



Brushless Motor

BLH Series Digital Setting Type

OPERATING MANUAL



Thank you for purchasing an Oriental Motor product.
This Operating Manual describes product handling procedures and safety precautions.

- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

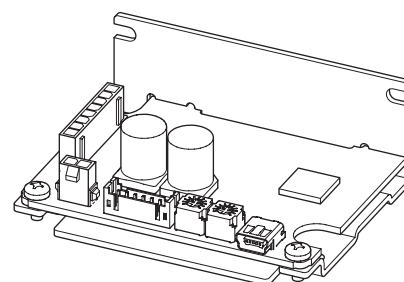


Table of contents

| | | | | | |
|------|---|----|------|--|----|
| 1 | Introduction | 2 | 7 | Operation | 16 |
| 2 | Safety precautions | 3 | 7.1 | Guidance | 16 |
| 3 | Precautions for use | 4 | 7.2 | Setting the rotation speed | 16 |
| 4 | Preparation | 5 | 7.3 | Setting the acceleration time and deceleration time | 17 |
| 4.1 | Checking the product | 5 | 7.4 | Operation and stop | 18 |
| 4.2 | How to identify the product model | 5 | 7.5 | Rotation direction of the motor output shaft | 19 |
| 4.3 | Information about nameplate | 5 | 7.6 | Multi-motor control | 20 |
| 4.4 | Products possible to combine | 5 | 8 | Maintenance and inspection | 21 |
| 4.5 | Names and functions of parts | 6 | 8.1 | Inspection | 21 |
| 5 | Installation | 7 | 8.2 | Warranty | 21 |
| 5.1 | Installation location | 7 | 8.3 | Disposal | 21 |
| 5.2 | Installing the driver | 7 | 9 | Troubleshooting | 22 |
| 6 | Connection | 8 | 10 | Alarms | 24 |
| 6.1 | Connecting the motor and driver (CN3) | 8 | 10.1 | Alarm reset | 24 |
| 6.2 | Connecting the power supply (CN1) | 8 | 10.2 | Alarm history | 24 |
| 6.3 | Grounding | 9 | 10.3 | Alarm lists | 25 |
| 6.4 | Connecting the I/O signals (CN2) | 9 | 11 | Specifications | 26 |
| 6.5 | Driver I/O circuit | 10 | 11.1 | Specifications | 26 |
| 6.6 | Connecting external analog setting devices | 11 | 11.2 | General specifications | 26 |
| 6.7 | Connecting the USB cable (CN4) | 11 | 11.3 | Dimension | 26 |
| 6.8 | Connection diagram | 12 | 12 | Regulations and standards | 27 |
| 6.9 | Noise measures | 13 | 12.1 | UL Standards and CSA Standards | 27 |
| 6.10 | Conformity to the EMC Directive | 13 | 12.2 | EU Directives | 27 |
| 6.11 | I/O signals list | 15 | 12.3 | Republic of Korea, Radio Waves Act | 27 |
| | | | 12.4 | RoHS Directive | 27 |

1 Introduction

■ Before using the product

Only qualified personnel of electrical and mechanical engineering should work with the product.

Use the product correctly after thoroughly reading the section "2 Safety precautions." 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. For the power supply, use a DC power supply with reinforced insulation on its primary and secondary sides. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

■ Operating manuals for the product




Operating manuals for the **BLH** Series are listed below.



The USER MANUAL does not come with the product. For details, contact your nearest Oriental Motor sales office or download from Oriental Motor Website Download Page.




| Type of operating manual | Overview |
|---|---|
| Digital Setting Type OPERATING MANUAL (this document) | This manual explains the function, installation and connection methods, troubleshooting, and others for the driver. |
| Digital Setting Type USER MANUAL | This manual explains detailed operations, functions and others which are not described in the operating manual included with the product. |
| BLHM Motor OPERATING MANUAL BLHM Electromagnetic Brake Motor OPERATING MANUAL (included with the motor) | This manual explains the functions as well as the installation method and others for the motor. |





2 Safety precautions

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

| | |
|--|--|
|  WARNING | Handling the product without observing the instructions that accompany a "WARNING" symbol may result in serious injury or death. |
|  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 safe use of the product. |

Explanation of graphic symbols  Indicates "prohibited" actions that must not be performed.  Indicates "compulsory" actions that must be performed.

|  WARNING | |
|--|---|
|  | <ul style="list-style-type: none"> Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. Doing so may result in fire or injury. Do not forcibly bend, pull, or pinch the cable. Doing so may result in fire. Do not use in vertical drive such as elevating equipment. When the driver protective function is activated, the motor will stop operating. The moving part may fall, leading to injury or damage to equipment. Do not disassemble or modify the motor, gearhead or driver. Doing so may cause injury. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product. |
|  | <ul style="list-style-type: none"> Only qualified and educated personnel should be allowed to perform installation, connection, operation and inspection/troubleshooting of the product. Handling by unqualified and uneducated personnel may result in fire, injury or damage to equipment. If the driver protective function was activated, remove the cause before canceling the alarm. Continuing the operation without removing the cause of the problem may cause malfunction of the motor, leading to injury or damage to equipment. Install the motor, gearhead and driver in an enclosure. Failure to do so may result in injury. Always keep the power supply voltage of the driver within the specified range. Failure to do so may result in fire. Connect the cables securely according to the wiring example. Failure to do so may result in fire. For the driver 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. If the motor is operated by turning on and off the power supply, turn off the driver power in the event of a power failure. Otherwise, the motor may suddenly start when the power is restored, causing injury or damage to equipment. |

|  CAUTION | |
|--|--|
|  | <ul style="list-style-type: none"> Do not use the motor, gearhead, and driver beyond the specifications. Doing so may result in injury or damage to equipment. Do not touch the motor and driver during operation or immediately after stopping. The surface is hot, and this may cause a skin burn(s). Do not lift up the motor by holding the output shaft of the motor or the gearhead, or the motor cable. Doing so may cause the product to fall, leading to injury. Keep the area around the motor and driver free of combustible materials. Failure to do so may result in fire or a skin burn(s). Do not leave anything around the motor and driver that would obstruct ventilation. Doing so may result in damage to equipment. Do not shut off the negative side of the power supply. Also, make sure that the wiring for the power supply does not disconnect. This may result in damage to equipment. Do not touch the rotating part (output shaft) while operating the motor. Doing so may cause injury. Pay enough attention to safe operation when starting and stopping the motor by switching ON-OFF of the power supply. Failure to do so may result in injury or damage to equipment. |
|  | <ul style="list-style-type: none"> Provide a cover over the rotating part (output shaft) of the motor and gearhead. Failure to do so may result in injury. Use a motor and driver only in the specified combination. An incorrect combination may cause a fire. Provide an emergency stop device or emergency stop circuit external to the equipment so that the entire equipment will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury. Immediately when trouble has occurred, stop operation and turn off the driver power. Failure to do so may result in fire, electrical shock or injury. Before turning on the power to the driver, make sure to turn all input signals of the driver to OFF. Otherwise, the motor may suddenly start when the power is on, leading to injury or damage to equipment. The motor surface temperature may exceed 70°C (158°F) even under normal operating conditions. If the operator is allowed to approach the motor in operation, attach a warning label in a conspicuous position as shown in the figure. Failure to do so may result in a skin burn(s). <div style="text-align: right;">  Warning label </div> |

3 Precautions for use

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

Be sure to match the output power of the driver with that of the motor when using.

- Notes for continuous regeneration operation

When regeneration operation is continuously performed, check the following conditions are satisfied before use.

- Set the value of the "Deceleration mode selection" parameter to "Deceleration stop 3."
- Use a power supply that can sufficiently allow the regenerative power.

Note

Do not perform gravitational operation (vertical drive) because a load may fall.

- Do not conduct the insulation resistance measurement or the dielectric strength test with the motor and driver connected.

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

- Note on power ON/OFF using a mechanical contact

When turning on or off the power supply using a mechanical contact (breaker, electromagnetic switch, relay, etc.), do so only the positive side (+) of the power supply using the mechanical contact.

Turning on or off the positive side (+) and the negative side (–) of the power supply simultaneously using a mechanical contact may cause damage to the control circuit or peripheral equipment.

Refer to the USER MANUAL for details.

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

The driver's USB connector is not electrically insulated. When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and these equipment to short, damaging both.

- Noise elimination measures

Refer to p.13 for the noise elimination measures.

- Notes when saving the data to the non-volatile memory

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

The non-volatile memory can be rewritten approximately 100,000 times.

- Grease measures

On rare occasions, grease may ooze out from the gearhead. If there is concern over possible environmental contamination resulting from the leakage of grease, check for grease stains during regular inspections. Alternatively, install an oil pan or other device to prevent damage resulting from contamination. Grease leakage may lead to problems in the user's equipment or products.

- Apply grease to the hollow output shaft of a hollow shaft flat gearhead.

Apply grease (molybdenum disulfide grease, etc.) on the surface of the load shaft and the inner walls of the hollow output shaft to prevent seizure.

- Sliding noise of electromagnetic brake

Sliding noise of the brake disk for the electromagnetic brake motor may be generated during operation.

It is no functional problem.

4 Preparation

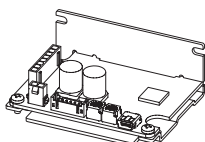
This chapter explains the items you should check, as well as the name and function of each part.

4.1 Checking the product

Verify that the items listed below are included.

Report any missing or damaged items to the branch or sales office from which you purchased the product.
Refer to "4.4 Products possible to combine" for combinations of the driver and motor.

Driver..... 1 unit OPERATING MANUAL..... 1 copy



4.2 How to identify the product model

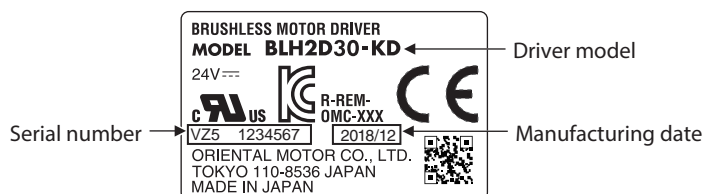
BLH2D 30 - K D

① ② ③ ④

| | | |
|---|-------------------------|--|
| ① | Driver type | BLH2D: BLH Series driver |
| ② | Output power | 15: 15 W 30: 30 W 50: 50 W |
| ③ | Power supply voltage | K: 24 VDC |
| ④ | D: Digital setting type | Blank: Analog setting type R: RS-485 communication type |

4.3 Information about nameplate

The following nameplate is an example for the 30 W type driver.



4.4 Products possible to combine

Products with which the drivers can be combined are listed below.

Verify the motor model and the driver model against the model name described on the nameplate of the product.

The box (□) in the motor model name indicates a code or a number representing the gear ratio, the shaft type, or the gearhead type.

For details about the motor, refer to the operating manual included with the motor.

| Output power | Motor model | Driver model | Cable set model |
|--------------|--|-------------------|--|
| 15 W | BLHM015K-□□ | BLH2D15-KD | LHS003CD or LHS010CD |
| 30 W | BLHM230KC-□□* BLHM230KCM-□□ | BLH2D30-KD | |
| 50 W | BLHM450KC-□□* BLHM450KCM-□□ | BLH2D50-KD | |

* For the lead wire type, "KC" of the motor model are replaced by "K".

● Cable set (Each cable can be purchased separately.)

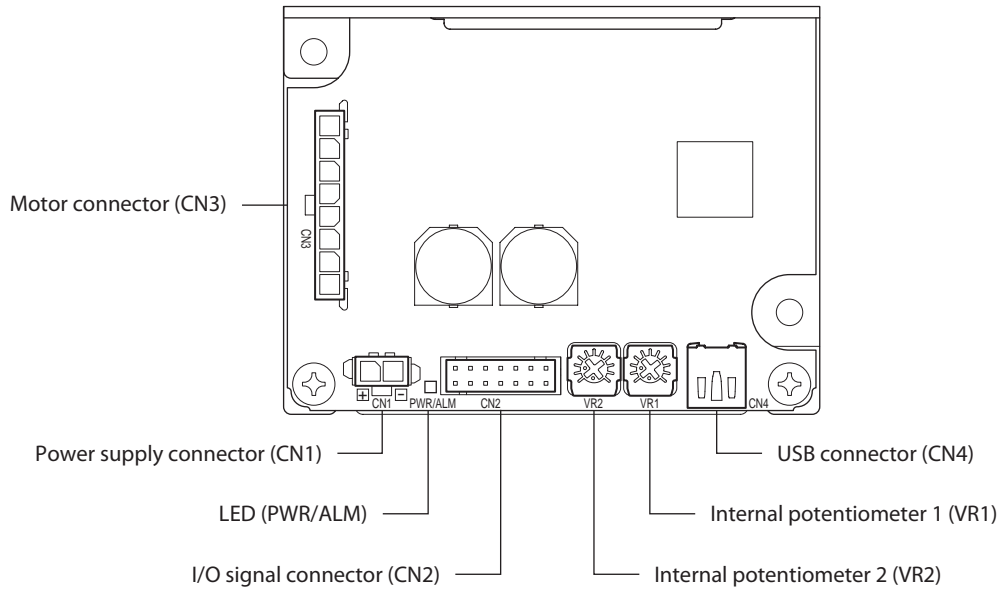
● I/O signal cable 1 pc ● Power supply cable 1 pc



| Length | Cable set model | I/O signal cable | Power supply cable |
|--------------------|-----------------|------------------|--------------------|
| 300 mm (11.8 in.) | LHS003CD | LH003C4 | LH003C1 |
| 1000 mm (39.4 in.) | LHS010CD | LH010C4 | LH010C1 |

4.5 Names and functions of parts

This section explains the name and function for each part of the driver.



| Name | Indication | Description |
|--------------------------|------------|---|
| Power supply connector | CN1 | Connects the power supply cable. |
| I/O signal connector | CN2 | Connects the I/O signal cable to connect with an external control device. |
| Motor connector | CN3 | Connects the motor cable. |
| USB connector | CN4 | Connects a PC in which the MEXE02 has been installed. |
| LED | PWR/ALM | Lit in green while the power is supplied. If an alarm is generated, this LED will blink in red. If information is generated, it will blink in orange. |
| Internal potentiometer * | VR1 | Uses to set the operation data. Factory setting: The rotation speed in the operation data No.1 can be set. |
| | VR2 | Uses to set the operation data. Factory setting: The acceleration time and deceleration time in the operation data No.0 and No.1 can be set. |

* The function can be changed using the **MEXE02**.

5 Installation

5.1 Installation location

The driver is designed and manufactured to be incorporated in equipment.

Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature: 0 to +50°C [+32 to +122 °F] (non-freezing)
- Operating ambient humidity: 85% or less (non-condensing)
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area free of excessive salt
- Area not subject to splashing water (rain, water droplets), oil (oil droplets) or other liquids
- 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
- Altitude: Up to 1000 m (3300 ft.) above sea level

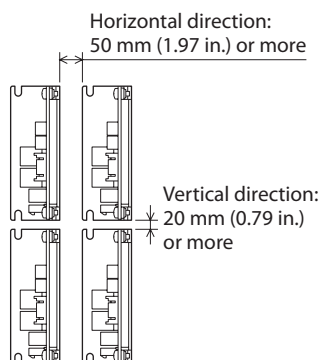
5.2 Installing the driver

■ Installation direction

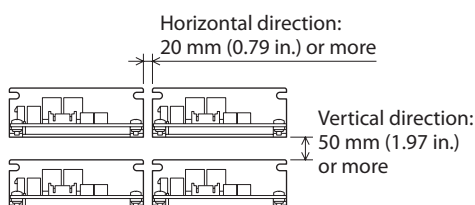
The driver is designed on the basis of heat radiation by air convection and heat conduction to an enclosure.

When installing the driver in an enclosure, be sure to use the mounting holes on the driver, and install it in a vertical direction or horizontal direction.

● Vertical installation

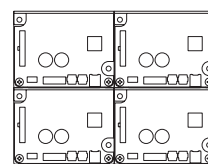


● Horizontal installation



- Drivers can be installed as shown in the figure below.

When using the USB cable for communication, install them with taking the cable outlet position into account.



Both the vertical installation and the horizontal installation are available.

■ Installation method

Install the driver onto an appropriate flat metal plate having excellent vibration resistance and heat conductivity.

Using the mounting holes or notches of the driver, secure it with two screws (M3: not included) so as not to leave a gap between the driver and metal plate.

Note

- Do not install any equipment that generates a large amount of heat or noise near the driver.
- If the ambient temperature of the driver exceeds the upper limit of the operating ambient temperature, reconsider the ventilation condition or forcibly cool the area around the driver using a fan in order to keep within the operating ambient temperature.

6 Connection

This chapter explains how to connect the driver with the motor, power supply, and I/O signals.

6.1 Connecting the motor and driver (CN3)

Insert the motor cable connector into the motor connector (CN3) on the driver.

When extending the motor cable, use a connection cable (sold separately).

The maximum extension distance including the cable length of the motor itself should be 2 m (6.6 ft.).

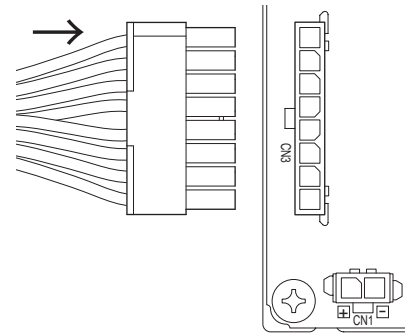
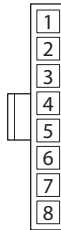


- Firmly insert the connector in position. Insecure connector connection may cause malfunction or damage to the motor or driver.
- Be sure to insert and pull out the connector while holding the connectors part. Do not apply any force in a direction other than the direction of inserting and pulling out the connector. Applying improper force may cause damage to the connector and driver.

CN3 pin assignment

| Pin No. | Lead wire color* | Lead wire size |
|---------|------------------|----------------|
| 1 | Gray (Black) | AWG22 |
| 2 | Purple | |
| 3 | Blue | |
| 4 | Yellow | AWG26 |
| 5 | Green | |
| 6 | Orange | |
| 7 | Red | |
| 8 | Brown (White) | |

Viewed from the direction of an arrow in the right figure



* The color in parentheses () indicates the 15 W type.

- Housing 43645-0800 (molex)
- Terminal AWG22, 24: 43030-0001 (molex)
AWG26: 43030-0004 (molex)

For lead wire type, all lead wire sizes are AWG22 (15W: AWG24).

6.2 Connecting the power supply (CN1)

Insert the power supply cable connector into the power supply connector (CN1) on the driver.

Lead wire size: AWG22 (0.3 mm²)



- When connecting, pay attention to the polarity of the power supply. Connection with incorrect polarity may cause damage to the driver.
- Do not wire the power supply cable of the driver in the same cable duct with other power lines or motor cables.
- When turning on or off the power supply using a mechanical contact (breaker, electromagnetic switch, relay, etc.), do so only the positive side (+) of the power supply using the mechanical contact. Turning on or off the positive side (+) and the negative side (-) of the power supply simultaneously using a mechanical contact may cause damage to the control circuit or peripheral equipment.
- When turning on the power again or inserting/pulling out the motor cable connector, turn off the power and wait for at least 5 seconds before doing so.

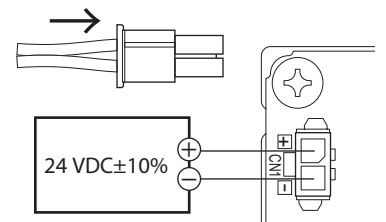
CN1 pin assignment

| Pin No. | Lead wire color | Lead wire size |
|---------|-----------------|----------------|
| 1 | Red | AWG22 |
| 2 | Black | |

Viewed from the direction of an arrow in the right figure



- Housing: 43645-0200 (molex)
- Terminal: 43030-0001 (molex)



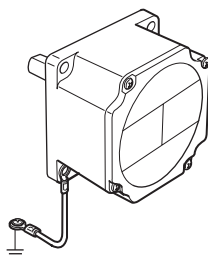
6.3 Grounding

The wire used to ground the motor and driver must be as thick and short to the grounding point as possible so that no potential difference is generated. Choose a large, thick and uniformly conductive surface for the grounding point.

● Grounding the motor

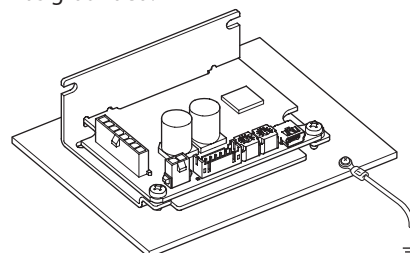
Connect the grounding wire along with a set screw to the grounding point, using a shakeproof washer.

For the 15 W type motor, remove the paint from the mounting surface of the geared motor, and install it to a metal surface that has grounded.



● Grounding the driver

Install the driver to a metal surface that has grounded.



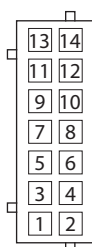
6.4 Connecting the I/O signals (CN2)

Insert the connector of the I/O signal cable into the I/O signal connector (CN2) of the driver.

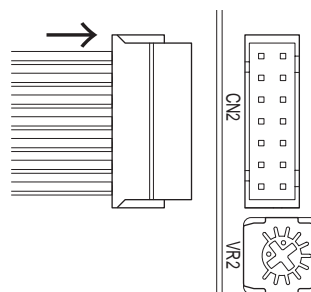
Lead wire size: AWG26 (0.14 mm²)

CN2 pin assignment

Viewed from the direction of an arrow in the right figure



Housing: PHDR-14VS (JST)
Terminal: SPHD-001T-P0.5 (JST)



| Pin No. | Lead wire color | Terminal name | Initial assignment signal *1 | Description |
|---------|-----------------|---------------|-----------------------------------|--|
| 14 | Yellow/Black | DIN0 | [START/STOP] | These signals are used to operate the motor. The motor rotates according to the acceleration time when both the START/STOP input and the RUN/BRAKE input are turned ON. |
| 13 | Orange/White | DIN1 | [RUN/BRAKE] | If the START/STOP input is turned OFF, the motor stops according to the deceleration time. If the RUN/BRAKE input is turned OFF, the motor stops instantaneously. |
| 12 | Red/White | DIN2 | [FWD/REV] | This signal is used to change the motor rotation direction. The motor rotates in the forward direction when the signal is turned ON. *2 |
| 11 | Brown/White | DIN3 | [M0] | The operation data number can be selected based on a combination of ON-OFF status of the M0 and M1 inputs. |
| 10 | Black | DIN4 | [M1] | |
| 9 | White | DIN5 | [ALM-RST] | This signal is used to reset the alarm. (The alarm will be reset at the ON edge of the input.) |
| 8 | Gray | VH | External analog setting device *3 | These terminals are used when the rotation speed or torque limiting value is externally set using an external analog setting device (external potentiometer or external DC voltage). |
| 7 | Purple | VM | | |
| 6 | Blue | VL | | |
| 5 | Green | GND | GND | I/O signals common |
| 4 | Yellow | DOUT0 | [SPEED-OUT] | 30 pulses are output while the motor output shaft makes one revolution. |
| 3 | Orange | DOUT1 | [ALM-B] | This is a signal to output an alarm status. It is turned OFF when an alarm is generated. (Normally closed) |
| 2 | Red | DOUT2 | [TLC] | This is a signal to output when the motor output torque is limited. *4 |
| 1 | Brown | DOUT3 | [DIR] | This is a signal to output information of the motor rotation direction. (It is turned ON when the motor rotates in the forward direction.) |

*1 A signal assigned at the time of shipment is described in brackets []. Functions for the pin No.1 to No.4 and No.9 to No.14 can be changed using the **MEXE02**.

*2 The rotation direction of the output shaft varies depending on the gear ratio of the gearhead. The rotation direction can be changed by setting of the "Motor rotation direction" parameter.

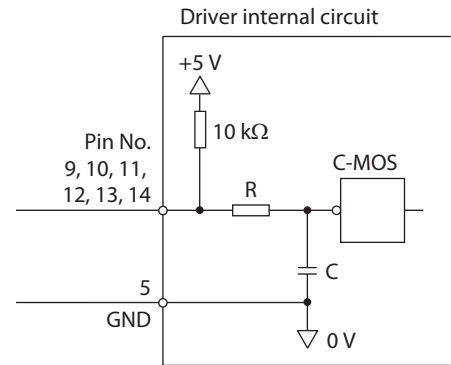
*3 If the "External setting method" parameter is changed, the rotation speed and torque limiting value can be set with the PWM signal input.

*4 The torque limiting value is set to 200% at the time of shipment and can be changed using the **MEXE02**.

6.5 Driver I/O circuit

■ Input signals circuit

Input signals of the driver are C-MOS inputs.
The signal state represents "ON: 0 to 0.5 V (L level)" and "OFF: 4 to 5 V (H level)."

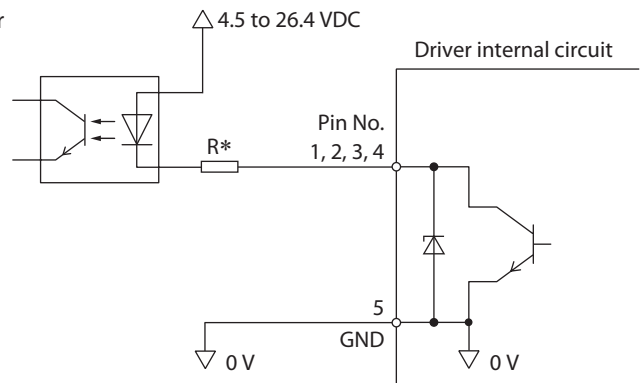


● Changing the logic level setting of input signals

The logic level setting for input terminals DIN0 to DIN5 can be changed using the **MEXE02**. Refer to the USER MANUAL for details.

■ Output signals circuit

Output signals of the driver are transistor open-collector outputs. The signal state represents a state of "ON: Carrying current" or "OFF: Not carrying current" for the internal photocoupler rather than the voltage level of the signal.
ON voltage: 0.5 VDC maximum
External power supply: 4.5 to 26.4 VDC, 10 mA or less



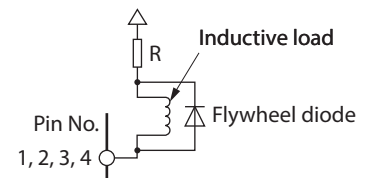
* Recommended resistance value when a current limiting resistor R is connected:
For 24 VDC: 2.7 kΩ to 4.7 kΩ (1 W)
For 5 VDC: 560 Ω to 820 Ω (0.25 W)

● Changing the logic level setting of output signals

The logic level setting for output terminals DOUT0 to DOUT3 can be changed using the **MEXE02**. However, if the SPEED-OUT output is assigned, it cannot be changed. Refer to the USER MANUAL for details.



- Be sure to suppress a current flowing to the output circuit at 10 mA or less. Connect a current limiting resistor R externally if the current exceeds this specified value. If the driver is used without connecting a current-limiting resistor, it will be damaged.
- When a relay (inductive load) is connected, provide a control measure for the fly-back voltage against the relay by connecting a diode. Or use a relay with built-in flywheel diode.



6.6 Connecting external analog setting devices

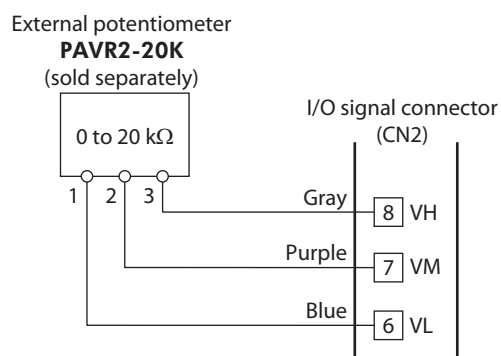
Using an external potentiometer (sold separately), external DC voltage, or PWM signal input, the rotation speed or torque limiting value can be set.

■ Using an external potentiometer

Connect to the pin No.6 to No.8 of the CN2.



When the **PAVR2-20K** is used, use the ferrule (rod terminal).
 Manufacturer: PHOENIX CONTACT GmbH & Co. KG
 Model: AI 0,14-8 [AWG26 (0.14mm²)]



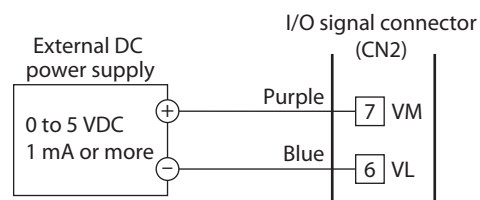
When a shielded cable is used for connection with the external potentiometer, connect shields to VL of the pin No.6 from near the I/O signal connector (CN2).

■ Using external DC voltage

For the external DC voltage, use a DC power supply (0 to 5 VDC) with reinforced insulation on its primary and secondary sides, and connect to the pin No.6 and No.7 of the CN2.

The input impedance between the VM input and the VL input is approximately 47 kΩ.

The VL input is connected to GND inside the driver.

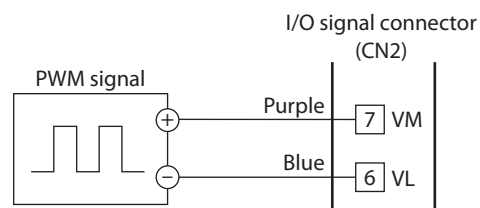


- Be sure to use the voltage of an external control device at 5 VDC or lower. When connecting an external control device, make sure the polarities are correct. If the polarities are reversed, the driver may be damaged.
- When a shielded cable is used for connection with the external control device, connect shields to VL of the pin No.6 from near the I/O signal connector (CN2).

■ Using PWM signal input

When the operation data is set using the PWM signal input, connect the PWM signal lines to the pin No.6 and No.7 of the CN2.

Refer to the USER MANUAL for details about the PWM signal.



6.7 Connecting the USB cable (CN4)

When the **MEXE02** is used, connect the USB cable to the USB connector.

Specifications of USB cable

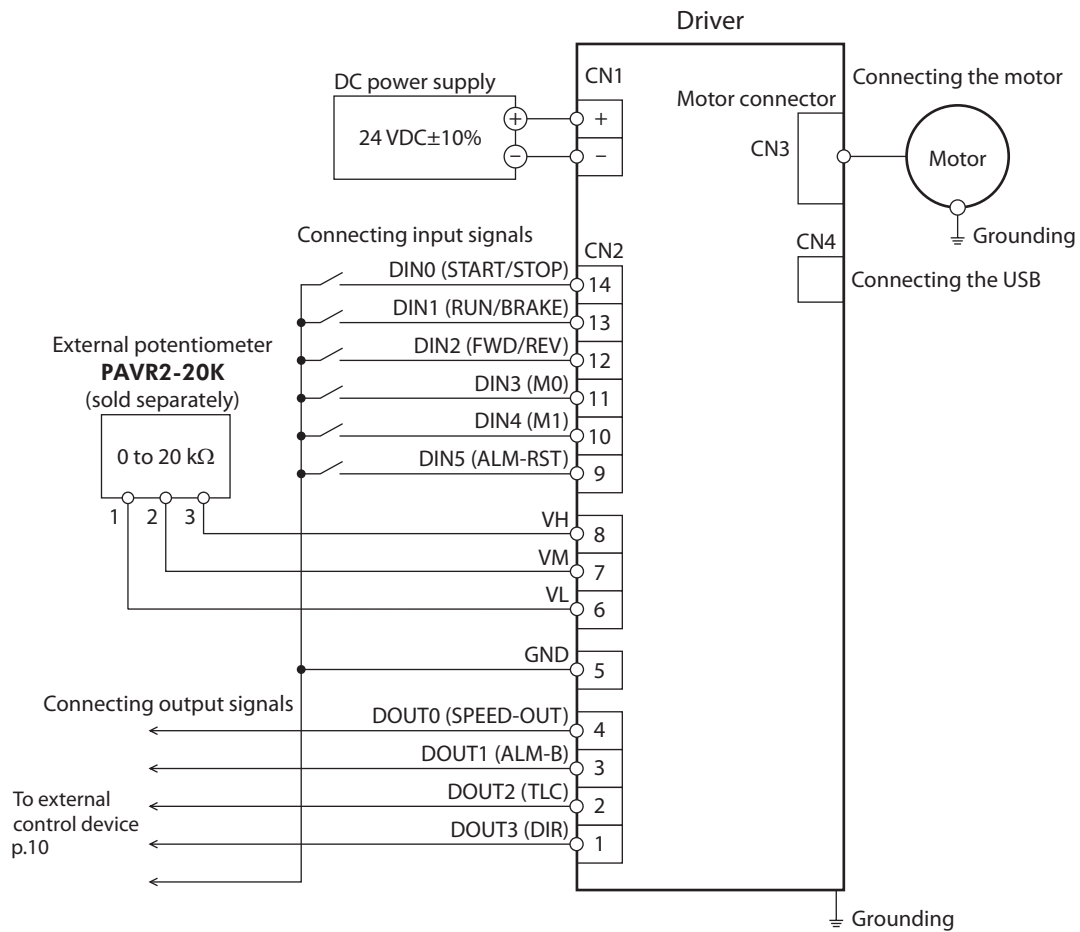
| Specifications | USB2.0 (full speed) |
|----------------|---|
| Cable | Length: 3 m (9.8 ft.) or less Shape: A to mini B |



- Connect the driver and PC directly with the USB cable without using a hub or extension cable.
- In large electrically noisy environments, use the USB cable with a ferrite core or install a ferrite core to the USB cable.

6.8 Connection diagram

The figure shows an example when an external potentiometer is connected.



Note Insulate unused lead wires which are on the opposite side to the connector of the I/O signal cable to prevent them from contacting other devices, or connect them to 5 VDC or the signal ground (GND) of your external control device according to usage of signals.

6.9 Noise measures

There are two types of electrical noises: 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

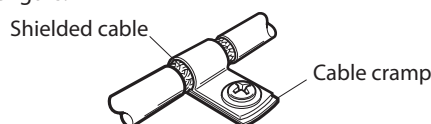
There are the following three methods mainly to take measures against the electrical noise.

● Noise suppression

- When relays or electromagnetic switches are used, use noise filters or CR circuits to suppress surge generated by them.
- Use a connection cable (sold separately) when extending the wiring distance between the motor and the driver. This is effective in suppressing the electrical noise emitted from the motor.
- Cover the driver by a metal plate such as aluminum. This is effective in shielding the electrical noise emitted from the driver.

● Prevention of noise propagation

- Separate power lines such as motor cable and power supply cable from signal lines for a distance of 100 mm (3.94 in.) or more, and also do not bundle them or wire them in parallel. If the power lines must cross over the signal lines, wire them at right angles.
- Use a cable of AWG26 (0.14 mm²) or thicker for the signal cable of the driver, and keep the wiring distance of 3 m (9.8 ft.) or less.
- For more effective elimination of noise, use shielded cables for a power supply cable and I/O signal cable, or attach ferrite cores if non-shielded cables are used.
- Keep cables as short as possible without coiling and bundling extra lengths.
- To ground a shielded cable, use a metal cable clamp that can maintain contact with the entire circumference of the shielded cable, and ground as near the product as possible.



- Grounding multiple points will increase effect to block electrical noise because impedance on the grounding points is decreased. However, ground them so that a potential difference does not occur among the grounding points.

● 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. When increasing the effect of noise attenuation by the ferrite core, loop the cable a lot.

6.10 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. Refer to p.27 for the applicable standards.

Oriental Motor conducts EMC measurements on its motors and drivers in accordance with "Example of installation and wiring" shown on the next page.

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

■ About power supply

The **BLH** Series is a product of DC power supply input. Use a DC power supply (such as a switching power supply) that optimally conforms to the EMC Directive.

■ Connecting the motor cable

When extending the motor cable, use a connection cable (sold separately). The maximum extension distance including the cable length of the motor itself should be 2 m (6.6 ft.).

■ Ferrite core

Use a ferrite core to suppress effect by noise propagation.

Use 7427122 (Würth Elektronik GmbH & Co.KG), ZCAT3035-1330 (TDK Corporation) or equivalent ferrite cores.

Install the ferrite cores close to the motor and driver, respectively.

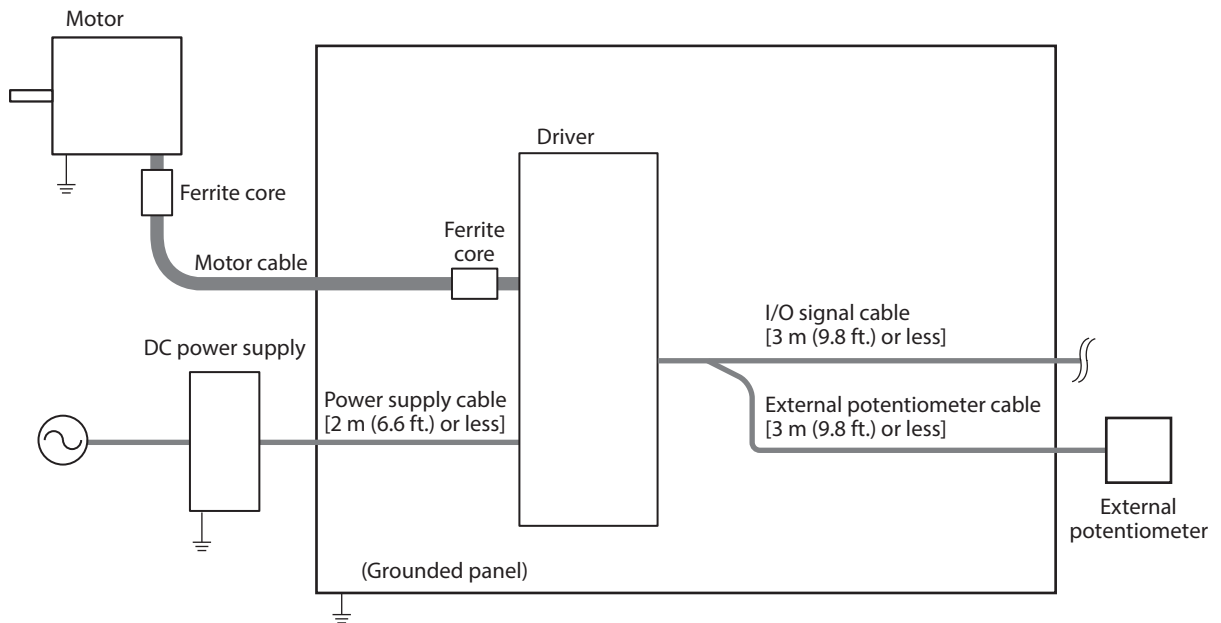
■ Wiring the I/O signal cable

Refer to "Prevention of noise propagation" on p.13.

■ Notes about installation and wiring

- Connect the motor, driver and other peripheral control equipment directly to the grounding point so as to prevent a potential difference from developing between grounds.
- When relays or electromagnetic switches are used together with the system, use noise filters and CR circuits to suppress surges generated by them.
- Keep a power supply cable and signal cable as short as possible without coiling and bundling extra lengths.
- Separate power lines such as motor cable and power supply cable from signal lines, and wire them apart as much as possible [example: about 100 to 200 mm (3.94 to 7.87 in.)]. If the power lines must cross over the signal lines, wire them at right angles.

■ Example of installation and wiring



■ Precautions about static electricity

Static electricity may cause the driver to malfunction or suffer damage. Be careful when handling the driver while the power is supplied.

Always use an insulated screwdriver to adjust the internal potentiometers of the driver.



Do not approach or touch the driver while the power is supplied.

6.11 I/O signals list

This section explains about input signals and output signals.

■ Input signals

| Terminal name | Signal name | Description | |
|---|-------------|--|-------------|
| DIN0 | START/STOP | This signal is used to rotate the motor or decelerate to stop it. | 3-Wire mode |
| DIN1 | RUN/BRAKE | This signal is used to rotate the motor or stop it instantaneously. | |
| DIN2 | FWD/REV | This signal is used to select the motor rotation direction. | |
| DIN3 | M0 | These signal are used to select the operation data number. | 2-Wire mode |
| DIN4 | M1 | | |
| DIN5 | ALM-RST | This signal is used to reset the alarm generated presently. | |
| Signals possible to change the assignment | FWD* | This signal is used to rotate the motor in the forward direction. | |
| | REV* | This signal is used to rotate the motor in the reverse direction. | |
| | STOP-MODE* | This signal is used to select how to stop the motor. | |
| | M2 | This signal is used to select the operation data number. | |
| | TL | This signal is used to switch whether to enable or disable the torque limiting function. | |
| | INFO-CLR | This signal is used to reset the information generated presently. | |
| | HMI | This signal is used to release the function limitation of the MEXE02 . | |
| | EXT-ERROR | This signal is used to stop the motor forcibly by the external signal. | |

* This is a signal to switch using a parameter.

■ Output signals

| Terminal name | Signal name | Description |
|---|-------------|--|
| DOUT0 | SPEED-OUT | 30 pulses are output while the motor output shaft makes one revolution in synchronization with the motor rotation. |
| DOUT1 | ALM-B | If an alarm is generated, this output is turned OFF (normally closed). |
| DOUT2 | TLC | When the output torque is limited, this output is turned ON. |
| DOUT3 | DIR | Information of the motor rotation direction is output. (When the motor rotates in the forward direction: ON) The ON state will be continued until the motor will reversely rotates. |
| Signals possible to change the assignment | ALM-A | If an alarm is generated, this output is turned ON (normally open). |
| | MOVE | When the motor rotates, this output is turned ON. |
| | INFO | Information status of the driver is output. |
| | VA | When the detected speed reached the plus or minus range of "VA detection width" with respect to the setting speed, this output is turned ON. |
| | INFO-DRVTMP | When the corresponding information is generated, the output is turned ON. |
| | INFO-OVOLT | |
| | INFO-UVOLT | |
| | INFO-LOAD | |
| | INFO-SPD | |
| | INFO-SET-E | |
| | INFO-DRV | |
| | INFO-TRIP | |
| | INFO-ODO | |
| | INFO-TRQ-DE | |
| | INFO-SPD-DE | |
| | INFO-PTIME | |
| | INFO-PCOUNT | |
| | INFO-DSLMTD | |
| INFO-IOTEST | | |
| INFO-CFG | | |
| INFO-RBT | | |

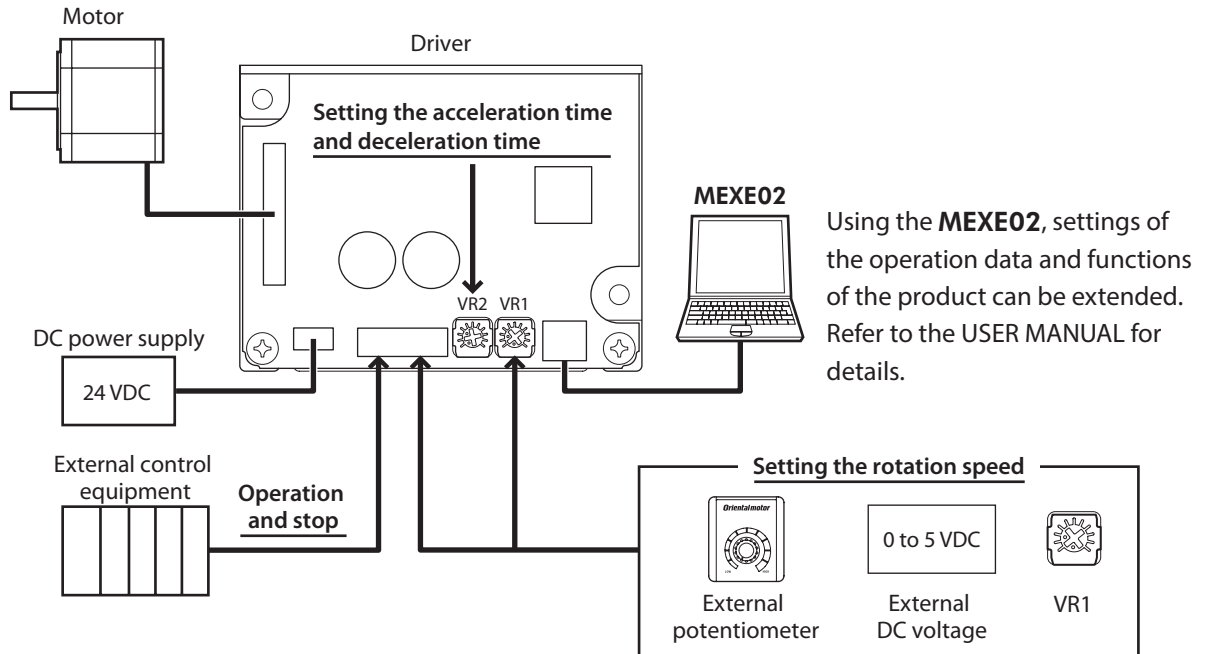
: These signals are assigned at the time of shipment.

Refer to the USER MANUAL when changing the signal assigned to the I/O signal terminals.

7 Operation

This chapter explains how to operate the product in a state of the factory setting without using the **MEXE02**.

7.1 Guidance



7.2 Setting the rotation speed

The rotation speed can be set using the external analog setting device (external potentiometer or external DC voltage) or VR1.

Whether to use the external analog setting device or VR1 can be selected by switching the ON/OFF status of the M0 input.

The setting range is 100 to 3000 r/min.

The setting range of the **MEXE02** is 80 to 3150 r/min. Refer to the USER MANUAL for details.

| M0 input | OFF | ON |
|---------------|--------------------------------|-----|
| Speed setting | External analog setting device | VR1 |

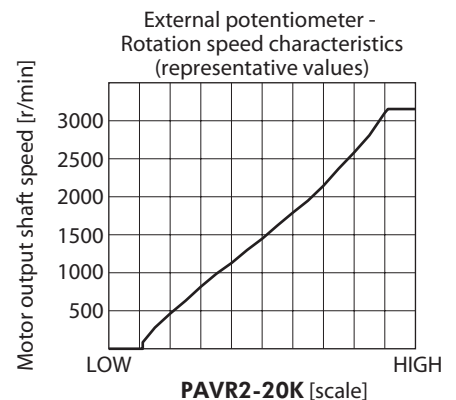
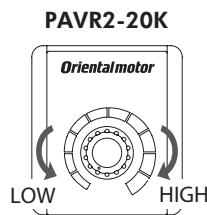
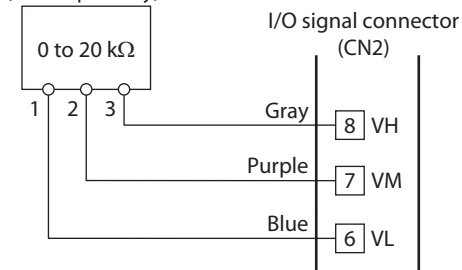
External potentiometer

An external potentiometer is used when the speed is set from a place away from the driver.

Use the **PAVR2-20K** (sold separately) for an external potentiometer.

External potentiometer

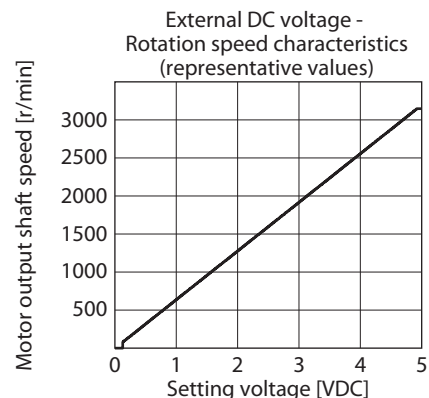
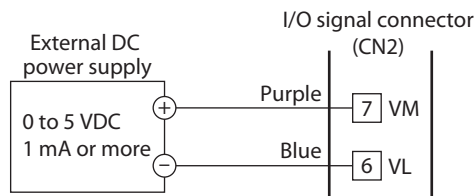
PAVR2-20K
(sold separately)



External DC voltage

External DC voltage is used when the speed is set from an external control device.

For the external DC voltage, use a DC power supply (0 to 5 VDC, 1 mA or more) with reinforced insulation on its primary and secondary sides.

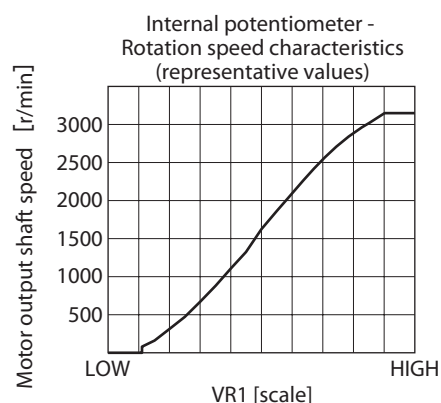
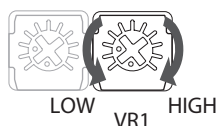


VR1

The internal potentiometer VR1 is used when the rotation speed is not changed frequently or is set without providing an external setting device.

Adjust the potentiometer using an insulated screwdriver.

Factory setting: 0 r/min



7.3 Setting the acceleration time and deceleration time

The acceleration time and deceleration time can be set so that an impact is not applied to a load when the motor starts or stops.

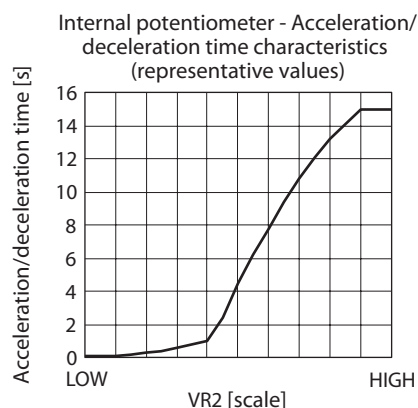
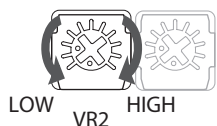
The acceleration time refers to a time needed for the motor to reach 3000 r/min from a standstill state.

The deceleration time refers to a time needed for the motor to stop from the 3000 r/min.

The actual acceleration time and deceleration time vary depending on the conditions of use, load inertia, or load torque specified by the customer.

The setting range is 0.1 s to 15.0 s.

Factory setting: 0.1 s



7.4 Operation and stop

To switch between operation and stop movement (instantaneous stop or deceleration stop) of the motor in the 3-wire mode, the START/STOP input and RUN/BRAKE input are used.

| | START/STOP input | RUN/BRAKE input | Motor operation |
|--------------|------------------|-----------------|--------------------|
| Signal level | ON | ON | Operation |
| | ON | OFF | Instantaneous stop |
| | OFF | ON | Deceleration stop |

If the RUN/BRAKE input is turned OFF during deceleration stop, the motor stops instantaneously.

Deceleration stop: The motor decelerates to a stop according to a time set in the deceleration time.

Instantaneous stop: The motor stops at the shortest time without following the deceleration time.

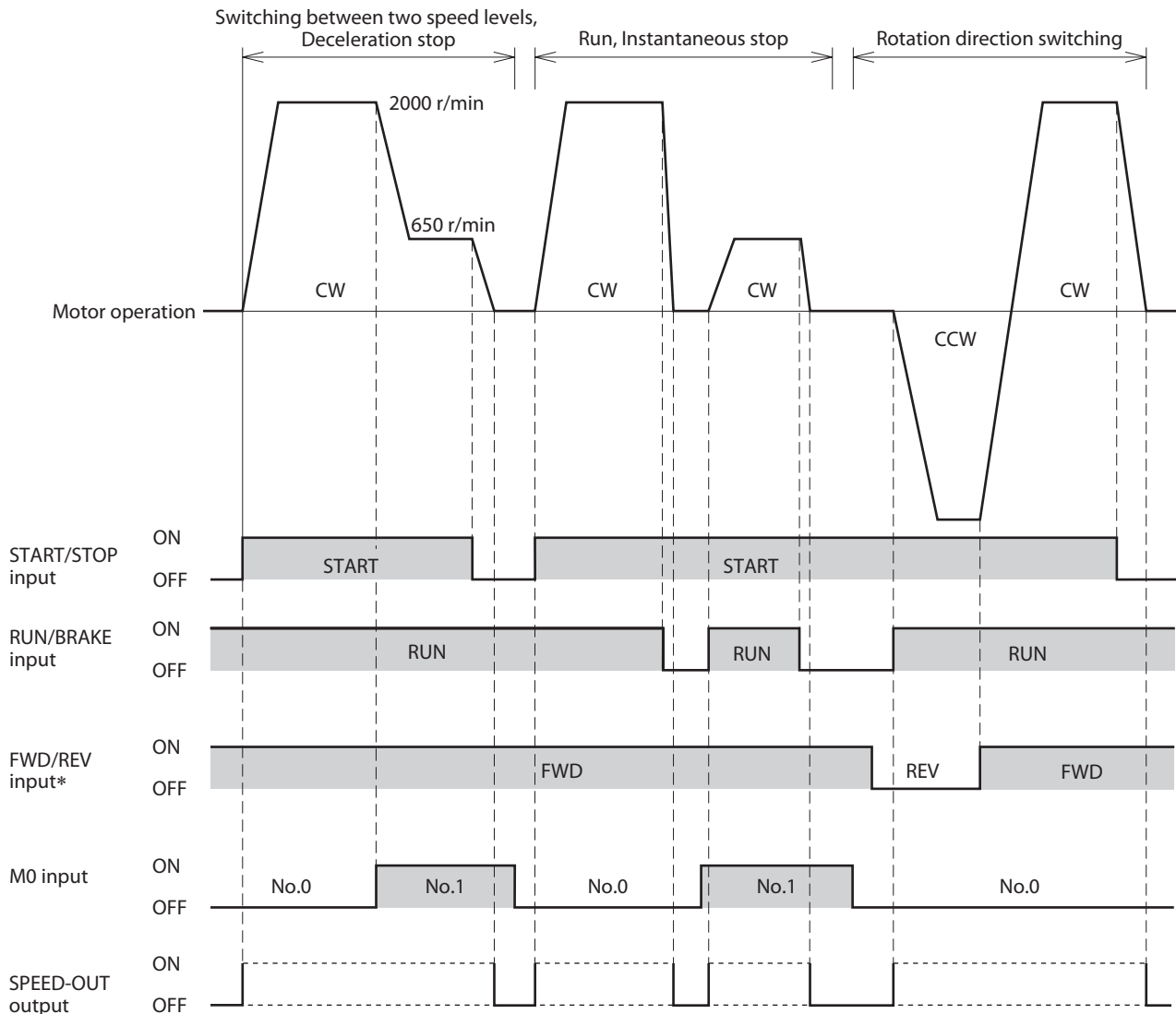


- When the START/STOP input and the RUN/BRAKE input are turned OFF simultaneously, the RUN/BRAKE input is prioritized.
- The actual acceleration time and deceleration time are affected by customer's conditions of use, load inertia, and load torque.

Examples of operation patterns

The figure shows an example of the 3-wire mode when 2000 r/min is set in the operation data No.0 and 650 r/min is set in the operating data No.1.

The rotation direction show the round shaft type. It varies depending on the gear ratio of gearhead.

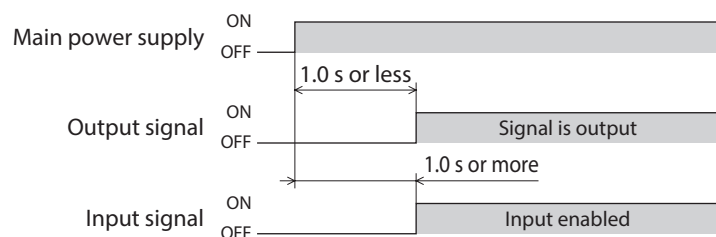


* The motor rotation direction when the FWD/REV input is turned ON can be changed by setting of the "Motor rotation direction" parameter. Refer to the USER MANUAL for details.



To surely recognize the input signal, ensure the ON time and OFF time of each input signal for at least 10 ms.

● Timing chart when power is input

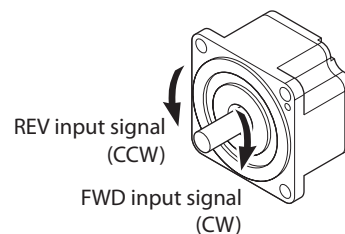


7.5 Rotation direction of the motor output shaft

The rotation direction of the motor output shaft represents the direction when viewed from the motor output shaft.

The motor rotation direction can be changed using the **MEXE02**.

The figure shows when the "Motor rotation direction" parameter is set to "+=CW."



Rotation direction of the gearhead output shaft

The rotation direction of the gearhead output shaft varies depending on the type or the gear ratio of the gearhead. Check the operating manual supplied with the motor for the rotation direction of the gearhead output shaft.

7.6 Multi-motor control

Operating two or more motors at the same speed can be performed using any of the external potentiometer, external DC voltage, or PWM signal.

Using an external potentiometer

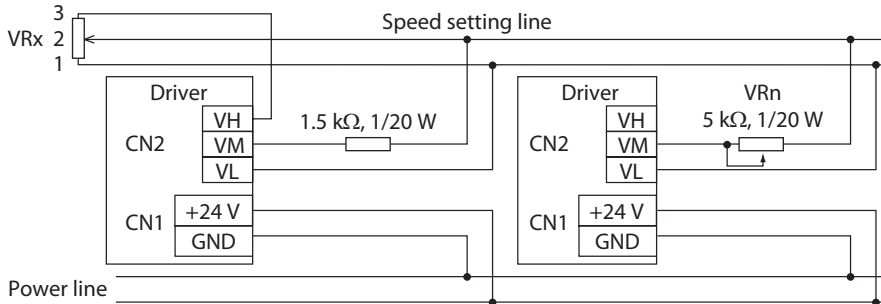
Use common lines for the power supply and speed setting, and set the speed using VRx as shown in the figure below.

- Obtain the resistance value for the external speed potentiometer as follows.

Resistance VRx when the number of drivers is n units: $VRx (k\Omega) = 20 k\Omega/n$, permissible dissipation (W) = $n/20$

Example: If two drivers are connected, 10 k Ω and 1/10 W are obtained.

- For I/O signals other than the speed setting, connect for each driver.
- If multiple motors are used with speed differences among them, adjust as follows.
The first driver: Connect a resistor of 1.5 k Ω , 1/20 W to the terminal M on the driver.
- The second and subsequent drivers: Connect a variable resistor (VRn) of 5 k Ω , 1/20 W to the terminal M on the driver.
- Keep the number of drivers to 10 units or less in multi-motor control using an external potentiometer.



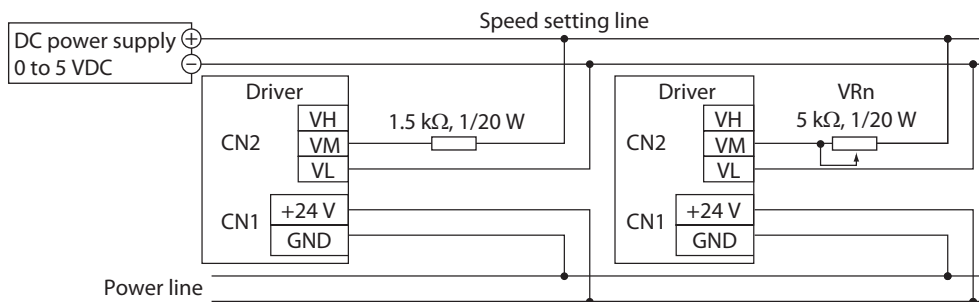
Using external DC voltage

- Use a DC power supply whose current capacity is at least the value calculated by the formula below.

Current capacity (mA) when the number of drivers is n units = $1 mA \times n$

Example: If two drivers are connected, the current capacity should be at least 2 mA.

- For I/O signals other than the speed setting, connect for each driver.
- If multiple motors are used with speed differences among them, adjust as follows.
The first driver: Connect a resistor of 1.5 k Ω , 1/20 W to the terminal M on the driver.
- The second and subsequent drivers: Connect a variable resistor (VRn) of 5 k Ω , 1/20 W to the terminal M on the driver.



8 Maintenance and inspection

8.1 Inspection

It is recommended that periodic inspections would 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.



- Do not conduct the insulation resistance measurement or dielectric strength test with the motor and driver connected.
Doing so may cause damage to the product.
- The driver uses semiconductor elements, so be extremely careful when handling them.
Static electricity may damage the driver.

■ Inspection item

- Check if any of the mounting screws of the motor and gearhead is loose.
- Check if the bearing part (ball bearings) of the motor generates unusual noises.
- Check if the bearing part (ball bearings) or gear meshing part of the gearhead generates unusual noises.
- Check if the output shaft of the motor and gearhead and a load shaft are out of alignment.
- Check if a damage or stress is applied on the cable or the connection part between the cable and driver is loose.
- Check if dust is deposited on the driver.

8.2 Warranty

Check on the Oriental Motor Website for the product warranty.

8.3 Disposal

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

9 Troubleshooting

The motor or driver may not operate properly if the rotation speed is wrongly set or the connection is wrong. If the motor cannot operate properly, refer to the contents provided in this chapter and take appropriate action. If the problem persists, contact your nearest Oriental Motor sales office.



Check the alarm contents when an alarm is generated.

I/O signal status can be checked using the monitor mode of the **MEXE02**. Use it to check the wiring condition of the I/O signals. Refer to the USER MANUAL for details.

| | |
|---|--|
| <p>The motor does not rotate.</p> | <ul style="list-style-type: none"> ● The power supply is not connected correctly or it is improper connection. <ul style="list-style-type: none"> ▷ Check the connection of the power supply. ● The operation input signal is not turned ON. <ul style="list-style-type: none"> ▷ Check the connection and the ON-OFF status of signal. The signal input status can be checked using the internal I/O monitor or D-I/O monitor. ● The operation data number is selected wrongly. Or the motor connector is not connected properly. <ul style="list-style-type: none"> ▷ Check the connection and the ON-OFF status of signal. The signal input status can be checked using the internal I/O monitor or D-I/O monitor. ● An alarm is present. <ul style="list-style-type: none"> ▷ Check if an alarm is generated. The PWR/ALM LED blinks in red while an alarm is present. The alarm content can be checked by counting the number of times the LED blinks or by using the MEXE02. Refer to p.24, and reset the alarm after removing the cause of the alarm. ● The operation data is set wrongly. <ul style="list-style-type: none"> ▷ Check how to set the operation data. The setting method and setting value of the operation data selected can be checked using the status monitor. |
| <p>The motor does not move according to the set operation data.</p> | <ul style="list-style-type: none"> ● The operation data number is selected wrongly. Or the motor connector is not connected properly. <ul style="list-style-type: none"> ▷ Check the connection and the ON-OFF status of signal. The signal input status can be checked using the internal I/O monitor or D-I/O monitor. ● The setting method or setting value is wrong. <ul style="list-style-type: none"> ▷ Check the setting method. The setting method and setting value presently selected can be checked using the status monitor. ● A load is too large. <ul style="list-style-type: none"> ▷ Check if the torque is enough. ● An external analog setting device or PWM signal input is set wrongly. <ul style="list-style-type: none"> ▷ Check the setting value of the "External setting method" parameter. The setting of the "External setting method" parameter can be checked using the unit information monitor. |
| <p>The rotation speed cannot be increased.</p> | <ul style="list-style-type: none"> ● The rotation speed equal to or higher than the value set in the "Speed upper limit" parameter is set. <ul style="list-style-type: none"> ▷ Reconsider the setting value of the "Speed upper limit" parameter or operation data. |
| <p>The rotation speed cannot be decreased.</p> | <ul style="list-style-type: none"> ● The rotation speed lower than the value set in the "Speed lower limit" parameter is set. <ul style="list-style-type: none"> ▷ Reconsider the setting value of the "Speed lower limit" parameter or operation data. |
| <ul style="list-style-type: none"> • A time for stopping is long. • The stopping method is wrong. | <ul style="list-style-type: none"> ● The stopping method is wrongly selected. <ul style="list-style-type: none"> ▷ Check the stopping method. In the case of the 3-wire mode of the operation input mode, the stop movement by turning the RUN/BRAKE input OFF is different from that by turning the START/STOP input OFF. In the case of the 2-wire mode of the operation input mode, the stop movement when the STOP-MODE input is ON is different from that when it is OFF. Refer to the USER MANUAL for details. ▷ For the deceleration stop, check the setting value of the "Deceleration mode selection" parameter. Check the setting value of the parameter using the unit information monitor. ● Load inertia is too large. <ul style="list-style-type: none"> ▷ Check by increasing the frictional load or reducing the load inertia. |

| | |
|--|---|
| <p>Torque limiting value is not increased.</p> | <ul style="list-style-type: none"> ● The value set in the "Torque limiting maximum value" parameter is exceeded. <ul style="list-style-type: none"> ▷ Reconsider the setting value of the "Torque limiting maximum value" parameter or operation data. |
| <p>Torque cannot be limited.</p> | <ul style="list-style-type: none"> ● If the TL input is turned OFF, the torque limiting function is disabled. <ul style="list-style-type: none"> ▷ Check the connection and the ON-OFF status of signal. The signal input status can be checked using the internal I/O monitor or D-I/O monitor. |
| <p>The PWR/ALM LED blinks in orange.</p> | <ul style="list-style-type: none"> ● Information is present. <ul style="list-style-type: none"> ▷ Information is present because of any of the causes. Check the generated information using the information monitor or internal I/O monitor, and clear the cause of generation or disable the "INFO action" parameter. |
| <p>The motor rotates in the opposite direction to the specified one.</p> | <ul style="list-style-type: none"> ● The ON-OFF operation of the FWD/REV input is used wrongly or the FWD/REV input is not connected correctly. <ul style="list-style-type: none"> ▷ Check the connection and the ON-OFF status of signal. The signal input status can be checked using the internal I/O monitor or D-I/O monitor. ● The setting of the "Motor rotation direction" parameter has been changed. <ul style="list-style-type: none"> ▷ The motor rotates in the forward direction when the FWD/REV input is turned ON. The setting for rotating in the forward direction can be set with the "Motor rotation direction" parameter. (Initial value: +=CW) ● The gearhead with a reduction ratio which rotation direction is opposite to the motor output shaft is used. (Refer to p.19 for the rotation direction of the gearhead output shaft) <ul style="list-style-type: none"> ▷ Reverse the ON-OFF status of the FWD/REV input or invert the logic level setting of the input. Change the setting for the "Motor rotation direction" parameter. ● A hollow shaft flat gearhead is used. <ul style="list-style-type: none"> ▷ The hollow shaft flat gearhead rotates in the opposite direction to the motor when viewed from the front side of the gearhead, and rotates in the same direction to the motor when viewed from the rear side (motor mounting side). |
| <p>• The motor movement is not stable. • Motor vibration is too large.</p> | <ul style="list-style-type: none"> ● The motor and gearhead output shaft and a load shaft are out of alignment. <ul style="list-style-type: none"> ▷ Check the coupling condition of the motor and gearhead output shaft and the load shaft. ● The motor output power and the driver output power are not matched. <ul style="list-style-type: none"> ▷ Check if the motor output power and the driver output power are the same. The driver output power can be checked by the driver model name in the unit information monitor. ● The product is affected by electrical noise. <ul style="list-style-type: none"> ▷ Check the operation using the motor, driver and a minimum of external equipment required for operation. If an effect of noise has been confirmed, implement the following countermeasures: [Keep away from the noise sources.] [Reconsider the wiring.] |

10.3 Alarm lists

| Number of times PWR/ALM LED blinks | Alarm name | Cause | Remedial action | Reset using the ALM-RST input |
|------------------------------------|-------------------------------------|--|---|-------------------------------|
| Two times | Overload | A load exceeding the rated torque was applied to the motor for a time set in the "Overload alarm detection time" parameter or more. * | <ul style="list-style-type: none"> Decrease a load. Reconsider operating conditions such as the acceleration time and deceleration time. If the alarm is generated at a low temperature, warm up. | Possible |
| Three times | Sensor error | The sensor line in the motor cable was disconnected. Or the motor cable was come off. | Check the connection between the driver and motor. | |
| | Sensor error at power-on | The sensor line in the motor cable was disconnected. Or the driver power supply was turned on in a state where the motor cable was come off. | | |
| Four times | Overvoltage | <ul style="list-style-type: none"> The internal voltage of the driver exceeded 38 VDC. A large inertial load was suddenly stopped. | <ul style="list-style-type: none"> Check the power supply voltage. If the alarm is generated during operation, decrease a load or increase the deceleration time. If the motor is rotated by external force, reconsider how to use or environment. | |
| Five times | Undervoltage | The internal voltage of the driver dropped below 18 VDC. | <ul style="list-style-type: none"> Check the power supply voltage. Check the wiring of the power supply cable. | |
| Six times | Overspeed | The motor rotation speed was exceeded 5200 r/min. | <ul style="list-style-type: none"> Decrease a load. Reconsider operating conditions such as the acceleration time and deceleration time. If the motor is rotated by external force, reconsider how to use or environment. | |
| Seven times | Overcurrent | Excessive current was flown through the driver due to ground fault, etc. | Turn off the power, and turn on the power again after checking if the product is not damaged. If the alarm is not cleared, contact your nearest Oriental Motor sales office. | Not possible |
| Eight times | EEPROM error | The data stored in the driver was damaged. | Initialize the parameters, and turn on the power again. | |
| Nine times | Main circuit overheat | The internal temperature of the driver exceeded 85 °C (185 °F). | <ul style="list-style-type: none"> Reconsider the ambient temperature. Reconsider the ventilation condition. Reconsider the operating condition. | |
| 10 times | External stop | <ul style="list-style-type: none"> The EXT-ERROR input signal was turned OFF. External stop was executed using the MEXE02. | Check the EXT-ERROR input signal. | Possible |
| 11 times | Prevention of operation at power-on | The power supply was turned on in a state where the "Prevention of operation at power-on alarm" parameter was set to "enable" and the operation input signal was being ON. | Before supplying power to the driver, turn the operation input signal OFF. | |
| Lit | CPU error | The CPU is not operated properly. | Turn on the power again. If the alarm is not cleared, contact your nearest Oriental Motor sales office. | Not possible |

* The setting can be changed using the "Overload alarm detection time" parameter. Refer to the USER MANUAL for details.

11 Specifications

11.1 Specifications

Values in the rated torque, peak torque, rated rotation speed, and speed control range represent those in a state where the gearhead is not combined. Refer to "4.4 Products possible to combine" (p.5) for the motor model name.

| Model | Motor | BLHM015K-□□ | BLHM230KC-□□*1 BLHM230KCM-□□ | BLHM450KC-□□*1 BLHM450KCM-□□ |
|---------------------------------|---------------------------|---------------------------|---------------------------------|---------------------------------|
| | Driver | BLH2D15-KD | BLH2D30-KD | BLH2D50-KD |
| Rated output power (Continuous) | | 15 W | 30 W | 50 W |
| Power supply input | Rated voltage | 24 VDC | | |
| | Permissible voltage range | -10 to +10% | | |
| | Rated input current | 0.93 A | 1.9 A | 2.9 A |
| | Maximum input current | 2.3 A | 4.1 A | 5.4 A |
| Rated torque | | 0.048 N·m (6.8 oz-in) | 0.115 N·m (16.3 oz-in) | 0.191 N·m (27 oz-in) |
| Peak torque | | 0.072 N·m (10.2 oz-in) | 0.173 N·m (24 oz-in) | 0.287 N·m (40 oz-in) |
| Rated rotation speed | | 3000 r/min | 2500 r/min | |
| Speed control range | | (80 *2) 100 to 3000 r/min | | |

*1 For the lead wire type, "KC" of the motor model are replaced by "K".

*2 Digital setting

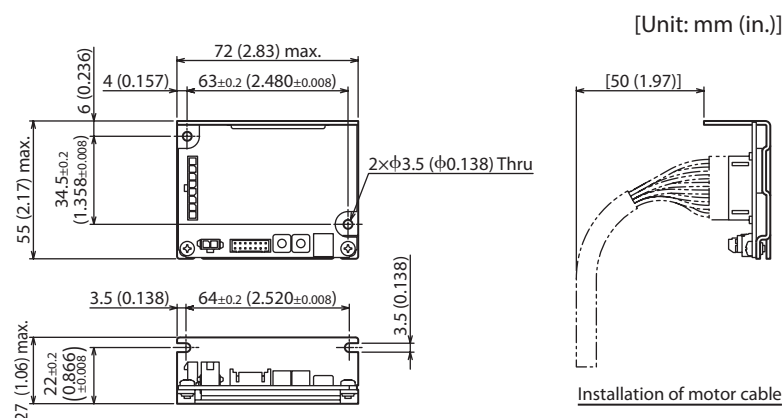
Check on the Oriental Motor Website for the product specifications.

11.2 General specifications

| | | |
|---|------------------------|---|
| Operating environment | Ambient temperature | Driver: 0 to +50 °C [+32 to +122 °F] (non-freezing) |
| | Ambient humidity | 85% or less (non-condensing) |
| | Altitude | Up to 1000 m (3300 ft.) above sea level |
| | Surrounding atmosphere | No corrosive gas, dust, water or oil. Cannot be used in radioactive materials, magnetic field, vacuum or other special environment. (For details about installation locations, refer to p.7.) |
| | Vibration | Not subject to continuous vibrations or excessive impact. In conformance with JIS C 60068-2-6 "Sine-wave vibration test method" Frequency range: 10 to 55 Hz Pulsating amplitude: 0.15 mm (0.006 in.) Sweep direction: 3 directions (X, Y, Z) Number of sweeps: 20 times |
| Storage environment Shipping environment | Ambient temperature | Driver: -25 to +70 °C [-13 to +158 °F] (non-freezing) |
| | Ambient humidity | 85% or less (non-condensing) |
| | Altitude | Up to 3000 m (10000 ft.) above sea level |
| | Surrounding atmosphere | No corrosive gas, dust, water or oil. Cannot be used in radioactive materials, magnetic field, vacuum or other special environment. |
| Degree of protection | | IP00 |

11.3 Dimension

Mass: 46 g (1.62 oz.)



12 Regulations and standards

12.1 UL Standards and CSA Standards

This product is recognized by UL under the UL and CSA standards.

| Applicable Standards | Certification Body/Standards File No. |
|------------------------------------|---------------------------------------|
| UL 62368-1 CSA C22.2 No.62368-1 | UL/E208200 |

12.2 EU Directives

■ CE Marking

This product is affixed the CE Marking under the EMC Directive.

● Low Voltage Directives

- This product is not subject to the coverage of the Low Voltage Directive because the input power supply voltage is 24 VDC.
- When conforming the equipment incorporating this product to the Low Voltage Directive, connect the driver power supply input to the DC power supply where the primary and secondary sides are provided with reinforced insulation.
- Install this product inside an enclosure because it is designed and manufactured to be incorporated in equipment.
- Degree of protection for driver: IP00

● EMC Directive

This product has received EMC compliance under the conditions specified in "Example of installation and wiring" on p.14. The final level of conformance of your mechanical equipment to the EMC Directive will vary depending on such factors as the control system equipment used with the motor and driver, configuration of electrical parts, wiring, layout, and hazard level. It therefore must be verified through conducting EMC measures on your mechanical equipment.

Applicable standards

| | |
|-----|------------------------|
| EMI | EN 55011 group1 classA |
| | EN 61000-6-4 |
| EMS | EN 61000-6-2 |

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.

12.3 Republic of Korea, Radio Waves Act

KC Mark is affixed to this product under the Radio Waves Act, the republic of Korea.

12.4 RoHS Directive

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

- Unauthorized reproduction or copying of all or part of this manual is prohibited.
If a new copy is required to replace an original manual that has been damaged or lost, please contact your nearest Oriental Motor branch or sales office.
- Oriental Motor shall not be liable whatsoever for any problems relating to industrial property rights arising from use of any information, circuit, equipment or device provided or referenced in this manual.
- Characteristics, specifications and dimensions are subject to change without notice.
- While we make every effort to offer accurate information in the manual, we welcome your input. Should you find unclear descriptions, errors or omissions, please contact the nearest office.
- **Oriental motor** is a registered trademark or trademark of Oriental Motor Co., Ltd., in Japan and other countries.
Other product names and company names mentioned in this manual may be registered trademarks or trademarks of their respective companies and are hereby acknowledged. The third-party products mentioned in this manual are recommended products, and references to their names shall not be construed as any form of performance guarantee. Oriental Motor is not liable whatsoever for the performance of these third-party products.

© Copyright ORIENTAL MOTOR CO., LTD. 2018

Published in October 2019

- Please contact your nearest Oriental Motor office for further information.

ORIENTAL MOTOR U.S.A. CORP.
Technical Support Tel:(800)468-3982
8:30 A.M. to 5:00 P.M., P.S.T. (M-F)
7:30 A.M. to 5:00 P.M., C.S.T. (M-F)
www.orientalmotor.com

ORIENTAL MOTOR DO BRASIL LTDA.
Tel:+55-11-3266-6018
www.orientalmotor.com.br

ORIENTAL MOTOR (EUROPA) GmbH
Schiessstraße 44, 40549 Düsseldorf, Germany
Technical Support Tel:00 800/22 55 66 22
www.orientalmotor.de

ORIENTAL MOTOR (UK) LTD.
Tel:01256-347090
www.oriental-motor.co.uk

ORIENTAL MOTOR (FRANCE) SARL
Tel:01 47 86 97 50
www.orientalmotor.fr

ORIENTAL MOTOR ITALIA s.r.l.
Tel:02-93906346
www.orientalmotor.it

ORIENTAL MOTOR ASIA PACIFIC PTE. LTD.
Singapore
Tel:1800-8420280
www.orientalmotor.com.sg

ORIENTAL MOTOR (MALAYSIA) SDN. BHD.
Tel:1800-806161
www.orientalmotor.com.my

ORIENTAL MOTOR (THAILAND) CO., LTD.
Tel:1800-888-881
www.orientalmotor.co.th

ORIENTAL MOTOR (INDIA) PVT. LTD.
Tel:+91-80-41125586
www.orientalmotor.co.in

TAIWAN ORIENTAL MOTOR CO., LTD.
Tel:0800-060708
www.orientalmotor.com.tw

SHANGHAI ORIENTAL MOTOR CO., LTD.
Tel:400-820-6516
www.orientalmotor.com.cn

INA ORIENTAL MOTOR CO., LTD.
Korea
Tel:080-777-2042
www.inaom.co.kr

ORIENTAL MOTOR CO., LTD.
Hong Kong Branch
Tel:+852-2427-9800

ORIENTAL MOTOR CO., LTD.
4-8-1 Higashiueno, Taito-ku, Tokyo
110-8536 Japan
Tel:03-6744-0361
www.orientalmotor.co.jp