Oriental motor

HM-40071-4

OPERATING MANUAL

αSTEP

AR Series AC power supply input driver

Thank you for purchasing an Oriental Motor product.
This Operating Manual describes product handling procedures and safety precautions.
- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

Introduction

■ Before use

Only qualified personnel should work with the product.
Use the product correctly after thoroughly reading the "Safety precautions".
The product described in this manual has been designed and manufactured for use in general industrial machinery, and must not be used for any other purpose. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

■ Operating Manuals for the AR Series

Operating manuals for the **AR** series are listed below.

- **AR** Series Motor OPERATING MANUAL

This manual explains the motor functions and how to install the motor, among others.

- **AR** Series AC power supply input driver OPERATING MANUAL (this document)

This manual explains the driver functions and how to install the driver, among others.

- **AR** Series AC power supply input driver USER MANUAL (CD-ROM)

Explains the function, installation, connection and troubleshooting of the motor and driver.

■ Checking the product

Verify that the items listed below are included. Report any missing or damaged items to the branch or sales office from which you purchased the product. The unit models and corresponding motor/driver combinations are listed on p.2.

- Driver ..... 1 unit
- CN1 connector (6 pins)..... 1 pc.
- CN3 connector (5 pins)..... 1 pc.
- CN5 connector (36 pins)..... 1 pc.
- Connector wiring lever (for CN3) ..... 1 pc.
- **AR** Series AC power supply input driver OPERATING MANUAL (this document)..... 1 copy
- CD-ROM..... 1 pc.

■ Standard and CE Marking

This product is recognized by UL and certified by CSA.
A certification by TÜV Rheinland has been obtained to confirm compliance with the EN standards.

- Applicable Standards

Applicable Standards	Certification Body	Standard File No.
UL 508C CSA C22.2 No.14	UL	E171462
EN 50178	Conforming to the respective standards.	
EN 61800-5-1	TÜV	R 50124204

- For UL standard (UL 508C), the product is recognized for the condition of Maximum Surrounding Air Temperature 50 °C (122 °F).
- Connect a Class 2 power supply (UL-certified) to the 24 VDC power supply.

- Installation conditions (EN Standard)

Driver is to be used as a component within other equipment.
Overvoltage category: II
Pollution degree: 2
Protection against electric shock: Class I

- For Low Voltage Directive

- The product is a type with machinery incorporated, so it should be installed within an enclosure.
- This product cannot be used with cables normally used for IT equipment.
- Install the product within the enclosure in order to avoid contact with hands.
- Be sure to maintain a protective ground in case hands should make contact with the product. Securely ground the protective earth terminals of the motor and driver.
- To protect against electric shock using an earth leakage breaker (RCD), connect a type B earth leakage breaker to the primary side of the driver.
- When using a circuit breaker (MCCB), use a unit conforming to the EN or IEC standard.
- Isolate the motor cable, power-supply cable and other drive cables from the signal cables (CN1, CN4, CN5) by means of double insulation.
- The temperature of the driver's heat sink may exceed 90°C (194 °F) depending on the driving conditions. Accordingly, take heed of the following items:
  · Do not touch the driver.
  · Do not use the driver near flammable objects.
  · Always conduct a trial operation to check the driver temperature.

- EMC Directive

EMC of this product has been measured according to the configuration illustrated in "Example of installation and wiring" on USER MANUAL. The compliance of the final machinery with the EMC Directive will depend on such factors as the configuration, wiring, layout and risk involved in the control-system equipment and electrical parts. It therefore must be verified through EMC measures by the customer of the machinery.

Applicable standards

EMI

Emission Tests	EN 61000-6-4, EN 61800-3 C3
Radiated Emission Test	EN 55011 group 1 class A
Conducted Emission Test	EN 55011 group 1 class A
Harmonics Current Test	EN 61000-3-2
Voltage Fluctuations Test	EN 61000-3-3

EMS

Immunity Tests	EN 61000-6-2 EN 61800-3 C3
Radiation Field Immunity Test	IEC 61000-4-3
Electrostatic Discharge Immunity Test	IEC 61000-4-2
Fast Transient / Burst Immunity Test	IEC 61000-4-4
Conductive Noise Immunity Test	IEC 61000-4-6
Surge Immunity Test	IEC 61000-4-5
Voltage Dip Immunity Test	IEC 61000-4-11
Voltage Interruption Immunity Test	IEC 61000-4-11

■ WARNING FOR UL MARKING ON DRIVER

These drivers have not been evaluated for motor overload protection. The motor overload protection alarm of the driver should be considered in the end use product.

■ Hazardous substances

RoHS (Directive 2002/95/EC 27Jan.2003) compliant

■ Combinations of motors and drivers

- □ indicates **A** (single shaft), **B** (double shaft) or **M** (with electromagnetic brake). In **AR911**, □ indicates **A** (single shaft) or **B** (double shaft). In geared type, □ indicates **A** (single shaft) or **M** (with electromagnetic brake).
- ■ in the unit model represents a number indicating the gear ratio.
- ○ indicates the cable length.

• Standard type

Unit model	Motor model	Driver model
AR46□A-○	ARM46□C	ARD-A
AR66□A-○	ARM66□C	
AR69□A-○	ARM69□C	
AR98□A-○	ARM98□C	
AR911□A-○	ARM911□C	
AR46□C-○	ARM46□C	ARD-C
AR66□C-○	ARM66□C	
AR69□C-○	ARM69□C	
AR98□C-○	ARM98□C	
AR911□C-○	ARM911□C	
AR46□S-○	ARM46□C	ARD-S
AR66□S-○	ARM66□C	
AR69□S-○	ARM69□C	
AR98□S-○	ARM98□C	
AR911□S-○	ARM911□C	

• TH geared type

Unit model	Motor model	Driver model
AR46□A-T■-○	ARM46□C-T■	ARD-A
AR66□A-T■-○	ARM66□C-T■	
AR98□A-T■-○	ARM98□C-T■	
AR46□C-T■-○	ARM46□C-T■	ARD-C
AR66□C-T■-○	ARM66□C-T■	
AR98□C-T■-○	ARM98□C-T■	
AR46□S-T■-○	ARM46□C-T■	ARD-S
AR66□S-T■-○	ARM66□C-T■	
AR98□S-T■-○	ARM98□C-T■	

• PL geared type

Unit model	Motor model	Driver model
AR46□A-P■-○	ARM46□C-P■	ARD-A
AR66□A-P■-○	ARM66□C-P■	
AR98□A-P■-○	ARM98□C-P■	
AR46□C-P■-○	ARM46□C-P■	ARD-C
AR66□C-P■-○	ARM66□C-P■	
AR98□C-P■-○	ARM98□C-P■	
AR46□S-P■-○	ARM46□C-P■	ARD-S
AR66□S-P■-○	ARM66□C-P■	
AR98□S-P■-○	ARM98□C-P■	

• PS geared type

Unit model	Motor model	Driver model
AR46□A-PS■-○	ARM46□C-PS■	ARD-A
AR66□A-PS■-○	ARM66□C-PS■	
AR98□A-PS■-○	ARM98□C-PS■	
AR46□C-PS■-○	ARM46□C-PS■	ARD-C
AR66□C-PS■-○	ARM66□C-PS■	
AR98□C-PS■-○	ARM98□C-PS■	
AR46□S-PS■-○	ARM46□C-PS■	ARD-S
AR66□S-PS■-○	ARM66□C-PS■	
AR98□S-PS■-○	ARM98□C-PS■	

• PN geared type

Unit model	Motor model	Driver model
AR46□A-N■-○	ARM46□C-N■	ARD-A
AR66□A-N■-○	ARM66□C-N■	
AR98□A-N■-○	ARM98□C-N■	
AR46□C-N■-○	ARM46□C-N■	ARD-C
AR66□C-N■-○	ARM66□C-N■	
AR98□C-N■-○	ARM98□C-N■	
AR46□S-N■-○	ARM46□C-N■	ARD-S
AR66□S-N■-○	ARM66□C-N■	
AR98□S-N■-○	ARM98□C-N■	

• Harmonic geared type

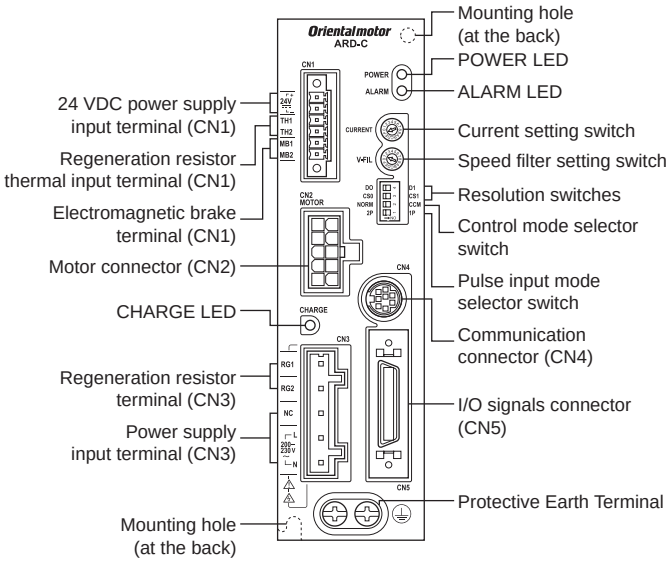
Unit model	Motor model	Driver model
AR46□A-H■-○	ARM46□C-H■	ARD-A
AR66□A-H■-○	ARM66□C-H■	
AR98□A-H■-○	ARM98□C-H■	
AR46□C-H■-○	ARM46□C-H■	ARD-C
AR66□C-H■-○	ARM66□C-H■	
AR98□C-H■-○	ARM98□C-H■	
AR46□S-H■-○	ARM46□C-H■	ARD-S
AR66□S-H■-○	ARM66□C-H■	
AR98□S-H■-○	ARM98□C-H■	

■ Input/output power ratings

- □ indicates **A** (single shaft), **B** (double shaft) or **M** (with electromagnetic brake). In **AR911**, □ indicates **A** (single shaft) or **B** (double shaft). In geared type, □ indicates **A** (single shaft) or **M** (with electromagnetic brake).
- ● in the unit model represents a number indicating the gear type and gear ratio for geared type.
- ○ indicates the cable length.

Unit model	Motor model	Driver model	Input			Output current
			Voltage	Frequency	Current	
AR46□A●-○	ARM46□C●	ARD-A	Single-phase 100-115 V	50/60 Hz	2.9 A	0.49 A
AR66□A●-○	ARM66□C●				4.4 A	0.74 A
AR69□A-○	ARM69□C				6.1 A	0.92 A
AR98□A●-○	ARM98□C●				5.5 A	1.13 A
AR911□A-○	ARM911□C				6.5 A	1.27 A
AR46□C●-○	ARM46□C●	ARD-C	Single-phase 200-230 V		1.9 A	0.49 A
AR66□C●-○	ARM66□C●				2.7 A	0.74 A
AR69□C-○	ARM69□C				3.8 A	0.92 A
AR98□C●-○	ARM98□C●				3.4 A	1.13 A
AR911□C-○	ARM911□C				4.1 A	1.27 A
AR46□S●-○	ARM46□C●	ARD-S	Three-phase 200-230 V		1.0 A	0.49 A
AR66□S●-○	ARM66□C●				1.4 A	0.74 A
AR69□S-○	ARM69□C				2.0 A	0.92 A
AR98□S●-○	ARM98□C●				1.8 A	1.13 A
AR911□S-○	ARM911□C				2.2 A	1.27 A

■ Names and functions of parts



Name	Description
POWER LED (green)	This LED is lit while the main power or 24 VDC power is input.
ALARM LED (red)	This LED will blink when an alarm generates. It is possible to check the generated alarm by counting the number of times the LED blinks.
Current setting switch (CURRENT)	This switch adjusts the operating current. A desired current can be set as a percentage (%) of the rated output current. The factory setting is “F.”
Speed filter setting switch (V-FIL)	This switch adjusts the motor response. Adjust the switch if you want to suppress motor vibration or cause the motor to start/stop smoothly. The factory setting is “1.”
Resolution switches (D0/D1, CS0/CS1)	These two switches are used to toggle the resolution per revolution of the motor output shaft. The factory settings are “D0” and “CS0” (1000 P/R).
Control mode selector switch (NORM/CCM)	This switch toggles the driver between the normal mode and current control mode. The factory setting is “NORM.”
Pulse input mode selector switch (2P/1P)	This switch is used to toggle between the 1-pulse input mode and 2-pulse input mode according to the pulse output mode of the controller. The factory setting of the pulse-input mode depends on the destination country.
Communication connector (CN4)	Connect a PC in which the **MEXE02** has been installed, or the **OPX-2A**.
I/O signals connector (CN5)	Connect the I/O signals of the controller.
Protective Earth Terminal	Ground this terminal using a grounding wire larger than AWG16 (1.25 mm^2).
24 VDC power supply input terminal (CN1) [24V]	Connect 24 VDC. Once a 24 VDC power supply is connected, you can check the contents of alarms that have generated even when the main power is cut off. If a motor with electromagnetic brake is used, be sure to connect a 24 VDC power supply as the electromagnetic brake power.
Regeneration resistor thermal input terminal (CN1) [TH1, TH2]	Connect the optional regeneration unit **RGB100** (sold separately). If no regeneration unit is connected, plug in the CN1 connector to short the TH1 and TH2 terminals.
Electromagnetic brake terminal (CN1) [MB1, MB2]	Connect the lead wires from the electromagnetic brake (24 VDC). MB1: Electromagnetic brake − (black) MB2: Electromagnetic brake + (white)
Motor connector (CN2)	Connect the motor.
CHARGE LED (red)	This LED is lit while the main power is input. After the main power has been turned off, the LED will turn off once the residual voltage in the driver drops to a safe level.
Regeneration resistor terminal (CN3) [RG1, RG2]	Connect the regeneration unit **RGB100**.
Power supply input terminal (CN3)	• Single-phase 100-115 V, single-phase 200-230 V L, N: Connect a single-phase 100-115 VAC or 200-230 VAC. • Three-phase 200-230 V L1, L2, L3: Connect a three-phase 200-230 VAC. • NC: Not used.
Mounting holes (2 locations at the back)	These mounting holes are used to affix the driver with screws.

Safety precautions

The precautions described below are intended to prevent danger or injury to the user and other personnel through safe, correct use of the product. Use the product only after carefully reading and fully understanding these instructions.

⚠Warning

Handling the product without observing the instructions that accompany a “Warning” symbol may result in serious injury or death.

General

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. Doing so may result in fire, electric shock or injury.
- Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Failure to do so may result in fire, electric shock or injury.
- Do not transport, install the product, perform connections or inspections when the power is on. Always turn the power off before carrying out these operations. Failure to do so may result in electric shock.
- The terminals on the driver’s front panel marked with ⚠ ⚠ symbol indicate the presence of high voltage. Do not touch these terminals while the power is on to avoid the risk of fire or electric shock.
- When the driver generates an alarm (any of the driver’s protective functions is triggered), the motor will stop and lose its holding torque. Accordingly, provide measures to hold the moving part in place in the event of an alarm. Failure to do so may result in injury or equipment damage.
- When the driver’s protection function is triggered, first remove the cause and then clear the protection function. Continuing the operation without removing the cause of the problem may cause malfunction of the motor and driver, leading to injury or damage to equipment.

Installation

- The driver is a Class I equipment. When installing the driver, do not touch the driver without grounding the driver first. Failure to do so may cause electric shock.
- Install the driver in the enclosure in order to prevent electric shock or injury.

Connection

- Keep the driver’s input-power voltage within the specified range to avoid fire and electric shock.
- Connect the cables securely according to the wiring diagram in order to prevent fire and electric shock.
- Do not forcibly bend, pull or pinch the cable. Doing so may fire and electric shock.

Operation
- Turn off the driver power in the event of a power failure, or the motor may suddenly start when the power is restored and may cause injury or damage to equipment.
- Do not turn the FREE input to ON while the motor is operating. The motor will stop and lose its holding ability, which may result in injury or damage to equipment.

Maintenance and inspection
- Do not touch the connection terminals on the driver while the power is supplied or for at least 10 minutes after turning off the power. Before making wiring connections or carrying out checks, also wait for the CHARGE LED to turn off and check the voltage with a tester, etc. Failure to do so may result in electric shock.

Repair, disassembly and modification
- Do not disassemble or modify the driver. This may cause electric shock or injury. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.

⚠Caution

Handling the product without observing the instructions that accompany a "Caution" symbol may result in injury or property damage.

General
- Do not use the driver beyond its specifications, or electric shock, injury or damage to equipment may result.
- Keep your fingers and objects out of the openings in the driver, or fire, electric shock or injury may result.
- Do not touch the driver during operation or immediately after stopping. The surface is hot and may cause a skin burn(s).

Installation
- To prevent the risk of damage to equipment, leave nothing around the driver that would obstruct ventilation.

Connection
- The communication connector (CN4) and analog I/O connector (CN5) are not electrically insulated. When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and these equipments to short, damaging both.

Operation
- Use a motor and driver only in the specified combination. An incorrect combination may cause a fire.
- Provide an emergency-stop device or emergency-stop circuit external to the equipment so that the entire equipment will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury.
- Before supplying power to the driver, turn all input signals to the driver to OFF. Otherwise, the motor may start suddenly and cause injury or damage to equipment.
- When moving the motor output shaft by hand while the motor is at standstill, confirm first that the FREE input of the driver is turned ON. If the FREE input is not ON, an attempt to move the motor output shaft by hand may result in injury.
- Use a 24 VDC power supply that has been given reinforced insulation between the primary side and secondary side. Failure to do so may cause electric shock.
- Immediately when trouble has occurred, stop running and turn off the driver power. Failure to do so may result in fire, electric shock or injury.
- To prevent electric shock, use only an insulated screwdriver to adjust the driver's switches.

Maintenance and inspection
- To prevent the risk of electric shock, do not touch the terminals while measuring the insulation resistance or conducting a voltage-resistance test.

Disposal
- To dispose of the driver, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste.

Precautions for use

This section covers limitations and requirements the user should consider when using the product.

- Conduct the insulation resistance measurement or withstand voltage test separately on the motor and the driver.

Conducting the insulation resistance measurement or withstand voltage test with the motor and driver connected may result in injury or damage to equipment.

- Motor excitation at power ON

Simply turning on the power will not excite the motor. To excite the motor, always turn the C-ON input ON. It is possible to set the motor to be excited automatically after the power has been turned on, by changing the applicable driver parameter using the **OPX-2A** or **MEXE02**.

- Preventing leakage current

Stray capacitance exists between the driver's current-carrying line and other current-carrying lines, the earth and the motor, respectively. A high-frequency current may leak out through such capacitance, having a detrimental effect on the surrounding equipment. The actual leakage current depends on the driver's switching frequency, the length of wiring between the driver and motor, and so on.
When providing a leakage current breaker, use the following products, for instance, which have high-frequency signal protection:
Mitsubishi Electric Corporation: NV series
Fuji Electric FA Components & Systems Co., Ltd.: EG and SG series

- Preventing electrical noise

See USER MANUAL for measures with regard to noise.

- Saving data to the NV memory

Do not turn off the main power supply or 24 VDC power supply while data is being written to the NV memory and 5 seconds after the completion of data write. Doing so may abort the data write and cause an EEPROM error alarm to generate. The NV memory can be rewritten approx. 100,000 times.

- Use the optional regeneration unit **RGB100** (sold separately) if gravitational operation or other operation involving up/down movement, or sudden starting/stopping of a large inertial load, will be repeated frequently.

An overvoltage protection alarm may be detected depending on the driving condition of the motor. If an overvoltage protection alarm is detected, adjust the driving condition or use the optional regeneration unit **RGB100** (sold separately).

Installation

■ Location for installation

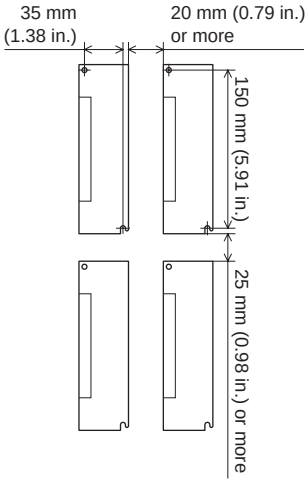
The driver is designed and manufactured for installation in equipment. Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature 0 to +50 °C (+32 to +122 °F) (non-freezing)
- Operating ambient humidity 85% or less (non-condensing)
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area not subject to splashing water (rain, water droplets), oil (oil droplets) or other liquids
- Area free of excessive salt
- Area not subject to continuous vibration or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)
- Area free of radioactive materials, magnetic fields or vacuum
- Up to 1000 m (3300 ft.) above sea level

■ Installation method

The driver is designed so that heat is dissipated via air convection and conduction through the enclosure. Install the driver on a flat metal plate [material: aluminium, 200×200×2 mm (7.87×7.87×0.08 in.) equivalent] having excellent heat conductivity.

When two or more drivers are to be installed side by side, provide 20 mm (0.79 in.) and 25 mm (0.98 in.) clearances in the horizontal and vertical directions, respectively. When installing the driver in an enclosure, use two screws (M4, not supplied) to affix the driver through the mounting holes.

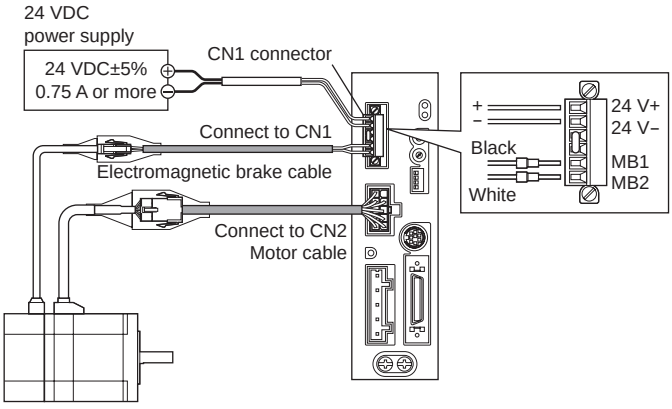


Note

- Install the driver in an enclosure whose pollution degree is 2 or better environment, or whose degree of protection is IP54 minimum.
- Do not install any equipment that generates a large amount of heat or noise near the driver.
- Do not install the driver underneath the controller or other equipment vulnerable to heat.
- Check ventilation if the ambient temperature of the driver exceeds 50 °C (122 °F).
- Be sure to install (position) the driver vertically.

Connection

■ Connecting the electromagnetic brake motor

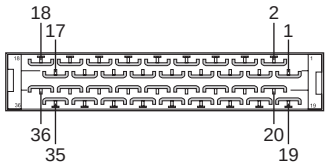


Note

- Have the connector plugged in securely. Insecure connector connection may cause malfunction or damage to the motor or driver.
- When plugging/unplugging the connector, turn off the power and wait for the CHARGE LED to turn off. The residual voltage may cause electric shock.
- When installing the motor to a moving part, use a flexible cable offering excellent flexibility. See USER MANUAL for details.

■ Connecting the I/O signals

Solder the I/O signal cable (AWG28 to 26: 0.08 to 0.14 mm^2) to the CN5 connector (36 pins) while checking the pin numbers in "Connector function table" provided below. Use a shielded cable for I/O signals.



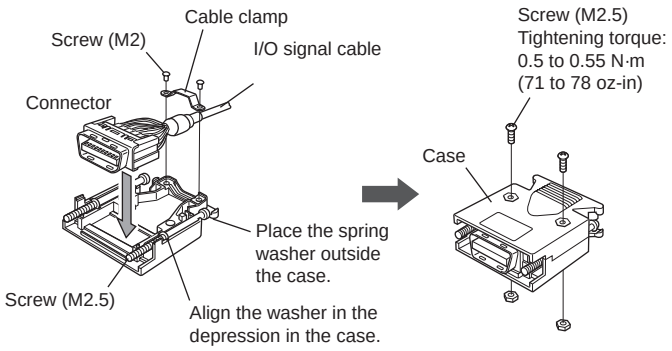
Connector pin assignment
(viewed from soldering side)

- **Connector function table**

Pin No	Operating mode		Name	
	Positioning operation	Push-motion operation*	Positioning operation	Push-motion operation*
1	−		−	
2	GND		Ground connection	
3	ASG+		A-phase pulse output (line driver)	
4	ASG−			
5	BSG+		B-phase pulse output (line driver)	
6	BSG−			
7	TIM1+		Timing output (line driver)	
8	TIM1−			
9	ALM+		Alarm output	
10	ALM−			
11	WNG+		Warning output	
12	WNG−			
13	END+		Positioning complete output	
14	END−			
15	READY+/AL0+*		Operation ready complete output/ Alarm code output 0	
16	READY−/AL0−*			
17	TLC+/AL1+*		Torque limit output/ Alarm code output 1	
18	TLC−/AL1−*			
19	TIM2+/AL2+*		Timing output (open collector)/ Alarm code output 2	
20	TIM2−/AL2−*			
21	GND		Ground connection	
22	IN-COM		Input common	
23	C-ON		Current on input	
24	CLR/ALM-RST		Deviation clear input/ Alarm reset input	
25	CCM		Current control mode ON input	
26	CS	T-MODE*	Resolution selection input	Push-motion operation ON
27	−	M0*	−	Push-current setting selection input
28	RETURN	M1*	Return to electrical home operation	
29	P-RESET	M2*	Position reset input	
30	FREE		Excitation OFF, electromagnetic brake release	
31	CW+/PLS+		CW pulse input/Pulse input (+5 V or line driver)	
32	CW−/PLS−			
33	CW+24 V/PLS+24 V		CW pulse input/Pulse input (+24 V)	
34	CCW+24 V/DIR+24 V		CCW pulse input/Direction input (+24 V)	
35	CCW+/DIR+		CCW pulse input/Direction input (+5 V or line driver)	
36	CCW−/ DIR−			

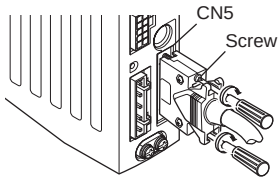
* The signal will become effective if the applicable setting has been changed using the **OPX-2A** or **MEXE02**.

- **Assembling the connector**



- **Connecting the connector**

Tightening torque:
0.3 to 0.35 N·m (42 to 49 oz-in)



■ Connecting the power supply

Use the CN3 connector (5 pins) to connect the power supply cable (AWG16 to 14: 1.25 to 2.0 mm^2) to the main power supply connector (CN3) on the driver.

- Single-phase 100-115 V

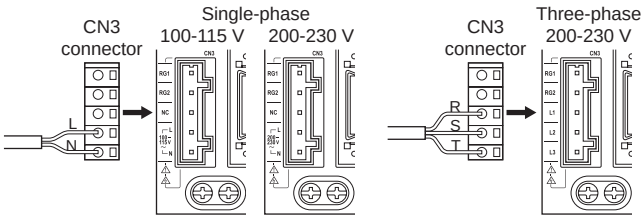
Unit model	Current capacity
AR46	2.9 A or more
AR66	4.4 A or more
AR69	6.1 A or more
AR98	5.5 A or more
AR911	6.5 A or more

- Single-phase 200-230 V

Unit model	Current capacity
AR46	1.9 A or more
AR66	2.7 A or more
AR69	3.8 A or more
AR98	3.4 A or more
AR911	4.1 A or more

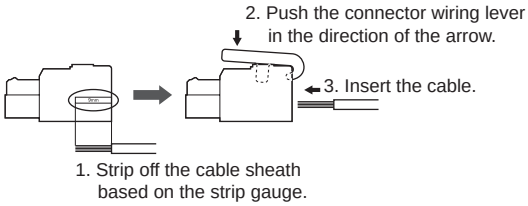
- Three-phase 200-230 V

Unit model	Current capacity
AR46	1.0 A or more
AR66	1.4 A or more
AR69	2.0 A or more
AR98	1.8 A or more
AR911	2.2 A or more



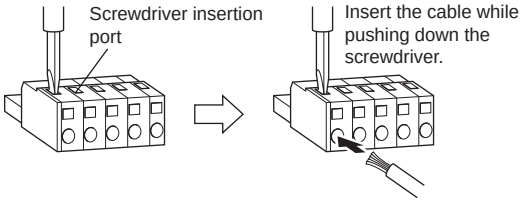
Note
- Do not wire the power supply cable of the driver in the same cable duct with other power line or motor cable. Doing so may cause malfunction due to noise.
- When cycle the power or plugging/unplugging the connector, turn off the power and wait for the CHARGE LED to turn off. The residual voltage may cause electric shock.

- **How to connect the power supply cable**



- You can also connect the power supply cable using a flat-tip screwdriver.

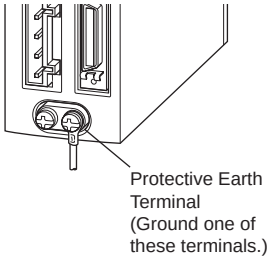
Insert a flat-tip screwdriver with a tip of 3.0 to 3.5 mm (0.12 to 0.14 in.) in width into the insertion port and push. In this condition, insert the cable.



■ Grounding the driver

Be sure to ground the protective earth terminal (screw size: M4) of the driver.
Tightening torque: 1.2 N·m (170 oz-in)

You can ground either of the two protective earth terminals. The terminal that is not grounded is used as a service terminal. Use the service terminal according to your specific need, such as connecting it to the motor in order to ground the motor.



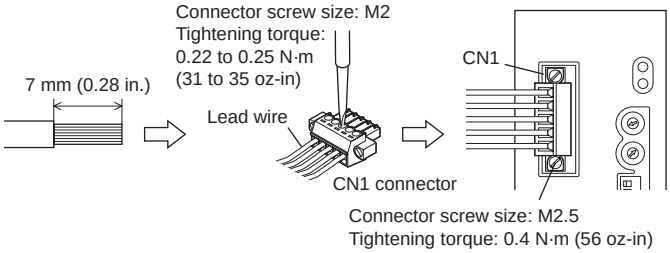
Use a grounding wire of a size equivalent to or larger than the power-supply cable (AWG16 to 14: 1.25 to 2.0 mm^2), and do not share the protective earth terminal with a welder or any other power equipment.
When grounding the protective earth terminal, use a round terminal and affix the grounding point near the driver.

■ Connecting the 24 VDC power supply input, regeneration resistor/unit and electromagnetic brake

Use the CN1 connector (6 pins) to connect the 24 VDC power supply input, regeneration resistor thermal input and electromagnetic brake. Connect the lead wire (AWG28 to 16: 0.08 to 1.25 mm^2) to the connector while checking the pin numbers in below.

Display	Description
24V+	24 VDC power supply input (Be sure to connect this pin when an electromagnetic brake is used.)
24V−	
TH1	Regeneration resistor thermal input
TH2	(If this pin is not used, short it using a jumper wire.)
MB1	Electromagnetic brake − (Connect the black lead wire of the electromagnetic brake.)
MB2	Electromagnetic brake + (Connect the white lead wire of the electromagnetic brake.)

- **Connecting method**



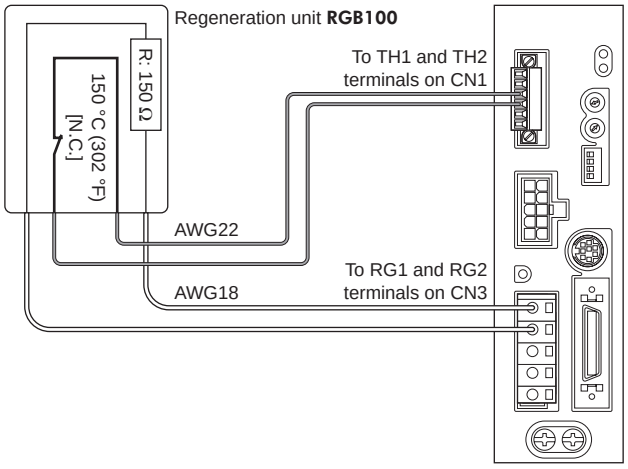
- **Connecting the 24 VDC power supply input**

Connect a power supply of 24±5% VDC, 0.75 A or more.
Once a 24 VDC power supply is connected, you can check the contents of alarms that have generated even when the main power is cut off. If a motor with electromagnetic brake is used, be sure to connect a 24 VDC power supply as the electromagnetic brake power.
The 24 VDC power supply will not be used to drive the motor. Connect a 24 VDC power supply as necessary.

Note If the distance between the motor and driver is extended to 20 m (65.6 ft.) or longer, use a power supply of 24 VDC±4%.

- **Connecting the regeneration unit**

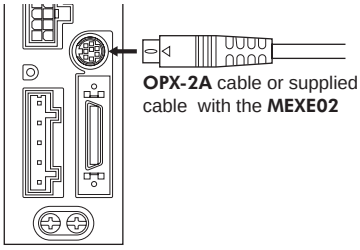
Use the optional regeneration unit **RGB100** (sold separately) if gravitational operation or other operation involving up/down movement, or sudden starting/stopping of a large inertia load, will be repeated frequently.



Note
- Before connecting the regeneration unit, be sure to remove the jumper wire from the CN1 connector.
- If the current consumption of the regeneration unit exceeds the allowable level, the thermostat will be triggered and a regeneration unit overheat alarm will generate. If a regeneration unit overheat alarm generates, turn off the power and check the content of the error.

■ Connecting the communication cable

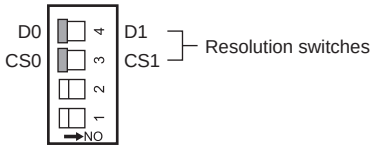
Connect the **OPX-2A** cable or supplied cable with the **MEXE02** to the communication connector (CN4) on the driver.



⚠Caution The communication connector (CN4) and analog I/O connector (CN5) are not electrically insulated. When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and these equipments to short, damaging both.

Setting

■ Resolution

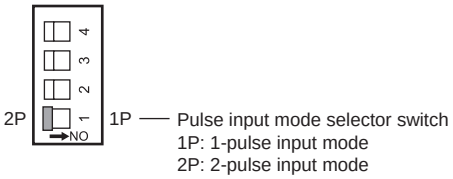


Resolution switches	D0	D1
CS0	1000 P/R (0.36°/pulse)*	500 P/R (0.72°/pulse)
CS1	10000 P/R (0.036°/pulse)	5000 P/R (0.072°/pulse)

* Factory setting

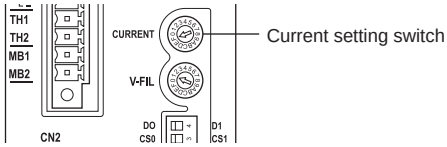
Note
- The new settings of the resolution switches will become effective after the power is cycled. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.
- When changing the resolution using the CS input, use the switches in “CS0”/“D0” or “CS0”/“D1” combination. If the CS input is turned ON when “CS1” is selected, the resolution will not be changed.

■ Pulse input mode



Note The new setting of the pulse input mode selector switch will become effective after the power is cycled. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.

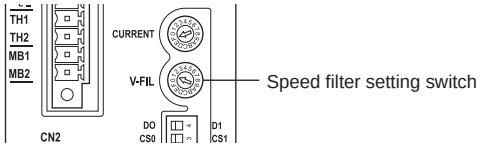
■ Operating current



Dial setting	Operating current rate (%)	Dial setting	Operating current rate (%)
0	6.3	8	56.3
1	12.5	9	62.5
2	18.8	A	68.8
3	25.0	B	75.0
4	31.3	C	81.3
5	37.5	D	87.5
6	43.8	E	93.8
7	50.0	F	100 (factory setting)

Note If the operating current is too low, starting of the motor and its position hold function may be affected. Do not lower the operating current more than necessary.

■ Speed filter



Dial setting	Speed filter time constant (ms)	Dial setting	Speed filter time constant (ms)
0	0	8	30
1	1 (factory setting)	9	50
2	2	A	70
3	3	B	100
4	5	C	120
5	7	D	150
6	10	E	170
7	20	F	200

General specifications

Operation environment	Degree of protection	IP20
	Ambient temperature	0 to +50 °C (+32 to +122 °F) (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 1000 m (3300 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil
Storage environment	Ambient temperature	−20 to +60 °C (−4 to +140 °F) (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 3000 m (10000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil
Shipping environment	Ambient temperature	−20 to +60 °C (−4 to +140 °F) (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 3000 m (10000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil

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