AC Power Input
2-Phase Closed-loop Stepper Motor Driver

AiSA-D Series

INSTRUCTION MANUAL

TCD210120AC

Autonics

Thank you for choosing our Autonics product.
Read and understand the instruction manual and manual thoroughly before using the product.
For your safety, read and follow the below safety considerations before using.
For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.
Keep this instruction manual in a place where you can find easily.
The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.
Follow Autonics website for the latest information.

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime / disaster prevention devices, etc.)
Failure to follow this instruction may result in personal injury, economic loss or fire.
02. Do not use the unit in the place where flammable / explosive / corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact or salinity may be present.
Failure to follow this instruction may result in explosion or fire.
03. Do not connect, repair, or inspect the unit while connected to a power source.
Failure to follow this instruction may result in fire or electric shock.
04. Install the unit after considering counter plan against power failure.
Failure to follow this instruction may result in personal injury, economic loss or fire.
05. Check 'Connections' before wiring.
Failure to follow this instruction may result in fire.
06. Do not disassemble or modify the unit.
Failure to follow this instruction may result in fire or electric shock.
07. Install the driver in the housing or ground it.
Failure to follow this instruction may result in personal injury, fire or electronic shock.
08. Do not touch the unit during or after operation for a while.
Failure to follow this instruction may result in burn or electric shock due to high temperature of the surface.
09. Emergency stop directly when error occurs.
Failure to follow this instruction may result in personal injury or fire.

⚠ Caution Failure to follow instructions may result in injury or product damage.

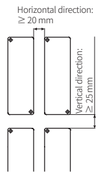
01. When connecting the power input, use AWG18 (0.75 mm²) cable or over.
02. Brake is non-polar. When connecting the brake, use AWG24 (0.2 mm²) cable or over.
Failure to follow this instruction may result in fire or malfunction due to contact failure.
03. To use the motor safely, do not apply external force to the motor.
It is recommended to use STOPPER for the vertical load.
04. Install over-current prevention device (e.g. the current breaker, etc.) to connect the driver with power.
Failure to follow this instruction may result in fire.
05. Check the control input signal before supplying power to the driver.
Failure to follow this instruction may result in personal injury or product damage by unexpected driver movement.
06. Install a safety device to maintain the vertical position after turn off the power of this driver.
Failure to follow this instruction may result in personal injury or product damage by releasing holding torque of the motor.
07. Use the unit within the rated specifications.
Failure to follow this instruction may result in fire or product damage.
08. Use a dry cloth to clean the unit, and do not use water or organic solvent.
Failure to follow this instruction may result in fire or electric shock.
09. The driver may overheat depending on the environment.
Install the unit at the well-ventilated environment and forced cooling with a cooling fan.
Failure to follow this instruction may result in product damage or degradation by heat.
10. Keep the product away from metal chip, dust, and wire residue which flow into the unit.
Failure to follow this instruction may result in fire or product damage.
11. Use the designated motor only.
Failure to follow this instruction may result in fire or product damage.

Cautions during Use

- Follow instructions in 'Cautions during Use'.
  Otherwise, it may cause unexpected accidents.
- Do not input CW, CCW signal at the same time in 2 pulse input method.
- When the signal input voltage is exceeded the rated voltage, connect additional resistance at the outside.
- In case of unwanted noise generating from peripherals and power, use ferrite core in the wiring.
- The thickness of cable should be same or thicker than the below specifications when connecting the cable for connector.
  - Motor + Encoder connector: AWG 22
  - Power connector: AWG 18
  - I/O connector: AWG 28
  - Brake connector: AWG 22
- Keep the distance between power cable and signal cable over 10 cm.
- Install vertically so that the alarm / status display part is located on top.
- For heat radiation of the driver, install a fan.
- Do not change any setting switches (Function, Resolution, Control Gain, Speed filter/limit, In-Position switches) during the operation.
- Do not input external signal until the driver is initialized (In-Position LED ON) after power is applied.
- Motor vibration and noise may occur in a specific frequency range.
  - Change the motor installation method or attach the damper.
  - Use the unit out of the corresponding frequency range due to changing motor RUN speed.
- Maintain and inspect regularly the following lists.
  - Unwinding bolts and connection parts for the unit installation and load connection
  - Abnormal sound from ball-bearing of the unit
  - Damage and stress of lead cable of the unit
  - Connection error with motor
  - Inconsistency between the axis of motor output and the center, concentric (eccentric, declination) of the load, etc.
- This product does not contain a protection function for a motor unit.
- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000 m
  - Pollution degree 2
  - Installation category II

Cautions during Installation

- Install on the metal plate with high thermal conductivity for heat dissipation of the driver.
- Install in the well-ventilated area and install the cooling fan in the unventilated environment.
- Failure to heat dissipation may result in damage or malfunction due to the stress on the product.
  Check the environment of use within the specifications and install on the well-heat dissipated area
- In case of installing the drivers more than two, keep distance at least 20 mm in horizontal direction and at least 25 mm in vertical direction.



Ordering Information

This is only for reference, the actual product does not support all combinations..
For selecting the specified model, follow the Autonics website.
Select a model that matches the ordering information of the motor and the driver.

AiSA - D - ❶ ❷ A - ❸

❶ Frame size
Number: Frame size (mm)

❷ Axial length
M: Medium
L: Long

❸ Motor type
No mark: Standard type
B: Built-in brake type

Product Components

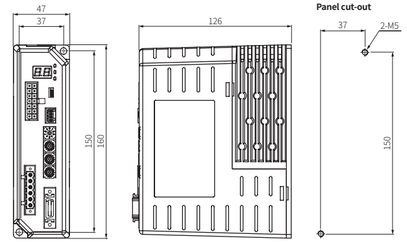
- Product
- Instruction manual
- Power connector
- I/O connector
- Brake connector (AiSA-D-B Series)

Sold Separately

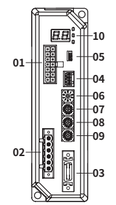
- Motor + Encoder cable: C1D14M-□ (fixed type), C1DF14M-□ (flexible type)
- I/O cable: CO20-MP□-R (specifications: AiS TAG)

Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics website.



Unit Descriptions



01. Motor + Encoder connector
02. Power connector
03. I/O connector
04. Brake connector
05. Function selection DIP switch
06. Resolution setting rotary Switch
07. Control Gain setting rotary switch
08. Speed filter / Speed limit setting rotary switch
09. In-Position setting rotary switch
10. Status display part / indicators

Status Display Part / Indicators

Display part / Indicator	Color	Descriptions
Status display part (7 segment)	Red	Displays the rotating status by rotation direction, speed when normal status Displays the set torque % when torque mode and normal status Displays the corresponding number and the set rotary switch
Power / Alarm indicator (PWR/AL)	Green	Turns ON when the unit operates in normal after power is applied Flashes depending on the warning type
	Red	Flashes depending on the alarm type
In-Position indicator (INP.)	Yellow	Turns ON when motor is placed at command position after positioning input
Servo ON / OFF indicator (SERVO)	Orange	Turns ON when servo is ON, Turns OFF when servo is OFF

Alarm

The status display part displays segment depending on Alarm / Warning type.
Depending on the alarm type, it flashes for 0.4 sec interval and it turns OFF for 0.8 sec repeatedly.

■ Alarm

Display	No. of flashing	Alarm type	Display	No. of flashing	Alarm type
E 1	1	Overcurrent error	E B	8	Overvoltage error
E 2	2	Overspeed error	E 9	9	Undervoltage error
E 3	3	Position tracking error	E A	10	Motor alignment error
E 4	4	Overload error	E b	11	Input pulse error
E 5	5	Overheat error	E C	12	In-Position error
E 6	6	Motor connection error	E d	13	Brake connection error
E 7	7	Encoder connection error	-		

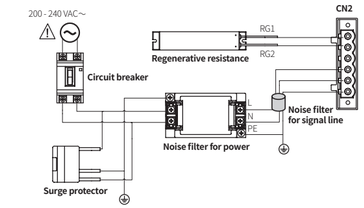
Specifications

Model		AiSA-D-60MA-□	AiSA-D-60LA-□	AiSA-D-86MA-□	AiSA-D-86LA-□
Main	Power supply	200 - 240 VAC~ 50 / 60 Hz			
	Max. RUN power[01]	≤ 800 VA			
	Stop power[02]	≤ 60 VA		≤ 65 VA	≤ 70 VA
AUX[03]	Power supply	24 VDC⎓			
	Input current	0.3 A		0.5 A	
Max. RUN current[04]		2.0 A / Phase			
Stop current		20% to 100% of max. RUN current			
Resolution		500 (factory default), 1000, 1600, 2000, 3200, 3600, 5000, 6400, 7200, 10000 PPR			

01) When changing the load rapidly, instantaneous peak current may increase. The capacity of power supply should be over 1.5 to 2 times of max. RUN power.
02) Based on ambient temp. 25℃, ambient humi. 55%RH, stop current 50%
03) Auxiliary power is only available in built-in brake type and not available in standard type.
04) RUN current varies depending on the input RUN frequency and max. RUN current at the moment varies also.

Run method	2-phase bipolar closed-loop control method
Speed filter	Disable (factory default), 2, 4, 6, 8, 10, 20, 40, 60, 80, 100, 120, 140, 160, 180, 200 ms
Control Gain	Standard Gain: 0 to F, Inertia Gain: 0 to F
Max. rotation speed	3000 rpm
In-Position	Fast Response: 0 (factory default) to 7, Accurate Response: 0 to 7
Rotation direction	CW (factory default), CCW
Operation mode	Standard mode, Torque mode
Input	CW/CCW (RUN pulse), Servo ON/OFF, Alarm Reset (Photocoupler input)
Output	In-Position, Alarm Out (Photocoupler output), Encoder Signal (A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$, Line driver output)
Pulse input method	1 pulse, 2 pulse (factory default)
Pulse input voltage	CW, CCW-[H]: 4 - 8 VDC⎓, [L]: 0 - 0.5 VDC⎓, Servo ON/OFF, Alarm Reset-[H]: 24 VDC⎓, [L]: 0 - 0.5 VDC⎓
Max. input pulse frequency	CW, CCW: 500 kHz
Pulse width	CW, CCW: 0.5 μs Servo ON/OFF: ≥ 1 ms Alarm Reset: ≥ 10 ms
Rise fall time	CW, CCW: ≤ 0.5 μs
Input resistance	4.7 kΩ (Anode Pull-Up)
Insulation resistance	≥ 200 MΩ (500 VDC⎓ megger)
Dielectric strength	1,500 VAC~ 60 Hz for 1 minute
Vibration	1.5 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	300 m/s² (≈ 30 G) in each X, Y, Z direction for 3 times
Ambient temp.	0 to 50℃, storage: -10 to 60℃ (no freezing or condensation)
Ambient humi.	35 to 85%RH, storage: 10 to 90%RH (no freezing or condensation)
Protection rating	IP20 (IEC standard)
Approval	CE ®us EAC
Unit weight (packaged)	≈ 780 g (≈ 1,020 g)

Power Supply Configuration Diagram



■ Noise filter for signal line

Connect to wiring to suppress external noise.
Depending on frequency, filtered noise may different.

Type	Model	Manufacture
Motor line, I/O signal line	28A5776-0A2	Lairdtech
Power line	28A5131-0A2	
Communication line	28A2025-0A2	

■ Noise filter for power

Connect the power to suppress external noise.
The wires should be connected as short as possible and grounded.

Model	Specifications	Manufacture
RNS-2006	Rated voltage: 250 V Rated current: 6 A Max. leakage current: 1 mA	Orient Electronics

■ Regenerative resistance

Connect the pin 1, 2 on the power connector.
Use in condition of the high inertia load or the short deceleration time.
Forced cooling is required in condition of high surface temperature of regenerative resistance.

Model	Specifications	Manufacture
IRC100	Resistance: 100 Ω ±5%, Rated power: 60 W (standby), 100 W (heatsink attached)	Rara Electronics Corp.

■ Surge protector

Protect the product from external noise and surge by connecting power.
Be sure to disconnect the surge protector when testing internal pressure.
It may result in product damage.

Model	Specifications	Manufacture
LT-C12G801W	Nominal discharge current: 2500 A Max. discharge current: 5000 A Voltage protection level: 1.5 kV	OTOWA Electric Co. Ltd

Troubleshooting

Malfunction	Causes	Troubleshooting
When motor does not excite	Servo is not ON.	Check that servo ON/OFF input signal is OFF. In case of ON, servo is OFF and excitation of motor is released.
	Alarm occurs.	Check the alarm type and remove the cause.
When motor rotates to the opposite direction of the designated direction	Rotation direction setting is incorrect.	Check the DIR setting in the function selection DIP switch.
When motor drives unstable	Connection between motor and encoder is unstable.	Check the driver and motor are connected correctly.
	Control Gain value is not correct.	Change the Control Gain rotary switch.

18, Bansong-ro 513Beon-gil, Haeundae-gu, Busan, Republic of Korea, 48002
www.autonics.com | +82-2-2048-1577 | sales@autonics.com

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