX	-99999.999999 to 99999.999999	Set the X coordinate value of the U axis pivot point in the return to origin status. 
UY	-99999.999999 to 99999.999999 [0.000000]	Set the Y coordinate value of the U axis pivot point in the return to origin status.
VX	-99999.999999 to 99999.999999 [0.000000]	Set the X coordinate value of the V axis pivot point in the return to origin status.
VY	-99999.999999 to 99999.999999 [0.000000]	Set the Y coordinate value of the V axis pivot point in the return to origin status.
WX	-99999.999999 to 99999.999999 [0.000000]	Set the X coordinate value of the W axis pivot point in the return to origin status.
WY	-99999.999999 to 99999.999999 [0.000000]	Set the Y coordinate value of the W axis pivot point in the return to origin status.
RX	-99999.999999 to 99999.999999 [0.000000]	Set the X coordinate value of the R axis pivot point in the return to origin status.
RY	-99999.999999 to 99999.999999 [0.000000]	Set the Y coordinate value of the R axis pivot point in the return to origin status.
Rotation center X	-99999.999999 to 99999.999999 [0.000000]	Set the X coordinate value of the rotation center in the return to origin status.
Rotation center Y	-99999.999999 to 99999.999999 [0.000000]	Set the Y coordinate value of the rotation center in the return to origin status.

Setting item	Setting value [Factory default]	Description
R1	0.000000 to 99999.999999 [0.000000]	Set the length of line segment connecting the stage rotation center and U axis pivot point in the return to origin (each axis' movement amount is 0) status. 
θ1	-360.000000 to 360.000000 [0.000000]	Set the angle from the X axis of the line segment connecting the stage rotation center and U axis pivot point in the return to origin (each axis' movement amount is 0) status. As for the angle, the X axis is set to 0° and the direction from X axis forward to Y axis forward is set to +.
R2	0.000000 to 99999.999999 [0.000000]	Set the length of line segment connecting the stage rotation center and V axis pivot point in the return to origin (each axis' movement amount is 0) status. 
θ2	-360.000000 to 360.000000 [0.000000]	Set the angle from the X axis of the line segment connecting the stage rotation center and V axis pivot point in the return to origin (each axis' movement amount is 0) status. As for the angle, the X axis is set to 0° and the direction from X axis forward to Y axis forward is set to +.

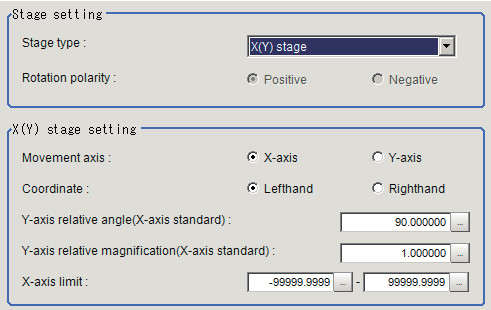
Setting item	Setting value [Factory default]	Description
R3	0.000000 to 99999.999999 [0.000000]	Set the length of line segment connecting the stage rotation center and W axis pivot point in the return to origin (each axis' movement amount is 0) status. 
θ3	-360.000000 to 360.000000 [0.000000]	Set the angle from the X axis of the line segment connecting the stage rotation center and W axis pivot point in the return to origin (each axis' movement amount is 0) status. As for the angle, the X axis is set to 0° and the direction from X axis forward to Y axis forward is set to +.
R4	0.000000 to 99999.999999 [0.000000]	Set the length of line segment connecting the stage rotation center and R axis pivot point in the return to origin (each axis' movement amount is 0) status. 
θ4	-360.000000 to 360.000000 [0.000000]	Set the angle from the X axis of the line segment connecting the stage rotation center and R axis pivot point in the return to origin (each axis' movement amount is 0) status. As for the angle, the X axis is set to 0° and the direction from X axis forward to Y axis forward is set to +.

Set parameters depending on each of Stage (X(Y) Stage)

In this setting area, set X Stage and Y Stage.

1 Selecting [XY stage] in [Stage type], [XY stage setting] is displayed.

Set parameters in [XY stage setting] area.

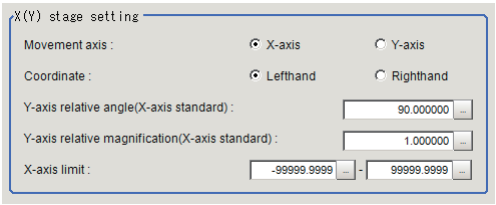


2 Select type of Stage in [Movement axis] in [X(Y) stage setting] area.

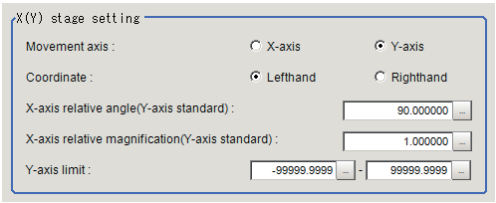
Selecting [X-axis] as [Movement axis] and set [Y-axis] to X stage, then [Y-axis] is set to Y stage.

Parameter name in [X(Y) stage setting] area will change depending on selected [Movement axis]. *1, *2, *3

When you select [X-axis]



When you select [Y-axis]

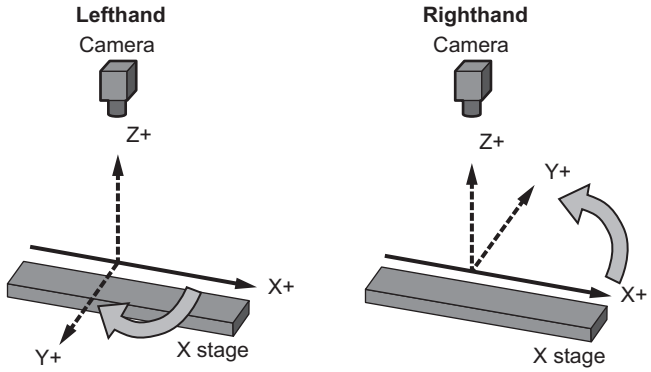


3 Select [Lefthand] or [Righthand] in [Coordinate].

Camera position is Z-axis respects to the surface where put on the work piece including movement axis.

[Lefthand]: Clockwise from camera vision.

[Righthand]: Counterclockwise from camera vision.



4 Clicking […] in [Y-axis relative angle(X-axis standard)], set relative angle of X-axis. *1
Set an angle configured X-axis and virtually-calculated Y-axis. The orthogonal coordinate is normaly 90°.

5 Clicking […] in [Y-axis relative angle(X-axis standard)], set relative angle of X-axis. *2
Set an angle configured X-axis and virtually-calculated Y-axis. The orthogonal coordinate is normaly 90°.

6 Clicking […] in [X-axis limit], set both upper and lower limit of movement axis (X-axis). *3

Setting Item	Setting value [Factory default]	Description
Movement axis	• [X-axis] • Y-axis	This parameter is for selecting type of Stage. When you select X-axis, set as X Stage. When you select Y-axis, set as Y Stage.
Coordinate	• [Lefthand] • Righthand	Set coordinate. [Lefthand]: Clockwise from camera vision. [Righthand]: Counterclockwise from camera vision.
Y-axis relative angle (X-axis standard) *1	0.000001 to 180.000000 [90.000000]	When you select X-axis as Movement axis, set an angle virtually-calculated of Y-axis. When you select Y-axis as Movement axis, set an angle virtually-calculated of X-axis.
Y-axis relative angle magnification (X-axis standard) *2	0.100000 to 9.999999 [1.000000]	When you select X-axis as Movement axis, set a relative angle virtually-calculated of Y-axis. When you select Y-axis as Movement axis, set a relative angle virtually-calculated of X-axis.
X-axis limit *3	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	When you select X-axis as Movement axis, set upper and lower limit of X-axis. When you select Y-axis as Movement axis, set upper and lower limit of Y-axis. Unit is a coordinate set in calibration function.

*1, *2, *3. Those function name are displayed on the screen. If you select Y-axis in Movement axis, those name will change as below.

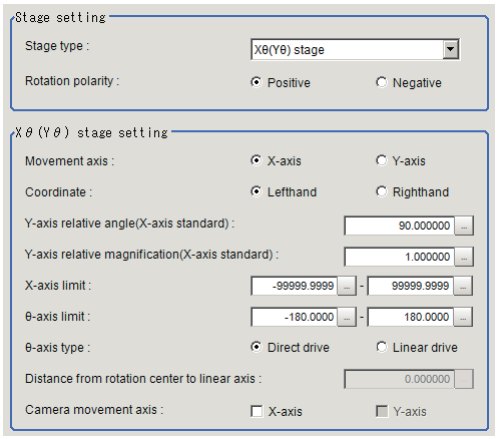
	Select X-axis as Measurement axis	Select Y-axis as Measurement axis
*1	Y-axis relative angle (X-axis standard)	X-axis relative angle (Y-axis standard)
*2	Y-axis relative angle magnification (X-axis standard)	X-axis relative angle magnification (Y-axis standard)
*3	X-axis limit	Y-axis limit

Set parameters depending on each of Stage (Xθ stage and Yθ stage)

In this setting area, set Xθ stage and Yθ stage.

1 Selecting [Xθ stage] in [Stage type], [Xθ(Yθ) stage setting] is displayed.

Set parameters in [Xθ(Yθ) stage setting] area.

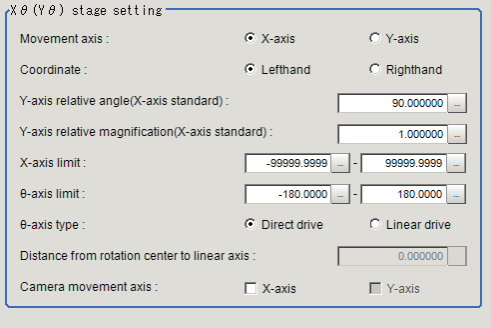


2 Select type of Stage in [Movement axis] in [Xθ(Yθ) stage setting] area.

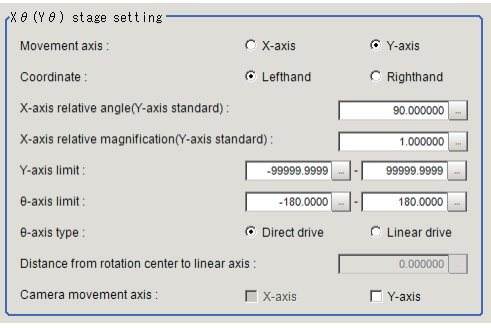
Selecting [X-axis] as [Movement axis] and set [Y-axis] to Xθ stage. Selecting [Y-axis] is set to Yθ stage.

Parameter name in [Xθ(Yθ) stage setting] area will change depending on selected [Movement axis]. *1, *2, *3

When you select [X-axis]



When you select [Y-axis]



3 Select [Lefthand] or [Righthand] in [Coordinate].

4 Clicking […] in [Y-axis relative angle(X-axis standard)], set relative angle of X-axis. *1

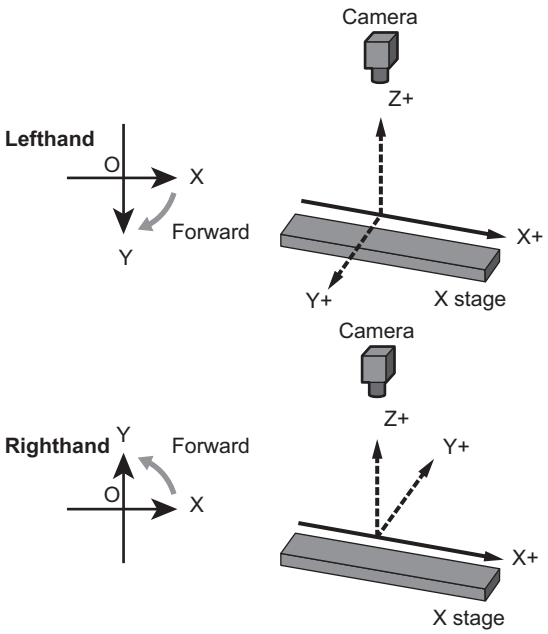
5 Clicking […] in [Y-axis relative angle(X-axis standard)], set relative angle of X-axis. *2

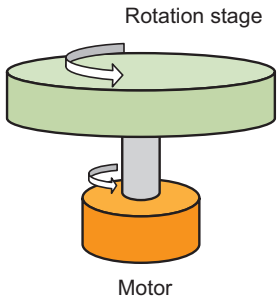
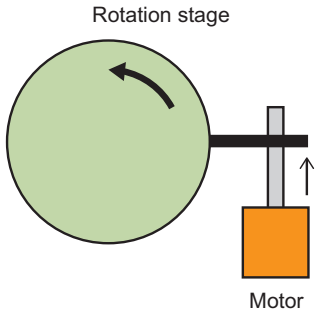
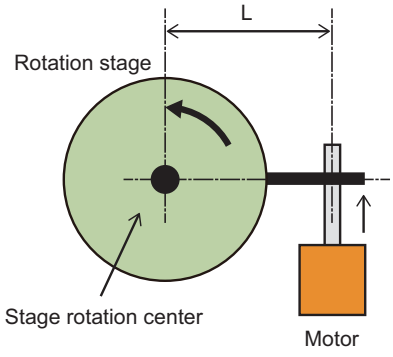
6 Clicking […] in [X-axis limit], set both upper and lower limit of movement axis (X-axis). *3

7 Clicking […] in [θ-axis limit], set both upper and lower limit of movement axis (θ-axis) on the Xθ stage.

8 Select moving method of θ-axis in [θ-axis type].

9 Selecting [Linear drive] in [θ-axis type], [Distance from rotation center to linear axis] is applied, the you can set values by clicking […].

Setting Item	Setting value [Factory default]	Description
Movement axis	• [X-axis] • Y-axis	This parameter is for selecting type of Stage. When you select X-axis, set as Xθ stage. When you select Y-axis, set as Yθ stage.
Coordinate	• [Lefthand] • Righthand	Set coordinate. [Lefthand]: Clockwise from camera vision. [Righthand]: Counterclockwise from camera vision. 
Y-axis relative angle (X-axis standard) *1	0.000001 to 180.000000 [90.000000]	When you select X-axis as Movement axis, set an angle virtually-calculated of Y-axis. When you select Y-axis as Movement axis, set an angle virtually-calculated of X-axis. Unit is angle.
Y-axis relative angle magnification (X-axis standard) *2	0.100000 to 9.999999 [1.000000]	When you select X-axis as Movement axis, set a relative angle virtually-calculated of Y-axis. When you select Y-axis as Movement axis, set a relative angle virtually-calculated of X-axis.
X-axis limit *3	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	When you select X-axis as Movement axis, set upper and lower limit of X-axis. When you select Y-axis as Movement axis, set upper and lower limit of Y-axis. Unit is a coordinate set in calibration function.

Setting Item	Setting value [Factory default]	Description
θ-axis (linear drive) limit	-180.0000 to 180.0000 [-180.0000] to [180.0000]	Set upper and lower limit of θ-axis. Unit is angle.
θ-axis type	• [Direct dirive] • Linear drive	Select the q axis drive type. [Direct drive]: Movement method comberting rotation of θ-axis to rotation axis of motor.  Linear dive: Control rotation of θ-axis with linear movement of motor rotation. 
Distance from rotation center to linear axis	0.0000 to 99999.9999 [0.0000]	When you select [Linear], set the distance (L) from rotation center to linear axis. 

*1, *2, *3. Those function name are displayed on the screen. If you select Y-axis in Movement axis, those name will change as below.

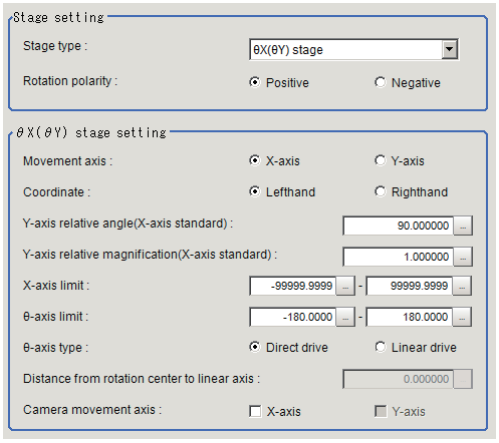
	Select X-axis as Measurement axis	Select Y-axis as Measurement axis
*1	Y-axis relative angle (X-axis standard)	X-axis relative angle (Y-axis standard)
*2	Y-axis relative angle magnification (X-axis standard)	X-axis relative angle magnification (Y-axis standard)
*3	X-axis limit	Y-axis limit

Set parameters depending on each of Stage (θX stage and θY stage)

In this setting area, set θX stage and θY stage.

1 Selecting [θX(θY) stage] in [Stage type], [θX(θY) stage setting] is displayed.

Set parameters in [θX(θY) stage setting] area.

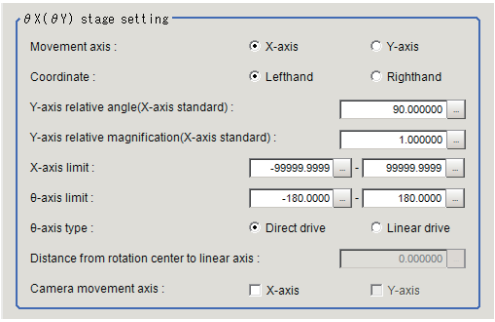


2 Select type of Stage in [Movement axis] in [θX(θY) stage setting] area.

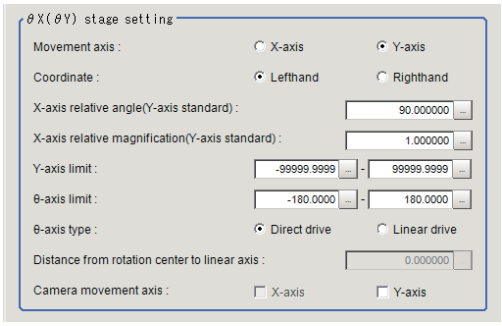
Selecting [X-axis] as [Movement axis] and set [Y-axis] to Yθ stage. Selecting [Y-axis] is set to Yθ stage.

Parameter name in [θX(θY) stage setting] area will change depending on selected [Movement axis]. *1, *2, *3

When you select [X-axis]



When you select [Y-axis]



3 Select [Lefthand] or [Righthand] in [Coordinate].

4 Clicking […] in [Y-axis relative angle(X-axis standard)], set relative angle of X-axis. *1

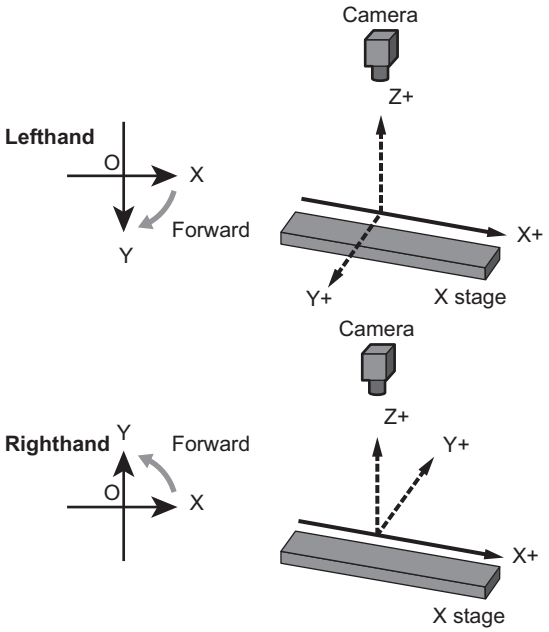
5 Clicking […] in [Y-axis relative angle(X-axis standard)], set relative angle of X-axis. *2

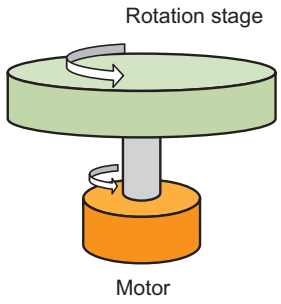
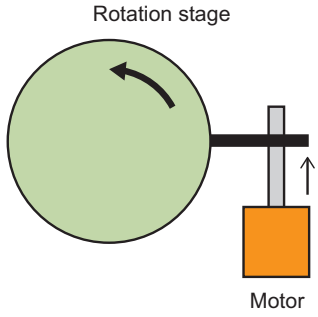
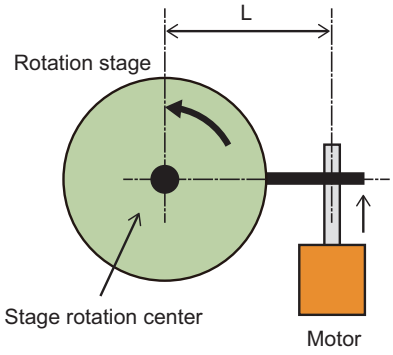
6 Clicking […] in [X-axis limit], set both upper and lower limit of movement axis (X-axis). *3

7 Clicking […] in [θ-axis limit], set both upper and lower limit of movement axis (θ-axis) on the Xθ stage.

8 Select moving method of θ-axis in [θ-axis type].

9 Selecting [Linear drive] in [θ-axis type], [Distance from rotation center to linear axis] is applied, the you can set values by clicking […].

Setting Item	Setting value [Factory default]	Description
Movement axis	• [X-axis] • Y-axis	This parameter is for selecting type of Stage. When you select X-axis, set as Xθ stage. When you select Y-axis, set as Yθ stage.
Coordinate	• [Lefthand] • Righthand	Set coordinate. [Lefthand]: Clockwise from camera vision. [Righthand]: Counterclockwise from camera vision. 
Y-axis relative angle (X-axis standard) *1	0.000001 to 180.000000 [90.000000]	When you select X-axis as Movement axis, set an angle virtually-calculated of Y-axis. When you select Y-axis as Movement axis, set an angle virtually-calculated of X-axis. Unit is angle.
Y-axis relative angle magnification (X-axis standard) *2	0.100000 to 9.999999 [1.000000]	When you select X-axis as Movement axis, set a relative angle virtually-calculated of Y-axis. When you select Y-axis as Movement axis, set a relative angle virtually-calculated of X-axis.
X-axis limit *3	-99999.9999 to 99999.9999 [-99999.9999] to [99999.9999]	When you select X-axis as Movement axis, set upper and lower limit of X-axis. When you select Y-axis as Movement axis, set upper and lower limit of Y-axis. Unit is a coordinate set in calibration function.

Setting Item	Setting value [Factory default]	Description
θ-axis (linear drive) limit	-180.0000 to 180.0000 [-180.0000] to [180.0000]	Set upper and lower limit of θ-axis. Unit is angle.
θ-axis type	• [Direct drive] • Linear drive	Select the q axis drive type. [Direct drive]: Movement method comforting rotation of θ-axis to rotation axis of motor.  Linear dive: Control rotation of θ-axis with linear movement of motor rotation. 
Distance from rotation center to linear axis	0.0000 to 99999.9999 [0.0000]	When you select [Linear], set the distance (L) from rotation center to linear axis. 

*1, *2, *3. Those function name are displayed on the screen. If you select Y-axis in Movement axis, those name will change as below.

	Select X-axis as Movement axis	Select Y-axis as Movement axis
*1	Y-axis relative angle (X-axis standard)	X-axis relative angle (Y-axis standard)
*2	Y-axis relative angle magnification (X-axis standard)	X-axis relative angle magnification (Y-axis standard)
*3	X-axis limit	Y-axis limit

4-35-2 Measurement Results for Which Output Is Possible (Stage Data)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result

4-35-3 External Reference Tables (Stage Data)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
120	Stage type	machineType	Set/Get	0: XY stage 1: XYθ stage 2: θXY stage 3: UVW stage 4: UVWR stage 5: Xθ (Yθ) stage 6: θX (θY) stage 7: X (Y) stage
121	Rotation polarity	rotationPolarValue	Set/Get	-1: Negative (Y to X direction) 1: Positive (X to Y direction)
122	Distance from rotation center to linear axis	centerPositionDist	Set/Get	0.000000 to 99,999.999999
123	Axis parameter setting	settingType	Set/Get	0: Setting by XY coordinate 1: Setting by Polar coordinate system.
124	Rotation center X	stageRotPosX	Set/Get	-99,999.999999 to 99,999.999999
125	Rotation center Y	stageRotPosY	Set/Get	-99,999.999999 to 99,999.999999
126	Fulcrum type	sliderType	Set/Get	0: Rotation 1: Linear
127	θ-axis type	thetaType	Set/Get	0: Direct drive 1: Linear drive
128	Camera movement axis X-axis	cameraMoveAxisX	Set/Get	0: Camera moving axis X is not used 1: Camera moving axis X is used
129	Camera movement axis Y-axis	cameraMoveAxisY	Set/Get	0: Camera moving axis Y is not used 1: Camera moving axis Y is used
130	R1	axisDistU	Set/Get	0.000000 to 99,999.999999
131	θ1	axisAngleU	Set/Get	-360.000000 to 360.000000
132	R2	axisDistV	Set/Get	0.000000 to 99,999.999999
133	θ2	axisAngleV	Set/Get	-360.000000 to 360.000000
134	R3	axisDistW	Set/Get	0.000000 to 99,999.999999
135	θ3	axisAngleW	Set/Get	-360.000000 to 360.000000
136	R4	axisDistR	Set/Get	0.000000 to 99,999.999999
137	θ4	axisAngleR	Set/Get	-360.000000 to 360.000000

No.	Data Name	Ident	Set/Get	Data range
150	UX	axisPosXU	Set/Get	-99,999.999999 to 99,999.999999
151	UY	axisPosYU	Set/Get	-99,999.999999 to 99,999.999999
152	VX	axisPosXV	Set/Get	-99,999.999999 to 99,999.999999
153	VY	axisPosYV	Set/Get	-99,999.999999 to 99,999.999999
154	WX	axisPosXW	Set/Get	-99,999.999999 to 99,999.999999
155	WY	axisPosYW	Set/Get	-99,999.999999 to 99,999.999999
156	RX	axisPosXR	Set/Get	-99,999.999999 to 99,999.999999
157	RY	axisPosYR	Set/Get	-99,999.999999 to 99,999.999999
170	U-axis direction	axisKindU	Set/Get	0: X-axis positive 1: X-axis negative 2: Y-axis positive 3: Y-axis negative
171	V-axis direction	axisKindV	Set/Get	0: X-axis positive 1: X-axis negative 2: Y-axis positive 3: Y-axis negative
172	W-axis direction	axisKindW	Set/Get	0: X-axis positive 1: X-axis negative 2: Y-axis positive 3: Y-axis negative
173	R-axis direction	axisKindR	Set/Get	0: X-axis positive 1: X-axis negative 2: Y-axis positive 3: Y-axis negative
180	Lower limit of X-axis movement	lowerMoveX	Set/Get	-99,999.9999 to 99,999.9999
181	Upper limit of X-axis movement	upperMoveX	Set/Get	-99,999.9999 to 99,999.9999
182	Lower limit of Y-axis movement	lowerMoveY	Set/Get	-99,999.9999 to 99,999.9999
183	Upper limit of Y-axis movement	upperMoveY	Set/Get	-99,999.9999 to 99,999.9999
184	Lower limit of θ-axis movement	lowerMoveTheta	Set/Get	-180 to 180
185	Upper limit of θ-axis movement	upperMoveTheta	Set/Get	-180 to 180
186	Lower limit of θ-axis (linear drive) movement	lowerMoveLinearTheta	Set/Get	-99,999.9999 to 99,999.9999
187	Upper limit of θ-axis (linear drive) movement	upperMoveLinearTheta	Set/Get	-99,999.9999 to 99,999.9999
190	Lower limit of U-axis movement	lowerMoveU	Set/Get	-99,999.9999 to 99,999.9999
191	Upper limit of U-axis movement	upperMoveU	Set/Get	-99,999.9999 to 99,999.9999
192	Lower limit of V-axis movement	lowerMoveV	Set/Get	-99,999.9999 to 99,999.9999

No.	Data Name	Ident	Set/Get	Data range
193	Upper limit of V-axis movement	upperMoveV	Set/Get	-99,999.9999 to 99,999.9999
194	Lower limit of W-axis movement	lowerMoveW	Set/Get	-99,999.9999 to 99,999.9999
195	Upper limit of W-axis movement	upperMoveW	Set/Get	-99,999.9999 to 99,999.9999
196	Lower limit of R-axis movement	lowerMoveR	Set/Get	-99,999.9999 to 99,999.9999
197	Upper limit of R-axis movement	upperMoveR	Set/Get	-99,999.9999 to 99,999.9999
300	Movement axis	moveAxis	Set/Get	0: X-axis 1: Y-axis
301	Coordinate	coordinate	Set/Get	0: Lefthand 1: Righthand
302	relative angle	relativeAngle	Set/Get	1.000000 to 179.000000
303	relative magnification	relativeScale	Set/Get	0.100000 to 9.999999

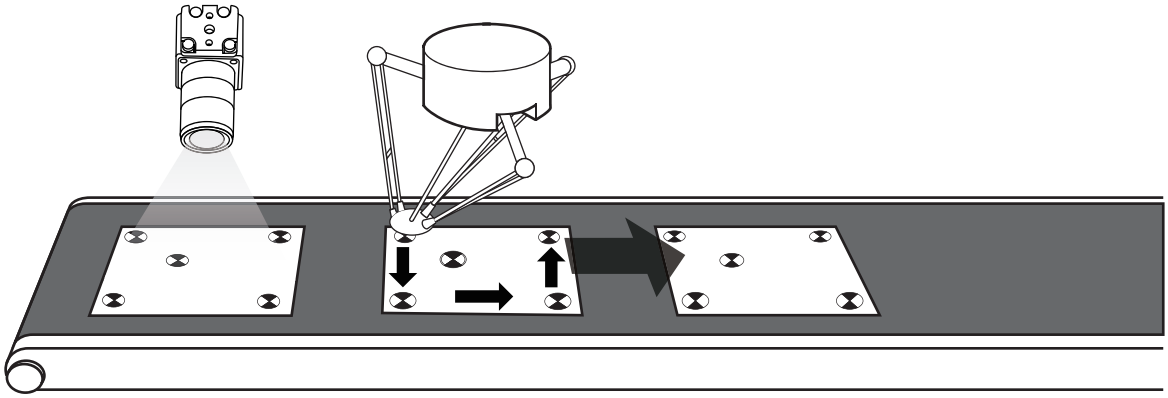
4-36 Conveyor Calibration

Conveyor Calibration is an FH Sensor Controller processing item exclusively for conveyor tracking application. Conveyor Calibration cannot be launched from an FH Sensor Controller User Interface. Use Sysmac Studio for this function.

For more information, refer to *Vision Sensor FH Series Conveyor Tracking Application Sample Scene and Sample Macro User's Guide.*

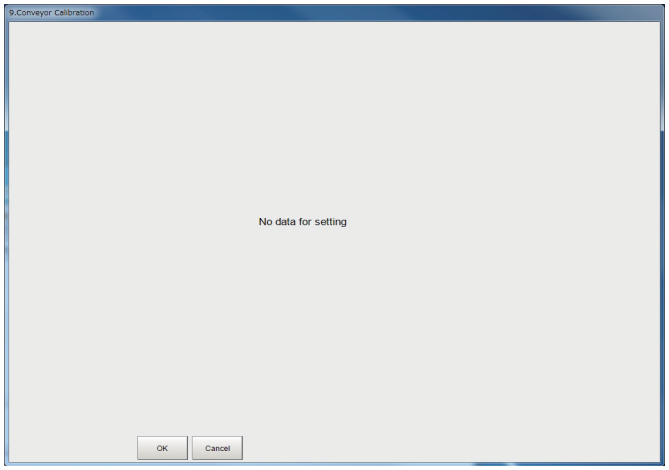
Used in the Following Case

Conveyor Calibration is used to calibrate camera, conveyor, and robots for conveyor tracking application.



Additional Information

You can choose exclusive processing items for conveyor tracking application on the Edit Flow Window on the FH/FHV/FZ5 Sensor Controller. However, properties setting is unavailable on the FH/FHV/FZ5 Sensor Controller.
The following image is the Properties Setting window when it is opened on the FH/FHV/FZ5 Sensor Controller.



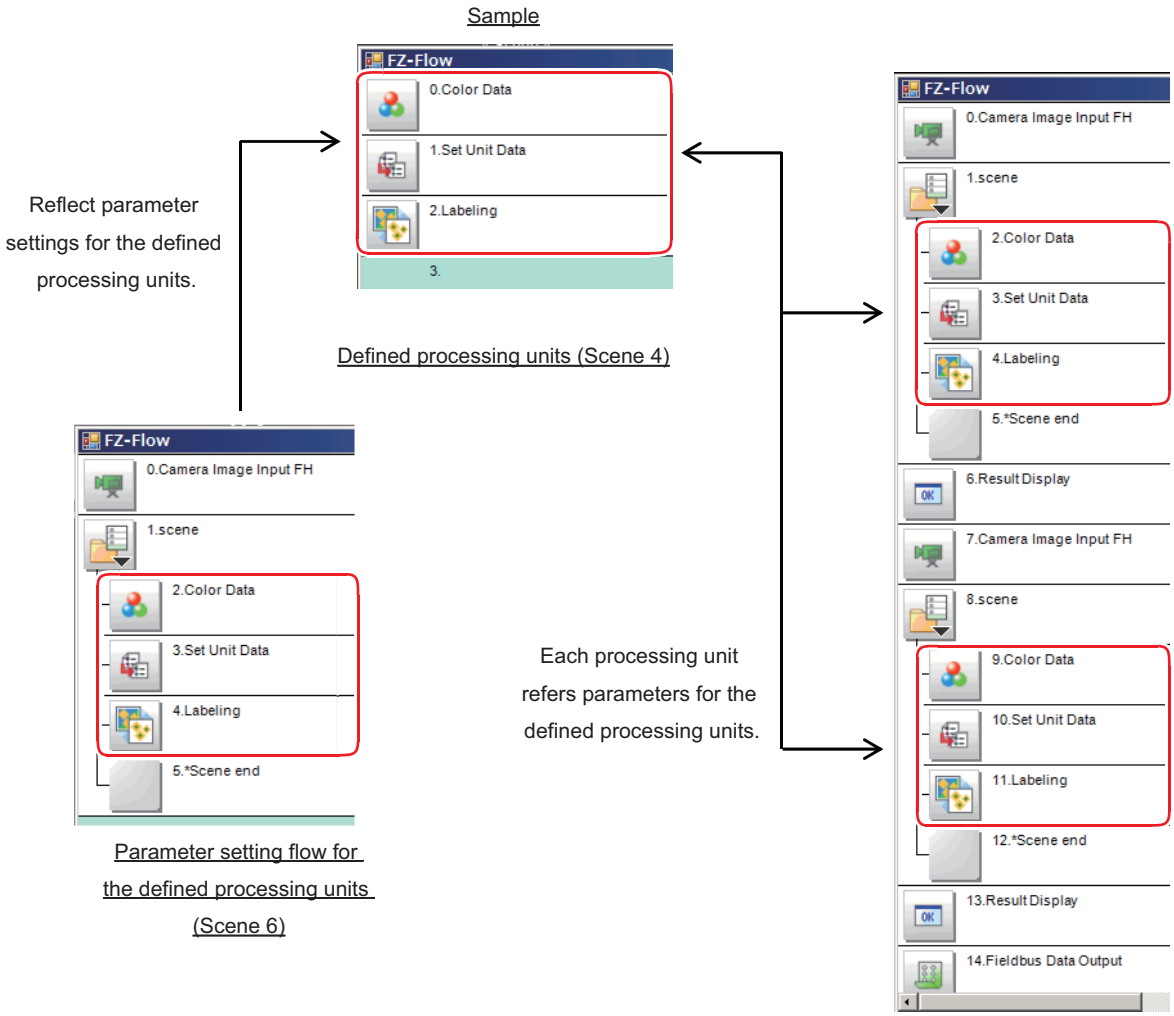
4-37 Scene

Processing item that registers processing units for reference frequently performed in the measurement flow that are defined in a scene number. In the defined processing units, performing the parameter settings once can reflect the settings to all registered processing units in the measurement flow.

Moreover, such reflection is also available from the measurement flow.

Used in the Following Case

When reducing time for parameter settings for the same processing units frequently performed in the measurement flow.



Important

- Ensure that the [Scene] processing item and [Scene end] processing item are paired.
- Between [Scene] processing items, do not refer to each other.
- In [Scene] processing items, do not refer to a scene in the measurement flow.
- In [Scene] processing items, the scene numbers that can be referred to are those in the same scene group.
- In [Scene] processing items, do not include [Retain display image] processing items within reference scenes. When rebuilding the flow after switching a scene, the saved image will be cleared.
- In [Scene] processing items, if a scene that has not been defined is selected, then the scene will not be registered.

4-37-1 Scene Setting (Scene)

First, define processing units with a different scene number repeatedly used in the measurement flow in the same scene group.

Second, create a setting/adjusting flow for the defined processing units in another scene number in the same scene group.

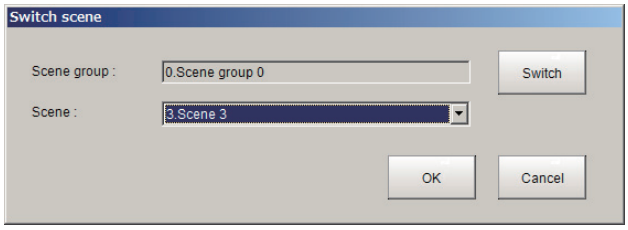
Lastly, create a measurement flow in another scene number in the same scene group and insert the defined processing units by using the [Scene] processing time function.

Define Processing Units

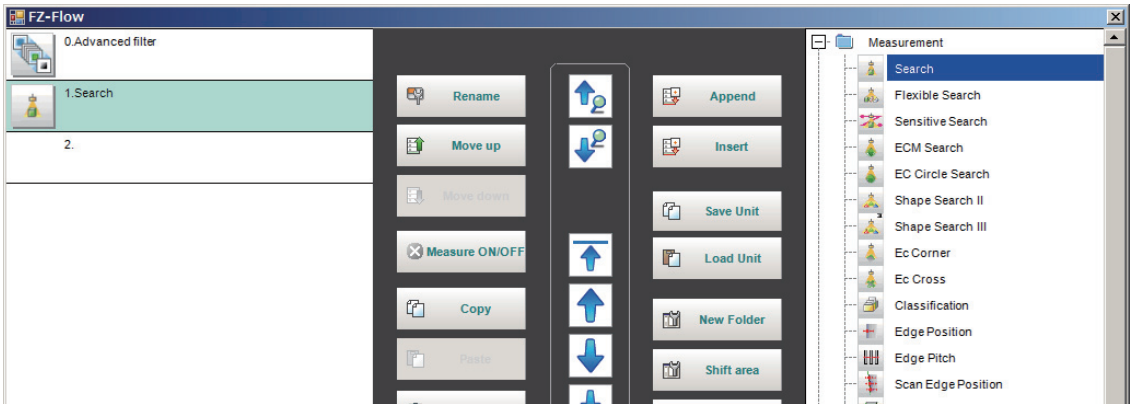
Create a flow for processing units to be defined.

1 Click [Scene switch] on the tool window in the main screen to set the scene to use.

In the example, use the scene three



2 Click [Edit flow] on the tool window to create a flow.



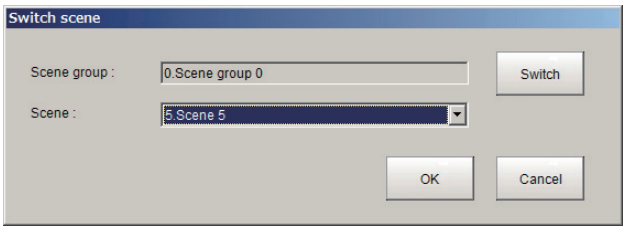
3 Click [Close] to return to the main screen.

Create a Flow of the Setting/Adjusting for Defined Processing Units

Create a flow of the setting/adjusting for defined processing units in another scene in the same scene group. Use this scene when setting/adjusting the defined processing units.

1 Click [Scene switch] on the tool window in the main screen to set the scene to use.

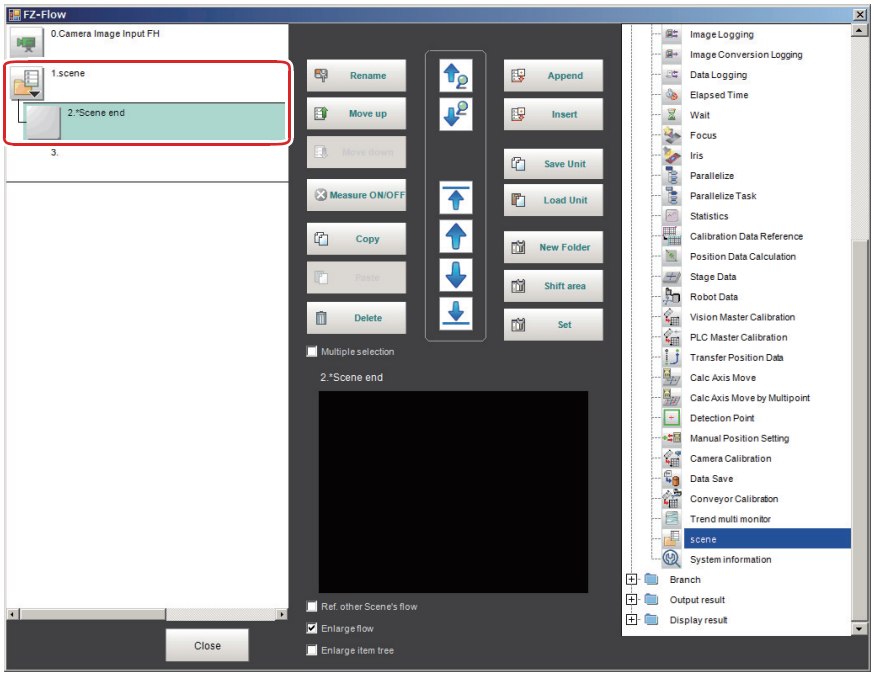
In the example, use the scene five.



2 Click [Edit flow] on the tool window to create a flow.

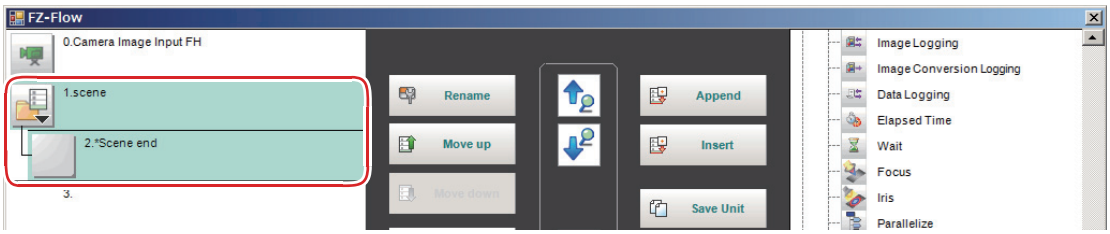
3 Add [Scene] processing item into the flow.

The [Scene] processing item and the [Scene end] processing item are added into the flow as a pair.



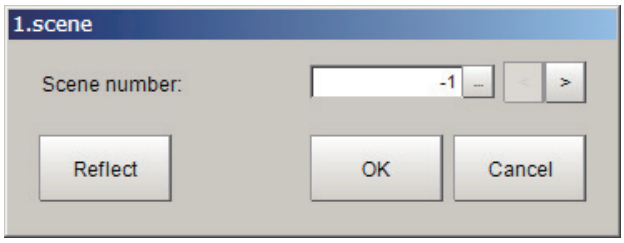
4 Select the [Scene] processing item on the flow.

The [Scene] processing item and the [Scene end] processing item are selected as a pair.



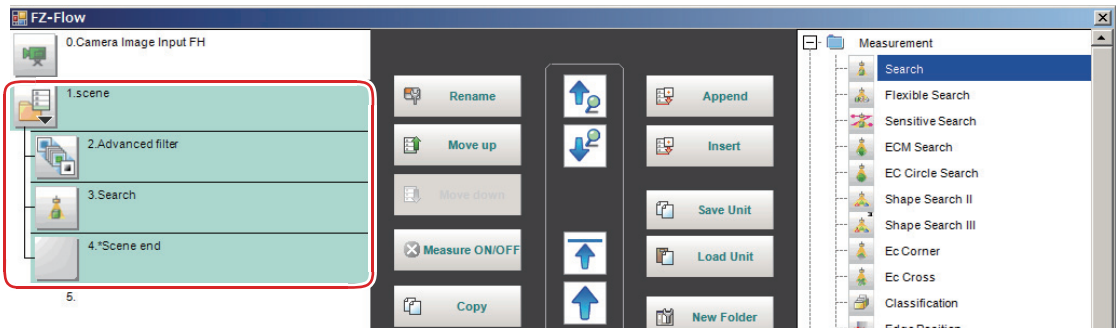
5 Click [Set].

The Scene setting dialog is displayed.



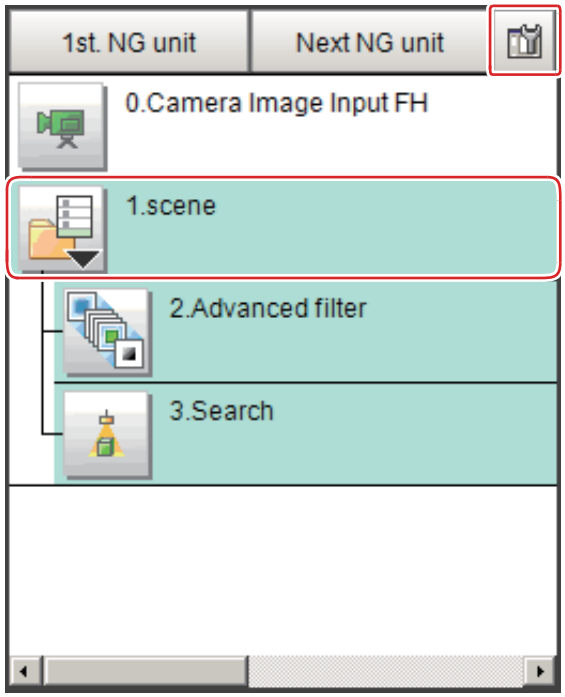
6 Input the scene number for the defined processing units in the [Scene number] and click [OK].

The defined processing units are inserted between the [Scene] processing item and the [Scene end] processing item.

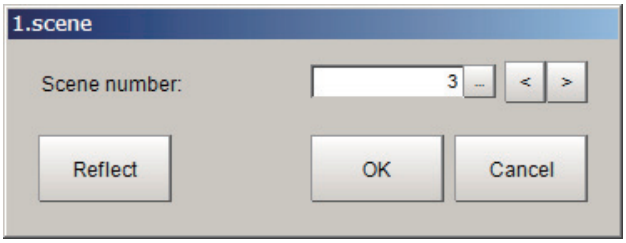


7 Measure and set parameters in the main screen.

8 Select the [Scene] processing item on the upper right in the flow display area and then click .



The Scene setting dialog is displayed.



9 Input the scene number for the defined scene number.

10 Click [Reflect].

The set parameters are reflected to the defined processing units.

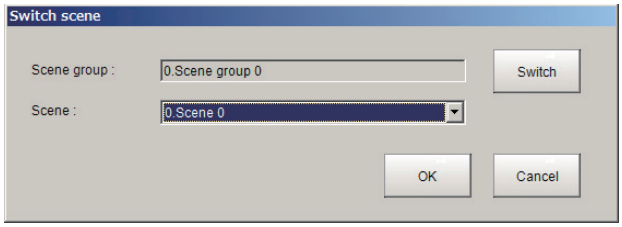
11 Click [OK].

Scene setting

Create a measurement flow in another scene in the same scene group.

1 Click [Scene switch] on the tool window in the main screen to set the scene to use.

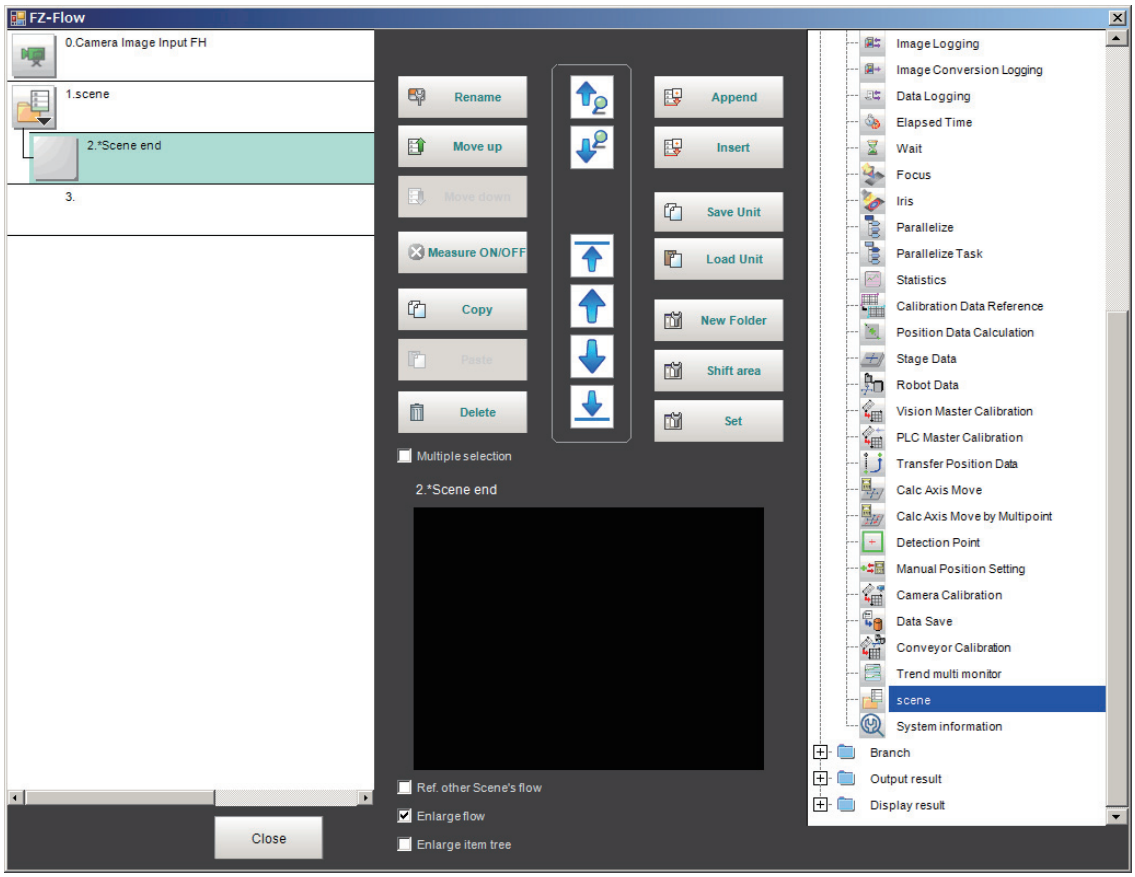
In the example, use the scene zero.



2 Click [Edit flow] on the tool window to create a flow.

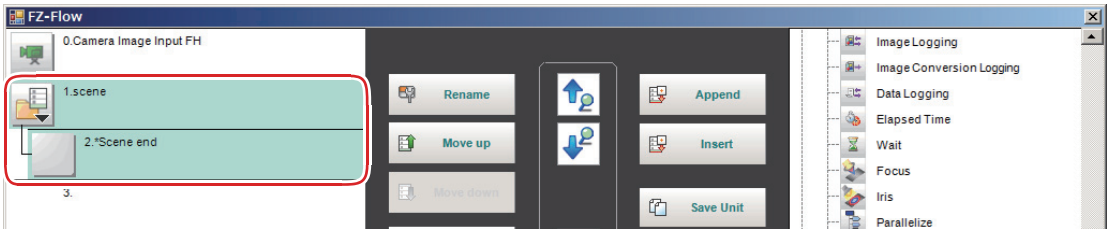
3 Add [Scene] processing item into the flow.

The [Scene] processing item and the [Scene end] processing item are added into the flow as a pair.



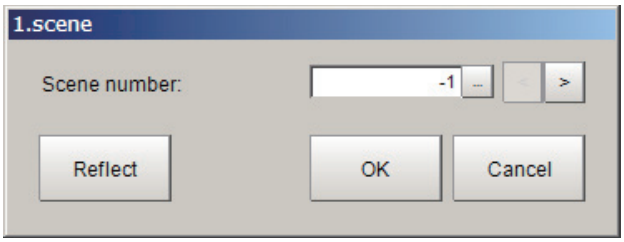
4 Select the [Scene] processing item in the flow.

The [Scene] processing item and the [Scene end] processing item are selected as a pair.



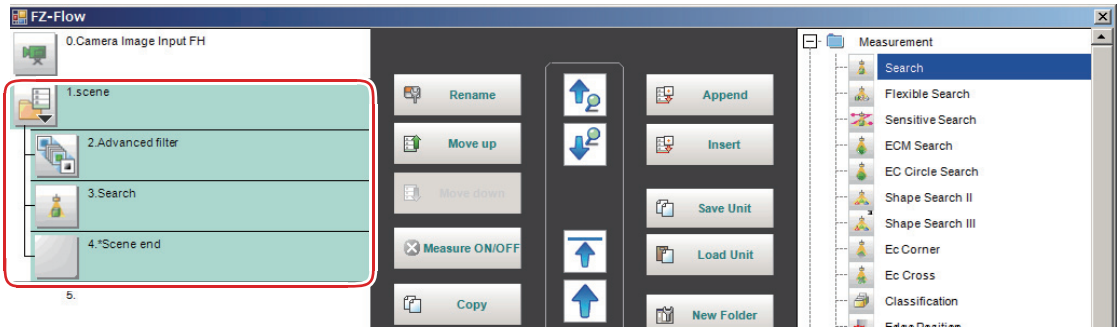
5 Click [Set].

The Scene setting dialog is displayed.



6 Input the scene number for the defined processing units in the [Scene number] and click [OK].

The defined processing units are inserted between the [Scene] processing item and the [Scene end] processing item.



7 Create the measurement flow by repeating the same procedure as required.

8 Click [Close] to return to the main screen.

Reflect the Modified Settings on the Measurement Flow

Any modifications between the [Scene] processing item and the [Scene end] processing item such as additions to processing items, deletions of processing units, and corrections to processing unit parameters to the defined processing units can be reflected in the defined processing units.

Important

- If there are multiple scene processing items, after reflecting any modifications in a pair of the [Scene] processing item and the [Scene end] processing items and then move to the next pair.

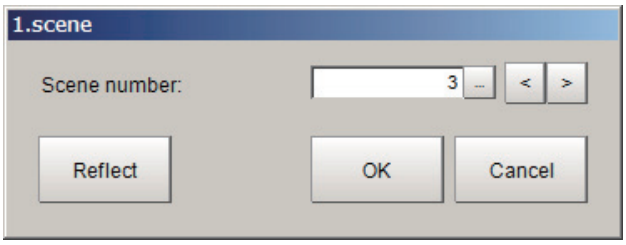
1 In the flow edit screen, add processing items, delete processing units, or change the parameters of defined processing units for scene processing items to between the [Scene] processing item and the [Scene end] processing item.

2 Select the [Scene] processing item in the flow.

The [Scene] processing item and the [Scene end] processing item are selected as a pair.

3 Click [Set].

The Scene setting dialog is displayed with the scene number for the defined processing units.



4 Click [Reflect].

The modifications are reflected in the defined processing units.

5 Click [OK].

6 Repeat the procedure 1 to 6 by the number of the [Scene] processing items.

7 Click [Close] to return to the main window.

8 Click [Data save] to save the modification.

4-37-2 External Reference Tables (Scene)

This processing item does not have an external reference number. Confirm using data identifier name and data mane.

No.	Identifier name	Data name	Set/Get	Data range
0	Judge	Judgement	Get only	0: No judgement (Unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (Image format mismatch) -11: Error (Unregistered model) -12: Error (Insufficient memory) -20: Error (Other errors)
Undefined	sceneNo	Scene No.	Set/Get	-1: No setting 0 to 9999: Scene No. of the reference

4-38 System Information

Processing item that retrieves system information such as memory capacity, disk space, and I/O input signal status of the sensor controller.

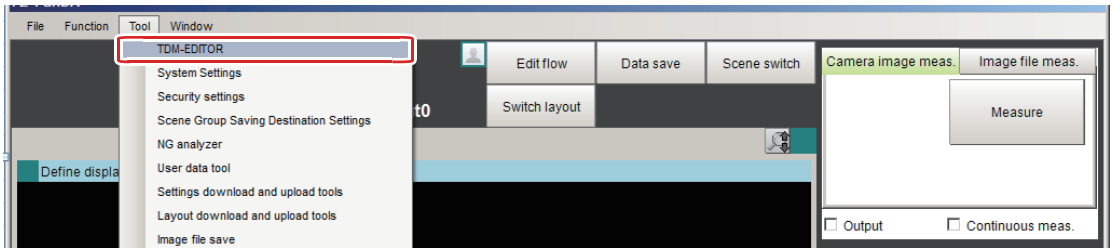
Just add this processing item and no setup is required.

Used in the Following Case

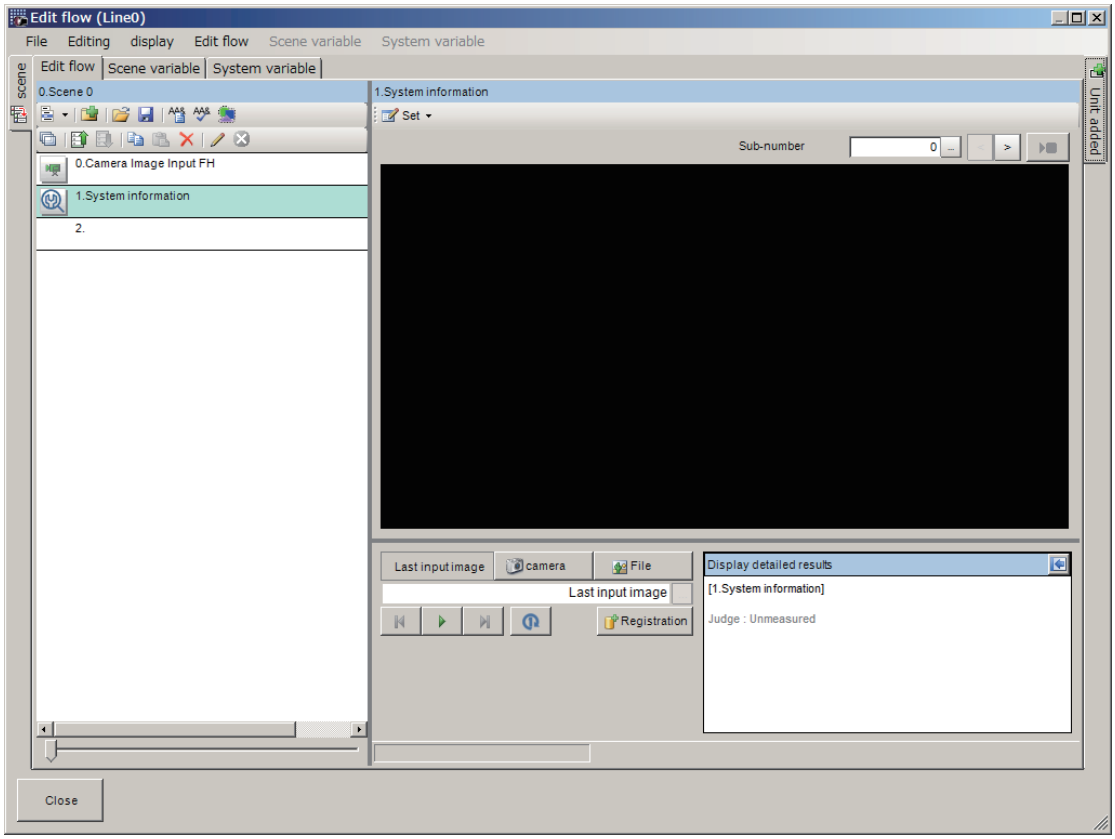
When retrieving system information such as memory capacity, disk space, and I/O input signal status of the sensor controller.

Usage

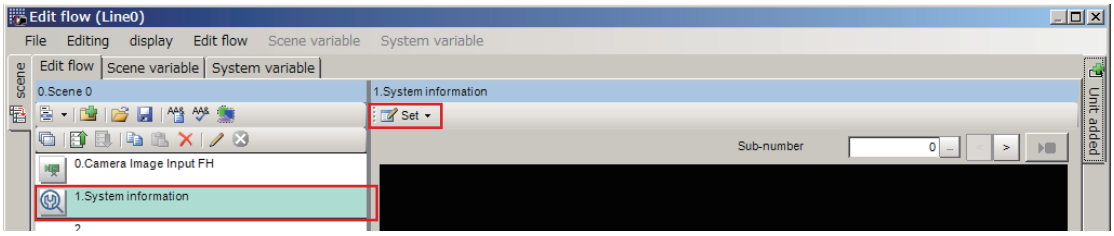
1 Click [TDM-Editor] in [Tool].



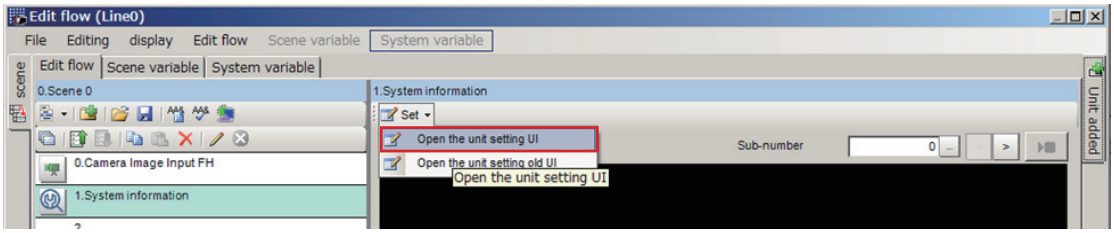
TDM-Editor appears.



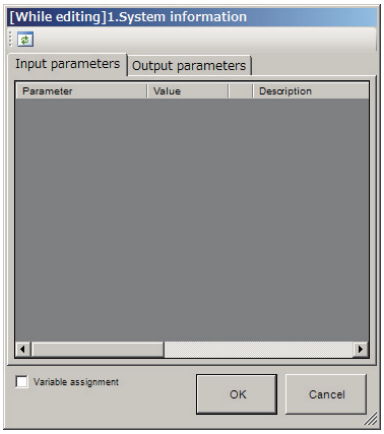
2 Click [1. System information] on the processing unit list and [Set] on the “1. System information” area.



3 Click [Open the unit setting UI] on the drop down menu.

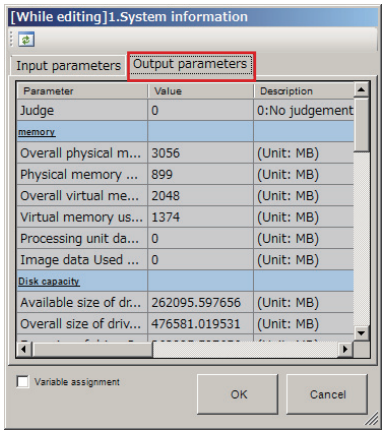


“Input/output parameter” window appears.

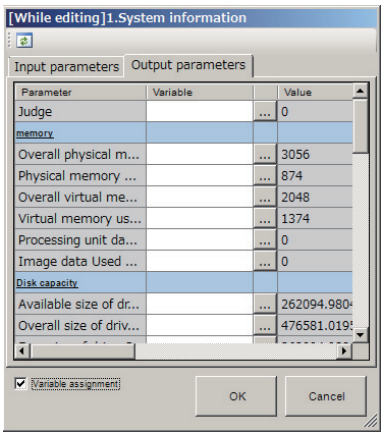


4 Click [Output parameters].

The output parameters are displayed.



5 Check the box of [Variable assignment] in the lower part of the window.
Assign variables to parameters you want to retrieve.



Available System Information (System information)

The following values can be output. The available information depends on models.

Classification	System information	Description
Classification	System information	Description
Judge		0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (Image format mismatch) -11: Error (Unregistered model) -12: Error (Insufficient memory) -20: Error (Other errors)
Memory	Overall physical memory size	Unit: MB
	Physical memory usable size	Unit: MB
	Overall virtual memory size	Unit: MB
	Virtual memory usable size	Unit: MB
	Processing unit data used size	Unit: MB
	Image data used size	Unit: MB
Disk capacity	Available size of drive C	Unit: MB
	Overall size of drive C	Unit: MB
	Free size of drive C	Unit: MB
	Available size of drive E	Unit: MB
	Overall size of drive E	Unit: MB
	Free size of drive E	Unit: MB
	Available size of drive F	Unit: MB
	Overall size of drive F	Unit: MB
	Free size of drive F	Unit: MB
	Available size of drive M	Unit: MB
	Overall size of drive M	Unit: MB
	Free size of drive M	Unit: MB
	Available size of drive S	Unit: MB
	Overall size of drive S	Unit: MB
	Free size of drive S	Unit: MB
	Available size of drive T	Unit: MB
	Overall size of drive T	Unit: MB
	Free size of drive T	Unit: MB

Classification	System information	Description
Disk capacity	Available size of drive U	Unit: MB
	Overall size of drive U	Unit: MB
	Free size of drive U	Unit: MB
	Available size of drive V	Unit: MB
	Overall size of drive V	Unit: MB
	Free size of drive V	Unit: MB
	Available size of drive W	Unit: MB
	Overall size of drive W	Unit: MB
	Free size of drive W	Unit: MB
	Available size of drive X	Unit: MB
	Overall size of drive X	Unit: MB
	Free size of drive X	Unit: MB
	Available size of drive Y	Unit: MB
	Overall size of drive Y	Unit: MB
	Free size of drive Y	Unit: MB
	Available size of drive Z	Unit: MB
	Overall size of drive Z	Unit: MB
	Free size of drive Z	Unit: MB
I/O input signal	Standard Parallel I/O	The bit sum of the pin whose input signal is ON.

4-38-1 External Reference Tables (System information)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
None	Overall physical memory size	memory.physicalTotal	Get only	(Unit: MB)
None	Physical memory usable size	memory.physicalAvailable	Get only	(Unit: MB)
None	Overall virtual memory size	memory.virtualTotal	Get only	(Unit: MB)
None	Virtual memory usable size	memory.virtualAvailable	Get only	(Unit: MB)
None	Processing unit data Used size	memory.procUnitUsed	Get only	(Unit: MB)
None	Image data Used size	memory.imageUsed	Get only	(Unit: MB)
None	Available size of drive C	disk.availableC	Get only	(Unit: MB)
None	Overall size of drive C	disk.totalC	Get only	(Unit: MB)
None	Free size of drive C	disk.freeC	Get only	(Unit: MB)
None	Available size of drive D	disk.availableD	Get only	(Unit: MB)
None	Overall size of drive D	disk.totalD	Get only	(Unit: MB)
None	Free size of drive D	disk.freeD	Get only	(Unit: MB)
None	Available size of drive E	disk.availableE	Get only	(Unit: MB)
None	Overall size of drive E	disk.totalE	Get only	(Unit: MB)
None	Free size of drive E	disk.freeE	Get only	(Unit: MB)
None	Available size of drive F	disk.availableF	Get only	(Unit: MB)
None	Overall size of drive F	disk.totalF	Get only	(Unit: MB)
None	Free size of drive F	disk.freeF	Get only	(Unit: MB)

No.	Data Name	Ident	Set/Get	Data range
None	Available size of drive M	disk.availableM	Get only	(Unit: MB)
None	Overall size of drive M	disk.totalM	Get only	(Unit: MB)
None	Free size of drive M	disk.freeM	Get only	(Unit: MB)
None	Available size of drive S	disk.availableS	Get only	(Unit: MB)
None	Overall size of drive S	disk.totalS	Get only	(Unit: MB)
None	Free size of drive S	disk.freeS	Get only	(Unit: MB)
None	Available size of drive T	disk.availableT	Get only	(Unit: MB)
None	Overall size of drive T	disk.totalT	Get only	(Unit: MB)
None	Free size of drive T	disk.freeT	Get only	(Unit: MB)
None	Available size of drive U	disk.availableU	Get only	(Unit: MB)
None	Overall size of drive U	disk.totalU	Get only	(Unit: MB)
None	Free size of drive U	disk.freeU	Get only	(Unit: MB)
None	Available size of drive V	disk.availableV	Get only	(Unit: MB)
None	Overall size of drive V	disk.totalV	Get only	(Unit: MB)
None	Free size of drive V	disk.freeV	Get only	(Unit: MB)
None	Available size of drive W	disk.availableW	Get only	(Unit: MB)
None	Overall size of drive W	disk.totalW	Get only	(Unit: MB)
None	Free size of drive W	disk.freeW	Get only	(Unit: MB)
None	Available size of drive X	disk.availableX	Get only	(Unit: MB)
None	Overall size of drive X	disk.totalX	Get only	(Unit: MB)
None	Free size of drive X	disk.freeX	Get only	(Unit: MB)
None	Available size of drive Y	disk.availableY	Get only	(Unit: MB)
None	Overall size of drive Y	disk.totalY	Get only	(Unit: MB)
None	Free size of drive Y	disk.freeY	Get only	(Unit: MB)
None	Available size of drive Z	disk.availableZ	Get only	(Unit: MB)
None	Overall size of drive Z	disk.totalZ	Get only	(Unit: MB)
None	Free size of drive Z	disk.freeZ	Get only	(Unit: MB)
None	Standard Parallel I/O	io.ParallelIo.GetAll	Get only	The bit sum of the pin whose input signal is ON
None	Line number	multiLine.no	Get only	Number of the current line
None	Scene group number	sceneGroup.no	Get only	Number of the current scene group
None	Scene group title name	sceneGroup.title	Get only	Title name of the current scene group
None	Scene number	scene.no	Get only	Number of the current scene
None	Scene title name	scene.title	Get only	Title name of the current scene
None	Measurement ID	measure.measureId	Get only	Measurement ID
None	Controller type	version.machine	Get only	Controller type
None	Version	version.version	Get only	Application software version
None	Date of creation	version.date	Get only	Creation date of application software

5

Branch

This chapter describes setting methods for when branch processing is performed.

5-1 Conditional Branch

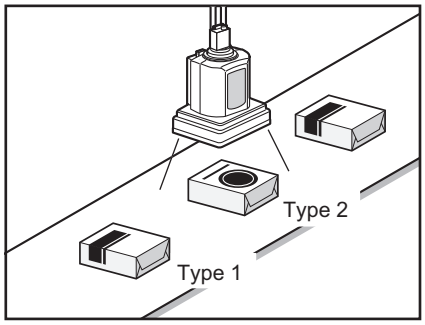
This processing item can not be used in the FHV series.

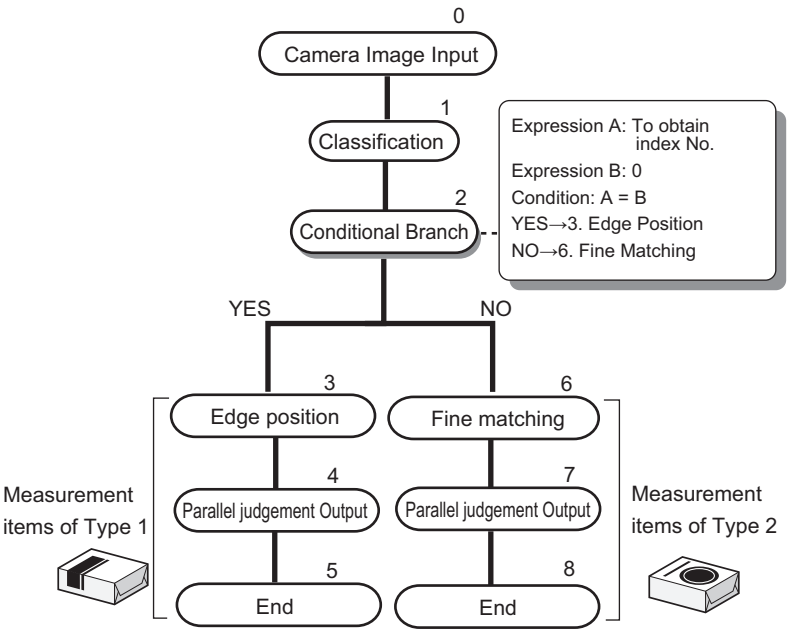
Expressions and conditions are set, and processing after this processing item is divided into two according to the comparison calculation.

Used in the Following Case

When two more types of products are on the production line and inspection is to be performed separately for each

Example) Detect the printing quality of candy boxes.





List of Conditional Branch Items

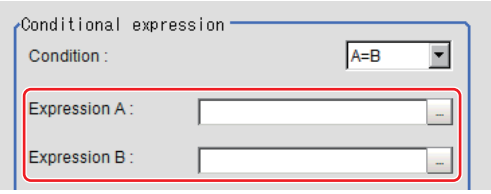
Set		Set value [Factory default]	Description
Condition		• [A = B] • A ≤ B • A < B • A ≥ B • A > B	Select the method to compare expression A and B. Compare two data items that are obtained through conditional expressions.
Expression A		Up to 256 characters	Set the evaluation expression that is to be the basis for branching. Set the expression through calculation. Refer to *4-3-1 Settings (Calculation)* on page 4-10.
Expression B			
Destination unit	YES	• -1: [End processing] • 0 to 32767: unit No.	Select the destination unit number for when the result of the comparison is true.
	NO	• -1: [End processing] • 0 to 32767: unit No.	Select the destination unit number for when the result of the comparison is false.

5-1-1 Conditional Branch

Specify expression A and B for the branching conditions.

1 Set expression A and B separately.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12.



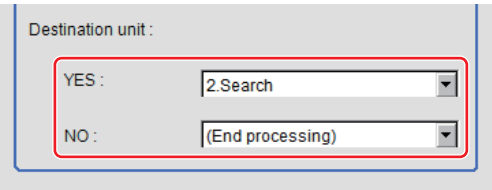
2 Click [icon] to set up conditions.

Condition	Description
A=B	If the value from expression A is equal to that from expression B, moves to the unit in which "Destination unit" is YES. If not, moves to the NO unit.
A<=B	If the value from expression A is equal to that of expression B, or if the value of A is lower than that of B, moves to the unit in which "Destination unit" is "YES". If A is larger, moves to the unit with "NO".
A<B	If the value from expression A is lower than the value from expression B, moves to the unit in which "Destination unit" is YES. If A is equal to or greater than B, moves to the NO unit.
A>=B	If the value from expression A is equal to that of expression B, or if the value of A is higher than that of B, moves to the unit in which "Destination unit" is "YES". If B is higher, moves to the unit with "NO".
A>B	If the value from expression A is higher than the value from expression B, moves to the unit in which "Destination unit" is YES. If A is equal to or less than B, moves to the NO unit.

3 Set the branch destination.

Important

- In order to avoid measurement processing looping, for the branch destination, set a processing unit number that is after the [Conditional Branch].
- Make sure to set "End" at the last branch destination to indicate the end of the branch. Refer to *5-2 End* on page 5-9.
- Do not set [Camera Image Input](processing unit 0) for the branch destination. You will not be able to load the image correctly.



Additional Information

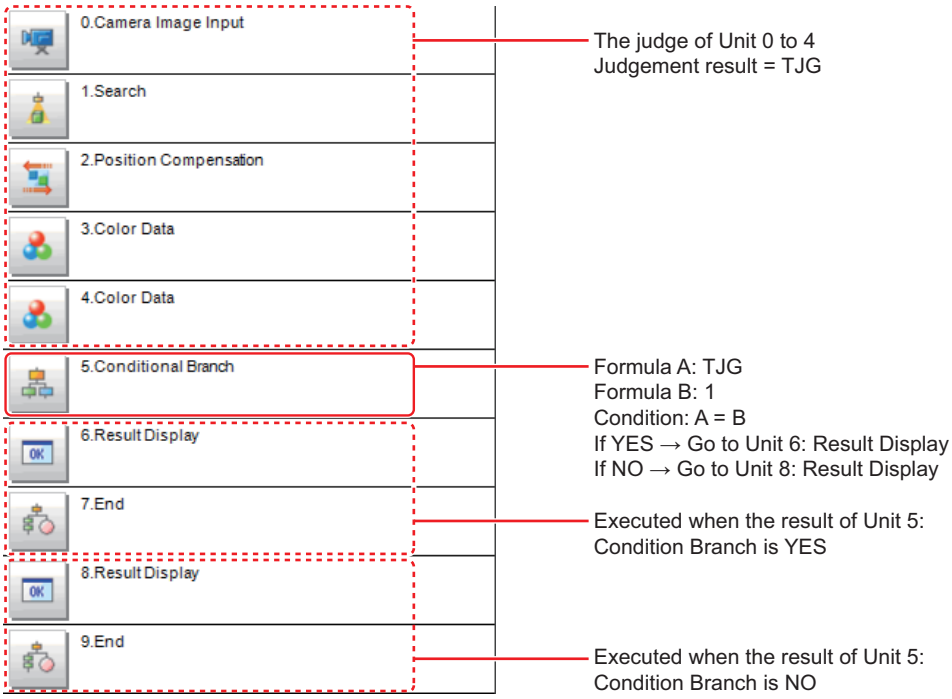
- The judgement result for a processing unit is finalized when that processing unit is processed.
- The overall judgement is finalized when all processing unit measurement is complete.

5-1-2 Conditional Branch Settings Examples

The overall judgement result for processing up to the unit number in which the expression is set is acquired and subsequent measurement is branched according the result.

For example, condition branching is performed based on the overall judgement result of Units 0 to 4.

Sample Display



1 Set [Conditional Branch] in Unit 5. Set the following expressions in Expression A and B, respectively.

- Expression A: TJG

  Acquire the overall judgement results from Unit 0 to Unit 4. The overall results based on the judgement results of Unit 0 to Unit 4 are output in the following manner.

Result of unit 0 to unit 4	TJG output
All the unit's judgement results are OK	1
The judgement results of one or more units are NG	-1

- Expression B: 1

  Set the value that will be compared with the value of A (TJG value).

2 Set the condition of the conditional expression to "A = B".

A = B, which means that TJG = 1, is set as the condition. As a result, if all the unit judgement results from 0 to 4 are OK, then the condition judgement result will be "YES".

3 Set each of the Conditional Branch destinations.

If "Yes", branch to unit 6. If "No", branch to unit 8.

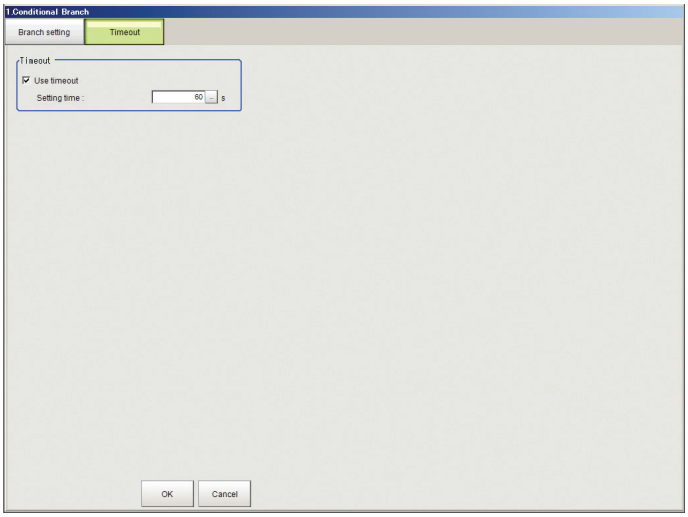
Important

Parameters for units that do not pass through a conditional branch
The measurement results other than the unit judgement result (JG) retain the measurement results from the previous time the unit passed through the conditional branch. The JG for units that do not pass through the condition branch becomes unmeasured (0). Note, however, that the unit JG becomes unmeasured at the point in time when all the measurement processing ends. During flow processing, the previous time judgement (JG) is retained.

5-1-3 Timeout (Conditional Branch)

Set the conditions under which the branching processing times out.

1 In the Item Tab area, click [Timeout].



2 In the "Timeout" area, specify a value for each item.

Setting item	Setting value [Factory default]	Description
Use timeout	• Unchecked • [Checked]	Click on the [Use timeout] checkbox to turn it ON if you want the branching processing to time out after a set amount of time passes.
Setting time	1 to 3600 [60]	This can be set when the "Use timeout" checkbox is selected. Set the length of time until the measurement process times out on the selected processing unit in seconds. When the measurement process for this processing unit is executed, a timeout occurs once the amount of time that passes since the start of the measurement exceeds the set [Setting time]. If a timeout occurs to disrupt the measurement process, the judgement results in NG.

Important

- Normally the “Use timeout” check box should be selected. Unchecking the [Use timeout] checkbox may cause the measurement flow to become stuck in an infinite loop when measurements are started depending on the branching processing settings.
- If using conditional branching within the block for the parallelization task in the measurement flow, set it up so that branching occurs only within the relevant block for the parallelization task. Attempting to introduce branching across blocks for the parallelization task may cause the timout function to stop working even with the [Use timeout] checkbox checked.

5-1-4 Measurement Results for Which Output Is Possible (Conditional Branch)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Expression A result	D0	Operational result of expression selected in expression A
Expression B result	D1	Operational result of expression selected in expression B
Comparison result	RS	Result from comparing the expressions (0: NO, 1: YES)
Destination unit No.	BU	Unit No. at destination based on the compares results of expressions

5-1-5 External Reference Tables (Conditional Branch)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Expression A result	resultExpA	Get only	Maximum 256 characters (result of calculation selected in expression A)
6	Expression B result	resultExpB	Get only	Maximum 256 characters (result of calculation selected in expression B)
7	Comparison result	judgeExpression	Get only	0: NO 1: YES
8	Destination unit No.	branchUnitNo	Get only	0 to 9,999
120	Condition type	conditionType	Set/Get	0: A = B 1: A ≤ B 2: A < B 3: A ≥ B 4: A > B
121	Yes branch destination unit No.	unitBranchOK	Set/Get	-1: End processing 0 to 9,999: Unit No.
122	No branch destination unit No.	unitBranchNG	Set/Get	-1: End processing 0 to 9,999: Unit No.
123	Expression A	expressionA	Set/Get	Exp. character string
124	Expression B	expressionB	Set/Get	Exp. character string
125	Timeout	timeout	Set/Get	0: Not used 1: Used
126	Timeout time [s]	timeoutTime	Set/Get	1 to 3,600

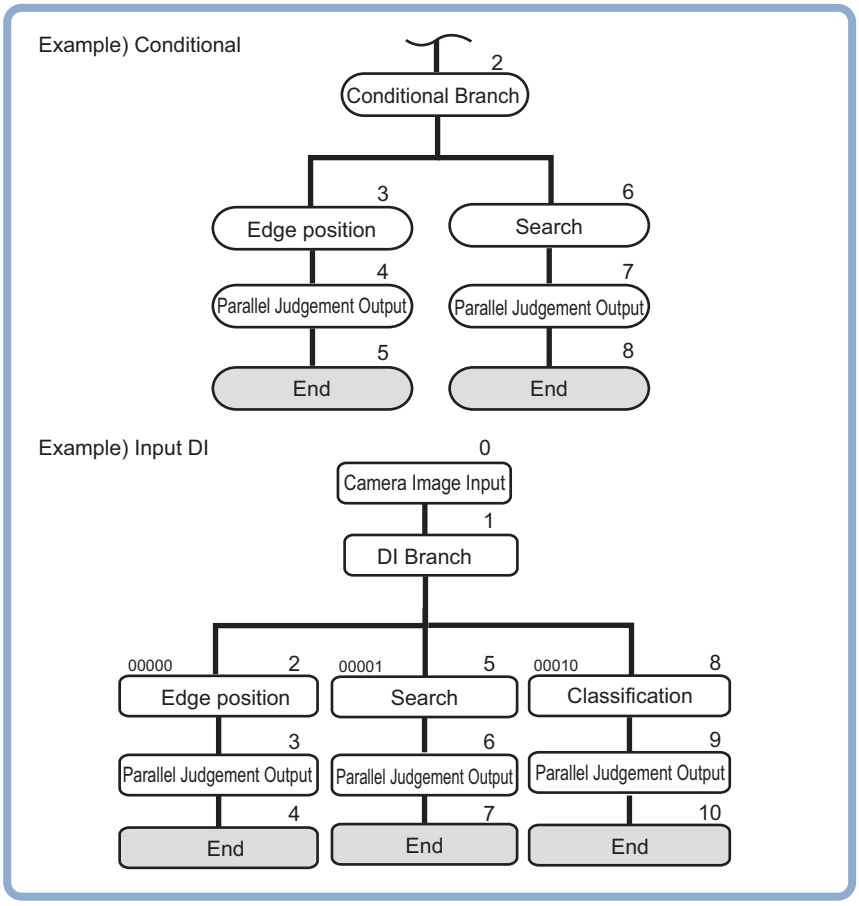
5-2 End

This processing item only needs to be added to the scene. Operations such as condition setting are unnecessary.

Please set at the last unit of each branch.

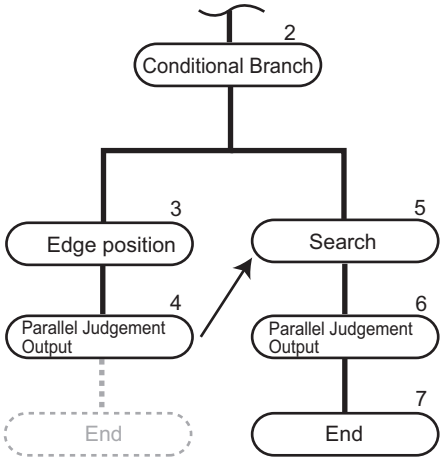
Used in the Following Case

When finishing the last Processing Item of a branch



Additional Information

If [End] is not set at the end of a branch, the processing in the scene will continue to move to the next unit No. even if the branch has been completed.



5-3 DI Branch

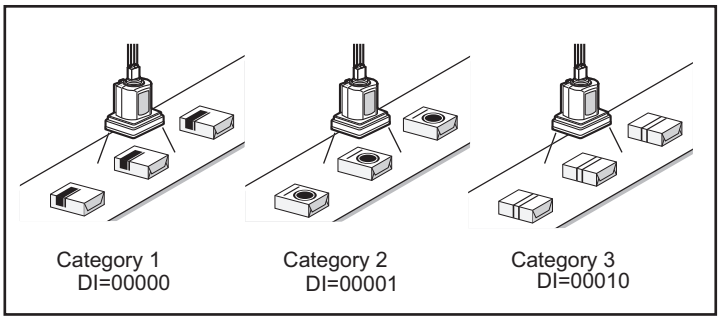
This processing item can not be used in the FHV series.

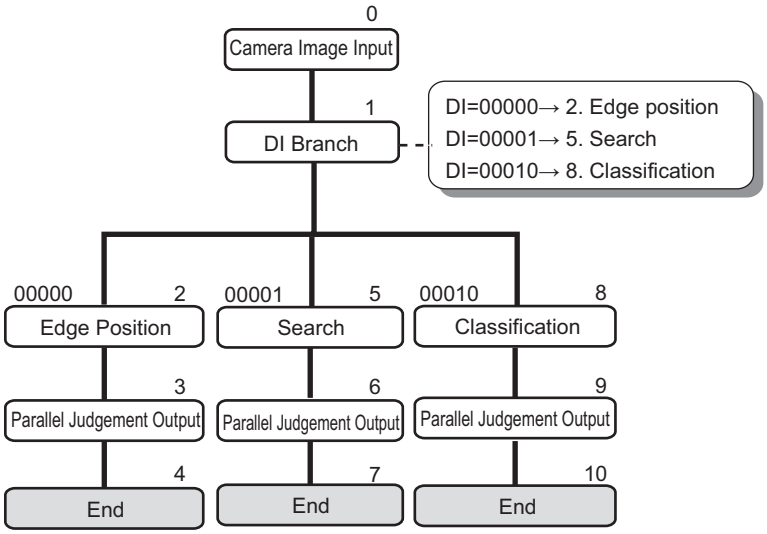
Starting from this processing item, processing is branched according to the information input to terminal blocks DI0 to DI4. Up to 32 branch destinations can be set.

Used in the Following Case

When products on one production line are to be inspected according to a time interval

Example) Detect the printing quality of candy different candy boxes.





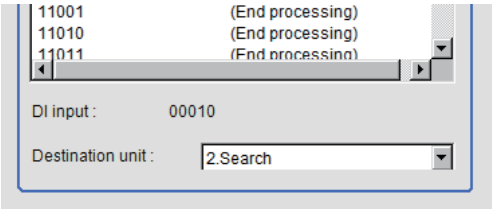
5-3-1 Settings (DI Branch)

Select the destination unit. Perform settings according to the information input in DI.

1 In the item tab area, click [Setting].

2 Click the DI input from the input signal list for which the branch destination is to be set up.

3 At "Destination unit", click [▼] and set the destination unit.



Important

- In order to avoid measurement processing looping, for the branch destination, set a processing unit number that is after the [DI Branch].
- Make sure to set "End" at the last branch destination to indicate the end of the branch.
  Refer to *5-2 End* on page 5-9.
- If the operation mode (FZ series) is set to [Multi-line random-trigger mode], DI inputs are handled differently as follows.
  Line 0: Conform to the statuses of DI0 and 1 inputs.
  Line 1: Conform to the statuses of DI2 and 3 inputs.
- If the operation mode (FZ5-8□□/FZ5-11□□/FZ5-12□□) is set to [Multi-line random-trigger mode], DI inputs are handled differently as follows.
  Line 0: Conform to the statuses of DI0 and 1 inputs.
  Line 1: Conform to the statuses of DI2 and 3 inputs.

4 Repeat the steps 2 to 3 and set the destination units for other input signals.

Additional Information

- Up to 32 (0 to 31) branch destinations can be set.
- The controller references the DI signal when the [DI Branch] measurement is executed.

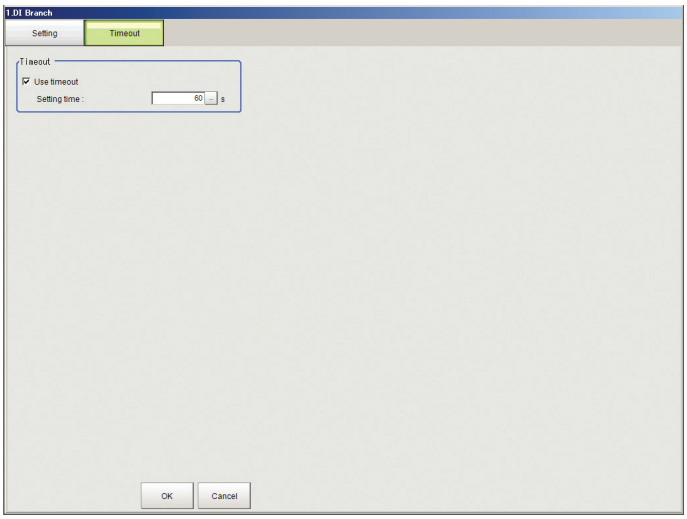
5 Click [OK].

The settings are finalized.

5-3-2 Timeout (DI Branch)

Set the conditions under which the branching processing times out.

1 In the Item Tab area, click [Timeout].



2 In the "Timeout" area, specify a value for each item.

Setting item	Setting value [Factory default]	Description
Use timeout	• Unchecked • [Checked]	Click on the [Use timeout] checkbox to turn it ON if you want the input condition branching processing to time out after a set amount of time passes.
Setting time	1 to 3600 [60]	This can be set when the "Use timeout"checkbox is selected. Set the length of time until the measurement process times out on the selected processing unit in seconds. When the measurement process for this processing unit is executed, a timeout occurs once the amount of time that passes since the start of the measurement exceeds the set [Setting time]. If a timeout occurs to disrupt the measurement process, the judgement results in NG.

Important

- Normally the “Use timeout” check box should be selected. Unchecking the [Use timeout] checkbox may cause the measurement flow to become stuck in an infinite loop when measurements are started depending on the input condition branching processing settings.
- If using input condition branching within the block for the parallelization task in the measurement flow, set it up so that branching occurs only within the relevant block for the parallelization task. Attempting to introduce branching across blocks for the parallelization task may cause the timout function to stop working even with the [Use timeout] checkbox checked.

5-3-3 Measurement Results for Which Output Is Possible (DI Branch)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
DI input No.	DI	Number (decimal) corresponding to DI input (00000 - 11111)
Unit No	BU	Unit number at destination corresponding to DI input

5-3-4 External Reference Tables (DI Branch)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	DI input No.	inputDINo	Get only	No. used to indicate DI input (00000 to 11111)
6	Unit No.	branchUnitNo	Get only	0 to 9,999
120	Destination Unit No. 0 (DI input 00000)	unitBranch0	Set/Get	-1: End processing 0 to 9,999: Unit No.
121	Destination Unit No. 1 (DI input 00001)	unitBranch1	Set/Get	-1: End processing 0 to 9,999: Unit No.
122	Destination Unit No. 2 (DI input 00010)	unitBranch2	Set/Get	-1: End processing 0 to 9,999: Unit No.
123	Destination Unit No. 3 (DI input 00011)	unitBranch3	Set/Get	-1: End processing 0 to 9,999: Unit No.
124	Destination Unit No. 4 (DI input 00100)	unitBranch4	Set/Get	-1: End processing 0 to 9,999: Unit No.
125	Destination Unit No. 5 (DI input 00101)	unitBranch5	Set/Get	-1: End processing 0 to 9,999: Unit No.
126	Destination Unit No. 6 (DI input 00110)	unitBranch6	Set/Get	-1: End processing 0 to 9,999: Unit No.
127	Destination Unit No. 7 (DI input 00111)	unitBranch7	Set/Get	-1: End processing 0 to 9,999: Unit No.
128	Destination Unit No. 8 (DI input 01000)	unitBranch8	Set/Get	-1: End processing 0 to 9,999: Unit No.
129	Destination Unit No. 9 (DI input 01001)	unitBranch9	Set/Get	-1: End processing 0 to 9,999: Unit No.
130	Destination Unit No. 10 (DI input 01010)	unitBranch10	Set/Get	-1: End processing 0 to 9,999: Unit No.
131	Destination Unit No. 11 (DI input 01011)	unitBranch11	Set/Get	-1: End processing 0 to 9,999: Unit No.

No.	Data name	Ident	Set/Get	Data range
132	Destination Unit No. 12 (DI input 01100)	unitBranch12	Set/Get	-1: End processing 0 to 9,999: Unit No.
133	Destination Unit No. 13 (DI input 01101)	unitBranch13	Set/Get	-1: End processing 0 to 9,999: Unit No.
134	Destination Unit No. 14 (DI input 01110)	unitBranch14	Set/Get	-1: End processing 0 to 9,999: Unit No.
135	Destination Unit No. 15 (DI input 01111)	unitBranch15	Set/Get	-1: End processing 0 to 9,999: Unit No.
136	Destination Unit No. 16 (DI input 10000)	unitBranch16	Set/Get	-1: End processing 0 to 9,999: Unit No.
137	Destination Unit No. 17 (DI input 10001)	unitBranch17	Set/Get	-1: End processing 0 to 9,999: Unit No.
138	Destination Unit No. 18 (DI input 10010)	unitBranch18	Set/Get	-1: End processing 0 to 9,999: Unit No.
139	Destination Unit No. 19 (DI input 10011)	unitBranch19	Set/Get	-1: End processing 0 to 9,999: Unit No.
140	Destination Unit No. 20 (DI input 10100)	unitBranch20	Set/Get	-1: End processing 0 to 9,999: Unit No.
141	Destination Unit No. 21 (DI input 10101)	unitBranch21	Set/Get	-1: End processing 0 to 9,999: Unit No.
142	Destination Unit No. 22 (DI input 10110)	unitBranch22	Set/Get	-1: End processing 0 to 9,999: Unit No.
143	Destination Unit No. 23 (DI input 10111)	unitBranch23	Set/Get	-1: End processing 0 to 9,999: Unit No.
144	Destination Unit No. 24 (DI input 11000)	unitBranch24	Set/Get	-1: End processing 0 to 9,999: Unit No.
145	Destination Unit No. 25 (DI input 11001)	unitBranch25	Set/Get	-1: End processing 0 to 9,999: Unit No.
146	Destination Unit No. 26 (DI input 11010)	unitBranch26	Set/Get	-1: End processing 0 to 9,999: Unit No.
147	Destination Unit No. 27 (DI input 11011)	unitBranch27	Set/Get	-1: End processing 0 to 9,999: Unit No.
148	Destination Unit No. 28 (DI input 11100)	unitBranch28	Set/Get	-1: End processing 0 to 9,999: Unit No.
149	Destination Unit No. 29 (DI input 11101)	unitBranch29	Set/Get	-1: End processing 0 to 9,999: Unit No.
150	Destination Unit No. 30 (DI input 11110)	unitBranch30	Set/Get	-1: End processing 0 to 9,999: Unit No.
151	Destination Unit No. 31 (DI input 11111)	unitBranch31	Set/Get	-1: End processing 0 to 9,999: Unit No.
200	Timeout	timeout	Set/Get	0: Not used 1: Used
201	Timeout time [s]	timeoutTime	Set/Get	1 to 3,600

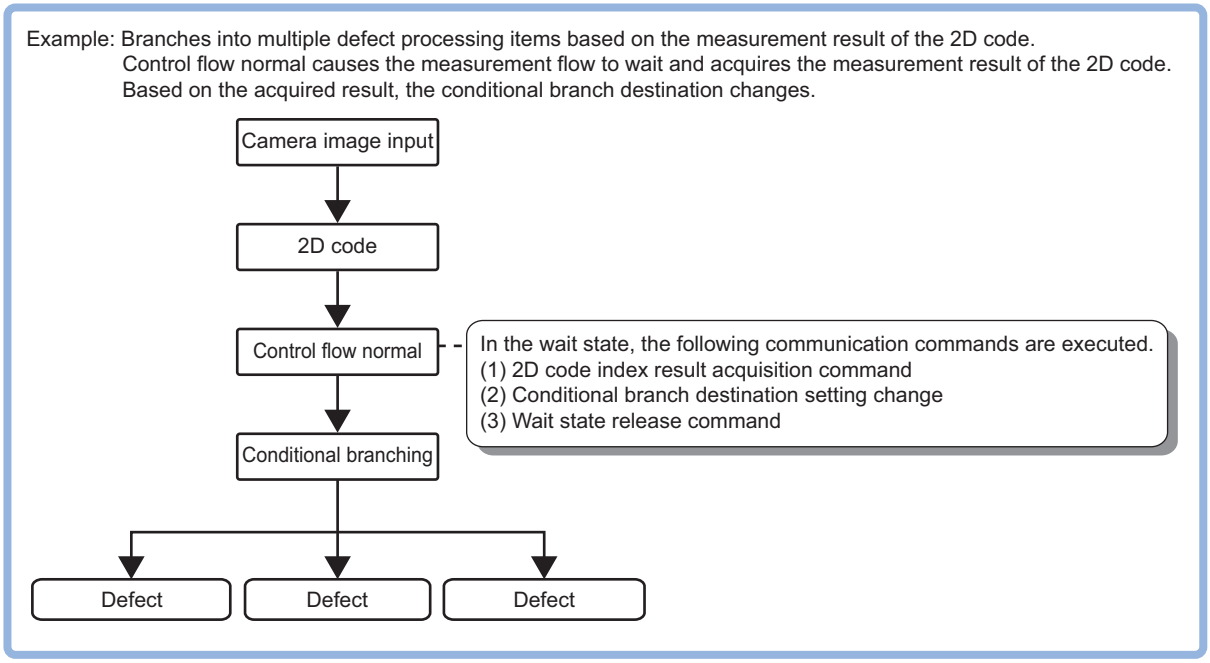
5-4 Control Flow Normal

This processing item can not be used in the FHV series.

This function is used to put the currently executed measurement flow in the wait state to allow execution of a specific communication command from an external device.

Used in the Following Case

To execute a communication command during measurement flow processing



This processing item is compatible with measurement flow control using the communication modules below.

Parallel	PLC Link	EtherNet/IP	EtherCAT	Non-procedure*1
NA	NA	NA	NA	OK

*1. Unless the Communication module is non-procedure (UDP) (Fxxx Series) or non procedure (Fxxx Series).

In the wait state, the communication commands below can be executed. For details on the communication commands, for details, refer to *List of Commands* in *Section 3 Appendixes - Command Control* in the *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Cat. No. Z342).

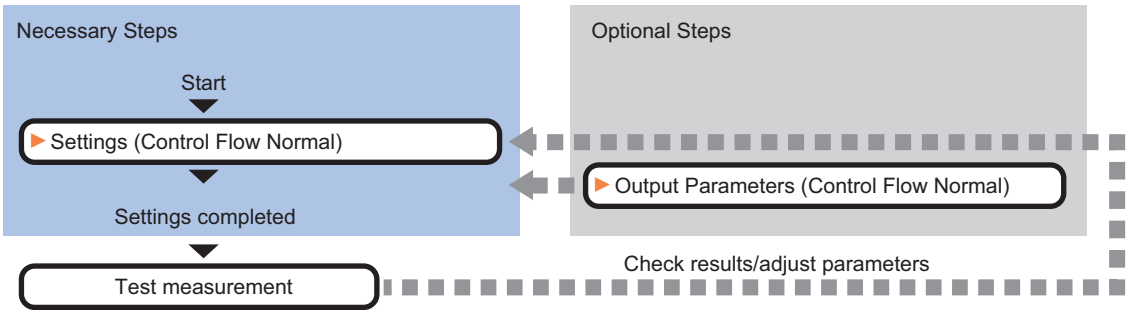
Command name	Function
Get Unit Data	Gets the parameters and measurement values of the processing unit.
Set Unit Data	Sets the parameters and measurement values of the processing unit.
Return to Start of Flow	Branches to the start of the measurement flow (processing unit 0)

To clear the wait state, use the Set Unit Data command. The wait state can be cleared by setting the "Wait state clear command" to "1" in the External Reference Table.

Refer to *5-4-6 External Reference Tables (Control Flow Normal)* on page 5-20.

5-4-1 Settings Flow (Control Flow Normal)

Set up control flow normal according to the following steps.



List of Control Flow Normal Items

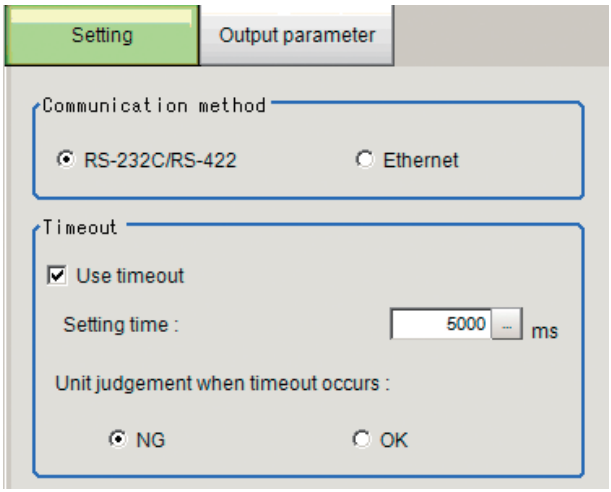
The following items can be set in control flow normal.

Item name	Description
Setting	Set communication and timeout conditions for controlling the measurement flow. Refer to *5-4-2 Settings (Control Flow Normal)* on page 5-17.
Output parameter	You can set this item to change the output parameters. Set the conditions and parameters for outputting measurement results to other processing units or external devices. Refer to *5-4-5 Measurement Results for Which Output Is Possible (Control Flow Normal)* on page 5-19.

5-4-2 Settings (Control Flow Normal)

Set communication and timeout conditions for controlling the measurement flow.

1 In the Item Tab area, click [Setting].



2 In the “Communication method” area, specify a value for each item.

Setting item	Setting value [Factory default]	Description
Communication method	• [RS-232C/RS-422] • Ethernet	Select the communication method used for controlling the measurement flow from an external device.

3 In the “Timeout” area, specify a value for each item.

Setting item	Setting value [Factory default]	Description
Use timeout	• [Checked] • Unchecked	If you want to clear the measurement flow wait state after a certain period of time elapses, select the “Use timeout” check box. This should normally be used with the check box selected.
Setting time	0 to 120,000 [5,000]	This item can be set when the [Use timeout] check box is selected. Set the time in ms after which the wait state on the processing unit is cleared. When a timeout is used, the wait state is cleared when the time set in “Setting time” elapses after the measurement unit starts measurement processing. When the wait state is cleared, the measurement flow resumes.
Unit judgement in timeout	• [NG] • OK	This item can be set when the [Use timeout] check box is selected. Select whether the judgement result of the processing unit is NG or OK when the processing unit times out after the “Setting time” in measurement processing.

Important

Normally the “Use timeout” check box should be selected. When the check mark is removed from “Use timeout”, the wait state can only be cleared by executing a “Wait state clear command” from an external device.

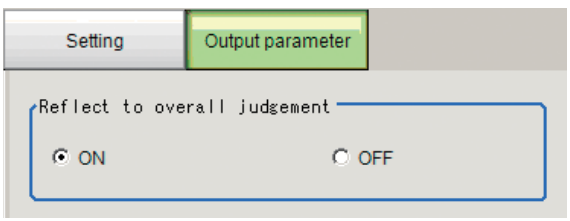
5-4-3 Output Parameters (Control Flow Normal)

You can set this item to change the output parameters.

The output parameters are the conditions and parameters for outputting measurement results to other processing units or external devices. Normally, the factory default values can be used.

1 Click [Output parameter] in the Item Tab area.

2 Specify a value for each item.



Setting item	Setting value [Factory default]	Description
Reflect to the overall judgement	• [ON] • OFF	Set whether the judgement result from this processing unit is applied to the overall scene judgement.

5-4-4 Key Points for Test Measurement and Adjustment (Control Flow Normal)

You can adjust the parameters while you perform test measurements and check the measurement results to increase the measurement precision and speed.

Select the adjustment method by considering the following point.

Check the measurement results that can be displayed and output in “Measurement Results for Which Output Is Possible”.

Items Displayed in the Detail Result Area

The following measurement results are displayed in the “Detail result” area as text.

Displayed item	Description
Judge	Displays the judgement result for the processing unit.

Items Displayed in the Image Display Area

You can specify a sub-image number to display the next image in the image display area.

Sub image number	Description
0	The measurement image appears.

5-4-5 Measurement Results for Which Output Is Possible (Control Flow Normal)

Measurement results in control flow normal are as shown below. The measurement results appear in the “Detail Result” area, and you can also use result output processing items to output the measurement results to an external device.

Refer to the “External Reference Tables” for the parameters that can be referenced, including measurement results.

Refer to *5-4-6 External Reference Tables (Control Flow Normal)* on page 5-20.

Measurement item	Character string	Description
Judge	JG	The judgement result for the processing unit

5-4-6 External Reference Tables (Control Flow Normal)

By specifying a number, you can access the following data from processing items that support processing unit data setting/acquisition, and from control commands.

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	status	status	Get only	0: Flow is running 1: Flow has stopped
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Timeout	timeout	Set/Get	0: Not used 1: Used
121	Timeout time [ms]	timeoutTime	Set/Get	0 to 120,000
122	Communication method	comType	Set/Get	0: RS-232C/RS-422 1: Ethernet
123	Unit judgement in timeout	timeoutJudge	Set/Get	0: NG 1: OK
5000	Release waiting	releaseWaiting	Set only	1: Release waiting status

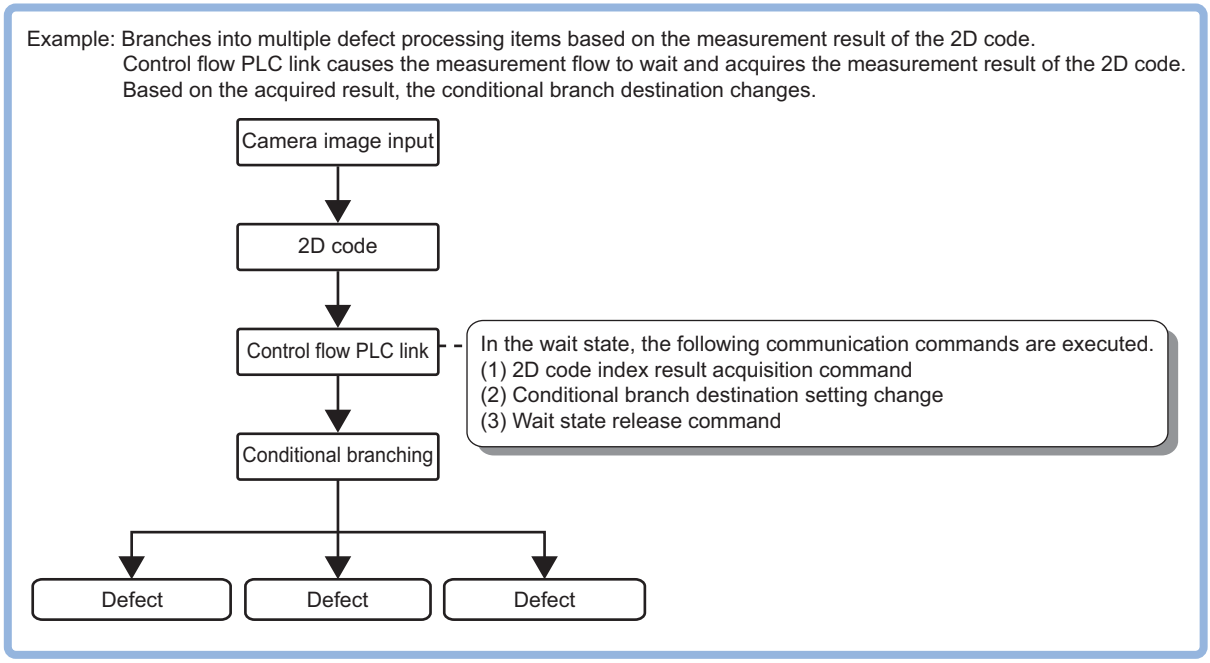
5-5 Control Flow PLC Link

This processing item can not be used in the FHV series.

This function is used to put the currently executed measurement flow in the wait state to allow execution of a specific communication command from an external device.

Used in the Following Case

To execute a communication command during measurement flow processing



This processing item is compatible with measurement flow control using the communication modules below.

Parallel	PLC Link	EtherNet/IP	EtherCAT	Non-procedure
NA	OK	NA	NA	NA

In the wait state, the communication commands below can be executed. For details on the communication commands, for details, refer to *List of Commands* in *Section 3 Appendixes - Command Control* in the *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Cat. No. Z342).

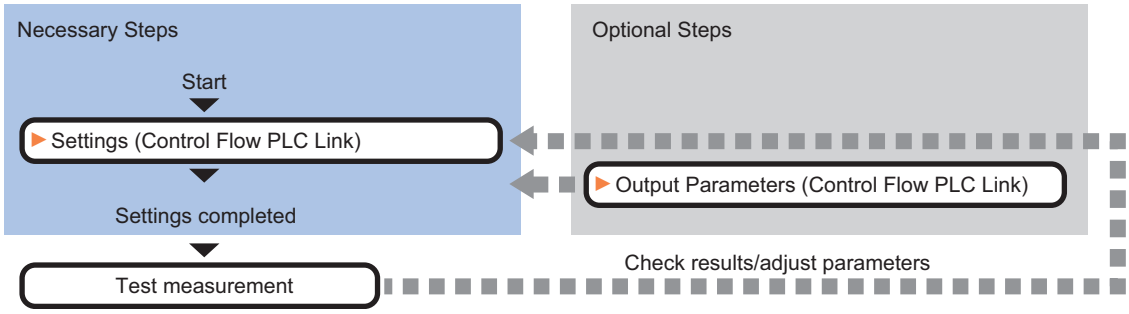
Command name	Function
Get Unit Data	Gets the parameters and measurement values of the processing unit.
Set Unit Data	Sets the parameters and measurement values of the processing unit.
Return to Start of Flow	Branches to the start of the measurement flow (processing unit 0)

To clear the wait state, use the Set Unit Data command. The wait state can be cleared by setting the "Wait state clear command" to "1" in the External Reference Table.

Refer to *5-5-6 External Reference Tables (Control Flow PLC Link)* on page 5-25.

5-5-1 Settings Flow (Control Flow PLC Link)

Set up control flow PLC link according to the following steps.



List of Control Flow PLC Link Items

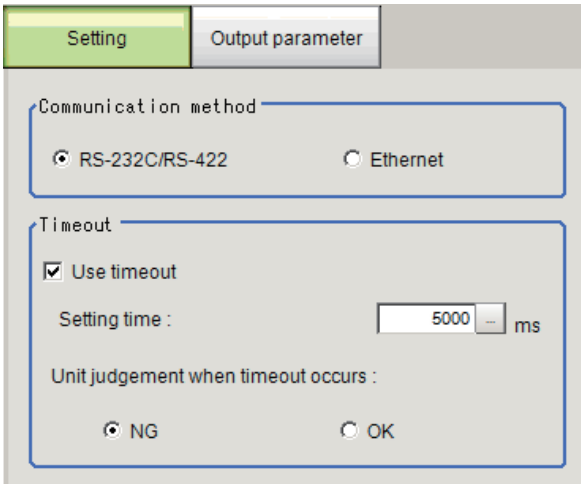
The following items can be set in control flow PLC link.

Item name	Description
Setting	Set communication and timeout conditions for controlling the measurement flow. Refer to *5-5-2 Settings (Control Flow PLC Link)* on page 5-22.
Output parameter	You can set this item to change the output parameters. Set the conditions and parameters for outputting measurement results to other processing units or external devices. Refer to *5-5-5 Measurement Results for Which Output Is Possible (Control Flow PLC Link)* on page 5-24.

5-5-2 Settings (Control Flow PLC Link)

Set communication and timeout conditions for controlling the measurement flow.

1 In the Item Tab area, click [Setting].



2 In the “Communication method” area, specify a value for each item.

Setting item	Setting value [Factory default]	Description
Communication method	• [RS-232C/RS-422] • Ethernet	Select the communication method used for controlling the measurement flow from an external device.

3 In the “Timeout” area, specify a value for each item.

Setting item	Setting value [Factory default]	Description
Use timeout	• [Checked] • Unchecked	If you want to clear the measurement flow wait state after a certain period of time elapses, select the “Use timeout” check box. This should normally be used with the check box selected.
Setting time	0 to 120,000 [5,000]	This item can be set when the [Use timeout] check box is selected. Set the time in ms after which the wait state on the processing unit is cleared. When a timeout is used, the wait state is cleared when the time set in “Setting time” elapses after the measurement unit starts measurement processing. When the wait state is cleared, the measurement flow resumes.
Unit judgement in timeout	• [NG] • OK	This item can be set when the [Use timeout] check box is selected. Select whether the judgement result of the processing unit is NG or OK when the processing unit times out after the “Setting time” in measurement processing.

Important

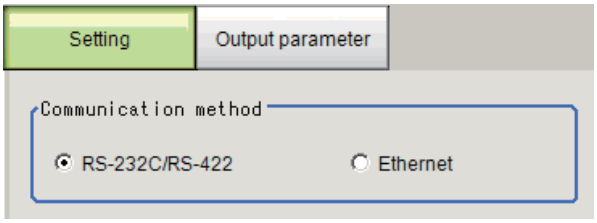
Normally the “Use timeout” check box should be selected. When the check mark is removed from “Use timeout”, the wait state can only be cleared by executing a “Wait state clear command” from an external device.

5-5-3 Output Parameters (Control Flow PLC Link)

You can set this item to change the output parameters.

The output parameters are the conditions and parameters for outputting measurement results to other processing units or external devices. Normally, the factory default values can be used.

1 Click [Output parameter] in the Item Tab area.



2 Specify a value for each item.

Setting item	Setting value [Factory default]	Description
Reflect to the overall judgement	• [ON] • OFF	Set whether the judgement result from this processing unit is applied to the overall scene judgement.

5-5-4 Key Points for Test Measurement and Adjustment (Control Flow PLC Link)

You can adjust the parameters while you perform test measurements and check the measurement results to increase the measurement precision and speed.

Select the adjustment method by considering the following point.

For the display of measurement results and the results that are output, refer to *5-5-5 Measurement Results for Which Output Is Possible (Control Flow PLC Link)* on page 5-24.

Items Displayed in the Detail Result Area

The following measurement results are displayed in the “Detail result” area as text.

Displayed item	Description
Judge	Displays the judgement result for the processing unit.

Items Displayed in the Image Display Area

You can specify a sub-image number to display the next image in the image display area.

Sub image number	Description
0	The measurement image appears.

5-5-5 Measurement Results for Which Output Is Possible (Control Flow PLC Link)

The measurement results provided by control flow PLC link are shown below. The measurement results appear in the “Detail Result” area, and you can also use result output processing items to output the measurement results to an external device.

Refer to the “External Reference Tables” for the parameters that can be referenced, including measurement results.

Refer to *5-5-6 External Reference Tables (Control Flow PLC Link)* on page 5-25.

Measurement item	Character string	Description
Judge	JG	The judgement result for the processing unit

5-5-6 External Reference Tables (Control Flow PLC Link)

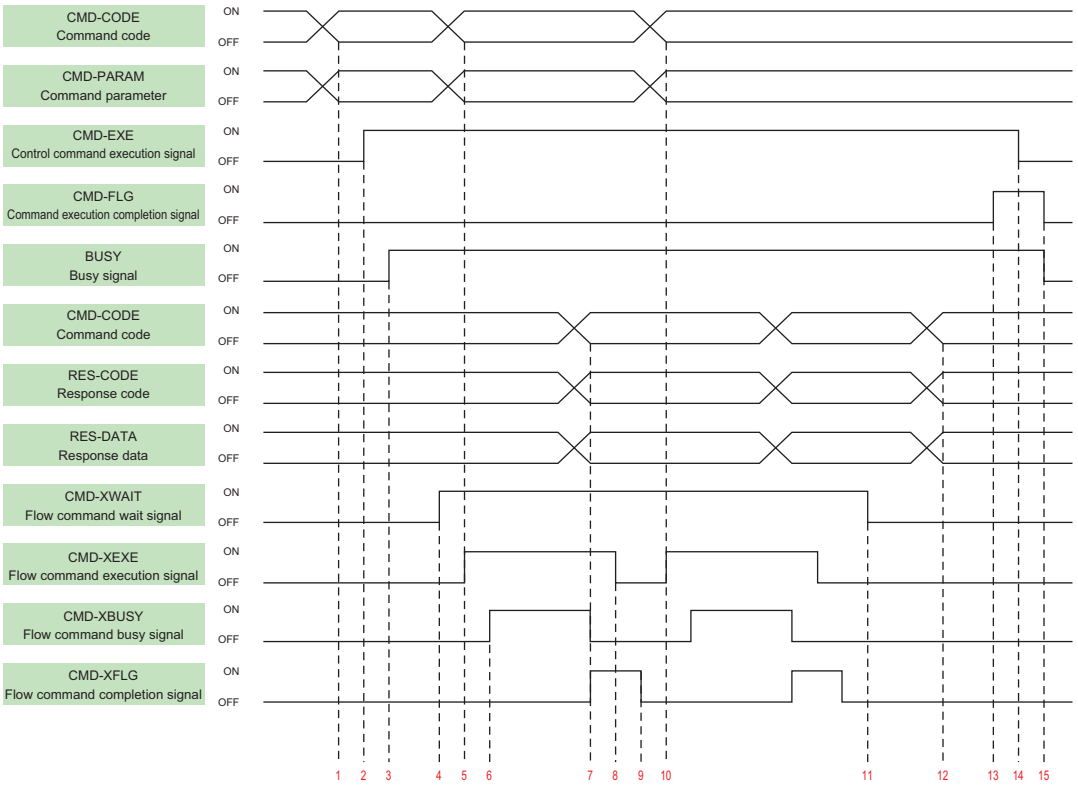
By specifying a number, you can access the following data from processing items that support processing unit data setting/acquisition, and from control commands.

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	status	status	Get only	0: Flow is running 1: Flow has stopped
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Timeout	timeout	Set/Get	0: Not used 1: Used
121	Timeout time [ms]	timeoutTime	Set/Get	0 to 120,000
122	Communication method	comType	Set/Get	0: RS-232C/RS-422 1: Ethernet
123	Unit judgement in timeout	timeoutJudge	Set/Get	0: NG 1: OK
5000	Release waiting	releaseWaiting	Set only	1: Release waiting status

5-5-7 Timing Chart (Control Flow PLC Link)

To execute a command using a Control Flow PLC Link processing item during a measurement flow, control the sensor controller paying attention to the timing of the signals from the external device. Refer to the timing chart below.

Example: The measurement command is executed by PLC Link, and the processing unit data setting command is executed by Control Flow PLC Link processing during measurement.



1. Set the command code and command parameters to be executed by the user (PLC). (In the above example, this is the measurement command.)
2. The user (PLC) turns ON the control command execution signal (EXE signal).
3. The sensor controller turns ON the processing busy signal (BUSY signal).
4. When the processing unit is executed inside the measurement flow, the sensor controller turns ON the measuring command standby signal (XWAIT signal).
5. The user (PLC) sets the command code to be executed during measurement and the command parameters, during measurement, and turns ON the measuring command execution signal (XEXE signal). (In the above example, this is the Set Unit Data command.)
6. The sensor controller turns ON the measuring command executing signal (XBUSY signal).
7. After setting the command code executed during measurement, the response code, and response data, the sensor controller turns ON the flow command completion signal (XFLG signal), and turns OFF the measuring command executing signal (XBUSY signal).
8. The user (PLC) turns OFF the flow command execution signal (XEXE signal). If the signal does not turn OFF within the set timeout time, the control flow advances directly to step 14.
9. The sensor controller turns OFF the measuring command completion signal (XFLG signal).
10. The user (PLC) sets the command code to be executed during measurement and the command parameters, during measurement, and turns ON the measuring command execution signal (XEXE signal). (In the above example, this is clearing of the wait state by the processing unit data setting command.)
    After this, steps 6 through 9 are performed.

11. When the processing unit finishes measurement processing, the sensor controller turns OFF the measuring command standby signal (XWAIT signal).
12. The sensor controller sets the executed command code, response code, and response data.
13. The sensor controller turns ON the command completion signal (FLG signal).
14. The user (PLC) turns OFF the command execution signal (EXE signal).
15. The sensor controller turns OFF the command completion signal (FLG signal), and turns OFF the processing busy signal (BUSY signal).

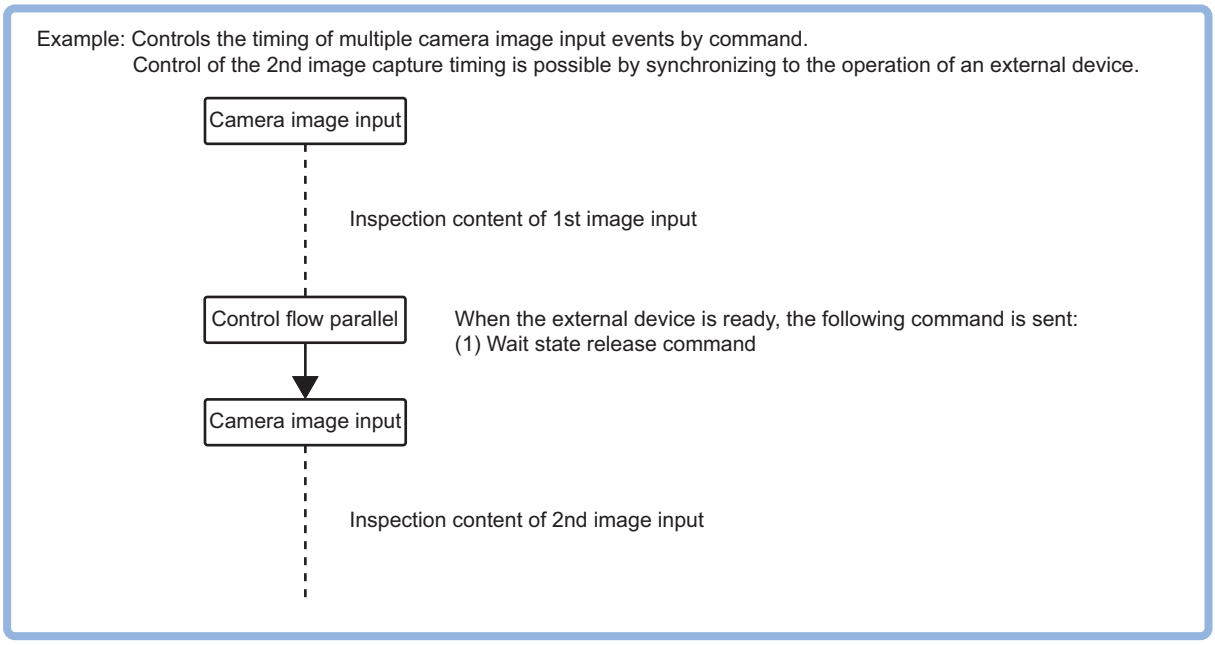
5-6 Control Flow Parallel

This processing item can not be used in the FHV series.

This function is used to put the currently executed measurement flow in the wait state to allow execution of a specific communication command from an external device.

Used in the Following Case

To execute a communication command during measurement flow processing



This processing item is compatible with measurement flow control using the communication modules below.

Parallel	PLC Link	EtherNet/IP	EtherCAT	Non-procedure
OK	NA	NA	NA	NA

Measurement flow processing is placed in a wait state to allow certain commands to be executed.

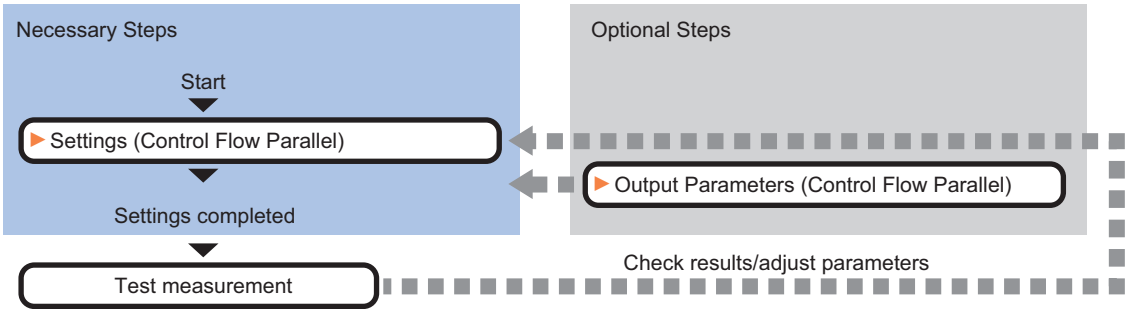
There are two ways to clear the wait state, either through use of a command or through use of a set timeout time.

In the wait state, the communication commands below can be executed.

Item	Description	Input Format (DI7 to DI0)			Input Example (DI7 to DI0)
		Execution (DI7)	Command (DI6, DI5)	Command Data (DI4 to DI0)	
Wait state release	Clears the wait state for processing items for control flow parallel.	1	10	01111	1101111

5-6-1 Settings Flow (Control Flow Parallel)

Set up control flow parallel according to the following steps.



List of Control Flow Parallel Items

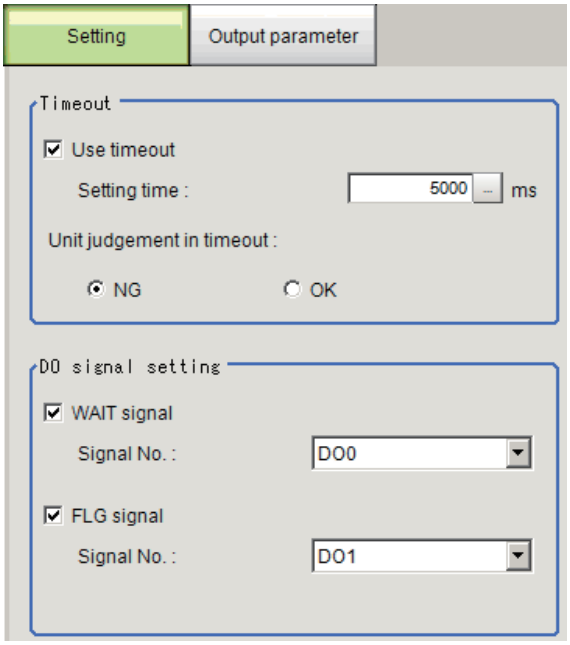
The following items can be set in control flow parallel.

Item name	Description
Setting	Set communication and timeout conditions for controlling the measurement flow. Refer to *5-6-2 Settings (Control Flow Parallel)* on page 5-29.
Output parameter	You can set this item to change the output parameters. Set the conditions and parameters for outputting measurement results to other processing units or external devices. Refer to *5-4-3 Output Parameters (Control Flow Normal)* on page 5-18.

5-6-2 Settings (Control Flow Parallel)

Set communication and timeout conditions for controlling the measurement flow.

1. In the Item Tab area, click [Setting].
2. In the “Timeout” area, specify a value for each item.



Setting item	Setting value [Factory default]	Description
Use timeout	• [Checked] • Unchecked	If you want to clear the measurement flow wait state after a certain period of time elapses, select the “Use timeout” check box. This should normally be used with the check box selected.
Setting time	0 to 120,000 [5,000]	This item can be set when the [Use timeout] check box is selected. Set the time in ms after which the wait state on the processing unit is cleared. When a timeout is used, the wait state is cleared when the time set in “Setting time” elapses after the measurement unit starts measurement processing. When the wait state is cleared, the measurement flow resumes.
Unit judgement in timeout	• [NG] • OK	This item can be set when the [Use timeout] check box is selected. Select whether the judgement result of the processing unit is NG or OK when the processing unit times out after the “Setting time” in measurement processing.

Important

Normally the “Use timeout” check box should be selected. When the check mark is removed from “Use timeout”, the wait state can only be cleared by executing a “Wait state clear command” from an external device.

3 In the “DO Signal Setting” area, specify a value for each item.

Setting item	Setting value [Factory default]	Description
Wait signal	• [Checked] • Unchecked	To use a DO signal as a Flow Command Wait signal, select the “WAIT signal” (a signal indicating that a command is available during a flow) checkbox. This should normally be used with the check box selected.
Signal No.	DO0 to DO15 [DO0]	Set the signal that is used as a WAIT signal. The signal set here can be used as a Flow Command Wait signal.
FLG signal	• [Checked] • Unchecked	To use a DO signal as a Flow Command Completion signal, select the “FLG signal” (a signal indicating a flow command completion) checkbox. This should normally be used with the check box selected.
Signal No.	DO0 to DO15 [DO1]	Set the signal that is used as the FLG signal. The signal set here can be used as a Flow Command Completion signal.

Additional Information

If the same signal is set for the WAIT signal and the FLG signal, a “Same Signals are Assigned” error message will appear. Assign different signals for each.

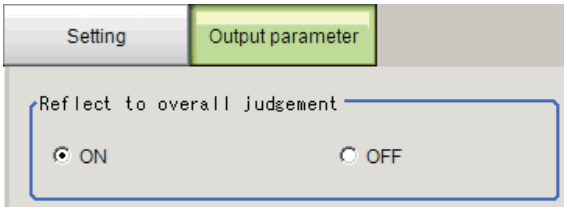
5-6-3 Output Parameters (Control Flow Parallel)

You can set this item to change the output parameters.

The output parameters are the conditions and parameters for outputting measurement results to other processing units or external devices. Normally, the factory default values can be used.

1 Click [Output parameter] in the Item Tab area.

2 Specify a value for each item.



Setting item	Setting value [Factory default]	Description
Reflect to the overall judgement	• [ON] • OFF	Set whether the judgement result from this processing unit is applied to the overall scene judgement.

5-6-4 Key Points for Test Measurement and Adjustment (Control Flow Parallel)

You can adjust the parameters while you perform test measurements and check the measurement results to increase the measurement precision and speed.

Select the adjustment method by considering the following point.

For the display of measurement results and the results that are output, refer to *5-6-5 Measurement Results for Which Output Is Possible (Control Flow Parallel)* on page 5-32.

Items Displayed in the Detail Result Area

The following measurement results are displayed in the “Detail result” area as text.

Displayed item	Description
Judge	Displays the judgement result for the processing unit.

Items Displayed in the Image Display Area

You can specify a sub-image number to display the next image in the image display area.

Sub image number	Description
0	The measurement image appears.

5-6-5 Measurement Results for Which Output Is Possible (Control Flow Parallel)

The measurement results provided by control flow parallel are shown below. The measurement results appear in the “Detail Result” area, and you can also use result output processing items to output the measurement results to an external device.

Refer to the “External Reference Tables” for the parameters that can be referenced, including measurement results.

Refer to *5-6-6 External Reference Tables (Control Flow Parallel)* on page 5-32.

Measurement item	Character string	Description
Judge	JG	The judgement result for the processing unit

5-6-6 External Reference Tables (Control Flow Parallel)

By specifying a number, you can access the following data from processing items that support processing unit data setting/acquisition, and from control commands.

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	status	status	Get only	0: Flow is running 1: Flow has stopped
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Timeout	timeout	Set/Get	0: Not used 1: Used
121	Timeout time [ms]	timeoutTime	Set/Get	0 to 120,000
122	WAIT signal	readyOutput	Set/Get	0: Not used 1: Used
123	WAIT signal No.	readyOutputNo	Set/Get	0 to 15: DO0 to DO15
124	FLG signal	flgOutput	Set/Get	0: Not used 1: Used
125	FLG signal No.	flgOutputNo	Set/Get	0 to 15: DO0 to DO15
126	Unit judgement in timeout	timeoutJudge	Set/Get	0: NG 1: OK
5000	Release waiting	releaseWaiting	Set only	1: Release waiting status

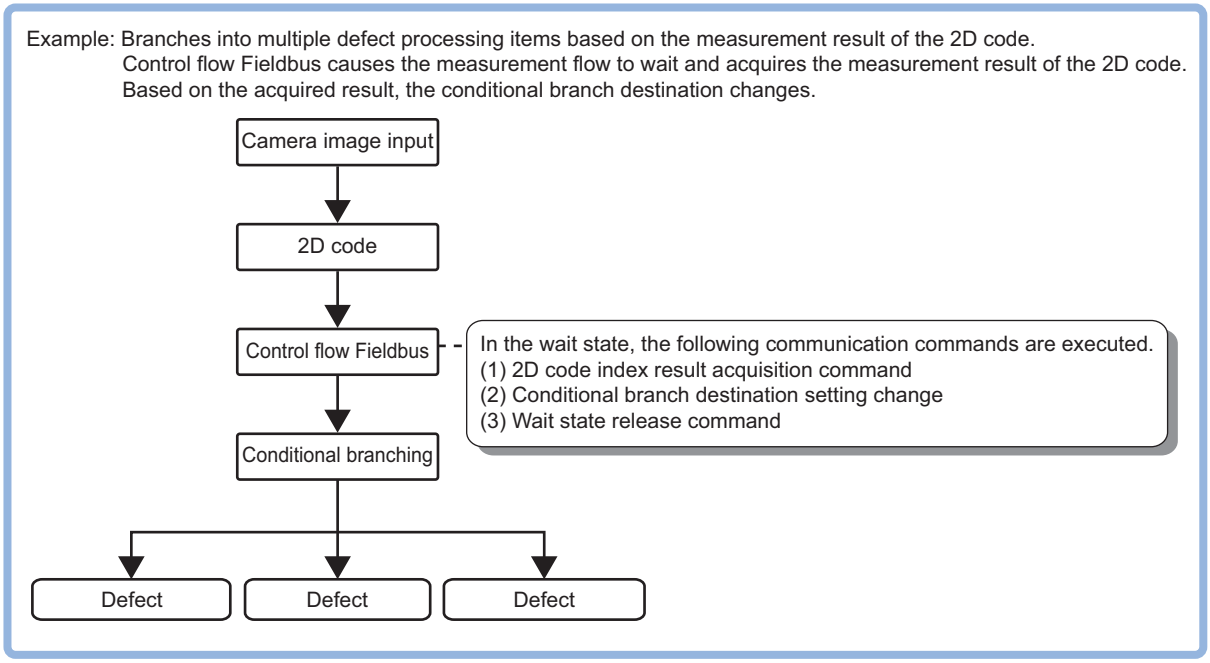
5-7 Control Flow Fieldbus

This processing item can not be used in the FHV series.

This function is used to put the currently executed measurement flow in the wait state to allow execution of a specific communication command from an external device.

Used in the Following Case

To execute a communication command during measurement flow processing



This processing item is compatible with measurement flow control using the communication modules below.

Parallel	PLC Link	EtherNet/IP	EtherCAT	Non-procedure
NA	NA	OK	OK	NA

In the wait state, the communication commands below can be executed. For details on the communication commands, refer to *List of Commands* in *Section 3 Appendixes - Command Control* in the *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Cat. No. Z342).

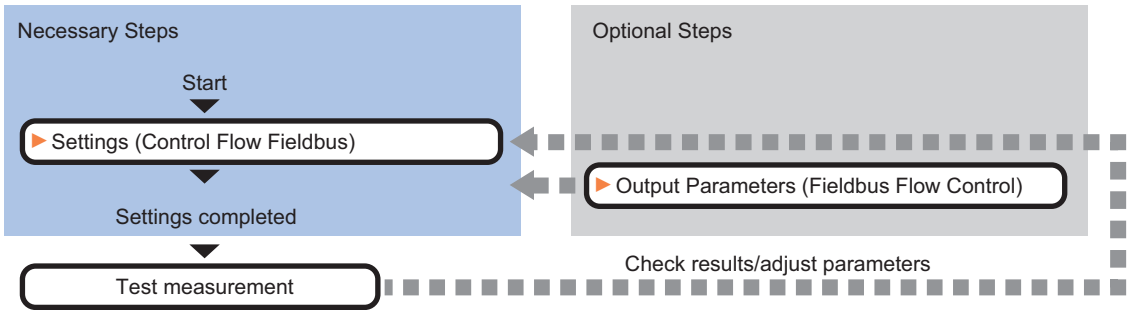
Command name	Function
Get Unit Data	Gets the parameters and measurement values of the processing unit.
Set Unit Data	Sets the parameters and measurement values of the processing unit.
Return to Start of Flow	Branches to the start of the measurement flow (processing unit 0)

To clear the wait state, use the Set Unit Data command. The wait state can be cleared by setting the "Wait state clear command" to "1" in the External Reference Table.

Refer to *5-7-6 External Reference Tables (Control Flow Fieldbus)* on page 5-37.

5-7-1 Settings Flow (Control Flow Fieldbus)

Set up control flow Fieldbus according to the following steps.



List of Control Flow Fieldbus Items

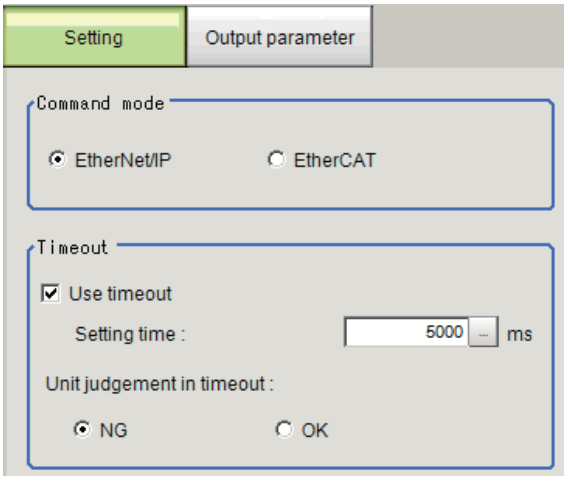
The following items can be set in control flow Fieldbus.

Item name	Description
Setting	Set communication and timeout conditions for controlling the measurement flow. Refer to *5-7-2 Settings (Control Flow Fieldbus)* on page 5-34.
Output parameter	You can set this item to change the output parameters. Set the conditions and parameters for outputting measurement results to other processing units or external devices. Refer to *5-7-5 Measurement Results for Which Output Is Possible (Control Flow Fieldbus)* on page 5-36.

5-7-2 Settings (Control Flow Fieldbus)

Set communication and timeout conditions for controlling the measurement flow.

1 In the Item Tab area, click [Setting].



2 In the “Communication method” area, specify a value for each item.

Setting item	Setting value [Factory default]	Description
Communication method	• [EtherNet/IP] • EtherCAT	Select the communication method used for controlling the measurement flow from an external device. “EtherCAT” can only be selected on the FH.

3 In the “Timeout” area, specify a value for each item.

Setting item	Setting value [Factory default]	Description
Use timeout	• [Checked] • Unchecked	If you want to clear the measurement flow wait state after a certain period of time elapses, select the “Use timeout” check box. This should normally be used with the check box selected.
Setting time	0 to 120,000 [5,000]	This item can be set when the [Use timeout] check box is selected. Set the time in ms after which the wait state on the processing unit is cleared. When a timeout is used, the wait state is cleared when the time set in “Setting time” elapses after the measurement unit starts measurement processing. When the wait state is cleared, the measurement flow resumes.
Unit judgement in timeout	• [NG] • OK	This item can be set when the [Use timeout] check box is selected. Select whether the judgement result of the processing unit is NG or OK when the processing unit times out after the “Setting time” in measurement processing.

Important

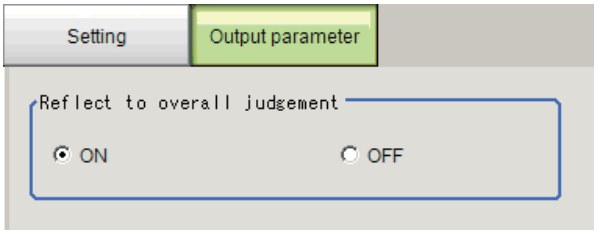
Normally the “Use timeout” check box should be selected. When the check mark is removed from “Use timeout”, the wait state can only be cleared by executing a “Wait state clear command” from an external device.

5-7-3 Output Parameters (Control Flow Fieldbus)

You can set this item to change the output parameters.

The output parameters are the conditions and parameters for outputting measurement results to other processing units or external devices. Normally, the factory default values can be used.

1 Click [Output parameter] in the Item Tab area.



2 Specify a value for each item.

Setting item	Setting value [Factory default]	Description
Reflect to the overall judgement	• [ON] • OFF	Set whether the judgement result from this processing unit is applied to the overall scene judgement.

5-7-4 Key Points for Test Measurement and Adjustment (Control Flow Fieldbus)

You can adjust the parameters while you perform test measurements and check the measurement results to increase the measurement precision and speed.

Select the adjustment method by considering the following point.

For the display of measurement results and the results that are output, refer to *5-7-5 Measurement Results for Which Output Is Possible (Control Flow Fieldbus)* on page 5-36.

Items Displayed in the Detail Result Area

The following measurement results are displayed in the “Detail result” area as text.

Displayed item	Description
Judge	Displays the judgement result for the processing unit.

Items Displayed in the Image Display Area

You can specify a sub-image number to display the next image in the image display area.

Sub image number	Description
0	The measurement image appears.

5-7-5 Measurement Results for Which Output Is Possible (Control Flow Fieldbus)

The measurement results provided by control flow parallel are shown below. The measurement results appear in the “Detail Result” area, and you can also use result output processing items to output the measurement results to an external device.

Refer to the “External Reference Tables” for the parameters that can be referenced, including measurement results.

Refer to *5-7-6 External Reference Tables (Control Flow Fieldbus)* on page 5-37.

Measurement item	Character string	Description
Judge	JG	The judgement result for the processing unit

5-7-6 External Reference Tables (Control Flow Fieldbus)

By specifying a number, you can access the following data from processing items that support processing unit data setting/acquisition, and from control commands.

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	status	status	Get only	0: Flow is running 1: Flow has stopped
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Timeout	timeout	Set/Get	0: Not used 1: Used
121	Timeout time [ms]	timeoutTime	Set/Get	0 to 120,000
122	Communication method	comType	Set/Get	0: EtherNet/IP 1: EtherCAT 2: PROFINET
123	Unit judgement in timeout	timeoutJudge	Set/Get	0: NG 1: OK
5000	Release waiting	releaseWaiting	Set only	1: Release waiting status

5-7-7 Timing Chart (Control Flow Fieldbus Flow)

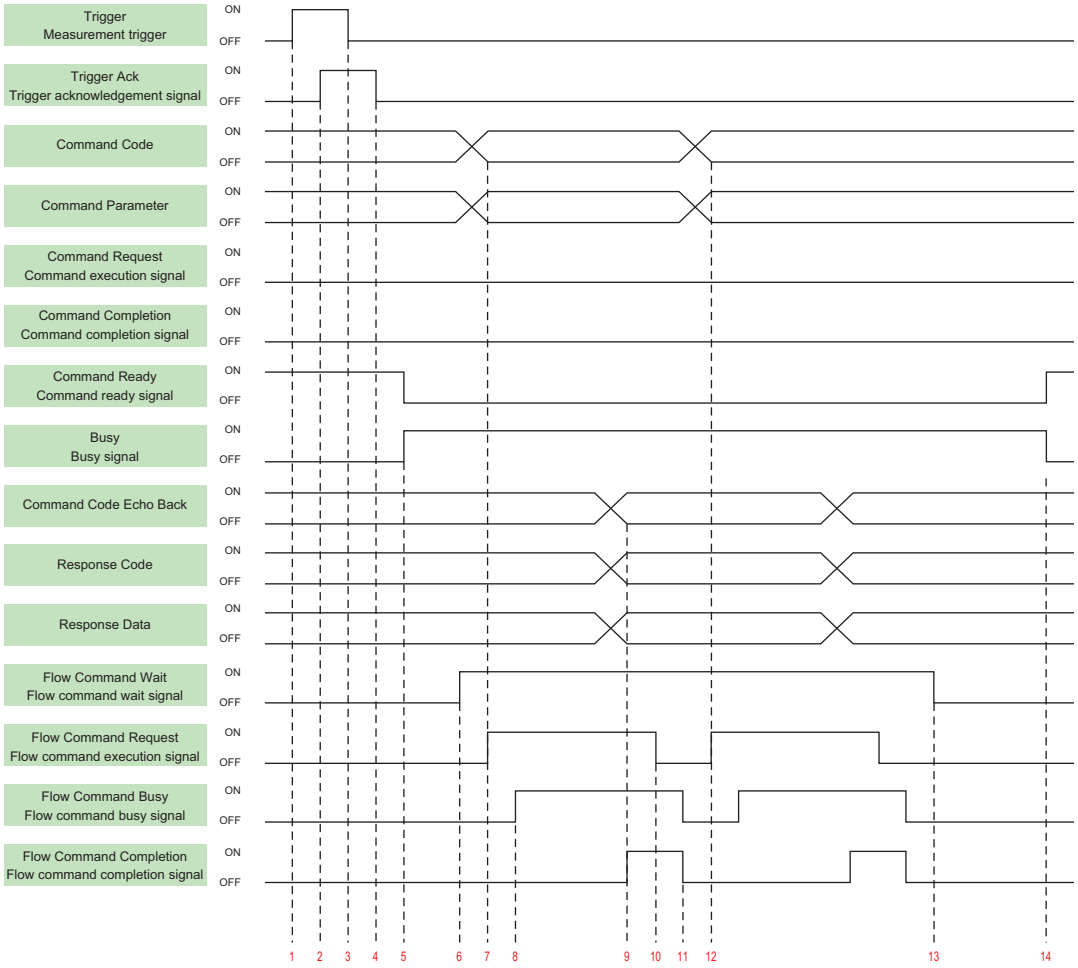
To execute a command using a Control Flow Fieldbus processing item during a measurement flow, control the sensor controller paying attention to the timing of the signals from the external device. Refer to the timing chart below.

Flow Control in EtherCAT Communication

The basic timing chart when Control Flow Fieldbus is used with EtherCAT communication is shown below.

EtherCAT communication can only be used on the FH.

Example: A measurement trigger is input by EtherCAT, and the Set Unit Data command is executed by Flow Control Fieldbus processing during measurement.



1. The controller (master) turns ON the measurement trigger signal (Trigger signal).
2. The sensor controller (slave) turns ON the trigger acknowledge signal (Trigger Ack signal).
3. The controller (slave) turns OFF the measurement trigger signal (Trigger signal).
4. The sensor controller (slave) turns OFF the trigger acknowledge signal (Trigger Ack signal).
5. The sensor controller (slave) turns ON the processing signal (Busy signal).
6. When the processing unit is executed inside the measurement flow, the sensor controller (slave) turns ON the flow command wait signal (Flow Command Wait signal).
7. The controller (master) sets the command code and command parameters to be executed during measurement, and turns ON the measuring command execution signal (Flow Command Request signal). (In the above example, this is the Set Unit Data command.)

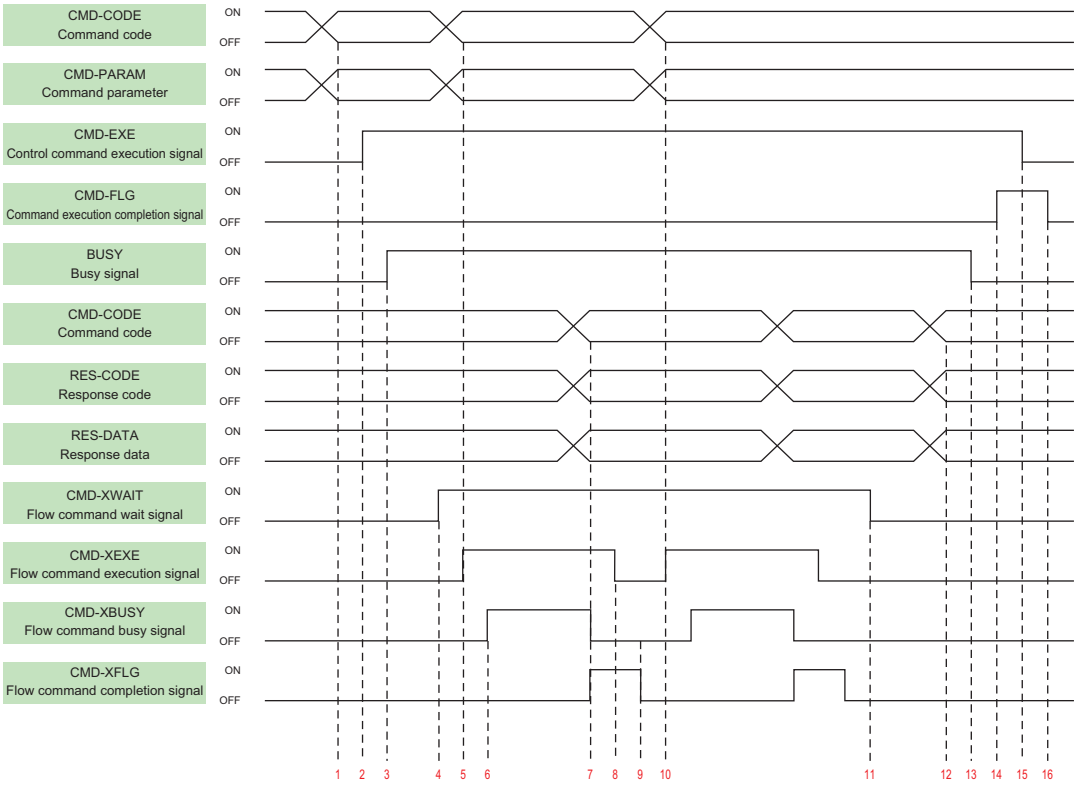
8. The sensor controller (slave) turns ON the measuring command executing signal (Flow Command Busy signal).
9. After setting the echo back of the command code executed during measurement, the response code, and response data, the sensor controller turns ON the flow command completion signal (Flow Command Completion signal), and turns OFF the flow command busy signal (Flow Command Busy signal).
10. The controller (master) turns OFF the flow command execution signal (Flow Command Request signal). If the signal does not turn OFF within the set timeout time, the control flow advances directly to step 13.
11. The sensor controller (slave) turns OFF the measuring command completion signal (Flow Completion Busy signal).
12. The controller (master) sets the command code and command parameters to be executed during measurement, and turns ON the measuring command execution signal (Flow Command Request signal). (In the above example, the wait state is cleared by Set Unit Data command.)

    After this, steps 8 through 11 are performed.
13. When the processing unit finishes measurement processing, the sensor controller (slave) turns OFF the measuring command standby signal (Flow Command Wait signal).
14. When execution of the measurement flow ends, the sensor controller (slave) turns OFF the Command executing signal (Busy signal).

Flow Control in EtherNet/IP Communication

The basic timing chart when Control Flow Fieldbus is used with EtherNet/IP communication is shown below.

Example: The measurement command is executed by EtherNet/IP, and the Set Unit Data command is executed by Flow Control Fieldbus processing during measurement.



1. Set the command code and command parameters to be executed by the user (PLC). (In the above example, this is the measurement command.)
2. The user (PLC) turns ON the control command execution signal (EXE signal).

3. The sensor controller turns ON the processing busy signal (BUSY signal).
4. When the processing unit is executed inside the measurement flow, the sensor controller turns ON the measuring command standby signal (XWAIT signal).
5. The user (PLC) sets the command code to be executed during measurement and the command parameters, during measurement, and turns ON the measuring command execution signal (XEXE signal). (In the above example, this is the Set Unit Data command.)
6. The sensor controller turns ON the measuring command executing signal (XBUSY signal).
7. After setting the command code executed during measurement, the response code, and response data, the sensor controller turns ON the flow command completion signal (XFLG signal), and turns OFF the measuring command executing signal (XBUSY signal).
8. The user (PLC) turns OFF the flow command execution signal (XEXE signal). If the signal does not turn OFF within the set timeout time, the control flow advances directly to step 14.
9. The sensor controller turns OFF the measuring command completion signal (XFLG signal).
10. The user (PLC) sets the command code to be executed during measurement and the command parameters, during measurement, and turns ON the measuring command execution signal (XEXE signal). (In the above example, this is clearing of the wait state by the Set Unit Data command.)

    After this, steps 6 through 9 are performed.
11. When the processing unit finishes measurement processing, the sensor controller turns OFF the measuring command standby signal (XWAIT signal).
12. The sensor controller sets the executed command code, response code, and response data.
13. The sensor controller turns OFF the command executing signal (BUSY signal).
14. The sensor controller turns ON the command completion signal (FLG signal).
15. The user (PLC) turns OFF the command execution signal (EXE signal).
16. The sensor controller turns OFF the command completion signal (FLG signal).

5-8 Selective Branch

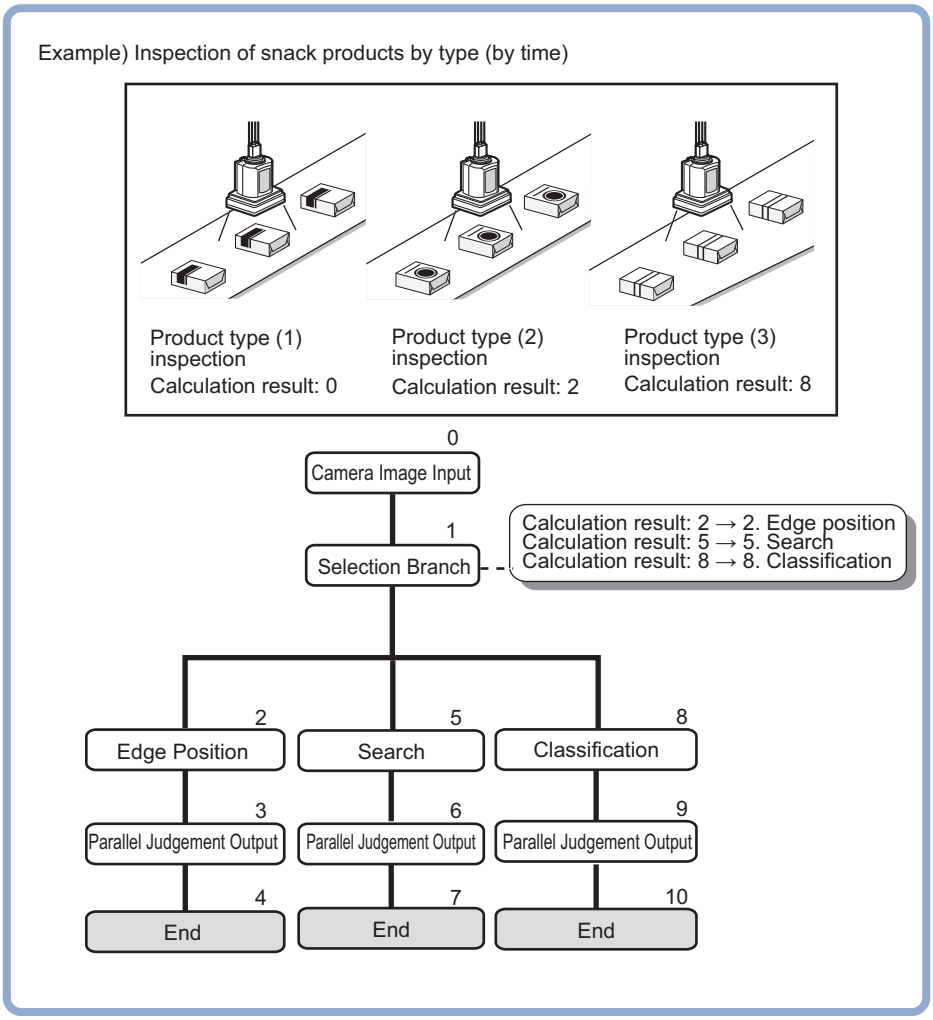
This processing item can not be used in the FHV series.

The calculation and selection value are set, and based on the matching results of the calculation result and selection value, they branch out from this processing item.

Up to 32 branch destinations can be set.

Used in the Following Case

When products on one production line are to be inspected according to a time interval



List of Selective Branch Items

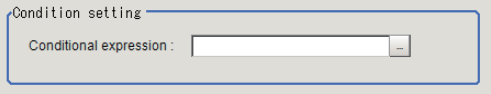
Item name	Description
Selective Branch	This item sets the branch conditions. Refer to *5-8-1 Selective Branch (Selective Branch)* on page 5-42.
Output parameter	This item can be changed if necessary. Normally, the factory default value will be used. Refer to *5-8-2 Output Parameter (Selective Branch)* on page 5-43.
Timeout	Set the conditions under which the branching processing times out. Refer to *5-8-3 Timeout (Selective Branch)* on page 5-43.

5-8-1 Selective Branch (Selective Branch)

This item sets the branch conditions. Up to 32 branch destinations can be set. Branch destinations can be easily enabled or disabled using the checkboxes. Only set the necessary items.

1 In the Item Tab area, click [Selective Branch].

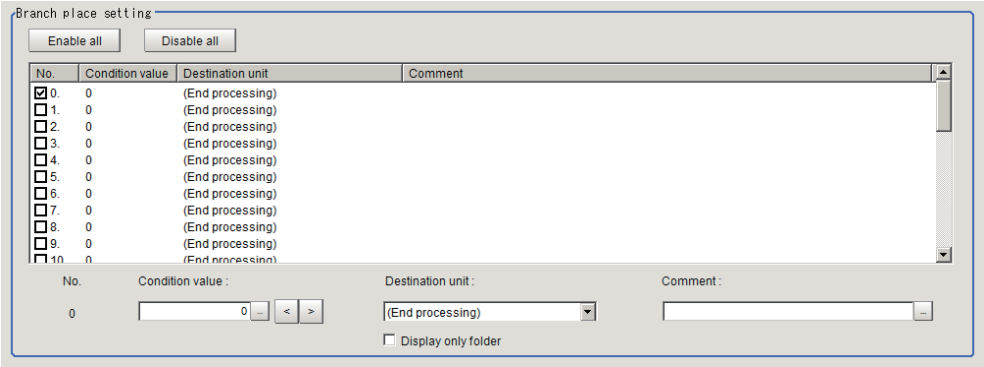
2 In the "Condition setting" area, set the expression of the condition to branch.



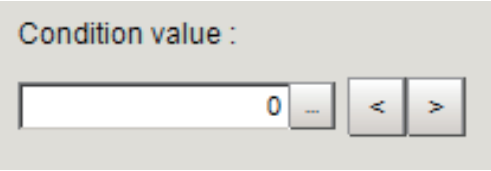
3 In the "Branch place setting" area, click the number of the branch destination that will set the condition to branch.

Clicking [Enable all] will enable all branch destinations.

Clicking [Disable all] will enable all branch destinations.

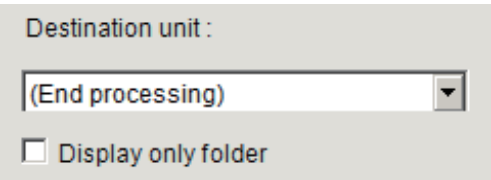


4 Click [<] or [>], or click [...] in [Condition value] to set the selection value.



5 Click [▼] in [Destination unit] and select the destination unit.

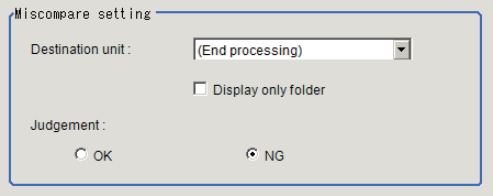
If [Display only folder] is checked, only the folder first unit will be set.



6 Click [...] in [Comment] to enter a comment.

Multilingual is also supported. For details, refer to *3-2-2 Inputting Text in the Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

7 Click [▼] in [Destination unit] in the "Miscompare setting" area and set the destination unit.
If [Display only folder] is checked, only the folder first unit will be set.



8 Select [Judgement].

9 Click [OK].

5-8-2 Output Parameter (Selective Branch)

Specifies whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

1 Click [Output parameter] in the Item Tab area.

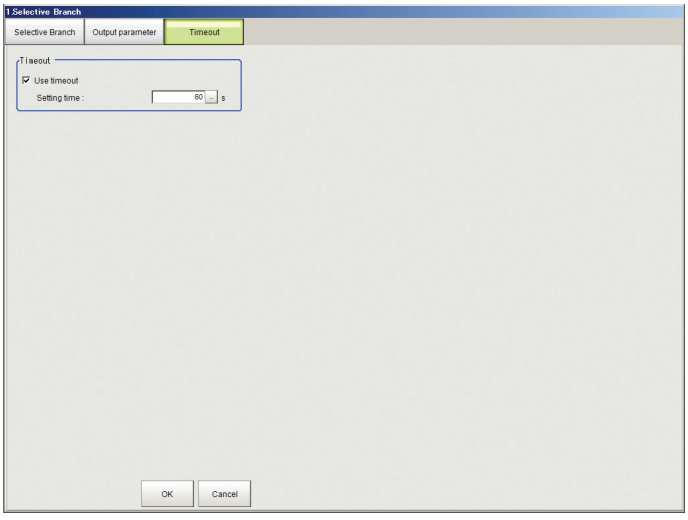
2 Select the "Reflect to overall judgement".

Setting item	Setting value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Specify whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

5-8-3 Timeout (Selective Branch)

Set the conditions under which the branching processing times out.

1 In the Item Tab area, click [Timeout].



2 In the "Timeout" area, specify a value for each item.

Setting item	Setting value [Factory default]	Description
Use timeout	• Unchecked • [Checked]	Click on the [Use timeout] checkbox to turn it ON if you want the selective branching to time out after a set amount of time passes.
Setting time	1 to 3600 [60]	This can be set when the "Use timeout" checkbox is selected. Set the length of time until the measurement process times out on the selected processing unit in seconds. When the measurement process for this processing unit is executed, a timeout occurs once the amount of time that passes since the start of the measurement exceeds the set [Setting time]. If a timeout occurs to disrupt the measurement process, the judgement results in NG.

Important

- Normally the “Use timeout” check box should be selected. Unchecking the [Use timeout] checkbox may cause the measurement flow to become stuck in an infinite loop when measurements are started depending on the selective branching settings.
- If using selective branching within the block for the parallelization task in the measurement flow, set it up so that branching occurs only within the relevant block for the parallelization task. Attempting to introduce conditional branching across blocks for the parallelization task may cause the timout function to stop working even with the [Use timeout] checkbox checked.

5-8-4 Key Points for Adjustment (Selective Branch)

Select the adjustment method referring to the following points.

● When the system freezes after executing the measurement

Parameter to be adjusted	Troubleshooting
Selection branch	An infinite loop occurs when the branch destination unit is incorrect. In order to avoid a measurement processing looping, for the branch destination, set a processing unit number that is after the [Selection branch].

● When measurement processing of an unintended unit is executed

Parameter to be adjusted	Troubleshooting
-	If [End] is not registered at the end of a branch, the processing in the scene will continue to move to the next unit No. even if the branch has been completed. Make sure to set "End" at the last branch destination.

- **When the judgement results (JG) of the unit within the flow is updated or not updated**

Parameter to be adjusted	Troubleshooting
-	The system is designed this way. For results other than the unit's judgement results (JG), the measurement result during the previous pass is retained. The JG for units that do not pass through the condition branch becomes unmeasured (0). Note, however, that the unit JG becomes unmeasured at the point in time when all the measurement processing ends. During flow processing, the previous time judgement (JG) is retained.

5-8-5 Measurement Results for Which Output Is Possible (Selective Branch)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Condition No	JN	Condition number that matches the selection condition expression result
Destination	BU	Branch destination unit number of the condition that matches the selection condition expression result
Conditional expression	DJ	Expression result of the selection conditional expression

5-8-6 External Reference Tables (Selective Branch)

No.	Data name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Condition No.	jumpUnitNo	Get only	-1 to 31
6	Branch place	resultNoJudge	Get only	-1 to 9,999
7	Conditional expression	resultExpJudge	Get only	-
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Miscompare branch place	jumpUnitNoDefault	Set/Get	-1 to 9,999
121	Miscompare judgement	unitJudgeDefault	Set/Get	0: NG 1: OK
122	Condition value judge	expressionJudge	Set/Get	Exp. character string
123	Timeout	timeout	Set/Get	0: Not used 1: Used

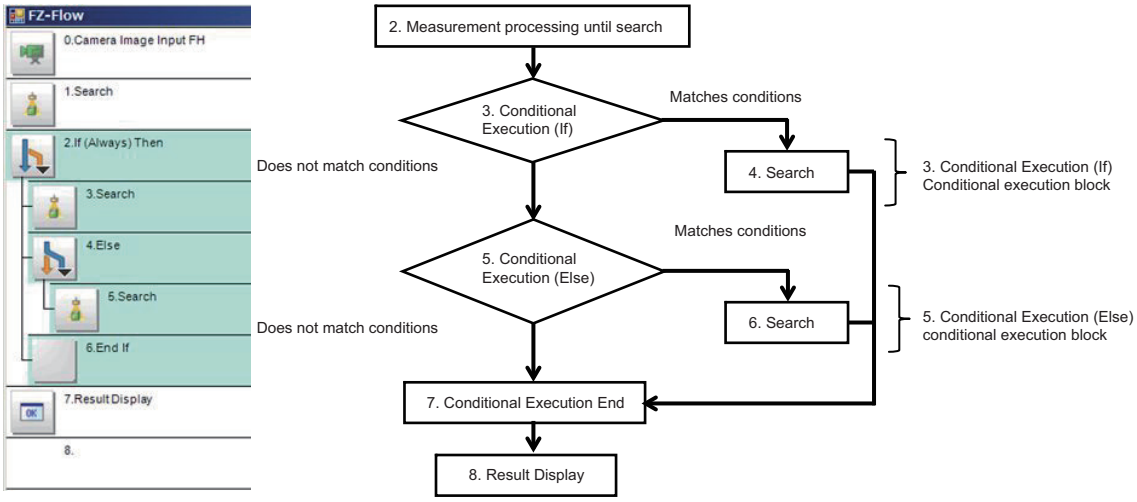
No.	Data name	Ident	Set/Get	Data range
124	Timeout time [s]	timeoutTime	Set/Get	1 to 3,600
130+Nx10 (N: 0 to 31)	Destination unit No.	unitBranchOK	Set/Get	-1 to 9,999
131+Nx10 (N: 0 to 31)	Condition value	expression	Set/Get	-9,999 to 9,999
132+Nx10 (N: 0 to 31)	Comment	comment	Set/Get	Character string
133+Nx10 (N: 0 to 31)	Validation Flag	checkFlag	Set/Get	0: No validation 1: Validation

5-9 Conditional Execution (If)

Set expressions and conditions, and use results of comparison to branch the measurement flow.

Used in the Following Cases

When branching a measurement flow because of interim results in the measurement flow.



Important

- Ensure that [Conditional execution (If)] processing items and [Conditional Execution End] processing items are paired.
- Ensure that [Conditional Execution (Else)] processing items are inserted between the [Conditional Execution (If)] processing item and [Conditional Execution End] processing item.
- When using a [Conditional Branching] processing item within a Conditional Execution block, ensure that the branch destination unit is located within the same Conditional Execution block.
- When using a [Conditional Branching] processing item outside a Conditional Execution block, do not locate the branch destination unit within the same Conditional Execution block.

5-9-1 Conditional Execution Settings (Conditional Execution (If))

Configure the following two settings.

Flow settings for executing Conditional Execution (If) processing items (Conditional Execution block settings)

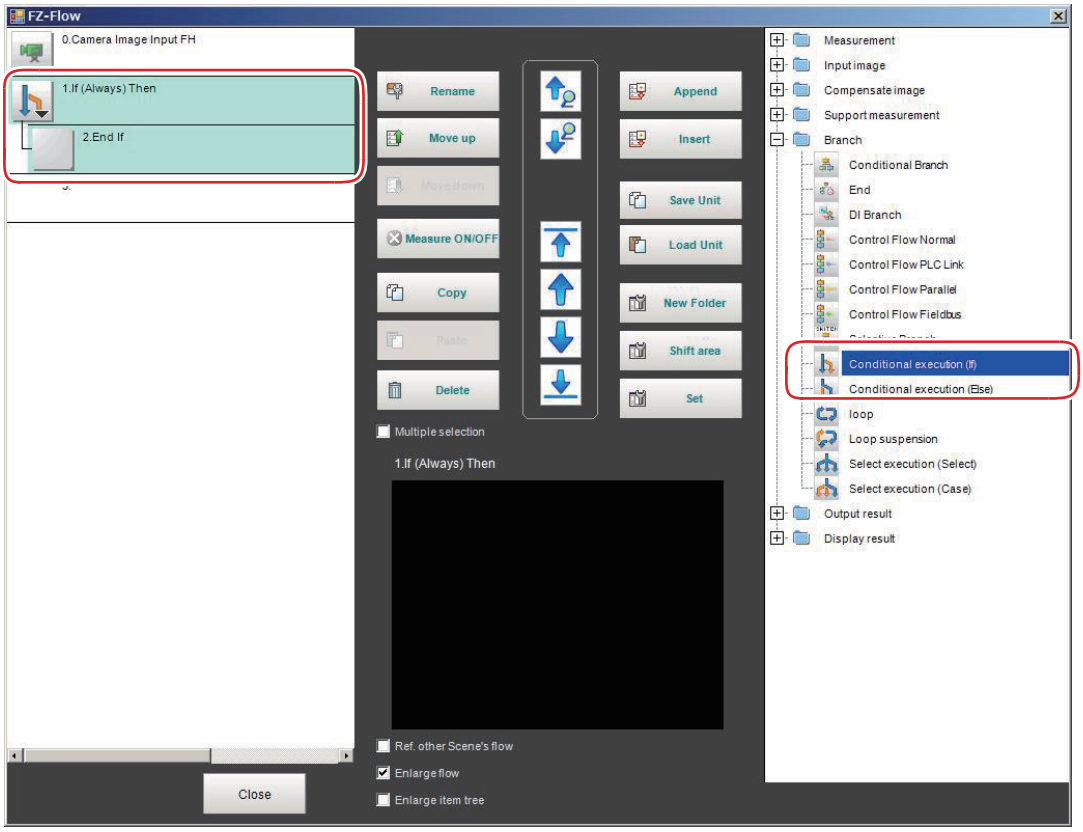
Settings for conditions executed with Conditional Execution (If) processing items

Setting the flow to execute (Conditional Execution block Settings)

Set the flow to execute if conditions are met between the [Conditional Execution (If)] processing item and [Conditional Execution End] processing item (Conditional Execution block).

1 In the Edit Flow Window, add the Conditional Execution (If) processing item to the flow.

The Conditional Execution (If) processing item and Conditional Execution End processing item are added to the flow as a pair.



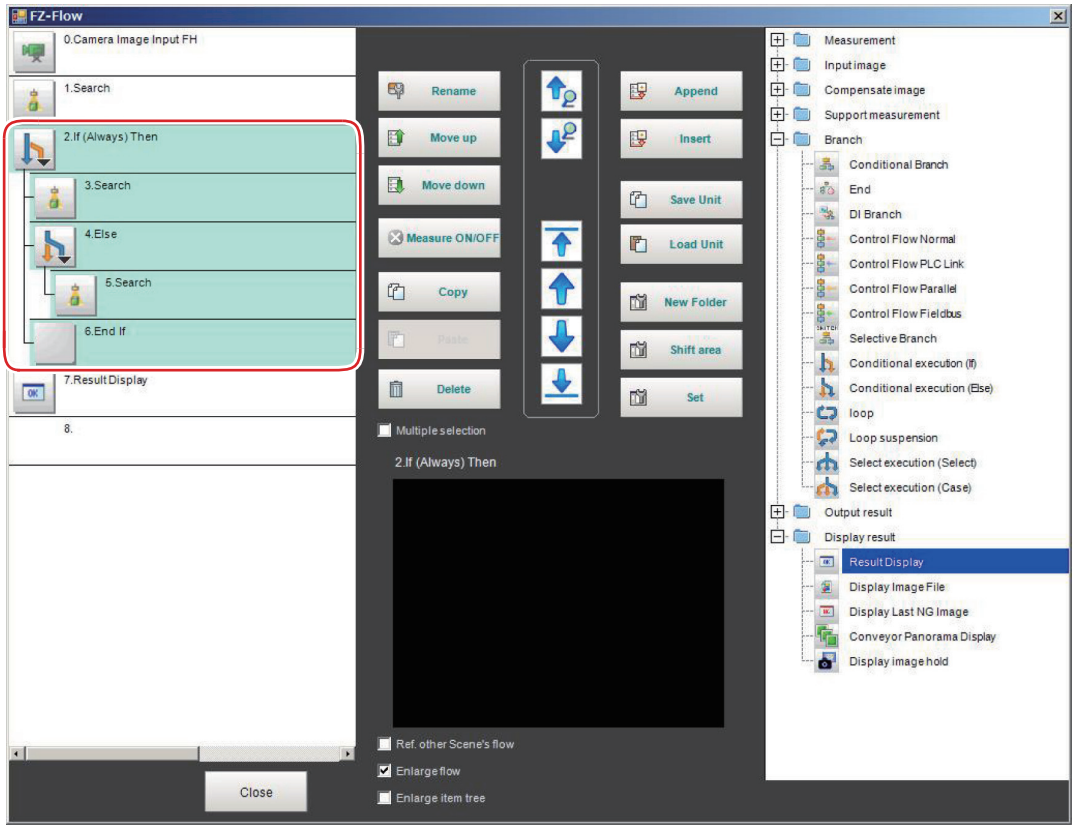
2 Set the Conditional Execution block between the Conditional Execution (If) processing item and Conditional Execution End processing item.

Setting conditions

Configure the condition details and comparison conditions.

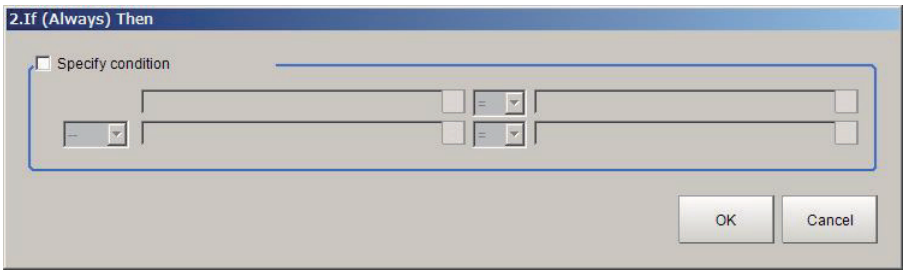
1 In the Edit Flow Window, select the Conditional Execution (If) processing item to set conditions.

From the selected Conditional Execution (If) processing item to the Conditional Execution End processing item are selected.



2 Click the [Set] button.

The Conditional Execution (If) settings dialog box is displayed.



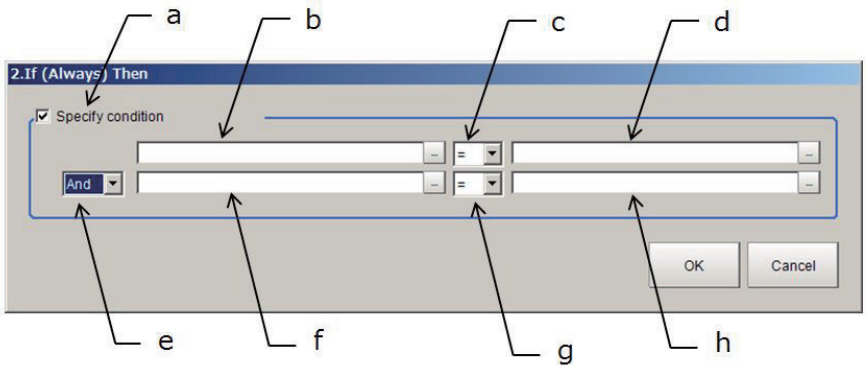
Additional Information

The settings dialog box can also be displayed using the following procedure.

- Select the settings target processing unit in the main screen flow display window, and click the property setting icon in the upper right side of the flow display window.
  Refer to *Main Window (Layout 0): Adjustment Window (Default)* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

3 Configure conditions.

Configure conditions as explained below.



a Conditions setting check box

Selected : if meeting set conditions (true), the Conditional Execution block will be executed.

Not selected: regardless of conditions, the Conditional Execution block will be executed.

b Condition input box (expression A0)

Set the condition with a calculation expression.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12

c Comparison condition selection box

Compare expression A0 (b condition) and expression B0 (d condition).

Comparison operator	Contents
=	If the expression A0 value is equal to the expression B0 value, then "true".
≤	If the expression A0 value is less than or equal to the expression B0 value, then "true".
<	If the expression A0 value is less than the expression B0 value, then "true".
≥	If the expression A0 value is equal to or more than the expression B0 value, then "true".
>	If the expression A0 value is more than the expression B0 value, then "true".
≠	If the expression A0 value is not equal to the expression B0 value, then "true".

d Condition input box (expression B0)

Set the condition with a calculation expression.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12

e Logical operation selection box

Set logical operation conditions for conditions set in b, c, and d (expression 0), and conditions set in f, g, and h (expression 1).

Logical operator	Contents
---	If expression 0 is true, then "true". Expression 1 is grayed out.
And	If both expression 0 and expression 1 are true, then "true". If either of these are false, then "false".
Or	If either or both expression 0 or expression 1 are true, then "true". If both of these are false, then "false".

f Condition input box (expression A1)

Set the condition with a calculation expression.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12

g Comparison condition selection box

Compare expression A1 (f condition) and expression B1 (h condition).

h Condition input box (expression B1)

Set the condition with a calculation expression.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12

5-9-2 External Reference Tables (Conditional execution (If))

This processing item does not have an external reference number. Confirm using data identifier name and data name.

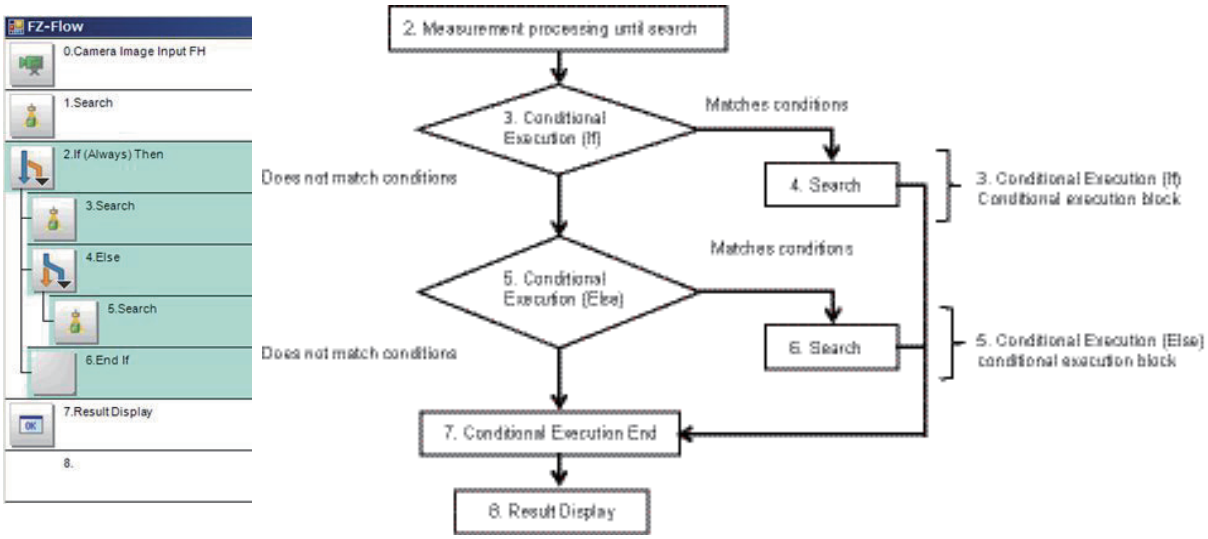
No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
None	Specify condition	specifyCondition	Set/Get	0: OFF 1: ON
None	Expression A0	expressionA0	Set/Get	Exp. character string
None	Expression B0	expressionB0	Set/Get	Exp. character string
None	Expression 0 code	conditionType0	Set/Get	0: = 1: ≤ 2: < 3: ≥ 4: > 5: ≠
None	Logical operation	logicalOperation1	Set/Get	0: -- 1: And 2: Or
None	Expression A1	expressionA1	Set/Get	Exp. character string
None	Expression B1	expressionB1	Set/Get	Exp. character string
None	Expression 1 code	conditionType1	Set/Get	0: = 1: <= 2: < 3: >= 4: > 5: ≠
None	Expression A0 result	valueA0	Get only	result of calculation selected in expression A0
None	Expression B0 result	valueB0	Get only	result of calculation selected in expression B0
None	Expression A1 result	valueA1	Get only	result of calculation selected in expression A1
None	Expression B1 result	valueB1	Get only	result of calculation selected in expression B1
None	Result	result	Get only	0: NO 1: YES

5-10 Conditional Execution (Else)

Insert between [Conditional Execution (If)] processing item and [Conditional Execution End] processing item, set expressions and conditions, and use results of comparison to branch the measurement flow.

Used in the Following Cases

When branching a measurement flow because of interim results in the measurement flow.



Important

- Ensure that [Conditional execution (If)] processing items and [Conditional Execution End] processing items are paired.
- Ensure that [Conditional Execution (Else)] processing items are inserted between the [Conditional Execution (If)] processing item and [Conditional Execution End] processing item.
- When using a [Conditional Branching] processing item within a Conditional Execution block, ensure that the branch destination unit is located within the same Conditional Execution block.
- When using a [Conditional Branching] processing item outside a Conditional Execution block, do not locate the branch destination unit within the same Conditional Execution block.

5-10-1 Conditional Execution Settings (Conditional Execution (Else))

Configure two settings.

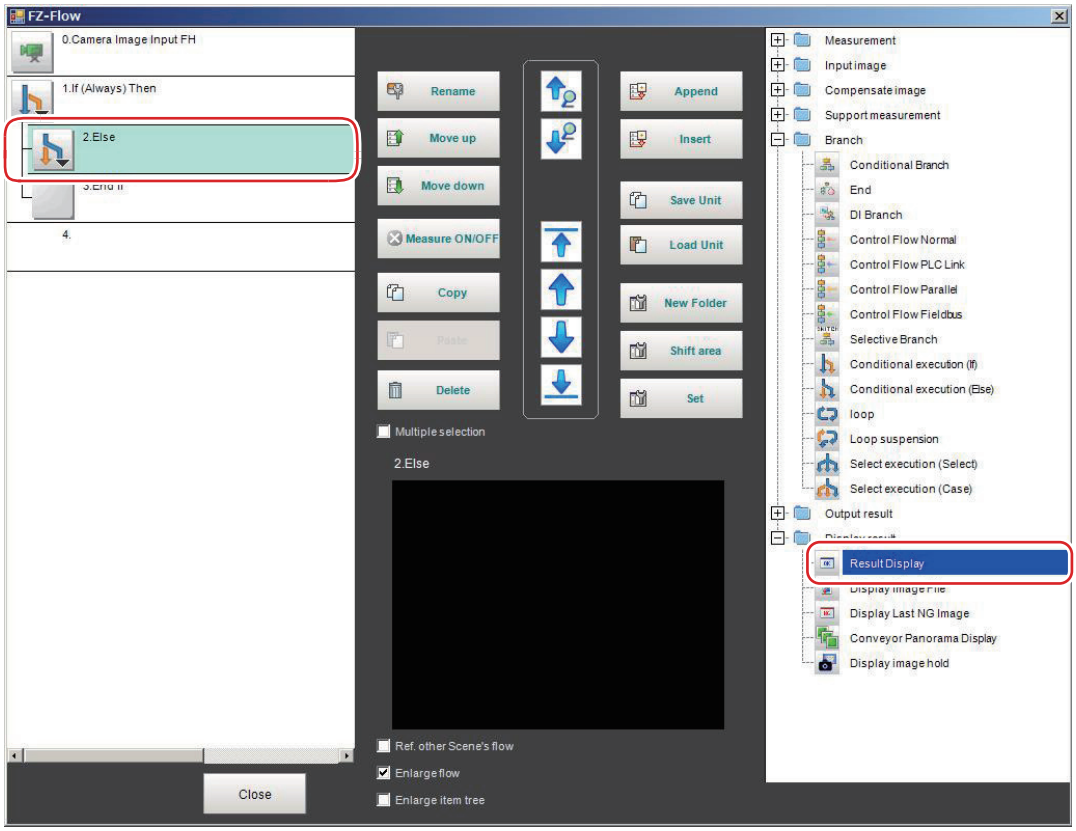
Flow settings for executing Conditional Execution (Else) processing items (Conditional Execution block settings)

Settings for conditions executed with Conditional Execution (Else) processing items

Setting the flow to execute (Conditional Execution block Settings)

Set the flow to execute if conditions are met between the [Conditional Execution (Else)] processing item and [Conditional Execution End] processing item (Conditional Execution block).

1 In the Edit Flow Window, add the Conditional Execution (Else) processing item between the Conditional Execution (If) processing item and Conditional Execution End processing item.



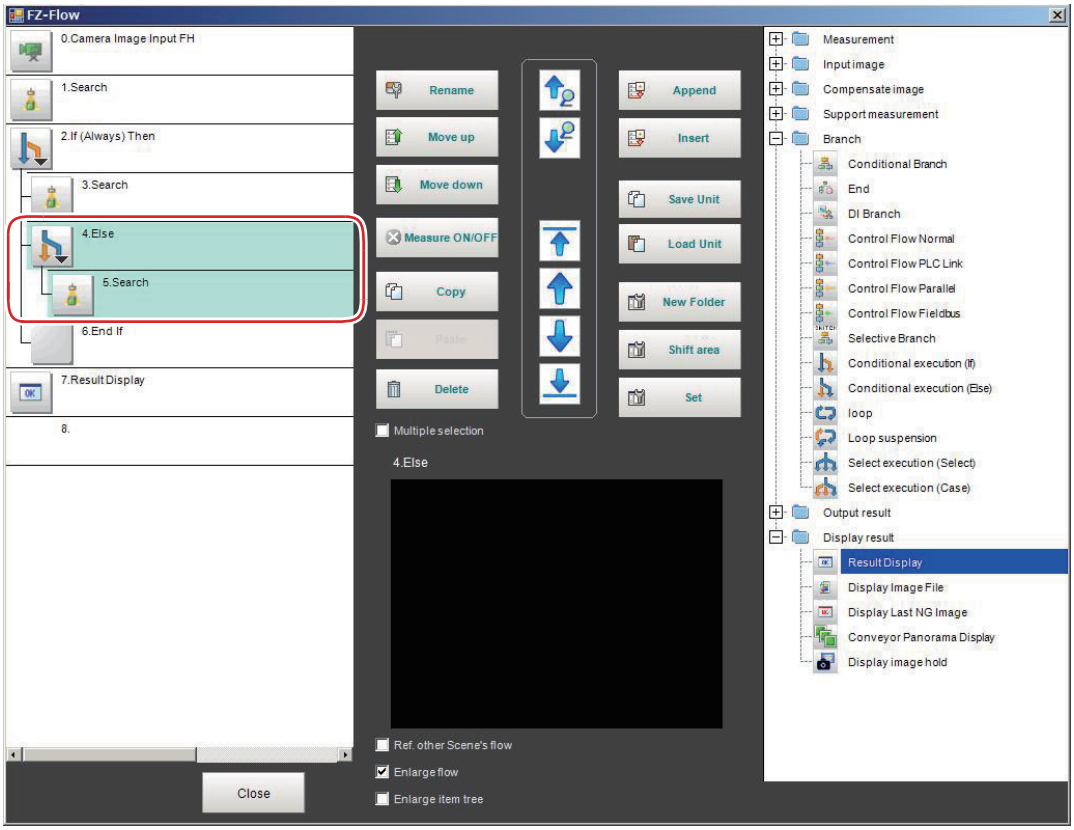
2 Set the Conditional Execution block between the Conditional Execution (Else) processing item and Conditional Execution End processing item.

Setting conditions

Configure the condition details and comparison conditions.

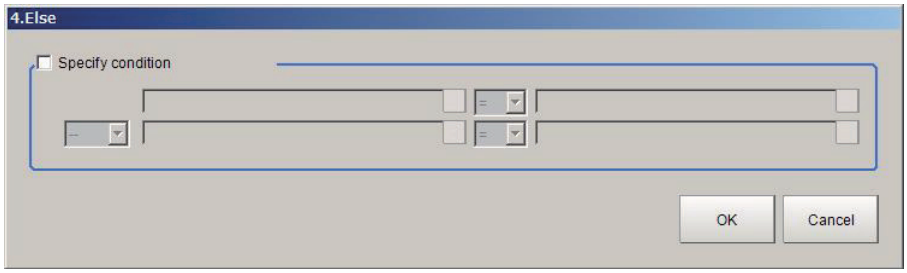
1 In the Edit Flow Window, select the Conditional Execution (Else) processing item to set conditions.

The selected Conditional Execution (Else) processing item and its Conditional Execution block will be selected.



2 Click the [Properties Dialog Box] display button.

The Conditional Execution (Else) settings dialog box is displayed.



Additional Information

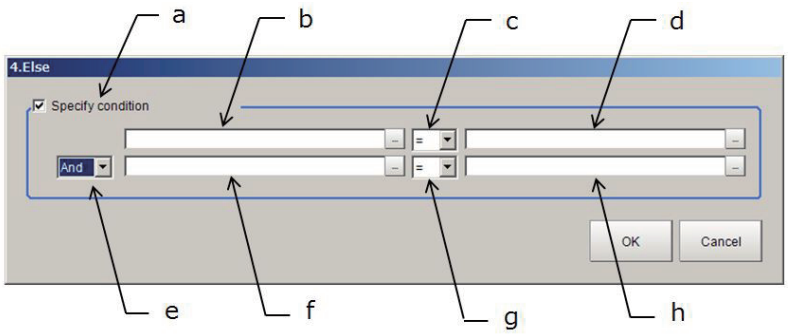
The settings dialog box can also be displayed using the following procedure.

- Select the settings target processing unit in the main screen flow display window, and click the property setting icon in the upper right side of the flow display window.
  Refer to Main Window (Layout 0): Adjustment Window (Default) in the Vision System FH/FHV/FZ5 Series User's Manual (Cat. No. Z365).

3 Configure conditions.

Configure conditions as explained below.

The settings method is the same as for Conditional Execution (If) processing items.



a Conditions setting check box

Selected : if meeting set conditions (true), the Conditional Execution block will be executed.

Not selected: regardless of conditions, the Conditional Execution block will be executed.

b Condition input box (expression A0)

Set the condition with a calculation expression.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12.

c Comparison condition selection box

Compare expression A0 (b condition) and expression B0 (d condition).

Comparison operator	Contents
=	If the expression A0 value is equal to the expression B0 value, then "true".
≤	If the expression A0 value is less than or equal to the expression B0 value, then "true".
<	If the expression A0 value is less than the expression B0 value, then "true".
≥	If the expression A0 value is equal to or more than the expression B0 value, then "true".
>	If the expression A0 value is more than the expression B0 value, then "true".
≠	If the expression A0 value is not equal to the expression B0 value, then "true".

d Condition input box (expression B0)

Set the condition with a calculation expression.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12.

e Logical operation selection box

Set logical operation conditions for conditions set in b, c, and d (expression 0), and conditions set in f, g, and h (expression 1).

Logical operator	Contents
---	If expression 0 is true, then "true". Expression 1 is grayed out.
And	If both expression 0 and expression 1 are true, then "true". If either of these are false, then "false".
Or	If either or both expression 0 or expression 1 are true, then "true". If both of these are false, then "false".

f Condition input box (expression A1)

Set the condition with a calculation expression.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12.

g Comparison condition selection box

Compare expression A1 (f condition) and expression B1 (h condition).

h Condition input box (expression B1)

Set the condition with a calculation expression.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12.

5-10-2 External Reference Tables (Conditional execution (Else))

This processing item does not have an external reference number. Confirm using data identifier name and data name.

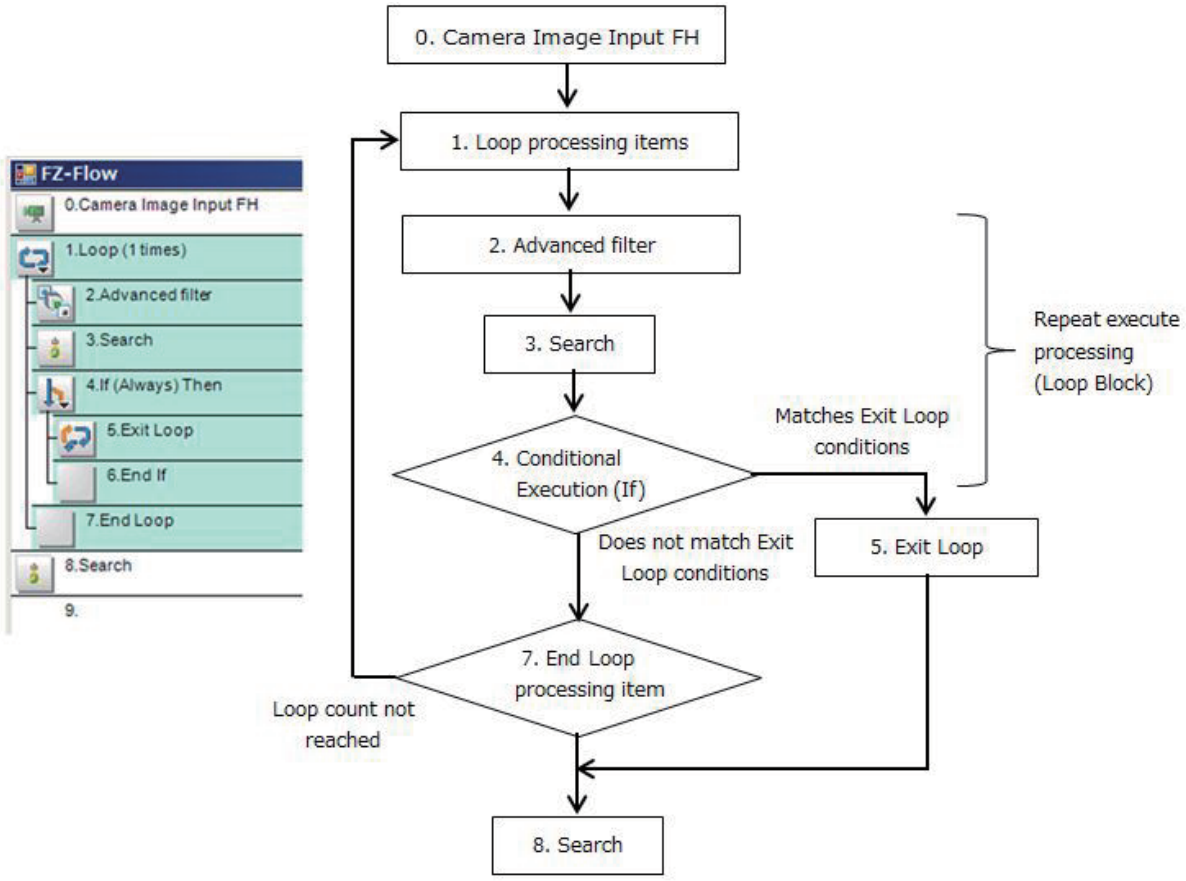
No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
None	Specify condition	specifyCondition	Set/Get	0: OFF 1: ON
None	Expression A0	expressionA0	Set/Get	Exp. character string
None	Expression B0	expressionB0	Set/Get	Exp. character string
None	Expression 0 code	conditionType0	Set/Get	0: = 1: ≤ 2: < 3: ≥ 4: > 5: ≠
None	Logical operation	logicalOperation1	Set/Get	0: -- 1: And 2: Or
None	Expression A1	expressionA1	Set/Get	Exp. character string
None	Expression B1	expressionB1	Set/Get	Exp. character string
None	Expression 1 code	conditionType1	Set/Get	0: = 1: ≤ 2: < 3: ≥ 4: > 5: ≠
None	Expression A0 result	valueA0	Get only	result of calculation selected in expression A0
None	Expression B0 result	valueB0	Get only	result of calculation selected in expression B0
None	Expression A1 result	valueA1	Get only	result of calculation selected in expression A1
None	Expression B1 result	valueB1	Get only	result of calculation selected in expression B1
None	Result	result	Get only	0: NO 1: YES

5-11 Loop

If the set processing is repeated, and arrives at the set loop count, then move to the following processing.

Used in the Following Cases

When repeating processing until conditions are met.



Important

- Ensure that the [Loop] processing item and [End Loop] processing item are paired.
- Loop processing can only be exited from when the loop count is reached or the [Exit Loop] processing item is reached.
- In order to exit from a loop during processing, use the [Exit Loop] processing item. If exited from because of conditional branching, then the loop count can not be initialized, and an accurate loop count will not be obtained.
- Ensure that the [Exit Loop] processing items are inserted between the [Loop] processing item and [End Loop] processing item.
- When using a [Conditional Branching] processing item within a loop block, ensure that the branch destination unit is located within the same loop block.
- When using a [Conditional Branching] processing item outside a loop block, do not locate the branch destination unit within the same loop block.

5-11-1 Loop detail settings (Loop)

Configure two settings.

Flow settings for loop processing items (loop block settings)

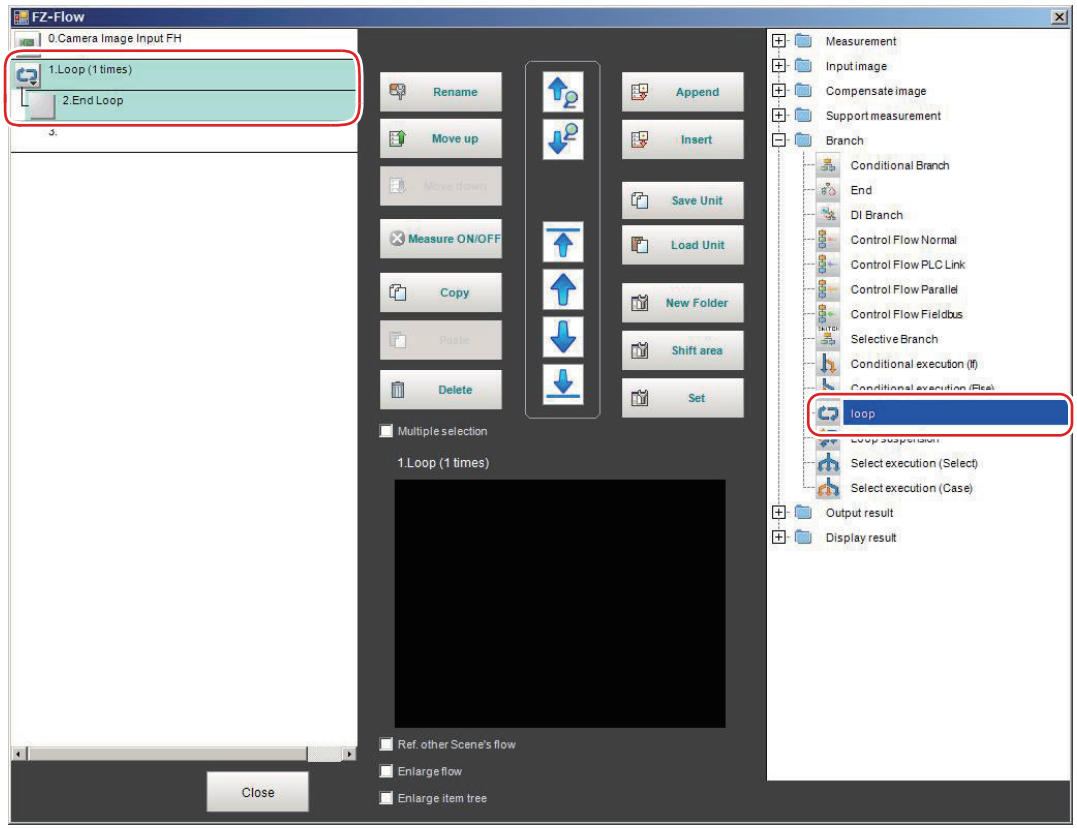
Loop count settings

Setting the flow to repeatedly execute (Loop Block Settings)

Set the flow (loop block) to repeatedly execute between the [Loop] processing item and [End Loop] processing item.

1 In the Edit Flow Window, add the [Loop] processing item to the flow.

The [Loop] processing item and [End Loop] processing item are added to the flow as a pair.



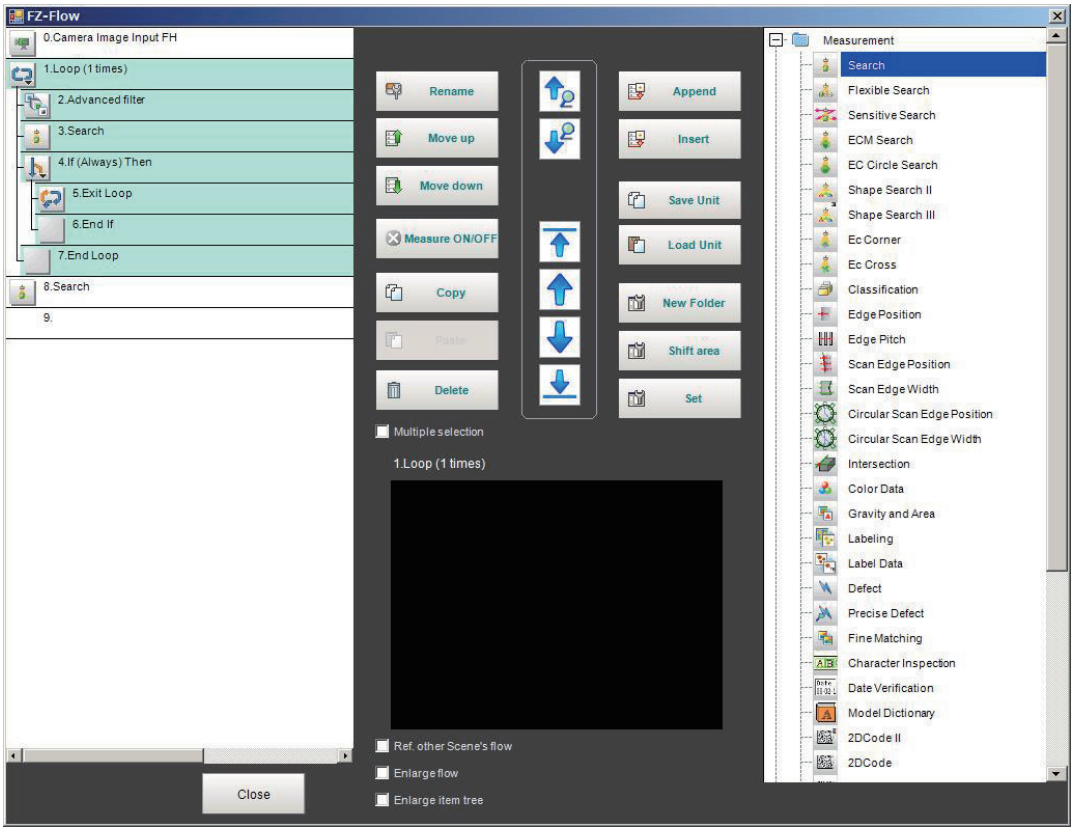
2 Set the loop block between the [Loop] processing item and [End Loop] processing item.

Setting the loop count

Set the loop count for the loop block.

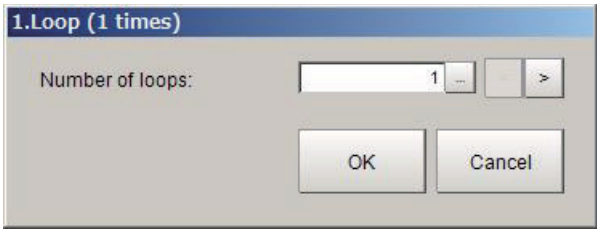
1 In the Edit Flow Window, select the [Loop] processing item to set the loop count.

From the selected [Loop] processing item to the [End Loop] processing item are selected.



2 Click [Set] button.

The Loop count settings dialog box appears.



Additional Information

The settings dialog box can also be displayed using the following procedure.

- Select the settings target processing unit in the main screen flow display window, and click the property setting icon in the upper right side of the flow display window.
  Refer to *Main Window (Layout 0): Adjustment Window (Default)* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

3 After setting the loop count, click [OK].

Displayed item	Setting value [Factory default]	Description
Loop count	[1] to 2147483647	Set the loop count. Increment the loop count from 0.

5-11-2 External Reference Tables (Loop)

This processing item does not have an external reference number. Confirm using data identifier name and data name.

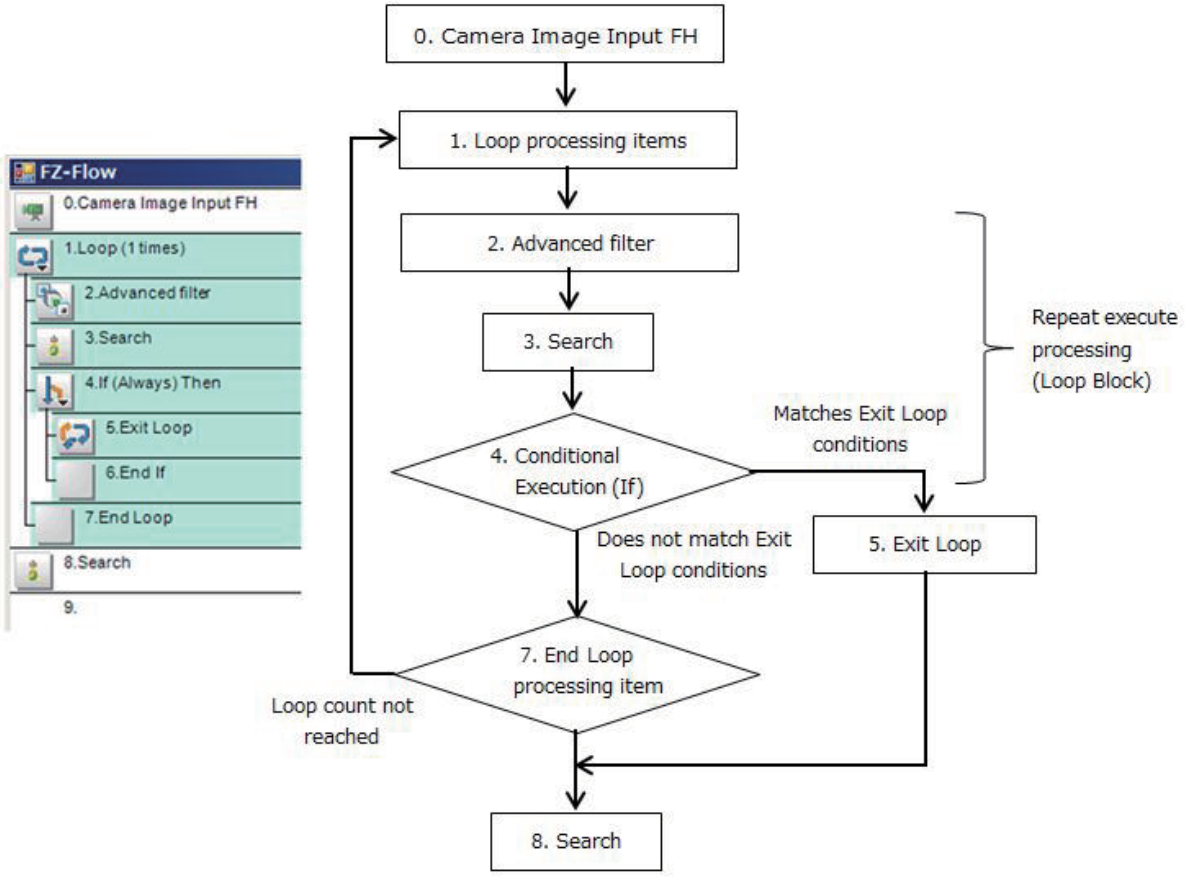
No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
None	Number of loops	loopCount	Set/Get	1 to 2,147,483,647
None	Loop counter	CNT	Get only	0 to Number of loops

5-12 Loop Interrupt

Processing inserted between [Loop] processing item and End Loop processing item, and used when exiting from a loop other than from the loop count. If interruption conditions are set within a loop, and interruption conditions are met, then even if the loop count is not met, the loop can be exited from.

Used in the Following Cases

When exiting from the loop while repeating processing until conditions are met.



Important

- Ensure that the [Loop] processing item and [End Loop] processing item are paired.
- Loop processing can only be exited from when the loop count is reached or the [Exit Loop] processing item is reached.
- In order to exit from a loop during processing, use the [Exit Loop] processing item. If exited from because of conditional branching, then the loop count can not be initialized, and an accurate loop count will not be obtained.
- Ensure that the [Exit Loop] processing items are inserted between the [Loop] processing item and [End Loop] processing item.
- When using a [Conditional Branching] processing item within a loop block, ensure that the branch destination unit is located within the same loop block.
- When using a [Conditional Branching] processing item outside a loop block, do not locate the branch destination unit within the same loop block.

5-12-1 Loop Interrupt Settings (Loop Interrupt)

This processing item can exit from a loop by executing processing. Complete settings by situating this in a scene, between the [Loop] processing item and the [End Loop] item. There are no items to set.

5-12-2 External Reference Table (Loop Interrupt)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)

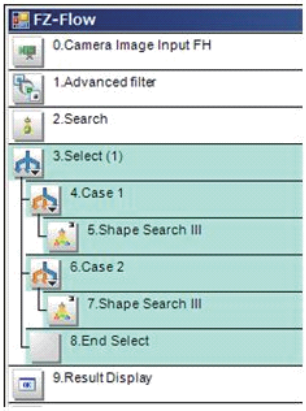
5-13 Select Execution (Select)

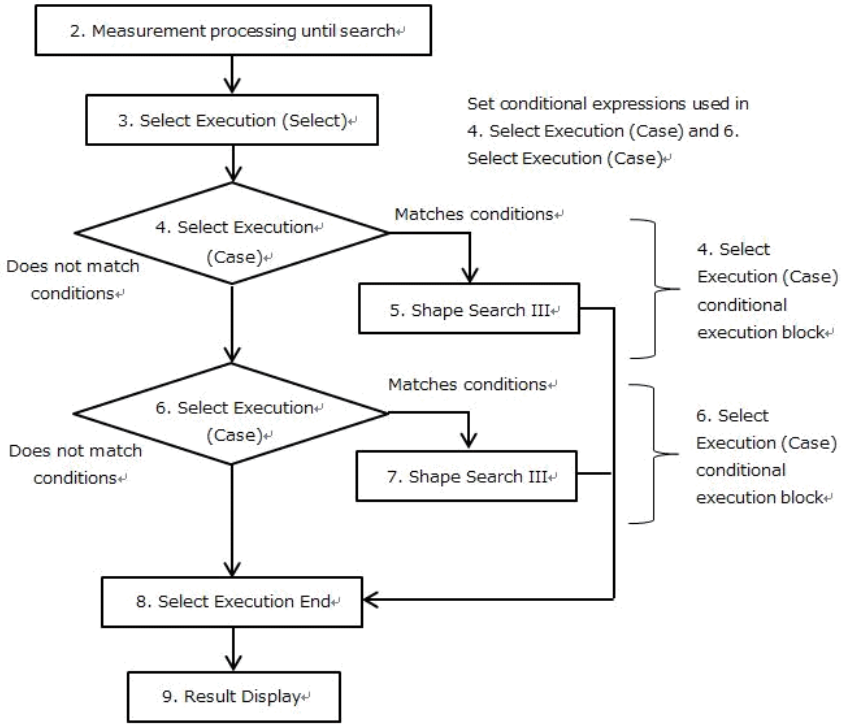
Set conditions using expressions, and use results of comparison to branch the measurement flow.

Set conditions using Select Execution (Select) processing items, and judge using Select Execution (Case). Only integer values can be set as conditions.

Used in the Following Cases

When branching a measurement flow because of interim results in the measurement flow.





Important

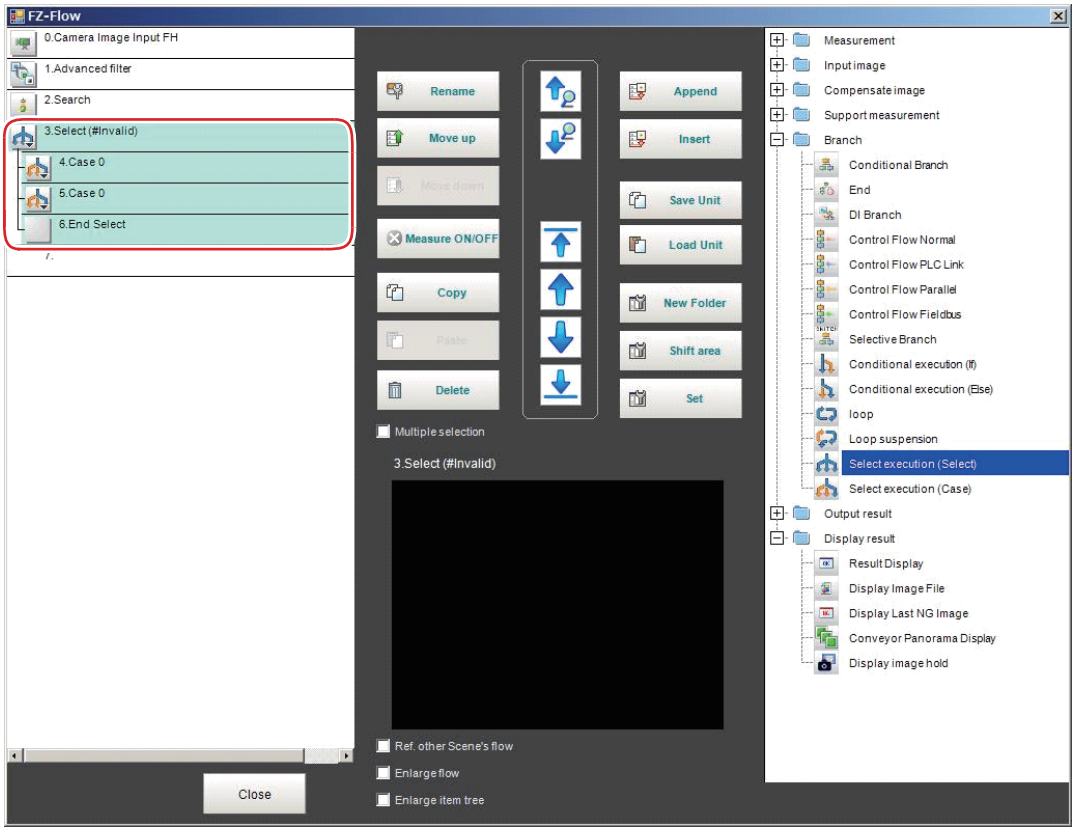
- Ensure that [Select Execution (Select)] processing items and [Select Execution End] processing items are paired.
- Ensure that [Select Execution (Case)] processing items are inserted between the [Select Execution (Select)] processing item and [Select Execution End] processing item.
- When using a [Conditional Branching] processing item within a Conditional Execution block, ensure that the branch destination unit is located within the same Conditional Execution block.
- When using a [Conditional Branching] processing item outside a Conditional Execution block, do not locate the branch destination unit within the same Conditional Execution block.

5-13-1 Select Execution Setting (Select Execution (Select))

Set which data to use as branching condition.

1 In the Edit Flow Window, add the [Select Execution (Select)] processing item to the flow.

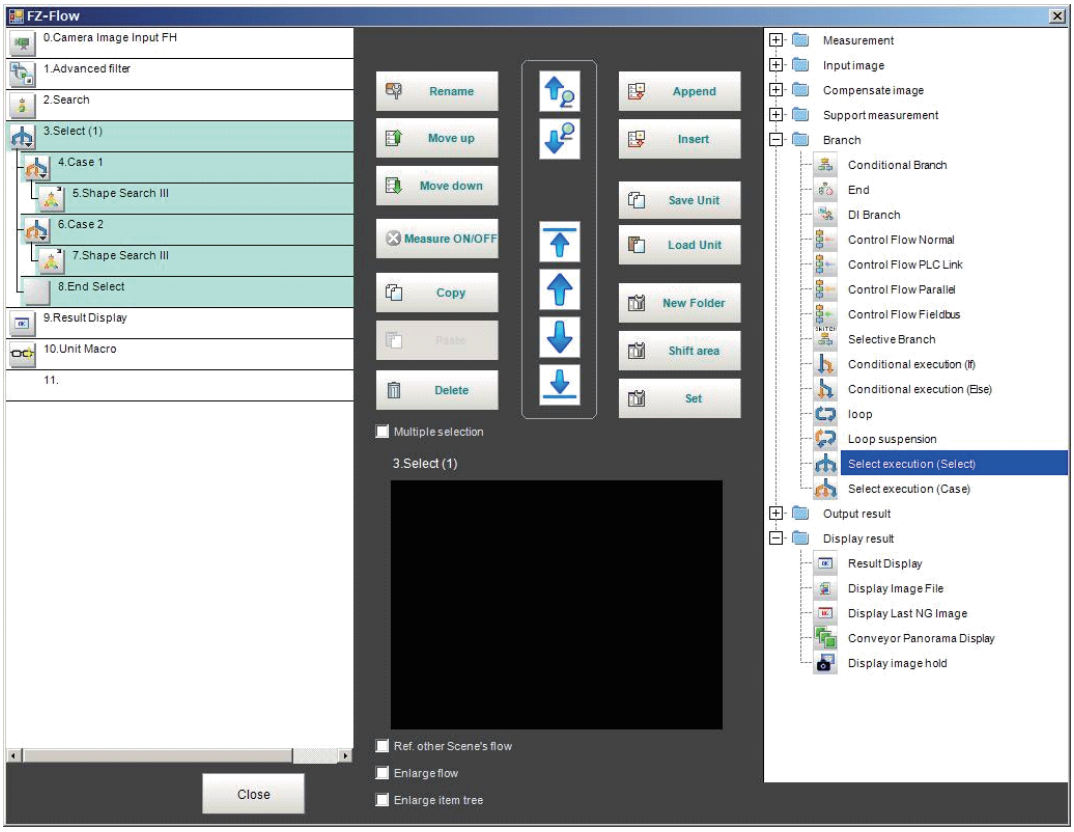
A total of four processing items are added as a set – the [Select Execution (Select)] processing item, the [Select Execution (Case)] processing item (x2), and the [Select Execution End] processing item.



2 Set the flow for each Conditional Execution block.

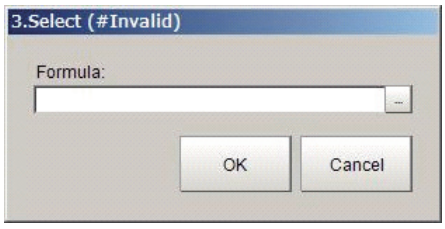
3 Select the [Select Execution (Select) processing item for which to set conditions.

From the selected [Select Execution (Select)] processing item to the [Select Execution End] processing item are selected.



4 Click the [Set] button.

The [Select Execution (Select)] setting dialog box is displayed.



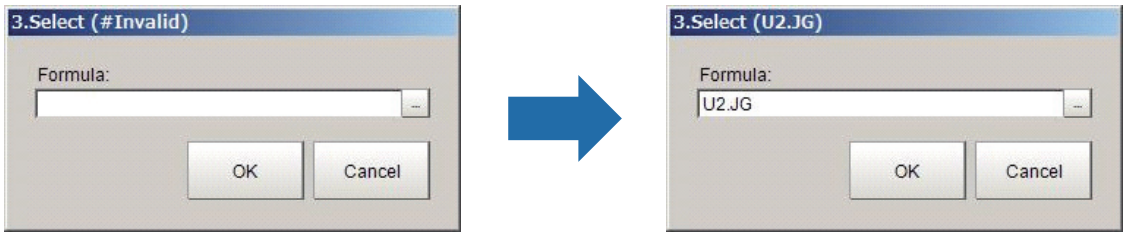
Additional Information

The settings dialog box can also be displayed using the following procedure.

- Select the settings target processing unit in the main screen flow display window, and click the property setting icon in the upper right side of the flow display window.
  Refer to *Main Window (Layout 0): Adjustment Window (Default)* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

5 Click ... to set conditions.

Set the condition with a calculation expression.



When setting the conditions, the input conditions are displayed in (#Invalid) part.

Refer to *4-3-3 Layout of Setting Expression Window* on page 4-12.

When the value calculated with the set conditions and the value for the Select Execution (Case) processing item following this processing item are the same, then this Select Execution block will be executed.

5-13-2 External Reference Tables (Select Execution (Select))

This processing item does not have an external reference number. Confirm using data identifier name and data name.

No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
None	Formula	expression	Set/Get	Exp. character string
None	Expression result	value	Get only	result of calculation selected in expression

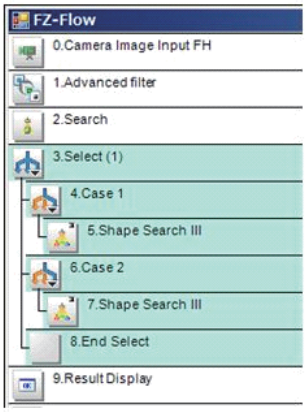
5-14 Select Execution (Case)

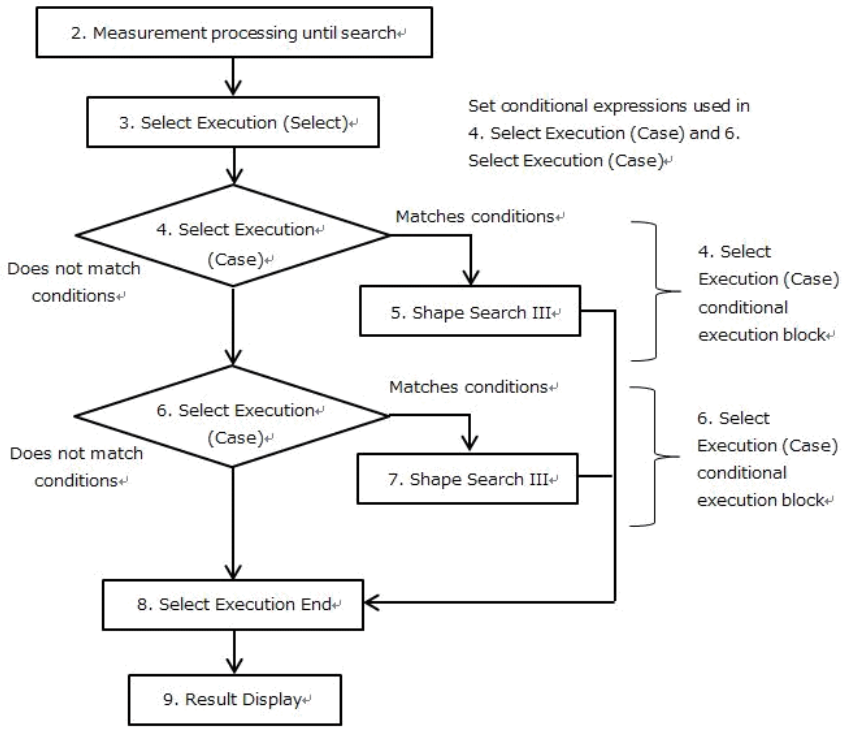
Set expressions and conditions, and use results of comparison to branch the measurement flow.

Set conditions using Select Execution (Select) processing items, and judge using Select Execution (Case). Only integer values can be set as conditions.

Used in the Following Cases

When branching a measurement flow because of interim results in the measurement flow.





Important

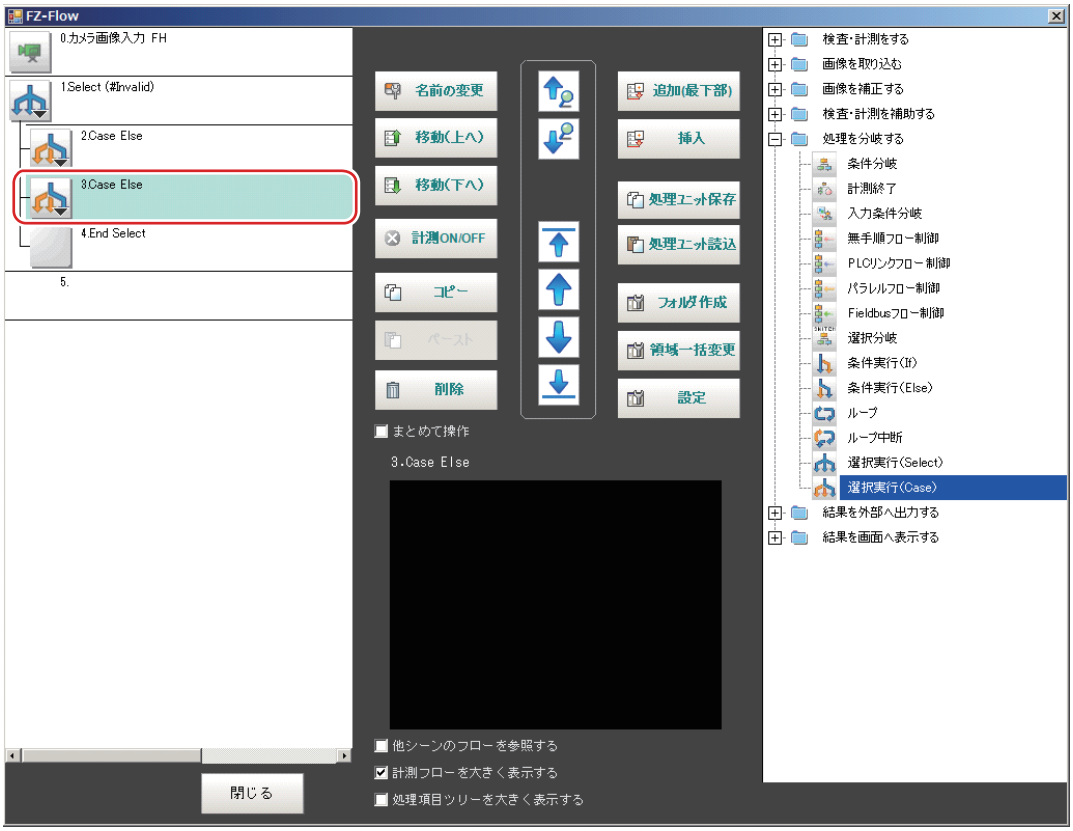
- Ensure that [Select Execution (Select)] processing items and [Select Execution End] processing items are paired.
- Ensure that [Select Execution (Case)] processing items are inserted between the [Select Execution (Select)] processing item and [Select Execution End] processing item.
- When using a [Conditional Branching] processing item between the [Select Execution (Select)] processing item and [Select Execution End] processing item, then set the branch destination unit between the [Select Execution (Select)] processing item and [Select Execution End] processing item.
- Do not set a [Conditional Branching] processing unit branch destination unit used externally between the [Select Execution (Select)] processing item and [Select Execution End] processing item.

5-14-1 Select Execution Setting (Select Execution (Case))

Set the value set in the [Select Execution (Select)] processing item and the value to compare.

1 In the Edit Flow Window, add the [Select Execution (Case)] processing item to the flow.

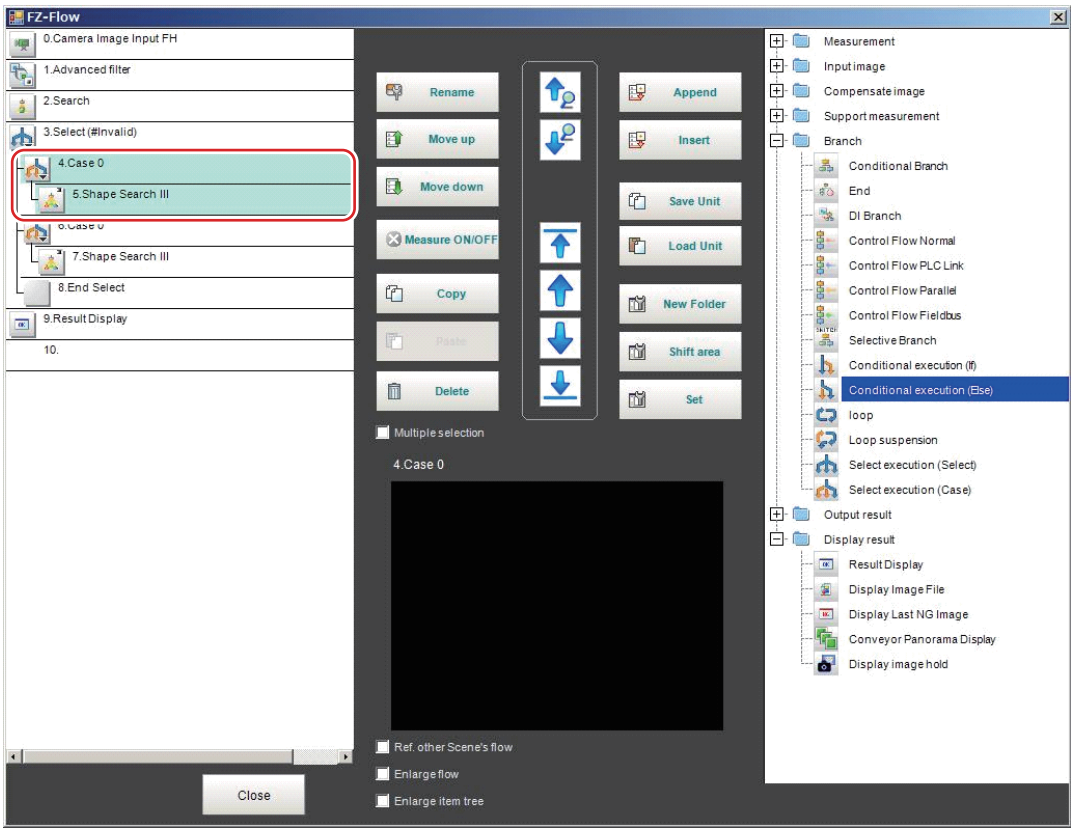
The [Select Execution (Case)] processing item is added to the flow.



2 Set the flow for each Conditional Execution block.

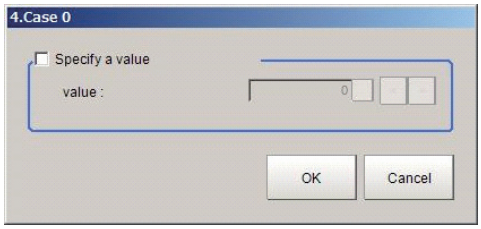
3 Select the [Select Execution (Case)] processing item for which to set conditions.

The [Select Execution (Case)] processing item and its Conditional Execution block will be selected.



4 Click the [Set] button.

The [Select Execution (Case)] setting dialog box is displayed.



Additional Information

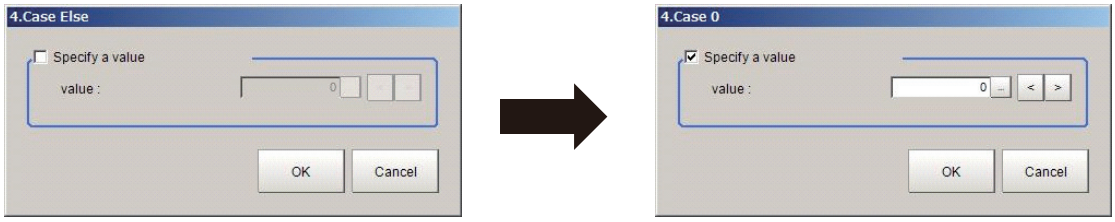
The settings dialog box can also be displayed using the following procedure.

- Select the settings target processing unit in the main screen flow display window, and click the property setting icon in the upper right side of the flow display window.

  Refer to *Main Window (Layout 0): Adjustment Window (Default)* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

5 Click … to set conditions.

When the set value and the value for the [Select Execution (Select)] processing item are the same, then this [Select Execution (Case)] processing item Conditional Execution block will be executed.



When setting the conditions, the set conditions will be displayed in “Else” part.

Displayed item	Setting value [Factory default]	Description
Specify a value	• [Unchecked] • Checked	Set the value, and when comparing with the value set in the [Select Execution (Select)] processing unit, select using the check box. Selected : Compare with the value selected in the [Select Execution (Select)] processing unit, and if these match, insert, and execute the Conditional Execution block. Not selected: Unconditionally execute the Conditional Execution block.
Value	-2147483648 to 2147483647: Refer to data No. [0]	Set the value set in the [Select Execution (Select)] processing item and the integer value to compare. Only enabled if [Specify value] is selected with a check mark.

Important

- If [Specify value] in the [Select Execution (Case)] processing item is not selected with a check mark, then the Conditional Execution block is unconditionally executed, then the [Select Execution End] processing item is executed.
- The [Select Execution (Case)] processing item value is a positive integer. Accordingly, if the value set in the [Select Execution (Select)] processing item is other than a positive integer, then the [Select Execution (Case)] processing item will result in an unconditional mismatch.

5-14-2 External Reference Tables (Select Execution (Case))

This processing item does not have an external reference number. Confirm using data identifier name and data name.

No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)

No.	Data Name	Ident	Set/Get	Data range
None	Specify condition	specify-Value	Set/Get	-2,147,483,648 to 2,147,483,647
None	value	value	Set/Get	

6

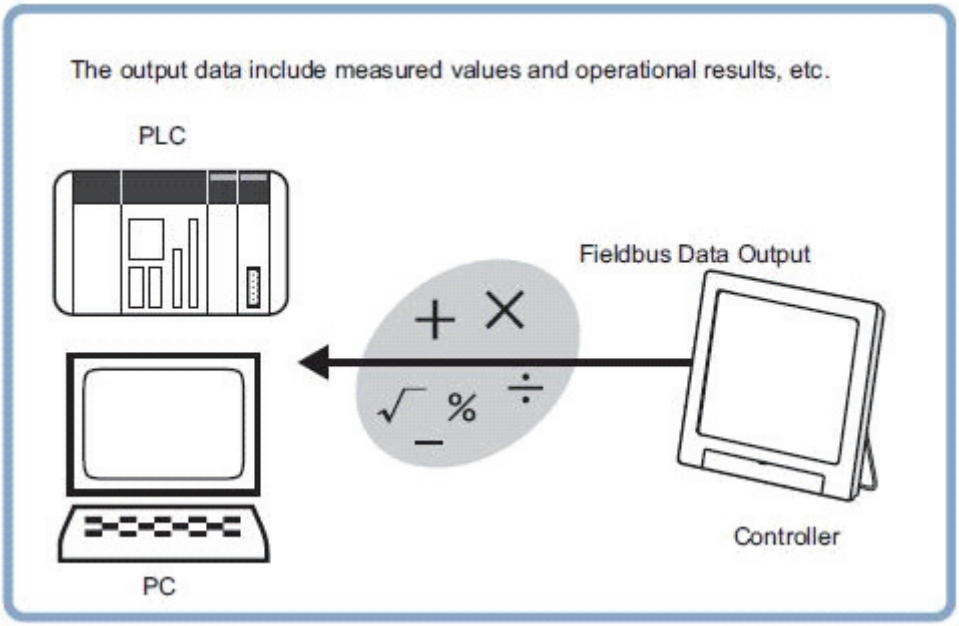
Output result

This chapter describes setting methods for when measurement results are output to the external devices.

6-1 Result Output (I/O)

Used in the Following Case

Output data to the external devices such as a programmable controller or a PC via PLC Link or Fieldbus interface (EtherCAT, EtherNet/IP (except message communications), and PROFINET).



The settings for the PLC Link or Fieldbus, refer to *Chapter 2 Methods for Connecting and Communicating with External Devices Parallel Communications* in the *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

6-1-1 External Reference Tables (Result Output (I/O))

No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
None	Output device	ioIdent	Set/Get	IoModule2: Serial (Ethernet) IoModule1: (RS-232C/422) IoModule3: Fieldbus
None	Output data	outputN (N: 0 to 1023)	Set/Get	String *1
None	Title of output data	titleN (N: 0 to 1023)	Set/Get	String

*1. The output data strings format is below.

Integer values:
"INT, <Offset>,<Data>"
Real values (Double-precision):
"DBL,<Offset>,<Data>" ?Double-precision)
Strings:
"STR,<Offset>,<Size>,<Code page>,<Data>"

For <Code page>, specify the code page number.
(For instance, a code page conforming to Japanese Shift_JIS is 932.)

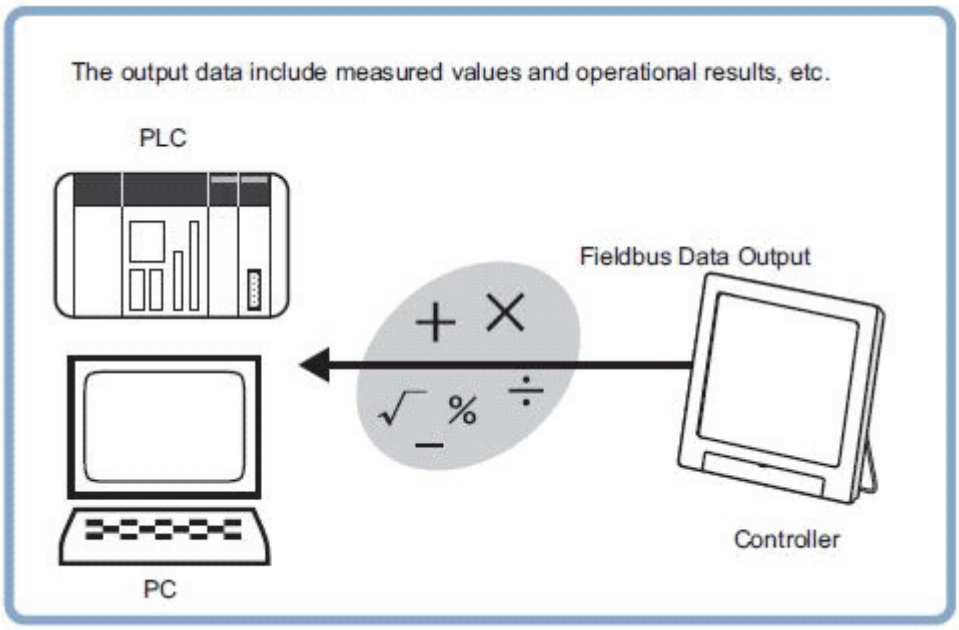
For <Data>, specify data to be output.
Fixed values: (Ex.) 123.456
Fixed strings: (Ex.) "ABC" (enclosed with double quotation marks)
Variables: (Ex.) SC.AA&

Escape sequence codes are enabled when specifying fixed strings.
\r → CR
\n → LF
\t → TAB
\xXX→ ASCII code specified by "XX" (numerical value)

6-2 Result Output (Message)

Used in the Following Case

Output data to the external devices such as a programmable controller or a PC with non-procedure mode via the serial interface or EtherNet (message communications). This processing item allows you to save the logging data as a ".csv" file into the Sensor Controller as well.



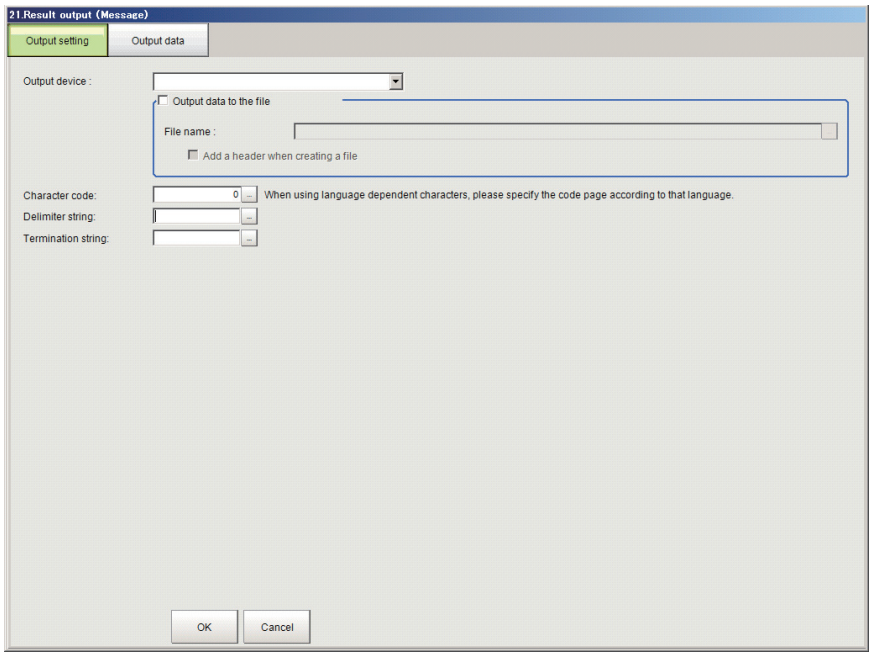
The settings for the serial data output with non-procedure protocol, refer to *Chapter 2 Methods for Connecting and Communicating with External Devices* in the *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

Saving Logging Data

1. On the Main window, click [Edit flow] in the Tool bar.
2. Click [Result Output (Message)] from the processing item tree.
3. Click [Append].

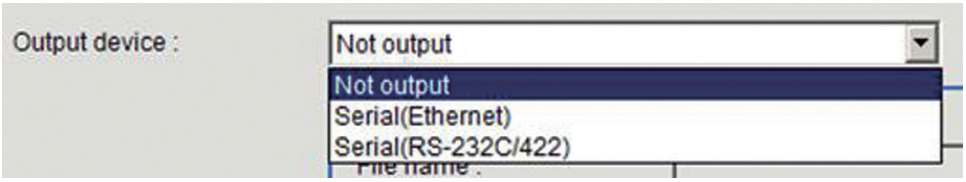
4 Click icon of the [Result Output (Message)] or Set to set the output setting and output item data.

[Result Output (Message)] setting window is displayed.



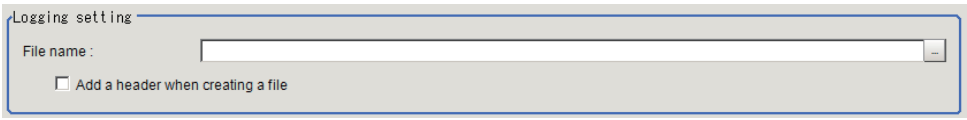
5 Click on the right side of the “Output device” text box.

- Select “Serial (Ethernet)” or “Serial (RS-232C/422)” according to communication protocols when outputting character strings together in non-procedure protocol.
- Select “Not output” when executing only the data logging.



6 Place a check in the check box for the “Output data to the file” when executing the data logging.

The following part will be enabled.



7 Contents entered in “Title” on the “Output data editing” dialog in the “Output data” tab will be inserted in the first line of logged data when placing a check in the check box for the “Add a header when creating a file”.

8 Click ... on the right side of the “File name” text box.

“FileExplore”r will appear.

9 Specify a “.csv” file to be used in the data logging or enter a file name and click [OK].

10 Click [OK] to end the setting.

Additional Information

- A byte-order-mark (BOM: 0xEF 0xBB 0xBF) will be added in the head of the file when specifying “UTF-8” for the character code.
- This data logging has no dependency with “Data logging” on the “Logging setting” in the “System settings”.
  The data logged is always output when “Output data to the file” is checked.

6-2-1 External Reference Tables (Result Output (Message))

No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
None	Output device	ioIdent	Set/Get	IoModule2: Serial (Ethernet) IoModule1: Serial (RS-232C/422)
None	File name	fileName	Set/Get	String *1
None	Add a header when creating a file	fileHeader	Set/Get	0: Not output 1: Output
None	Character code:	codePage	Set/Get	When using language-dependent characters, specify a code page according to the language
None	Delimiter string	separator	Set/Get	String *2
None	Termination string	terminator	Set/Get	String *2
None	Output data	outputN (N: 0 to 1023)	Set/Get	String *3
None	Title of output data	titleN (N: 0 to 1023)	Set/Get	String

*1. Input the full path of file.

*2. For delimited strings and terminated strings, any strings and escape sequence codes can be input.

Ex.) Escape sequence

\r → CR

\n → LF

\t → TAB

\xXX→ ASCII code specified by "XX" (numerical value)

\r\n → Line feed

*3. The output data strings format is below.

Numerical values:

"NUM,<Integer part>,<Fraction part>,<? suppress>,<Represented in negative numbers>,<Data>"

Strings:

"STR,<Number of characters>,<Data>"

<Integer part>,<Fraction part>,<? suppress>,<Represented in negative numbers>

Those conform to arguments in Str2$() function in Macro.

<Number of characters>

Specify the maximum number of characters (number of digits).

When a string length exceeds the specified number of characters (number of digits), the exceeded part is omitted. When a string length is shorter than the specified number of characters, spaces are added to the end of the string. (Left-justify)

When a negative value is specified, the absolute value is handled as the maximum number of characters. the shortfall is filled with spaces from the head. (Right-justify)

When 0 (zero) is specified, a string specified in <Data> is output as-is.

For <Data>, specify data to be output.

Fixed values: (Ex.) 123.456

Fixed strings: (Ex.) "ABC" (enclosed with double quotation marks)

Variables: (Ex.) SC.AA&

Escape sequence codes are enabled when specifying fixed strings.

\r → CR

\n → LF

\t → TAB

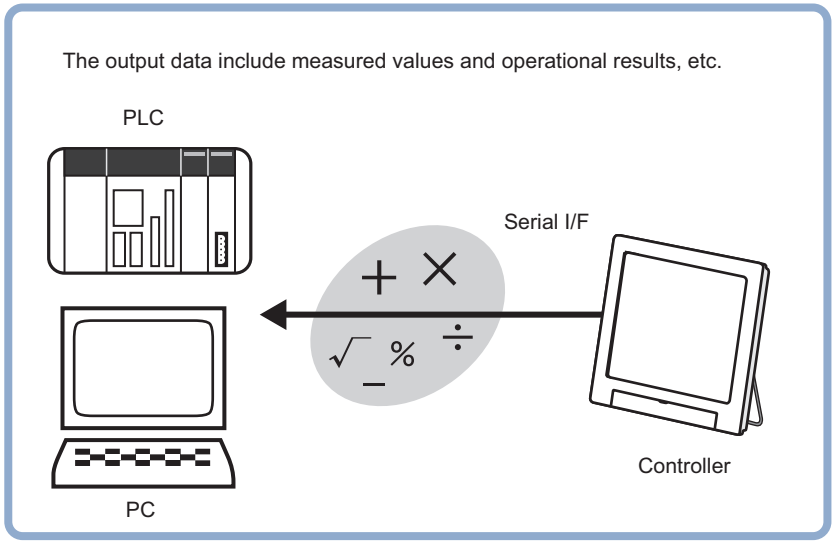
\xXX→ ASCII code specified by "XX" (numerical value)

6-3 Data Output

This processing item can not be used in the FHV series.

Used in the Following Case

Output data to the external devices such as programmable controller and PC with the no-order mode via the serial interface. With serial data output, output starts immediately after the end of processing of serial data output in the flow.



The settings for the serial data output, refer to *Chapter 2 Methods for Connecting and Communicating with External Devices* in the *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

6-3-1 External Reference Tables (Result Output (I/O))

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
136	Communication method	comSelect	Set/Get	0: Ethernet 1: RS-232C/ RS-422
137	Output format	dataFormat	Set/Get	0: ASCII 1: Binary
138	Integer	integerDigit	Set/Get	1 to 10
139	Decimal	decimalDigit	Set/Get	0 to 4
140	Minus	minusNum	Set/Get	0: - 1: 8
141	Field separator	fieldSeparator	Set/Get	0: OFF 1: Comma 2: Tab 3: Space 4: Delimiter

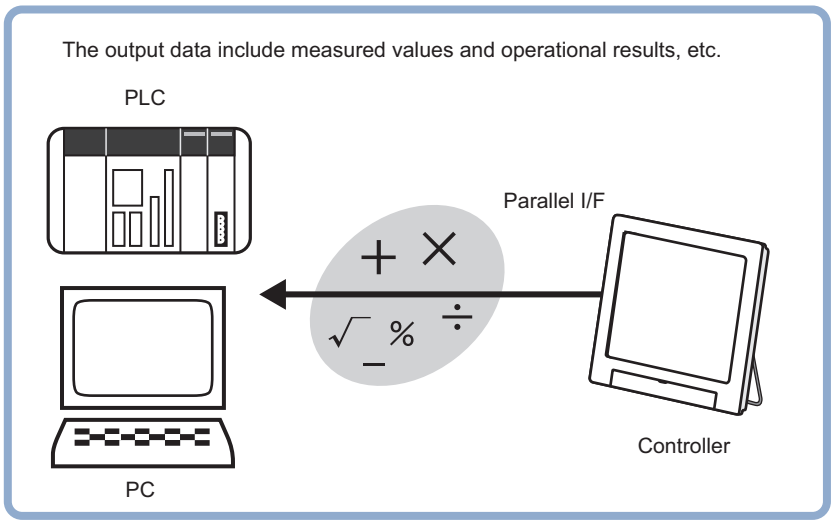
No.	Data Name	Ident	Set/Get	Data range
142	Record separator	recordSeparator	Set/Get	0: OFF 1: Comma 2: Tab 3: Space 4: Delimiter
143	0 suppress	zeroSuppress	Set/Get	0: OFF 1: ON
144+N (N: 0 to 3)	Output IP address	iPAddress	Set/Get	Output iPAdress iPAddress1: 1 to 223 iPAddress2 to iPAddress4: 0 to 255
149	Output IP address setting (only when "Ethernet" is selected for the communication method)	iPAddressDiv	Set/Get	0: Reference to system 1: Individual specification
150	Output form (decimal)	decOutputForm	Set/Get	0: fixed point 1: floating point
151	Offset	OutputOffset	Set/Get	0 to 99,999
152	Number of output data items (Valid only for PLC link)	dataNum	Set/Get	8 to 256
153	Plus	plusNum	Set/Get	0: OFF 1: +
160+N (N: 0 to 255)	Comment view	commentView	Set/Get	0: OFF 1: ON
1000+N (N: 0 to 255)	Data	resultData	Get only	ASCII: -999,999,999.9999 to 999,999,999.9999 Binary: -2,147,483.648 to 2,147,483.647
2000+N (N: 0 to 255)	Output data	setupData	Set/Get	Exp. character string
3000+N (N: 0 to 255)	Comment about the output data	comment	Set/Get	Character string

6-4 Parallel Data Output

This processing item can not be used in the FHV series.

Used in the Following Case

Used when outputting data to external devices such as a programmable controller or a PC via the parallel interface.



The settings for the parallel data output, refer to *Chapter 2 Methods for Connecting and Communicating with External Devices Parallel Communications* in the *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

6-4-1 External Reference Tables (Parallel Data Output)

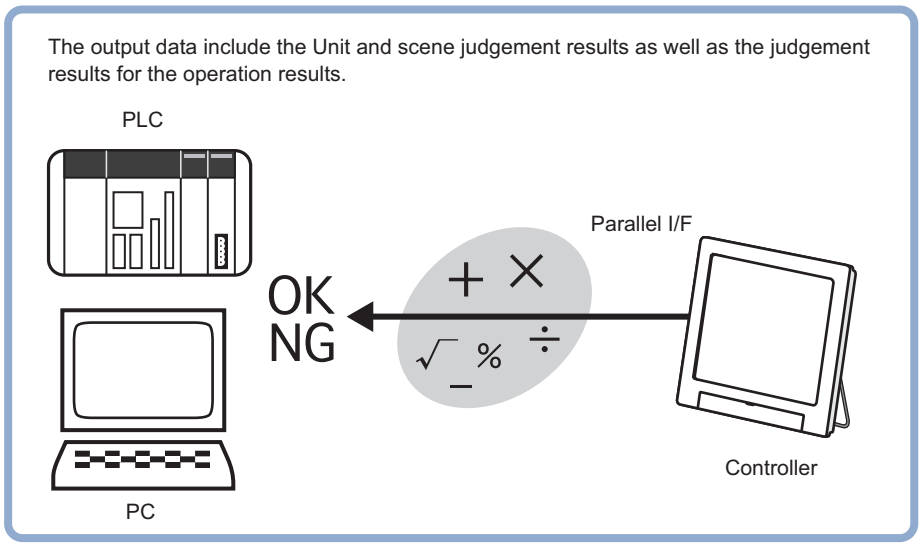
No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5	Data	resultData	Get only	Binary: -32,768 to 32,768 BCD: -999 to 999
120	Output data	setupData	Set/Get	Exp. character string
128	Data type	formatType	Set/Get	0: Binary 1: BCD
129	Comment about the output data	comment	Set/Get	Character string
160	Comment view	commentView	Set/Get	0: OFF 1: ON

6-5 Parallel Judgement Output

This processing item can not be used in the FHV series.

Used in the Following Case

Used when outputting judgement results to external devices such as a programmable controller or PC via the parallel interface.



The settings for the parallel judgement output, refer to *Chapter 2 Methods for Connecting and Communicating with External Devices Parallel Communications* in the *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

6-5-1 External Reference Tables (Parallel Judgement Output)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5+N (N: 0 to 15)	Data	resultData	Get only	-999,999,999.9999 to 999,999,999.9999
21+N (N: 0 to 15)	Judge	resultJudge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120+N (N: 0 to 15)	Judgement data	setupData	Set/Get	Exp. character string
136+Nx2 (N: 0 to 15)	Upper limit for judgement	upperCalc	Set/Get	-999,999,999.9999 to 999,999,999.9999
137+Nx2 (N: 0 to 15)	Lower limit for judgement	lowerCalc	Set/Get	-999,999,999.9999 to 999,999,999.9999

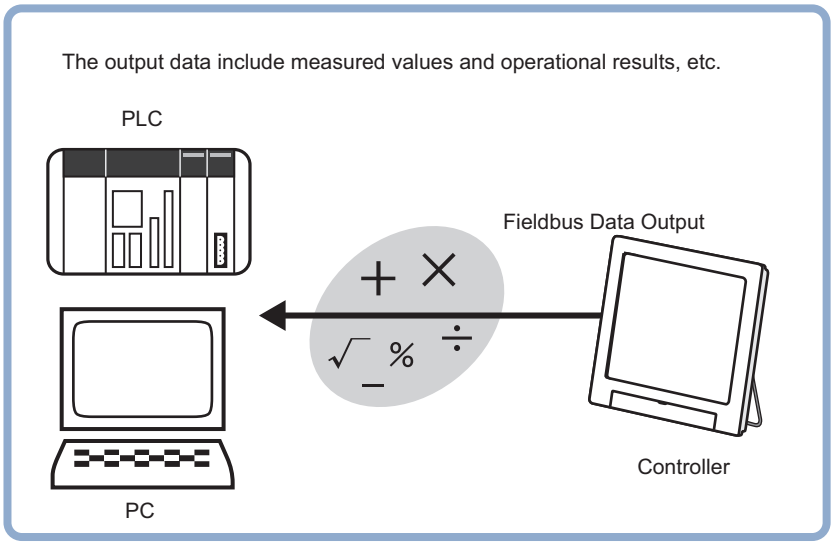
No.	Data Name	Ident	Set/Get	Data range
168+N (N: 0 to 15)	Comment about the judgement data	comment	Set/Get	Character string
190+N (N: 0 to 15)	Comment view	commentView	Set/Get	0: OFF 1: ON
210	Output polarity setting	outputPolaritySetting	Set/Get	0: System (parallel) 1: Unit
211	Output polarity	outputPolarity	Set/Get	0: ON at NG 1: ON at OK

6-6 Fieldbus Data Output

This processing item can not be used in the FHV series.

Used in the Following Case

Used when outputting data to an external device, such as a programmable controller, via the Fieldbus interface.



The settings for the Fieldbus data output, refer to *Chapter 2 Methods for Connecting and Communicating with External Devices EtherCAT Connections (FH Only) / Communicating with EtherNet/IP* in the *Vision System FH/FHV/FZ5 Series User's Manual for Communications Settings* (Z342).

6-6-1 External Reference Tables (Fieldbus Data Output)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
120+N (N: 0 to 7)	Expressions	setupData	Set/Get	Exp. character string
129+N (N: 0 to 7)	Comment	comment	Set/Get	Character string
150	Output form (decimal)	decOutputForm	Set/Get	0: fixed point 1: floating point
1000+Nx10 (N: 0 to 63)	Result data (DINT)	resultDataDINT	Get only	Result data
1001+Nx10 (N: 0 to 63)	Expressions (DINT)	setupDataDINT	Set/Get	Exp. character string
1002+Nx10 (N: 0 to 63)	Comment (DINT)	commentDINT	Set/Get	Character string

No.	Data Name	Ident	Set/Get	Data range
2000+Nx10 (N: 0 to 31)	Result data (LREAL)	resultDataLREAL	Get only	Result data
2001+Nx10 (N: 0 to 31)	Expressions (LREAL)	setupDataLREAL	Set/Get	Exp. character string
2002+Nx10 (N: 0 to 31)	Comment (LREAL)	commentLREAL	Set/Get	Character string
3000+Nx10 (N: 0 to 7)	Comment display	commentViewN-ONE	Set/Get	0: OFF 1: ON
3001+Nx10 (N: 0 to 63)	Comment display (DINT)	comment-ViewDINT	Set/Get	0: OFF 1: ON
3002+Nx10 (N: 0 to 31)	Comment display (LREAL)	commentViewL-REAL	Set/Get	0: OFF 1: ON
3003+Nx10 (N: 0 to 63)	Comment display (EtherNet/IP)	commentViewEIP	Set/Get	0: OFF 1: ON
4000+Nx10 (N: 0 to 63)	Result data (EtherNet/IP)	resultDataEIP	Get only	Result data
4001+Nx10 (N: 0 to 63)	Expressions (EtherNet/IP)	setupDataEIP	Set/Get	Exp. character string
4002+Nx10 (N: 0 to 63)	Comment (EtherNet/IP)	commentEIP	Set/Get	Character string

7

Display result

This chapter describes how to display strings and figures in the window that displays the measurement results.

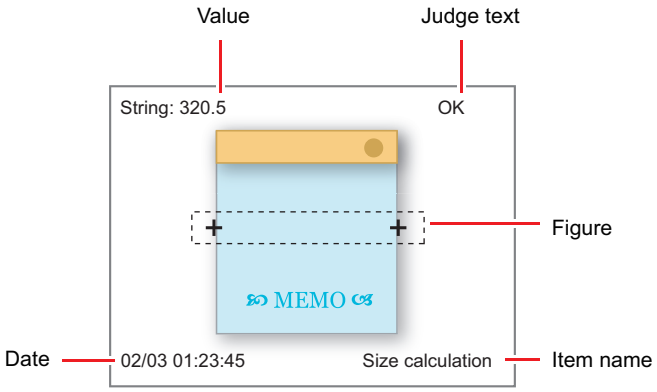
7-1 Result Display

Used in the Following Case

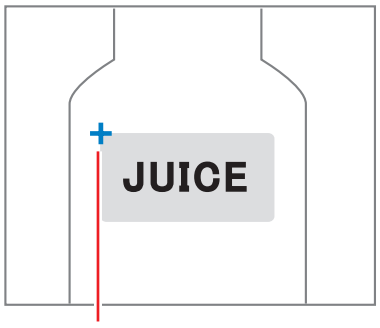
For your convenience in verifying measurement results, text and figures will be displayed in the "Image display" area.

The following content can be displayed.

Example) Displaying options, such as Display string, Display value, Display judge, Display item name, Display date, on screen.



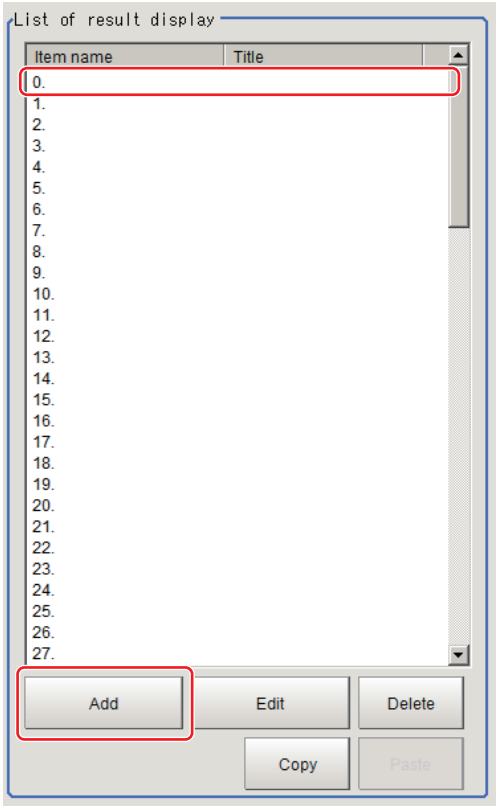
Example) Display the cross-shaped cursor at the measured position of the label.



Display the cross-shaped cursor at the measured position.

7-1-1 Result Display

1 In the "List of result display" area, select the number with which to set the object and click [Add].

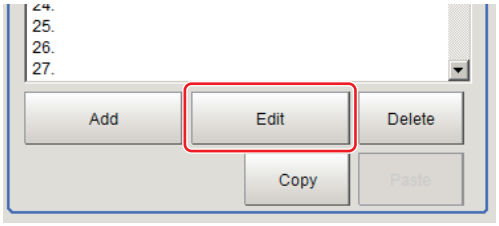


2 Select the object to be added in the Select Items to Display window and click [OK].

The selected object is added to the "List of result display" area and the Image Display area.

3 In the "List of result display" area, select the object and click [Edit].

Setting options are displayed. The setting items are different depending on the object.



4 Click [Change title] as necessary to change titles displayed in the list of result display.

Up to 31 characters can be entered.

When Display Rectangle, Line, Circle, Ellipse, Arc, Cursor Display or Display Cross Line Is Selected

Specify display position, style, width, and color of figure.

Setting item	Setting item	Description
Display position Disp pos	Figure (or Numerical)	Select this if you would like the figure to always display in the same location. Methods for specifying display position include drawing the figure on the window and indicating coordinates numerically. If you would like to always display the figure in a reference position, set up an expression using "Operation".
	Operation	Select this when you would like to change display position for each measurement based on the measured value. Set up the expression to specify the display position.
Style	• Solid line • Dashed line	Select the line type.
Width	1 to 10	Modify the line width.
Color	OK Color	Displayed in green.
	NG Color	Displayed in red.
	Judgement	Displayed using OK color or NG color based on the judgment results. Specify measurement values subject to judgment and set up respective judgment conditions.
	Arbitrary color	Displayed using specified color. Methods for specifying color include specifying by clicking on a color chart and specifying RGB values.

• Display cross line

Setting item	Setting item	Description
Scale display	-	Place a check to show the scale.
Unit	• [Calibration] • Pixels	Select the unit used when grids are displayed.
Interval	0.0000 to 9999.9999 [50.0000]	Set the intervals of the scale on the grids.
Line length	0.0000 to 9999.9999 [10.0000]	Set the length of the scale line on the grids.

When Display String, Value, Item name, Judge, Date or Display Unit string Is Selected

Sets display position, size, and color etc. of characters.

- Common settings

Setting item	Setting item	Description
Display position	Figure (or Numerical)	Select this if you would like the figure to always display in the same location. Methods include specifying by clicking on the window and specifying coordinate values. However, if you would like to always display the figure in a reference position, set an expression using "Operation".
	Operation	Select this when you would like to change display position for each measurement based on the measured value. Set up the expression to specify the display position.

- Detail

Setting item	Setting item	Description
Align	• Top • Bottom • Left • Center • Right	Specify the alignment of the text.
Size	10 to 200	Specify the font size.
Angle	0 to 359	Specify the display angle.
Style	• Bold • Italic • Under line • Mark out	Specify the character decoration.
Color	OK Color	Displayed in green.
	NG Color	Displayed in red.
	Judgement	Displayed using OK color or NG color based on the judgment results. Specify measurement values subject to judgment and set up respective judgment conditions.
	Arbitrary color	Displayed using specified color. Methods for specifying color include specifying by clicking on a color chart and specifying RGB values.

- Display string

Setting item	Description
Set letter	Set characters within 64 characters. Multilingual is also supported. For details, refer to 3-2-2 Inputting Text in the Vision System FH/FHV/FZ5 Series User's Manual (Cat. No. Z365).

- Display judge

Setting item	Description
Judge type	Specify measurement values subject to judgment and set up respective judgment conditions. Displays using OK letter or NG letter based on the judgment results.
Judgement condition	
OK letter	Sets characters displayed for the case that judgment results are OK.
NG letter	Sets characters displayed for the case that judgment results are NG.

- Display date

Setting item	Setting item	Description
Date kind	• Month/Day/Hour/Minute/Second • Month/Day/Hour/Minute • Hour/Minute/Second • Hour/Minute	Select display format Please adjust the calendar time that comes with the controller in advance. For details, refer to *Chapter 6 Changing the System Environment Setting the System Operation Environment Setting the Date and Time [Date-time Setting]* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

- Display value

Setting item	Setting item	Description
Measurement	-	Specify the measurement value you would like to display using expression.
Digits of integer	1 to 10	Specify the digits of the integer part including the sign. For positive numbers, the plus sign is not output. Example Setting: 4 digits, data -5619 -999 is output.
Decimal	0 to 4	Set the number of decimal fraction digits. Decimals are rounded up and output. When 0 is selected, the decimal digits will be rounded off.

- Display item name

Setting item	Description
Processing item	Choose processing item name from among the scenes being displayed.

- Display Unit String

Setting item	Description
Item	Select the processing item name from among the scenes being displayed. Processing items for barcode, 2D code, and character inspection can be selected.
Set unit string	Select a character string contained in the selected processing item name. • Character inspection: Reading string, verification string • Barcode: Reading string, comparison string, error output character string • 2D code: Reading string, comparison string, error output character string
String range specify	Place a check to set the display range of character string. Specify a number in the range of 1 to 999.

When Display unit graphic is Selected

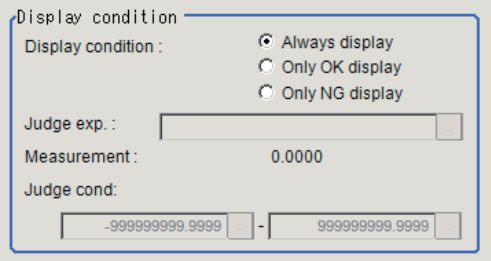
Specify unit number and image number.

- Display unit graphic

Setting item	Setting value [Factory default]	Description
processing item	0 to 9999 [0]	Select the processing item name from among the scenes being displayed.
Sub number	-1 to 99 [0]	Select the sub image number you want to display for the selected processing item.

Toggling between Show/Hide by judgement

Show/Hide can be toggled by judgement.



Setting item	Setting item	Description
Display condition	• [Always display] • Only OK display • Only NG display	Place a check to show the scale.
Judge exp.	-	Set an expression to determine whether it is OK or NG.
Judge condition	-999999999.99999 to 999999999.99999	Specify the range where the measurement result is judged to be OK.

7-1-2 External Reference Tables (Result Display)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
1100	Title	title_00	Set/Get	Character string
1101	Display position	type_00	Set/Get	0: Figure (Numerical) 1: Operation 2: Camera middle
1102	L-Up X	calcstr0Box_00	Set/Get	Exp. character string
1103	L-Up Y	calcstr1Box_00	Set/Get	Exp. character string

No.	Data Name	Ident	Set/Get	Data range
1104	R-Down X	calcstr2Box_00	Set/Get	Exp. character string
1105	R-Down Y	calcstr3Box_00	Set/Get	Exp. character string
1106	Init X	calcstr0Line_00	Set/Get	Exp. character string
1107	Init Y	calcstr1Line_00	Set/Get	Exp. character string
1108	Terminal X	calcstr2Line_00	Set/Get	Exp. character string
1109	Terminal Y	calcstr3Line_00	Set/Get	Exp. character string
1110	Width (Line)	calcstr4Line_00	Set/Get	Exp. character string
1111	Central X (Expression)	calcstr0Circle_00	Set/Get	Exp. character string
1112	Central Y (Expression)	calcstr1Circle_00	Set/Get	Exp. character string
1113	Radius	calcstr2Circle_00	Set/Get	Exp. character string
1114	Width (Circumference)	calcstr3Circle_00	Set/Get	Exp. character string
1115	Radius X	calcstr2Ellipse_00	Set/Get	Exp. character string
1116	Radius Y	calcstr3Ellipse_00	Set/Get	Exp. character string
1117	Width (Arc)	calcstr3Arc_00	Set/Get	Exp. character string
1118	Start angle	calcstr4Arc_00	Set/Get	Exp. character string
1119	End angle	calcstr5Arc_00	Set/Get	Exp. character string
1120	Disp pos X (Expression)	calcPositionX_00	Set/Get	Exp. character string
1121	Disp pos Y (Expression)	calcPositionY_00	Set/Get	Exp. character string
1122	Disp pos X	positionX_00	Set/Get	0 to 99,999
1123	Disp pos Y	positionY_00	Set/Get	0 to 99,999
1124	Central X	positionXMid_00	Set/Get	0 to 99,999
1125	Central Y	positionYMid_00	Set/Get	0 to 99,999
1126	Style	style_00	Set/Get	0: Solid 1: Dot
1127	Width	width_00	Set/Get	1 to 10
1128	Color	colorKind_00	Set/Get	0: OK Color 1: NG Color 2: Specify judgement condition 3: Arbitrary color
1129	Color R	colorR_00	Set/Get	0 to 255
1130	Color G	colorG_00	Set/Get	0 to 255
1131	Color B	colorB_00	Set/Get	0 to 255
1132	Color Specify judgement condition	colorStr_00	Set/Get	Exp. character string
1133	Color Upper limit of judgement	colorUpp_00	Set/Get	-999,999,999.9999 to 999,999,999.9999
1134	Color Upper limit of judgement	colorLow_00	Set/Get	-999,999,999.9999 to 999,999,999.9999
1135	Alignment	align_00	Set/Get	0: Top Left 1: Top Center 2: Top Right 3: Bottom Left 4: Bottom Center 5: Bottom Right
1136	Bold	bold_00	Set/Get	0: OFF 1: ON
1137	Italic	italic_00	Set/Get	0: OFF 1: ON

No.	Data Name	Ident	Set/Get	Data range
1138	Underline	underline_00	Set/Get	0: OFF 1: ON
1139	Denied line	strikeout_00	Set/Get	0: OFF 1: ON
1140	Size	size_00	Set/Get	10 to 200
1141	Angle	angle_00	Set/Get	0 to 359
1142	Set letter	setString_00	Set/Get	Character string
1143	Measurement	calcValue_00	Set/Get	Exp. character string
1144	Integer	integerDigit_00	Set/Get	1 to 10
1145	Decimal	decimalDigit_00	Set/Get	0 to 4
1146	Item	unitNo_00	Set/Get	-1 to 9,999
1147	OK letter	stringOK_00	Set/Get	Character string
1148	NG letter	stringNG_00	Set/Get	Character string
1149	Judge type (Display judge)	calcJudge_00	Set/Get	Exp. character string
1150	Upper limit of judgement (Display judge)	judgeUpp_00	Set/Get	-999,999,999.9999 to 999,999,999.9999
1151	Lower limit of judgement (Display judge)	judgeLow_00	Set/Get	-999,999,999.9999 to 999,999,999.9999
1152	Date kind	typeDate_00	Set/Get	0: Month/Day/Hour/Minute/Second 1: Month/Day/Hour/Minute 2: Hour/Minute/Second 3: Hour/Minute
1153	Scale	dispScale_00	Set/Get	0: OFF 1: ON
1154	Interval	scaleInterval_00	Set/Get	0.0000 to 9,999.9999
1155	Length	scaleLength_00	Set/Get	0.0000 to 9,999.9999
1156	Unit	scaleUnit_00	Set/Get	0: Calibration parameter 1: Pixel
1157	String range specify	strRange_00	Set/Get	0: OFF 1: ON
1158	Lower limit of string range specify	strlenLow_00	Set/Get	1 to 3,200
1159	Upper limit of string range specify	strlenUpper_00	Set/Get	1 to 3,200
1160	Set unit string	stringIdent_00	Set/Get	0 to 100
1161	Image	subNo_00	Set/Get	-1 to 99
1162	Condition display	dispType_00	Set/Get	0: Always display 1: Only OK display 2: Only NG display
1163	Judge type	judgeDispStr_00	Set/Get	Exp. character string
1164	Upper limit of judgement	judgeDispUpp_00	Set/Get	-999,999,999.9999 to 999,999,999.9999
1165	Lower limit of judgement	judgeDispLow_00	Set/Get	-999,999,999.9999 to 999,999,999.9999

No.	Data Name	Ident	Set/Get	Data range
1166	Select items to display	assign_00	Set/Get	0: Display rectangle 1: Display line 2: Display circle 3: Display ellipse 4: Display arc 5: Display cursor 6: Display string 7: Display value 8: Display item name 9: Display judge 10: Display date 11: Display cross line 12: Display unit string 13: Display unit graphic
2100	Title	title_01	Set/Get	Character string
2101	Display position	type_01	Set/Get	0: Figure (Numerical) 1: Operation 2: Camera middle
2102	L-Up X	calcstr0Box_01	Set/Get	Exp. character string
2103	L-Up Y	calcstr1Box_01	Set/Get	Exp. character string
2104	R-Down X	calcstr2Box_01	Set/Get	Exp. character string
2105	R-Down Y	calcstr3Box_01	Set/Get	Exp. character string
2106	Init X	calcstr0Line_01	Set/Get	Exp. character string
2107	Init Y	calcstr1Line_01	Set/Get	Exp. character string
2108	Terminal X	calcstr2Line_01	Set/Get	Exp. character string
2109	Terminal Y	calcstr3Line_01	Set/Get	Exp. character string
2110	Width (Line)	calcstr4Line_01	Set/Get	Exp. character string
2111	Central X (Expression)	calcstr0Circle_01	Set/Get	Exp. character string
2112	Central Y (Expression)	calcstr1Circle_01	Set/Get	Exp. character string
2113	Radius	calcstr2Circle_01	Set/Get	Exp. character string
2114	Width (Circumference)	calcstr3Circle_01	Set/Get	Exp. character string
2115	Radius X	calcstr2Ellipse_01	Set/Get	Exp. character string
2116	Radius Y	calcstr3Ellipse_01	Set/Get	Exp. character string
2117	Width (Arc)	calcstr3Arc_01	Set/Get	Exp. character string
2118	Start angle	calcstr4Arc_01	Set/Get	Exp. character string
2119	End angle	calcstr5Arc_01	Set/Get	Exp. character string
2120	Disp pos X (Expression)	calcPositionX_01	Set/Get	Exp. character string
2121	Disp pos Y (Expression)	calcPositionY_01	Set/Get	Exp. character string
2122	Disp pos X	positionX_01	Set/Get	0 to 99,999
2123	Disp pos Y	positionY_01	Set/Get	0 to 99,999
2124	Central X	positionXMid_01	Set/Get	0 to 99,999
2125	Central Y	positionYMid_01	Set/Get	0 to 99,999
2126	Style	style_01	Set/Get	0: Solid 1: Dot
2127	Width	width_01	Set/Get	1 to 10
2128	Color	colorKind_01	Set/Get	0: OK Color 1: NG Color 2: Specify judgement condition 3: Arbitrary color

No.	Data Name	Ident	Set/Get	Data range
2129	Color R	colorR_01	Set/Get	0 to 255
2130	Color G	colorG_01	Set/Get	0 to 255
2131	Color B	colorB_01	Set/Get	0 to 255
2132	Color Specify judgement condition	colorStr_01	Set/Get	Exp. character string
2133	Color Upper limit of judgement	colorUpp_01	Set/Get	-999,999,999.9999 to 999,999,999.9999
2134	Color Upper limit of judgement	colorLow_01	Set/Get	-999,999,999.9999 to 999,999,999.9999
2135	Alignment	align_01	Set/Get	0: Top Left 1: Top Center 2: Top Right 3: Bottom Left 4: Bottom Center 5: Bottom Right
2136	Bold	bold_01	Set/Get	0: OFF 1: ON
2137	Italic	italic_01	Set/Get	0: OFF 1: ON
2138	Underline	underline_01	Set/Get	0: OFF 1: ON
2139	Denied line	strikeout_01	Set/Get	0: OFF 1: ON
2140	Size	size_01	Set/Get	10 to 200
2141	Angle	angle_01	Set/Get	0 to 359
2142	Set letter	setString_01	Set/Get	Character string
2143	Measurement	calcValue_01	Set/Get	Exp. character string
2144	Integer	integerDigit_01	Set/Get	1 to 10
2145	Decimal	decimalDigit_01	Set/Get	0 to 4
2146	Item	unitNo_01	Set/Get	-1 to 9,999
2147	OK letter	stringOK_01	Set/Get	Character string
2148	NG letter	stringNG_01	Set/Get	Character string
2149	Judge type (Display judge)	calcJudge_01	Set/Get	Exp. character string
2150	Upper limit of judgement (Display judge)	judgeUpp_01	Set/Get	-999,999,999.9999 to 999,999,999.9999
2151	Lower limit of judgement (Display judge)	judgeLow_01	Set/Get	-999,999,999.9999 to 999,999,999.9999
2152	Date kind	typeDate_01	Set/Get	0: Month/Day/Hour/Minute/Second 1: Month/Day/Hour/Minute 2: Hour/Minute/Second 3: Hour/Minute
2153	Scale	dispScale_01	Set/Get	0: OFF 1: ON
2154	Interval	scaleInterval_01	Set/Get	0.0000 to 9,999.9999
2155	Length	scaleLength_01	Set/Get	0.0000 to 9,999.9999
2156	Unit	scaleUnit_01	Set/Get	0: Calibration parameter 1: Pixel
2157	String range specify	strRange_01	Set/Get	0: OFF 1: ON
2158	Lower limit of string range specify	strlenLow_01	Set/Get	1 to 3,200

No.	Data Name	Ident	Set/Get	Data range
2159	Upper limit of string range specify	strlenUpper_01	Set/Get	1 to 3,200
2160	Set unit string	stringIdent_01	Set/Get	0 to 100
2161	Image	subNo_01	Set/Get	-1 to 99
2162	Condition display	dispType_01	Set/Get	0: Always display 1: Only OK display 2: Only NG display
2163	Judge type	judgeDispStr_01	Set/Get	Exp. character string
2164	Upper limit of judgement	judgeDispUpp_01	Set/Get	-999,999,999.9999 to 999,999,999.9999
2165	Lower limit of judgement	judgeDispLow_01	Set/Get	-999,999,999.9999 to 999,999,999.9999
2166	Select items to display	assign_01	Set/Get	0: Display rectangle 1: Display line 2: Display circle 3: Display ellipse 4: Display arc 5: Display cursor 6: Display string 7: Display value 8: Display item name 9: Display judge 10: Display date 11: Display cross line 12: Display unit string 13: Display unit graphic
● ● ●	● ● ●	● ● ●	● ● ●	● ● ●
100100	Title	title_99	Set/Get	Character string
100101	Display position	type_99	Set/Get	0: Figure (Numerical) 1: Operation 2: Camera middle
100102	L-Up X	calcstr0Box_99	Set/Get	Exp. character string
100103	L-Up Y	calcstr1Box_99	Set/Get	Exp. character string
100104	R-Down X	calcstr2Box_99	Set/Get	Exp. character string
100105	R-Down Y	calcstr3Box_99	Set/Get	Exp. character string
100106	Init X	calcstr0Line_99	Set/Get	Exp. character string
100107	Init Y	calcstr1Line_99	Set/Get	Exp. character string
100108	Terminal X	calcstr2Line_99	Set/Get	Exp. character string
100109	Terminal Y	calcstr3Line_99	Set/Get	Exp. character string
100110	Width (Line)	calcstr4Line_99	Set/Get	Exp. character string
100111	Central X (Expression)	calcstr0Circle_99	Set/Get	Exp. character string
100112	Central Y (Expression)	calcstr1Circle_99	Set/Get	Exp. character string
100113	Radius	calcstr2Circle_99	Set/Get	Exp. character string
100114	Width (Circumference)	calcstr3Circle_99	Set/Get	Exp. character string
100115	Radius X	calcstr2Ellipse_99	Set/Get	Exp. character string
100116	Radius Y	calcstr3Ellipse_99	Set/Get	Exp. character string
100117	Width (Arc)	calcstr3Arc_99	Set/Get	Exp. character string
100118	Start angle	calcstr4Arc_99	Set/Get	Exp. character string
100119	End angle	calcstr5Arc_99	Set/Get	Exp. character string

No.	Data Name	Ident	Set/Get	Data range
100120	Disp pos X (Expression)	calcPositionX_99	Set/Get	Exp. character string
100121	Disp pos Y (Expression)	calcPositionY_99	Set/Get	Exp. character string
100122	Disp pos X	positionX_99	Set/Get	0 to 99,999
100123	Disp pos Y	positionY_99	Set/Get	0 to 99,999
100124	Central X	positionXMid_99	Set/Get	0 to 99,999
100125	Central Y	positionYMid_99	Set/Get	0 to 99,999
100126	Style	style_99	Set/Get	0: Solid 1: Dot
100127	Width	width_99	Set/Get	1 to 10
100128	Color	colorKind_99	Set/Get	0: OK Color 1: NG Color 2: Specify judgement condition 3: Arbitrary color
100129	Color R	colorR_99	Set/Get	0 to 255
100130	Color G	colorG_99	Set/Get	0 to 255
100131	Color B	colorB_99	Set/Get	0 to 255
100132	Color Specify judgement condition	colorStr_99	Set/Get	Exp. character string
100133	Color Upper limit of judgement	colorUpp_99	Set/Get	-999,999,999.9999 to 999,999,999.9999
100134	Color Upper limit of judgement	colorLow_99	Set/Get	-999,999,999.9999 to 999,999,999.9999
100135	Alignment	align_99	Set/Get	0: Top Left 1: Top Center 2: Top Right 3: Bottom Left 4: Bottom Center 5: Bottom Right
100136	Bold	bold_99	Set/Get	0: OFF 1: ON
100137	Italic	italic_99	Set/Get	0: OFF 1: ON
100138	Underline	underline_99	Set/Get	0: OFF 1: ON
100139	Denied line	strikeout_99	Set/Get	0: OFF 1: ON
100140	Size	size_99	Set/Get	10 to 200
100141	Angle	angle_99	Set/Get	0 to 359
100142	Set letter	setString_99	Set/Get	Character string
100143	Measurement	calcValue_99	Set/Get	Exp. character string
100144	Integer	integerDigit_99	Set/Get	1 to 10
100145	Decimal	decimalDigit_99	Set/Get	0 to 4
100146	Item	unitNo_99	Set/Get	-1 to 9,999
100147	OK letter	stringOK_99	Set/Get	Character string
100148	NG letter	stringNG_99	Set/Get	Character string
100149	Judge type (Display judge)	calcJudge_99	Set/Get	Exp. character string
100150	Upper limit of judgement (Display judge)	judgeUpp_99	Set/Get	-999,999,999.9999 to 999,999,999.9999

No.	Data Name	Ident	Set/Get	Data range
100151	Lower limit of judgement (Display judge)	judgeLow_99	Set/Get	-999,999,999.9999 to 999,999,999.9999
100152	Date kind	typeDate_99	Set/Get	0: Month/Day/Hour/Minute/Second 1: Month/Day/Hour/Minute 2: Hour/Minute/Second 3: Hour/Minute
100153	Scale	dispScale_99	Set/Get	0: OFF 1: ON
100154	Interval	scaleInterval_99	Set/Get	0.0000 to 9,999.9999
100155	Length	scaleLength_99	Set/Get	0.0000 to 9,999.9999
100156	Unit	scaleUnit_99	Set/Get	0: Calibration parameter 1: Pixel
100157	String range specify	strRange_99	Set/Get	0: OFF 1: ON
100158	Lower limit of string range specify	strlenLow_99	Set/Get	1 to 3,200
100159	Upper limit of string range specify	strlenUpper_99	Set/Get	1 to 3,200
100160	Set unit string	stringIdent_99	Set/Get	0 to 100
100161	Image	subNo_99	Set/Get	-1 to 99
100162	Condition display	dispType_99	Set/Get	0: Always display 1: Only OK display 2: Only NG display
100163	Judge type	judgeDispStr_99	Set/Get	Exp. character string
100164	Upper limit of judgement	judgeDispUpp_99	Set/Get	-999,999,999.9999 to 999,999,999.9999
100165	Lower limit of judgement	judgeDispLow_99	Set/Get	-999,999,999.9999 to 999,999,999.9999
100166	Select items to display	assign_99	Set/Get	0: Display rectangle 1: Display line 2: Display circle 3: Display ellipse 4: Display arc 5: Display cursor 6: Display string 7: Display value 8: Display item name 9: Display judge 10: Display date 11: Display cross line 12: Display unit string 13: Display unit graphic

7-2 Display Image File

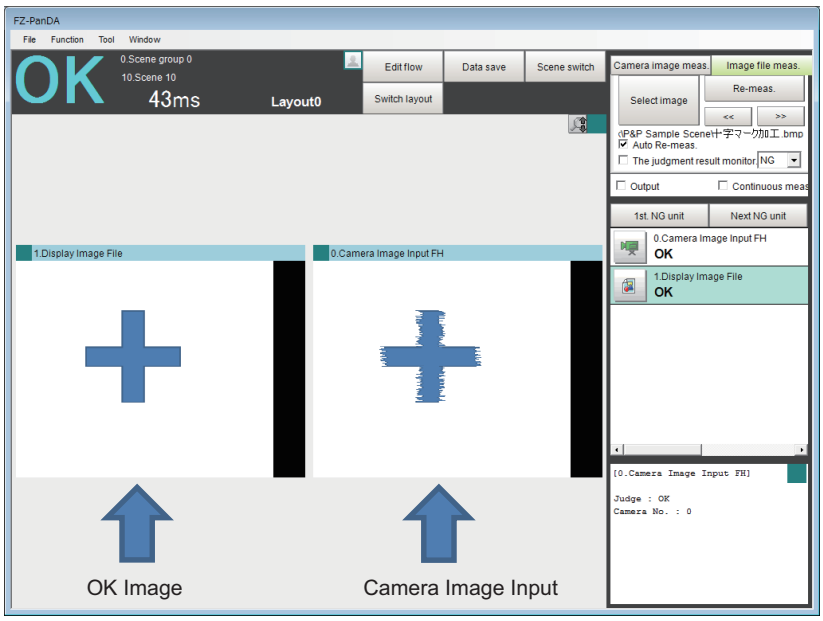
This processing item can not be used in the FHV series.

Displays image files in the external memory device, i.e. USB memory or RAMDisk.

Used in the Following Case

Use when you want to display camera input images to be used as reference or work images that are OK or NG (Judgment is Passed or Failed).

Example) Display OK image and Camera Image Input side by side.



7-2-1 Select Image (Display Image File)

1 Set the number of image files to be registered.

Up to 4 images can be selected by entering [Number of image]

2 Specify image to be displayed.

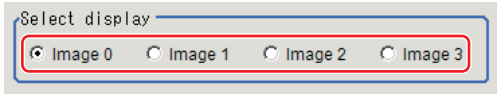
If [System Settings]-[Logging setting]-[Multiple image logging] is set to [ON] and there are multiple images in an image file, an image can be selected by entering the [Capture No.][*1] and [Camera No.]

*1. Input the number of Camera input image to [Capture No.].
For details, refer to *Appendixes Image file* in the *Vision Sensor FH/FHV/FZ5 Series Vision System User's Manual* (Z365).

Important

Only image logging files (ifz format) and BMP format image files for which the region size is 1600 × 1200 or less can be specified.

3 Select the image to be displayed on the Properties Dialogue Box.



Important

The images in image file 0 to 3 can be displayed by specifying the sub image number on the RUN window/ ADJUST window.
For details, refer to *Chapter 3 Performing Test Measurement/Starting Operation Arranging the Window Changing Display Contents, such as Image Mode* in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

4 Click [OK].

The settings are finalized.

7-2-2 Key Points for Test Measurement and Adjustment (Display Image File)

The following content can be confirmed in the "Detail result" area using text.

Displayed item	Description
Judge	Judgement result

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image number.	Explanation of image to be displayed
0	Image 0
1	Image 1
2	Image 2
3	Image 3

7-2-3 External Reference Tables (Display Image File)

No.	Data Name	Ident	Set/Get	Data range
120	Number of files	fileNum	Set/Get	1 to 4
121	Camera No.0	cameraNo0	Set/Get	0 to 15
122	Camera No.1	cameraNo1	Set/Get	0 to 15
123	Camera No.2	cameraNo2	Set/Get	0 to 15
124	Camera No.3	cameraNo3	Set/Get	0 to 15
125	File name 0	file0	Set/Get	Character string
126	File name 1	file1	Set/Get	Character string
127	File name 2	file2	Set/Get	Character string
128	File name 3	file3	Set/Get	Character string
129	Capture No.0	captureNo0	Set/Get	0 to 9,999 (maximum depend on image file)
130	Capture No.1	captureNo1	Set/Get	0 to 9,999 (maximum depend on image file)
131	Capture No.2	captureNo2	Set/Get	0 to 9,999 (maximum depend on image file)
132	Capture No.3	captureNo3	Set/Get	0 to 9,999 (maximum depend on image file)

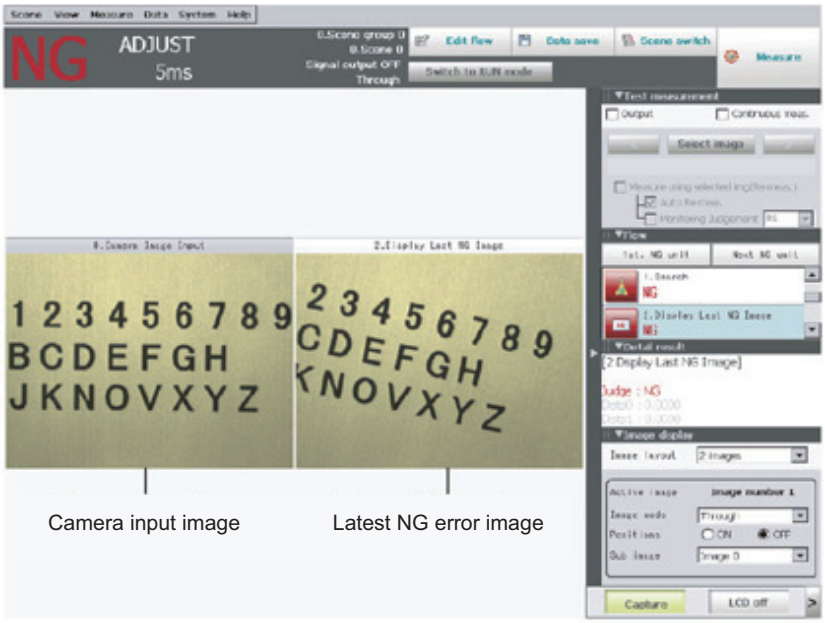
7-3 Display Last NG Image

You can store the Specified the measurement image of Processing Unit, maximum 4 images, or specified data by arithmetic expression. Since the stored images or data are remained even if you operate the window.

Used in the Following Case

Image and data for NG case are saved.

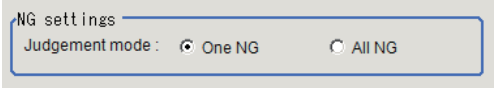
Example) Displaying the latest NG error display and the camera image input next to each other



7-3-1 NG Error Judgement (Display Last NG Image)

Sets conditions for NG judgement.

1. Click [Judge NG] in the Item Tab area.
2. Set the judgment mode in the NG settings area.



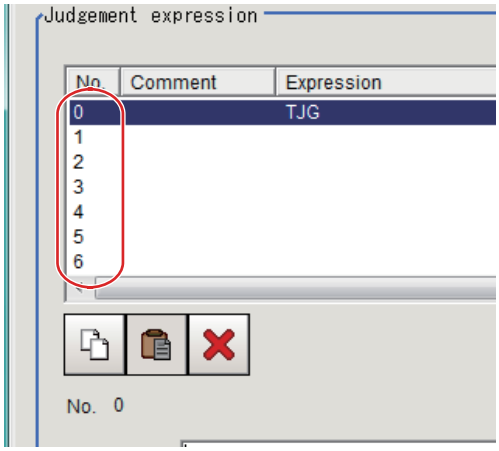
Setting item	Set value [Factory default]	Description
Judgement mode	[One NG]	The image is saved even if only one of the judgment criteria set using "Judgment expression" has a judgment of NG.
	All NG	The image is saved if all of the judgment criteria set using "Judgment expression" have a judgment of NG.

Expression Settings

The measurement details used for NG judgment are set up using an expression.

1 Click [No.] to set the expression on the [Judgement expression] area.

The No. selected will be displayed below the list.



2 Click [...] for the expression and set the expression.

An expression setting window appears.

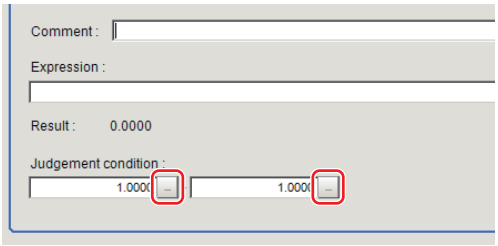
3 After setting up the expression, click [OK].

The expression is confirmed.

4 Click [...] for Comment and input an explanation of the expression as necessary.

Multilingual is also supported. For details, refer to *3-2-2 Inputting Text in the Vision System FH/FHV/FZ5 Series User's Manual* (Cat. No. Z365).

5 Set up the judgement upper limit and the judgement lower limit for "Judgement".



Setting item	Setting value [Factory default]	Description
Judgement condition	-999999999.9999 to 999999999.9999	This is a judgement condition for the expression. Set upper and lower limits for judging as OK.

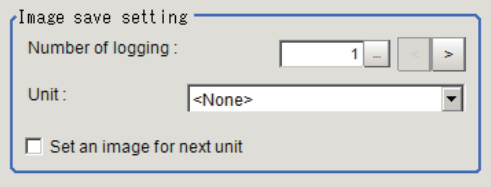
6 Repeat the Steps 1 to 5 and set up the expression.

7-3-2 Image Saving (Display Last NG Image)

Specifies the target unit to be saved and number of times images are saved when an NG occurs.

1 Click [Image save] in the Item Tab area.

2 Specify each of the following items.



Setting item	Set value [Factory default]	Description
Number of logging	[1] to 4	Sets the number of NG images that are saved. A maximum of 4 NG images consisting of Last NG, Last 1 NG, Last 2 NG, Last 3 NG can be saved.
Unit	-	Specifies target processing unit for saving image. Select the unit (camera input image, image with pre-processing or position compensation) with the image you would like to save. Please select a unit from earlier than the unit being processed as the target unit.
Set an image for next unit	• Checked • [Unchecked]	Check when using an image acquired by a processing unit after this unit.

3 Set up the expression.

Refer to *Expression Settings* on page 7-19.

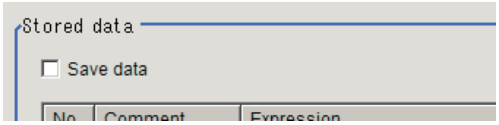
Additional Information

Saved images are stored in Sub-image number 0 to 3.
Details of Sun-images are the following:
0: Last NG
1: Previous NG image
2: NG error image from 2 previous
3: NG error image from 3 previous
To display Sub-image number, refer to the Chapter 3 *Performing Test Measurement/Starting Operation Arranging the Window Changing Display Contents*, such as Image Mode in the *Vision System FH/FHV/FZ5 Series User's Manual* (Z365).

7-3-3 Data Saving (Display Last NG Image)

Sets data to be saved when NG occurs.

1. Click [Saving data] in the Item Tab area.
2. Specify each of the following items.



Setting item	Set value [Factory default]	Description
Save data	[Unchecked] Checked	Check when saving measurement data using an expression when NG occurs. In conjunction with the number of saves, a maximum of 4 items of measurement data from Last NG, Last 1 NG, Last 2 NG, Last 3 NG can be saved for one expression. Please set the expression to reference a unit prior to the unit currently being processed.

3. Set up the expression.

   Refer to *Expression Settings* on page 7-19.
4. Set up the judgement condition.

Additional Information

For stored data, refer to *7-3-6 Measurement Results for Which Output Is Possible (Display Last NG Image)* on page 7-22.

7-3-4 Output Parameters (Display Last NG Image)

Specifies whether or not the judgement results of this processing unit is reflected in the scene overall judgement.

1. Click [Output parameter] in the Item Tab area.
2. Choose whether or not to reflect the judgement result in the scene overall judgement in "Reflect to overall judgement" area.

Setting item	Set value [Factory default]	Description
Reflect to overall judgement	• [ON] • OFF	Enables choosing whether or not the judgment results of this processing unit is reflected in the scene overall judgment.

7-3-5 Key Points for Test Measurement and Adjustment (Display Last NG Image)

The following content is displayed in the "Detail result" area as text.

Displayed items	Description
Data 0 comment	Expression result of Expression 0
Data 1 comment	Expression result of Expression 1
Data 2 comment	Expression result of Expression 2
Data 3 comment	Expression result of Expression 3
Data 4 comment	Expression result of Expression 4
Data 5 comment	Expression result of Expression 5
Data 6 comment	Expression result of Expression 6
Data 7 comment	Expression result of Expression 7
Data 8 comment	Expression result of Expression 8
Data 9 comment	Expression result of Expression 9
Data 10 comment	Expression result of Expression 10
Data 11 comment	Expression result of Expression 11
Data 12 comment	Expression result of Expression 12
Data 13 comment	Expression result of Expression 13
Data 14 comment	Expression result of Expression 14
Data 15 comment	Expression result of Expression 15

The image specified in the Sub-image number in image display setting is displayed in the image display area.

Sub image number.	Explanation of image to be displayed
0	Last NG
1	Previous NG error image (Displayed when there are 2 or more saved images. Otherwise, "Last NG" is displayed.)
2	NG error image from 2 previous (Displayed when there are 3 or more saved images. Otherwise, "Last NG" is displayed.)
3	NG error image from 3 previous (Displayed when there are 4 or more saved images. Otherwise, "Last NG" is displayed.)

7-3-6 Measurement Results for Which Output Is Possible (Display Last NG Image)

The following values can be output using processing items related to results output. It is also possible to reference measurement values from expressions and other processing units.

Measurement items	Character string	Description
Judge	JG	Judgement result
Judge data 00 to 07	JD 00 to 07	Calculation data 00 to 07 for inclusion 0
Judge judge 00 to 07	JJ 00 to 07	Calculation judgment 00 to 07 for inclusion 0
Last NG data 00 to 15	D000 to 15	NG data 00 to 15
Last NG judge 00 to 15	J000 to 15	Judge NG 00 to 15
Last 1 NG data 00 to 15	D100 to 15	Last N NG data 00 to 15
Last 1 NG judge 00 to 15	J100 to 15	Last N NG judge 00 to 15
Last 2 NG data 00 to 15	D200 to 15	Last N NG data 00 to 15
Last 2 NG judge 00 to 15	J200 to 15	Last N NG judge 00 to 15
Last 3 NG data 00 to 15	D300 to 15	Last N NG data 00 to 15
Last 3 NG judge 00 to 15	J300 to 15	Last N NG judge 00 to 15

7-3-7 External Reference Tables (Display Last NG Image)

No.	Data Name	Ident	Set/Get	Data range
0	Judge	judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
5+N (N: 0 to 7)	Judge data	judgeData	Set/Get	-999,999,999.9999 to 999,999,999.9999
13+N (N: 0 to 7)	Judge judge	judgeJudge	Set/Get	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
103	Reflect to overall judgement	overallJudge	Set/Get	0: ON 1: OFF
120	Judgement mode	judgeMode	Set/Get	0: One NG 1: All NG
121	Save type	saveType	Set/Get	0: Image 1: Image + data
122	Number of loggings	saveCount	Set/Get	1 to 4
123	Target processing unit number	unitNo	Set/Get	-1: Images in own processing unit saved 0 to 9,999
124	Image memory setting flag	setImageFlag	Set/Get	0: OFF 1: ON
140+N (N: 0 to 7)	Condition exp	judgeStr	Set/Get	Exp. character string for inclusion processing unit 0
148+Nx2 (N: 0 to 31)	Upper limit of condition calculation	upperJudge	Set/Get	-999,999,999.9999 to 999,999,999.9999
149+Nx2 (N: 0 to 31)	Lower limit of condition calculation	lowerJudge	Set/Get	-999,999,999.9999 to 999,999,999.9999
164+N (N: 0 to 7)	Condition calculation Comment	commentJudge	Set/Get	Character string
180+N (N: 0 to 15)	Data exp	setupData	Set/Get	Exp character string
196+Nx2 (N: 0 to 15)	Upper limit for data calculation	upperCalc	Set/Get	-999,999,999.9999 to 999,999,999.9999
197+Nx2 (N: 0 to 15)	Lower limit for data calculation	lowerCalc	Set/Get	-999,999,999.9999 to 999,999,999.9999
228+N (N: 0 to 15)	Data calculation comment	comment	Set/Get	Character string
244+N (N: 0 to 15)	Comment view	commentView	Set/Get	0: OFF 1: ON
500+N (N: 0 to 15)	Latest NG image data	resultData	Get only	-999,999,999.9999 to 999,999,999.9999

No.	Data Name	Ident	Set/Get	Data range
516+N (N: 0 to 15)	Last NG judge	J0	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
532+N (N: 0 to 15)	1 time before NG image data	D1	Get only	-999,999,999.9999 to 999,999,999.9999
548+N (N: 0 to 15)	Last 1 NG judge	J1	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
564+N (N: 0 to 15)	2 times before NG image data	D2	Get only	-999,999,999.9999 to 999,999,999.9999
580+N (N: 0 to 15)	Last 2 NG judge	J2	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG
596+N (N: 0 to 15)	3 times before NG image data	D3	Get only	-999,999,999.9999 to 999,999,999.9999
612+N (N: 0 to 15)	Last 3 NG judge	J3	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG

7-4 Conveyor Panorama Display

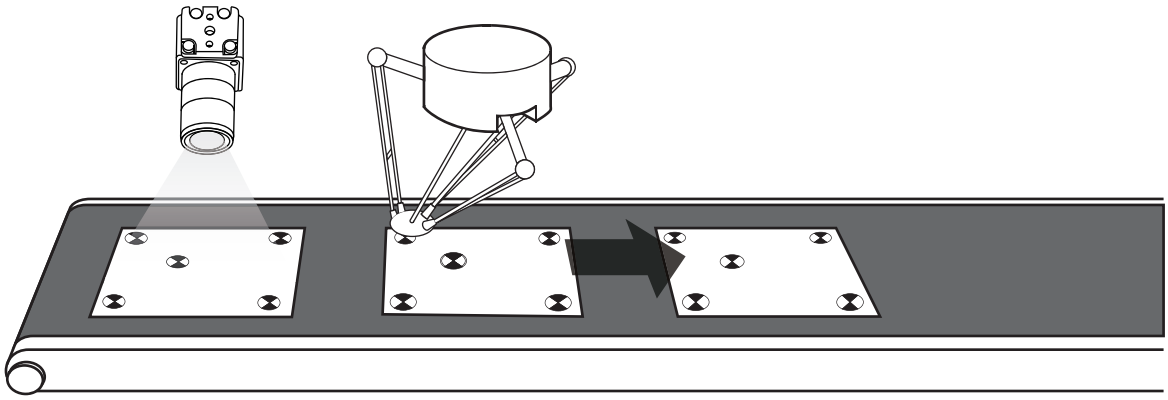
Conveyor Panorama Display is a processing item exclusively for the FH Sensor Controller and is specifically used for the conveyor tracking application.

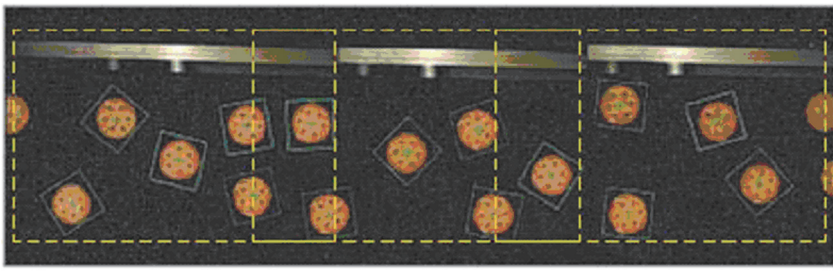
Conveyor Panorama Display cannot be operated on the FH Sensor Controller. Use Sysmac Studio.

For more information, refer to the *Vision Sensor FH Series Conveyor Tracking Application Sample Scene and Sample Macro User's Guide*.

Used in the Following Case

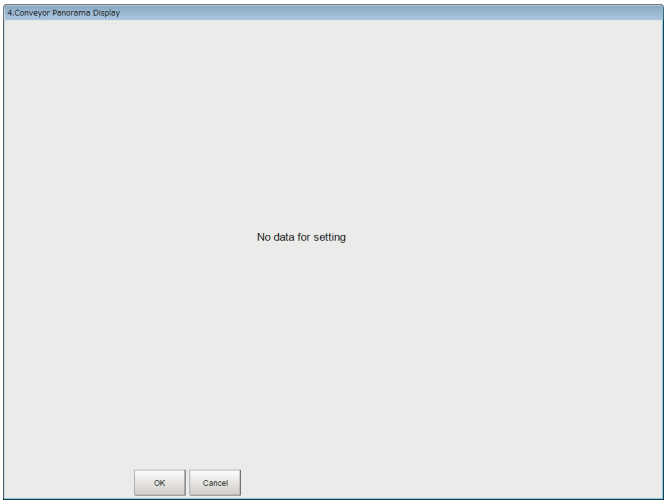
Use Conveyor Panorama Display when you want to show images of the tracking area as a panoramic image to help in the adjusting of the conveyor speed and trigger interval.





Additional Information

Processing items exclusively for conveyor tracking application can be selected on the Edit Flow Window of the FH/FHV/FZ5 Sensor Controller. However, the properties setting is unavailable on the FH/FHV/FZ5 Sensor Controller.
The Properties Dialog Box will appear as the following figure.



7-5 Display Image Hold

Processing item to retain images, including measurement results.

This processing item captures the image window for the image input type system processing items processed

immediately before, as the set position list display status.

Used in the Following Cases

When measurement results are deleted having not passed through a branching, and are displayed as not measured.

After scene switching, when measurement results are deleted and are displayed as not measured.

Important

- This processing item captures the image window as the position list display. Accordingly, if zoomed then character strings will be enlarged, and graphics diagrams displayed with thicker lines.
- Additionally, previous processing type processing item settings up until image input type processing items immediately before are not reflected.

7-5-1 Display Image Retention Settings (Display Image Hold)

This processing item is set by situating in a scene. There are no items to set.

This processing item captures the image window for the image input type processing items processed

immediately before the situated flow, as the set position list display status.

Up to a maximum of four images are retained up to the three previous input images, Including the most recently input image. With each input, the oldest images are overwritten.

Retained images are retained even after scene switching. Delete retained images by switching the scene group, turning the power OFF, or from [Function] in the menu, executing [Clear Measurement Results].

7-5-2 External Reference Tables (Display Image Hold)

This processing item does not have an external reference number. Confirm using data identifier name and data name.

No.	Data Name	Ident	Set/Get	Data range
0	Judge	Judge	Get only	0: No judgement (unmeasured) 1: Judgement result OK -1: Judgement result NG -10: Error (image format mismatch) -11: Error (unregistered model) -12: Error (insufficient memory) -20: Error (other errors)
None	Unit number to be displayed	displayUnitNo	Set/Get	
None	Sub-image number to be displayed	subNo	Set/Get	Sub-number possessed by processing item to be displayed

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