

5-Phase Stepping Motor

RKII Series/ Motorized actuator equipped with RKII Series Pulse input type

USER MANUAL

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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 of electrical and mechanical engineering should work with the product.

Use the product correctly after thoroughly reading the section "4 Safety precautions" on p.5. In addition, be sure to observe the contents described in warning, caution, and note in this manual.

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.

■ Related operating manuals

For operating manuals, download from Oriental Motor Website Download Page or contact your nearest Oriental Motor sales office.

- **RKII** Series/Motorized actuator equipped with **RKII** Series
USER MANUAL (this manual)

Read the following operating manuals for motorized actuators.

- OPERATING MANUAL Actuator Edition
- Motorized Actuator OPERATING MANUAL Function Setting Edition

■ 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 Overview of the product

This product is a motor and driver package product consisting, 5-phase stepping motor and high-performance microstep driver.

■ Main features

● Energy-saving

Motor and driver losses have been substantially reduced to achieve low heat generation and save energy. Since the motor and driver generate much less heat, they can now be operated for longer hours at high speed, which was not possible with conventional motors/drivers.

● Closely installable compact, slim size driver

This compact size driver helps downsizing and space-saving for the control box and equipment. Since the drivers are available to install closely, the limited space can effectively be utilized.

● Simple wiring

Screwless type connectors have adopted for connection of I/O signals.
The motor can be connected with ease using the dedicated cable/connector assembly.

● Low vibration

Adopting a high performance microstep driver, this product achieved a smooth drive operation with ultra low-vibration, even if the operation was at low speeds.

● Various resolution

The resolution can be selected from 32 types that are in the range of 200 PPR to 200,000 PPR. Also, the same resolution as 2-phase stepping motor can be set.

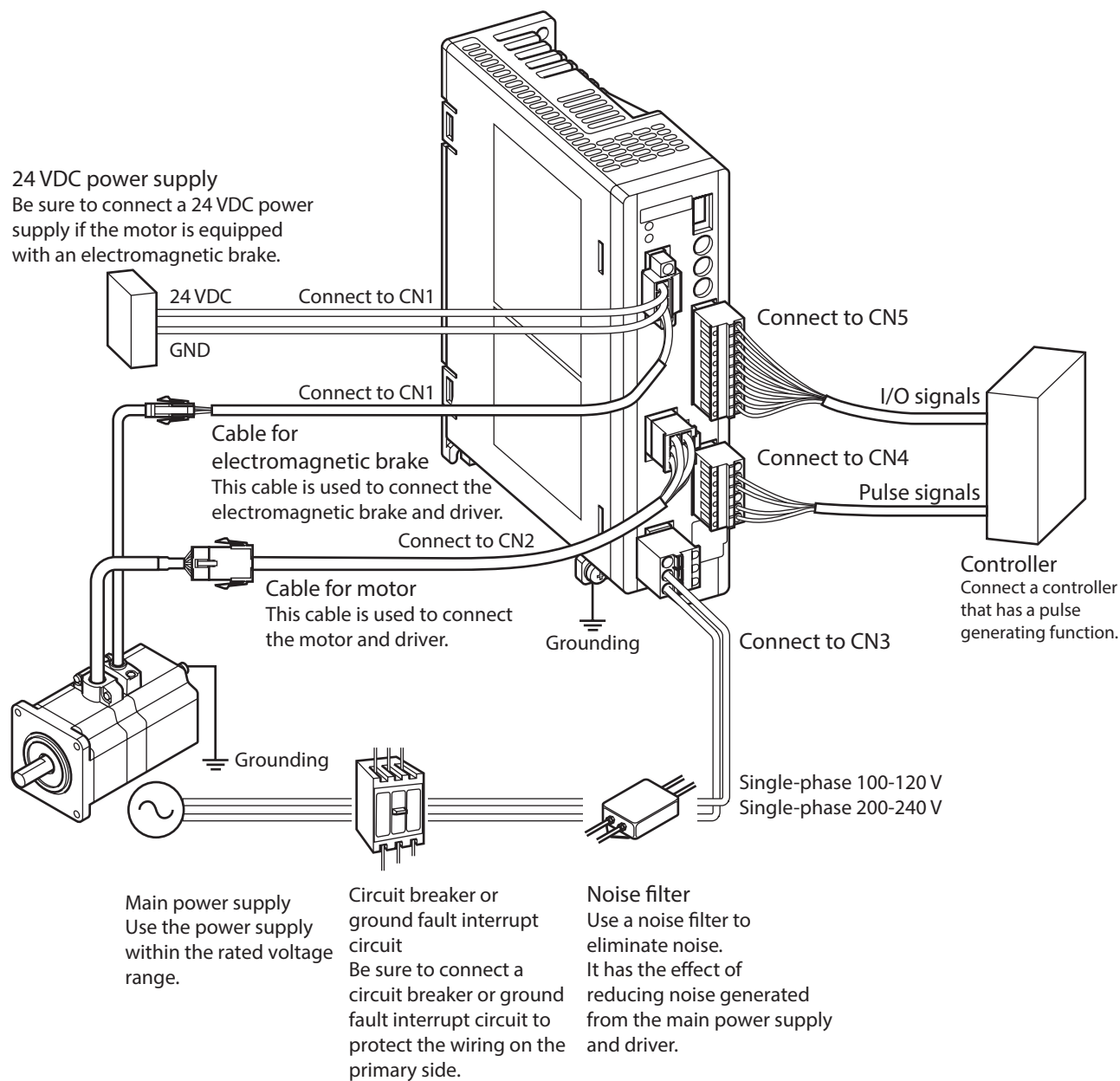
● Automatic control of the electromagnetic brake (electromagnetic brake type only)

This driver controls the electromagnetic brake automatically. The control signal input or the troublesome ladder logic design can be saved.

● Alarm function

The driver provides alarms that are designed to protect the driver from overheating, poor connection, error in operation, etc. (protective functions).




3 System configuration



4 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.
 Note	The items under this heading contain important handling instructions that the user should observe to ensure the safe use of the product.

Description of graphic symbols

	Indicates "prohibited" actions that must not be performed.		Indicates "compulsory" actions that must be performed.
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 WARNING	
	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 use the brake mechanism of an electromagnetic brake motor as a deceleration/safety brake. This may cause injury or damage to the equipment.
	Do not forcibly bend, pull or pinch the cable. This may cause fire or electric shock.
	Do not remove the motor excitation during operation. Doing so may cause the motor to stop and lose the holding force, resulting in injury or damage to equipment.
	Do not touch the connection terminals on the driver immediately (within 10 minute) after the main power supply is turned off. This may cause electric shock.
	Do not disassemble or modify the product. This may cause injury or damage to equipment.
	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 an 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), take measures to hold the moving part in place since the motor stops and loses its holding torque. 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 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.

 WARNING	
	Install the product in an enclosure. Failure to do so may result in electric shock or injury.
	Be sure to ground the driver as it is Class I equipment. Failure to do so may result in electric shock.
	Keep the driver's input-power voltage within the specified range. Failure to do so may result in fire or 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.
	Take safety measures to protect against momentary voltage drops. Failure to do so may cause the motor to stop or reduce the holding force or rotational torque, resulting in injury or damage to equipment.

 CAUTION	
	Do not use the product beyond its specifications. This may cause injury, electric shock 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).
	Do not forcibly bend or pull the cable that was connected to the driver. Doing so may cause damage.
	Do not hold the output shaft or cable. This may cause injury.
	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 touch the rotating parts (output shaft etc.) during operation. This may cause injury.
	Do not touch the terminals while performing the insulation resistance test or dielectric strength test. This may cause electric shock.
	Provide a cover over the rotating parts (output shaft etc.). Failure to do so may result in injury.
	Use a motor and driver only in the specified combination. Failure to do so may result in fire.
	For the 24 VDC 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.
	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. Failure to do so may result in injury or damage to equipment.
	When moving the moving part manually, put the motor into a non-excitation state. Continuing the work while the motor is in an excitation state 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.
	Use only an insulated screwdriver to adjust the driver's switches. Failure to do so may result in electric shock.
	The motor surface temperature may exceed 70 °C (158 °F) even under normal operating conditions. If the operator is allowed to approach the running motor, attach a warning label as shown below in a conspicuous position. Failure to do so may result in skin burn(s).
 <div>Warning label</div>	

■ Warning information

A warning label with handling instructions is attached on the driver. Be sure to observe the instructions on the label when handling the driver.

	WARNING – Risk of electric shock.
	<ul style="list-style-type: none"> • Read manual before installing. • Do not touch the driver for 10 minutes after the power is turned off. Residual voltage may cause electric shock.
	AVERTISSEMENT – Risque de décharge électrique.
	<ul style="list-style-type: none"> • Lire le manuel avant l'installation. • Ne touchez pas les variateur les 10 minutes qui suivent la mise hors tension. La tension résiduelle peut entraîner un choc électrique.
	警告 – けが・感電のおそれがあります。
	<ul style="list-style-type: none"> • 据え付け、運転の前には必ず取扱説明書をお読みください。 • 電源を切った直後、10 分間ドライバに触れないでください。残留電圧により感電の原因になります。

Material: PET

5 Precautions for use

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

- **Be sure to use Oriental Motor cable to connect the motor and the driver.**

Be sure to purchase Oriental Motor cable separately in the following cases. Check the cable models on p.57.

- 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.

- **When conducting the insulation resistance measurement and the dielectric strength test, be sure to separate the connection between 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.

- **Do not apply a radial load and axial load in excess of the specified permissible limit**

Operating the motor under an excessive radial load or axial load may damage the motor bearings (ball bearings). Be sure to operate the motor within the specified permissible limit of radial load and axial load. Refer to p.26 for details.

- **Motor case temperature**

- The driver has an overheat protection function, but the motor has no such feature. The motor surface temperature may exceed 100 °C (212 °F) under certain conditions (operating ambient temperature, operating speed, duty cycle, etc.). To prevent the motor bearings (ball bearings) from reaching its usable life quickly, use the motor in conditions where the surface temperature does not exceed 100 °C (212 °F).
- Use the geared motor in a condition where the gear case temperature does not exceed 70 °C (158 °F), in order to prevent deterioration of grease and parts in the gear case.

- **Holding torque at standstill**

The motor holding torque is reduced by the current cutback function of the driver at motor standstill. When selecting a motor, check the holding torque at motor standstill in the specifications on the catalog.

- **Do not use the electromagnetic brake to reduce speed or as a safety brake.**

Do not use the electromagnetic brake as a means to decelerate and stop the motor. The brake hub of the electromagnetic brake will wear significantly and the braking force will drop if used to stop the motor.

The electromagnetic brake is a power-off activated type. This means that although it helps maintain the position of the load in the event of power outage, etc., this brake cannot securely hold the load in place. Accordingly, do not use the electromagnetic brake as a safety brake. To use the electromagnetic brake to hold the load in place, do so after the motor has stopped.

- **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

- **Preventing electrical noise**

See "10-6 Noise measures" on p.38 for measures with regard to noise.

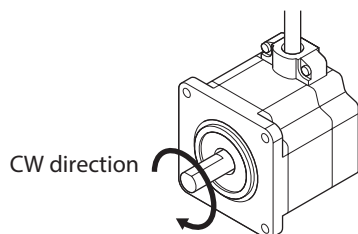
- **Grease of geared motor**

On rare occasions, a small amount of grease may ooze out from the geared motor. If there is concern over possible environmental damage resulting from the leakage of grease, check for grease stains during regular inspections. Alternatively, install an oil pan or other device to prevent leakage from causing further damage. Oil leakage may lead to problems in the customer's equipment or products.

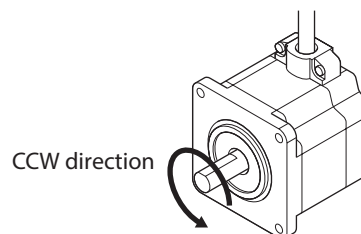
● Rotation direction of the output shaft

The output shaft rotates in the figure at the factory setting.

- 2-pulse input mode
When the CW input is turned from OFF to ON.
- 1-pulse input mode
When the PLS input is turned from OFF to ON in a state where the DIR. input is being ON.



- 2-pulse input mode
When the CCW input is turned from OFF to ON.
- 1-pulse input mode
When the PLS input is turned from OFF to ON in a state where the DIR. input is being OFF.



For geared type, the relationship between the rotation direction of the motor output shaft and that of the gear output shaft changes as follows, depending on the gear type and gear ratio. Check with the following table.

Type of gear	Gear ratio	Rotation direction of the gear output shaft (relative to the motor output shaft)
TS geared	3.6, 7.2, 10	Same direction
	20, 30	Opposite direction
FC geared, PS geared	All gear ratios	Same direction
Harmonic geared	All gear ratios	Opposite direction

● Peak torque of geared motor

Always operate the geared motor under a load not exceeding the peak torque. If the load exceeds the peak torque, the gear will be damaged.

■ Notes when the connection cable is used

Note the following points when Oriental Motor cable is used.

● When inserting the connector

Hold the connector main body, and insert it in straight securely. Inserting the connector in an inclined state may result in damage to terminals or a connection failure.

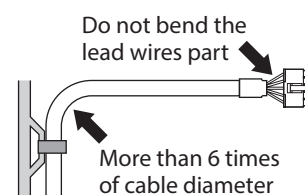
● When pulling out the connector

Pull out the connector in straight while releasing the lock part of the connector. Pulling out the connector with holding the lead wire may result in damage to the connector.

● Bending radius of cable

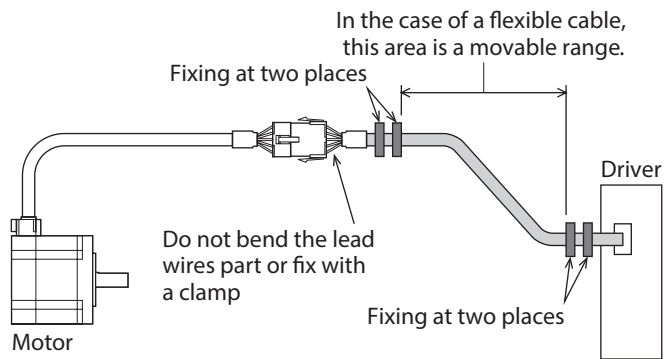
Use the cable in a state where the bending radius of the cable is more than six times of the cable diameter.

Do not bend the lead wires part or fix it with a clamp. Doing so may cause damage to the connector.



- **How to fix the cable**

Fix the cable near the connectors at two places as shown in the figure or fix it with a wide clamp to take measures to prevent stress from being applied to the connectors.



6 Specifications

■ Driver specifications

Maximum input pulse frequency	When the programmable controller is of line driver output: 500 kHz (duty cycle 50 %) When the programmable controller is of open collector output: 250 kHz (duty cycle 50 %) Negative logic pulse input
Input signals	Photocoupler inputs Input signal voltage: 11.4 to 26.4 V [AWO, CS, FREE, ALM-RST] Photocoupler inputs Input signal voltage: 3 to 5.25 V [CW (PLS) +5 V, CCW (DIR.) +5 V] Photocoupler inputs Input signal voltage: 21.6 to 26.4 V [CW (PLS) +24 V, CCW (DIR.) +24 V]
Output signals	Photocoupler/open-collector output External use condition: 30 VDC, 10 mA or less (READY, ALM, TIM)

■ General specifications

		Motor	Driver
Degree of protection		IP20	IP20
Operation environment	Ambient temperature	−10 to +50 °C (+14 to +122 °F) (non-freezing) Harmonic geared type: 0 to +40 °C (+32 to +104 °F) (non-freezing)	0 to +55 °C (+32 to 131 °F) * (non-freezing)
	Humidity	85 % or less (non-condensing)	
	Altitude	Up to 1,000 m (3,300 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)	−25 to +70 °C (−13 to +158 °F) (non-freezing)
	Humidity	85 % or less (non-condensing)	
	Altitude	Up to 3,000 m (10,000 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)	−25 to +70 °C (−13 to +158 °F) (non-freezing)
	Humidity	85 % or less (non-condensing)	
	Altitude	Up to 3,000 m (10,000 ft.) above sea level	
	Surrounding atmosphere	No corrosive gas, dust, water or oil	
Insulation resistance		100 MΩ or more when 500 VDC megger is applied between the following places: • Case - Motor windings • Case - Electromagnetic brake windings	100 MΩ or more when 500 VDC megger is applied between the following places: • PE terminal - Power supply terminals • Signal I/O terminals - Power supply terminals
Dielectric strength		Sufficient to withstand the following for 1 minute • Case - Motor windings 1.5 kVAC 50/60 Hz • Case - Electromagnetic brake windings 1.5 kVAC 50/60 Hz	Sufficient to withstand the following for 1 minute: • PE terminal - Power supply terminals 1.8 kVAC 50/60 Hz • Signal I/O terminals - Power supply terminals 1.9 kVAC 50/60 Hz

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

7 Regulations and standards

7-1 UL Standards

Check the "APPENDIX UL Standards and CSA Standards for **RKII** Series" for recognition information about UL Standards.

7-2 CE Marking

This product is affixed with the mark under the following directives.

■ Low Voltage Directive

● Installation conditions

The installation conditions are common for motors and drivers.

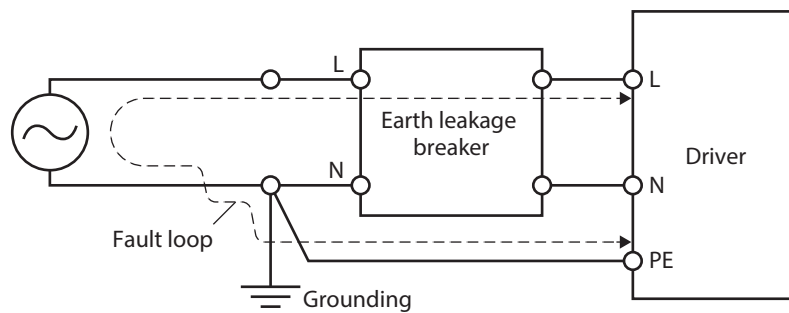
Item	Motor	Driver
Overvoltage category	II	II
Pollution degree	2	2
Degree of protection	IP20	IP20
Protection against electric shock	Class I	Class I

- This product cannot be used in IT power distribution systems.
- Isolate the motor cable, the power supply cable and other drive cables from the signal cables by means of double insulation.
- The temperature of the driver's heat sink may exceed 90 °C (194 °F) depending on the driving condition. Observe the followings.
 - Be sure to perform test operation and check the driver temperature.
 - Do not use the driver near combustibles.
 - Do not touch the driver while operating.
- Use a circuit breaker conforming to EN or IEC Standards.
- The driver is not provided with the electronic motor overload protection and the motor overtemperature protection specified in EN Standards.
- The driver is not provided with the ground fault protection circuit. Wire the product in accordance with "Example of wiring to power supply considering ground fault protection." Also observe the followings.
 - Earth leakage breaker: Rated current 15 A, rated sensitivity current 30 mA
 - When connecting to a power supply of Overvoltage category III, use an insulation transformer to ground its secondary side (N for single-phase).
 - Fault loop impedance: Equal to or less than the value in table

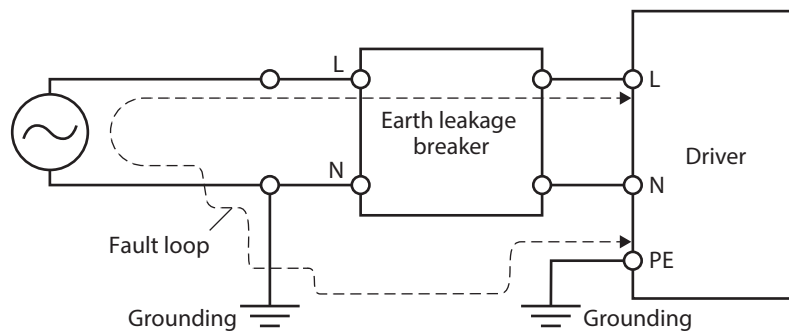
Power supply specifications of driver	Fault loop impedance
Single-phase 100-200 VAC	500 Ω
Single-phase 200-240 VAC	1,000 Ω

● Example of wiring to power supply considering ground fault protection

- TN power distribution systems



- TT power distribution systems



■ EMC Directive

Refer to "10-7 Conformity to the EMC Directive" on p.39 for details about conformity.

■ RoHS Directive

This product does not contain the substances exceeding the restriction values.

8 Preparation

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

8-1 Checking the product

Verify that the items listed below are included. Report any missing or damaged items to the Oriental Motor sales office from which you purchased the product.
The motor and driver package names and corresponding motor/driver combinations are listed "8-5 Combinations of motors and drivers" on p.18.

● **Motor**

- Motor 1 unit
- Cable for motor 1 pc. *1
- Cable for electromagnetic brake 1 pc. *2
- Parallel key 1 pc. *3
- Motor mounting screw (M4) 4 pcs. *4
- Motor mounting screw (M8) 4 pcs. *5
- Instructions and Precautions for Safe Use 1 copy
- APPENDIX UL Standards and CSA Standards for **RKII** Series 1 copy

*1 When the product is included with a connection cable.
*2 When the product is a motor with an electromagnetic brake included with a connection cable.
*3 Included with geared types; except for the **PKE543-TS**.
*4 Included with **PKE564-TS**.
*5 Included with **PKE596-TS**.

● **Driver**

- Driver 1 unit
 - CN1 connector (4 pins) 1 pc. *
 - CN3 connector (3 pins) 1 pc.
 - CN4 connector (6 pins) 1 pc.
 - CN5 connector (9 pins) 1 pc.
 - Instructions and Precautions for Safe Use 1 copy
- * When the product is a motor with an electromagnetic brake.

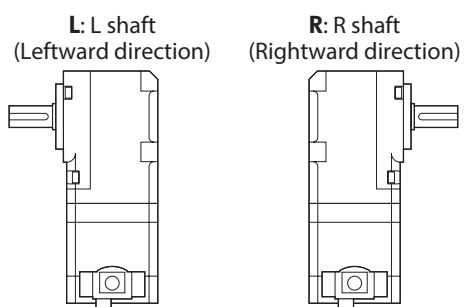
8-2 How to identify the product model (Motor and driver package)

RKS 5 6 4 A C - HS 50 □ □ -3
 1 2 3 4 5 6 7 8 9 10 11

1	Series name	RKII Series
2	5-phase	
3	Motor frame size	4: 42 mm (1.65 in.) 6: 60 mm (2.36 in.) 9: 85 mm (3.35 in.) [90 mm (3.54 in) for geared types]
4	Motor case length	
5	Motor type	A: Single shaft B: Double shaft M: With electromagnetic brake
6	Power supply input	A: Single-phase 100-120 V C: Single-phase 200-240 V
7	Geared type	TS: TS geared FC: FCgeared PS: PS geared HS: Harmonic geared Blank: Standard
8	Gear ratio	
9	Output shaft direction*1*2	L: L shaft (Leftward direction) R: R shaft (Rightward direction)
10	Motor identification*1	A: Solid shaft
11	Length of connection cable	Number: Length of included connection cable (m) None: Without connection cable

*1 **FC** geared type only.

*2 The direction of the output shaft represents that as the view from the motor cable outlet side.



8-3 How to identify the product model (Individual model)

Check the model name of the motor and driver against the model name shown on the nameplate.
Refer to p.17 for how to identify the nameplate.

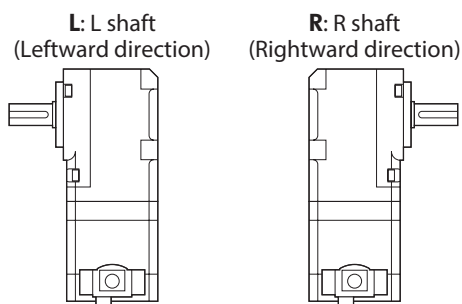
■ Motor

PKE 5 4 5 A C - FC 7.2 L A
 1 2 3 4 5 6 7 8 9 10

1	Series name	RKII Series motor
2	5-phase	
3	Motor frame size	4 : 42 mm (1.65 in.) 6 : 60 mm (2.36 in.) 9 : 85 mm (3.35 in.) [90 mm (3.54 in) for geared types]
4	Motor case length	
5	Motor type	A : Single shaft B : Double shaft M : With electromagnetic brake
6	Power supply input	C : AC power input type
7	Geared type	TS : TS geared PS : PS geared FC : FC geared HS : Harmonic geared
8	Gear ratio	
9	Output shaft direction*1*2	L : L shaft (Leftward direction) R : R shaft (Rightward direction)
10	Motor identification*1	A : Solid shaft

*1 **FC** geared type only.

*2 The direction of the output shaft represents that as the view from the motor cable outlet side.



■ Driver

RKSD 5 07 M - A
 1 2 3 4 5

1	Series name	RKSD : RKII Series driver
2	5-phase	
3	Rated current	
4	Electromagnetic brake	M : For products with electromagnetic brake Blank: For products without electromagnetic brake
5	Power supply input	A : Single-phase 100-120 V C : Single-phase 200-240 V

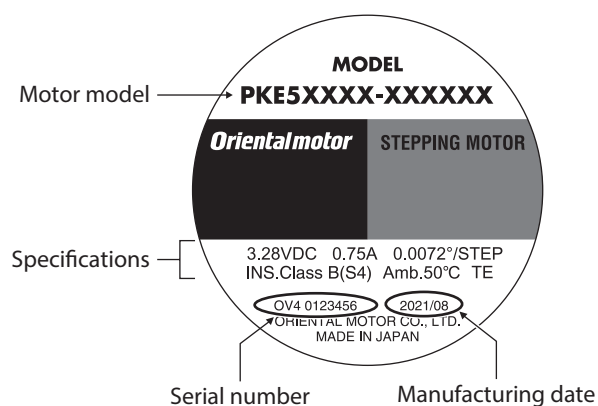
8-4 Information about nameplate

The figure shows an example.

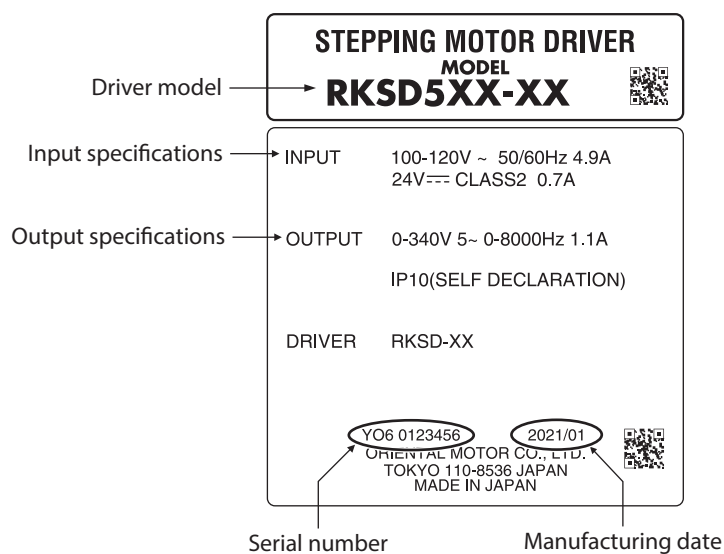


The position describing the information may vary depending on the product.

■ Motor



■ Driver



8-5 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.

- The box (■) in the model name indicates **A** (single-phase 100-120 V) or **C** (single-phase 200-240 V).
- When the connection cable is included, the box (○) in the model name indicates a number (-1, -2, -3) representing the cable length.

● Standard type (single shaft)

Model	Motor model	Driver model
RKS543A■○	PKE543AC	RKSD503-■
RKS544A■○	PKE544AC	
RKS545A■○	PKE545AC	
RKS564A■○	PKE564AC	RKSD507-■
RKS566A■○	PKE566AC	
RKS569A■○	PKE569AC	
RKS596A■○	PKE596AC	
RKS599A■○	PKE599AC	
RKS5913A■○	PKE5913AC	

● Standard type (double shaft)

Model	Motor model	Driver model
RKS543B■○	PKE543BC	RKSD503-■
RKS544B■○	PKE544BC	
RKS545B■○	PKE545BC	
RKS564B■○	PKE564BC	RKSD507-■
RKS566B■○	PKE566BC	
RKS569B■○	PKE569BC	
RKS596B■○	PKE596BC	
RKS599B■○	PKE599BC	
RKS5913B■○	PKE5913BC	

● Standard type (with electromagnetic brake)

Model	Motor model	Driver model
RKS543M■○	PKE543MC	RKSD503M-■
RKS544M■○	PKE544MC	
RKS545M■○	PKE545MC	
RKS564M■○	PKE564MC	RKSD507M-■
RKS566M■○	PKE566MC	
RKS569M■○	PKE569MC	
RKS596M■○	PKE596MC	
RKS599M■○	PKE599MC	
RKS5913M■○	PKE5913MC	

● TS geared type (single shaft)

Model	Motor model	Driver model
RKS543A■-TS3.6○	PKE543AC-TS3.6	RKSD503-■
RKS543A■-TS7.2○	PKE543AC-TS7.2	
RKS543A■-TS10○	PKE543AC-TS10	
RKS543A■-TS20○	PKE543AC-TS20	
RKS543A■-TS30○	PKE543AC-TS30	
RKS564A■-TS3.6○	PKE564AC-TS3.6	RKSD507-■
RKS564A■-TS7.2○	PKE564AC-TS7.2	
RKS564A■-TS10○	PKE564AC-TS10	
RKS564A■-TS20○	PKE564AC-TS20	
RKS564A■-TS30○	PKE564AC-TS30	
RKS596A■-TS3.6○	PKE596AC-TS3.6	
RKS596A■-TS7.2○	PKE596AC-TS7.2	
RKS596A■-TS10○	PKE596AC-TS10	
RKS596A■-TS20○	PKE596AC-TS20	
RKS596A■-TS30○	PKE596AC-TS30	

● TS geared type (double shaft)

Model	Motor model	Driver model
RKS543B■-TS3.6○	PKE543BC-TS3.6	RKSD503-■
RKS543B■-TS7.2○	PKE543BC-TS7.2	
RKS543B■-TS10○	PKE543BC-TS10	
RKS543B■-TS20○	PKE543BC-TS20	
RKS543B■-TS30○	PKE543BC-TS30	
RKS564B■-TS3.6○	PKE564BC-TS3.6	RKSD507-■
RKS564B■-TS7.2○	PKE564BC-TS7.2	
RKS564B■-TS10○	PKE564BC-TS10	
RKS564B■-TS20○	PKE564BC-TS20	
RKS564B■-TS30○	PKE564BC-TS30	
RKS596B■-TS3.6○	PKE596BC-TS3.6	
RKS596B■-TS7.2○	PKE596BC-TS7.2	
RKS596B■-TS10○	PKE596BC-TS10	
RKS596B■-TS20○	PKE596BC-TS20	
RKS596B■-TS30○	PKE596BC-TS30	

● TS geared type (with electromagnetic brake)

Model	Motor model	Driver model
RKS543M■-TS3.6○	PKE543MC-TS3.6	RKSD503M-■
RKS543M■-TS7.2○	PKE543MC-TS7.2	
RKS543M■-TS10○	PKE543MC-TS10	
RKS543M■-TS20○	PKE543MC-TS20	
RKS543M■-TS30○	PKE543MC-TS30	
RKS564M■-TS3.6○	PKE564MC-TS3.6	RKSD507M-■
RKS564M■-TS7.2○	PKE564MC-TS7.2	
RKS564M■-TS10○	PKE564MC-TS10	
RKS564M■-TS20○	PKE564MC-TS20	
RKS564M■-TS30○	PKE564MC-TS30	
RKS596M■-TS3.6○	PKE596MC-TS3.6	
RKS596M■-TS7.2○	PKE596MC-TS7.2	
RKS596M■-TS10○	PKE596MC-TS10	
RKS596M■-TS20○	PKE596MC-TS20	
RKS596M■-TS30○	PKE596MC-TS30	

● FC geared type (single shaft)

Model	Motor model	Driver model
RKS545A■-FC7.2LA○	PKE545AC-FC7.2LA	RKSD503-■
RKS545A■-FC7.2RA○	PKE545AC-FC7.2RA	
RKS545A■-FC10LA○	PKE545AC-FC10LA	
RKS545A■-FC10RA○	PKE545AC-FC10RA	
RKS545A■-FC20LA○	PKE545AC-FC20LA	
RKS545A■-FC20RA○	PKE545AC-FC20RA	
RKS545A■-FC30LA○	PKE545AC-FC30LA	
RKS545A■-FC30RA○	PKE545AC-FC30RA	
RKS566A■-FC7.2LA○	PKE566AC-FC7.2LA	RKSD507-■
RKS566A■-FC7.2RA○	PKE566AC-FC7.2RA	
RKS566A■-FC10LA○	PKE566AC-FC10LA	
RKS566A■-FC10RA○	PKE566AC-FC10RA	
RKS566A■-FC20LA○	PKE566AC-FC20LA	
RKS566A■-FC20RA○	PKE566AC-FC20RA	
RKS566A■-FC30LA○	PKE566AC-FC30LA	
RKS566A■-FC30RA○	PKE566AC-FC30RA	

● PS geared type (single shaft)

Model	Motor model	Driver model
RKS545A■-PS5○	PKE545AC-PS5	RKSD503-■
RKS545A■-PS7.2○	PKE545AC-PS7.2	
RKS545A■-PS10○	PKE545AC-PS10	
RKS543A■-PS25○	PKE543AC-PS25	
RKS543A■-PS36○	PKE543AC-PS36	
RKS543A■-PS50○	PKE543AC-PS50	
RKS566A■-PS5○	PKE566AC-PS5	RKSD507-■
RKS566A■-PS7.2○	PKE566AC-PS7.2	
RKS566A■-PS10○	PKE566AC-PS10	
RKS564A■-PS25○	PKE564AC-PS25	
RKS564A■-PS36○	PKE564AC-PS36	
RKS564A■-PS50○	PKE564AC-PS50	
RKS599A■-PS5○	PKE599AC-PS5	
RKS599A■-PS7.2○	PKE599AC-PS7.2	
RKS599A■-PS10○	PKE599AC-PS10	
RKS596A■-PS25○	PKE596AC-PS25	
RKS596A■-PS36○	PKE596AC-PS36	
RKS596A■-PS50○	PKE596AC-PS50	

● PS geared type (double shaft)

Model	Motor model	Driver model
RKS545B■-PS5○	PKE545BC-PS5	RKSD503-■
RKS545B■-PS7.2○	PKE545BC-PS7.2	
RKS545B■-PS10○	PKE545BC-PS10	
RKS543B■-PS25○	PKE543BC-PS25	
RKS543B■-PS36○	PKE543BC-PS36	
RKS543B■-PS50○	PKE543BC-PS50	
RKS566B■-PS5○	PKE566BC-PS5	RKSD507-■
RKS566B■-PS7.2○	PKE566BC-PS7.2	
RKS566B■-PS10○	PKE566BC-PS10	
RKS564B■-PS25○	PKE564BC-PS25	
RKS564B■-PS36○	PKE564BC-PS36	
RKS564B■-PS50○	PKE564BC-PS50	
RKS599B■-PS5○	PKE599BC-PS5	
RKS599B■-PS7.2○	PKE599BC-PS7.2	
RKS599B■-PS10○	PKE599BC-PS10	
RKS596B■-PS25○	PKE596BC-PS25	
RKS596B■-PS36○	PKE596BC-PS36	
RKS596B■-PS50○	PKE596BC-PS50	

● PS geared type (with electromagnetic brake)

Model	Motor model	Driver model
RKS545M■-PS5○	PKE545MC-PS5	RKSD503M-■
RKS545M■-PS7.2○	PKE545MC-PS7.2	
RKS545M■-PS10○	PKE545MC-PS10	
RKS543M■-PS25○	PKE543MC-PS25	
RKS543M■-PS36○	PKE543MC-PS36	
RKS543M■-PS50○	PKE543MC-PS50	
RKS566M■-PS5○	PKE566MC-PS5	RKSD507M-■
RKS566M■-PS7.2○	PKE566MC-PS7.2	
RKS566M■-PS10○	PKE566MC-PS10	
RKS564M■-PS25○	PKE564MC-PS25	
RKS564M■-PS36○	PKE564MC-PS36	
RKS564M■-PS50○	PKE564MC-PS50	
RKS599M■-PS5○	PKE599MC-PS5	
RKS599M■-PS7.2○	PKE599MC-PS7.2	
RKS599M■-PS10○	PKE599MC-PS10	
RKS596M■-PS25○	PKE596MC-PS25	
RKS596M■-PS36○	PKE596MC-PS36	
RKS596M■-PS50○	PKE596MC-PS50	

● Harmonic geared type (single shaft)

Model	Motor model	Driver model
RKS543A■-HS50○	PKE543AC-HS50	RKSD503-■
RKS543A■-HS100○	PKE543AC-HS100	
RKS564A■-HS50○	PKE564AC-HS50	RKSD507-■
RKS564A■-HS100○	PKE564AC-HS100	
RKS596A■-HS50○	PKE596AC-HS50	
RKS596A■-HS100○	PKE596AC-HS100	

● Harmonic geared type (double shaft)

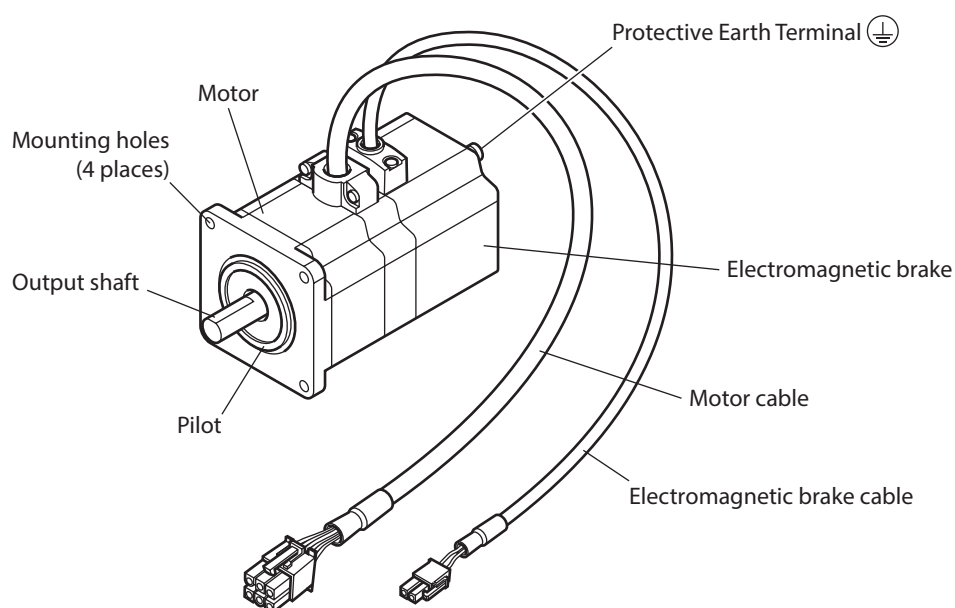
Model	Motor model	Driver model
RKS543B■-HS50○	PKE543BC-HS50	RKSD503-■
RKS543B■-HS100○	PKE543BC-HS100	
RKS564B■-HS50○	PKE564BC-HS50	RKSD507-■
RKS564B■-HS100○	PKE564BC-HS100	
RKS596B■-HS50○	PKE596BC-HS50	
RKS596B■-HS100○	PKE596BC-HS100	

● Harmonic geared type (with electromagnetic brake)

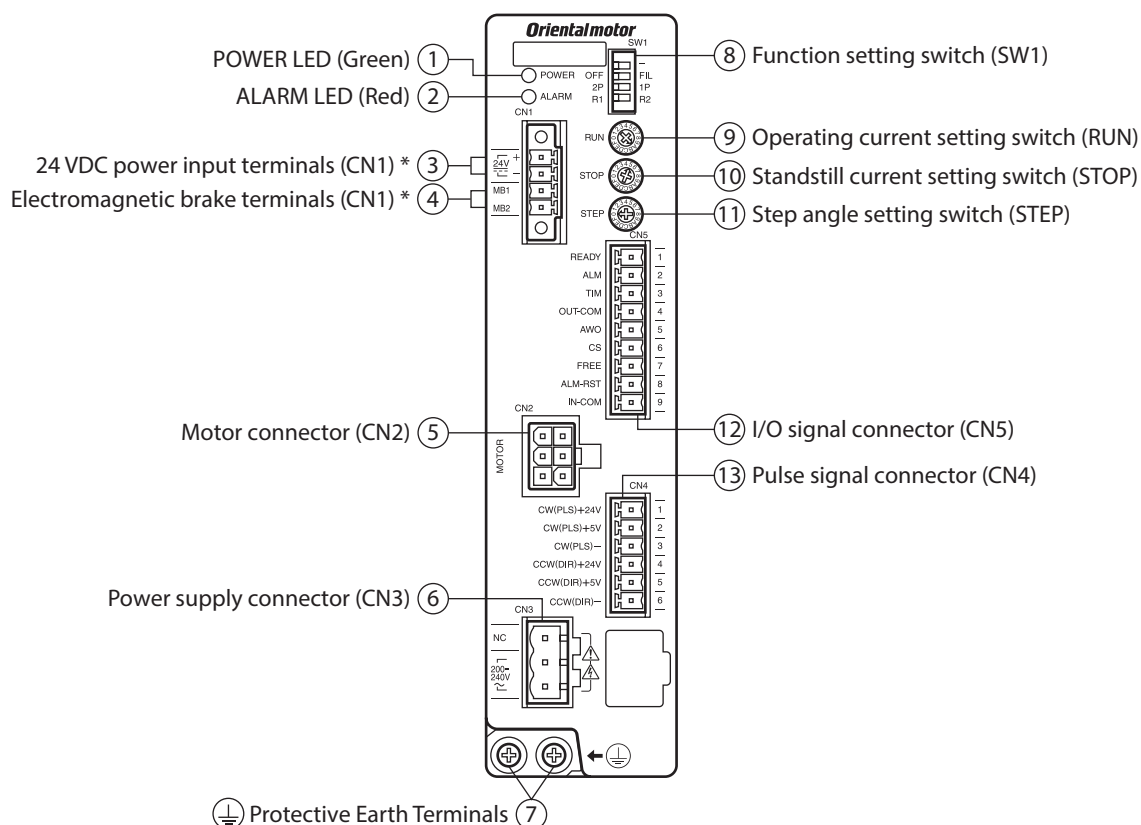
Model	Motor model	Driver model
RKS543M■-HS50○	PKE543MC-HS50	RKSD503M-■
RKS543M■-HS100○	PKE543MC-HS100	
RKS564M■-HS50○	PKE564MC-HS50	RKSD507M-■
RKS564M■-HS100○	PKE564MC-HS100	
RKS596M■-HS50○	PKE596MC-HS50	
RKS596M■-HS100○	PKE596MC-HS100	

8-6 Names and functions of parts

■ Motor (example: electromagnetic brake motor)

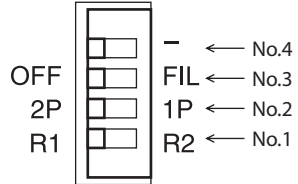


■ Driver front side (example: electromagnetic brake type)

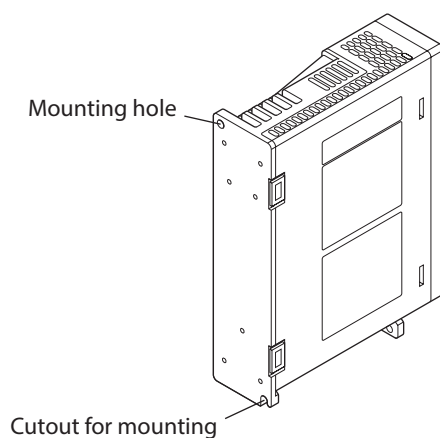


* Electromagnetic brake type only

No.	Name	Description	Ref
1	POWER LED (Green)	This LED is lit while the main power supply is input.	—
2	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.	p.53
3	24 VDC power input terminals (CN1: 24V+, 24V-)	Connects the 24 VDC power supply for electromagnetic brake. (electromagnetic brake motor only)	p.31
4	Electromagnetic brake terminals (CN1: MB1, MB2)	Connects the lead wires of the "cable for electromagnetic brake." (electromagnetic brake motor only) MB1: Electromagnetic brake – (black) MB2: Electromagnetic brake + (white)	
5	Motor connector (CN2)	Connects the motor using the "cable for motor."	
6	Power supply connector (CN3)	Connects the main power supply.	p.32
7	Protective Earth Terminals (⏏)	Used for grounding via a grounding cable of AWG16 to 14 (1.25 to 2.0 mm ²).	p.38

No.	Name	Description	Ref
8	Function setting switch (SW1)	 <ul style="list-style-type: none"> • No.1: This switch is used to set the motor step angle in combination with the step angle setting switch. (R1/R2) • No.2: This switch is used to set the pulse input mode. (2P/1P) • No.3: This switch is used to set the motor response corresponding to input pulses can be adjusted. (OFF/FIL) • No.4: Not used. 	p.49
9	Operating current setting switch (RUN)	This switch is used to set the motor operating current.	p.50
10	Standstill current setting switch (STOP)	This switch is used to set the motor standstill current.	
11	Step angle setting switch (STEP)	This switch is used to set the motor step angle in combination with SW1-No.1 (R1/R2) of the function setting switch.	p.49
12	I/O signal connector (CN5)	Connects the input/output signals.	p.33
13	Pulse signal connector (CN4)	Connects the pulse signals.	

■ Driver rear side



9 Installation

This chapter explains the installation location and installation methods of the motor and driver, along with load installation.

9-1 Location for installation

The motor and driver are designed and manufactured to be incorporated in equipment. Install them in a well-ventilated location that provides easy access for inspection.

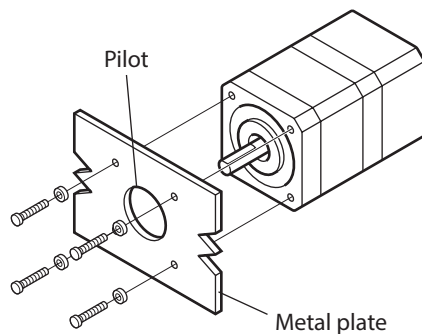
The location must also satisfy the following conditions:

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature
 - Motor: -10 to $+50$ °C ($+14$ to $+122$ °F) (non-freezing)
 - Harmonic geared type: 0 to $+40$ °C ($+32$ to $+104$ °F) (non-freezing)
 - Driver: 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
- 1,000 m (3,300 ft.) or lower above sea level

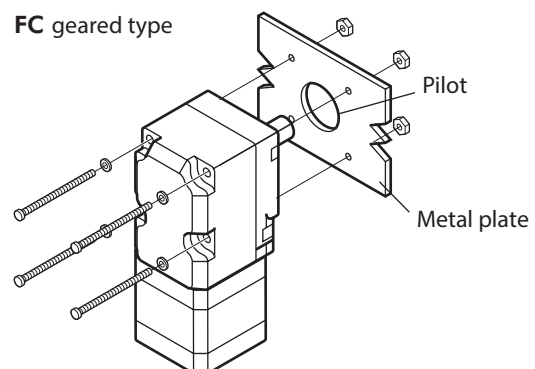
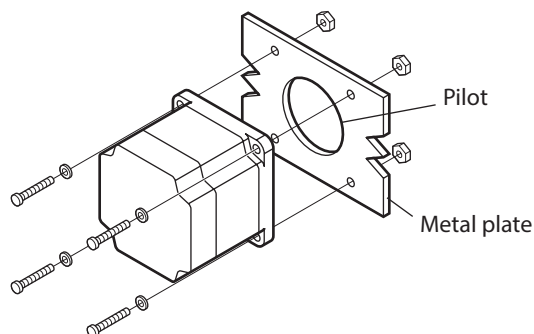
9-2 Installing the motor

The motor can be installed in any direction. To allow for heat dissipation and prevent vibration, install the motor on a metal surface of sufficient strength. For **PKE564-TS** and **PKE596-TS**, install the motor using the included screws. Values of the tightening torque are recommended. Tighten the screws with a suitable torque according to the design conditions of the metal plate to be installed.

● Installation method A



● Installation method B



● **Nominal size, tightening torque and installation method**

Type	Model	Nominal size	Tightening torque [N·m (oz·in)]	Effective depth of screw thread [mm (in.)]	Installation method
Standard	PKE54	M3	1 (142)	4.5 (0.177)	A
	PKE56	M4	2 (280)	—	B
	PKE59	M6	3 (420)		
TS geared	PKE54	M4	2 (280)	8 (0.315)	A
	PKE56	M4	2 (280)	—	B
	PKE59	M8	4 (560)		
FC geared	PKE54	M4	2 (280)	—	B
	PKE56	M5	2.5 (350)		
PS geared	PKE54	M4	2 (280)	8 (0.315)	A
	PKE56	M5	2.5 (350)	10 (0.394)	
	PKE59	M8	4 (560)	15 (0.591)	
Harmonic geared	PKE54	M4	2 (280)	8 (0.315)	A
	PKE56	M5	2.5 (350)	10 (0.394)	
	PKE59	M8	4 (560)	—	B

9-3 Installing a load

This section describes how to install a load to the motor.

Note

- When installing a load on the output shaft, pay attention to centering, belt tension, parallelism of pulleys, etc. Also, securely tighten the screws of a coupling or pulley.
- When installing a coupling or pulley on the output shaft, be careful not to damage to the output shaft or the bearing (ball bearings).
- Do not modify or machine the output shaft. Doing so may damage the bearing (ball bearings), resulting in damage to the motor.
- When removing the parallel key from the output shaft, be careful not to apply excessive force with a hammer or other tool. Doing so may damage the output shaft or bearing (ball bearings).

● **Using a coupling**

Align the axis of rotation for the output shaft and load in a straight line.

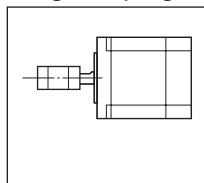
● **Using a belt**

- Align the axis of rotation for the output shaft and load parallel to each other.
- Make the axis of rotation for the output shaft and load perpendicular to a line connecting the centers of the two pulleys.

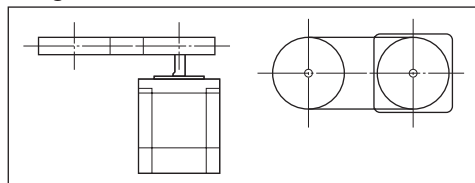
● **Using a gear drive**

- Align the output shaft and gear axis parallel to each other.
- Properly engage the centers of the gear tooth surfaces.

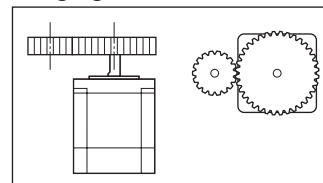
Using a coupling



Using a belt



Using a gear drive

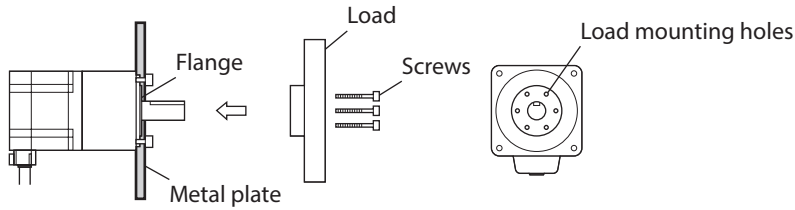


● **Using a key to fasten (geared motor)**

When installing a load on the output shaft with a machined key slot, machine a key slot on the load side and secure the load and output shaft with the included key.

● Installing on the flange surface (Harmonic geared type)

With a Harmonic geared type (excluding **PKE596**), a load can be installed directly to the gear using the load mounting holes provided on the flange surface.



Model	Nominal size	Number of screw	Tightening torque [N·m (oz-in)]	Effective depth of screw thread [mm (in.)]
PKE543	M3	6	1.4 (198)	5 (0.2)
PKE564	M4	6	2.5 (350)	6 (0.24)



- When installing a load on the flange surface, the load cannot be mounted using the key slot in the output shaft.
- Design an appropriate installation layout so that the load will not contact the metal plate or screws used for installing the motor.

9-4 Permissible radial load and permissible axial load

The radial load and the axial load on the motor's output shaft must be kept under the permissible values listed below.



Failure due to fatigue may occur when the motor bearings and output shaft are subject to repeated loading by a radial or axial load that is in excess of the permissible limit.



The permissible radial load and permissible axial load of the **PS** geared type represent the value that the service life of the gear part satisfies 20,000 hours when either of the radial load or axial load is applied to the gear output shaft.

Type	Motor model	Gear ratio	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
			Distance from the tip of output shaft [mm (in.)]					
			0 (0)	5 (0.20)	10 (0.39)	15 (0.59)	20 (0.79)	
Standard	PKE54	—	35 (7.8)	44 (9.9)	58 (13)	85 (19.1)	—	15 (3.3)
	PKE56		90 (20)	100 (22)	130 (29)	180 (40)	270 (60)	30 (6.7)
	PKE59		260 (58)	290 (65)	340 (76)	390 (87)	480 (108)	60 (13.5)
TS geared	PKE54	3.6, 7.2, 10	20 (4.5)	30 (6.7)	40 (9)	50 (11.2)	—	15 (3.3)
		20, 30	40 (9)	50 (11.2)	60 (13.5)	70 (15.7)	—	
	PKE56	3.6, 7.2, 10	120 (27)	135 (30)	150 (33)	165 (37)	180 (40)	40 (9)
		20, 30	170 (38)	185 (41)	200 (45)	215 (48)	230 (51)	
	PKE59	3.6, 7.2, 10	300 (67)	325 (73)	350 (78)	375 (84)	400 (90)	150 (33)
		20, 30	400 (90)	450 (101)	500 (112)	550 (123)	600 (135)	
FC geared	PKE54	7.2, 10 20, 30	180 (40)	200 (45)	220 (49)	250 (56)	—	100 (22)
	PKE56		270 (60)	290 (65)	310 (69)	330 (74)	350 (78)	200 (45)
PS geared	PKE54	5	70 (15.7)	80 (18)	95 (21)	120 (27)	—	100 (22)
		7.2	80 (18)	90 (20)	110 (24)	140 (31)	—	
		10	85 (19.1)	100 (22)	120 (27)	150 (33)	—	
		25	120 (27)	140 (31)	170 (38)	210 (47)	—	
		36	130 (29)	160 (36)	190 (42)	240 (54)	—	
		50	150 (33)	170 (38)	210 (47)	260 (58)	—	

Type	Motor model	Gear ratio	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
			Distance from the tip of output shaft [mm (in.)]					
			0 (0)	5 (0.20)	10 (0.39)	15 (0.59)	20 (0.79)	
PS geared	PKE56	5	170 (38)	200 (45)	230 (51)	270 (60)	320 (72)	200 (45)
		7.2	200 (45)	220 (49)	260 (58)	310 (69)	370 (83)	
		10	220 (49)	250 (56)	290 (65)	350 (78)	410 (92)	
		25	300 (67)	340 (76)	400 (90)	470 (105)	560 (126)	
		36	340 (76)	380 (85)	450 (101)	530 (119)	630 (141)	
		50	380 (85)	430 (96)	500 (112)	600 (135)	700 (157)	
	PKE59	5	380 (85)	420 (94)	470 (105)	540 (121)	630 (141)	600 (135)
		7.2	430 (96)	470 (105)	530 (119)	610 (137)	710 (159)	
		10	480 (108)	530 (119)	590 (132)	680 (153)	790 (177)	
		25	650 (146)	720 (162)	810 (182)	920 (200)	1,070 (240)	
		36	730 (164)	810 (182)	910 (200)	1,040 (230)	1,210 (270)	
		50	820 (184)	910 (200)	1,020 (220)	1,160 (260)	1,350 (300)	
Harmonic geared	PKE543	50, 100	180 (40)	220 (49)	270 (60)	360 (81)	510 (114)	220 (49)
	PKE564		320 (72)	370 (83)	440 (99)	550 (123)	720 (162)	450 (101)
	PKE596		1,090 (240)	1,150 (250)	1,230 (270)	1,310 (290)	1,410 (310)	1,300 (290)

■ Permissible moment load of the Harmonic geared type

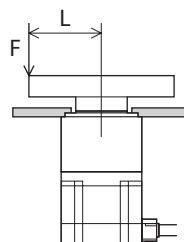
When installing an arm or table on the flange surface, calculate the moment load using the formula below if the flange surface receives any eccentric load. The moment load should not exceed the permissible value specified in the table.

L: Distance from the center of the output flange (m)

F: External force (N)

Moment load: $M \text{ (N·m)} = F \times L$

Motor model	Permissible moment load (N·m)
PKE543	5.6
PKE564	11.6



9-5 Installing the driver

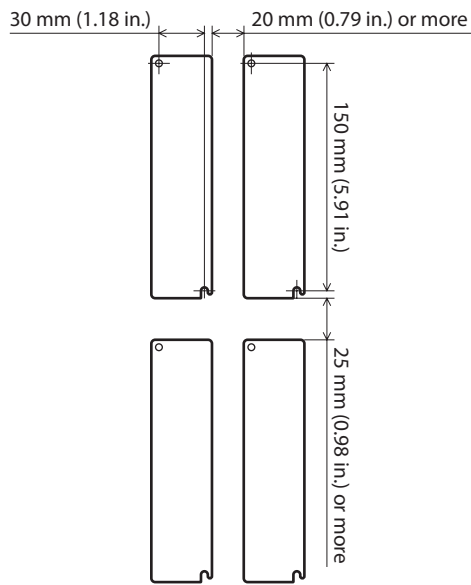
The driver is designed so that heat is dissipated via air convection and conduction through the enclosure. Install the driver on a flat metal plate [material: aluminium, 200×200×2 mm (7.87×7.87×0.08 in.) equivalent] having excellent heat conductivity.

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 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.

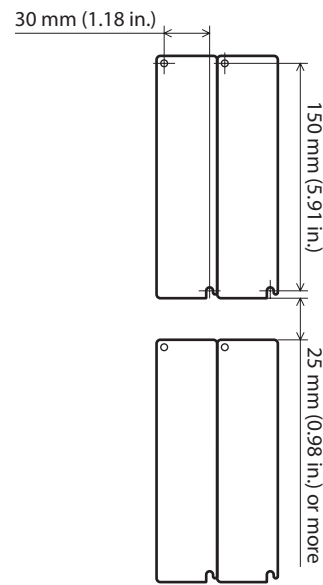
When installing two or more drivers in parallel, it is possible to install them closely in the horizontal direction. In this case, use the drivers in conditions that an ambient temperature is 0 to +40 °C (+32 to +104 °F) and the standstill current is 50 % or less.

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

- When installing drivers while keeping clearances in the horizontal and vertical directions.



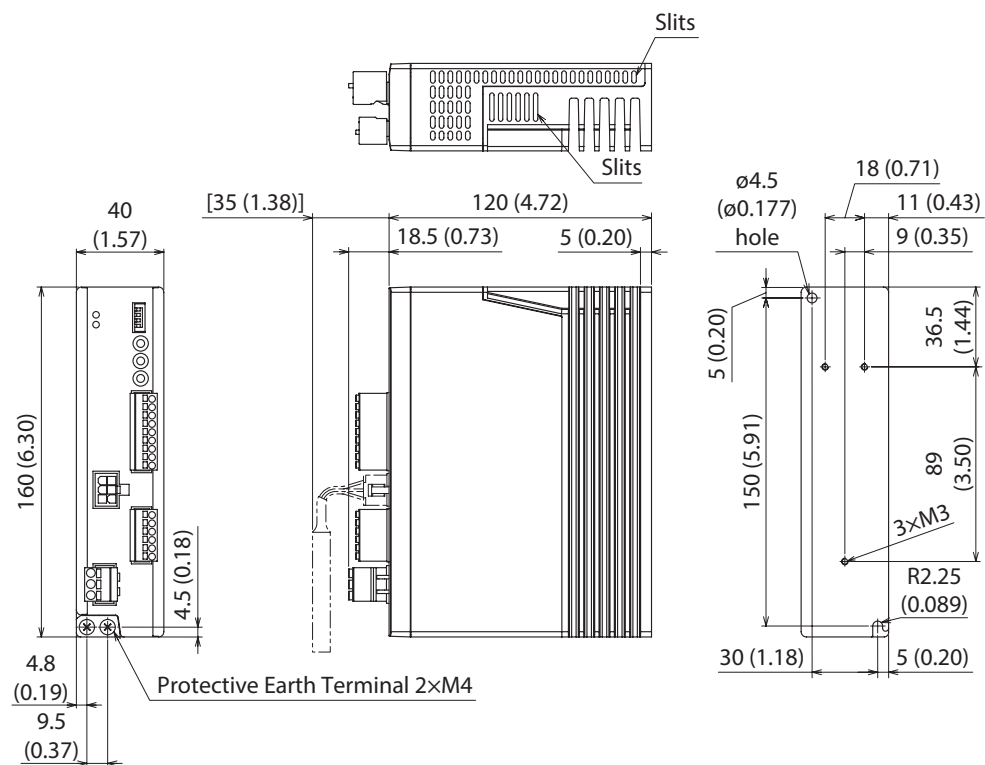
- When installing drivers closely in the horizontal direction.



- 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. Also, when the standstill current is set to 60 %, use the driver in a condition that an ambient temperature does not exceed 50 °C (122 °F). See p.50 for the standstill current.
- Be sure to install the driver vertically (vertical position).

Dimension [unit: mm (in.)]

Mass: 0.8 kg (1.76 lb)



10 Connection

This chapter explains how to connect the motor, I/O signals and power supply to the driver, as well as grounding method. The installation and wiring methods in compliance with the EMC Directive as well as protection against noise are also explained.

⚠ WARNING

- For protection against electric shock, do not turn on the power supply until the wiring is completed.
- A high voltage is applied to the motor connector (CN2) and the power supply input terminal (CN3). Do not touch these terminals while the power is on. Doing so may result in fire or electric shock.

10-1 Connection example

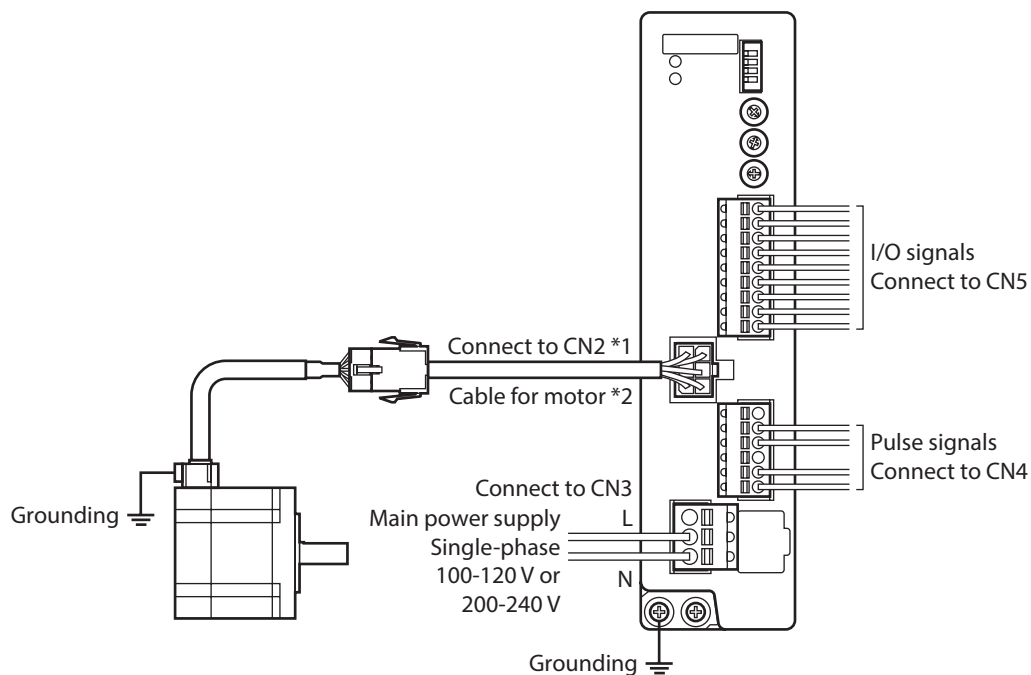
Note

- 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 main power supply and wait for minimum 10 minutes before doing so. 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.

memo

- When unplugging the connector, 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. For the flexible motor cable, refer to p.57.

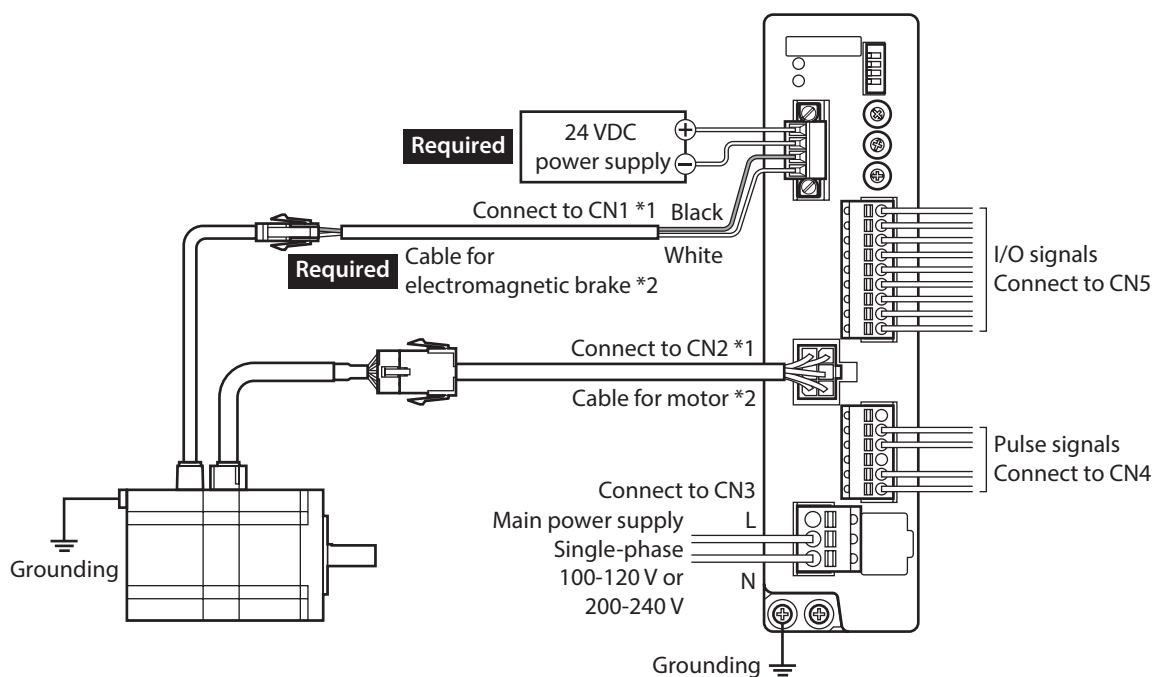
■ Standard type



*1 Keep 20 m (65.6 ft.) or less for the wiring distance between the motor and driver.

*2 Included with the product or sold separately.

■ Standard type with electromagnetic brake



*1 Keep 20 m (65.6 ft.) or less for the wiring distance between the motor and driver.

*2 Included with the product or sold separately.

10-2 Connecting the 24 VDC power supply and electromagnetic brake

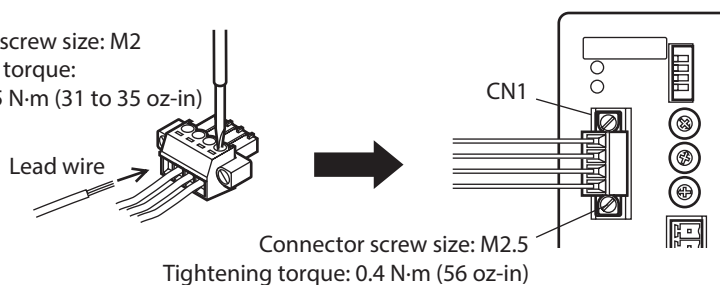
Using the CN1 connector (4 pins), connect the 24 VDC power supply and electromagnetic brake.

■ Wiring method

- Applicable lead wire: AWG28 to 16 (0.08 to 1.25 mm²)
- Strip length of the insulation cover: 7 mm (0.28 in.)

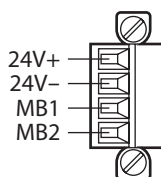
1. Insert the lead wire into the CN1 connector and tighten the screw using a slotted screwdriver.
2. Insert the CN1 connector into CN1 and tighten the screws.

Connector screw size: M2
Tightening torque:
0.22 to 0.25 N·m (31 to 35 oz-in)



■ Pin assignment

Display	Description
24V+	Connect the 24 VDC power supply for the electromagnetic brake.
24V-	
MB1	Electromagnetic brake - (black)
MB2	Electromagnetic brake + (white)



■ Power supply capacity

Model	Power supply voltage	Current capacity
PKE54	24 VDC±5 % *	0.1 A or more
PKE56		0.3 A or more
PKE59		0.6 A or more

* If the distance between the motor and driver is extended to 15 to 20 m (49.2 to 65.6 ft.), use a power supply of 24 VDC±4 %.

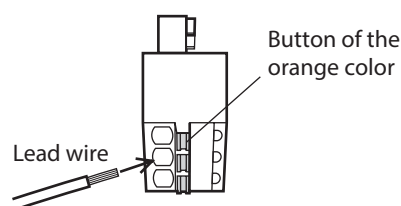
10-3 Connecting the main power supply

Using the CN3 connector (3 pins), connect the main power supply to the power supply connector (CN3).

■ Wiring method

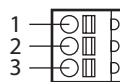
- Applicable lead wire: AWG16 to 14 (1.25 to 2.0 mm²)
- Strip length of the insulation cover: 10 mm (0.39 in.)

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



■ Pin assignment

Pin No.	Display	Description
1	NC	Not used.
2	L	Connect the main power supply.
3	N	



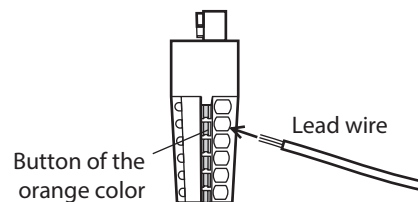
■ Power supply capacity

Model	Single-phase 100-120 V –15 to +10 % 50/60 Hz	Single-phase 200-240 V –15 to +10 % 50/60 Hz
PKE543	2.1 A or more	1.3 A or more
PKE544 PKE545	1.9 A or more	1.2 A or more
PKE564	4.0 A or more	2.4 A or more
PKE566	3.8 A or more	2.4 A or more
PKE569	4.0 A or more	2.5 A or more
PKE596	4.9 A or more	3.0 A or more
PKE599 PKE5913	3.5 A or more	2.2 A or more

10-4 Connecting the I/O signal

■ Wiring method

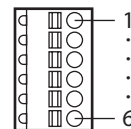
- Applicable lead wire: AWG26 to 16 (0.14 to 1.25 mm²)
 - Strip length of the insulation cover: 9 mm (0.35 in.)
1. Insert the lead wire while pushing the button of the orange color with a slotted screwdriver.
 2. After having inserted, release the button to secure the lead wire.



■ Pin assignment

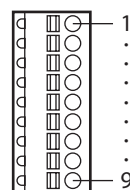
● Pulse signal (CN4)

Pin No.	Display	Description
1	CW (PLS) +24V	CW pulse input + (Pulse input +) [+24 V]
2	CW (PLS) +5V	CW pulse input + (Pulse input +) [+5 V or line driver]
3	CW (PLS) –	CW pulse input – (Pulse input –)
4	CCW (DIR.) +24V	CCW pulse input + (Rotation direction input +) [+24 V]
5	CCW (DIR.) +5V	CCW pulse input + (Rotation direction input +) [+5 V or line driver]
6	CCW (DIR.) –	CCW pulse input – (Rotation direction input –)



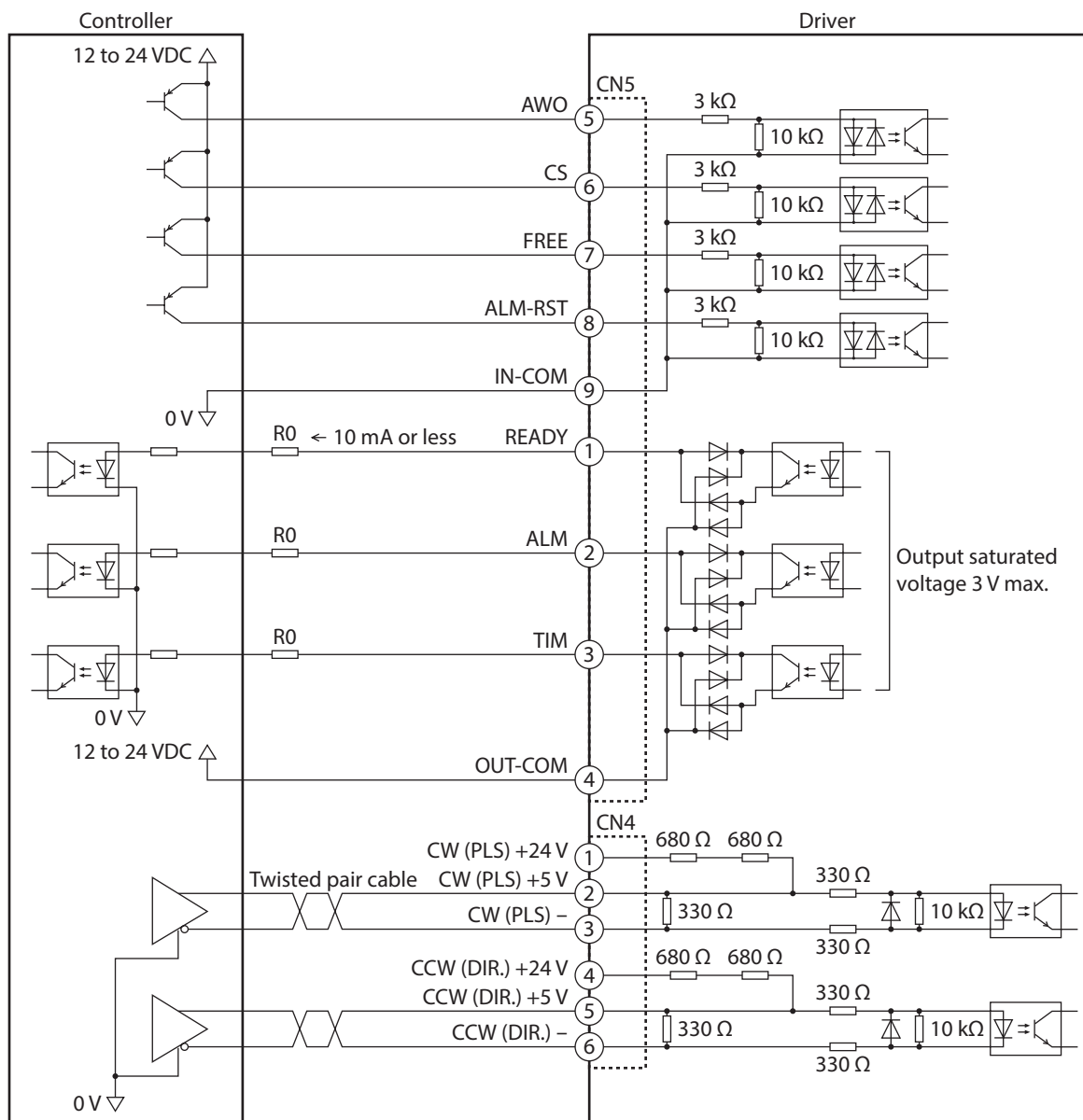
● I/O signal (CN5)

Pin No.	Display	I/O	Description
1	READY	Output	Ready
2	ALM		Alarm
3	TIM		Timing
4	OUT-COM		Output common
5	AWO	Input	All winding off
6	CS		Step angle switching
7	FREE		Motor excitation off, electromagnetic brake release
8	ALM-RST		Reset alarm
9	IN-COM		Input common



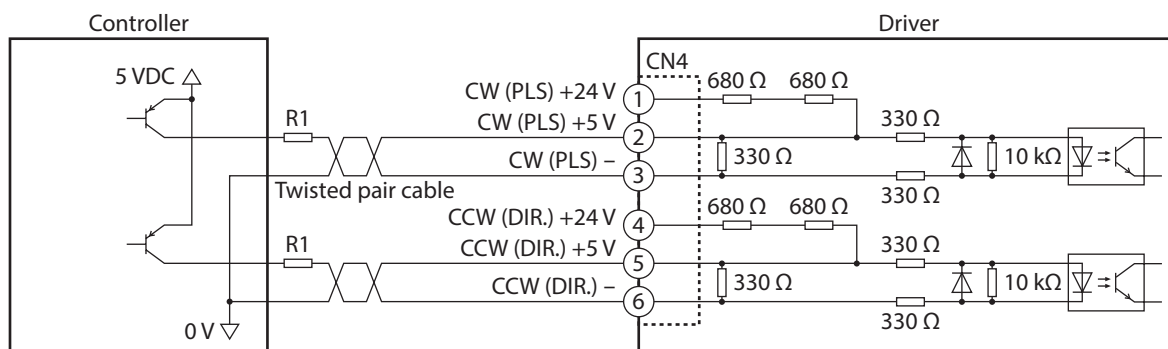
■ Connecting to a current source output circuit (PNP specifications)

● When pulse input is of line driver type



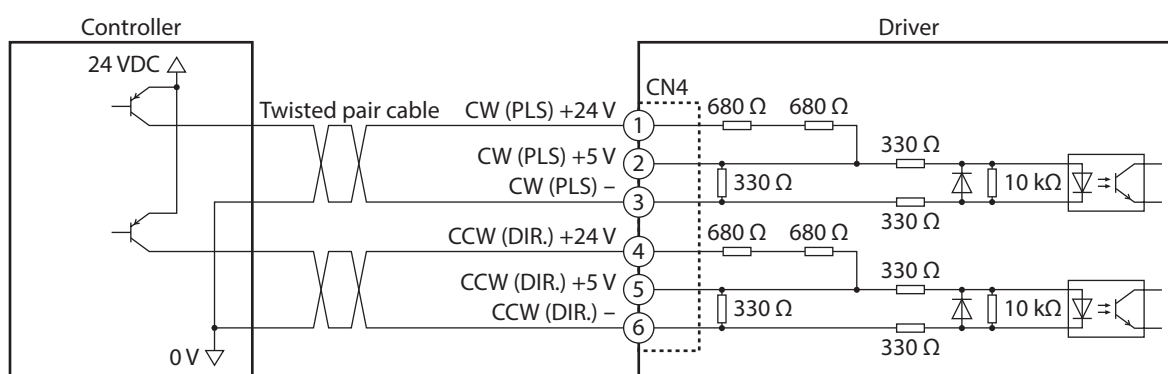
- Use input signals 12 to 24 VDC.
- Use output signals 12 to 24 VDC 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0.
- The saturated voltage of the output signal is 3 VDC maximum.

● When pulse input is of open-collector type (Input voltage: 5 VDC)



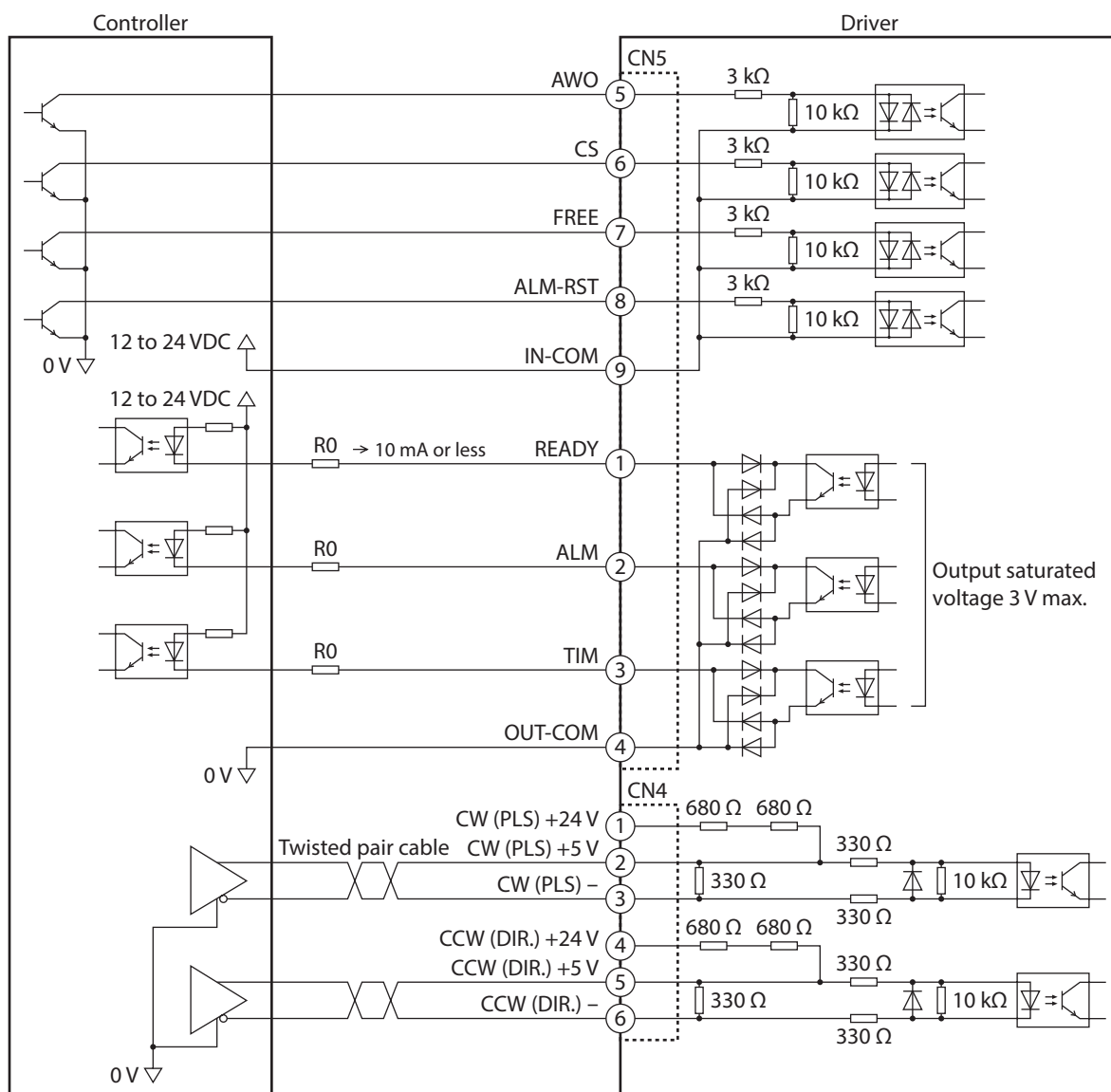
When the 12 VDC is used, be sure to connect an external resistor R1 (470 Ω, 0.25 W or more) so that the current exceeding 20 mA does not flow.

● When pulse input is of open-collector type (Input voltage: 24 VDC)



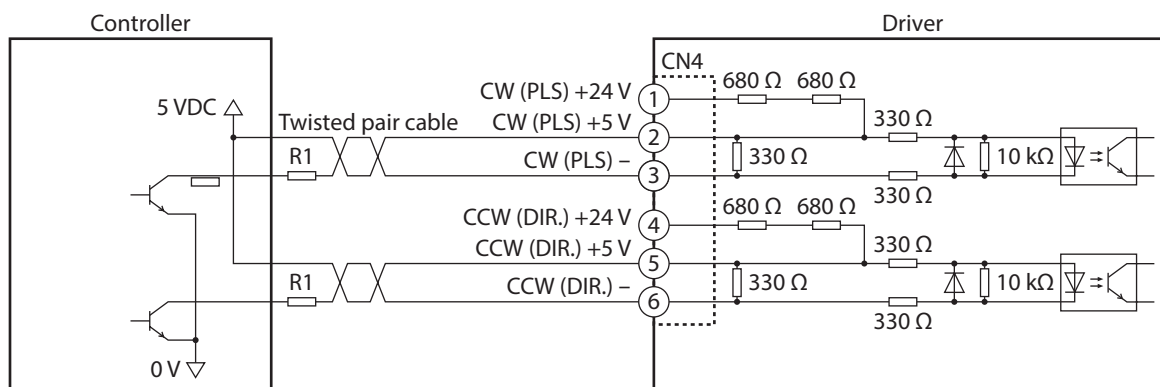
■ Connecting to a current sink output circuit (NPN specifications)

- When pulse input is of line driver type



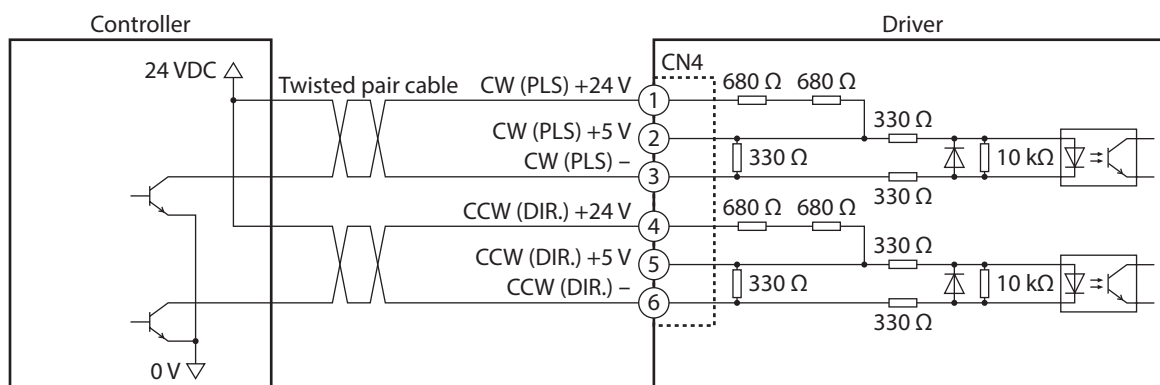
- Use input signals 12 to 24 VDC.
- Use output signals 12 to 24 VDC 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0.
- The saturated voltage of the output signal is 3 VDC maximum.

● When pulse input is of open-collector type (Input voltage: 5 VDC)



When the 12 VDC is used, be sure to connect an external resistor R1 (470 Ω, 0.25 W or more) so that the current exceeding 20 mA does not flow.

● When pulse input is of open-collector type (Input voltage: 24 VDC)



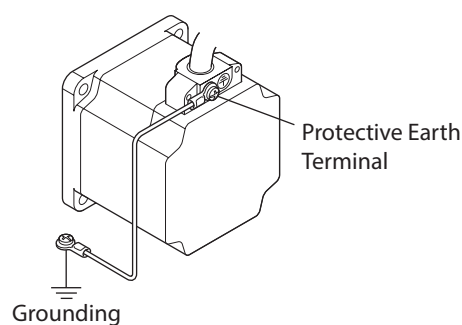
10-5 Grounding the motor and driver

■ Grounding the motor

Be sure to ground the Protective Earth Terminal of the motor.

- Screw size: M4
- Grounding wire: AWG18 (0.75 mm²) or more
- Tightening torque: 1.2 N·m (170 oz·in)

When grounding, use a round terminal and secure it with a mounting screw with a washer. Ground wires and crimp terminals are not included.



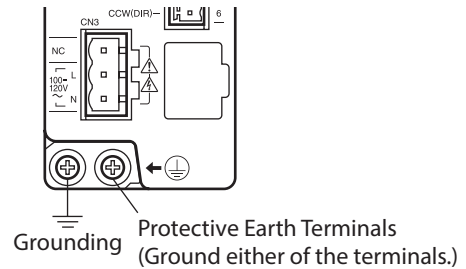
■ Grounding the driver

Be sure to ground the Protective Earth Terminal of the driver.

- Screw size: M4
- Grounding wire: AWG16 to 14 (1.25 to 2.0 mm²)
- 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. 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 affix the grounding point near the driver.



10-6 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

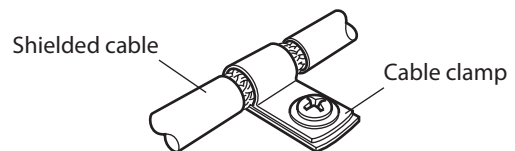
There are the following three methods mainly to take measures against the electrical noise.

● 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 Oriental Motor cable when extending a wiring distance between the motor and driver. This is effective in suppressing the electrical noise emitted from the motor. Check the model name on p.57.
- 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 100 mm (3.94 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 shielded twisted pair cables for power lines and signal lines.
- Keep cables as short as possible without coiling and bundling extra lengths.
- 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. I/O signal cable that include a ground wire are provided in Oriental Motor product line. Check the model name on p.59.
- 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.



● 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.
- Use the line driver type, which is less likely to be affected by electrical noise, for the output circuit of pulse signals. When the pulse signal of the controller is of the open collector type, it is possible to change to the line driver type by using Oriental Motor pulse signal converter for noise immunity. Check the model name on p.60.

■ 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.
HF2010A-UPF (SOSHIN ELECTRIC CO., LTD.)
FN2070-10-06 (Schaffner EMC)
- 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.

● Surge arrester

A surge arrester is effective for reduction of the surge voltage of the lightning surge generated between the AC power line and earth or between AC power lines. Connect the following surge arrester.

LT-C12G801WS (SOSHIN ELECTRIC CO., LTD.)

R-A-V-781BWZ-4 (OKAYA ELECTRIC INDUSTRIES CO., LTD.).



When measuring dielectric strength of the equipment, be sure to remove the surge arrester, or the surge arrester may be damaged.

■ Our noise suppression products

Check the model name on p.59 and p.60.

● I/O signal 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 Oriental Motor I/O signal cable.

● Pulse signal converter for noise immunity

This product converts a pulse signal, which is output from the open collector output, to a pulse signal for good noise immunity by outputting the pulse signal again from the differential output.

● 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.

10-7 Conformity to the 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.

Oriental Motor conducts EMC measurements on its motors and drivers in accordance with the "Example of motor and driver installation and wiring" on p.40.

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



CAUTION

This equipment is not intended for use in residential environments nor for use on a low-voltage public network supplied in residential premises, and it may not provide adequate protection to radio reception interference in such environments.

● Connecting noise filter

In large electrically noisy environments, connect a noise filter. Refer to p.39 for details.

● Connecting surge arrester

Refer to "Surge arrester"

● **Connecting the power supply for the electromagnetic brake (electromagnetic brake motor only)**

When the DC power supply for the electromagnetic brake is needed, use a power supply being compliant with the EMC Directive. Use a shielded twisted pair cable for wiring. Refer to "Prevention of noise propagation" on p.38 for wire the shielded twisted pair cable.

● **Connecting the motor cable**

Use Oriental Motor connection cable or extension cable when extending the wiring distance between the motor and driver. Check the model name on p.57.

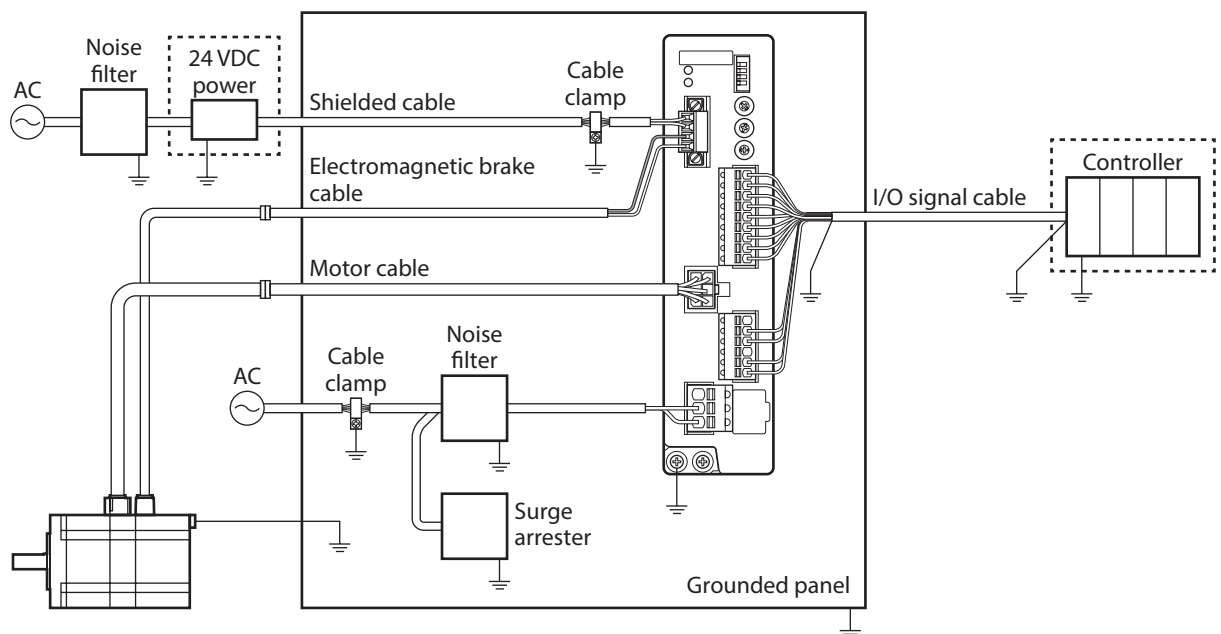
● **Connecting the signal cable**

Refer to "Prevention of noise propagation" on p.38.

● **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.37 for grounding method.

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



⏏ symbol indicate the grounding.
 is a shield box.

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.

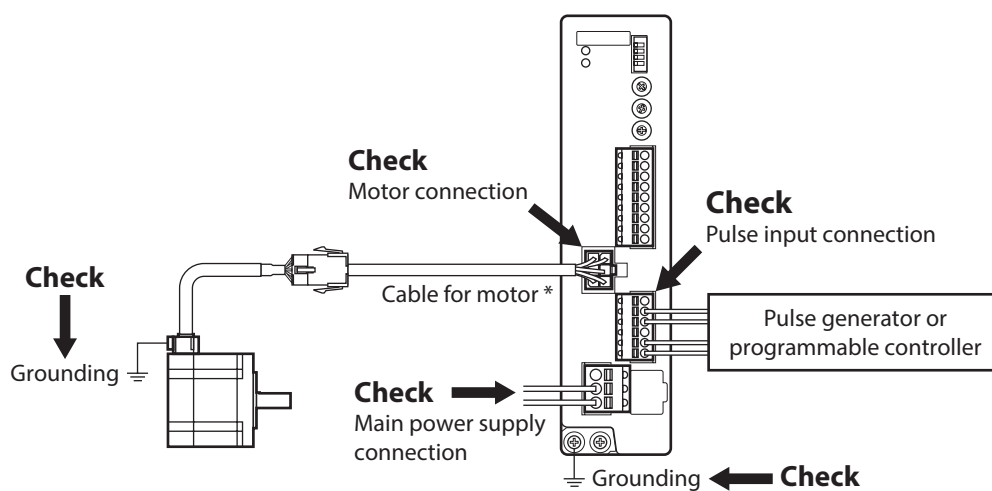
11 Guidance

If you are new to the **RKII** Series pulse input type, read this section to understand the operating methods along with the operation flow.

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

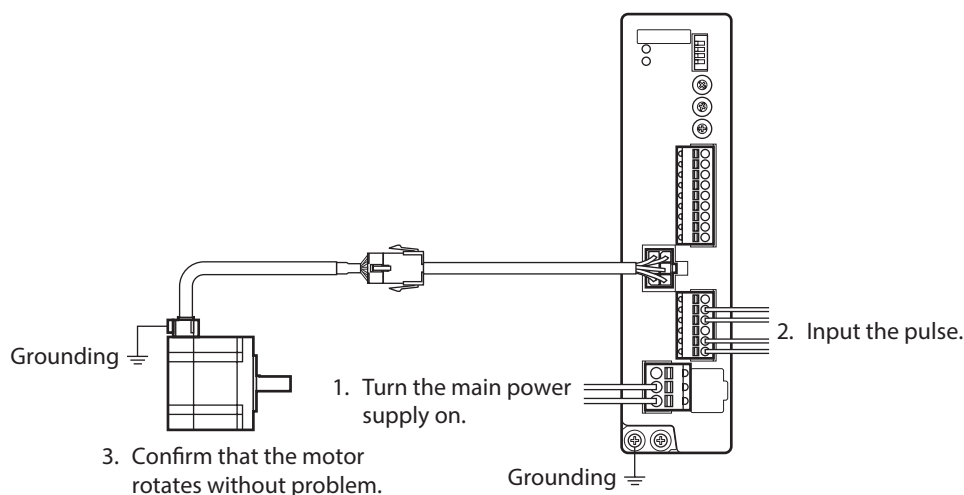
11-1 Standard type

STEP 1 Check the installation and connection



* Included with the product or sold separately.

STEP 2 Turn on the main power supply and operate the motor



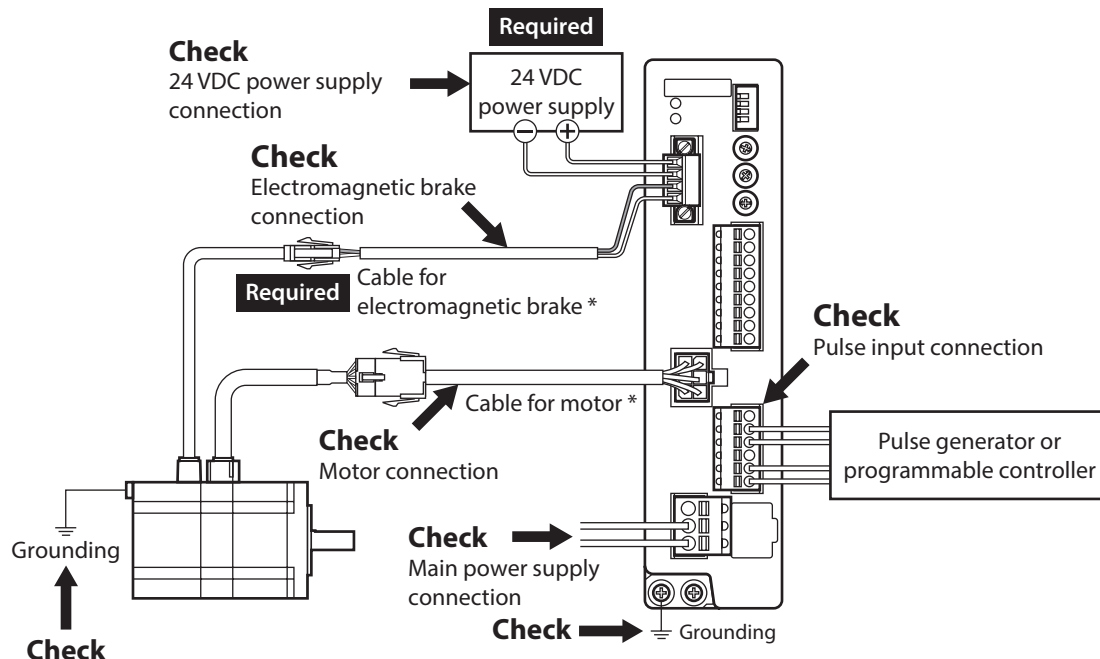
STEP 3 Were you able to operate the motor properly?

How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

- Is any alarm present?
- Are the main power supply, motor and pulse signal connected securely?

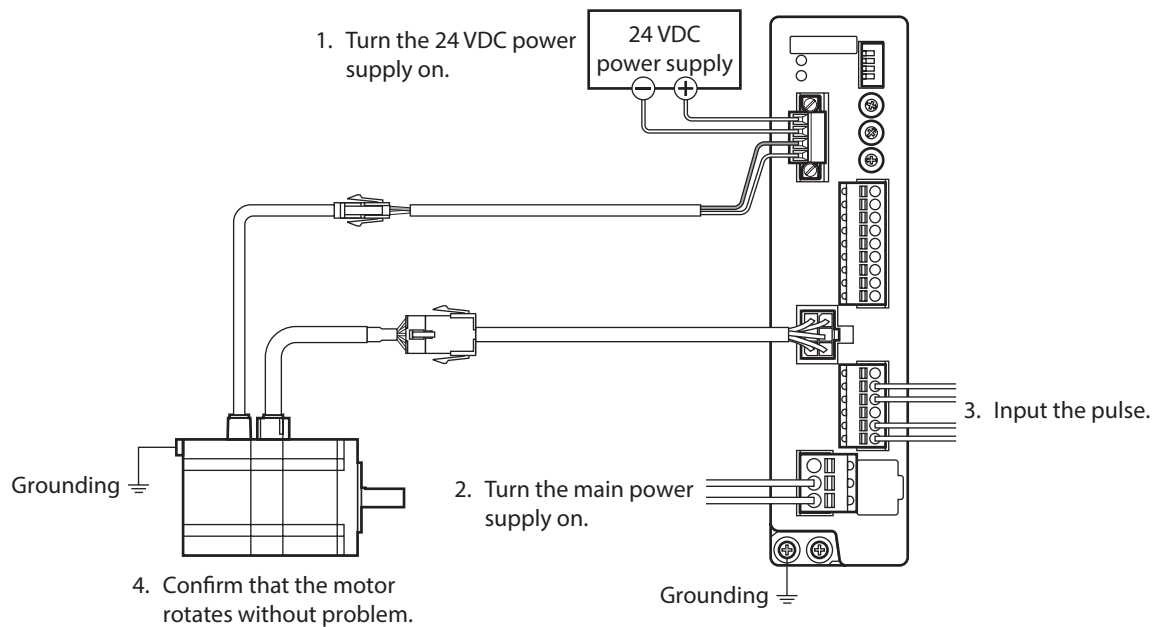
11-2 Standard type with electromagnetic brake

STEP 1 Check the installation and connection



* Included with the product or sold separately.

STEP 2 Turn on the power and operate the motor



STEP 3 Were you able to operate the motor properly?

How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

- Is any alarm present?
- Is the 24 VDC power supply for the electromagnetic brake connected without fail?
- Are the main power supply, motor and pulse signal connected securely?

12 Explanation of I/O signals

12-1 Input signals

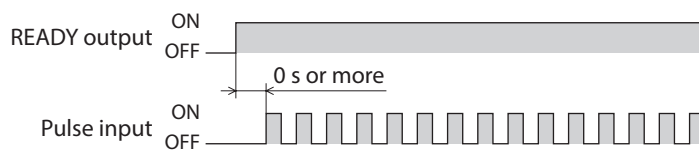
The following input signals of the driver are photocoupler inputs. The signal state represents the "ON: Carrying current" or "OFF: Not carrying current" state of the internal photocoupler rather than the voltage level of the signal.

■ CW (PLS) input, CCW (DIR.) input

These input serve as the CW and CCW inputs in the 2-pulse input mode, or PLS and DIR inputs in the 1-pulse input mode. They are common to all pulse input types including 5 VDC input, 24 VDC input and line driver input.

Set the pulse input mode of the driver according to the pulse output mode of the controller (pulse generator) used with the driver. See p.49 for how to set the pulse input mode.

When inputting the pulse, check the READY output is turned ON.

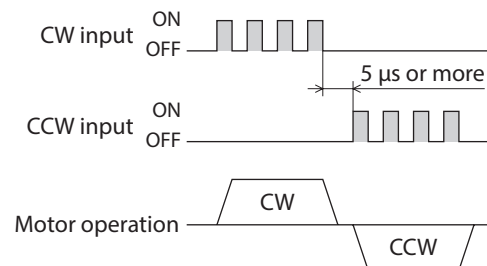


When the motor is at standstill, be sure to keep the photocoupler in OFF state.

● 2-pulse input mode

When the CW input is turned from OFF to ON, the motor will rotate by one step in CW direction.

When the CCW input is turned from OFF to ON, the motor will rotate by one step in CCW direction.

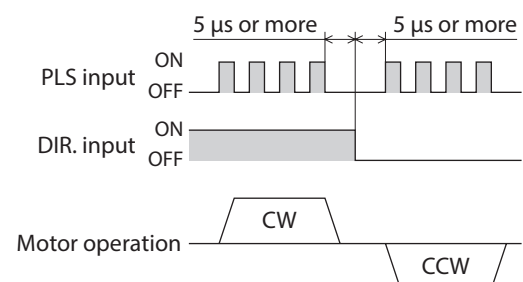


Do not input the CW signal and CCW signal simultaneously. If the other signal is input while one of the signals is ON, the motor cannot operate normally.

● 1-pulse input mode

When the PLS input is turned from OFF to ON while the DIR input is ON, the motor will rotate by one step in CW direction.

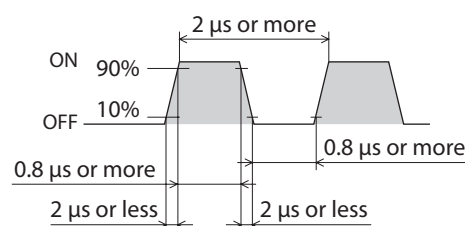
When the PLS input is turned from OFF to ON while the DIR input is OFF, the motor will rotate by one step in CCW direction.



● Pulse signal

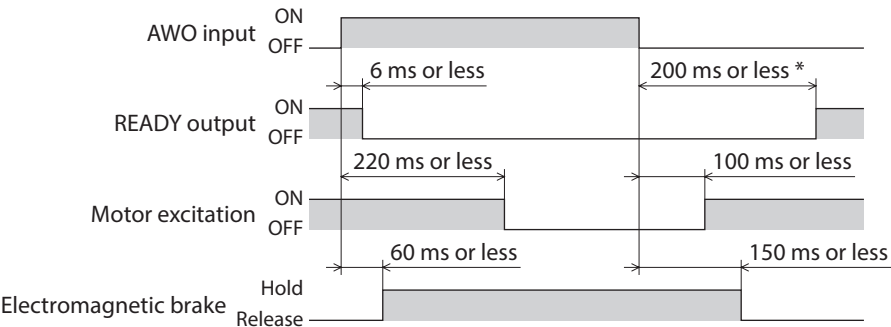
Input a pulse with sharp rising and falling edges as shown in the figure.

The figure shows the voltage levels of pulse signals.



■ **AWO input**

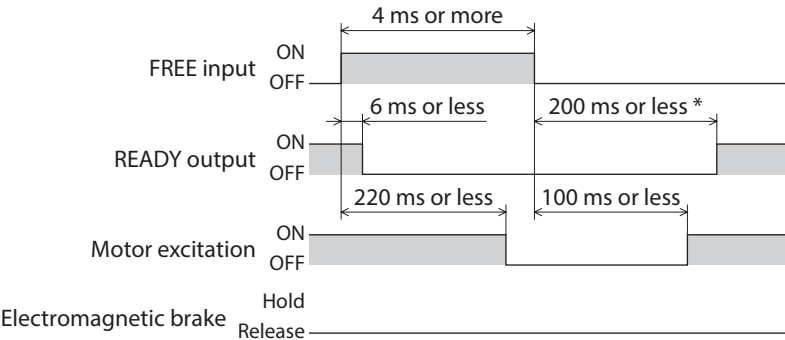
When the AWO input is turned ON, current supplied to the motor will be cut off, thereby allowing the output shaft to be turned by hand. When an electromagnetic brake motor is used, the electromagnetic brake will hold a load in position.



* 1.2 sec or less for the electromagnetic brake type

■ **FREE input**

When the FREE input is turned ON, the motor current will be cut off. The motor will lose its holding torque, and the output shaft can be turned manually. When an electromagnetic brake motor is used, the electromagnetic brake will be released.

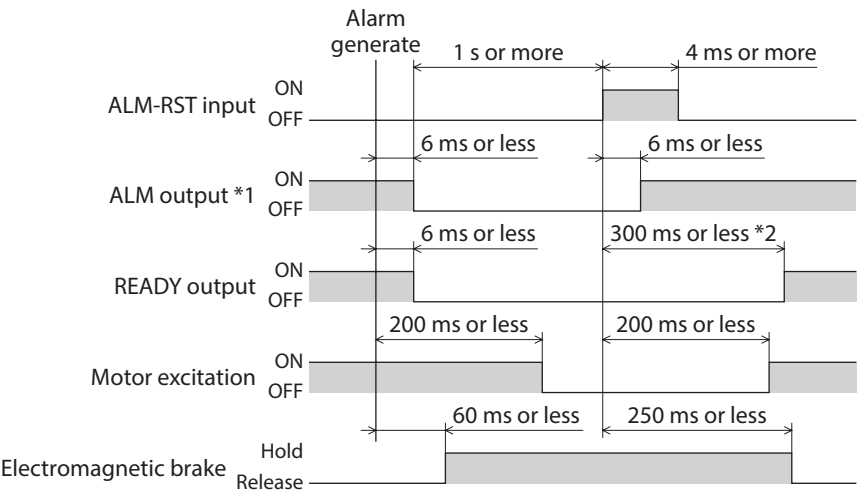


* 1.2 sec or less for the electromagnetic brake type

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

■ **ALM-RST input**

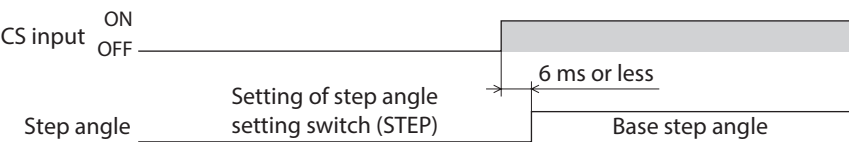
When an alarm generates, the motor will stop. When the ALM-RST input is turned from OFF to ON, the alarm will be reset. (This signal will become effective when turning from OFF to ON.) Always reset an alarm after removing the cause of the alarm and after ensuring safety.
Note that some alarms cannot be reset with the ALM-RST input. See p.53 for alarm descriptions.



*1 ALM output is normally closed. It is ON during normal operation and it turns OFF when an alarm generates.
*2 1.3 sec or less for the electromagnetic brake type

■ **CS input**

When turning the CS input ON, the motor rotates at a basic step angle. With the standard type, the basic step angle is 0.72°.
When turning the CS input OFF, the motor rotates at the step angle set by the step angle setting switch (STEP).
Refer to p.49 for step angle setting switch.



Note Do not change the CS input while operating. The motor may lose its synchronism, causing position deviation or standstill of the motor.

memo When changing the step angle using the CS input, do so while the TIM output is ON.

12-2 Output signals

The driver outputs signals are photocoupler/open-collector output. 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.

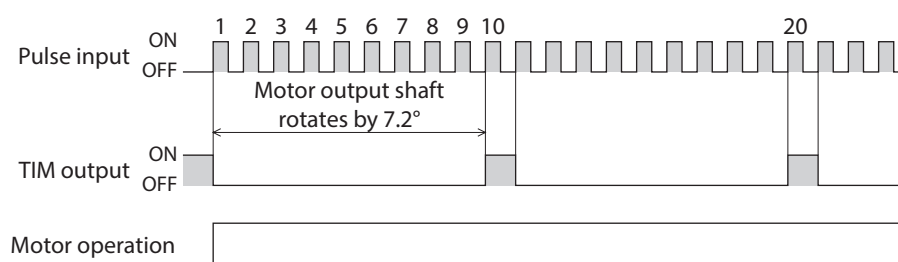
■ TIM output

This signal turns ON when the motor is at its excitation home. The present motor position will reset to the excitation home when turning on the driver main power supply.

If the base step angle of the motor is 0.72° , the TIM output will turn ON every time the motor moves by 7.2° from its excitation home in synchronization with the internal oscillation pulse.

If the "TIM signal detection with home-seeking" parameter is set to "1: Enable," when detecting the mechanical home in the equipment, the tolerance for the motor stop positions in a detection range of the home sensor can be reduced and the further accurate mechanical home can be detected.

Example of the TIM output when the motor step angle is 0.72° (resolution is 500 P/R)



Motor type	Number of divisions		TIM output
	1	10	
Motor with 0.72° /step base step angle	0.72°	0.072°	every 7.2°
Geared motor with 7.2 gear ratio	0.1°	0.01°	every 1°



- When using the TIM output, keep the input pulse frequency to be 500 Hz or less.
- When using the TIM output, set the pulse or step angle so that the motor output shaft stops at an integral multiple of 7.2° .

■ ALM output

When an alarm generates, the ALM output will turn OFF. At the same time, the ALARM LED of the driver will blink and the motor current will be cut off and the motor will stop. The ALM output is normally closed.

See p.53 for alarm.

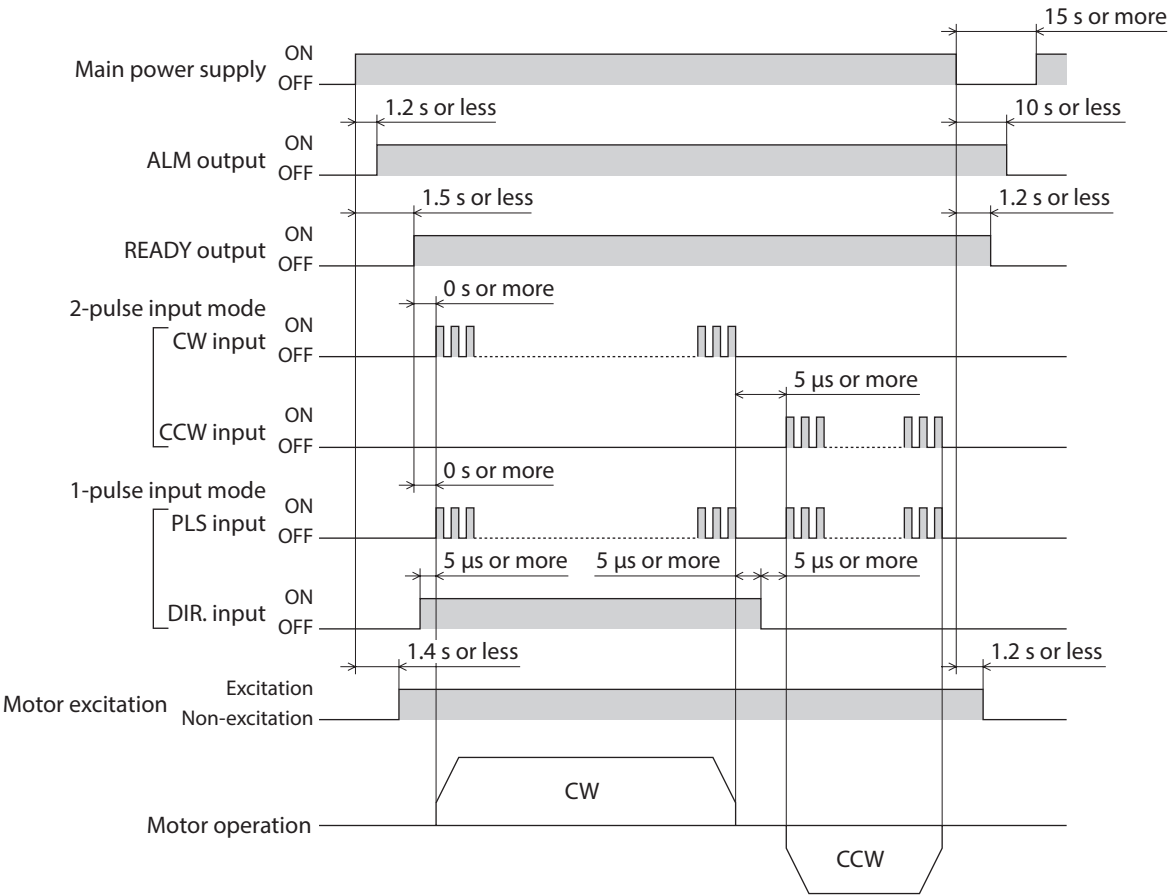
■ READY output

When the driver becomes ready, the READY output turns ON. Input the pulse to the driver after the READY output has turned ON. The READY output turns ON when all of the following conditions are satisfied.

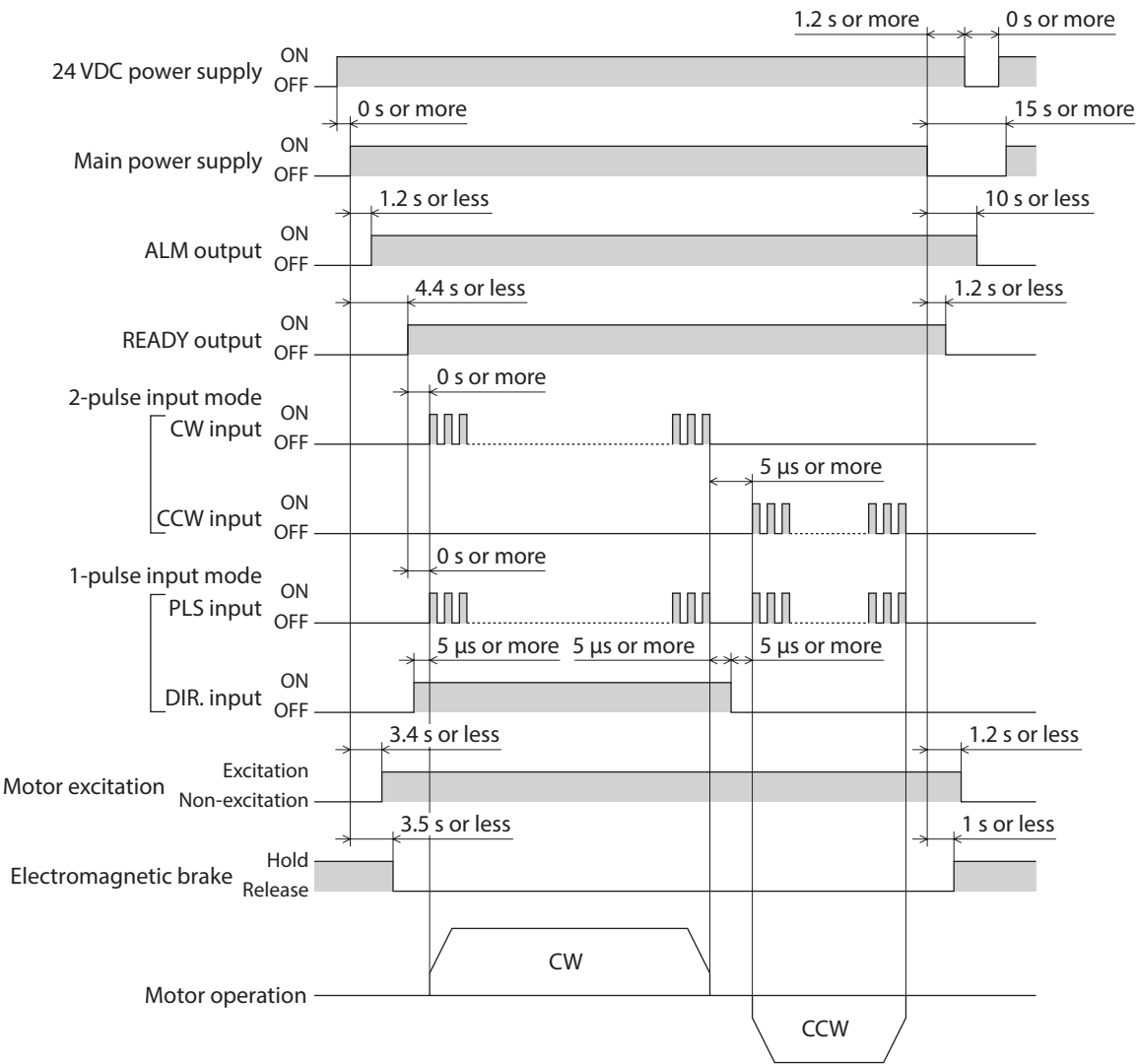
- AWO input is OFF
- FREE input is OFF
- An alarm is not present.
- When an electromagnetic brake motor is used, the electromagnetic brake is released.

12-3 Timing charts

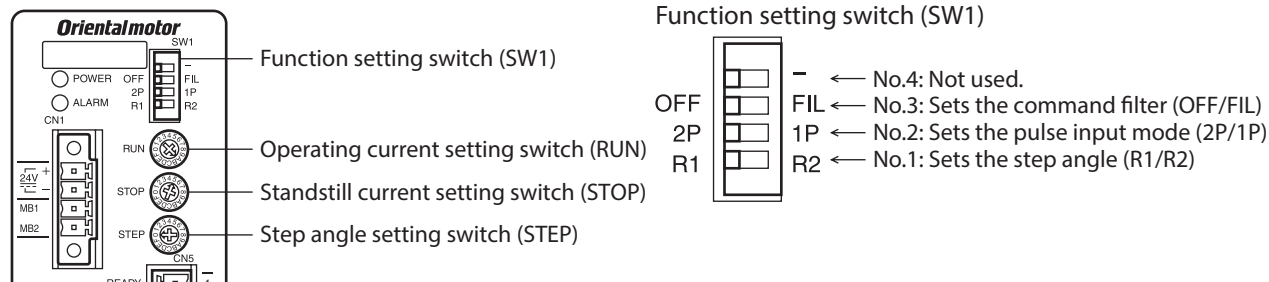
■ Standard type



■ Standard type with electromagnetic brake



13 Setting



13-1 Pulse input mode

Set a desired pulse input mode of the driver according to the pulse output mode of the controller (pulse generator) used with the driver. Set a desired mode using the SW1-No.2 (2P/1P) of the function setting switch. The factory setting of the pulse input mode depends on the destination country.



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

13-2 Step angle

Set the step angle from among the 32 preset levels using the step angle setting switch (STEP) and function setting switch SW1-No.1 (R1/R2).

The step angle refers to the angle that the motor rotates when one pulse is input. For example, when the step angle is 0.72°, the motor rotates 0.72° per one pulse.

See the next tables for the step angles that can be set.

Factory setting Step angle setting switch (STEP): 0

Function setting switch (SW1-No.1): R1

- When the function setting switch (SW1-No.1) is set to R1.

Dial of STEP	Resolution [P/R]	Step angle [°]	Number of divisions
0	500	0.72	1
1	1,000	0.36	2
2	1,250	0.288	2.5
3	2,000	0.18	4
4	2,500	0.144	5
5	4,000	0.09	8
6	5,000	0.072	10
7	10,000	0.036	20
8	12,500	0.0288	25
9	20,000	0.018	40
A	25,000	0.0144	50
B	40,000	0.009	80
C	50,000	0.0072	100
D	62,500	0.00576	125
E	100,000	0.0036	200
F	125,000	0.00288	250

- When the function setting switch (SW1-No.1) is set to R2.

Dial of STEP	Resolution [P/R]	Step angle [°]	Number of divisions
0	200	1.8	0.4
1	400	0.9	0.8
2	600	0.6	1.2
3	800	0.45	1.6
4	1,200	0.3	2.4
5	1,600	0.225	3.2
6	3,200	0.1125	6.4
7	6,000	0.06	12
8	6,400	0.05625	12.8
9	7,200	0.05	14.4
A	8,000	0.045	16
B	12,000	0.03	24
C	12,800	0.028125	25.6
D	16,000	0.0225	32
E	25,600	0.0140625	51.2
F	200,000	0.0018	400



- Be sure to turn off the driver power before setting the switches. The new setting of the function setting switch will become effective after the power is cycled.
- Step angles are theoretical values.
- For the geared type, the actual step angle is the value divided the step angle by the gear ratio.

13-3 Operating current

Set the maximum output current of the driver from among the 11 preset levels using the operating current setting switch (RUN). If the load is small and there is an ample allowance for torque, motor temperature rise can be suppressed by setting a lower operating current.

The operating current is a value in which the operating current rate is multiplied by the rated current (100 %).

Operating current = Motor rated current × Operating current rate

Factory setting A (100 %)

Dial setting	Operating current rate (%)	Dial setting	Operating current rate (%)
0	0	8	80
1	10	9	90
2	20	A	100
3	30	B	
4	40	C	
5	50	D	
6	60	E	
7	70	F	



Excessively low operating current may cause a problem in starting the motor or holding the load in position. Do not lower the operating current more than necessary.

13-4 Standstill current

When the motor stops, the motor current drops to the standstill current.

Set the standstill current from among the seven preset levels using the standstill current setting switch (STOP).

The standstill current is a value in which the standstill current rate is multiplied by the rated current (100 %).

Standstill current = Motor rated current × Standstill current rate

Factory setting 5 (50 %)

Dial setting	Standstill current rate (%)	Dial setting	Standstill current rate (%)
0	0	8	60
1	10	9	
2	20	A	
3	30	B	
4	40	C	
5	50	D	
6	60	E	
7		F	



Excessively low standstill current may cause a problem in starting the motor or holding the load in position. Do not lower the standstill current more than necessary.



- When installing two or more drivers in parallel, it is possible to install them closely in the horizontal direction. In this case, use the drivers in conditions that an ambient temperature is 0 to +40 °C (+32 to +104 °F) and the standstill current is 50 % or less.
- When the standstill current is set to 60 %, use the driver in a condition that an ambient temperature does not exceed 50 °C (122 °F).

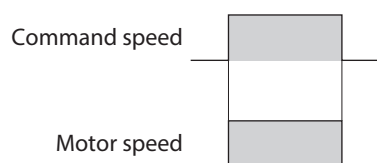
13-5 Command filter

The motor response corresponding to input pulses can be adjusted with the function setting switch SW1-No.3 (OFF/FIL) switch.

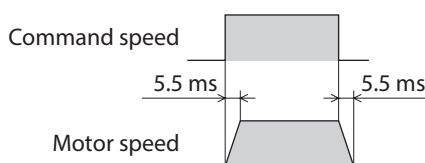
When the switch is set to the FIL side, smoother operation at starting/stopping of the motor can be achieved. Note, however, that synchronization performance in response to the commands is decreased. Set a suitable value based on the load or application.

Factory setting OFF (command filter is not used)

- When the command filter is not used



- When the command filter is used



14 Inspection and maintenance

14-1 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.

■ Inspection item

- Check if any of motor mounting screws is loose.
- Check if the bearings (ball bearings) of the motor or other moving parts of the gear generates unusual noises.
- Check if a damage or stress is applied on the cable.
- Check if any of the connection parts of the driver is loose.
- Check if the output shaft and the load shaft are out of alignment.
- Check if the openings in the driver are clogged.
- Check if the installation place of the driver is loose.
- Check if dust and others attach on the driver.
- Check if the driver has unusual smells or appearance defects.



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

14-2 Warranty

Check on the Oriental Motor Website for the product warranty.

14-3 Disposal

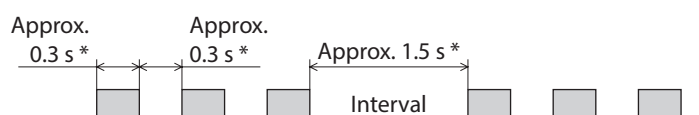
Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.

15 Alarms

When an alarm generates, the ALM output is turned OFF and the motor current is cut off, and thereby the motor holding torque will be lost.

At the same time, the ALARM LED of the driver will blink. The cause of the alarm can be checked by counting the number of times the ALARM LED blinks.

Example: Overvoltage alarm (number of blinks: 3)



* The interval gets longer when an alarm of the CPU peripheral circuit error was generated.

■ Alarm reset

Before resetting an alarm, always remove the cause of the alarm and ensure safety, and perform one of the reset operations specified below.

- Turn the ALM-RST input to OFF and then ON. (The alarm will be reset at the ON edge of the input.)
- Cycle the power.



Some alarms cannot be reset with the ALM-RST input. To reset these alarms, you must cycle the power.

■ Alarm list

No. of ALARM LED blinks	Alarm type	Cause	Remedial action	Reset using the ALM-RST input	Motor status
2	Main circuit overheat	The internal temperature of the driver exceeded 85 °C (185 °F).	Review the ventilation condition in the enclosure.	Possible	No holding power
3	Overvoltage	<ul style="list-style-type: none">• A voltage exceeding the specification value was applied.• A large inertial load was stopped abruptly or vertical operation was performed.	<ul style="list-style-type: none">• Check the input voltage of the main power supply.• If this alarm generates during operation, reduce the load or make the acceleration/ deceleration time longer.	Not possible	
4	Overspeed	The operating speed exceeded the permissible value.	Lower the command pulse frequency to the rate at which no alarm is output.	Possible	
5	Overcurrent	The motor, cable or driver output circuit was shorted.	Turn off the power and check the motor cable and driver for shorting, and then cycle the power.	Not possible	
6	Undervoltage	The main power supply was cut off momentarily or the voltage became low.	Check the input voltage of the main power supply.	Possible	
7	Electromagnetic brake automatic control error	<ul style="list-style-type: none">• The 24 VDC power supply is not connected.• The electromagnetic brake is not connected.• Connection error in the electromagnetic brake.	<ul style="list-style-type: none">• Connect 24 VDC power supply to CN1.• Connect the electromagnetic brake correctly.		

No. of ALARM LED blinks	Alarm type	Cause	Remedial action	Reset using the ALM-RST input	Motor status
9	Electrolytic capacitor error	The motor, cable or driver output circuit was shorted.	Turn off the power and check the motor, cable and driver output circuit for shorting, and then cycle the power.	Not possible	No holding power
		The electrolytic capacitor on the main circuit was damaged.	Contact your nearest Oriental Motor sales office.		
	EEPROM error	The stored data was damaged.			
	CPU peripheral circuit error	Error occurred in the CPU peripheral circuit.			
Lit	CPU error	CPU malfunctioned.	Cycle the power.		

If the alarm is not cleared even when these remedial actions have been performed, the driver may have been damaged. Contact your nearest Oriental Motor sales office.

16 Troubleshooting and remedial actions

During motor operation, the motor or driver may fail to function properly due to an improper speed 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.

Phenomenon	Possible cause	Remedial action
<ul style="list-style-type: none"> • The motor is not excited. • The output shaft can be moved by hand. (When an electromagnetic brake motor is used, the output shaft can be moved easily by releasing the electromagnetic brake.) 	Connection error in the motor.	Check the connections between the driver and motor.
	The AWO input is turned ON.	Turn the AWO input OFF and confirm that the output shaft will be excited.
	The FREE input is turned ON.	Turn the FREE input OFF.
The motor does not operate.	Pulse signals are not connected properly.	Check the connection between the controller and driver.
	The CW input and CCW input are turned ON simultaneously in the 2-pulse input mode.	Each pulse signal input should specify either the CW input or CCW input, but not both. Make sure the terminal not receiving the signal input remains OFF.
	The pulse signal is connected to DIR input in the 1-pulse input mode.	Connect the pulse signal to the PLS input.
	The electromagnetic brake is not released. (electromagnetic brake type)	<ul style="list-style-type: none"> • Connect 24 VDC power supply to CN1. • Connect the electromagnetic brake correctly.
The motor rotates in the direction opposite to the specified direction.	The CW input and CCW input are connected in reverse in the 2-pulse input mode.	Connect CW pulse signals via the CW input, and connect CCW pulse signals via the CCW input.
	The DIR input is set in reverse in the 1-pulse input mode.	Turn the DIR input ON to cause the motor to rotate in CW direction, and turn the input OFF to cause the motor to rotate in CCW direction.
The gear output shaft rotates in the direction opposite to the motor output shaft.	A gear that rotates in the direction opposite to the motor output shaft is used.	<ul style="list-style-type: none"> • With TS geared type, the gear output shaft rotates in the direction opposite to the motor output shaft when the gear ratio is 20 or 30. • With Harmonic geared type, the gear output shaft always rotates in the direction opposite to the motor output shaft.
The motor operation is unstable.	Connection error in the motor or power supply.	Check the connections between the driver, motor and power supply.
	The operating current or standstill current is too low.	Return the operating current or standstill current to its initial value and check. If the current is too low, the motor torque will also be too low and operation will be unstable.
	Pulse signals are not connected properly.	Check the connection between the controller and driver.
The motor loses its synchronism while accelerating, decelerating or operating.	Excessive load or large fluctuation in the load.	Check for a large fluctuation in the load during operation. If no problem is occurred even when the operating pulse speed has been set to the low-speed range that is higher torque area, check the load condition.
	The centers of the output shaft and load shaft are not aligned.	Check the connection condition of the output shaft and load shaft.
	The starting pulse speed is too high.	Reduce the starting pulse speed to a level at which starting becomes stable.
	The acceleration (deceleration) time is too short.	Increase the acceleration (deceleration) time to a level at which starting becomes stable.
	Effect of noise.	See p.38 and take measures.

Phenomenon	Possible cause	Remedial action
Motor vibration is too great.	The centers of the output shaft and load shaft are not aligned.	Check the connection condition of the output shaft and load shaft.
	Motor is resonating.	If the vibration decreases when the operating pulse speed is changed, it means the motor is resonating. Change the operating pulse speed or select a smaller step angle.
The TIM output does not turn ON.	CS input is switched while TIM output is OFF.	Switch the CS input while TIM output is ON.
The electromagnetic brake is not released. (electromagnetic brake type)	The 24 VDC power supply is not connected.	Connect 24 VDC power supply to CN1.
	<ul style="list-style-type: none"> • The electromagnetic brake is not connected. • Connection error in the electromagnetic brake. 	Connect the electromagnetic brake correctly.

17 Cables

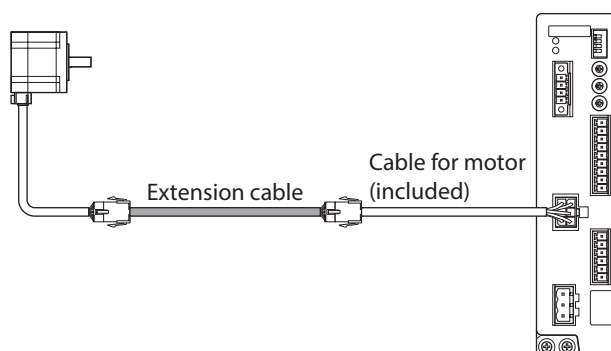
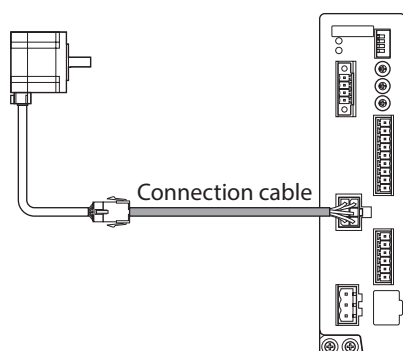
17-1 Motor cable

The **RKII** Series has models included with a "cable for motor" to connect the motor and driver, and also it has models without a "cable for motor." If the distance between the motor and driver is extended more than 3 m (9.8 ft.) when using the model with a "cable for motor," use the connection cable set. In the case of the model without a "cable for motor," use an extension cable set.

The cable set for electromagnetic brake motor consists of two cables, one for motor and the other for electromagnetic brake.

When installing the motor on a moving part, use a flexible cable offering excellent flexibility.

- Extending the wiring length using a connection cable set
Do not use the included cable.
- Extending the wiring length using an extension cable set
Connect an extension cable to the included cable.



When extending the wiring length by connecting an extension cable to the included cable, keep the total cable length to 20 m (65.6 ft.) or less.

■ Connection cable set

The cable set for electromagnetic brake motor consists of two cables, one for motor and the other for electromagnetic brake.

● For standard motor

Model	Length [m (ft.)]
CC010VPF	1 (3.3)
CC020VPF	2 (6.6)
CC030VPF	3 (9.8)
CC050VPF	5 (16.4)
CC070VPF	7 (23.0)
CC100VPF	10 (32.8)
CC150VPF	15 (49.2)
CC200VPF	20 (65.6)

● For electromagnetic brake motor

Model	Length [m (ft.)]
CC010VPFB	1 (3.3)
CC020VPFB	2 (6.6)
CC030VPFB	3 (9.8)
CC050VPFB	5 (16.4)
CC070VPFB	7 (23.0)
CC100VPFB	10 (32.8)
CC150VPFB	15 (49.2)
CC200VPFB	20 (65.6)

■ Flexible connection cable set

● For standard motor

Model	Length [m (ft.)]
CC010VPR	1 (3.3)
CC020VPR	2 (6.6)
CC030VPR	3 (9.8)
CC050VPR	5 (16.4)
CC070VPR	7 (23.0)
CC100VPR	10 (32.8)
CC150VPR	15 (49.2)
CC200VPR	20 (65.6)

● For electromagnetic brake motor

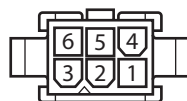
Model	Length [m (ft.)]
CC010VPRB	1 (3.3)
CC020VPRB	2 (6.6)
CC030VPRB	3 (9.8)
CC050VPRB	5 (16.4)
CC070VPRB	7 (23.0)
CC100VPRB	10 (32.8)
CC150VPRB	15 (49.2)
CC200VPRB	20 (65.6)

■ Connector pin assignments of connection cable set

● Cable for motor

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

● Motor side



Model: 5559-06P-210
(Molex Incorporated)

● Driver side



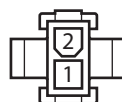
Model: 5557-06R-210
(Molex Incorporated)

● Cable for electromagnetic brake

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

* AWG21(0.5 mm²) for flexible cable

● Motor side



Model: 5559-02P-210
(Molex Incorporated)

■ Extension cable set

The cable set for electromagnetic brake motor consists of two cables, one for motor and the other for electromagnetic brake.

● For standard motor

Model	Length [m (ft.)]
CC010VPF	1 (3.3)
CC020VPF	2 (6.6)
CC030VPF	3 (9.8)
CC050VPF	5 (16.4)
CC070VPF	7 (23.0)
CC100VPF	10 (32.8)
CC150VPF	15 (49.2)

● For electromagnetic brake motor

Model	Length [m (ft.)]
CC010VPFBT	1 (3.3)
CC020VPFBT	2 (6.6)
CC030VPFBT	3 (9.8)
CC050VPFBT	5 (16.4)
CC070VPFBT	7 (23.0)
CC100VPFBT	10 (32.8)
CC150VPFBT	15 (49.2)

■ Flexible extension cable set

● For standard motor

Model	Length [m (ft.)]
CC010VPR	1 (3.3)
CC020VPR	2 (6.6)
CC030VPR	3 (9.8)
CC050VPR	5 (16.4)
CC070VPR	7 (23.0)
CC100VPR	10 (32.8)
CC150VPR	15 (49.2)

● For electromagnetic brake motor

Model	Length [m (ft.)]
CC010VPRBT	1 (3.3)
CC020VPRBT	2 (6.6)
CC030VPRBT	3 (9.8)
CC050VPRBT	5 (16.4)
CC070VPRBT	7 (23.0)
CC100VPRBT	10 (32.8)
CC150VPRBT	15 (49.2)

17-2 I/O signal cable

These are shielded cables for driver control I/O signals offering excellent noise resistance. 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.

General-purpose type

Cable 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

18 Accessories

■ Pulse signal converter for noise immunity

This product converts a pulse signal, which is output from the open collector output, to a pulse signal for good noise immunity by outputting the pulse signal again from the differential output.

Model: **VCS06**

■ 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.

Four 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**

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