



Stepping Motor and Driver Package *αSTEP* AZ Series/ Motorized actuator equipped the AZ Series AC power input *FLEX* Built-in controller type

OPERATING MANUAL Driver



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Thank you for purchasing an Oriental Motor product.
This 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.

1 Introduction

■ Before use

Only qualified personnel should work with the product.

Use the product correctly after thoroughly reading the "2 Safety precautions" on p.4.

The product described in this manual has been designed and manufactured to be incorporated in general industrial equipment.

Do not use 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 AZ Series

Operating manuals for the **AZ** Series FLEX Built-in controller type are listed below.

The "OPERATING MANUAL Function Edition" does not come with the product. For details, contact your nearest Oriental Motor sales office or download from Oriental Motor website download page.

After reading these manuals, keep them in a convenient place so that you can reference them at any time.

Applicable product	Type of operating manual	Description of operating manual
AZ Series AC power input FLEX Built-in controller type	OPERATING MANUAL Motor (Supplied with motor)	This manual explains the functions as well as the installation method and others for the motor.
	OPERATING MANUAL Driver (Supplied with driver)	This manual explains the functions as well as the installation/ connection method and others for the driver.
	OPERATING MANUAL Function Edition	This manual explains the details of functions and data setting methods as well as the operating method and others for the driver.
Data setting software MEXE02	OPERATING MANUAL	This manual explains how to set data using the accessory data setting software MEXE02 .
Network converter	CC-Link compatible NETC01-CC USER MANUAL	This manual explains the functions and installation/connection method as well as the operating method for the network converter.
	MECHATROLINK-II compatible NETC01-M2 USER MANUAL	
	MECHATROLINK-III compatible NETC01-M3 USER MANUAL	
	EtherCAT compatible NETC01-ECT USER MANUAL	

With regard to the information required to be certified under the UL Standard, refer to the "APPENDIX UL Standards for **AZ** Series AC power input type" (the paper is supplied with the product).

■ Hazardous substances

The products do not contain the substances exceeding the restriction values of RoHS Directive (2011/65/EU).

■ General specifications

Degree of protection		IP10
Operation environment	Ambient temperature	0 to +55 °C (+32 to +131 °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 Shipping environment	Ambient temperature	-25 to +70 °C (-13 to +158 °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

* When installing a driver on a heat sink. [material: aluminum, 200×200×2 mm (7.87×7.87×0.08 in.) equivalent]

Insulation resistance	100 MΩ or more when 500 VDC megger is applied between the following places: <ul style="list-style-type: none"> • PE terminal - Power supply terminals • Encoder connector - Power supply terminals • Signal I/O terminals - Power supply terminals
Dielectric strength	Sufficient to withstand the following for 1 minute: <ul style="list-style-type: none"> • PE terminal - Power supply terminals 1.5 kVAC 50/60 Hz • Encoder connector - Power supply terminals 1.8 kVAC 50/60 Hz • Signal I/O terminals - Power supply terminals 1.8 kVAC 50/60 Hz

■ About terms and units

Terms and units to be used vary depending on a motor or motorized actuator. This manual explains by using the terms of the motor. When the motorized actuator is used, read this manual by replacing the terms.

	Motor	Motorized actuator
Term	Torque	Thrust force
	Moment of inertia	Mass
	Rotation	Movement
	CW direction	Forward direction
	CCW direction	Reverse direction
	Rotation speed	Speed
	Resolution	Minimum travel amount
Unit	N·m	N
	kHz/s	m/s ²

2 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.

Description of signs

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

Description of graphic symbols

	Indicates "prohibited" actions that must not be performed.		Indicates "compulsory" actions that must be performed.
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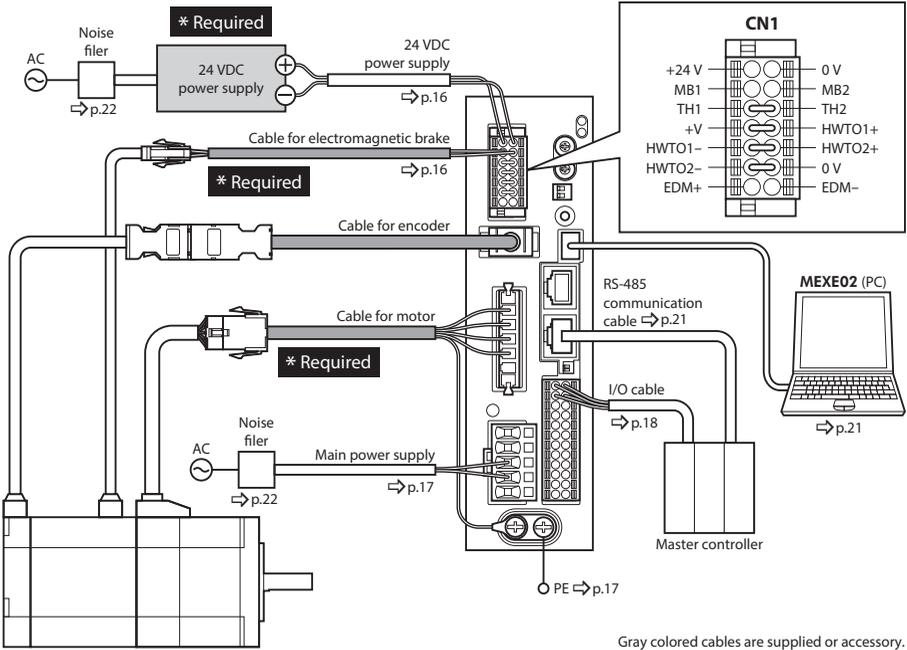
 Warning	
	<ul style="list-style-type: none"> Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. This may cause fire, electric shock or injury. Do not transport, install the product, perform connections or inspections when the power is on. This may cause electric shock. Do not touch the driver while the power is on. This may cause fire or 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. This may cause fire or electric shock. Do not forcibly bend, pull or pinch the cable. This may cause fire or electric shock. Do not turn the FREE input to ON while the motor is operating. This may cause injury or damage to equipment. Do not touch the connection terminals on the driver immediately (within 10 minute) after the power is turned off. This may cause electric shock. Do not disassemble or modify the product. This may cause injury or damage to equipment.
	<ul style="list-style-type: none"> 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, injury or damage to equipment. If this product is used in a vertical application, be sure to provide a measure for the position retention of moving parts. Failure to do so may result in injury or damage to equipment. When the driver generates an alarm (any of the driver's protective functions is triggered), first remove the cause and then clear the protective 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. Install the product in an enclosure. Failure to do so may result in electric shock or injury. Keep the driver's input-power voltage within the specified range. Failure to do so may result in fire or electric shock. Since this product is Class I Equipment, install it so that people cannot have contact with it, or ground it if people may have contact with it. Failure to do so may result in electric shock. Connect the cables securely according to the wiring diagram. Failure to do so may result in fire or electric shock. Turn off the driver power in the event of a power failure. Failure to do so may result in injury or damage to equipment.

 **Caution**

	<ul style="list-style-type: none"> • Do not use the product beyond its specifications. This may cause electric shock, injury or damage to equipment. • Keep your fingers and objects out of the openings in the product. Failure to do so may result in fire, electric shock or injury. • Do not touch the product during operation or immediately after stopping. This may cause a skin burn(s). • Keep the area around the product free of combustible materials. Failure to do so may result in fire or a skin burn(s). • Leave nothing around the product that would obstruct ventilation. Failure to do so may result in damage to equipment. • Do not forcibly bend or pull the cable that was connected to the driver. Doing so may cause damage. • Do not touch the terminals while conducting the insulation resistance test or dielectric strength test. This may cause electric shock.
	<ul style="list-style-type: none"> • Use a motor and driver only in the specified combination. Failure to do so may result in fire. • Take measures against static electricity when operating the switches of the driver. Failure to do so may result in the driver malfunction or damage to equipment. • For the control power supply, use a DC power supply with reinforced insulation on its primary and secondary sides. Failure to do so may result in electric shock. • Before supplying power to the driver, turn all input signals to the driver to OFF. Failure to do so may result in injury or damage to equipment. • 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 moving the motor directly with the hands, confirm that the FREE input turns ON. Failure to do so may result in injury. • When an abnormal condition has occurred, immediately stop operation and turn off the driver power. Failure to do so may result in fire, electric shock or injury. • To dispose of the product, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste.

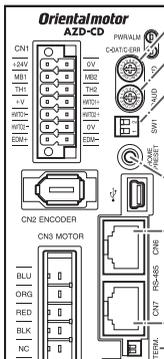
3 Setup guide

Wiring guide



Gray colored cables are supplied or accessory.

Setting of switches



- Address number setting switch (ID) * ⇨ p.26
- Transmission rate setting switch (BAUD) * ⇨ p.27
- Function setting switch (SW1) *
No.1 : set the address number ⇨ p.26 (slave address)
No.2 : Set the protocol ⇨ p.27

HOME-PRESET switch ⇨ p.28
The home position can be set easily by pressing and holding the switch.

Connecting to a touch screen makes a PC unnecessary!
Data editing, monitor, or checking alarm records can be performed
(Preparation or setting are additionally required)

Termination resistor setting switch (TERM.) * ⇨ p.27

Factory setting of switches

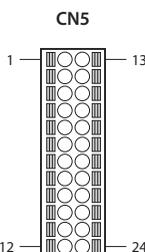
Address number	0 (ID: 0, SW1-No.1 : OFF)
Transmission rate	Network converter (BAUD : 7)
Protocol	Connecting with network converter (SW1-No.2 : OFF)
Termination resistor	Termination resistor disabled (TERM. : OFF)

* These are switches for communication.
When controlling via Modbus communication or industrial network, it is required to change the setting.

CN5 pin assignment (⇒ p.18)

Pin No.	Signal name	Description *
1	IN0	Control input 0 (START)
2	IN2	Control input 2 (M1)
3	IN4	Control input 4 (ZHOME)
4	IN6	Control input 6 (STOP)
5	IN-COM [0-7]	IN0 to IN7 input common
6	IN8	Control input 8 (FW-JOG)
7	OUT0	Control output 0 (HOME-END)
8	OUT2	Control output 2 (PLS-RDY)
9	OUT4	Control output 4 (MOVE)
10	OUT-COM	Output common
11	ASG+	A-phase pulse output+
12	BSG+	B-phase pulse output+

* (): Initial value



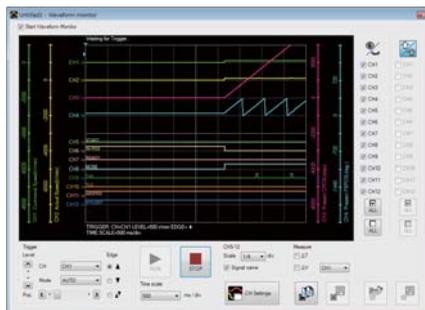
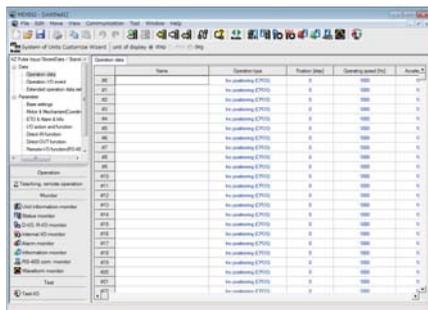
Pin No.	Signal name	Description *
13	IN1	Control input 1 (M0)
14	IN3	Control input 3 (M2)
15	IN5	Control input 5 (FREE)
16	IN7	Control input 7 (ALM-RST)
17	IN-COM [8-9]	IN8, IN9 input common
18	IN9	Control input 9 (RV-JOG)
19	OUT1	Control output 1 (IN-POS)
20	OUT3	Control output 3 (READY)
21	OUT5	Control output 5 (ALM-B)
22	GND	Ground
23	ASG-	A-phase pulse output-
24	BSG-	B-phase pulse output-

* (): Initial value

Provide the data setting software MEXE02 and USB cable (commercially available)

The MEXE02 is used for teaching function and others in addition to setting of data and parameters. Monitor function is also enhanced. Use it to check when designing or developing equipment.

- Operation data edit window
- Waveform monitor window



4 Precautions for use

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

- **Always use the cable (supplied or accessory) to connect the motor and driver.**

Be sure to use the cable (supplied or accessory) to connect the motor and driver. In the following condition, an appropriate accessory cable must be purchased separately.

- If a flexible cable is to be used.
- If a cable of 3 m (9.8 ft.) or longer is to be used.
- If a motor and driver package without a cable was purchased.

- **Conduct the insulation resistance measurement or dielectric strength test separately on the motor and the driver.**

Conducting the insulation resistance measurement or dielectric strength test with the motor and driver connected may result in damage to the equipment.

- **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 connecting an earth leakage breaker, use one of the following products offering resistance against high frequency current:

Mitsubishi Electric Corporation: NV series

Fuji Electric FA Components & Systems Co., Ltd.: EG and SG series

- **Saving data to the non-volatile memory**

Do not turn off the control power supply while writing the data to the non-volatile memory, and also do not turn off for 5 seconds after the completion of writing the data. Doing so may abort writing the data and cause an EEPROM error alarm to generate. The non-volatile memory can be rewritten approximately 100,000 times.

- **If vertical drive (gravitational operation) such as elevator applications is performed or if sudden start-stop operation of a large inertial load is repeated frequently, connect an accessory regeneration unit.**

The overvoltage alarm may generate depending on the operating condition of the motor.

When the overvoltage alarm has generated, review the operating conditions or connect an accessory regeneration unit. Refer to p.50 for connection method.

- **Note on connecting a power supply whose positive terminal is grounded**

The USB communication connector, CN5 connector and CN6/CN7 connectors are not 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 this equipment to short, damaging both. When connecting, do not ground equipment.

5 Regulations and standards

5-1 EU Directive

■ CE Marking

This product is affixed the CE Marking under the Low Voltage Directive and EMC Directive.

● Low Voltage Directive

Applicable Standards

Motor: EN 60034-1, EN 60034-5, EN 60664-1

Driver: EN 61800-5-1

Installation condition (EN Standards)

Motor	Driver
To be incorporated in equipment. Overvoltage category: II Pollution degree: 3 Degree of protection: IP66 Protection against electric shock: Class I	To be incorporated in equipment. Overvoltage category: II Pollution degree: 2 Degree of protection: IP10 Protection against electric shock: Class I

- This product cannot be used with cables normally used for IT power distribution systems.
- Install the product within the enclosure in order to avoid contact with hands.
- When a product can be touched with hands, be sure to ground. When installing the motor and driver, securely connect their Protective Earth Terminals.
- 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, CN5 to CN7) 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

This product is conducted EMC measurements in accordance with "Example of motor and driver installation and wiring" on p.23. The conformance of your mechanical equipment to the EMC Directive will vary depending on such factors as the control system equipment used with this product, configuration of electrical parts, wiring and layout. It therefore must be verified through conducting EMC measures in a state that all parts including this product have been installed in the equipment.

Applicable Standards

EMI	EN 55011 Group1 Class A
	EN 61000-6-4
	EN 61800-3
	EN 61000-3-2
	EN 61000-3-3
EMS	EN 61000-6-2
	EN 61800-3

This type of PDS is not intended to be used on a low-voltage public network which supplies domestic premises; radio frequency interference is expected if used on such a network.

6 Preparation

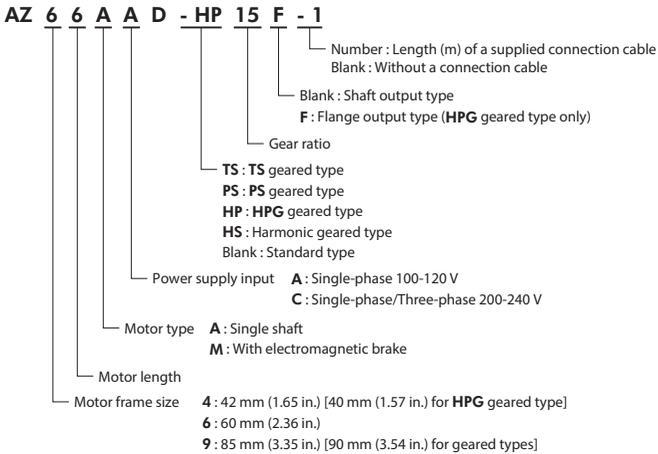
This chapter explains the items you should check, as well as the name and function of each part.

6-1 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.

- Driver.....1 unit
- CN1 connector (14 pins).....1 pc.
- CN4 connector (5 pins).....1 pc.
- CN5 connector (24 pins).....1 pc.
- Connector wiring lever.....1 pc. (for CN4 connector)
- OPERATING MANUAL Driver.....1 copy (this document)

6-2 How to identify the product model



6-3 Combinations of motors and drivers

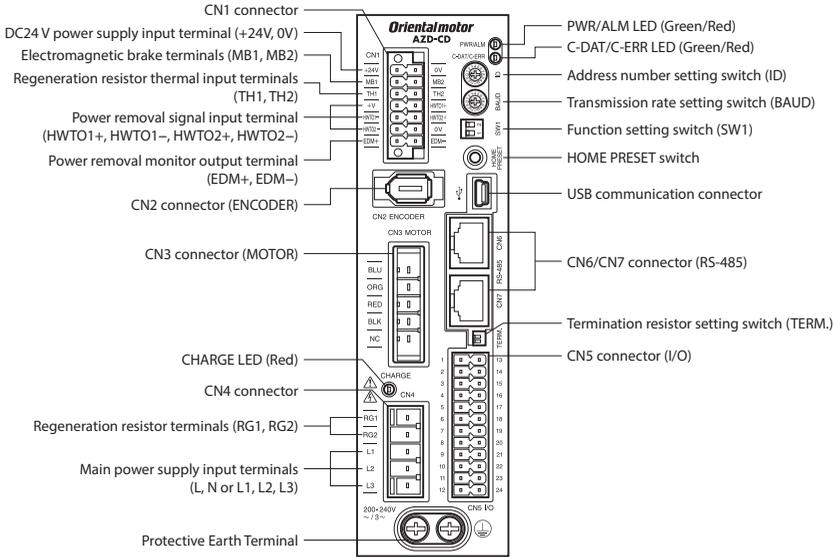
Verify the model number of the purchased product against the number shown on the package label.

Check the model number of the motor and driver against the number shown on the nameplate.

- indicates **A** (single-phase 100-120 V) or **C** (single-phase/three-phase 200-240 V).
- in the model names indicates a number representing the gear ratio.
- When a connection cable is included, ○ in the model names indicates a number (-1, -2, -3) representing the cable length.

Type	Model	Motor model	Driver model
Standard type	AZ46A□D○	AZM46AC	AZD-□□
	AZ66A□D○	AZM66AC	
	AZ69A□D○	AZM69AC	
	AZ98A□D○	AZM98AC	
	AZ911A□D○	AZM911AC	
	AZ46M□D○	AZM46MC	
	AZ66M□D○	AZM66MC	
	AZ69M□D○	AZM69MC	
AZ98M□D○	AZM98MC		
TS geared type	AZ46A□D-TS■○	AZM46AC-TS■	AZD-□□
	AZ66A□D-TS■○	AZM66AC-TS■	
	AZ98A□D-TS■○	AZM98AC-TS■	
	AZ46M□D-TS■○	AZM46MC-TS■	
	AZ66M□D-TS■○	AZM66MC-TS■	
AZ98M□D-TS■○	AZM98MC-TS■		
PS geared type	AZ46A□D-PS■○	AZM46AC-PS■	AZD-□□
	AZ66A□D-PS■○	AZM66AC-PS■	
	AZ98A□D-PS■○	AZM98AC-PS■	
	AZ46M□D-PS■○	AZM46MC-PS■	
	AZ66M□D-PS■○	AZM66MC-PS■	
	AZ98M□D-PS■○	AZM98MC-PS■	
HPG geared type	AZ46A□D-HP■○	AZM46AC-HP■	AZD-□□
	AZ46A□D-HP■F○	AZM46AC-HP■F	
	AZ66A□D-HP■○	AZM66AC-HP■	
	AZ66A□D-HP■F○	AZM66AC-HP■F	
	AZ98A□D-HP■○	AZM98AC-HP■	
	AZ98A□D-HP■F○	AZM98AC-HP■F	
	AZ46M□D-HP■○	AZM46MC-HP■	
	AZ46M□D-HP■F○	AZM46MC-HP■F	
	AZ66M□D-HP■○	AZM66MC-HP■	
	AZ66M□D-HP■F○	AZM66MC-HP■F	
	AZ98M□D-HP■○	AZM98MC-HP■	
AZ98M□D-HP■F○	AZM98MC-HP■F		
Harmonic geared type	AZ46A□D-HS■○	AZM46AC-HS■	AZD-□□
	AZ66A□D-HS■○	AZM66AC-HS■	
	AZ98A□D-HS■○	AZM98AC-HS■	
	AZ46M□D-HS■○	AZM46MC-HS■	
	AZ66M□D-HS■○	AZM66MC-HS■	
	AZ98M□D-HS■○	AZM98MC-HS■	

6-4 Names and functions of parts



Type	Name	Display	Description
LED	PWR/ALM LED (Green/Red)	PWR/ALM	<ul style="list-style-type: none"> This LED is lit in green while the 24 VDC power is input. If an alarm (protective function) generates, the LED will blink in red. If the ETO function (p.39) is triggered, the LED will blink in green.
	C-DAT/C-ERR LED (Green/Red)	C-DAT/C-ERR	<ul style="list-style-type: none"> This LED will blink or illuminate in green when the driver is communicating with the master station properly via RS-485 communication. This LED will illuminate in red when a RS-485 communication error occurs with the master station.
	CHARGE LED (Red)	CHARGE	This LED is lit while the main power is input. After the main power was turned off, the LED will turn off once the residual voltage in the driver drops to a safe level.
Switch	Address number setting switch	ID	Use this switch when controlling the system via RS-485 communication. Use this switch and SW1-No.1 of the function setting switch, to set the address number of RS-485 communication. Factory setting: 0
	Transmission rate setting switch	BAUD	Use this switch when controlling the system via RS-485 communication. Set the transmission rate of RS-485 communication. Factory setting: 7
	Function setting switch	SW1	Use this switch when controlling the system via RS-485 communication. <ul style="list-style-type: none"> No.1: Using this switch and the address number setting switch (ID), set the address number of RS-485 communication. Factory setting: OFF No.2: Set the protocol of RS-485 communication. Factory setting: OFF
	Termination resistor setting switch	TERM.	Use this switch when controlling the system via RS-485 communication. Set the termination resistor (120 Ω) of RS-485 communication. Factory setting: OFF (both No.1 and No.2)
	HOME PRESET switch	HOME PRESET	This switch is used to set the starting position (home position) when performing positioning operation.

Type	Name	Display	Description
Connector, Terminal	USB communication connector	–	Connects a PC in which the MEXE02 has been installed. (USB2.0 mini-B port)
	CN5 connector	I/O	Connects the I/O signals.
	24 VDC power supply input terminals (CN1)	+24V, 0V	Connects the control power supply of the driver. +24V: +24 VDC power supply input 0V: Power supply ground
	Electromagnetic brake terminals (CN1)	MB1, MB2	Connects the lead wires from the electromagnetic brake. MB1: Electromagnetic brake – (Black) MB2: Electromagnetic brake + (White)
	Regeneration resistor thermal input terminals (CN1)	TH1, TH2	Connects the signal line of the accessory regeneration unit. Refer to p.50 for the connection method. If no regeneration unit is connected, short the TH1 and TH2 terminals.
	Power removal signal input terminal (CN1)	HWT01+, HWT01– HWT02+, HWT02–	Connects the switch or programmable controller.
	Power removal monitor output terminal (CN1)	EDM+, EDM–	Connects the programmable controller.
	Encoder connector (CN2)	ENCODER	Connects the ABZO sensor.
	Motor connector (CN3)	MOTOR	Connects the motor.
	CN6/CN7 connector (RS-485)	RS-485	Connects the RS-485 communication cable.
	Regeneration resistor terminals (CN4)	RG1, RG2	Connects the accessory regeneration unit. Refer to p.50 for the connection method.
	Main power supply input terminals (CN4)	L, N, NC L1, L2, L3	Connects the main power supply.
Protective Earth Terminal		Used for grounding via a grounding cable of AWG16 to 14 (1.25 to 2.0 mm ²).	

7 Installation

This chapter explains the installation location and installation method of the driver.

7-1 Location for installation

The driver has been designed and manufactured to be incorporated 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 +55 °C (+32 to +131 °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
- 1000 m (3300 ft.) or lower above sea level

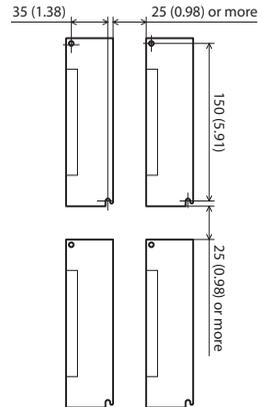
7-2 Installation method

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 equivalent (7.87×7.87×0.08 in.)] having excellent heat conductivity. There must be a clearance of at least 25 mm (0.98 in.) in the horizontal and vertical directions, between the driver and enclosure or other equipment within the enclosure.

When installing the driver in an enclosure, use two screws (M4, not supplied) to secure the driver through the mounting holes.



- 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.
- If the ambient temperature of the driver exceeds 55 °C (131 °F), improve the ventilation condition.
- Be sure to install the driver vertically (vertical position).



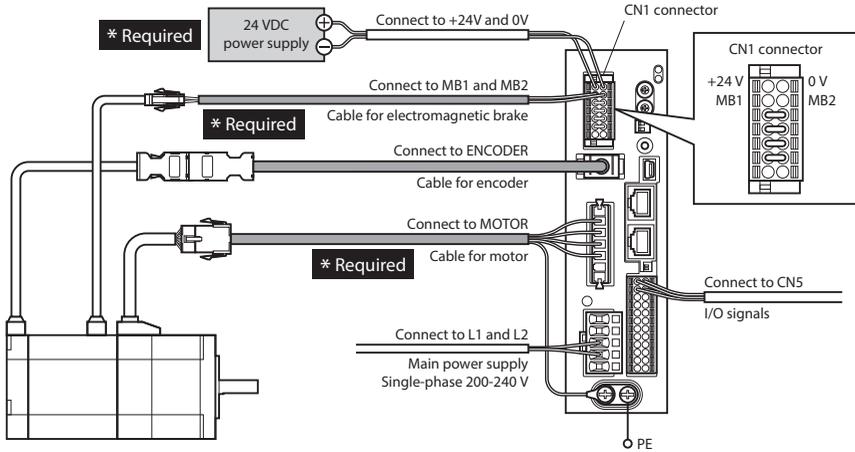
Unit: [mm (in.)]

8 Connection

This chapter explains how to connect the motor, power supply and I/O signals to the driver, as well as grounding method.

8-1 Connection method

The following figure shows models for the electromagnetic brake type and single-phase 200 to 240 VAC input.



Gray colored cables are supplied or accessory.

Note

- Have the connector plugged in securely. Insecure connections 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 before doing so. The residual voltage may cause electric shock.
- Do not wire the power supply cable of the driver in the same cable duct with other power lines or motor cables. Doing so may cause malfunction due to noise.
- The lead wires of the "cable for electromagnetic brake" have polarities, so connect them in the correct polarities. If the lead wires are connected with their polarities reversed, the electromagnetic brake will not operate properly.
- Keep 20 m (65.6 ft.) or less for the wiring distance between the motor and driver. To extend more than 20 m (65.6 ft.) may result in the driver heat generation or increase of the electrical noise emitted from the product.

memo

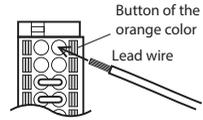
- The 24 VDC power supply is required with or without an electromagnetic brake. Be sure to connect it.
- When unplugging the motor cable, do so while pressing the latches on the connector.
- When installing the motor to a moving part, use an accessory flexible cable offering excellent flexibility.

8-2 Connecting to CN1

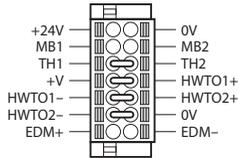
■ Wiring the CN1 connector

- Applicable lead wire: AWG24 to 16 (0.2 to 1.25 mm²)
- Length of the insulation cover which can be peeled: 10 mm (0.39 in.)

1. Strip the insulation cover of the lead wire.
2. Insert the lead wire while pushing the button of the orange color with a slotted screwdriver.
3. After having inserted, release the button to secure the lead wire.



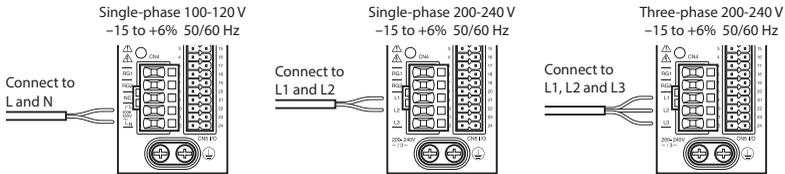
■ Pin assignment list



Display	Description
+24V, 0V	<p>Connects the control power supply.</p> <ul style="list-style-type: none"> • When the electromagnetic brake is not used: 24 VDC±5% 0.25 A • When the electromagnetic brake is used: 24 VDC±5% 0.5 A (0.33 A for AZ46) • When the electromagnetic brake is used and the distance between the motor and driver is 20 m (65.6 ft.): 24 VDC±4% 0.5 A (0.33 A for AZ46)
MB1, MB2	<p>Connects the lead wires from the electromagnetic brake.</p> <p>MB1: Electromagnetic brake - (Black) MB2: Electromagnetic brake + (White)</p>
TH1, TH2	<p>Connects the signal line of the accessory regeneration unit. Refer to p.50 for the connection method. If the regeneration unit is not used, connect a jumper wire between the terminals as shown in the figure.</p>
HWT01+, HWT01- HWT02+, HWT02-	<p>Connects the switch or programmable controller. If the power removal function is not used, connect a jumper wire between the terminals as shown in the figure.</p>
EDM+, EDM-	<p>Connects the programmable controller.</p>
+V, 0V	<p>For internal connections. Do not connect anything. If the power removal function is not used, connect a jumper wire between the terminals as shown in the figure.</p>

8-3 Connecting the power supply

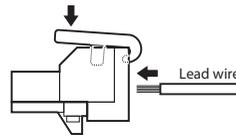
The connecting method varies depending on the power supply specification.



■ Wiring the CN4 connector

- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm²)
- Length of the insulation cover which can be peeled: 9 mm (0.35 in.)

1. Insert the connector lever.
2. Insert the lead wire while pushing down the connector lever.



■ Power supply current capacity

● Single-phase 100-120 V

Model	Power supply current capacity
AZ46	2.7 A or more
AZ66	3.8 A or more
AZ69	5.4 A or more
AZ98	5.5 A or more
AZ911	6.4 A or more

● Single-phase 200-240 V

Model	Power supply current capacity
AZ46	1.7 A or more
AZ66	2.3 A or more
AZ69	3.3 A or more
AZ98	3.3 A or more
AZ911	3.9 A or more

● Three-phase 200-240 V

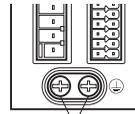
Model	Power supply current capacity
AZ46	1.0 A or more
AZ66	1.4 A or more
AZ69	2.0 A or more
AZ98	2.0 A or more
AZ911	2.3 A or more

8-4 Grounding

Two Protective Earth Terminals (screw size: M4) are provided on the driver. Be sure to ground one of the Protective Earth Terminals. You can ground either of the two Protective Earth Terminals. Grounding wire: AWG16 to 14 (1.25 to 2.0 mm²)
Tightening torque: 1.2 N·m (170 oz·in)

Connect the grounding wire of the "cable for motor" to the other terminal to ground the motor. Do not share the grounding wire with a welder or any other power equipment.

When grounding the Protective Earth Terminal, use a round terminal and secure the grounding point near the driver.



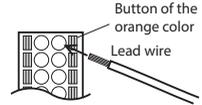
Protective Earth Terminal
(Ground one of these terminals.)

8-5 Connecting the I/O signals

■ Wiring the CN5 connector

- Applicable lead wire: AWG24 to 16 (0.2 to 1.25 mm²)
- Length of the insulation cover which can be peeled: 10 mm (0.39 in.)

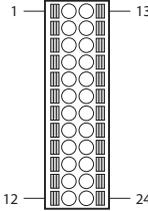
1. Strip the insulation cover of the lead wire.
2. Insert the lead wire while pushing the button of the orange color with a slotted screwdriver.
3. After having inserted, release the button to secure the lead wire.



Be certain the I/O signal cable is as short as possible. The maximum input frequency will decrease as the cable length increases.

■ Pin assignment list

Pin No.	Signal name	Description *
1	IN0	Control input 0 (START)
2	IN2	Control input 2 (M1)
3	IN4	Control input 4 (ZHOME)
4	IN6	Control input 6 (STOP)
5	IN-COM [0-7]	IN0 to IN7 input common
6	IN8	Control input 8 (FW-JOG)
7	OUT0	Control output 0 (HOME-END)
8	OUT2	Control output 2 (PLS-RDY)
9	OUT4	Control output 4 (MOVE)
10	OUT-COM	Output common
11	ASG+	A-phase pulse output+
12	BSG+	B-phase pulse output+



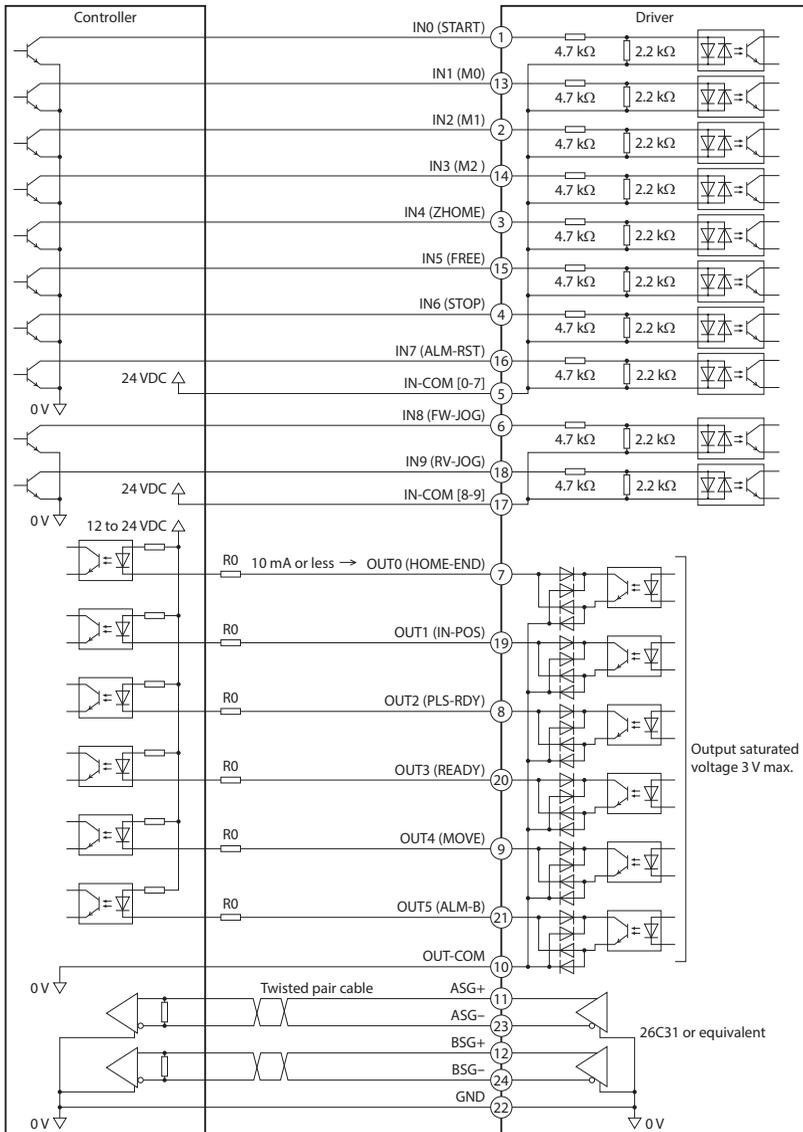
Pin No.	Signal name	Description *
13	IN1	Control input 1 (M0)
14	IN3	Control input 3 (M2)
15	IN5	Control input 5 (FREE)
16	IN7	Control input 7 (ALM-RST)
17	IN-COM [8-9]	IN8, IN9 input common
18	IN9	Control input 9 (RV-JOG)
19	OUT1	Control output 1 (IN-POS)
20	OUT3	Control output 3 (READY)
21	OUT5	Control output 5 (ALM-B)
22	GND	Ground
23	ASG-	A-phase pulse output-
24	BSG-	B-phase pulse output-

* (): Initial value

* (): Initial value

8-6 Connection diagram

■ Connecting to a current sink output circuit

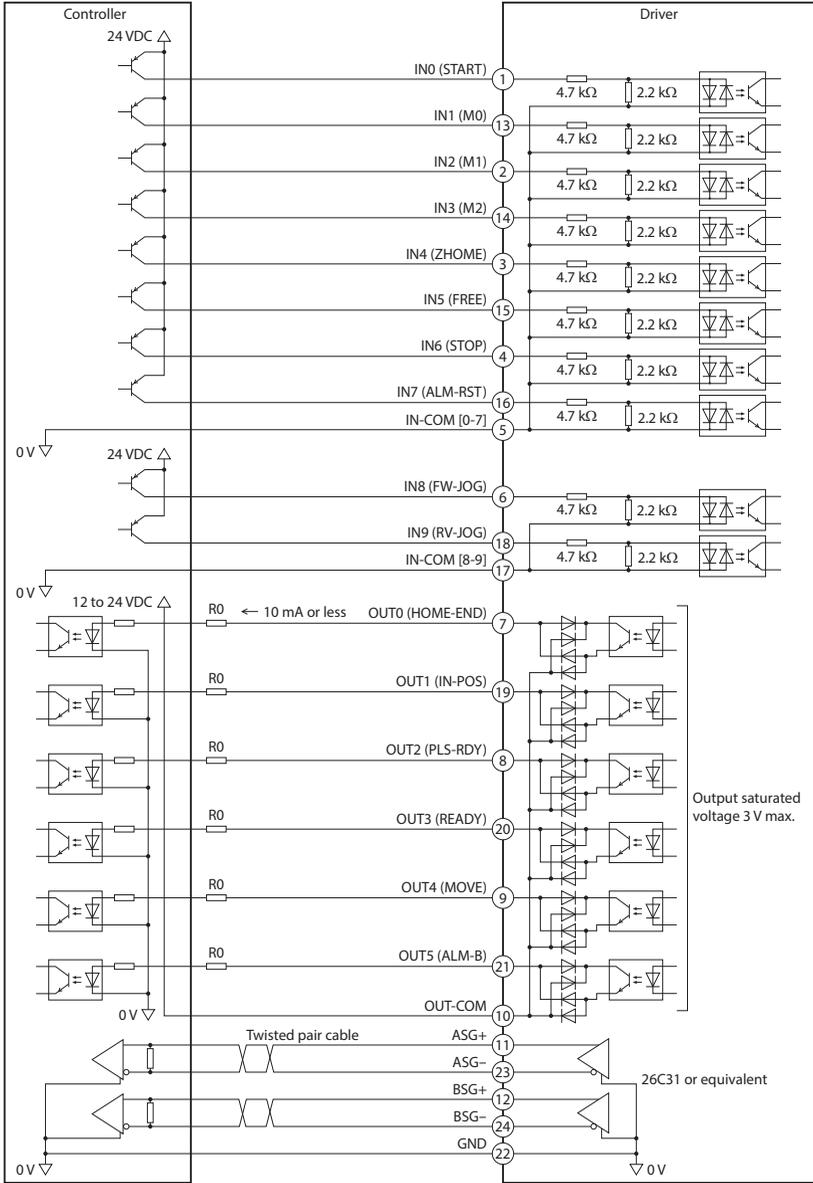


* (): Initial value



- Use input signals at 24 VDC.
- Use output signals at 12 to 24 VDC, 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0 so that the current becomes 10 mA or less.
- The saturated voltage of the output signal is 3 VDC maximum.

■ Connecting to a current source output circuit



* (): Initial value

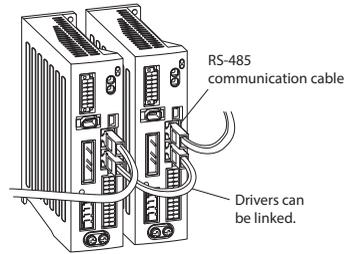


- Use input signals at 24 VDC.
- Use output signals at 12 to 24 VDC, 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0 so that the current becomes 10 mA or less.
- The saturated voltage of the output signal is 3 VDC maximum.

8-7 Connecting the RS-485 communication cable

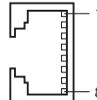
Connect this cable if you want to control your product via RS-485 communication. Connect the RS-485 communication cable to CN6 or CN7 on the driver.

You can use the vacant connectors to connect a different driver. A driver link cable is available as an accessory. A commercially-available LAN cable (shielded straight cable) can also be used to link drivers.

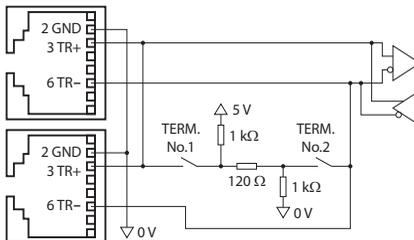


Pin assignment list

Pin No.	Signal name	Description
1	N.C.	Not used
2	GND	GND
3	TR+	RS-485 communication signal (+)
4	N.C.	Not used
5	N.C.	
6	TR-	RS-485 communication signal (-)
7	N.C.	Not used
8	N.C.	



Internal input circuit



8-8 Connecting the USB cable

Using a USB cable of the following specification, connect a PC in which the **MEXE02** has been installed to the USB communication connector.

Specification	USB2.0 (Full Speed)
Cable	Length: 3 m (9.8 ft.) or less Type: A--mini-B



- Connect the driver and PC directly using the USB cable.
- In large electrically noisy environments, use the USB cable with a ferrite core or install a ferrite core to the USB cable.

8-9 Noise measures

The electrical noise is of two types: One is a noise to invade into the driver from the outside and cause the driver malfunction, and the other is a noise to emit from the driver and cause peripheral equipments malfunction. For the noise that is invaded from the outside, take measures to prevent the driver malfunction. It is needed to take adequate measures because signal lines are very likely to be affected by the noise. For the noise that is emitted from the driver, take measures to suppress it.

■ Measures against electrical noise

There are the following three methods mainly to take measures against the electrical noise.

● Noise suppression

- When relays or electromagnetic switches are used together with the system, use noise filters and CR circuits to suppress surges generated by them.
- Use an accessory cable when extending a wiring distance between the motor and driver. This is effective in suppressing the electrical noise emitted from the motor.
- Cover the driver by a metal plate such as aluminum. This is effective in shielding the electrical noise emitted from the driver.

● Prevention of noise propagation

- Connect a noise filter in the power supply cable of driver.
- Place the power lines, such as the motor and power supply cables, keeping a distance of 200 mm (7.87 in.) or more from the signal lines, and also do not bundle them or wire them in parallel. If the power cables and signal cables have to cross, cross them at a right angle.
- Use a shielded cable of AWG18 to 14 (0.75 to 2.0 mm²) for the power lines. Use a shielded cable of AWG24 to 16 (0.2 to 1.25 mm²) for the signal lines.
- Keep cables as short as possible without coiling and bundling extra lengths.
- To ground a shielded cable, use a metal cable clamp that will maintain contact with the entire circumference of the cable. Ground the cable clamp near the product.
- When grounding PE terminals of multiple drivers to a grounding point, it becomes more effective to block the electrical noise since impedance on the grounding point is decreased. However, ground them so that a potential difference does not occur among the grounding points. An accessory driver cable including with a ground wire is available.



● Suppression of effect by noise propagation

Loop the noise propagated cable around a ferrite core. Doing so will prevent the propagated noise invades into the driver or emits from the driver. The frequency band in which an effect by the ferrite core can be seen is generally 1 MHz or more. Check the frequency characteristics of the ferrite core used. To increase the effect of noise attenuation by the ferrite core, loop the cable a lot.

■ Noise suppression parts

● Noise filter

- Connect the following noise filter (or equivalent) to the power line. Doing so will prevent the propagated noise through the power line. Install the noise filter as close to the driver as possible.

Manufacture	Single-phase 100-120 V Single-phase 200-240 V	Three-phase 200-240 V
SOSHIN ELECTRIC CO.,LTD	HF2010A-UPF	HF3010C-SZA
Schaffner EMC	FN2070-10-06	—

- Use the AWG18 (0.75 mm²) or thicker wire for the input and output cables of the noise filter, and secure firmly using a cable clamp etc. so that the cable does not come off the enclosure.
- Place the input cable as far apart as possible from the output cable, and do not wire the cables in parallel. If the input and output cable are placed at a close distance or if they are wired in parallel, the noise in the enclosure affects the power cable through stray capacitance, and the noise suppressing effect will reduce.
- Connect the ground terminal of the noise filter to the grounding point, using as thick and short a wire as possible.
- When connecting a noise filter in an enclosure, wire the input cable of the noise filter as short as possible. Wiring in long distance may reduce the noise suppressing effect.

■ Noise suppression parts (accessories)

Refer to p.45 for accessories.

● Driver cable

This cable is a shielded cable for good noise immunity to connect the driver and controller. The ground wires useful to grounding are provided at both ends of the cable. The EMC measures are conducted using the Oriental Motor driver cable.

- **Surge suppressor**

This product is effective to suppress the surge which occurs in a relay contact part. Connect it when using a relay or electromagnetic switch. CR circuit for surge suppression and CR circuit module are provided.

8-10 Installing and wiring in compliance with EMC Directive

Effective measures must be taken against the EMI that the motor and driver may give to adjacent control-system equipment, as well as the EMS of the motor and driver itself, in order to prevent a serious functional impediment in the machinery. The use of the following installation and wiring methods will enable the motor and driver to be compliant with the EMC directive. Refer to p.9 for the applicable standards.

Oriental Motor conducts EMC measurements on its motors and drivers in accordance with "Example of motor and driver installation and wiring" on p.23.

The user is responsible for ensuring the machine's compliance with the EMC Directive, based on the installation and wiring explained below.

- **Connecting the noise filter**

In large electrically noisy environments, connect a noise filter. Refer to "Noise filter" on p.22 for details.

- **Connecting the AC power line reactor**

When inputting single-phase 240 V, insert a reactor (5 A, 5 mH) in the AC power line to ensure compliance with EN 61000-3-2.

- **Connecting the 24 VDC power supply**

Use a 24 VDC power supply compliant with the EMC Directive.

Use a shielded cable for the wiring, and keep it as short as possible.

Refer to "Prevention of noise propagation" on p.22 for grounding the shielded cable.

- **Connecting the motor cable**

Use an accessory motor cable when extending the wiring distance between the motor and driver

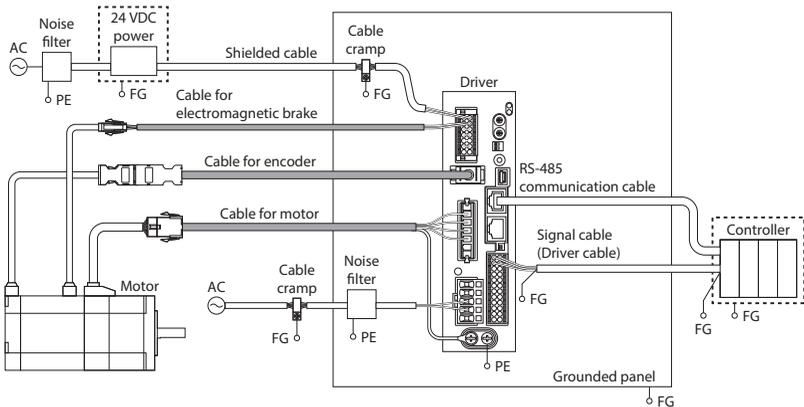
- **Connecting the signal cable**

Refer to "Prevention of noise propagation" on p.22.

- **How to ground**

- The cable used to ground the motor, driver and noise filter must be as thick and short as possible so that no potential difference is generated.
- Choose a large, thick and uniformly conductive surface for the grounding point.
- Be sure to ground the Protective Earth Terminal of the motor and driver. Refer to p.17 for grounding method.

- **Example of motor and driver installation and wiring**



----- is a shield box.

Gray colored cables are supplied or accessory.



Note The driver uses parts that are sensitive to electrostatic charge. Take measures against static electricity since static electricity may cause the driver to malfunction or suffer damage.

9 Explanation of I/O signals

9-1 Input signals

The following input signals of the driver are photocoupler inputs. The signal state represents the "ON: Carrying current" or "OFF: Not carrying current" state of the internal photocoupler rather than the voltage level of the signal.

■ START input

This signal is used to start positioning operation.

Select the operation data number and turn the START input ON to start positioning operation.

■ M0, M1, M2 input

Select a desired operation data number based on a combination of ON/OFF status of the M0 to M2 inputs.

Operation data No.	M2	M1	M0
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

■ ZHOME input

When the ZHOME input is turned ON, the motor will move to the home position set by the HOME PRESET switch. Since it does not require sensors, return-to-home is possible at high-speed.

■ FREE input

When the FREE input is turned ON, the motor current will be cut off. When an electromagnetic brake motor is used, the electromagnetic brake will be released.

The motor output shaft can be rotated manually since the motor holding torque is lost.



Do not turn the FREE input ON when driving a vertical load. Since the motor loses its holding torque, the load may drop.

■ STOP input

When the STOP input is turned ON, the motor will stop.

When resuming the operation, input the operation start signal to the driver after turning the STOP input OFF.

■ ALM-RST input

If the ALM-RST input is turned from OFF to ON while an alarm is generated, the alarm will be reset (The alarm will be reset at the ON edge of the ALM-RST input).

Before resetting an alarm, be sure to turn the pulse input OFF and remove the cause of the alarm to ensure safety.

Note that some alarms cannot be reset with the ALM-RST input.

■ FW-JOG input, RV-JOG input

These signals are used to start JOG operation.

The motor continuously operates in the forward direction when turning the FW-JOG input ON, and the motor continuously operates in the reverse direction when turning the RV-JOG input ON.

If the signal having inputted is turned OFF, the motor will stop. If the FWD-JOG and RVS-JOG inputs are turned ON simultaneously, the motor will stop.

9-2 Output signals

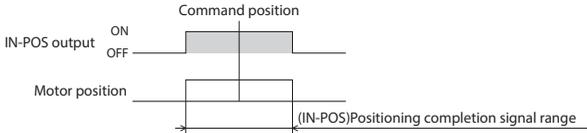
The driver outputs signals in the photocoupler/open-collector output mode or line driver output mode. The signal state represents the "ON: Carrying current" or "OFF: Not carrying current" state of the internal photocoupler rather than the voltage level of the signal.

■ HOME-END output

When the home position is set or when high-speed return-to-home operation is complete, the HOME-END output turns ON.

■ IN-POS output

When the motor has completed its movement, the IN-POS output will turn ON. When the motor detection position is in a range of the "(IN-POS)Positioning completion signal range" parameter (initial value: 1.8°) as a center of the command position, the IN-POS output turns ON.



■ PLS-RDY output

This output signal is not used for the built-in controller type driver.

■ READY output

When the driver is ready to execute operation, the READY output turns ON. Input the operation start signal to the driver after the READY output was turned ON.

■ MOVE output

The MOVE output turns ON while the motor is operating.

■ ALM-B output

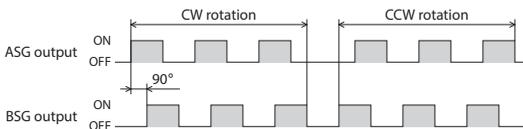
When an alarm generates, the ALM-B output will turn OFF, and the motor will stop. At the same time, the PWR/ALM LED on the driver will blink in red. The ALM-B output is normally closed.

■ ASG output, BSG output

The ASG output and BSG output are signals output from the ABZO sensor.

The ASG output is used to output pulses according to motor operation. The motor position can be monitored by counting the ASG output pulses. The number of output pulses per motor revolution varies depending on the resolution effective when turning the power on.

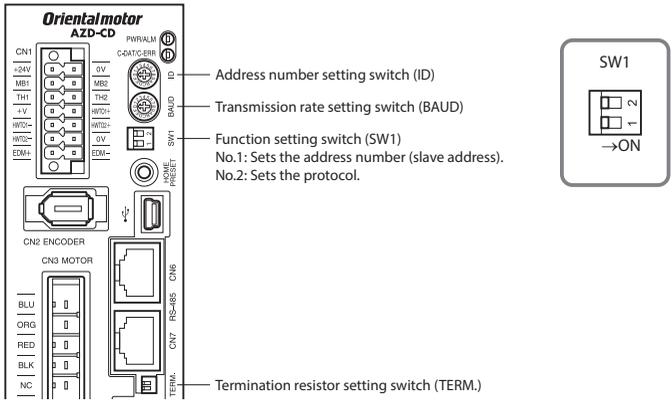
The BSG output has a 90° phase difference with respect to the ASG output. The motor rotation direction can be determined by detecting the BSG output level at the rise of the ASG output.



- The ASG output and BSG output are subject to a maximum delay of 0.1 ms with respect to motor operation. Use these outputs to check the position at which the motor is stopped.
- Connect a termination resistor of 100 Ω or more between the driver and the input of the line receiver.

10 Setting

This chapter explains how to set the motor and driver functions.



memo Be sure to turn off the driver power before setting the function setting switch (SW1). The new setting of the SW1 will become effective after the power is cycled.

10-1 Address number (slave address)

Set the address number (slave address) using the address number setting switch (ID) and SW1-No.1 of the function setting switch. Make sure each address number (slave address) you set for each driver is unique.

Factory setting ID: 0, SW1-No.1: OFF

ID	SW1-No.1	Address number (slave address)	ID	SW1-No.1	Address number (slave address)
0	OFF	0*	0	ON	16
1		1	17		
2		2	18		
3		3	19		
4		4	20		
5		5	21		
6		6	22		
7		7	23		
8		8	24		
9		9	25		
A		10	26		
B		11	27		
C		12	28		
D		13	29		
E		14	30		
F		15	31		

* In the case of Modbus protocol, the address number (slave address) 0 is reserved for broadcasting, so do not use this address.

10-2 Protocol

Set the protocol of RS-485 communication using the SW1-No.2 of the function setting switch.

Factory setting OFF

SW1-No.2	Protocol
ON	Modbus RTU mode
OFF	Connecting with network converter

10-3 Transmission rate

Set the transmission rate using transmission rate setting switch (BAUD).

The transmission rate to be set should be the same as the transmission rate of the master controller.

Factory setting 7

BAUD	Transmission rate (bps)
0	9600
1	19200
2	38400
3	57600
4	115,200
5	230,400
6	Not used.
7	Network converter
8 to F	Not used.



Do not set BAUD to positions 6 and 8 to F.

10-4 Termination resistor

Set a termination resistor to the driver located farthest away (positioned at the end) from the master controller or network converter. Turn the termination resistor setting switch (TERM-No.1 and No.2) ON to set the termination resistor for RS-485 communication (120 Ω).

Factory setting OFF for both No.1 and No.2 (termination resistor disabled)

TERM-No.1, No.2	Termination resistor (120 Ω)
Both are OFF	Disabled
Both are ON	Enabled



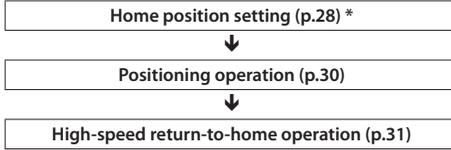
If only one of the two of No.1 and No.2 is turned ON, a communication error may occur.

11 Guidance

If you are new to the AZ Series, read this section to understand the operating methods along with the operation flow.

■ How to read the guidance

This chapter explains the operation procedure as follows.



* Perform the home position setting only once initially. Once the home position is set, it is no need to set afterward.

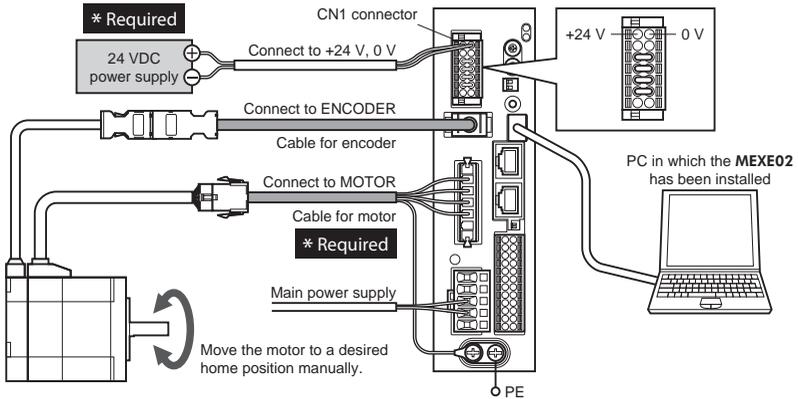
11-1 Guidance for home position setting

The home position has not set at the time of shipment. Before starting operation, be sure to set the home position. Perform the home position setting only once initially. Once the home position is set, the driver keeps the home information even if the power supply is shut down.

memo The home position is written to the non-volatile memory. The non-volatile memory can be rewritten approximately 100,000 times.

STEP 1 Connect the motor, power supply and MEXE02 to the driver

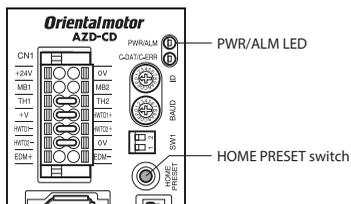
1. Wire the driver by reference to the figure. Be sure to connect a 24 VDC power supply.
2. Move the motor to a desired home position manually.



Gray colored cables are supplied or accessory.

STEP 2 Turn on the power and set the home position

1. Turn on the 24 VDC power supply and main power supply.
2. Keep pressing the HOME PRESET switch for one second.
Red color and green color on the PWR/ALM LED blinks simultaneously. (Red and green colors may overlap and it may be visible to orange.)

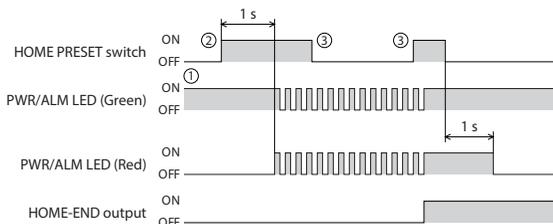


3. Remove the hand from the HOME PRESET switch within three seconds after the PWR/ALM LED started blinking, and press the switch again.
After both red color and green color on the PWR/ALM LED are lit, only green color continues to be lit.
The home position is set.



For the procedure 3, be sure to perform within three seconds after the PWR/ALM LED started blinking. If three seconds were passed, the PWR/ALM LED will return to the state being lit in green. In this case, perform from the procedure 2 again.

See the following timing charts for the procedure of home position setting.



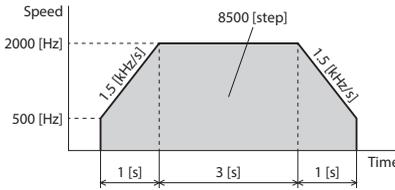
11-2 Guidance for position operation

This section explains an example to perform positioning operation using the **MEXE02**.
 After performing "11-1 Guidance for home position setting" on p.28, continuously perform positioning operation.

Note Before operating the motor, check the condition of the surrounding area to ensure safety.

STEP 1 Set the operation data using the MEXE02

1. Start a PC, and continuously start the **MEXE02**.
 Refer to the "Data setting software **MEXE02 OPERATING MANUAL**" for how to start or use the **MEXE02**.
2. Using the **MEXE02**, set the operation data of No.0 as follows.



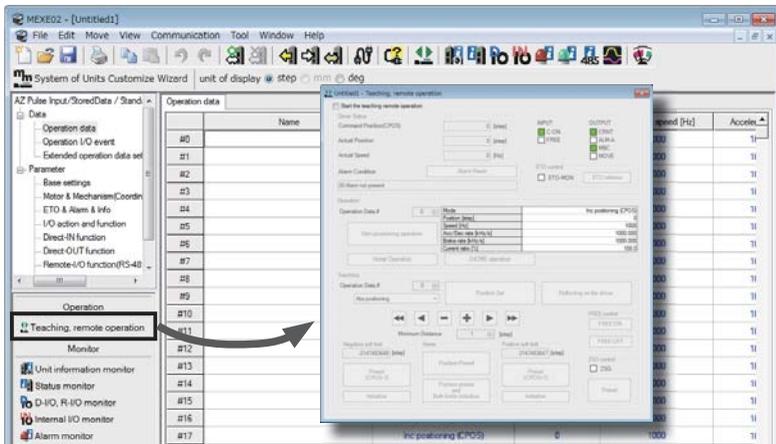
● Setting example of MEXE02

	Operation type	Position [step]	Operating speed [Hz]	Acceleration [kHz/s]	Stopping deceleration [kHz/s]
#0	Inc positioning (CPOS)	8500	2000	1500.000	1500.000
#1	Inc positioning (CPOS)	0	1000	1000.000	1000.000

Input in increments of 0.001 kHz/s.

STEP 2 Operate the motor

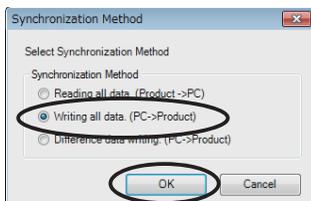
1. Click the [Teaching, remote operation] short-cut button in the left side of the screen.
 The teaching/remote operation window appears.



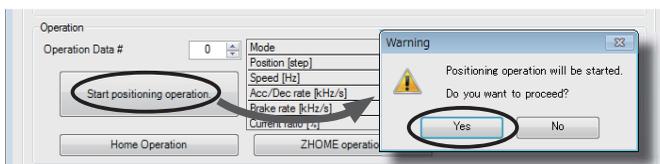
- Click "Start the teaching remote operation."
Since the pop-up window (Warning) is displayed, click [Yes].



- Write the edited data to the driver. Click "Writing all data. (PC → Product)," and click [OK].
The contents of the data No.0 will be written to the driver.



- Click [Start positioning operation].
Since the pop-up window (Warning) is displayed, click [Yes].



The motor performs positioning operation.

11-3 Guidance for high-speed return-to-home operation

After operation, return the motor to the home position. Using high-speed return-to-home operation (ZHOME) can return the motor position to the home position easily.
After performing "11-2 Guidance for position operation" on p.30, continuously perform high-speed return-to-home operation.

STEP 1 Check the present position

- Check the "Actual position" in the teaching/remote operation window.



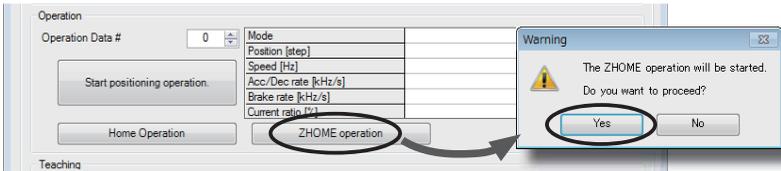
- To check if the ABZO sensor has memorized the home position, once turn off the power, and turn on again.

3. Check the "Actual position" again.
Check that the actual position is not 0.



STEP 2 Execute high-speed return-to-home operation

1. Click "ZHOME operation."
Since the pop-up window (Warning) is displayed, click [Yes].



The motor will start high-speed return-to-home operation.

2. After the motor returns to the home position, check that the "actual position" is 0.



STEP 3 End the teaching/remote operation

To end the teaching/remote operation, unselect "Start the teaching remote operation."



12 Operation

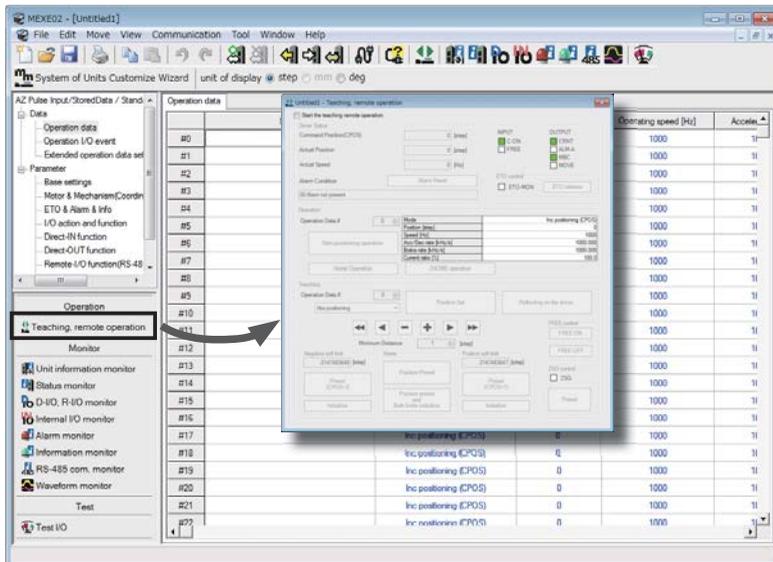
Three types of operation signals are assigned to the CN5 connector at the time of shipment.

This chapter explains operations (positioning operation, JOG operation, and high-speed return-to-home operation) that can be performed in the factory setting only.

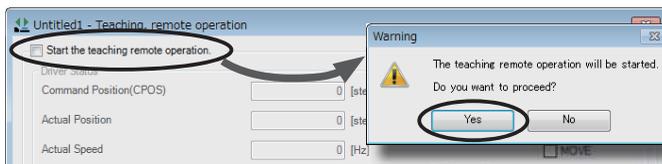
12-1 Set the home position using the MEXE02

The home position can be set using the **MEXE02** other than the HOME PRESET switch of the driver.

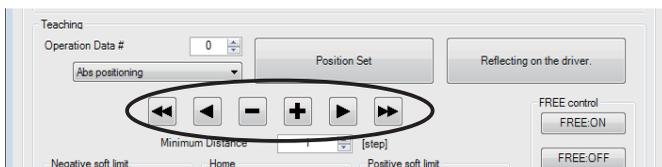
1. Click the [Teaching, remote operation] short-cut button in the left side of the screen. The teaching/remote operation window appears.



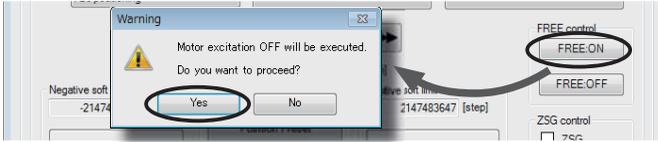
2. Click the "Teaching, remote operation," and click [Yes] on the pop-up window (Warning).



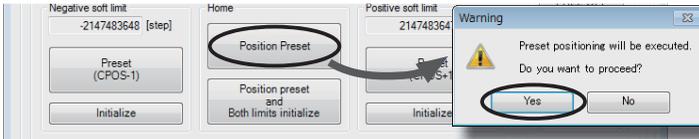
3. Adjust the motor position using the JOG operation switches.



- When adjusting the motor position manually, click [FREE: ON] first, and click [Yes] on the pop-up window (Warning). The holding power of the motor output shaft is lost, and the output shaft can be turned by hand. After adjustment, click [FREE: OFF], and recover the motor excitation.



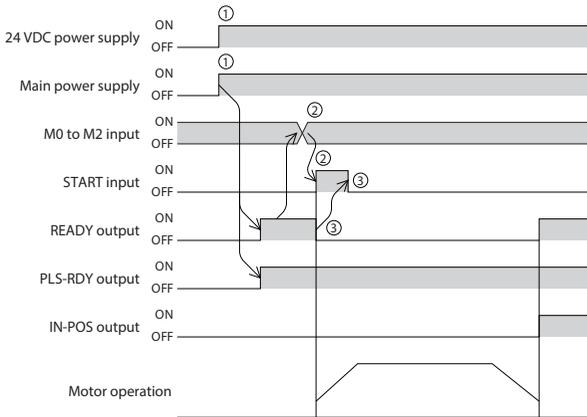
- After setting the motor home position, click [Position Preset], and click [Yes] on the pop-up window (Warning). The home position is set and written to the driver.



12-2 Positioning operation

Set the operation data and perform positioning operation.

- Turn on the 24 VDC power supply and main power supply. The READY output and PLS-RDY output will turn ON.
- Check the READY output is turned ON and turn the START input ON by selecting the operation data number with the M0 to M2 outputs. The motor will start positioning operation.
- Check the READY output has been turned OFF and turn the START input OFF. When the operation is complete, the READY output will turn ON.

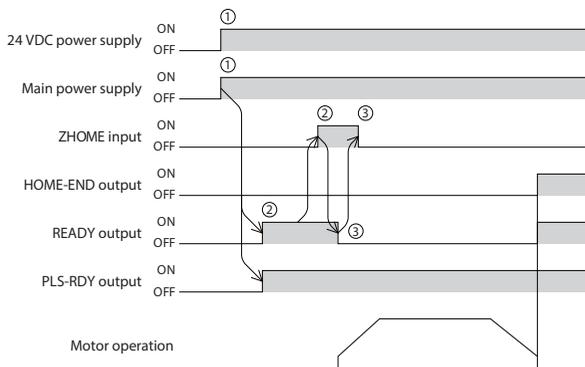


Refer to the [OPERATING MANUAL](#) Function Edition for details about operation.

12-3 High-speed return-to-home operation

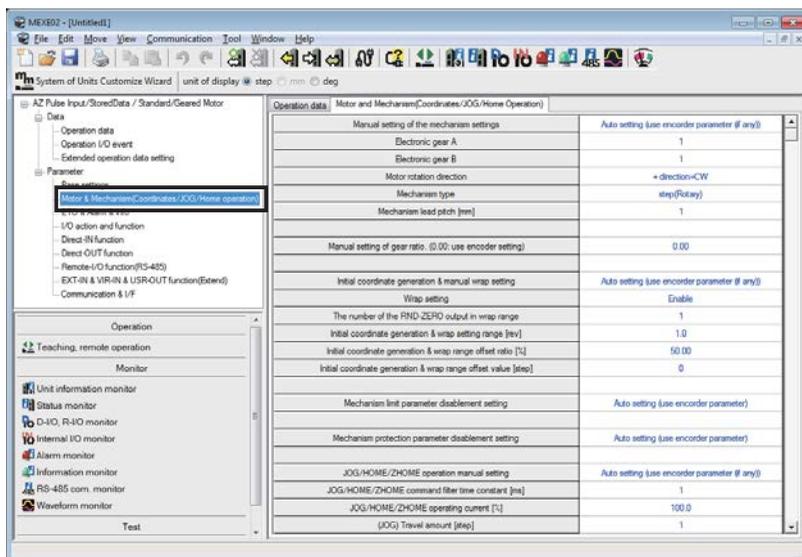
High-speed return-to-home operation is used to return to the home position that is set by the HOME PRESET switch.

1. Turn on the 24 VDC power supply and main power supply.
The READY output and PLS-RDY output will turn ON.
2. Check the READY output has been turned ON and turn the ZHOME input ON.
The READY output turns OFF, and the motor will start high-speed return-to-home operation.
3. If the READY output has been turned OFF, it is possible to turn the ZHOME input OFF.
When the home position is detected, the operation will be stopped.
The HOME-END output and READY output will turn ON.



■ When changing the operating condition of high-speed return-to-home operation

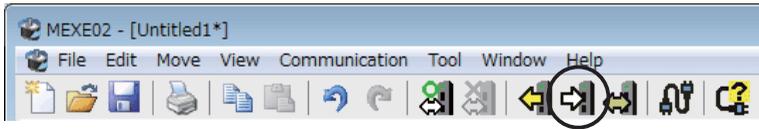
1. Click on "Motor and Mechanism(Coordinates/JOG/Home Operation)" under "Parameter," in the left side of the screen. Motor and mechanism parameter window will appear.



- The operating condition can be changed using three parameters in the figure.

Operation data		Motor and Mechanism(Coordinates/JOG/Home Operation)
(JOG)Travel amount [step]		1
(JOG)Operating speed [Hz]		1000
(JOG)Acceleration/deceleration rate [kHz/s]		1000.000
(JOG)Starting speed [Hz]		500
(JOG)Operating speed of JOG-H [Hz]		5000
(ZHOME)Operating speed [Hz]		5000
(ZHOME)Acceleration/deceleration [kHz/s]		1000.000
(ZHOME)Starting speed [Hz]		500
(HOME)Home-seeking mode		3 sensors
(HOME)Starting direction		Positive direction

- After changing the operating condition, click the [Writing data] icon in the toolbar to download to the driver.

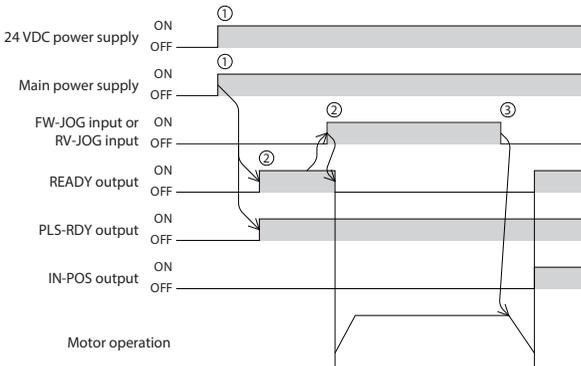


The process has been completed.

12-4 JOG operation

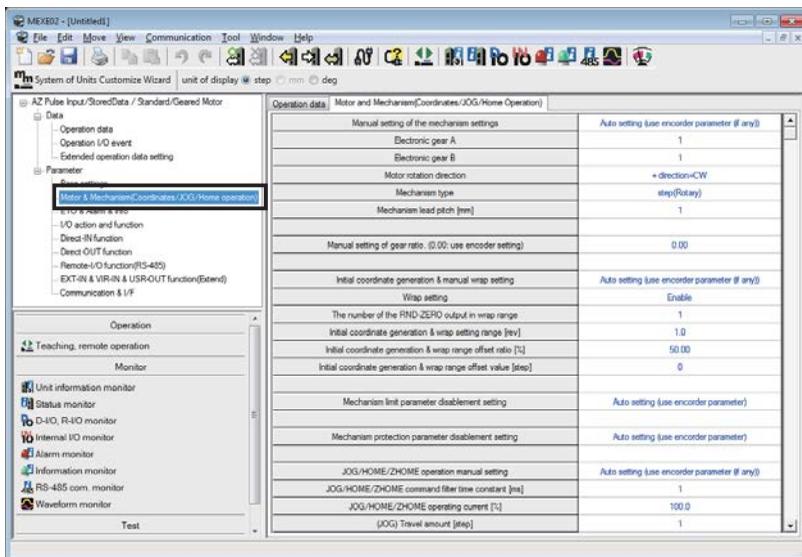
Constant speed operation (inching operation) can be performed with JOG operation. The motor operates continuously while the FW-JOG input or RV-JOG input is being ON.

- Turn on the 24 VDC power supply and main power supply.
The READY output and PLS-RDY output will turn ON.
- Check the READY output has been turned ON and turn the FW-JOG input or RV-JOG input ON.
The motor will start operation.
When the FW-JOG input is turned ON, the motor rotates in the forward direction, and when the RV-JOG input is turned ON, the motor rotates in the reverse direction.
- Turn the input signal OFF.
The motor will decelerate to a stop.
When the motor stops, the READY output will turn ON.



■ When changing the operating condition of JOG operation

1. Click on "Motor and Mechanism(Coordinates/JOG/Home Operation)" under "Parameter," in the left side of the screen. Motor and mechanism parameter window will appear.



2. The operating condition can be changed using five parameters in the figure.

Parameter	Value
(JOG)Travel amount [step]	1
(JOG)Operating speed [Hz]	1000
(JOG)Acceleration/deceleration rate [kHz/s]	1000.000
(JOG)Starting speed [Hz]	500
(JOG)Operating speed of JOG-H [Hz]	5000
(ZHOME)Operating speed [Hz]	5000
(ZHOME)Acceleration/deceleration [kHz/s]	1000.000
(ZHOME)Starting speed [Hz]	500
(HOME)Home-seeking mode	3 sensors
(HOME)Starting direction	Positive direction

3. After changing the operating condition, click the [Writing data] icon in the toolbar to download to the driver.



The process has been completed.

13 Power removal function (ETO function: External Torque Off)

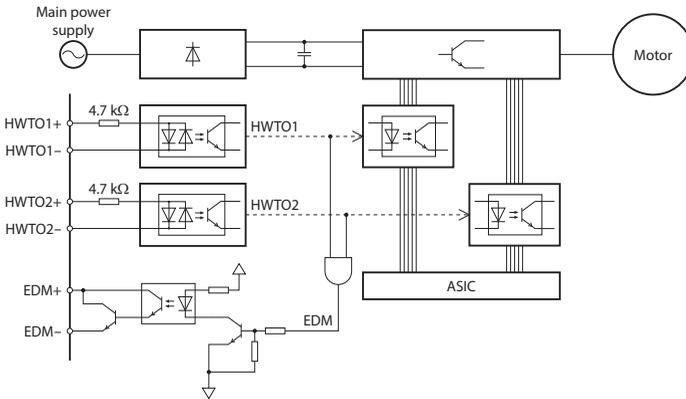
The power removable function (ETO function: External Torque Off function) is the one that stops supplying the power to the motor forcibly to put the motor into a non-excitation state if the HWTO input of the CN1 is shut off. This function, which is different from the FREE input, shuts off the power supply to the motor directly on the circuit. It can be used for the purpose of preventing dangerous movements of the moving part when maintenance of the equipment is performed.

Related I/O signals are the HWTO input and EDM output.



Be sure to check the motor is in a standstill state before executing the ETO function. If the ETO function is executed while the motor is operated, it may cause damage to the motor, driver, or equipment.

13-1 Block diagram



Signal name	Specification
HWTO1+ input, HWTO1- input HWTO2+ input, HWTO2- input	24 VDC±10%
EDM+ output, EDM- output	30 VDC or less, 50 mA or less Output saturated voltage 1.1 V

13-2 Related I/O signals

■ HWTO input

When either of the HWTO1 input or HWTO2 input is turned OFF, the power to the motor is cut off by the electronic circuit without involving the CPU, causing the motor to stop. In this time, the PWR/ALM LED will blink in green. When an electromagnetic brake motor is used, the electromagnetic brake continues to hold the position.

EDM output

If both the HWT01 input and HWT02 input are turned OFF, the EDM output will turn ON.

HWT01 input	HWT02 input	EDM output	Motor excitation
ON	ON	OFF	Excitation
ON	OFF	OFF	
OFF	ON	OFF	Non-excitation
OFF	OFF	ON	

13-3 Releasing ETO state

If the STOP input is turned ON while the ETO function is activated, the ETO state can be released (effective at the ON edge of the STOP input).

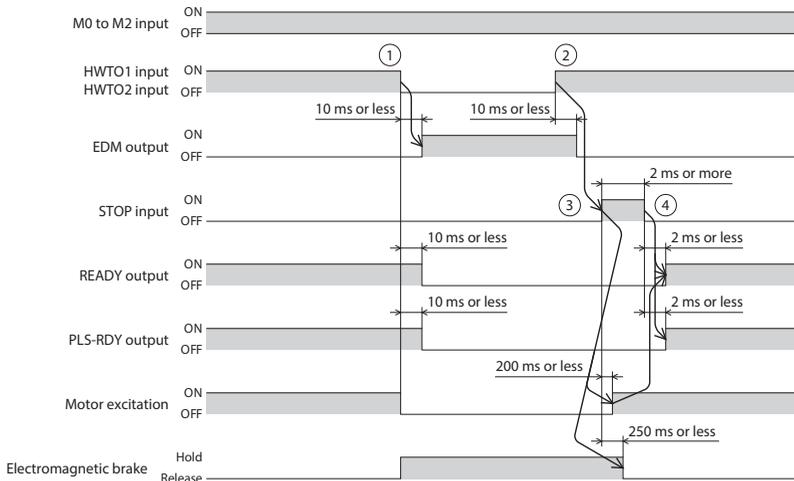
Be sure to turn the STOP input ON after turning the HWT01 input and HWT02 input ON.

13-4 Timing chart



Be sure to check the motor is in a standstill state before executing the ETO function. If the ETO function is executed while the motor is operated, it may cause damage to the motor, driver, or equipment.

- When both the HWT01 input and HWT02 input have been turned OFF, the EDM output will turn ON.
The power supply to the motor will be shut off.
- Turn the HWT01 input and HWT02 input ON.
- Turn the STOP input ON.
The power is supplied to the motor, and the motor will be excited.
- Turn the STOP input OFF.
The READY output turns ON, and the driver will be ready to operate.



13-5 To use this product safely

- **When the ETO function is used, be sure to conduct a risk assessment of equipment in advance to satisfy the safety requirements of the entire system.**
- **The ETO function is designed based on the assumption that the motor is in a standstill state. Do not execute the ETO function while the motor is rotating.**
- **Even if the ETO function is activated, the following potential risks can be estimated. Be sure to confirm the safety by conducting a risk assessment.**
 - The motor output shaft may be rotated by an external force. If the motor output shaft is kept in place, install an external brake mechanism or equivalent. Do not use the brake mechanism of the electromagnetic brake motor for braking the motor rotation.
 - If the ETO function is activated, the driver stops supplying the power to the motor. However, the input power to the driver is not shut off, and the driver is not electrically isolated. Before performing maintenance or inspection, always turn off the driver power, and check the voltage with a circuit tester after the CHARGE LED is turned off.
- **The EDM output is not an output signal to ensure the safety. Do not use the EDM output for any other purpose except for monitoring a failure.**

14 Inspection

It is recommended that periodic inspections be conducted for the items listed below after each operation of the motor. If an abnormal condition is noted, discontinue any use and contact your nearest Oriental Motor sales office.

■ During inspection

- Are the openings in the driver blocked?
- Are any of the mounting screws or connection parts of the driver loose?
- Is there attachment of dust, etc., on the driver?
- Are there any strange smells or appearances within the driver?



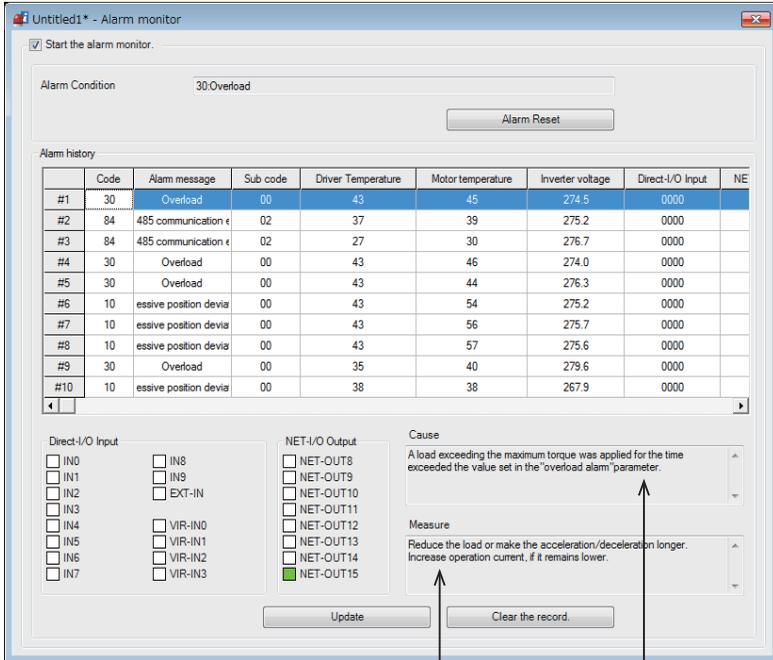
The driver uses semiconductor elements, so be extremely careful when handling them. Static electricity may damage the driver.

15 Alarm (protective function)

When an alarm generates, the ALM-B output will turn OFF and PWR/ALM LED will blink in red. Before resetting an alarm, always remove the cause of the alarm and ensure safety. For details about alarms, refer to the "OPERATING MANUAL, Function Edition."

■ Example of the alarm monitor screen of the MEXE02

The alarm message can be checked using the "Alarm monitor" of the MEXE02.



The measures are displayed.

The cause that generated the alarm is displayed.

16 Troubleshooting

During motor operation, the motor or driver may fail to function properly due to an improper setting or wiring. When the motor cannot be operated correctly, refer to the contents provided in this section and take appropriate action. If the problem persists, contact your nearest Oriental Motor sales office.

This chapter describes problems that may occur during operation in addition to the initial settings. Refer to the OPERATING MANUAL Function Edition for these contents.

Phenomenon	Possible cause	Remedial action
<ul style="list-style-type: none"> The motor is not excited. The motor output shaft can be moved by hand. 	The C-ON input is turned OFF.	Turn the C-ON input ON and confirm that the motor will be excited.
	The FREE input is turned ON.	Turn the FREE input OFF.
The motor does not operate.	An electromagnetic brake motor is used and the electromagnetic brake is in the holding state.	Check the connections between electromagnetic brake and driver.
	The STOP input is turned ON.	Turn the STOP input OFF.
	The position (distance) is not set in the operation data while positioning operation.	Check the operation data.
The motor does not operate.	The FWD-JOG input and RVS-JOG input are turned ON simultaneously in the JOG operation.	Turn either FWD-JOG input or RVS-JOG input ON.
	The "motor rotation direction" parameter is set wrong.	Check the setting of the "motor rotation direction" parameter.
The motor rotates in the direction opposite to the specified direction.	The "motor rotation direction" parameter is set wrong.	Check the setting of the "motor rotation direction" parameter.
The gear output shaft rotates in the direction opposite to the motor.	A gear that rotates in the direction opposite to the motor shaft is used.	<ul style="list-style-type: none"> With TS geared motor, the gear output shaft rotates in the direction opposite to the motor when the gear ratio is 20 or 30. With Harmonic geared motors, the gear output shaft always rotates in the direction opposite to the motor.
Motor operation is unstable.	Connection error in the motor or power supply.	Check the connections between the driver, motor and power supply.
	The "Base current" parameter or "Stop current" parameter is too low.	Return the "Base current" parameter or "Stop current" parameter to its initial setting and check the motor operation. If the current is too low, the motor torque will also be too low and operation will be unstable.
Motor vibration is too great.	Load is too small.	Lower the current using the "Base current" parameter. Vibration will increase if the motor's output torque is too large for the load.
The electromagnetic brake does not release.	The power is not supplied to the electromagnetic brake.	Check the connection of the electromagnetic brake.



- When an alarm generates, check the alarm message using the **MEXE02** or via RS-485 communication.
- I/O signals can be monitored using the **MEXE02** or via RS-485 communication. Use to check the wiring condition of the I/O signals.

17 To use the product in more convenient manners

Using the **MEXE02**, you can set the operation data or change I/O signals that assign to the CN5 connector. Also, you can monitor the operating status or perform test operation.

Refer to the [OPERATING MANUAL](#) Function Edition for details about operation.

Like to set the resolution based on the function

Like to change the I/O assignment

Like to utilize the sequence function

Like to utilize convenient functions for maintenance

Like to check operation by the waveform monitor

Like to change the alarm conditions

Like to perform push-motion operation

Like to operate via industrial network

18 Accessories

■ Motor cable set

● Connection cable set

This is a cable set needed when a motor and driver are connected. It is a set of two cables for the motor and encoder. For the cable set of electromagnetic brake motors, a set of three cables for the motor, encoder and electromagnetic brake is provided.

For standard type motor

Model	Length [m (ft.)]
CC010VZF	1 (3.3)
CC020VZF	2 (6.6)
CC030VZF	3 (9.8)
CC050VZF	5 (16.4)
CC070VZF	7 (23.0)
CC100VZF	10 (32.8)
CC150VZF	15 (49.2)
CC200VZF	20 (65.6)

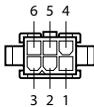
For electromagnetic brake type motor

Model	Length [m (ft.)]
CC010VZFB	1 (3.3)
CC020VZFB	2 (6.6)
CC030VZFB	3 (9.8)
CC050VZFB	5 (16.4)
CC070VZFB	7 (23.0)
CC100VZFB	10 (32.8)
CC150VZFB	15 (49.2)
CC200VZFB	20 (65.6)

Pin assignment of "cable for motor"

● Motor side

Pin No.	Color	Lead size
1	Orange	AWG22 (0.3 mm ²)
2	Green	
3	Green/Yellow	AWG18 (0.75 mm ²)
4	Blue	AWG22 (0.3 mm ²)
5	Red	
6	Black	



Manufacturer: Molex
Housing: 5559-06P-210
Terminal: 5558T

● Driver side

Pin No.	Color	Lead size
1	Blue	AWG22 (0.3 mm ²)
2	Orange	
3	Red	
4	Black	
5	N.C.	—

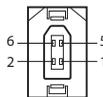


Manufacturer: J.S.T. Mfg Co., Ltd.
Housing: F32F55-05V-KX
Terminal: SF3F-01GF-P2.0

Pin assignment of "cable for encoder" [When the cable length is 1 to 5 m (3.3 to 16.4 ft.)]

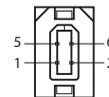
Pin No.	Color	Lead size
1	White	AWG24 (0.2 mm ²)
2	Black	
3	—	—
4	—	—
5	Purple	AWG24 (0.2 mm ²)
6	Brown	

● Motor side



Manufacturer: Molex
Model: 500655-0609
Terminal: 500145-0129

● Driver side



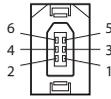
Manufacturer: Molex
Model: 500654-0609
Terminal: 50639-8128

* Do not connect anything to the pin No.3 and No.4.

Pin assignment of "cable for encoder" [When the cable length is 7 to 20 m (23.0 to 65.6 ft.)]

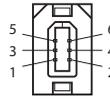
Pin No.	Color	Lead size
1	Green	AWG18 (0.75 mm ²)
2	Black	
3	Red	AWG24 (0.2 mm ²)
4	White	AWG18 (0.75 mm ²)
5	Yellow	AWG24 (0.2 mm ²)
6	Brown	

• Motor side



Manufacturer: Molex
Model: 54280-0609

• Driver side



Manufacturer: Molex
Model: 55100-0670

Pin assignment of "cable for electromagnetic brake"

Pin No. *	Color	Lead size
1	White	AWG20 (0.5 mm ²)
2	Black	

* A pin number of the driver side is described on the wire marker of the terminal.

• Motor side



Manufacturer: Molex
Housing: 5559-02P-210
Terminal: 5558T

• Driver side



Manufacturer: PHOENIX CONTACT
GmbH & Co. KG
Terminal: AI0.5 10WH

● **Flexible connection cable set**

This is a cable set offering excellent flexibility that is needed when a motor and driver are connected. It is a set of two cables for the motor and encoder. For the cable set of electromagnetic brake motors, a set of three cables for the motor, encoder and electromagnetic brake is provided.

For standard type motor

Model	Length [m (ft.)]
CC010VZR	1 (3.3)
CC020VZR	2 (6.6)
CC030VZR	3 (9.8)
CC050VZR	5 (16.4)
CC070VZR	7 (23.0)
CC100VZR	10 (32.8)
CC150VZR	15 (49.2)
CC200VZR	20 (65.6)

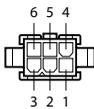
For electromagnetic brake type motor

Model	Length [m (ft.)]
CC010VZRB	1 (3.3)
CC020VZRB	2 (6.6)
CC030VZRB	3 (9.8)
CC050VZRB	5 (16.4)
CC070VZRB	7 (23.0)
CC100VZRB	10 (32.8)
CC150VZRB	15 (49.2)
CC200VZRB	20 (65.6)

Pin assignment of "cable for motor"

• Motor side

Pin No.	Color	Lead size
1	Orange	AWG22 (0.3 mm ²)
2	Green	
3	Green/Yellow	AWG18 (0.75 mm ²)
4	Blue	AWG22 (0.3 mm ²)
5	Red	
6	Black	



Manufacturer: Molex
Housing: 5559-06P-210
Terminal: 5558T

• Driver side

Pin No.	Color	Lead size
1	Blue	AWG22 (0.3 mm ²)
2	Orange	
3	Red	
4	Black	
5	N.C.	—

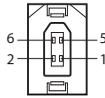


Manufacturer: J.S.T. Mfg Co., Ltd.
Housing: F32FSS-05V-KX
Terminal: SF3F-01GF-P2.0

Pin assignment of "cable for encoder" [When the cable length is 1 to 5 m (3.3 to 16.4 ft.)]

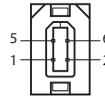
Pin No.	Color	Lead size
1	White	AWG24 (0.2 mm ²)
2	Black	
3	–	
4	–	–
5	Purple	AWG24 (0.2 mm ²)
6	Brown	

• Motor side



Manufacturer: Molex
Model: 500655-0609
Terminal: 500145-0129

• Driver side



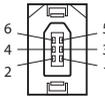
Manufacturer: Molex
Model: 500654-0609
Terminal: 50639-8128

* Do not connect anything to the pin No.3 and No.4.

Pin assignment of "cable for encoder" [When the cable length is 7 to 20 m (23.0 to 65.6 ft.)]

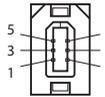
Pin No.	Color	Lead size
1	Green	AWG19 (0.75 mm ²)
2	Black	
3	Red	AWG25 (0.2 mm ²)
4	White	AWG19 (0.75 mm ²)
5	Yellow	AWG25 (0.2 mm ²)
6	Brown	

• Motor side



Manufacturer: Molex
Model: 54280-0609

• Driver side



Manufacturer: Molex
Model: 55100-0670

Pin assignment of "cable for electromagnetic brake"

Pin No. *	Color	Lead size
1	White	AWG21 (0.5 mm ²)
2	Black	

• Motor side



Manufacturer: Molex
Housing: 5559-02P-210
Terminal: 5558T

• Driver side



Manufacturer: PHOENIX CONTACT
GmbH & Co. KG
Terminal: AI0.5 10WH

* A pin number of the driver side is described on the wire marker of the terminal.

● **Extension cable set**

This is a cable set needed when a motor and driver are relayed. It is a set of two cables for the motor and encoder. For the cable set of electromagnetic brake motors, a set of three cables for the motor, encoder and electromagnetic brake is provided.

For standard type motor

Model	Length [m (ft.)]
CC010VZFT	1 (3.3)
CC020VZFT	2 (6.6)
CC030VZFT	3 (9.8)
CC050VZFT	5 (16.4)
CC070VZFT	7 (23.0)
CC100VZFT	10 (32.8)
CC150VZFT	15 (49.2)

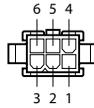
For electromagnetic brake type motor

Model	Length [m (ft.)]
CC010VZFBT	1 (3.3)
CC020VZFBT	2 (6.6)
CC030VZFBT	3 (9.8)
CC050VZFBT	5 (16.4)
CC070VZFBT	7 (23.0)
CC100VZFBT	10 (32.8)
CC150VZFBT	15 (49.2)

Pin assignment of "cable for motor"

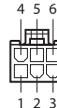
Pin No.	Color	Lead size
1	Orange	AWG22 (0.3 mm ²)
2	Green	
3	Green/Yellow	AWG18 (0.75 mm ²)
4	Blue	AWG22 (0.3 mm ²)
5	Red	
6	Black	

● Motor side



Manufacturer: Molex
Housing: 5559-06P-210
Terminal: 5558T

● Driver side

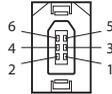


Manufacturer: Molex
Housing: 5557-06R-210
Terminal: 5556T

Pin assignment of "cable for encoder"

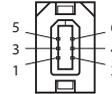
Pin No.	Color	Lead size
1	Green	AWG18 (0.75 mm ²)
2	Black	
3	Red	AWG24 (0.2 mm ²)
4	White	AWG18 (0.75 mm ²)
5	Yellow	AWG24 (0.2 mm ²)
6	Brown	

● Motor side



Manufacturer: Molex
Model: 54280-0609

● Driver side



Manufacturer: Molex
Model: 55100-0670

Pin assignment of "cable for electromagnetic brake"

Pin No.	Color	Lead size
1	White	AWG20 (0.5 mm ²)
2	Black	

● Motor side



Manufacturer: Molex
Housing: 5559-02P-210
Terminal: 5558T

● Driver side



Manufacturer: Molex
Housing: 5557-02R-210
Terminal: 5556T

● Flexible extension cable set

This is a cable set offering excellent flexibility that is needed when a motor and driver are relayed. It is a set of two cables for the motor and encoder. For the cable set of electromagnetic brake motors, a set of three cables for the motor, encoder and electromagnetic brake is provided.

For standard type motor

Model	Length [m (ft.)]
CC010VZRT	1 (3.3)
CC020VZRT	2 (6.6)
CC030VZRT	3 (9.8)
CC050VZRT	5 (16.4)
CC070VZRT	7 (23.0)
CC100VZRT	10 (32.8)
CC150VZRT	15 (49.2)

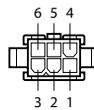
For electromagnetic brake type motor

Model	Length [m (ft.)]
CC010VZRB	1 (3.3)
CC020VZRB	2 (6.6)
CC030VZRB	3 (9.8)
CC050VZRB	5 (16.4)
CC070VZRB	7 (23.0)
CC100VZRB	10 (32.8)
CC150VZRB	15 (49.2)

Pin assignment of "cable for motor"

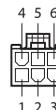
Pin No.	Color	Lead size
1	Orange	AWG22 (0.3 mm ²)
2	Green	
3	Green/Yellow	AWG18 (0.75 mm ²)
4	Blue	AWG22 (0.3 mm ²)
5	Red	
6	Black	

● Motor side



Manufacturer: Molex
Housing: 5559-06P-210
Terminal: 5558T

● Driver side

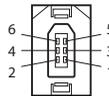


Manufacturer: Molex
Housing: 5557-06R-210
Terminal: 5556T

Pin assignment of "cable for encoder"

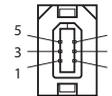
Pin No.	Color	Lead size
1	Green	AWG19 (0.75 mm ²)
2	Black	
3	Red	AWG25 (0.2 mm ²)
4	White	AWG19 (0.75 mm ²)
5	Yellow	AWG25 (0.2 mm ²)
6	Brown	

● Motor side



Manufacturer: Molex
Model: 54280-0609

● Driver side



Manufacturer: Molex
Model: 55100-0670

Pin assignment of "cable for electromagnetic brake"

Pin No.	Color	Lead size
1	White	AWG21 (0.5 mm ²)
2	Black	

● Motor side



Manufacturer: Molex
Housing: 5559-02P-210
Terminal: 5558T

● Driver side



Manufacturer: Molex
Housing: 5557-02R-210
Terminal: 5556T

■ Driver cable

This cable is a shielded cable for the driver control I/O that has good noise immunity.

The ground wires useful to grounding are provided at both ends of the cable.

Select the cable suitable for the number of I/O signals connected. If the number of the core wires in the cable is less than the number of the I/O signal, use multiple cables in combination.

Example) To connect 24 I/O signals → Use two cables in which the number of the core wires is 12 pieces.

Driver cable model list

Length [m (ft.)]	Number of lead wire			
	6 pcs.	10 pcs.	12 pcs.	16 pcs.
0.5 (1.6)	CC06D005B-1	CC10D005B-1	CC12D005B-1	CC16D005B-1
1 (3.3)	CC06D010B-1	CC10D010B-1	CC12D010B-1	CC16D010B-1
1.5 (4.9)	CC06D015B-1	CC10D015B-1	CC12D015B-1	CC16D015B-1
2 (6.6)	CC06D020B-1	CC10D020B-1	CC12D020B-1	CC16D020B-1

■ RS-485 communication cable

You can link drivers using this cable connected to the CN6/CN7 connectors.

Model: **CC002-RS4** [0.25 m (0.8 ft.)]

■ CR circuit for surge suppression

This product is effective to suppress the surge which occurs in a relay contact part. Use it to protect the contacts of the relay or switch.

Model: **EPCR1201-2**

■ CR circuit module

This product is effective to suppress the surge which occurs in a relay contact part. Use this product to protect the contacts of the relay or switch.

4 pieces of CR circuit for surge suppression are mounted on the compact circuit, and this product can be installed to the DIN rail. This product can make the wiring easily and securely since it also supports terminal block connection.

Model: **VCS02**

■ Regeneration unit

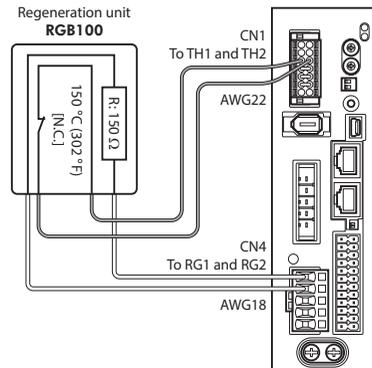
Connect the regeneration unit if gravitational operation or other operations involving up/down movement, or sudden starting/ stopping of a large inertial load, will be repeated frequently.

Always connect the regeneration unit if an overvoltage protection alarm generates.

Model: **RGB100**

● Connecting the regeneration unit

- The two thin lead wires (AWG22: 0.3 mm²) of the regeneration unit are the thermostat outputs. Connect them to the TH1 and TH2 using the CN1 connector.
- Regenerative current flows through the two thick lead wires (AWG18: 0.75 mm²) of the regeneration unit. Connect them to the RG1 and RG2 using the CN4 connector.





- Before connecting the regeneration unit, be sure to remove the jumper wire from the CN1 connector.
- If the allowable power consumption of the regeneration unit exceeds the allowable level, the thermostat will be triggered and the regeneration unit overheat alarm of the driver will generate. If the regeneration unit overheat alarm generates, turn off the power and check the connection or operating condition.

● Regeneration unit specification

Model	RGB100
Allowable current consumption	Continuous regenerative power: 50 W * Instantaneous regenerative power: 600 W
Resistance value	150 Ω
Thermostat operating temperature	Operation: Opens at 150±7 °C (302±12.6 °F) Reset: Closes at 145±12 °C (293±21.6 °F) [normally closed]
Thermostat electrical rating	120 VAC 4 A, 30 VDC 4 A (minimum current: 5 mA)

* Install the regeneration unit in a location where heat dissipation capacity equivalent to a level achieved with a heat sink [made of aluminum, 350×350×3 mm (13.78×13.78×0.12 in.)] is ensured.

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