Oriental motor

HP-5123

Brushless Motor

BXⅡ Series Driver Edition

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

■ 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. Oriental Motor Co., Ltd. is not responsible for any compensation for damage caused through failure to observe this warning.

■ Operating manuals for the product

Operating manuals for this product are listed below.
For operating manuals not included with the product, contact your nearest Oriental Motor sales office or download from Oriental Motor Website Download Page.

Type of operating manual	Overview	Included or not included with product
BX Ⅱ Series OPERATING MANUAL Motor Edition	This manual explains installation methods of the motor and load, and others.	Included
BX Ⅱ Series OPERATING MANUAL Driver Edition (this document)	This manual explains the functions as well as the installation/ connection methods and others for the driver.	Included
BX Ⅱ Series USER MANUAL	This manual explains detailed operations, functions and others which are not described in the operating manual included with the product.	Not included

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.

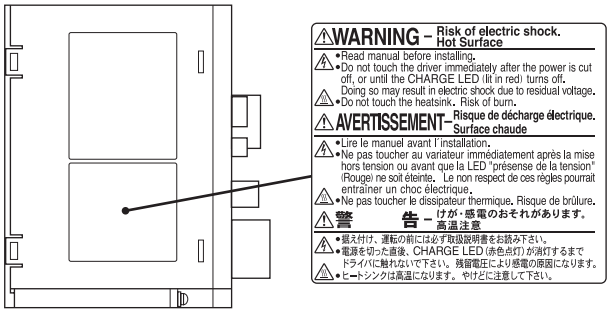
Indicates "compulsory" actions that must be performed.

⚠ WARNING	
⊘	• Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. Doing so may result in fire, electric shock, or injury. • Do not transport, install, connect or inspect the product while the power is supplied. Always turn off the power before carrying out these operations. This may result in electric shock or malfunction. • The terminals on the driver front panel marked with ⚠ ⚠ symbol indicate the presence of high voltage. Do not touch them while the power is supplied. Doing so may result in fire or electric shock. • Do not use the standard type (without electromagnetic brake) in a vertical application. If the driver protective function is activated, the motor will stop and the moving part will drop, thereby causing injury or damage to equipment. • Do not use the brake mechanism of the electromagnetic brake motor as a safety brake. It is intended to hold the moving part and motor positions. Using it as a safety brake may result in injury or damage to equipment. • Do not forcibly bend, pull or pinch the cable. Doing so may result in fire or electric shock. • Do not machine or modify the motor cable or connection cable. Doing so may result in fire or electric shock. • If the motor is operated in vertical direction, do not turn the FREE input ON. The holding power of the motor will be lost, causing injury or damage to equipment. • Do not touch the motor or driver when conducting the insulation resistance measurement or dielectric strength test. Accidental contact may result in electric shock. • Do not touch the connection terminals on the driver immediately (until the CHARGE LED turns off) after the power is turned off. Residual voltage may cause electric shock. • Do not disassemble or modify the motor, gearhead and driver. Doing so may result in electric shock, injury, or damage to equipment. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.
❗	• 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, electric shock, injury or equipment damage. • If the driver protective function was activated, remove the cause before clearing the protective function. Continuing the operation without removing the cause of the problem may cause malfunction of the motor and driver, leading to injury or damage to equipment. • The motor and driver are Class I equipment. When installing the motor and driver, ground their Protective Earth Terminals. Failure to do so may result in electric shock. • Install the motor and driver in an enclosure. Failure to do so may result in electric shock or injury. • Securely connect the cables in accordance with the connection examples. Failure to do so may result in fire or electric shock. • Be sure to observe the specified cable sizes. Use of unspecified cable sizes may result in fire. • Use a motor, gearhead, driver, and regeneration resistor only in the specified combination. Failure to do so may result in fire, electric shock, or damage to equipment. • Always keep the power supply voltage of the driver within the specified range. Failure to do so may result in fire or electric shock. • When using the electromagnetic brake type product in vertical drive such as elevating equipment, be sure to operate after checking the load condition. If a load in excess of the rated torque is applied or the small torque limiting value is set, the load may fall. This may cause injury or damage to equipment. • Always turn off the power before performing maintenance/inspection. Failure to do so may result in electric shock. • Regularly check the openings in the driver for accumulated dust. Accumulated dust may cause fire.

⚠ CAUTION	
	• Do not use the motor, gearhead, driver, or regeneration resistor in a state where the specification value is exceeded. Doing so may result in fire, electric shock, injury, or damage to equipment. • Do not insert an object into the openings in the driver. Doing so may result in fire, electrical shock, or injury. • Do not touch the motor, gearhead, driver, or regeneration resistor while operating or for a certain time after stopping. The surface of the motor, gearhead, driver, or regeneration resistor may be hot, thereby causing 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 touch the rotating part (output shaft) while operating the motor. Doing so may result in injury.
	• Securely install the motor, gearhead and driver to their respective mounting plates. Inappropriate installation may cause the motor, gearhead or driver to detach and fall, resulting in injury or damage to equipment. • For the power supply of I/O signals, 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 cause injury. • Immediately when a problem occurred, stop operation and turn off the driver power. Failure to do so may result in fire, electrical shock, or injury. • 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).  Warning label • Always use an insulated screwdriver to set the switches on the driver. Failure to do so may result in electric shock.

■ 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.



Driver side face

3 Precautions for use

This chapter covers restrictions 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.

Wiring

- Connect protective devices to the power line

  Connect a circuit breaker or earth leakage breaker to the driver power line to protect the primary circuit. When installing an earth leakage breaker, use a product with measures to suppress high-frequency current.

- Noise elimination measures

  Refer to the USER MANUAL for the noise elimination measures.

- 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 the following product with measures to suppress high-frequency current.
  Mitsubishi Electric Corporation: NV series

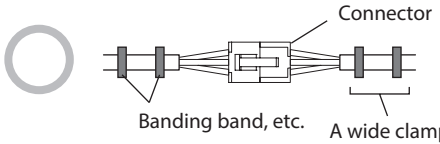
- Connecting the motor and driver

  Be sure to use the dedicated connection cable (sold separately) to connect the motor.

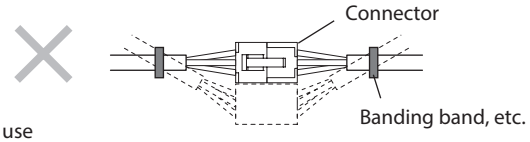
- How to fix the cable

  Fix the cable at the positions near the connector so that no stress is applied on the connector part.

  • Fixing at two places on each side
  Fix using two banding bands or a wide clamp.

  • Fixing at one place on each side
  When the cable is moved, it causes the connectors to move, causing stress to apply on the connector part.

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

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

  The data setter connector (CN6) and the connectors for input and output signals (CN5, CN7) on the driver are not electrically insulated. When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and this equipment to short, damaging both.

Installation circumstances

- 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.

- Note on using in low temperature environment

  When an ambient temperature is low, a load torque may increase due to the oil seal or viscosity of grease used in the gearhead, and the output torque may decrease or an overload alarm may be generated. However, as time passes, the oil seal or grease is warmed up, and the motor can be operated without generating the overload alarm.

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

  When using a hollow shaft flat gearhead, apply grease (molybdenum disulfide grease, etc.) on the surface of the load shaft and inner walls of the hollow output shaft to prevent seizure.

Insulation resistance measurement and dielectric strength test

- Conduct the insulation resistance measurement or dielectric strength test separately on the motor and the driver
  Conducting the insulation resistance measurement or dielectric strength test with the motor and driver connected may result in damage to the product.
- Do not conduct the insulation resistance measurement or dielectric strength test on an encoder.
  Doing so may damage the product.

Operations

- Use an electromagnetic brake motor in an application of vertical drive such as elevating equipment.
  When the motor is used in an application of vertical drive such as elevating equipment (lifting and lowering device), use an electromagnetic brake type product so that the load can be held in position.
- Do not use a solid-state relay (SSR) to turn on or off the power supply.
  A circuit that turns on or off the power supply via a solid-state relay (SSR) may damage the motor and driver.
- When the motor is used in vertical drive (gravitational operation) or in drive with a large inertia, use a regeneration resistor (sold separately).
  If the regenerative energy generated when performing vertical drive (gravitational operation) or sudden start-stop operation of a large inertia exceeds the allowable limit that the driver can absorb, the driver may damage. Using the regeneration resistor (sold separately) will discharge the regenerative energy, thereby protecting the driver.

Handling of the driver

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

Saving the data

- Saving 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 five 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.

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
- ☐ Driver mounting bracket ..... 1 set
  (Driver mounting bracket 2 pcs, mounting screw 4 pcs)
- ☐ Operating manual (this document) ..... 1 copy
- ☐ CN1 connector (6 pins) ..... 1 pc.
- ☐ CN5 connector (11 pins) ..... 1 pc.
- ☐ CN7 connector (12 pins) ..... 1 pc.

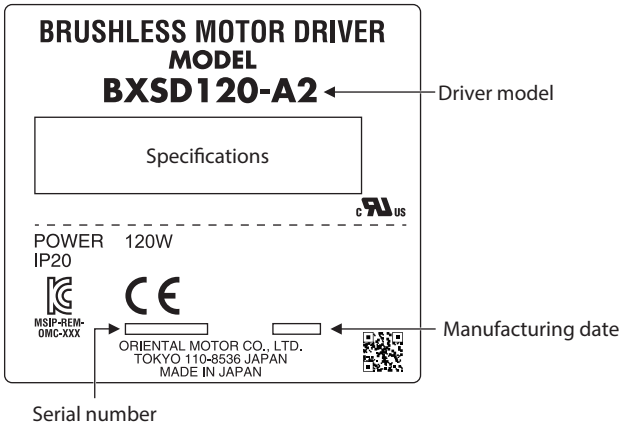
4.2 How to identify the product model

BXSD 120 - A 2
① ② ③ ④

①	Driver type	**BXSD**: **BX Ⅱ** Series driver
②	Output power	**30**: 30 W **60**: 60 W **120**: 120 W **200**: 200 W **400**: 400 W
③	Power supply voltage	**A**: Single-phase 100-120 VAC **C**: Single-phase 200-240 VAC, Three-phase 200-240 VAC
④	Identification code	

4.3 Information about nameplate

The following nameplate is an example for the 120 W type driver.



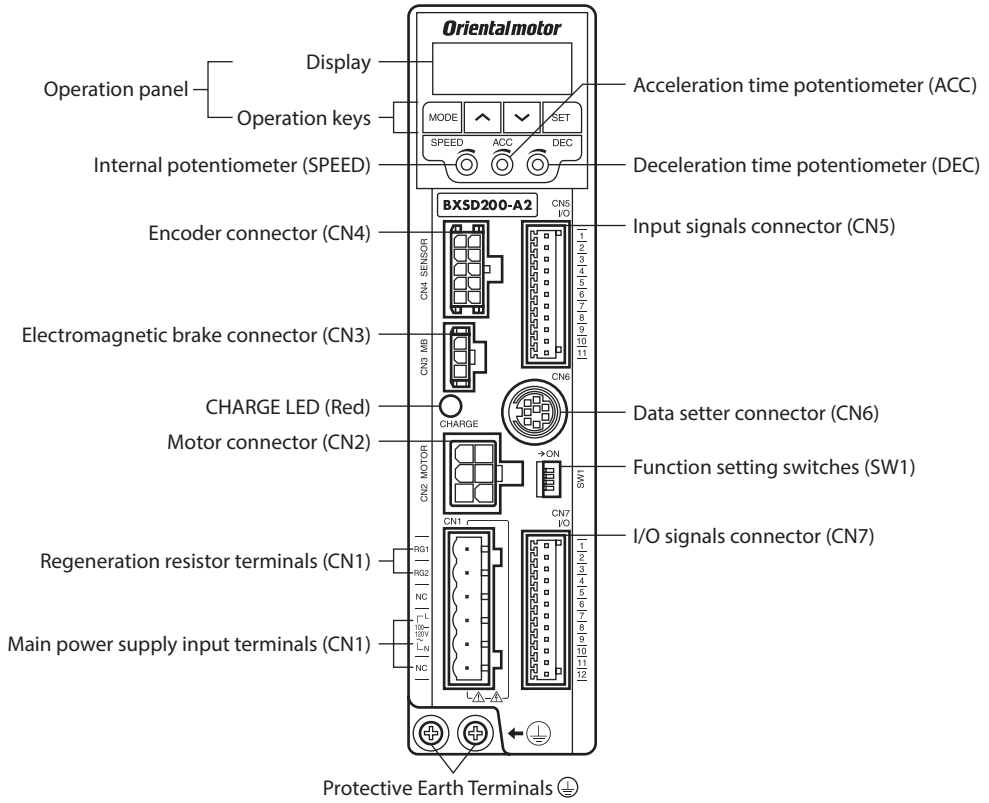
4.4 Products possible to combine

Products with which the drivers can be combined are listed below.
Verify the driver model and the motor model against the model name described on the package label.
In the motor model column in the table below, a part of the model name is described. For details about the motor model, refer to the operating manual included with the motor.

Output power	Driver model		Motor model
	Single-phase 100-120 VAC	Single-phase 200-240 VAC Three-phase 200-240 VAC	
30 W	**BXSD30-A2**	**BXSD30-C2**	**BXM230**
60 W	**BXSD60-A2**	**BXSD60-C2**	**BXM460**
120 W	**BXSD120-A2**	**BXSD120-C2**	**BXM5120**
200 W	**BXSD200-A2**	**BXSD200-C2**	**BXM6200**
400 W	–	**BXSD400-C2**	**BXM6400**

4.5 Names and functions of parts

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



Name	Sign	Description
Operation panel		Display: This display shows the monitor items, setting screen, alarms, etc. (Refer to p.22)
	MODE ∧ ∨ SET	Operation keys: These keys are used to switch the function mode or change parameters. (Refer to p.22)
Internal potentiometer (SPEED)	SPEED	This potentiometer is used to set the operating speed of the motor.
Acceleration time potentiometer (ACC)	ACC	This potentiometer is used to set the acceleration time when the motor is started.
Deceleration time potentiometer (DEC)	DEC	This potentiometer is used to set the deceleration time when the motor is stopped.
Encoder connector (CN4)	SENSOR	Connects the encoder connector of the connection cable.
Electromagnetic brake connector (CN3)	MB	Connects the electromagnetic brake connector of the connection cable.
CHARGE LED (Red)	CHARGE	This LED is lit while the main power supply is turned on. After the main power was turned off, the LED is turned off once the residual voltage in the driver drops to a safe level.
Motor connector (CN2)	MOTOR	Connects the motor power connector of the connection cable.
Regeneration resistor terminals (CN1)	RG1, RG2	Connects the regeneration resistor **EPRC-400P** (sold separately) or **RGB100** (sold separately).
Main power supply input terminals (CN1)		Connects the main power supply.
	L, N, NC	• Single-phase 100-120 VAC: Connects a single-phase 100-120 VAC power supply to L and N. NC is not used.
	L1, L2, L3	• Single-phase 200-240 VAC: Connects a single-phase 200-240 VAC power supply to L1 and L2. L3 is not used. • Three-phase 200-240 VAC: Connects a three-phase 200-240 VAC power supply to L1, L2, L3.
Input signals connector (CN5)	I/O	Connects the input signals.
Data setter connector (CN6)		Connects a PC in which the support software **MEXE02** has been installed or the data setter **OPX-2A** (sold separately).
Function setting switches (SW1)	SW1	• SW1-1: This is used to switch between the speed control mode and position control mode. [Factory setting: OFF] • SW1-2: This is used to set the **BX**-compatible mode. [Factory setting: OFF] • SW1-3: Not used. Keep this switch in the OFF position. • SW1-4: This switch is used to select the power supply for input signals (use the built-in power supply or external power supply). [Factory setting: OFF] (Refer to p.19)
I/O signals connector (CN7)	I/O	• Connects the external potentiometer **PAVR-20KZ** (sold separately) or external DC power supply. • Connects the output signals.
Protective Earth Terminals ⏚	⏚	Ground using a grounding wire of AWG 18 to 14 (0.75 to 2.0 mm^2).
Mounting holes (two places at the rear)		These mounting holes are used to install the driver with screws (M4).

5 Installation

5.1 Installation location

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

5.2 Installing the driver

The driver is designed so that heat is dissipated via air convection and conduction through the enclosure.
Install the driver in a state where clearances 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 are provided.

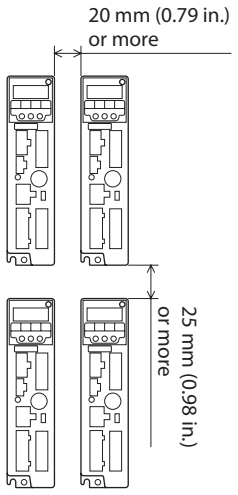
Note

- Install the driver in an enclosure whose pollution degree is 2 or better environment, or whose degree of protection is IP54 minimum.
- Do not install any equipment that generates a large amount of heat or noise near the driver.
- Do not install the driver underneath the controller or other equipment vulnerable to heat.
- 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.
- Be sure to install the driver vertically (in vertical position).

■ Installation conditions

Install the driver to a flat metal plate offering high heat conductivity [corresponding to an aluminum plate of 200×200×2 mm (7.87x7.87x0.08 in.)].
When installing two or more drivers side by side, provide 20 mm (0.79 in.) and 25 mm (0.98 in.) clearances in the horizontal and vertical directions, respectively.

- Operating ambient temperature: 0 to +50 °C (+32 to +122 °F)

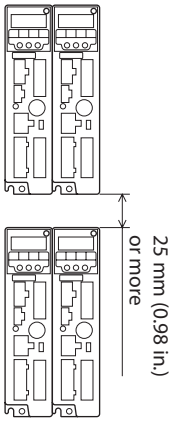


- When drivers are installed in a close contact state

  It is possible to install drivers closely in the horizontal direction.
  In this case, install the drivers to a flat metal plate offering high heat conductivity [corresponding to an aluminum plate of 350×350×2 mm (13.78x13.78x0.08 in.)].

  [30 W, 60 W, 120 W]
  • Operating ambient temperature: 0 to +50 °C (+32 to +122 °F)

  [200 W, 400 W]
  • Operating ambient temperature: 0 to +40 °C (+32 to +104 °F)
  • When using a DIN-rail or a mounting bracket, use in a state where the load factor is 90% or less.



■ Installation method

- Installation with screws

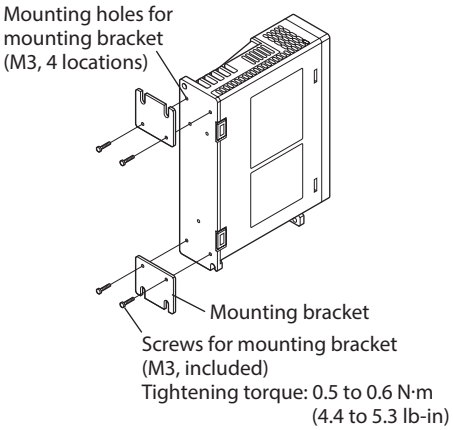
  Install the driver through the mounting holes using two screws (M4: not included).

- Installation to DIN rail

  When installing the driver to a DIN-rail, use the DIN rail mounting plate **MADP02** (sold separately) and mount it to a 35 mm (1.38 in.) wide DIN rail. Refer to "**MADP02** handling guideline" for installation method.

- Installation using driver mounting brackets

  Use the included mounting screws to secure the mounting brackets to the rear of the driver before installing inside the equipment.



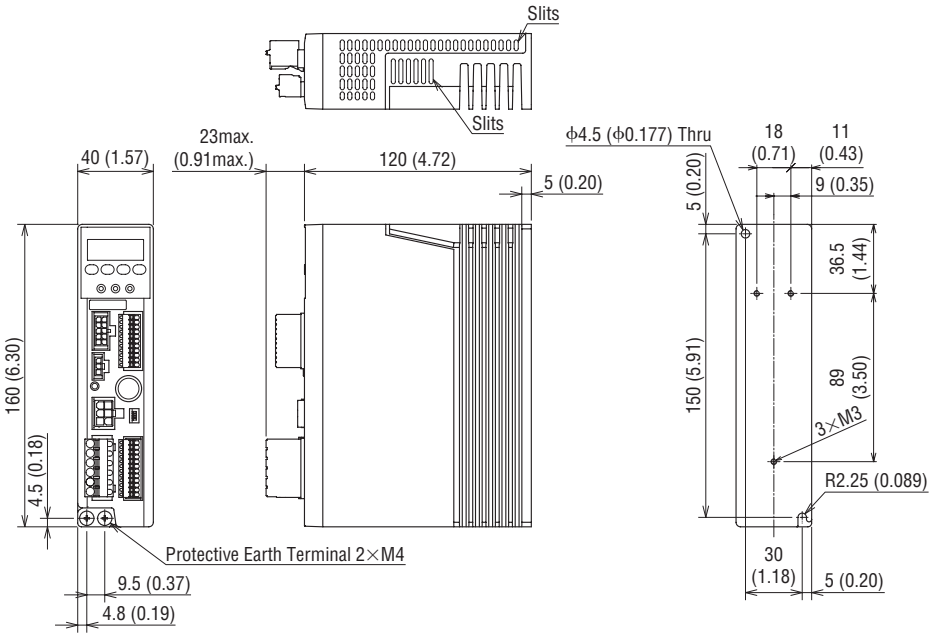
Note

- Do not use the mounting holes of the driver mounting bracket for any other purpose.
- Be sure to secure the driver mounting bracket using the included screws. The use of screws that would penetrate 3 mm (0.12 in.) or more through the surface of the driver may cause damage to the driver.

■ Dimensions

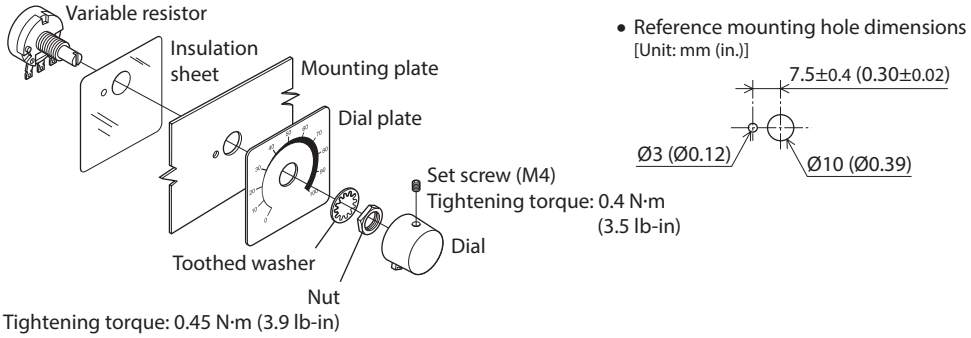
Mass: 0.8 kg (1.76 lb)

[Unit: mm (in.)]

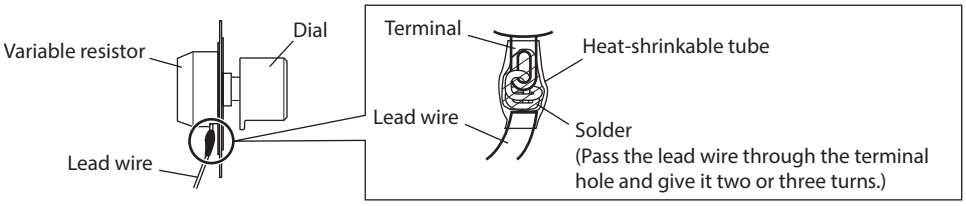


5.3 Installing the external potentiometer (sold separately)

Install the external potentiometer **PAVR-20KZ** (sold separately) as shown in the figure.

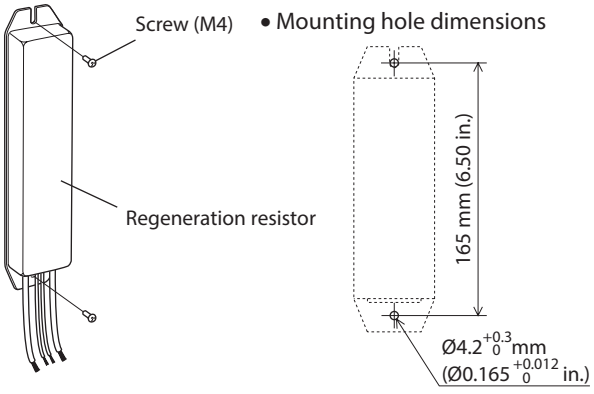


Soldering the variable resister terminals and the lead wires
Cover a heat-shrinkable tube over the soldered part to insulate.
Soldering condition: 235 °C (455 °F), less than 5 s



5.4 Installing the regeneration resistor (sold separately)

Install the regeneration resistor **EPRC-400P** (sold separately) or **RGB100** (sold separately) in a location where heat dissipation capacity equivalent to a level achieved with a heat sink [made of aluminum, 350×350×3 mm (13.78×13.78×0.12 in.) or equivalent] is ensured.
Secure the regeneration resistor on a smooth metal plate offering high heat conductivity, using two screws (M4, not included).
An available regeneration resistor varies depending on the output power. Refer to the USER MANUAL for details.

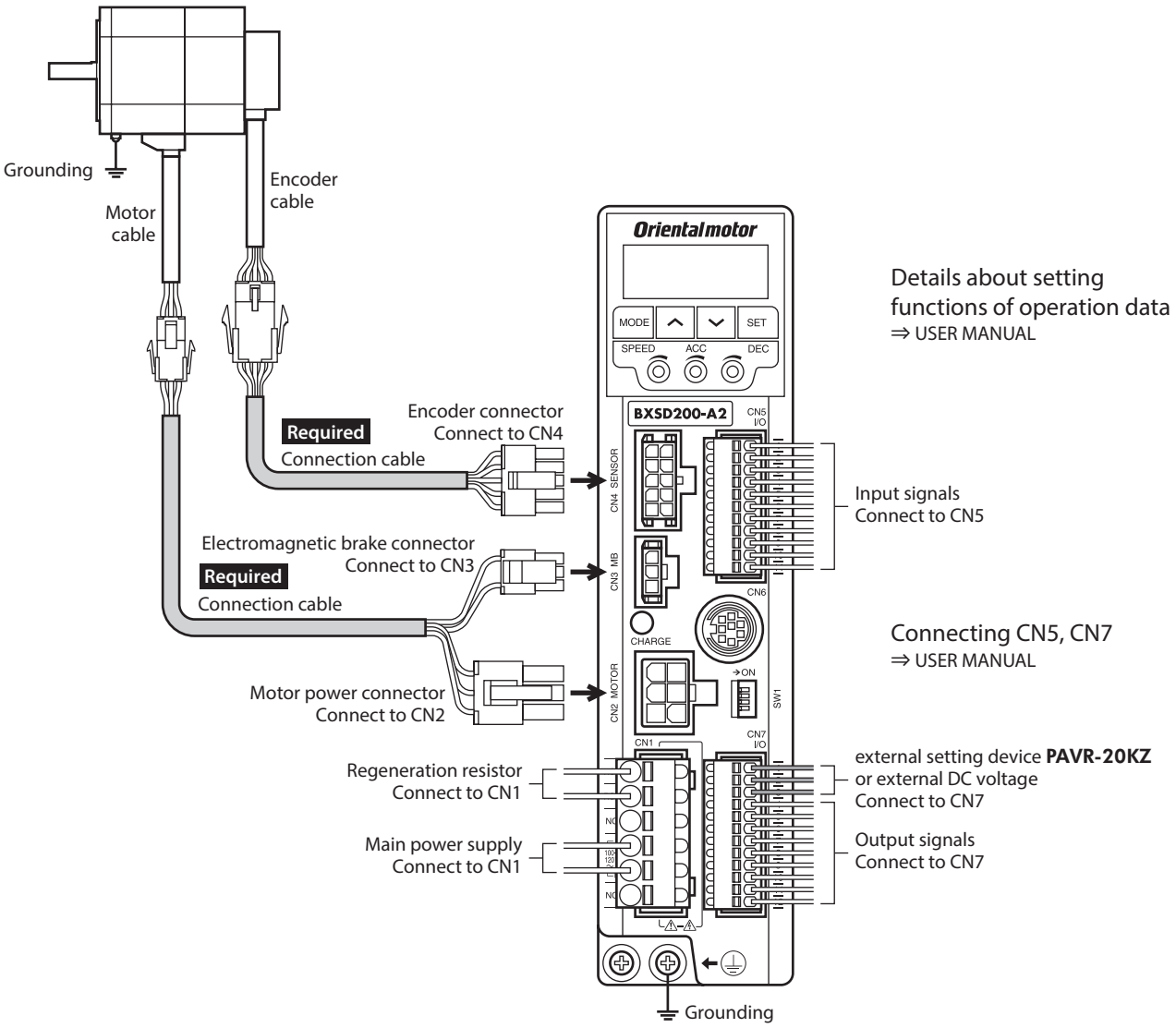


6 Connection

This chapter explains how to connect the motor and power supply to the driver. Refer to the USER MANUAL for details.

6.1 Connection example

Electromagnetic brake motor (200 W, 400W)



Note

- Be sure to use the dedicated connection cable (sold separately) to connect the motor.
- Regardless of whether an electromagnetic brake is equipped or not, always connect the electromagnetic brake connector to CN3.
- Connect the connectors securely. Insecure connections may cause malfunction or damage to the motor or driver.
- Do not wire the power supply cable of the driver in the same cable duct with other power lines or motor cable. Doing so may cause malfunction due to noise.
- When turning on the power again or inserting/pulling out the connector, turn off the power and wait until the CHARGE LED is turned off. Residual voltage may cause electric shock.

6.2 Connecting the power supply (CN1)

Connect a power supply to the main power supply input terminals (CN1).
A power supply cable is not included with the product. Provide a power supply cable separately.

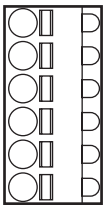
Applicable lead wire

- Lead wire size: AWG18 to 14 (0.75 to 2.0 mm^2)
- Conductive material: Use only copper wires.
- Lead wire strip length: 10 mm (0.39 in.)

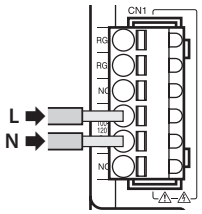
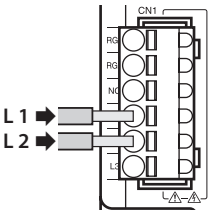
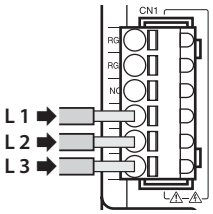
Applicable crimp terminal

If crimp terminals are used, select the following terminals.

Manufacturer	PHOENIX CONTACT GmbH & Co. KG
Model	AI 0,75-10 [AWG18 (0.75 mm^2)] AI 1-10 [AWG18 (0.75 mm^2)] AI 1,5-10 [AWG16 (1.25 mm^2)] AI 2,5-10 [AWG14 (2.0 mm^2)]



Manufacturer: PHOENIX CONTACT GmbH & Co. KG
Model: FKC2,5/6-ST-5,08

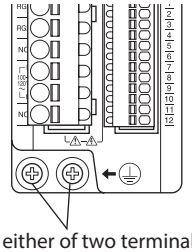
Single-phase 100-120 VAC 50/60 Hz	Single-phase 200-240 VAC 50/60 Hz	Three-phase 200-240 VAC 50/60 Hz
		
Connect the live side to terminal L, and the neutral side to terminal N.	Connect the live side to terminal L1, and the neutral side to terminal L2. If either of them is connected to terminal L3, the motor does not rotate.	Connect the R, S and T phase lines to L1, L2 and L3 terminals, respectively.

6.3 Circuit breaker

Be sure to connect a circuit breaker to the power line of the driver to protect the primary circuit.
Rated current of protective device: 15 A for single-phase input driver, 10 A for three-phase input driver
Circuit breaker: Mitsubishi Electric Corporation NF30

6.4 Grounding

Two Protective Earth Terminals are provided on the driver. Either of the two Protective Earth Terminals can be used for grounding the driver. A terminal not having grounded is provided as an extra terminal. Use it as necessary such as a purpose for connecting a motor to ground. Do not share the Protective Earth Terminal with a welder or any other power equipment.



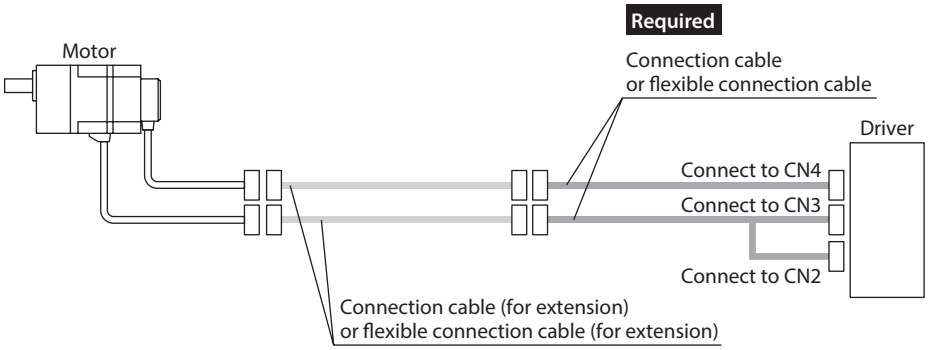
Ground either of two terminals

Protective Earth Terminal on driver

- Applicable crimp terminal: Insulated round crimp terminal
- Terminal screw size: M4
- Tightening torque: 1.2 N·m (10.6 lb-in)
- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm^2)

6.5 Connecting the motor (CN2, CN3, CN4)

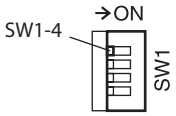
Connect the motor to the driver via the dedicated connection cable (sold separately).
Connect the motor power connector of the connection cable to CN2, the electromagnetic brake connector to CN3, and the encoder connector to CN4.
When extending the wiring distance between the motor and the driver, use the connection cable (for extension) which is sold separately.
The wiring distance can be extended to a maximum of 30.3 m (99.4 ft.).



Note Be sure to use the dedicated connection cable (sold separately) to connect the motor.

6.6 Selecting a power supply for input signals

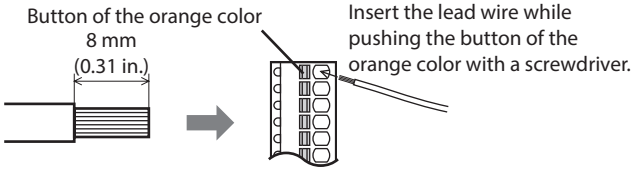
Select a power supply for input signals (use the built-in power supply or external power supply).
When controlling using a relay or a switch, turn SW1-4 ON to select the built-in power supply.
Factory setting: OFF (use an external power supply)



Note The built-in power supply cannot be used in the case of source logic. Do not turn the switch ON.

6.7 Connecting the I/O signals (CN5, CN7)

Connect the input signals to CN5 and the analog external input signals and output signals to CN7.
Applicable lead wire: AWG26 to 20 (0.14 to 0.5 mm^2)
Lead wire strip length: 8 mm (0.31 in.)

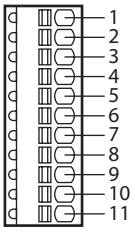


Applicable crimp terminal
If crimp terminals are used, select the following terminals.

Manufacturer	PHOENIX CONTACT GmbH & Co. KG
Model	A 0,25-7 [AWG24 (0.2 mm^2)] A 0,34-7 [AWG22 (0.3 mm^2)] A 0,5-8 [AWG20 (0.5 mm^2)]

■ CN5 pin assignments

Pin No.	Signal name	Function*
1	IN-COM0	Input signals common (for external power supply)
2	IN0	Input terminal 0 [FWD]
3	IN1	Input terminal 1 [RVS]
4	IN2	Input terminal 2 [M0]
5	IN3	Input terminal 3 [M1]
6	IN4	Input terminal 4 [M2]
7	IN5	Input terminal 5 [FREE]
8	IN6	Input terminal 6 [STOP]
9	IN7	Input terminal 7 [ALM-RST]
10	IN8	Input terminal 8 [Not used (possible to assign)]
11	IN-COM1	0 V (for built-in power supply)

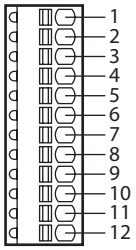


Manufacturer: PHOENIX CONTACT GmbH & Co. KG
Model: FK-MC0,5/11-ST-2,5

* The signal in brackets [ ] is a function that is assigned at the time of shipment (speed control mode).

■ CN7 pin assignments

Pin No.	Signal name	Function∗
1	VH	Analog external setting input
2	VM	
3	VL	
4	OUT0+	Output terminal 0+ [ALM]
5	OUT0–	Output terminal 0– [ALM]
6	OUT1+	Output terminal 1+ [MOVE]
7	OUT1–	Output terminal 1– [MOVE]
8	OUT2+	Output terminal 2+ [WNG]
9	OUT2–	Output terminal 2– [WNG]
10	ASG	Phase A output
11	BSG	Phase B output
12	OUT-COM	Common for ASG/BSG



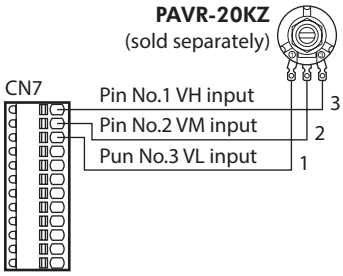
Manufacturer: PHOENIX CONTACT GmbH & Co. KG
Model: FK-MC0,5/12-ST-2,5

∗ The signal in brackets [ ] is a function that is assigned at the time of shipment (speed control mode).

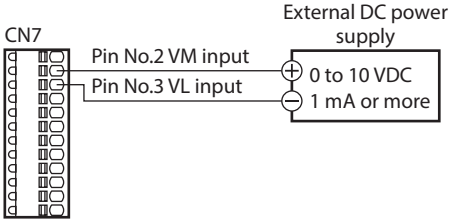
6.8 Connecting analog external setting devices

If the **PAVR-20KZ** (sold separately) or external DC voltage is connected to CN7, the analog setting for the operating speed or torque limit can be performed.
For the external DC voltage, use a DC power supply (0 to 10 VDC) with reinforced insulation on its primary and secondary sides.
The input impedance between the VM input and VL input is approximately 41.8 kΩ.

● Connecting **PAVR-20KZ**



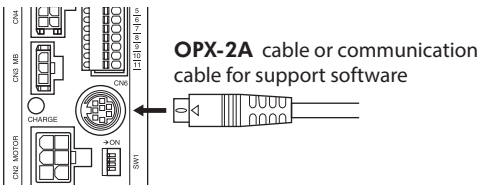
● Connecting external DC voltage



Note Be sure to use the external DC voltage at 10 V or lower. When connecting the external DC power supply, make sure the polarities are correct. If the polarities are reversed, the driver may be damaged.

6.9 Connecting the data setter (CN6)

Connect the cable of the **OPX-2A** or the communication cable for support software to CN6.



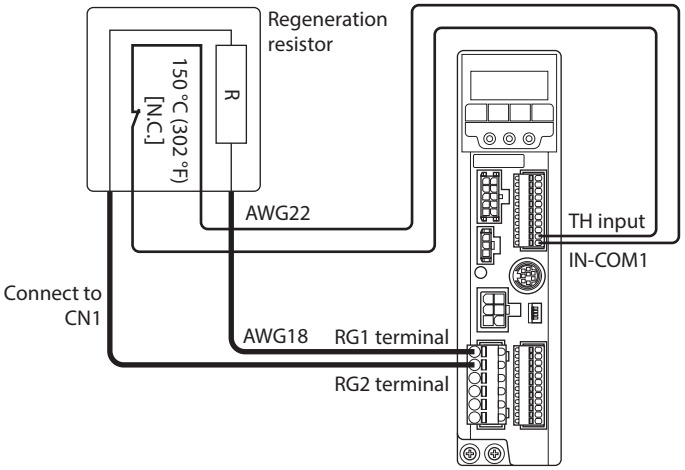
6.10 Connecting the regeneration resistor (sold separately)

If vertical drive (gravitational operation) such as elevator applications is performed or if sudden start-stop operation of a large inertia is repeated frequently, use the regeneration resistor **EPRC-400P** (sold separately) or **RGB100** (sold separately).
Install the regeneration resistor in a location where heat dissipation capacity equivalent to a level achieved with a heat sink [made of aluminum, 350×350×3 mm (13.78×13.78×0.12 in.)] is ensured.
An available regeneration resistor varies depending on the output power. Refer to the USER MANUAL for details.

Note Assign the TH input to the input terminal of CN5 when using the regeneration resistor.

Connection method

- Regenerative current flows through the two thick lead wires (AWG 18: 0.75 mm^2) of the regeneration resistor. Connect them to the RG1 and RG2 terminals of CN1.
- The two thin lead wires (AWG 22: 0.3 mm^2) of the regeneration resistor are the thermostat outputs. Connect them to the TH input assigned to CN5 and IN-COM1.



1. Assigning the TH input to CN5
   Change the "IN input function selection" parameter to change the assignment of input signals.
   Refer to the USER MANUAL for how to change.
2. Connecting the thermostat output to CN5
   The figure shows an example when the TH input is assigned to the IN8 terminal in the speed control mode to use the built-in power supply.
   Refer to the USER MANUAL when using an external power supply.

Note

- The TH input is not assigned to CN5 at the time of shipment. When using the regeneration resistor, change the "IN input function selection" parameter to assign the TH input. Refer to the USER MANUAL for details.
- When the TH input is assigned to CN5, if the power consumption of the regeneration resistor exceeds the allowable level, the thermostat will be triggered to generate the regeneration resistor overheat alarm. If the regeneration resistor overheat alarm is generated, turn off the power and check the details of error.
- When an external power supply is used for a power supply for input signals, turn on the external power supply before turning on the driver main power supply.

7 Operation

Four control modes are provided in the **BXⅡ** Series.
This chapter explains two operating methods that the motor can be operated immediately in the speed control mode (factory setting).

- Operation by input signals
- Test operation (JOG operation)

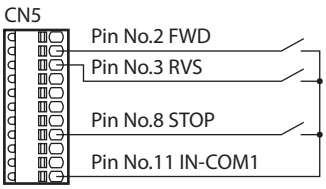
Refer to the USER MANUAL for other control modes and how to use in details.

7.1 Operation by input signals

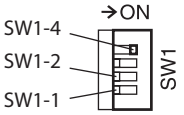
The motor can be operated by inputting signals to control operation.

1. Connect the input signals shown in the figure.
   Signals required for operation are assigned to the input terminals of CN5 in advance.
   Check the following table.

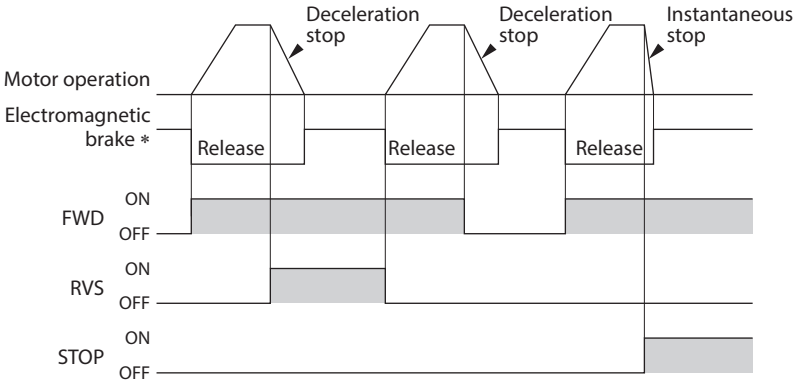
CN5 Pin No.	Signal name	Function	Description
2	IN0	FWD	This signal is used to rotate the motor in the clockwise direction.
3	IN1	RVS	This signal is used to rotate the motor in the counterclockwise direction.
8	IN6	STOP	This signal is used to stop the motor instantaneously.
11	IN-COM1	Input signals common	0 V (for built-in power supply)



2. Turn SW1-4 ON.



3. Set the operating speed of the motor.
   Refer to "Setting the operating speed" for how to set.
4. Operate the motor.
   When FWD is turned ON, the motor rotates in the clockwise direction.
   When RVS is turned ON, the motor rotates in the counterclockwise direction.
5. Stop the motor.
   When the operating signal having turned ON is turned OFF, the motor decelerates to a stop.
   If STOP is turned ON, the motor stops instantaneously.
   If both FWD and RVS are turned ON, the motor decelerates to a stop.



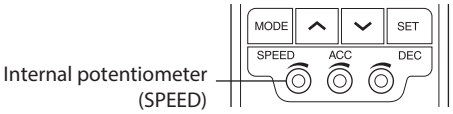
∗ In the case of electromagnetic brake type

■ Setting the operating speed

Set the operating speed of the motor using the internal potentiometer (SPEED), analog external setting devices, or operation keys of the operation panel. This section explains how to set the speed using the internal potentiometer and analog external setting devices.
Refer to the USER MANUAL for setting by the operation keys.
Setting range: 30 to 4000 r/min.
Initial value: 0 r/min

● Setting with internal potentiometer

Turn the M0 input OFF when using the internal potentiometer.
Turning the internal potentiometer to the right increases the speed, and turning to the left decreases it.



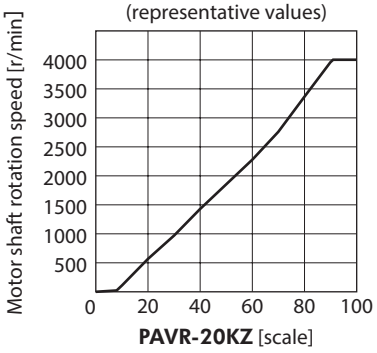
Note Be sure not to turn the internal potentiometer too much since it rotates lightly.
Doing so may damage the product.

● Setting with analog external setting devices

Using **PAVR-20KZ** (sold separately)

When using the **PAVR-20KZ**, turn the M0 input ON.
Turning the **PAVR-20KZ** to the right increases the speed, and turning to the left decreases it.

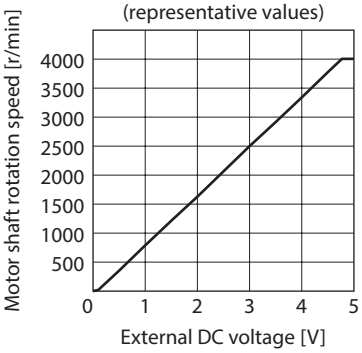
PAVR-20KZ—Rotation speed characteristics
(representative values)



Using external DC voltage

When using the external DC voltage, turn the M0 input ON.

External DC voltage - Rotation speed characteristics
(representative values)



Note Be sure to use the external DC voltage at 10 VDC or lower. Also, when connecting an external DC power supply, make sure the polarities are correct. If the polarities are reversed, the driver may be damaged.

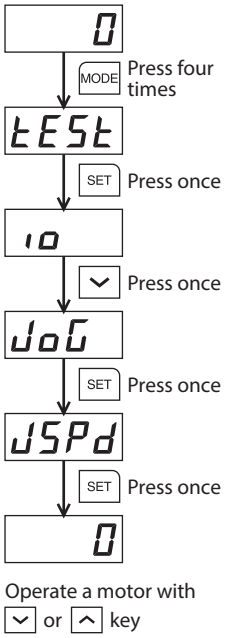
7.2 Test operation (JOG operation)

Simply connecting a power supply, motor, and driver can perform JOG operation. Using JOG operation, the connection between the motor and the driver can be checked.

■ Operating method (Speed control mode)

This section explains the procedure to operate in the speed control mode.

1. When the power supply is turned on, the speed of the monitor mode is displayed.
   Press the [MODE] key four times.
   The display changes to "tESt."
2. Press the [SET] key once.
   The display changes to "io."
3. Press the [∨] key once.
   The display changes to "JoG."
4. Press the [SET] key.
   The display changes to "JSPd."
5. Press the [SET] key once again.
   The display changes to "0."
6. Operate the motor in JOG operation by pressing the [∧] key or [∨] key.
   The operating speed is displayed during JOG operation.
   The motor rotates in the clockwise direction while the [∧] key is pressed.
   The motor rotates in the counterclockwise direction while the [∨] key is pressed.



■ Operating conditions of JOG operation

JOG operation is performed under the following conditions.

- Operating speed: 300 r/min
- Acceleration/deceleration: 0.100 sec
- Operating torque: 100% (rated torque)

The operating conditions can be changed by the parameter. Refer to the USER MANUAL for details.

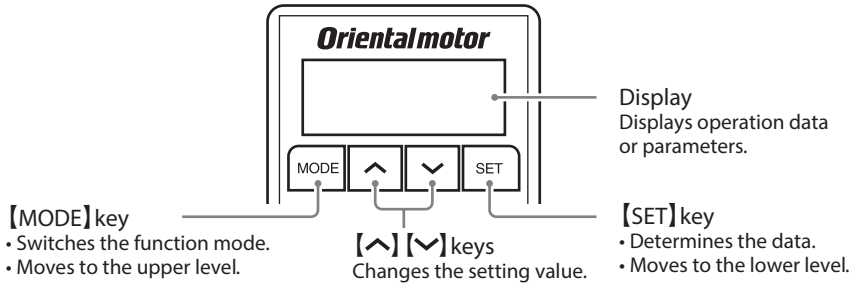
Note

- In JOG operation, the motor rotates while the [∧] key or the [∨] key is pressed. Make sure that there is no danger due to motor rotation before executing JOG operation.
- JOG operation cannot be executed while the FREE input or STOP input is being ON. Be sure to turn these input signals OFF before executing JOG operation.

8 Operation panel

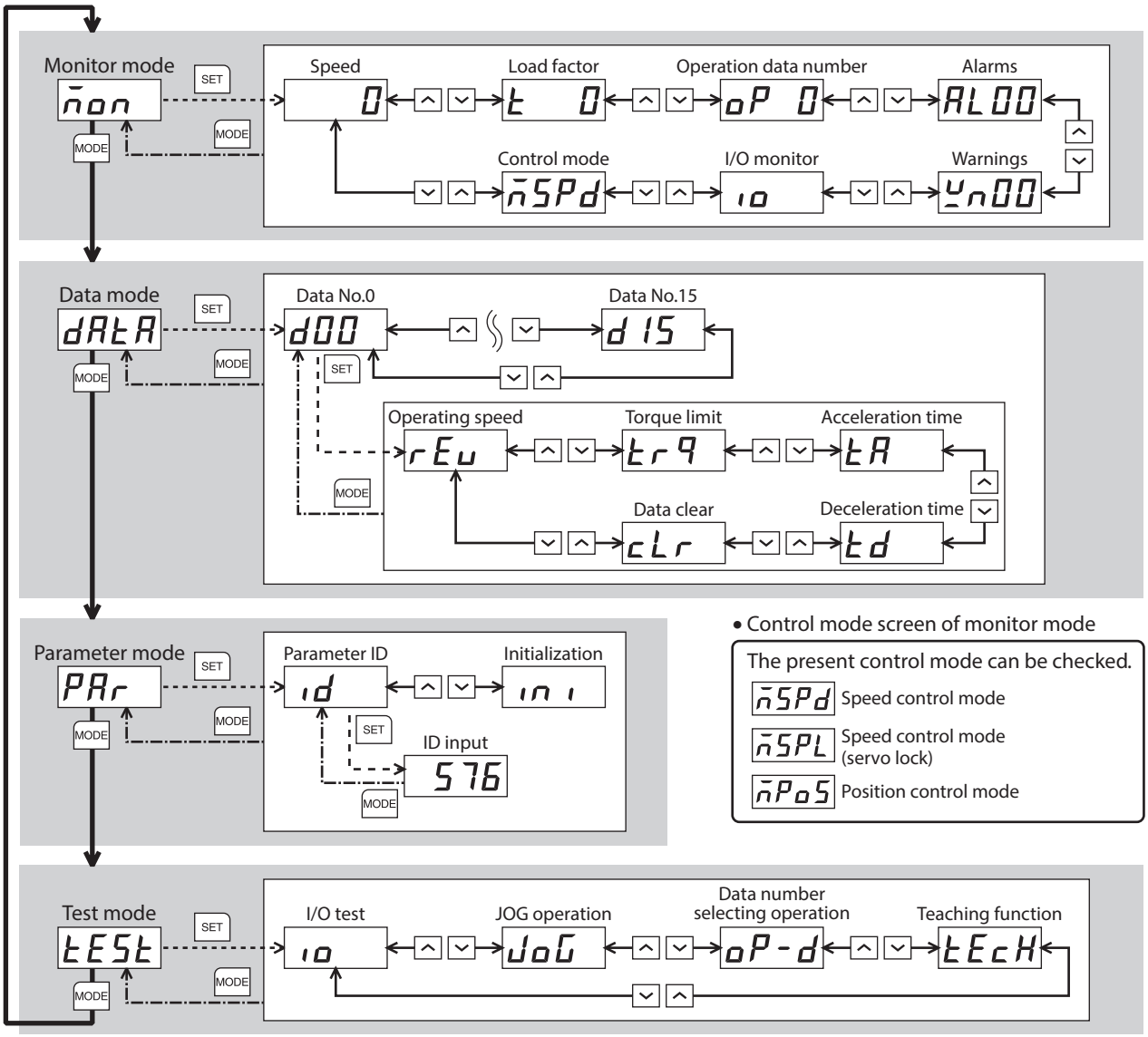
8.1 Names of parts for operation panel

The operation panel cannot be removed from the driver.



8.2 Main screen transitions

Screen transitions for the speed control mode are shown as follows. For details on each control mode and parameter, refer to the USER MANUAL.
When a power supply is turned on, the speed of the monitor mode is displayed (initial setting). Use the monitor mode when operating the motor.



9 Maintenance and inspection

9.1 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.

Note

- Conduct the insulation resistance measurement or dielectric strength test separately on the motor and the driver. Conducting the insulation resistance measurement or dielectric strength test with the motor and driver connected may result in damage to the product.
- The driver uses semiconductor elements, so be extremely careful when handling them. Static electricity may damage the driver.
- Do not conduct the insulation resistance measurement or dielectric strength test on an encoder itself. Doing so may damage the encoder.

■ 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 the openings in the driver are clogged.
- Check if any of the driver mounting screws or the main power supply input part is loose.
- Check if there is any abnormality or unusual smell inside the driver.

9.2 Warranty

Check on the Oriental Motor Website for the product warranty.

9.3 Disposal

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

10 Protective function

The driver provides alarms that are designed to protect the driver from overheating, poor connection, misoperation, etc. (protective functions), as well as warnings that are output before the corresponding alarms are generated (warning functions). Before resetting an alarm, always remove the cause of the alarm and ensure safety.
Refer to the USER MANUAL for how to reset an alarm.

10.1 Alarm list

Alarm code	Alarm type	Cause	Remedial action
AL 10	Excessive position deviation	• When the motor was in an excitation state, the deviation between the command position and actual position at the motor output shaft exceeded the value set in the "Excessive position deviation alarm" parameter. • A load is large or the acceleration/deceleration time is too short.	• Decrease the load. • Reconsider the operating conditions such as the acceleration/deceleration time.
AL20	Overcurrent	Excessive current was flown through the driver due to ground fault, etc.	• Check whether the wiring between the driver and motor is damaged. • If the alarm cannot be cleared even when the power has been cycled, contact your nearest Oriental Motor sales office.
AL22	Overvoltage	• The power supply voltage exceeded approximately 120% of the rated voltage. • A load exceeding the allowable gravitational capacity of the motor was driven or sudden starting/stopping of a large inertia was performed.	• Check the voltage of the main power supply. • If the alarm is generated during operation, decrease a load or increase the acceleration/deceleration time. • Connect the regeneration resistor.
AL25	Undervoltage	The power supply voltage dropped below approximately 60% of the rated voltage.	• Check the voltage of the main power supply. • Check the wiring of the power supply cable.
AL28	Sensor error	The encoder line of the motor was disconnected. Or the encoder connector was come off.	Check the connection between the driver and the motor.
AL2d	Main circuit output error∗1	The power line of the motor was disconnected. Or the motor power connector was come off.	Check the connection between the driver and the motor.
AL30	Overload	• A load exceeding the rated torque was applied to the motor for five seconds or more. • The motor was started in a state where the motor temperature was low.	• Decrease the load. • Reconsider the operating conditions such as the acceleration/deceleration time.
AL31	Overspeed	The rotation speed of the motor output shaft exceeded approximately 5200 r/min.	• Decrease the load. • Reconsider the operating conditions such as the acceleration/deceleration time.
AL41	EEPROM error	• Stored data was damaged. • Data became no longer writable or readable.	• Initialize all parameters. • If the alarm cannot be cleared even when the power has been cycled, contact your nearest Oriental Motor sales office.
AL42	Initial sensor error	The encoder line of the motor was disconnected before the main power supply was turned on. Or the encoder connector was come off.	Check the connection between the driver and the motor.
AL46	Alarm initial drive∗2	The main power supply was turned on when the operation input signal was being ON.	Turn the operation input signal OFF.

∗1 This alarm is not generated when the torque limiting value is set to less than 250%.
∗2 This alarm is generated when the "Alarm initial drive" function was set to enable.

Alarm code	Alarm type	Cause	Remedial action
AL51	Regeneration resistor overheat	• The regeneration resistor is not connected properly. • The regeneration resistor was overheated extraordinarily. • The main power supply of the driver was turned on before the external power supply for input signals was turned on.	• Check the connection for the thermostat output and the TH input of the regeneration resistor. • The power consumption of the regeneration resistor exceeds the allowable level. Reconsider the load condition and operating condition. • Turn on the external power supply for input signals before turning on the main power supply.
AL67	Software overtravel	When the "Software overtravel" parameter is enabled, the motor shaft position (travel amount) reached the set value of the software limit.	In single-motion operation, check if the position of operation data (travel amount) exceeds the software limit. In linked-motion operation, check if the position of operation data (travel amount) as the linked result exceeds the software limit.
AL70	Abnormal operation data	• Operation data of different directions was linked in linked-motion operation. • Five operation data or more was linked. • Positioning operation was performed at the operating speed of 0 r/min.	Check the operation data.

10.2 Warning list

Warning code	Warning type	Cause	Remedial action
Wn10	Excessive position deviation	• When the motor was in an excitation state, the deviation between the command position and actual position at the motor output shaft exceeded the value set in the "Excessive position deviation warning" parameter. • A load is large or the acceleration/deceleration time is too short.	Check the load condition.
Wn22	Overvoltage	• The power supply voltage exceeded the value set in the "Overvoltage warning" parameter. • A load exceeding the allowable gravitational capacity of the motor was driven or sudden starting/stopping of a large inertia was performed.	• Check the voltage of the main power supply. • If this alarm is generated during operation, check the load condition. • Connect the regeneration resistor.
Wn30	Overload	A load exceeding the value set in the "Overload warning" parameter was applied.	Check the load condition.
Wn6c	Operation prohibited	When the operation input signal is being ON, the function mode was changed from the test mode to other mode.	Turn the operation input signal OFF.

11 Specifications

■ Specifications

The value in a state where the gearhead is not combined is described in each specification for the rated torque, maximum instantaneous torque, and rated speed.
For motor models, refer to the operating manual included with the motor.

● 30 W, 60 W

Model	Motor	BXM230		BXM460	
	Driver	BXSD30-A2	BXSD30-C2	BXSD60-A2	BXSD60-C2
Rated output power (Continuous)		30 W		60 W	
Power supply input	Rated voltage	Single-phase 100-120 VAC	Single-phase 200-240 VAC Three-phase 200-240 VAC	Single-phase 100-120 VAC	Single-phase 200-240 VAC Three-phase 200-240 VAC
	Permissible voltage range	−15 to +10%			
	Rated frequency	50/60 Hz			
	Permissible frequency range	±5%			
	Rated input current	Single-phase: 1.4 A	Single-phase: 0.8 A Three-phase: 0.5 A	Single-phase: 2.2 A	Single-phase: 1.4 A Three-phase: 0.7 A
	Maximum input current	Single-phase: 4.0 A	Single-phase: 2.2 A Three-phase: 1.3 A	Single-phase: 5.5 A	Single-phase: 3.0 A Three-phase: 1.9 A
Rated torque		0.1 N·m (14.2 oz-in)		0.2 N·m (28 oz-in)	
Maximum instantaneous torque		0.2 N·m (28 oz-in)		0.4 N·m (56 oz-in)	
Rated speed		3000 r/min			

● 120 W, 200 W, 400 W

Model	Motor	BXM5120		BXM6200		BXM6400
	Driver	BXSD120-A2	BXSD120-C2	BXSD200-A2	BXSD200-C2	BXSD400-C2
Rated output power (Continuous)		120 W		200 W		400 W
Power supply input	Rated voltage	Single-phase 100-120 VAC	Single-phase 200-240 VAC Three-phase 200-240 VAC	Single-phase 100-120 VAC	Single-phase 200-240 VAC Three-phase 200-240 VAC	Single-phase 200-240 VAC Three-phase 200-240 VAC
	Permissible voltage range	−15 to +10%				
	Rated frequency	50/60 Hz				
	Permissible frequency range	±5%				
	Rated input current	Single-phase: 3.7 A	Single-phase: 2.3 A Three-phase: 1.1 A	Single-phase: 4.7 A	Single-phase: 2.8 A Three-phase: 1.7 A	Single-phase: 4.7 A Three-phase: 2.8 A
	Maximum input current	Single-phase: 9.8 A	Single-phase: 5.5 A Three-phase: 3.4 A	Single-phase: 11.3 A	Single-phase: 7.1 A Three-phase: 4.5 A	Single-phase: 9.8 A Three-phase: 6.4 A
Rated torque		0.4 N·m (56 oz-in)		0.65 N·m (92 oz-in)		1.3 N·m (184 oz-in)
Maximum instantaneous torque		0.8 N·m (113 oz-in)		1.3 N·m (184 oz-in)		2.6 N·m (360 oz-in)
Rated speed		3000 r/min				

■ General specifications

Operating environment	Ambient temperature	0 to +50 °C [+32 to 122 °F] (non-freezing) 0 to +40 °C [+32 to +104 °F)] when drivers of 200 W type or 400 W type are installed closely
	Ambient humidity	85% or less (non-condensing)
	Altitude	Up to 1000 m (3300 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust. Cannot be used in radioactive materials, magnetic field, vacuum or other special environment. (For details about installation locations, refer to p.10.)
	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	−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. Cannot be used in radioactive materials, magnetic field, vacuum or other special environment.
Degree of protection		IP20

12 Regulations and standards

This product is recognized by UL under the UL and CSA standards, and also affixed the CE Marking under the Low Voltage Directive and the EMC Directive.

12.1 UL Standards, CSA Standards

Applicable Standards	Certification body	Standards File No.
UL 61800-5-1 CSA C22.2 No.274	UL	E171462

12.2 CE Marking

■ Low Voltage Directive

- This product is designed and manufactured to be incorporated in equipment.
- This product cannot be used in IT power distribution systems.
- Install the product inside an enclosure in order to avoid contact with hands.
- When installing the motor and driver, securely connect their Protective Earth Terminals.
- Isolate the motor cable, power supply cable and other drive cables from the encoder cable and signal cables (CN5 to CN7) by means of double insulation.

Applicable Standards	Installation conditions (EN Standards)
EN 61800-5-1	• To be incorporated in equipment. • Overvoltage category: Ⅱ • Pollution degree: 2 • Protection against electric shock: Class Ⅰ

■ EMC Directive

This product has received EMC compliance under the conditions specified in "Example of installation and wiring" on the USER MANUAL. 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 Group 1 Class A EN 61000-6-4, EN 61800-3
EMS	EN 61000-6-2, EN 61800-3

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).

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