

Autonics 2-Phase Closed-Loop Stepper Motor Driver [AC type, Frame size 60/86] AiSA-D SERIES

INSTRUCTION MANUAL

Thank you for choosing our Autonics product.
Please read the following safety considerations before use.

Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.
※⚠ symbol represents caution due to special circumstances in which hazards may occur.

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

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

Warning

- 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.
- 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.
- 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.
- Install the unit after considering counter plan against power failure.**
Failure to follow this instruction may result in personal injury, economic loss or fire.
- Re-supply power after min. 20 sec from disconnected power.**
Failure to follow this instruction may result in product damage or malfunction.
- Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.
- For installing the unit, ground it exclusively and use over AWG 18 (0.75 mm²) ground cable.**
Failure to follow this instruction may result in electric shock.
- Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire or electric shock.
- Insulate the connector not to be exposed.**
Failure to follow this instruction may result in electric shock.
- Install the driver in the housing or ground it directly.**
Failure to follow this instruction may result in personal injury, fire or electric shock.
- 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.
- Do not remove the connector during or after operation for a while.**
Failure to follow this instruction may result in electric shock or product damage.
- Emergency stop directly when error occurs.**
Failure to follow this instruction may result in personal injury or fire.

Caution

- When connecting the power input, use AWG 18 (0.75 mm²) cable or over.**
- Brake is non-polar. When connecting the brake, use AWG 22 (0.3 mm²) cable or over.**
Failure to follow this instruction may result in fire or malfunction due to contact failure.
- Install overcurrent prevention device (e.g. the current breaker, etc) to connect the driver with power.**
Failure to follow this instruction may result in fire.
- 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.
- 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.
- Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
- 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.
- The driver may overheat depending on the environment.**
- Install the unit in the well ventilated place and forced cooling with a cooling fan.**
Failure to follow this instruction may result in product damage or degradation by heat.
- Keep metal chip, dust and wire residue from flowing into the unit.**
Failure to follow this instruction may result in fire or product damage.
- Use the designated motor only.**
Failure to follow this instruction may result in fire or product damage.

Product Components

Before use the product, check all components are contained. The components are contained each one.

- Motor driver
- Instruction manual
- Power connector
- I/O connector
- Brake connector^{※1}

※1: The brake connector is only included in built-in brake model.

Unit Descriptions

- Alarm/Status display part (orange)**
Displays the corresponding number, when alarm occurs, displays the rotary switch setting number and displays the torque value in torque mode
- Power/Alarm indicator (PWR/ALM) (green/red)**
- In-Position indicator (INP) (orange)**
Turns ON when motor is placed at command position after positioning input.
Turns OFF when torque mode is ON.
- Servo On/Off indicator (SERVO) (blue)**
Turns ON when servo is operating, turns OFF when servo is not operating
- Function selection DIP switch**

Function	ON	OFF (factory default)
1 DIR	Rotation direction selection	CCW
2 1P/2P	Pulse input method setting	1-pulse input
3 GS H/L	Motor GAIN setting	Inertia GAIN
4 TM	Torque mode setting	Torque mode
		Standard mode
- Resolution rotary switch (RES)**
[0 to 9]: 500 (factory default), 1000, 1600, 2000, 3200, 3600, 5000, 6400, 7200, 10000
- Motor gain setting rotary switch (GAIN)**
Depending on motor gain setting dip switch, the gain application in the rotary switch setting range (0 to F) is different.
[OFF] Standard GAIN 0 (factory default) to 15
[ON] Inertia GAIN 0 to 15
- Speed filter / Limit setting rotary switch (S.F)**
Depending on setting mode, the setting range is [0 to F].
Speed filter (standard mode) - disable (factory default), 2, 4, 6, 8, 10, 20, 40, 60, 80, 100, 120, 140, 160, 180, 200
Speed limit (torque mode) - 10, 20, 30, 40, 50, 60, 70, 80, 90, 120, 150, 200, 250, 300, 380, 500
- In-Position setting rotary switch (INP)**
[0 to 7] Fast Response: 0 (factory default) to 7
[8 to F] Accurate Response: 0 to 7

※The above specifications, dimensions, etc. are subject to change and some models may be discontinued without notice.
※Be sure to follow cautions written in the instruction manual, user manual and the technical descriptions (catalog, website).

Specifications

Model ^{※1}	AiSA-D-60MA(-B)	AiSA-D-60LA(-B)	AiSA-D-86MA(-B)	AiSA-D-86LA(-B)
Main power	Power supply STOP ^{※2}	200-240 VAC ~ 50/60 Hz		
	Max. during operation		Max. 65 W	Max. 70 W
	Max. Run current ^{※3}	Max. 160 W	Max. 220 W	Max. 250 W
Auxiliary power ^{※4}	Power supply	24 VDC =		
	Input current	0.3 A	0.5 A	
STOP current	20 to 100 % of max. RUN current			
Rotation speed	0 to 3000 rpm			
Resolution ^{※5}	500 (factory default), 1000, 1600, 2000, 3200, 3600, 5000, 6400, 7200, 10000 PPR			
Applied motor	AiA-M-60MA(-B)	AiA-M-60LA(-B)	AiA-M-86MA(-B)	AiA-M-86LA(-B)
Speed filter ^{※5}	0 (disable) (factory default), 2, 4, 6, 8, 10, 20, 40, 60, 80, 100, 120, 140, 160, 180, 200 ms			
Motor GAIN ^{※5}	Standard GAIN: 0 (factory default) to F, Inertia GAIN: 0 to F			
In-Position ^{※5}	Fast Response: 0 (factory default) to 7, Accurate Response: 0 to 7			
Pulse input method ^{※5}	1-pulse or 2-pulse (factory default)			
Motor rotation direction ^{※5}	CW (factory default), CCW			
Status indicator	Alarm/Status display part: orange LED 7 seg.		Power/Alarm indicator: green/red LED	
	In-Position indicator: orange LED		Servo On/Off indicator: blue LED	
I/O	Input	CW, CCW (Run pulse), Servo On/Off, Alarm reset (photocoupler input)		
	Output	• Photocoupler: In-Position, Alarm out • Line driver: encoder signal (phase A, Ā, B, B̄, Z, Z̄)		
Operation mode	Standard, Speed, Torque mode			
Input pulse specifications	Pulse width	CW, CCW: input pulse frequency duty 50 %, Servo On/Off: min. 1 ms, alarm reset: min. 10 ms		
	Rising/Falling time	CW, CCW: max. 0.5 μs		
	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 freq. ^{※5}	CW, CCW: 500 kHz		
Alarm	Overcurrent, overspeed, position tracking, overload, overheat, motor connection, encoder connection, overvoltage, undervoltage, motor misalignment, command pulse, in-position, brake			
Input resistance	4.7 kΩ (Anode Pull-up)			
Insulation resistance	Over 200 MΩ (at 500 VDC = megger)			
Dielectric strength	1,500 VAC ~ 60 Hz for 1 min			
Vibration	1.5 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours			
Shock	300 m/s ² (approx. 30 G) in each X, Y, Z direction for 3 times			
Environment	Ambient temp.	0 to 50 °C, storage: -10 to 60 °C		
	Ambient humi.	35 to 85 %RH, storage: 10 to 90 %RH		
Protection structure	IP20 (IEC standard)			
Sold separately	• I/O cable: CO20-MP□-R ^{※7} (standard: AiS TAG) • Motor+encoder cable - normal: C1D14M-□ ^{※8} / moving: C1DF14M-□ ^{※8}			
Approval	CE			
Weight ^{※9}	• Standard type: Approx. 920 g (approx. 800 g)			
	• Built-in brake type: Approx. 1,020 g (approx. 780 g)			

- ※1: The model name indicates driver type. (none: standard type, B: built-in brake type)
E.g.) AiSA-D-60MA-B: built-in brake type stepping motor driver.
- ※2: Based on the ambient temperature 25 °C, ambient humidity 55 %RH, and STOP current 20 %.
- ※3: RUN current varies depending on the input RUN frequency and max. RUN current at the moment varies also.
- ※4: Auxiliary power is only available in built-in brake type. Corresponding specification is not available in standard type.
- ※5: Settings are available with the switches located on the front. When setting, the power must not be applied and cannot be set after power is applied.
- ※6: Max. input pulse frequency is max. frequency to be input and is not the same as max. pull-out frequency or max. slewing frequency.
- ※7: □ of model name indicates cable length (010, 020, 030, 050, 070, 100, 150, 200)
E.g.) CO20-MP070-R: 7 m I/O cable.
For corresponding EMC standard, cable length should be below 2 m.
- ※8: □ of model name indicates cable length (1, 2, 3, 5, 7, 10, 15, 20)
E.g.) C1DF14M-10: 10 m moving type motor+encoder cable.
- ※9: The weight includes packaging. The weight in parentheses is for unit only.
※Environment resistance is rated at no freezing or condensation.

10. Motor+Encoder connector (CN1)

Pin	Function	Pin	Function
1	GND	8	+5 VDC =
2	Encoder A	9	Encoder Ā
3	Encoder B	10	Encoder B̄
4	Encoder Z	11	Encoder Z̄
5	PE	12	N-C
6	Motor A	13	Motor B
7	Motor Ā	14	Motor B̄

11. Power connector (CN2)

Pin	Function
1	Regenerative resistance
2	
3	N-C
4	AC power input
5	
6	PE

13. Brake connector (CN4)

Pin	Function
1	24VDC =
2	GND
3	Brake+
4	Brake-

※ Corresponding connector is for built-in brake type only.

[Connector specifications]

Type	Recommended specifications	Manufacture
CN1 Motor+Encoder	5557-14R (connector terminal: 5556T)	Molex
CN2 Power	5ESDM-06P-OR	Dinkle
CN3 I/O connector	10120-3000PE (Housing: 10320-S2FO-008)	3M
CN4 Brake connector	ESC250V-S2330704P	Dinkle

Configuration Diagram & Cautions for Wiring

※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.
① CN1 (motor+encoder connector): AWG 22 ② CN2 (power connector): AWG 18
③ CN3 (I/O connector): AWG 28 ④ CN4 (brake connector): AWG 28

When connecting wires, please purchase separately.

• **Noise filter for signal line**
Connect to wiring to suppress external noise.
Depending on frequency, filtered noise may different.

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

When connecting power, please purchase separately.

• **Regenerative resistance**
Connect Pin no. 1, 2 on power connector (CN2).
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	Specification	Manufacture
IRC100	• Resistance: 100 Ω ± 5 %, • Rated power: 60 W (standby), • 100 W (heatsink attached)	Rara Electronics Corp.

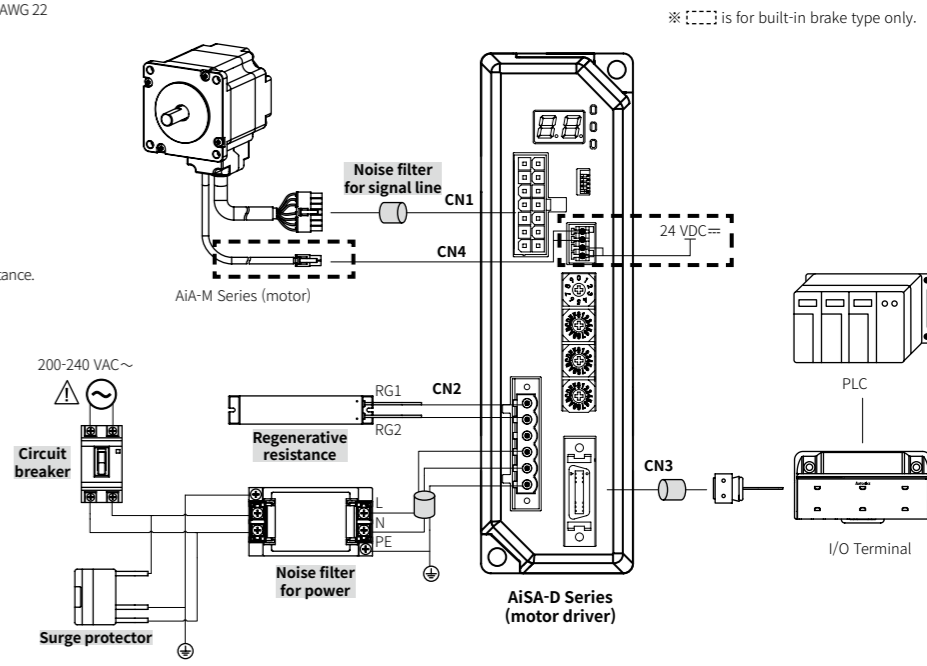
• **Noise filter for power**
Connect the power to suppress external noise.
The wires should be connected as short as possible and grounded.

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

• **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.

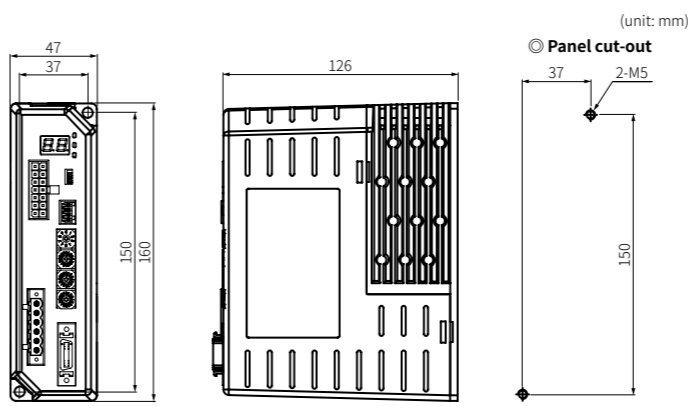
Model	Specification	Manufacture
LT-C12G801W	• Nominal discharge current: 2500 A • Max. discharge current: 5000 A • Voltage protection level: 1.5 kV	OTOWA Electric Co. Ltd

Circuit breaker



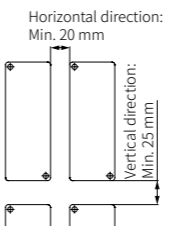
※ [] is for built-in brake type only.

Dimensions



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 rated 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 the horizontal direction and at least 25mm in the vertical direction.



Alarm Display

Depending on the alarm type, it displays as a segment on the Alarm/Status display part.
Depending on the alarm type, it flashes for 0.4 sec interval and it turns OFF for 0.8 sec repeatedly.

Alarm/Status	ALM (flashing)	Alarm type	Alarm/Status	ALM (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 misalignment
E 4	4	Overload error	E b	11	Command pulse error
E 5	5	Overheat error	E C	12	In-Position error
E 6	6	Motor connection error	E d	13	Brake error ^{※1}
E 7	7	Encoder connection error	—	—	—

※1: Corresponding alarm is built-in brake type only.

Manual

For the detail information and instructions, please refer to user manual, and be sure to follow cautions written in the technical descriptions (catalog, website).
Visit our website (www.autonics.com) to download user manual.

Troubleshooting

Malfunction	Causes	Troubleshooting
When motor does not excite	Servo is not On. Alarm occurs.	Check that servo On/Off input signal is Off. In case of On, servo is Off and excitation of motor is released. Check the alarm type and remove the cause of alarm.
When motor rotates to the opposite direction of the designated direction	Rotation direction setting is not correct.	Check the DIR setting in the function selection DIP switch.
When motor drive is unstable	Connection between motor and encoder is unstable. Motor gain value is not correct.	Check the Motor+Encoder connection cable. Check motor gain setting rotary switch (GAIN) value.

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.
- To extend the motor+encoder cable, use the designated cable.
- Keep the distance between power cable and signal cable more than 10 cm.
- Install the unit vertically on the alarm/status display part upper side.
- For heat radiation of the driver, install a fan.
- Do not change any setting switches (function, resolution, motor gain, speed filter/limit, in-position switches) during the operation.
Failure to follow this instruction may result in malfunction.
- Do not input external signal until the driver is initialized (In-Position LED ON) after power is applied.
- Motor vibration and noise can occur in specific frequency period
 - Change motor installation method or attach the damper.
 - Use and set the motor gain value.
- For using motor, it is recommended to maintenance and inspection regularly.
 - Unwinding bolts and connection parts for the unit installation and load connection
 - Strange 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 prepare protection function for a motor.
- 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