

## Smart Laser (CMOS) Amplifier E3NC-SA0

### INSTRUCTION SHEET

Thank you for selecting an OMRON product. This sheet primarily describes precautions required in installing and operating the product.

- A specialist who has the knowledge of electricity must treat the product.
- Please read this manual carefully, and use it correctly after thoroughly understanding the product.
- Please keep this manual properly for future reference whenever it is necessary.



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### PRECAUTIONS ON SAFETY

#### Meanings of Signal Words

**WARNING** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

#### Warning Indications

### WARNING

This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purpose.

Do not use the product with voltage in excess of the rated voltage. Excess voltage may result in malfunction or fire.

Never use the product with an AC power supply. Otherwise, explosion may result.

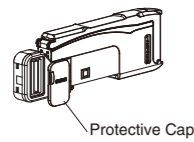
### PRECAUTIONS FOR SAFE USE

The following precautions must be observed to ensure safe operation of the product. Doing so may cause damage or fire.

- Do not install the product in the following locations.
  - (1) Locations subject to direct sunlight
  - (2) Locations subject to condensation due to high humidity
  - (3) Locations subject to corrosive gas
  - (4) Locations subject to vibration or mechanical shocks exceeding the rated values
  - (5) Locations subject to exposure to water, oil, chemicals
  - (6) Locations subject to steam
  - (7) Locations subjected to strong magnetic field or electric field
- Do not use the product in environments subject to flammable or explosive gases.
- Do not use the product in any atmosphere or environment that exceeds the ratings.
- To secure the safety of operation and maintenance, do not install the product close to high-voltage devices and power devices.
- Do not use the product if the case is damaged.
- Burn injury may occur. The product surface temperature rises depending on application conditions, such as the ambient temperature and the power supply voltage. Use caution when operating or cleaning the product.
- When setting the sensor, be sure to check safety such as by stopping the equipment.
- Be sure to turn off the power supply before connecting or disconnecting wires.
- Do not attempt to disassemble, repair, or modify the product in any way.
- When disposing of the product, treat it as industrial waste.

### PRECAUTIONS FOR CORRECT USE

- Do not miswire such as the polarity of the power supply.
- Be sure to mount the unit to the DIN track until it clicks.
- To prevent electric shock or short circuit, put a protection cap on unused connection power supply terminals.



- Do not apply excessive force (9.8N max.) such as tension, compression or torsion to the connector of the sensor head that is fixed to the amplifier unit.
- Always keep the protective cover in place when using the product. Not doing so may cause malfunction.
- It may take time until the received light intensity and measured value become stable immediately after the power is turned on depending on use environment.
- The Mobile Console E3X-MC11, E3X-MC11-SV2 and E3X-MC11-S cannot be connected.
- The mutual interference prevention function does not work when in combination with E3C/E2C/E3X.
- If the unit receives excessive sensor light, the mutual interference prevention function may not work properly, resulting in malfunction of the unit. In such case, increase the threshold.
- Sensor communication unit E3NW can be used. E3X-DRT21-S and E3X-CRT/ECT cannot be used.
- If you notice an abnormal condition such as a strange odor, extreme heating of the unit, or smoke, immediately stop using the product, turn off the power, and consult your dealer.
- Do not use thinner, benzene, acetone, and lamp oil for cleaning.

### Checking the Package Content

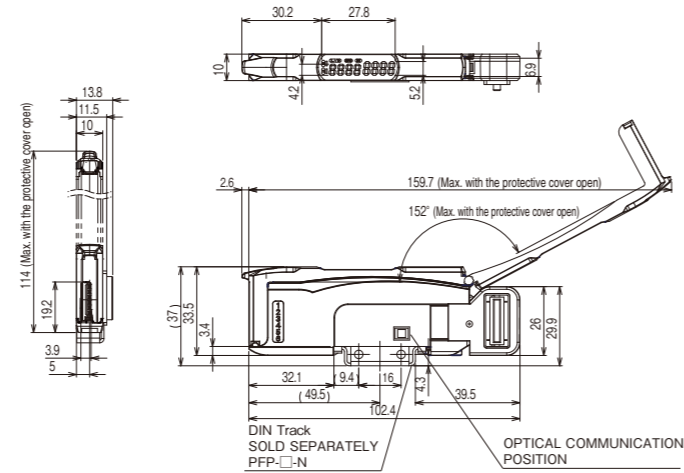
- Amplifier Unit: 1
- Instruction Sheet (this sheet): 1 (Japanese, English and Chinese)

### Compatible Communication Unit (Sold Separately)

E3NW Series Communication Unit, Distribution unit E3NW-DS

## 1 Installation

### 1-1 Dimensions



Dimensions in parentheses ( ) indicates the ones with related components. Unit: mm

### 1-2 Mounting the Amplifier Unit

#### Mounting on DIN Track

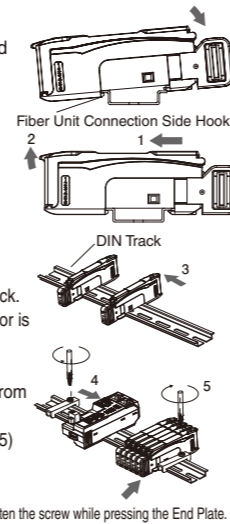
- (1) Let the hook on the Amplifier Unit's Sensor Head connection side catch the track.
- (2) Push the unit until the hook clicks into place.

#### Removing from DIN Track

- (1) Push the unit in the direction 1.
- (2) Lift the unit in the direction of arrow 2 while performing step (1).

#### Joining Amplifier Units

- (1) Mount the Amplifier Units one at a time onto the DIN track. Slide the Amplifier Unit until the communication connector is closely attached. (Arrow 3)
- (2) Use End Plates (PPF-M; separately sold) at both ends of the grouped Amplifier Units to prevent them from separating due to vibration or other cause. (Arrow 4)
- (3) Tighten the screw on the End Plates using a driver. (Arrow 5)



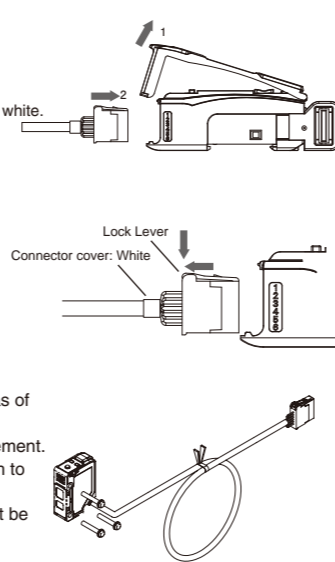
Up to 30 Amplifier Units can be connected to E3NW Series Communication Unit. Under environments such as vibration, use an End Plate even with a single amplifier unit.

### 1-3 Mounting the sensor head

1. Open the protection cover.
2. Insert the sensor head, with the lock lever on its connector area facing upward, all the way into the connector port. The color of the connector cover for E3NC-SH is white. Make sure to avoid misconnection by confirming the cover color in advance. To remove it, press and hold the lock lever then pull the sensor head out.

Fix the sensor head with M3 screws. Apply tightening torque of 0.5N-m for fixing.

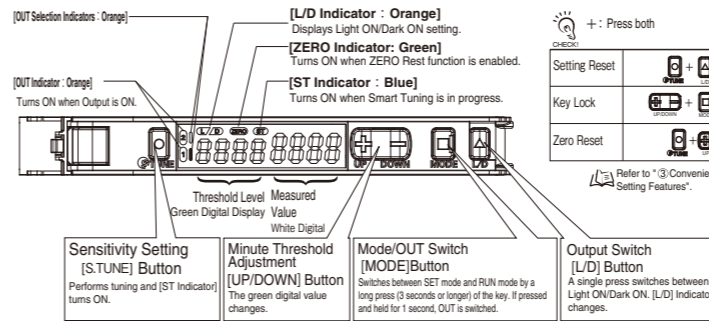
- Do not touch the emitter and receiver areas of the sensor head. A fingerprint may prevent proper measurement. If you accidentally touch it, use a soft cloth to wipe it out.
- Fix the connector area so that it should not be affected by oscillation and impact.



## 2 Settings

For settings with the Communication Unit, refer to the User's Manual that comes with the Communication Unit.

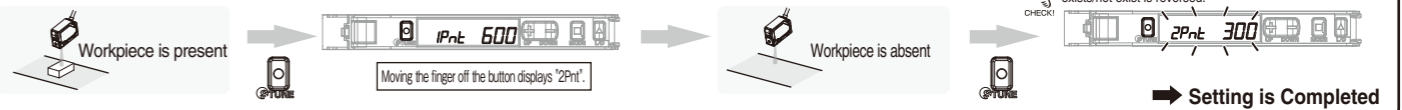
### 2-1 Setting and Display Overview



### 2-4 Smart Tuning [Easy Sensitivity Setting]

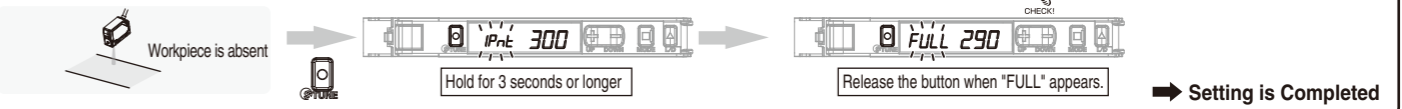
#### Basic Setting

##### 2-point Tuning



#### Setting for a workpiece nearer than the background

##### 1-point tuning



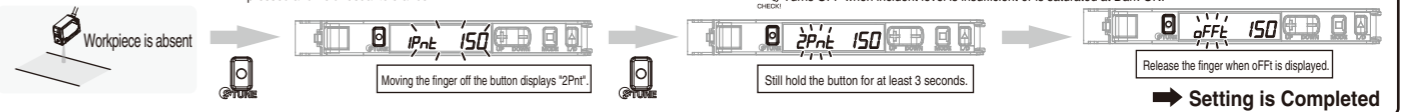
#### Setting for a Moving Workpiece

##### Full Auto Tuning



#### Setting for judging presence/absence of workpiece according to the background

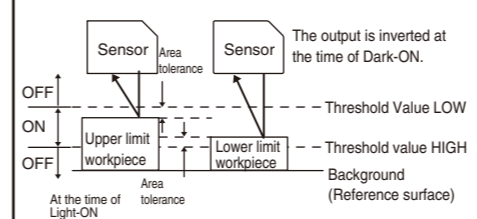
##### Tuning with workpiece absent



#### Setting for sensing within the range of the upper and lower limits

##### 2-point area tuning

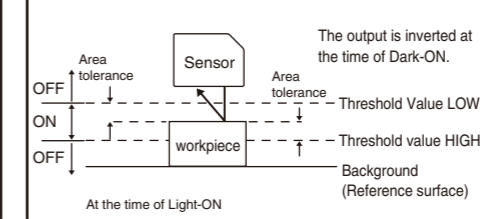
1. Select [Setting Mode] → [Output1 Mode] → [Area Sensing Mode].
2. Press and hold the [MODE] button for 3 seconds or longer to exit the Setting Mode.
3. Carry out the same operation as for the 2-point tuning.



#### Setting for sensing with ± tolerance for workpiece

##### 1-point area tuning

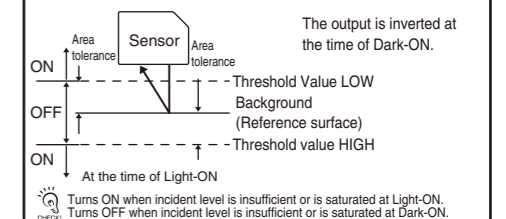
1. Select [Setting Mode] → [Output1 Mode] → [Area Sensing Mode].
2. Press and hold the [MODE] button for 3 seconds or longer to exit the Setting Mode.
3. Carry out the same operation as for the 1-point tuning.



#### Setting for sensing with ± tolerance for the background

##### Area tuning with workpiece absent

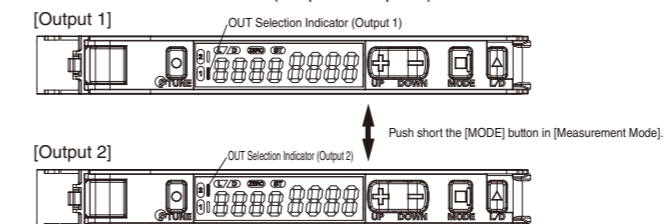
1. Select [Setting Mode] → [Output1 Mode] → [Area Sensing Mode].
2. Press and hold the [MODE] button for 3 seconds or longer to exit the Setting Mode.
3. Carry out the same operation as for the tuning with workpiece absent.



### 2-5 Output switching

#### OUT Selection Indicator switches to switch the settings.

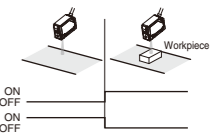
1. Push short the [MODE] button in [Measurement Mode].
2. OUT Selection Indicators (Output 1/Output 2) switch.



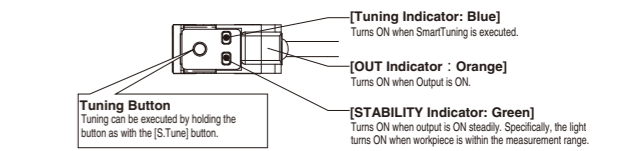
### 2-2 Switching Control Output

Press **L/D** button.

- Set to "Light ON" to turn the output ON with a workpiece in the detection area. [L/D Indicator] turns **L/ON**.
- Set to "Dark ON" to turn ON the output without a sensing object. [L/D Indicator] turns **D/ON**.



### 2-3 Sensor Head Display

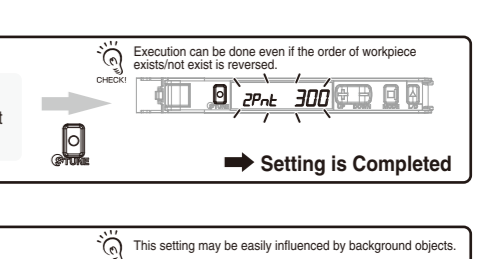


### 2-6 Minute Adjustment of Threshold Level

#### Margin of the threshold

Margins for threshold are shown below:  
2-4 Smart Tuning

Normal margin	E3NC-SH100: 8 E3NC-SH250: 80
Area margin	E3NC-SH100: 4 E3NC-SH250: 40



#### Smart Tuning Error

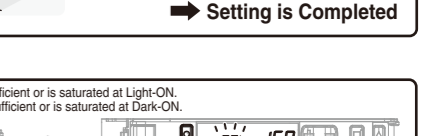
Tuning Error	All	• Change the response time slower and then perform tuning again. • Before tuning, make sure that the distance between the Sensor and workpiece is within the measurement range.
Near Error	2-point Tuning Full Auto Tuning	• Expand difference in the measured values for the 1st and 2nd points is too small.

#### 2-6 Minute Adjustment of Threshold Level

1. Press **UP/DOWN** button to adjust the threshold level.

The threshold level becomes higher.

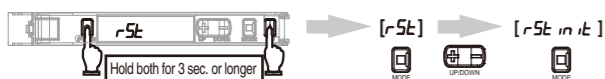
Hold the key for high-speed level adjustment.



## 3 Convenient Setting Features

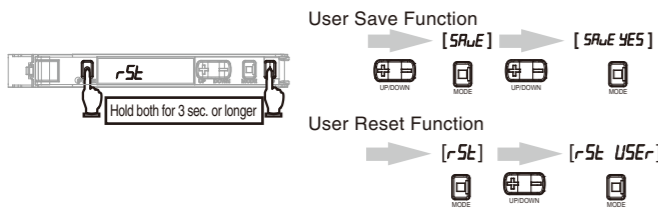
### Initializing Settings

- **Setting Reset** Initialize all settings to the factory-set defaults.



### Saving/Reading Settings

- **User Save Function/User Reset Function**

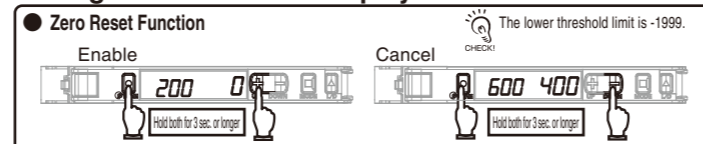


### Preventing Malfunction

- **Key Lock Function** Disables all the button operations.



### Setting measured value display to 0



## 4 Maintenance

### 4-1 Troubleshooting

- Troubleshooting

Phenomena	Cause	Remedy
No digital display.	Is the Eco function not turned ON?	Turn OFF the Eco function. Refer to "Convenient Setting Features".
Display is blank.	Is the power supply ON? Are the cables not broken?	Check the connection of the connector between the Communication Unit and Amplifier.
The Sensor restarts during operation.	Is an LD-OFF command sent from the Communication Unit?	Check whether the LD-OFF command is sent from the Communication Unit.
Laser is not emitted.	Is an LD-OFF command sent from the Communication Unit?	Check whether the LD-OFF command is sent from the Communication Unit.
[LoFF] appears in the display.	Temperature characteristic may be the cause.	Perform warming up at least for 10 minutes. Periodically zero-reset the value using a standard target object for compensation.

For information on troubleshooting with Communication Unit, refer to the User's Manual provided with the Communication Unit.

- Error Display

Error Name / Display	Cause	Remedy
Load short circuit detection error E-St	The judgment output line is short circuited.	Check the connection of the connector between the Communication Unit and Amplifier.
Overcurrent protection error E-Hd CUR	A connection error is found in the sensor head.	Check if the sensor head is correctly mounted and turn ON the power supply again.
Amp EEPROM time-out error E-nE 01	An error is found in amp setting memory.	Turn ON the power again. Reset the settings if the error is not corrected.
Amp EEPROM checksum error E-nE 02	An error is found in amp setting memory.	Turn OFF the power supply and check if the sensor head and amplifier unit are correctly connected and then turn ON the power supply again. If the error persists, the sensor head or amplifier unit are broken. Replace the sensor head or amplifier unit.
Sensor head single failure detection error E-Hd Ld	A measurement value count could not be acquired from sensor head.	Turn OFF the power supply and check if the sensor head and amplifier unit are correctly connected and then turn ON the power supply again. If the error persists, the sensor head or amplifier unit are broken. Replace the sensor head or amplifier unit.
Sensor head communications time-out error E-Hd Co n 1	A communications error is found between the sensor head and amp.	Replace the sensor head or amplifier unit.
Sensor head command response error E-Hd Co n 2	A communications error is found between the sensor head and amp.	Replace the sensor head or amplifier unit.
Sensor head command response error E-Hd Co n 3	A communications error is found between the sensor head and amp.	Replace the sensor head or amplifier unit.
Amp connection detection error E-Hd Co n 4	The sensor head is not connected to the amp.	Turn off the power, check the connection of the sensor head, and turn on the power again. If the error persists, the sensor head is out of order. Replace the sensor head.
Sensor head EEPROM time-out error E-Hd nE n 1	An error is found in sensor head setting memory.	Turn off the power, check the connection of the sensor head, and turn on the power again. If the error persists, the sensor head is out of order. Replace the sensor head.
Sensor head EEPROM checksum error E-Hd nE n 2	An error is found in sensor head setting memory.	Turn off the power, check the connection of the sensor head, and turn on the power again. If the error persists, the sensor head is out of order. Replace the sensor head.

- Status Display

Error Name / Display	Cause	Remedy
Lock ON LoC on	The key lock function enabled.	Cancel the key lock function. Refer to "Convenient Setting Features".
Insufficient light amount error dAR L	A measurement error is found due to insufficient receiving light amount.	Adjust the distance between the sensor head and a workpiece within the measurable range.
Light amount saturation error br Gt	A measurement error is found due to receiving light amount saturation.	Adjust the distance between the sensor head and a workpiece within the measurable range.
Moving average count unreach error ---	Moving average count could not be acquired from sensor head. BGS setting	Wait until the calculation of the moving average result is completed.
Before-checking-hold error ---	A hold result is not calculated yet. Hold setting	Please wait until a hold result is calculated.

### 4-2 Ratings and Specifications

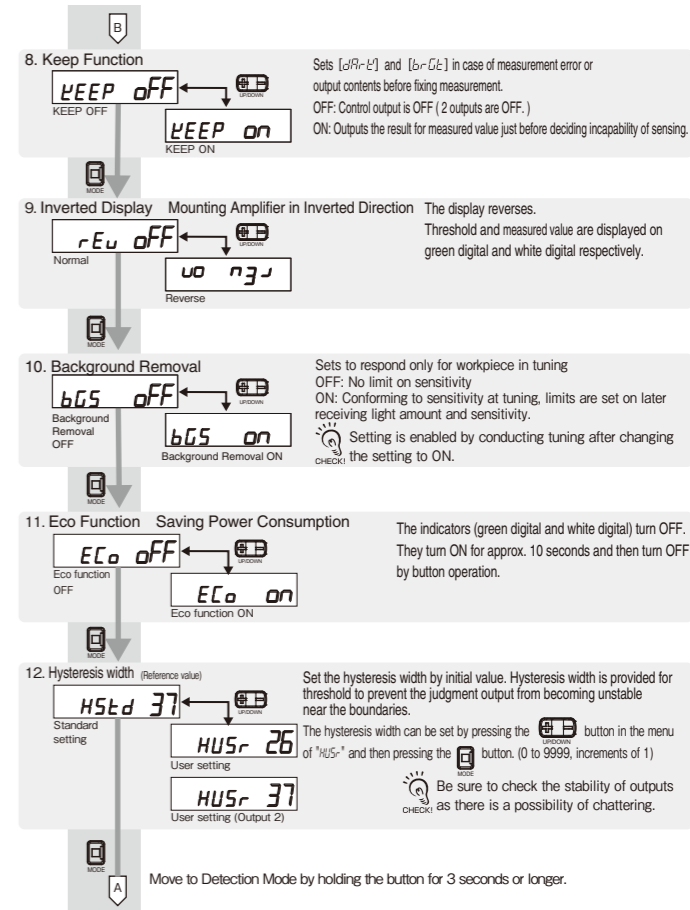
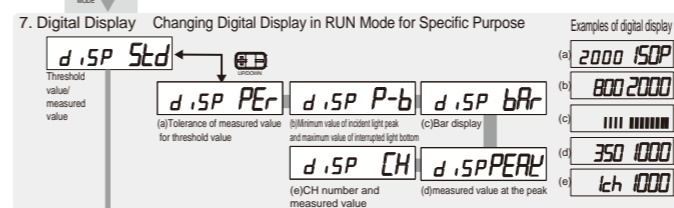
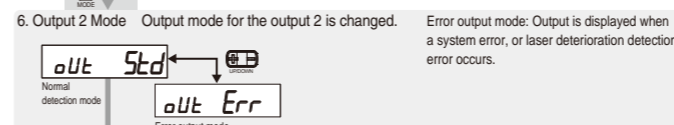
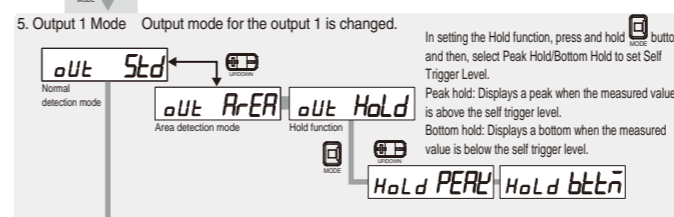
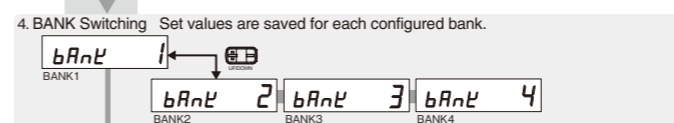
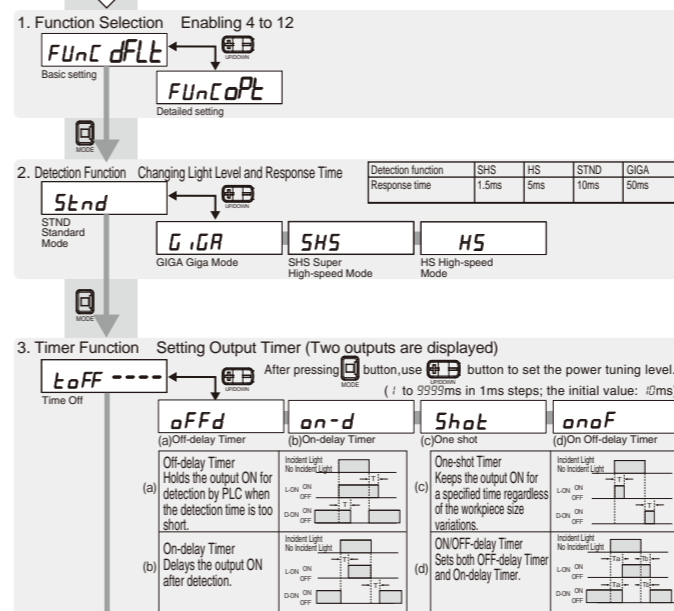
Model	E3NC-SA0
Control output	2
Operating range	E3NC-SH100: 35 to 100 mm (Display value: 350 to 1000) E3NC-SH250: 35 to 250 mm (Display value: 350 to 2500)
Display resolution	Unit: Approx. 0.1 mm * Note 1. A guideline of a displayed value for sensing distance. When performing a zero-reset of the set value, the value will be shifted.
Connection method	Communication Unit compatible wire-saving connector
Supported communications unit	E3NW Series Communication Unit, E3NW-DS
Power supply voltage	Supplied from the connector through the communications units.
Power consumption*1	Power supply voltage 24V: Normal mode: 1920mW max.(Power consumption 80mA max.) Power saving ECO: 1680mW max.(Power consumption 70mA max.)
Control output	Please refer to the specification of a communication unit.
Protection circuit	Power supply reverse polarity protection, output short-circuit protection
Maximum connectable Units	30 units
Number of units for mutual interference	0 Note: The mutual interference prevention functions are disabled if the SHS mode is selected for detection function. High-speed mode (HS) 2 Standard mode (SHS) 2 Giga mode (GIGA) 2
Ambient temperature range	Operating: 1 to 2 amplifiers connected: 0°C to 55°C, 3 to 10 amplifiers connected: 0°C to 50°C, 11 to 16 amplifiers connected: 0°C to 45°C, 17 to 30 amplifiers connected: 0°C to 40°C Storage: -30°C to 70°C (with no icing or condensation)
Ambient humidity range	Operating and storage: 35% to 85% RH (with no condensation)
Insulation resistance	20 MΩ min. (at 500 VDC)
Dielectric strength	1,000 VAC, 50/60 Hz, 1 minute
Vibration resistance	10 to 55 Hz with a 1.5-mm double amplitude for 2 hrs each in X, Y and Z directions
Shock resistance	150 m/s <sup>2</sup> , for 3 times each in X, Y and Z directions
Weight (packed state/sensor)	Approx. 65 g/Approx. 25 g
Materials	Case and cover: Polycarbonate (PC), Cable covering: PVC

\*1. Power consumption  
Power supply voltage 10V to 30V:  
Normal mode: 2250mW max.(Power supply voltage 30V: Power consumption 75mA max./Power supply voltage 10V: Power consumption 145mA max.)  
Power saving ECO: 1950mW max.(Power supply voltage 30V: Power consumption 65mA max./Power supply voltage 10V: Power consumption 125mA max.)

\*2. The minimum number of units in the specifications is applied to the mutual interference between different amplifiers such as between fiber and laser.

## 5 Detailed Settings

Hold **MODE** button for 3 seconds or longer to enter SET mode. The OUT Selection Indicators show items for Output1/Output 2 individually for each output.  
SET mode provides the function settings described hereafter. The initial display shown after transition from one function to another represents the factory default.



### Suitability for Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM. See also Product catalog for Warranty and Limitation of Liability.

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