Oriental motor

HP-5124-4

Brushless Motor

BXII Series

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.

How to read this manual

Entry	**1**	This part explains the types and outlines of operating manuals, the product overview, the name and function of each part and others.
Installation and connection	**2**	This part explains installation methods of the product and load, connection methods, and I/O signals.
How to use the operation panel	**3**	This part explains how to set data and how to operate a motor using the operation panel on the driver.
Parameter list	**4**	This part explains data and parameters that are required to operate a product.
Operation in speed control mode	**5**	This part explains operations possible to perform in the speed control mode such as operation/stop of the motor, changes of the operating speed, and others.
Operation in position control mode	**6**	This part explains operations possible to perform in the position control mode, such as positioning operation and return-to-home operation.
BX-compatible mode	**7**	The **BXⅡ** Series has the **BX**-compatible mode so that users can use it in almost the same connection as the traditional **BX** Series. This part explains about the **BX**-compatible mode.
How to use MEXE02	**8**	This part explains how to set and edit parameters and data with the support software **MEXE02**.
Inspection, troubleshooting and remedial action	**9**	This part explains how to perform the periodical inspection and how to check and take remedial actions when a problem occurs.
Appendix	**10**	This part explains cables and peripheral equipment (sold separately) used in combination with the products in addition to the regulations and standards.

1 Entry

2 Installation and connection

3 How to use the operation panel

4 Parameter list

5 Operation in speed control mode

6 Operation in position control mode

7 BX-compatible mode

8 How to use MEXE02

9 Inspection, troubleshooting and remedial actions

10 Appendix

1 Entry

This part explains the types and outlines of operating manuals, the product overview, the name and function of each part and others.

Table of contents

1 Introduction

1.1 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 document 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.

1.2 Related operating manuals

Operating manuals are not included with the product. Download from Oriental Motor Website Download Page or contact your nearest Oriental Motor sales office.

Operating manual name	Operating manual number
BXII Series OPERATING MANUAL (this document)	HP-5124
Data Setter **OPX-2A BXII** Series OPERATING MANUAL	HP-5058
Support software **MEXE02** Version 3 OPERATING MANUAL	HM-60131

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, in places 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 damage to equipment.
- 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 cable. Doing so may result in fire, electric shock or damage to equipment.
- 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 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 damage to equipment.
- 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 and ground in accordance with the connection diagram. Failure to do so may result in fire, electric shock or damage to equipment.
- Be sure to observe the specified cable sizes. Use of unspecified cable sizes may result in fire, electric shock or damage to equipment.
- Use a motor, 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.

⚠ WARNING

- 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 or 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, 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, electric shock, injury, or damage to equipment.
- Do not touch the motor, driver, or regeneration resistor while operating or for a certain time after stopping. The surface of the motor, 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 lift up the product by holding the output shaft or cable. Doing so may result in injury.
- Do not touch the motor output shaft (end or pinion) with bare hands. Doing so may result in injury.
- When assembling the motor with the gearhead, exercise caution not to pinch your fingers or other parts of your body between the motor and gearhead. Injury may result.
- When installing the motor in equipment, exercise caution not to pinch your fingers or other parts of your body between the equipment and motor. Injury may result.
- Do not touch the rotating part (output shaft) while operating the motor. Doing so may cause injury.

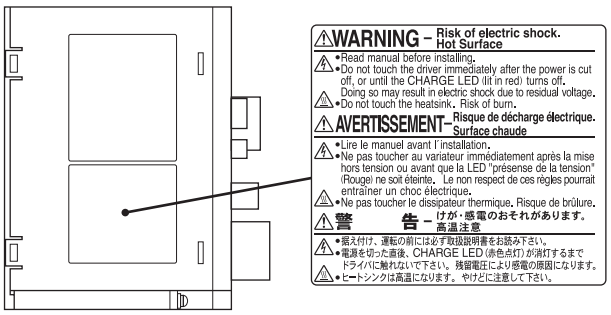
- Securely install the motor and driver to their respective mounting plates. Inappropriate installation may cause the motor or driver to detach and fall, resulting in injury or damage to equipment.
- Provide a cover over the rotating part (output shaft). Failure to do so may result in injury.
- Securely install a load on the output shaft. Inappropriate installation may result in injury.
- Be sure to ground the motor and driver to prevent them from being damaged by static electricity. Failure to do so may result in fire 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 trouble has occurred, stop operation and turn off the driver power. Failure to do so may result in fire, electric 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 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.

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 p.48 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

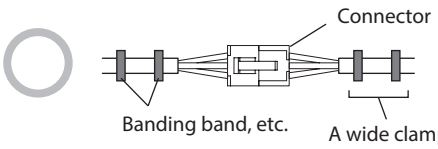
  Be sure to use the dedicated connection cable (sold separately) to connect the motor.

- How to fix the cable

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

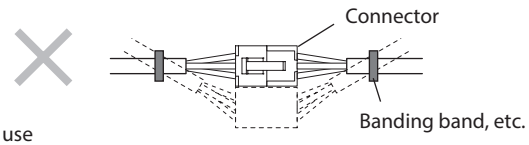
  • Fixing at two places on each side

  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

- Make sure not to hit or apply a strong impact on the motor output shaft or encoder.

  Making a strong impact on the motor output shaft or encoder may result in damage to the encoder or cause the motor to malfunction.

- 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 type product in vertical drive such as elevating equipment.

  When the motor is used in 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.
  Also, be sure to ground the product in order to prevent electric shock or product damage by static electricity.

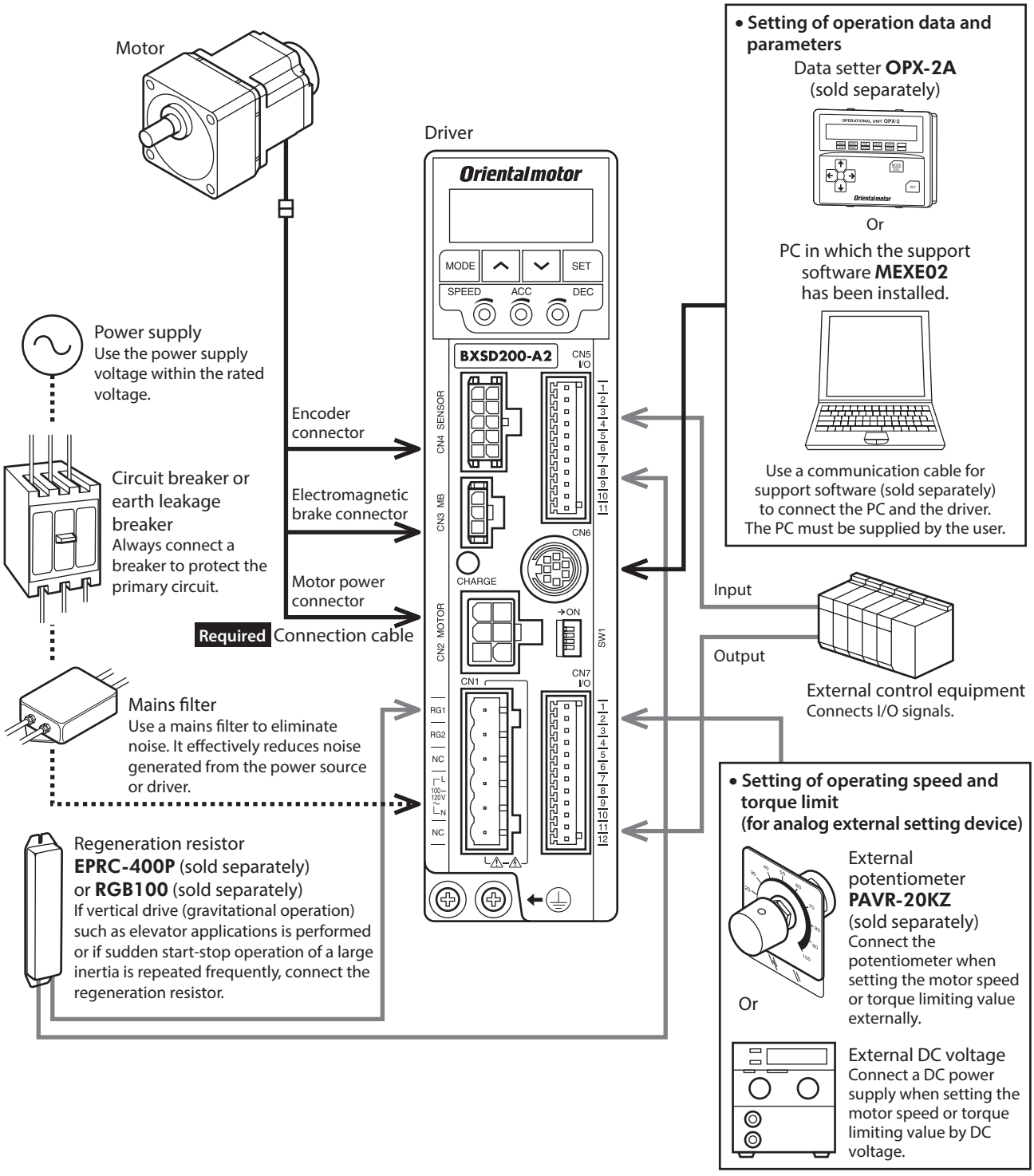
Saving the data

- 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 System configuration

The system configuration of the **BXII** Series is shown below.



5 Preparation

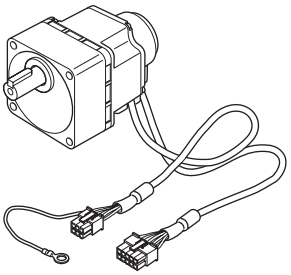
This chapter explains the items you should check, as well as the name and function of each part.

5.1 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.

■ Motor

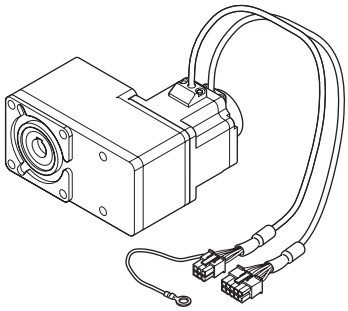
- Combination type-parallel shaft gearhead



☐ Motor ..... 1 unit (a gearhead is pre-assembled)
☐ Mounting screw ..... 1 set
(hexagonal socket head screw, plain washer, spring washer, nut each 4 pcs, parallel key 1pc∗)
☐ Instructions and Precautions for Safe Use ..... 1 copy

∗ For the 200 W and 400 W types, the parallel key is fixed to the gearhead output shaft.

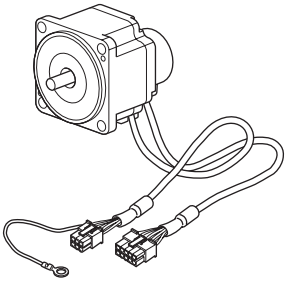
- Combination type-hollow shaft flat gearhead



☐ Motor ..... 1 unit (a gearhead is pre-assembled)
☐ Mounting screw ..... 1 set
(hexagonal socket head screw, plain washer, spring washer, nut∗ each 4 pcs, parallel key 1pc)
☐ Safety cover ..... 1 set
(safety cover 1 pc, mounting screw for safety cover 2 pcs)
☐ Instructions and Precautions for Safe Use ..... 1 copy

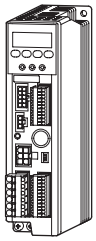
∗ For the 200 W and 400 W types, nuts are not included.

- Round shaft type



☐ Motor ..... 1 unit
☐ Instructions and Precautions for Safe Use ..... 1 copy

■ Driver



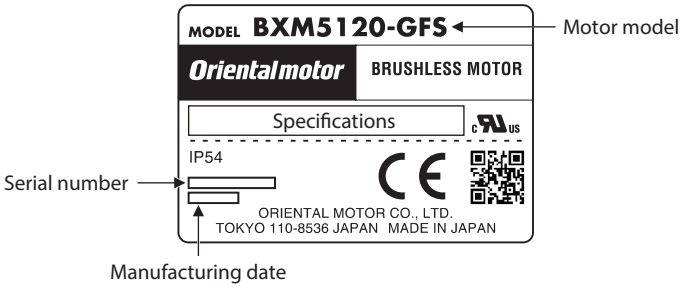
☐ Driver ..... 1 unit
☐ Driver mounting bracket ..... 1 set
(Driver mounting bracket 2 pcs, mounting screw 4 pcs)
☐ CN1 connector (6 pins) ..... 1 pc.
☐ CN5 connector (11 pins) ..... 1 pc.
☐ CN7 connector (12 pins) ..... 1 pc.
☐ Instructions and Precautions for Safe Use ..... 1 copy

■ Connection cable or flexible connection cable

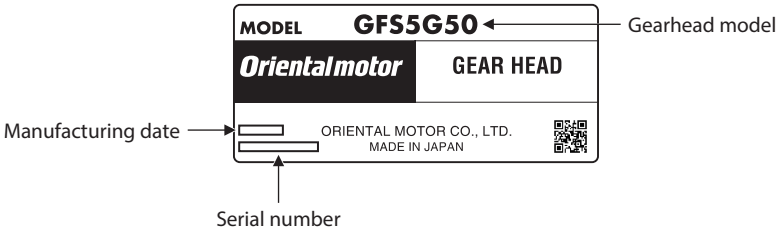
☐ Cable for motor ..... 1 pc.
☐ Cable for encoder ..... 1 pc.

5.2 Information about nameplate

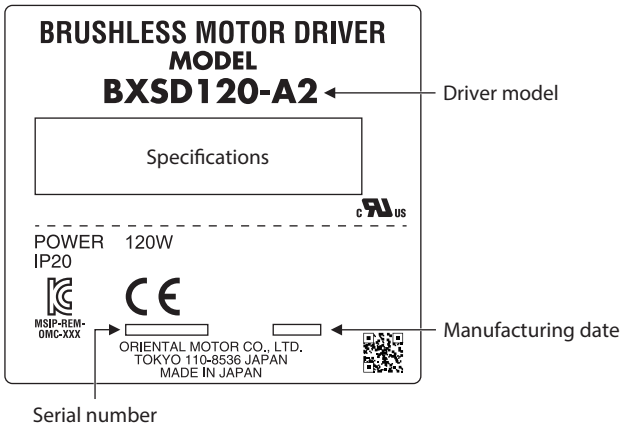
■ Motor



■ Gearhead



■ Driver



5.3 Lists of combinations

Verify the model name of the purchased product against the model shown on the package label.
Check the model name described on the nameplate of each product.

- In the case of the electromagnetic brake type, the box (■) in the model name indicates **M**.
- The box (□) in the model name indicates a number representing the gear ratio.
- The box (◆) in the model name indicates a number representing the cable length.
- To connect the motor and driver, the dedicated connection cable **CC◆SBF2** or flexible connection cable **CC◆SBR2** is required.
  To extend the wiring distance, use the connection cable for extension **CC◆SBF** or the flexible connection cable for extension **CC◆SBR**.
  Refer to p.177 for details.

■ Parallel shaft gearhead

Output power	Power supply voltage	Driver	Combination type motor			Cable
		Model	Model	Motor model	Gearhead model	Model
30 W	Single-phase 100-120 VAC	**BXSD30-A2**	**BXM230■-□**	BXM230■-GFS	GFS2G□	**CC◆SBF2** Or **CC◆SBR2**
	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD30-C2**				
60 W	Single-phase 100-120 VAC	**BXSD60-A2**	**BXM460■-□**	BXM460■-GFS	GFS4G□	
	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD60-C2**				
120 W	Single-phase 100-120 VAC	**BXSD120-A2**	**BXM5120■-□**	BXM5120■-GFS	GFS5G□	
	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD120-C2**				
200 W	Single-phase 100-120 VAC	**BXSD200-A2**	**BXM6200■-□**	BXM6200■-GFS	GFS6G□	
	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD200-C2**				
400 W	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD400-C2**	**BXM6400■-□**	BXM6400■-GFS		

■ Hollow shaft flat gearhead

Output power	Power supply voltage	Driver	Combination type motor			Cable
		Model	Model	Motor model	Gearhead model	Model
30 W	Single-phase 100-120 VAC	**BXSD30-A2**	**BXM230■-□FR**	BXM230■-GFS	GFS2G□FR	**CC◆SBF2** Or **CC◆SBR2**
	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD30-C2**				
60 W	Single-phase 100-120 VAC	**BXSD60-A2**	**BXM460■-□FR**	BXM460■-GFS	GFS4G□FR	
	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD60-C2**				
120 W	Single-phase 100-120 VAC	**BXSD120-A2**	**BXM5120■-□FR**	BXM5120■-GFS	GFS5G□FR	
	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD120-C2**				
200 W	Single-phase 100-120 VAC	**BXSD200-A2**	**BXM6200■-□FR**	BXM6200■-GFS	GFS6G□FR	
	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD200-C2**				
400 W	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD400-C2**	**BXM6400■-□FR**	BXM6400■-GFS		

■ Round shaft type

Output power	Power supply voltage	Driver	Motor	Cable
		Model	Model	Model
30 W	Single-phase 100-120 VAC	**BXSD30-A2**	**BXM230■-A2**	**CC◆SBF2** Or **CC◆SBR2**
	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD30-C2**		
60 W	Single-phase 100-120 VAC	**BXSD60-A2**	**BXM460■-A2**	
	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD60-C2**		
120 W	Single-phase 100-120 VAC	**BXSD120-A2**	**BXM5120■-A2**	
	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD120-C2**		
200 W	Single-phase 100-120 VAC	**BXSD200-A2**	**BXM6200■-A**	
	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD200-C2**		
400 W	Single-phase 200-240 VAC Three-phase 200-240 VAC	**BXSD400-C2**	**BXM6400■-A**	

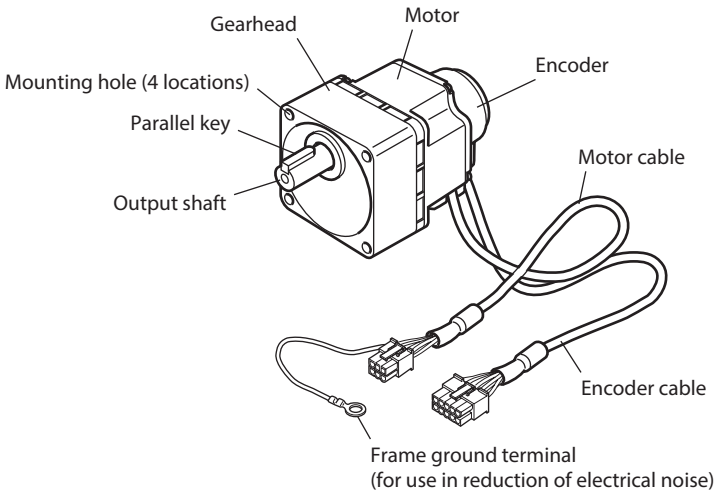
5.4 Names and functions of parts

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

■ Motor

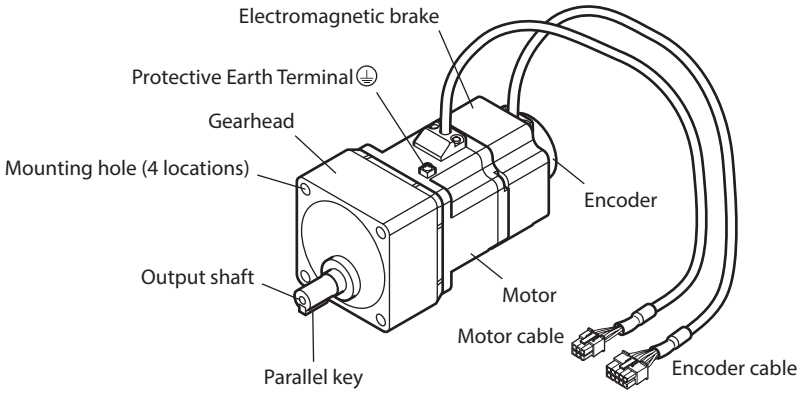
- Combination type-parallel shaft gearhead
  Standard type

  The figure shows a motor of 30 W, 60 W, or 120 W.



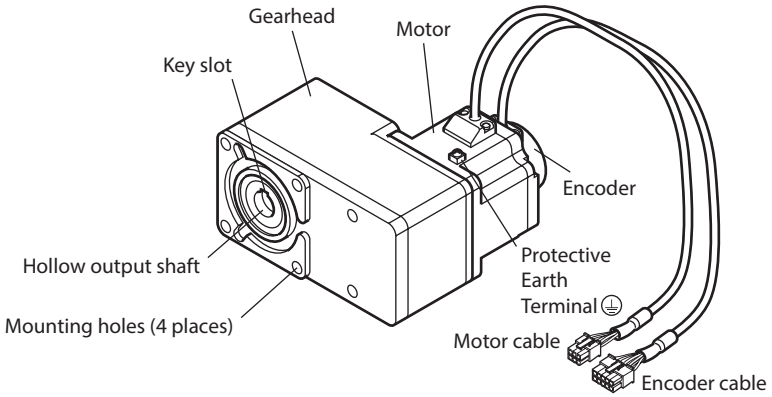
- Combination type-parallel shaft gearhead
  Electromagnetic brake type

  The figure shows a motor of 200 W or 400 W.

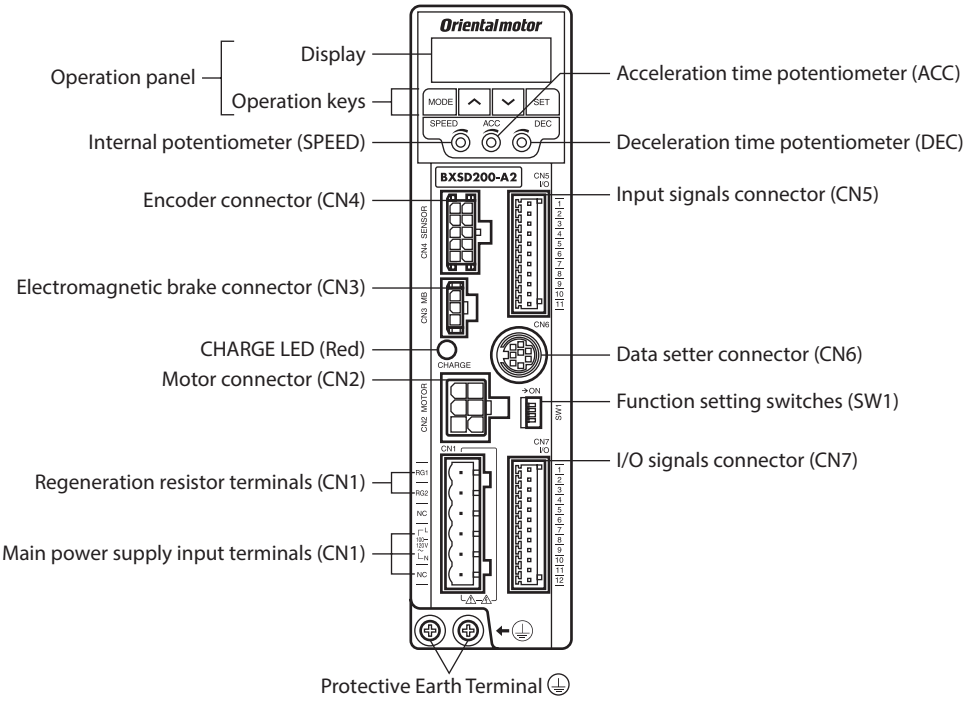


- Combination type-hollow shaft flat gearhead
  Standard type

  The figure shows a motor of 200 W or 400 W.



■ Driver



Name	Sign	Description	Ref.
Operation panel		Display: This display shows the monitor items, setting screen, alarms, etc.	p.64
	MODE ∧ ∨ SET	Operation keys: These keys are used to switch the function mode or change parameters.	
Internal potentiometer (SPEED)	SPEED	This potentiometer is used to set the operating speed of the motor.	p.104
Acceleration time potentiometer (ACC)	ACC	This potentiometer is used to set the acceleration time when starting the motor.	p.105
Deceleration time potentiometer (DEC)	DEC	This potentiometer is used to set the deceleration time when stopping the motor.	
Encoder connector (CN4)	SENSOR	Connects the encoder connector of the connection cable.	p.38
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 has been turned off, the LED will turn 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.	p.38
Regeneration resistor terminals (CN1)	RG1, RG2	Connects the regeneration resistor **EPRC-400P** (sold separately) or **RGB100** (sold separately).	p.44
Main power supply input terminals (CN1)		Connects the main power supply.	p.36
	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.	p.38
Data setter connector (CN6)		Connects a PC in which the support software **MEXE02** has been installed or the data setter **OPX-2A** (sold separately).	p.43
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]	p.38 p.49
I/O signals connector (CN7)	I/O	• Connects the external potentiometer **PAVR-20KZ** (sold separately) or external DC power supply. • Connects the output signals.	p.39
Protective Earth Terminals ⏚	⏚	Ground using a grounding wire of AWG 18 to 14 (0.75 to 2.0 mm^2).	p.37
Mounting holes (two places at the rear)		These mounting holes are used to install the driver with screws (M4).	p.32

2 Installation and connection

This part explains installation methods of the product and load, connection methods, and I/O signals.

Table of contents

1 Installation

This chapter explains the installation locations and installation methods of the motor and driver, as well as how to install a load and analog external setting devices.

1.1 Installation location

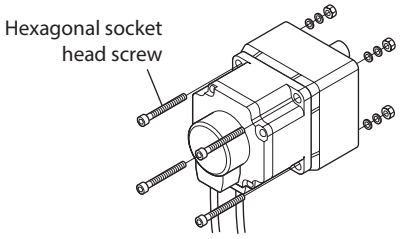
The motor and driver are designed and manufactured to be incorporated in equipment.
Install them in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

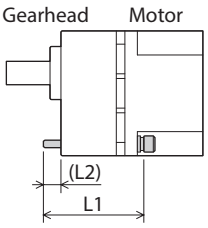
- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature: 0 to +50°C [+32 to 122 °F] (non-freezing)
- Operating ambient humidity: 85% or less (non-condensing)
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area free of excessive salt
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- 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

1.2 Installing the combination type-parallel shaft gearhead

Note Do not install the motor to the mounting hole diagonally or assemble the motor forcibly.
Doing so may cause damage to the flange pilot section, thereby resulting in damage to the motor.

Secure the motor and gearhead through four mounting holes using the included mounting screw set. Tighten the nuts until no gaps remain between the motor/gearhead and mounting plate.



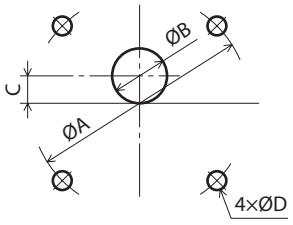


■ Mounting screw (included)

Model	Gear Ratio	Hexagonal socket head screw		L2 [mm (in.)]	Tightening torque [N·m (lb-in)]
		Screw size	L1 [mm (in.)]		
BXM230	**5** to **20**	M4	50 (1.97)	6 (0.24)	1.8 (15.9)
	30 to **100**		55 (2.17)	7 (0.28)	
	200		60 (2.36)	7 (0.28)	
BXM460	**5** to **20**	M6	65 (2.56)	13 (0.51)	6.4 (56)
	30 to **100**		70 (2.76)	13 (0.51)	
	200		75 (2.95)	13 (0.51)	
BXM5120	**5** to **20**	M8	75 (2.95)	16.5 (0.65)	15.5 (137)
	30 to **100**		90 (3.54)	18.5 (0.73)	
	200		95 (3.74)	17.5 (0.69)	
BXM6200 **BXM6400**	**5** to **20**		95 (3.74)	21 (0.83)	
	30, **50**		110 (4.33)	24 (0.94)	
	100, **200**		120 (4.72)	20 (0.79)	

■ Mounting hole dimensions [Unit: mm (in.)]

Model	ØA	ØB	C	ØD
BXM230	70 (2.76)	24 (0.94)	10 (0.39)	4.5 (0.177)
BXM460	94 (3.70)	34 (1.34)	13 (0.51)	6.5 (0.256)
BXM5120	104 (4.09)	40 (1.57)	18 (0.71)	8.5 (0.335)
BXM6200 **BXM6400**	120 (4.72)	42 (1.65)	20 (0.79)	8.5 (0.335)



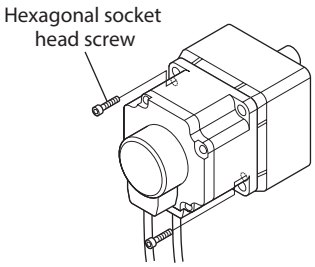
ØB indicates the external dimensions of the product.
Drill holes with a minimum diameter of ØB +1 mm (0.04 in.).

■ Removing/Installing the gearhead

See the following steps to replace the gearhead or to change the cable outlet position.

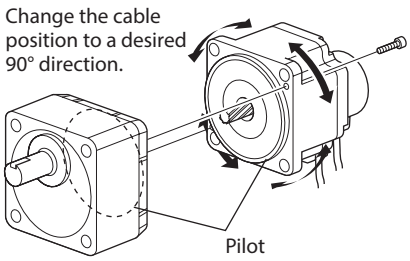
- Removing the gearhead from the motor

Remove the hexagonal socket head screws (2 places) assembling the motor and gearhead, and detach the gearhead from the motor.



- Assembling the gearhead to the motor

1. Keep the pilot sections of the motor and gearhead in parallel, and assemble the gearhead with the motor while slowly rotating it clockwise/counterclockwise.
   At this time, note so that the pinion of the motor output shaft does not hit the side panel or gears of the gearhead strongly.



2. Check no gaps remain between the motor and gearhead, and tighten them with hexagonal socket head screws (2 places).

Model	Screw size	Tightening torque [N·m (lb-in)]
BXM230 **BXM460**	M2.6	0.4 (3.5)
BXM5120 **BXM6200** **BXM6400**	M3	0.6 (5.3)

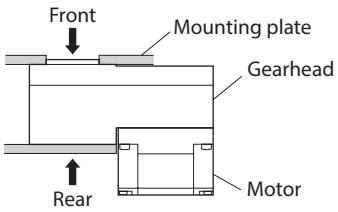
Note

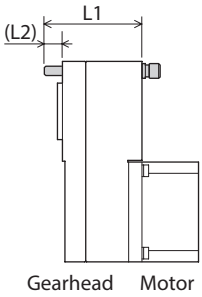
- Do not forcibly assemble the motor and gearhead. Also, prevent metal objects or foreign substances from entering in the gearhead. The pinion of the motor output shaft or gear may be damaged, resulting in noise or shorter service life.
- Do not allow dust to attach to the pilot sections of the motor and gearhead. Also, assemble the motor and gearhead carefully by not pinching the O-ring at the motor pilot section. If the O-ring is crushed or severed, grease may leak from the gearhead.

1.3 Installing the combination type-hollow shaft flat gearhead

Note Do not install the motor to the mounting hole diagonally or assemble the motor forcibly.
Doing so may cause damage to the flange pilot section, thereby resulting in damage to the motor.

A combination type-hollow shaft flat gearhead can be installed by using either its front or rear side as the mounting surface.
Secure the motor and gearhead through four mounting holes using the included mounting screw set. Tighten the nuts until no gaps remain between the motor/gearhead and mounting plate.
Attach the included safety cover to the hollow output shaft on the end opposite from the one where the load shaft is installed.



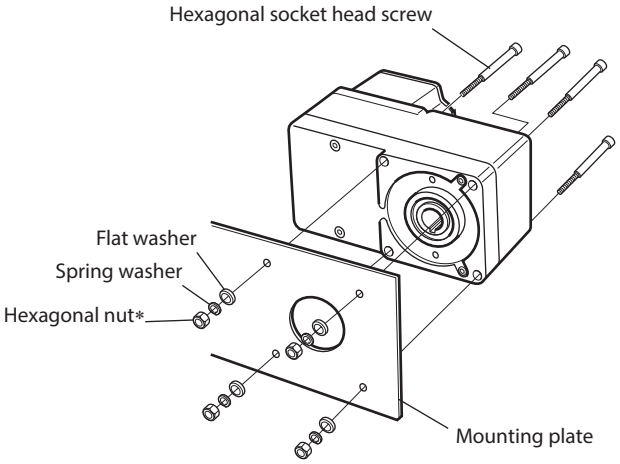


■ Mounting screw (included)

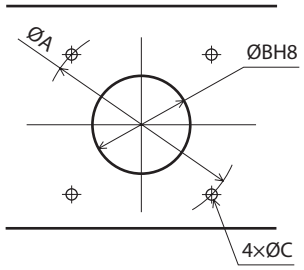
Model	Hexagonal socket head screw		L2 [mm (in.)]	Tightening torque [N·m (lb-in)]
	Screw size	L1 [mm (in.)]		
BXM230	M5	65 (2.56)	15 (0.59)	3.8 (33)
BXM460	M6	70 (2.76)	14 (0.55)	6.4 (56)
BXM5120	M8	90 (3.54)	21 (0.83)	15.5 (137)
BXM6200		100 (3.94)	13 (0.51)	
BXM6400				

■ Using the front side as the mounting surface

When the gearhead is installed by using its front side as the mounting surface, use the boss of the output shaft to align the center.



• Mounting hole dimensions

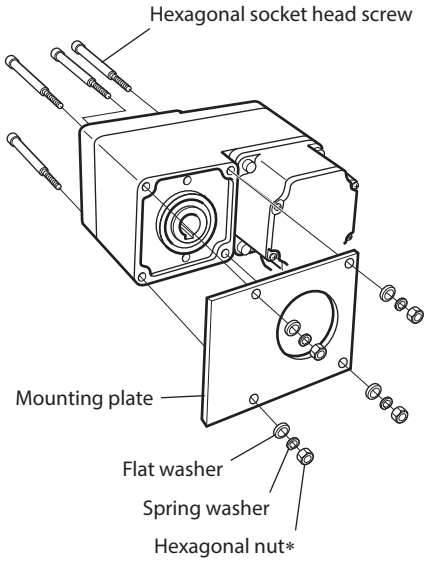


* Nuts are not included with the 200 W and 400 W types.
Provide nuts separately or drill tapped holes in the mounting plate.

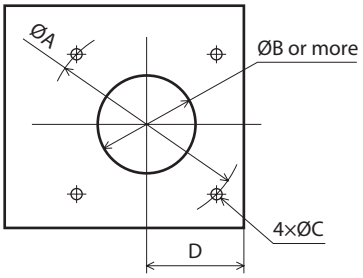
Mounting hole dimensions [Unit: mm (in.)]

Model	Screw size	Tightening torque [N·m (lb-in)]	ØA	ØBH8	ØC
BXM230	M5	3.8 (33)	70 (2.76)	$34^{+0.039}_{0}$ ($1.34^{+0.0015}_{0}$)	5.5 (0.217)
BXM460	M6	6.4 (56)	94 (3.70)	$38^{+0.039}_{0}$ ($1.50^{+0.0015}_{0}$)	6.5 (0.256)
BXM5120	M8	15.5 (137)	104 (4.09)	$50^{+0.039}_{0}$ ($1.97^{+0.0015}_{0}$)	8.5 (0.335)
BXM6200 **BXM6400**			120 (4.72)	$58^{+0.046}_{0}$ ($2.28^{+0.0018}_{0}$)	–

■ Using the rear side as the mounting surface



• Mounting hole dimensions



* Nuts are not included with the 200 W and 400 W types.
  Provide nuts separately or drill tapped holes in the mounting plate.

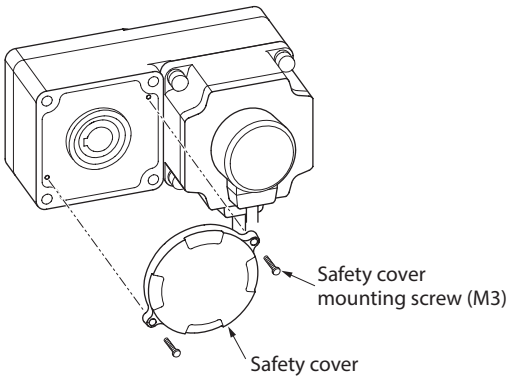
Mounting hole dimensions [Unit: mm (in.)]

Model	Screw size	Tightening torque [N·m (lb-in)]	ØA	ØB	ØC	D
BXM230	M5	3.8 (33)	70 (2.76)	25 (0.98)	5.5 (0.217)	29 (1.14)
BXM460	M6	6.4 (56)	94 (3.70)	30 (1.18)	6.5 (0.256)	39 (1.54)
BXM5120	M8	15.5 (137)	104 (4.09)	35 (1.38)	8.5 (0.335)	44 (1.73)
BXM6200 **BXM6400**			120 (4.72)	42 (1.65)	–	57 (2.24)

Note When installing the gearhead by using its rear side as the mounting surface, prevent contact between the mounting plate and motor by keeping dimension D below the specified value.

■ Installing the safety cover

After installing a load, attach the included safety cover.
The safety cover can be attached to either side.
Tightening torque: 0.45 N·m (3.9 lb-in)

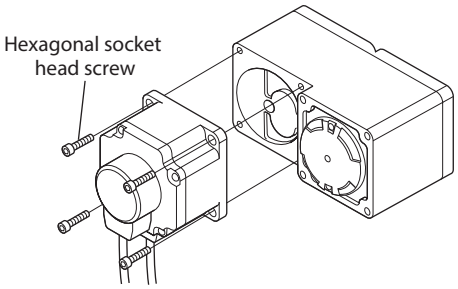


■ Removing/Installing the gearhead

See the following steps to replace the gearhead or to change the cable outlet position.
Note that the motor cable cannot be positioned in the direction where it faces to the gearhead output shaft side.

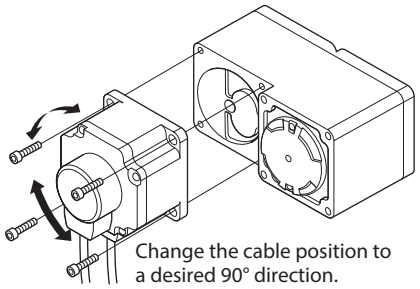
- Removing the gearhead from the motor

Remove the hexagonal socket head screws (4 places) assembling the motor and gearhead, and detach the gearhead from the motor.



- Assembling the gearhead to the motor

1. Keep the pilot sections of the motor and gearhead in parallel, and assemble the gearhead with the motor while slowly rotating it clockwise/counterclockwise.
   At this time, note so that the pinion of the motor output shaft does not hit the side panel or gears of the gearhead strongly.



2. Check no gaps remain between the motor and gearhead, and tighten them with hexagonal socket head screws (4 places).

Model	Screw size	Tightening torque [N·m (lb-in)]
BXM230	M4	1.8 (15.9)
BXM460	M6	6.4 (56)
BXM5120 **BXM6200** **BXM6400**	M8	15.5 (137)

Note

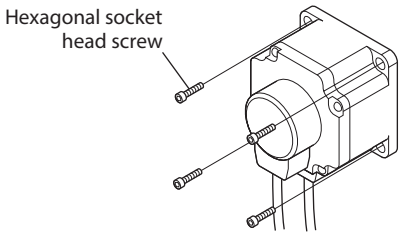
- Do not forcibly assemble the motor and gearhead. Also, prevent metal objects or foreign substances from entering in the gearhead. The pinion of the motor output shaft or gear may be damaged, resulting in noise or shorter service life.
- Do not allow dust to attach to the pilot sections of the motor and gearhead. Also, assemble the motor and gearhead carefully by not pinching the O-ring at the motor pilot section. If the O-ring is crushed or severed, grease may leak from the gearhead.

1.4 Installing the round shaft type

Note Do not install the motor to the mounting hole diagonally or assemble the motor forcibly.
Doing so may cause damage to the flange pilot section, thereby resulting in damage to the motor.

Secure the product using hexagonal socket head screws (not included) through the four mounting holes.
Do not leave a gap between the product and mounting plate.

Model	Screw size	Tightening torque [N·m (lb-in)]
BXM230	M4	1.8 (15.9)
BXM460	M6	6.4 (56)
BXM5120 **BXM6200** **BXM6400**	M8	15.5 (137)



■ Mounting plate dimensions

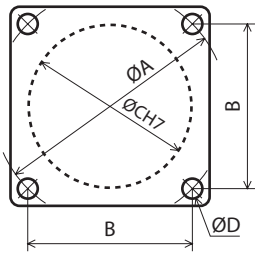
Install the motor to a mounting plate equivalent to the following size so that the motor case temperature will not exceed 90 °C (194 °F).

Model	Size of mounting plate [mm (in.)]	Thickness [mm (in.)]	Material
BXM230	115×115 (4.53 x 4.53)	5 (0.20)	Aluminum alloy
BXM460	135×135 (5.31 x 5.31)		
BXM5120	165×165 (6.50 x 6.50)		
BXM6200	200×200 (7.87 x 7.87)		
BXM6400	250×250 (9.84 x 9.84)	6 (0.24)	

■ Mounting hole dimensions [Unit: mm (in.)]

Model	ØA	B	ØCH7	ØD
BXM230	70 (2.76)	49.5 (1.949)	$54^{+0.030}_{0}$ ($2.1260^{+0.0012}_{0}$)	4.5 (0.177)
BXM460	94 (3.70)	66.47 (2.616)	$73^{+0.030}_{0}$ ($2.8740^{+0.0012}_{0}$)	6.5 (0.256)
BXM5120	104 (4.09)	73.54 (2.895)	$83^{+0.035}_{0}$ ($3.2677^{+0.0014}_{0}$)	8.5 (0.335)
BXM6200 **BXM6400**	120 (4.72)	84.85 (3.341)	$94^{+0.035}_{0}$ ($3.7008^{+0.0014}_{0}$)	8.5 (0.335)

ØC indicates the pilot diameter on the flange.



Note Fit the pilot on the motor mounting surface into a flange pilot.

1.5 Installing a load for combination type-parallel shaft gearhead, round shaft type

When installing a load on the motor or the gearhead, align the center of the motor output shaft (gearhead output shaft) with the center of the load shaft.

Note

- When coupling the motor or the gearhead with a load, pay attention to centering, belt tension, parallelism of pulleys, etc. Also, firmly secure the tightening screws of the coupling or pulleys.
- When installing a load, do not damage the motor output shaft (gearhead output shaft) or bearing. Forcing in the load by driving it with a hammer, etc., may break the bearing. Do not apply any excessive force to the output shaft.
- Do not modify or machine the output shaft of the motor or gearhead. This may damage the bearing, resulting in damage to the motor or gearhead.

■ Output shaft shape

- Combination type-parallel shaft gearhead

  A key slot is provided on the output shaft of gearhead. Form a key slot on the load side, and secure the load using the included parallel key.

- Round shaft type

  A flat section is provided on the motor output shaft of each round shaft type. Apply a double-point screw, etc., at the flat section to firmly secure the load and prevent it from spinning.

■ How to install a load

- Using a coupling

  Align the centerline of the motor or gearhead output shaft with the centerline of the load shaft.

- Using a belt

  Adjust the motor or gearhead output shaft to lie parallel with the load shaft, and form right angles between the output shaft/load shaft and the line connecting the centers of both pulleys.

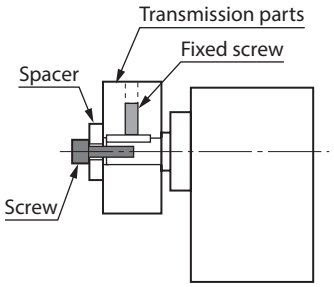
- Using a gear

  Adjust the motor or gearhead output shaft to lie parallel with the gear shaft, and allow the output shaft to mesh correctly with the centers of the gear teeth.

- When using the output shaft end tapped hole of a gearhead (excluding GFS2G)

  Use a tapped hole provided at the end of the output shaft as an auxiliary means for preventing the transfer mechanism from disengaging.

Gearhead model	Output shaft end tapped hole
GFS4G	M5, Effective depth 10 mm (0.39 in)
GFS5G GFS6G	M6, Effective depth 12 mm (0.47 in)



1.6 Installation of load for combination type-hollow shaft flat gearhead

If the motor is subject to a strong impact upon instantaneous stop or receives a large overhung load, use a stepped load shaft.

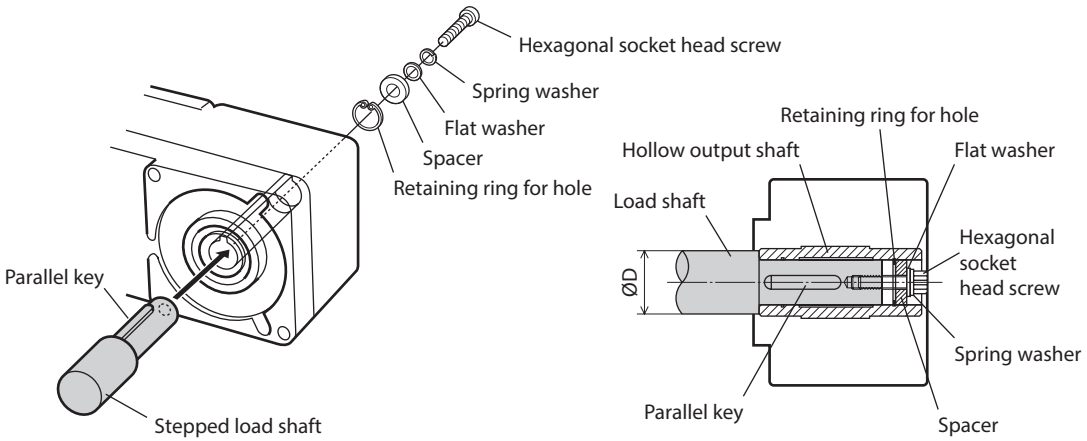
Note

- Apply grease (molybdenum disulfide grease, etc.) on the surface of the load shaft and inner walls of the hollow output shaft to prevent seizure.
- When installing a load, do not damage the motor output shaft (gearhead output shaft) or bearing. Forcing in the load by driving it with a hammer, etc., may break the bearing. Do not apply any excessive force to the output shaft.
- Do not modify or machine the output shaft of the motor or gearhead. This may damage the bearing, resulting in damage to the motor or gearhead.

■ Stepped load shaft

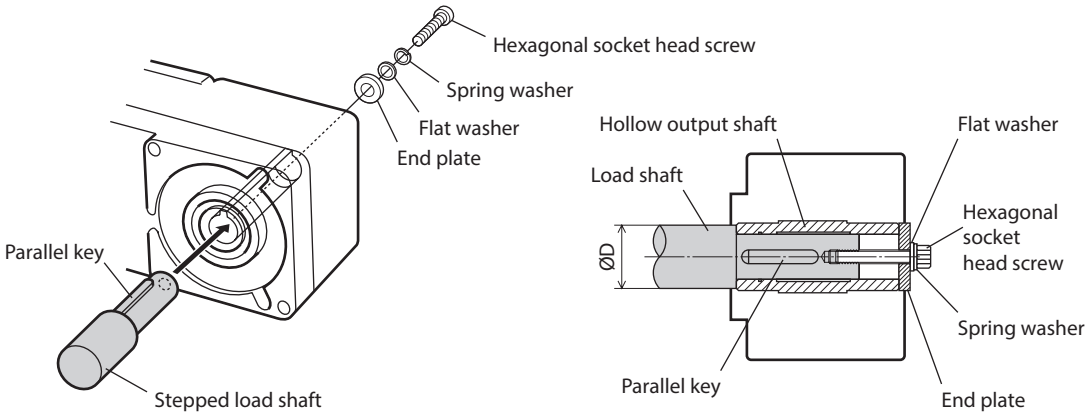
- Mounting method using retaining ring for hole

Secure the retaining ring for hole to the load shaft by tightening the hexagonal socket head screw over a spacer, plain washer and spring washer.



- Mounting method using end plate

Secure the end plate to the load shaft by tightening the hexagonal socket head screw over a flat washer and spring washer.



Note The included safety cover cannot be installed because it interferes against the hexagonal socket head screws. The user must provide other protective measure for the rotating part.

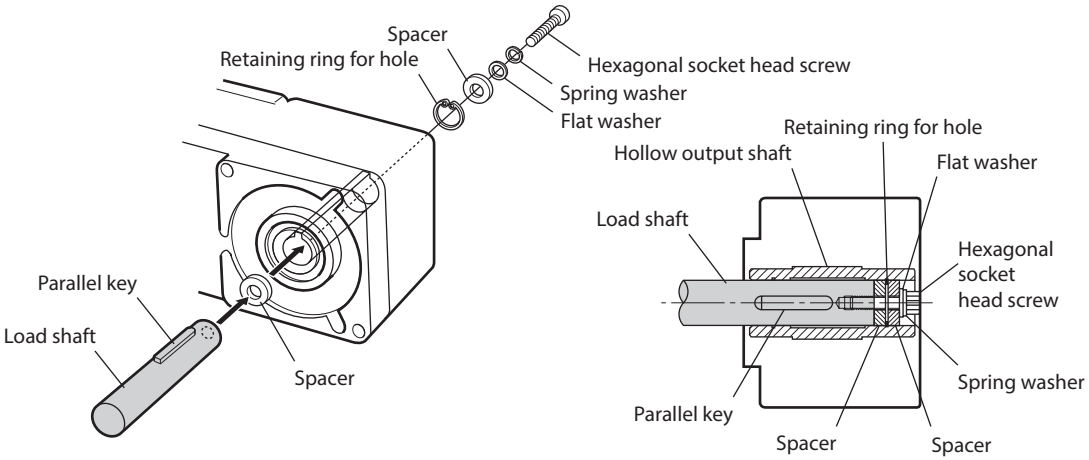
- Recommended load shaft installation dimensions [Unit: mm (in.)]

Model	Inner diameter of hollow shaft (H8)	Recommended diameter of load shaft (h7)	Nominal diameter of retaining ring for hole	Applicable screw	Spacer thickness	Outer diameter of stepped shaft (ØD)
BXM230	$Ø12^{+0.027}_{0}$ ($Ø0.4724^{+0.0011}_{0}$)	$Ø12^{0}_{-0.018}$ ($Ø0.4724^{0}_{-0.0007}$)	Ø12 (Ø0.47)	M4	3 (0.12)	20 (0.79)
BXM460	$Ø15^{+0.027}_{0}$ ($Ø0.5906^{+0.0011}_{0}$)	$Ø15^{0}_{-0.018}$ ($Ø0.5906^{0}_{-0.0007}$)	Ø15 (Ø0.59)	M5	4 (0.16)	25 (0.98)
BXM5120	$Ø20^{+0.033}_{0}$ ($Ø0.7874^{+0.0013}_{0}$)	$Ø20^{0}_{-0.021}$ ($Ø0.7874^{0}_{-0.0008}$)	Ø20 (Ø0.79)	M6	5 (0.20)	30 (1.18)
BXM6200 BXM6400	$Ø25^{+0.033}_{0}$ ($Ø0.9843^{+0.0013}_{0}$)	$Ø25^{0}_{-0.021}$ ($Ø0.9843^{0}_{-0.0008}$)	Ø25 (Ø0.98)	M8	6 (0.24) [3 (0.12)]∗	40 (1.57)

∗ The value in the brackets [ ] is that when using the rear side as the mounting surface.

■ Non-stepped load shaft

Install a spacer on the load shaft side and secure the retaining ring for hole to the load shaft by tightening the hexagonal socket head screw over a spacer, flat washer and spring washer.



Recommended load shaft installation dimensions [Unit: mm (in.)]

Model	Inner diameter of hollow shaft (H8)	Recommended diameter of load shaft (h7)	Nominal diameter of retaining ring	Applicable screw	Spacer thickness
BXM230	$Ø12^{+0.027}_{0}$ ($Ø0.4724^{+0.0011}_{0}$)	$Ø12^{0}_{-0.018}$ ($Ø0.4724^{0}_{-0.0007}$)	Ø12 (Ø0.47)	M4	3 (0.12)
BXM460	$Ø15^{+0.027}_{0}$ ($Ø0.5906^{+0.0011}_{0}$)	$Ø15^{0}_{-0.018}$ ($Ø0.5906^{0}_{-0.0007}$)	Ø15 (Ø0.59)	M5	4 (0.16)
BXM5120	$Ø20^{+0.033}_{0}$ ($Ø0.7874^{+0.0013}_{0}$)	$Ø20^{0}_{-0.021}$ ($Ø0.7874^{0}_{-0.0008}$)	Ø20 (Ø0.79)	M6	5 (0.20)
BXM6200 **BXM6400**	$Ø25^{+0.033}_{0}$ ($Ø0.9843^{+0.0013}_{0}$)	$Ø25^{0}_{-0.021}$ ($Ø0.9843^{0}_{-0.0008}$)	Ø25 (Ø0.98)	M8	6 (0.24) [3 (0.12)]∗

∗ The value in the brackets [ ] is that when using the rear side as the mounting surface.

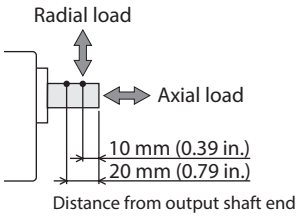
1.7 Permissible radial load and permissible axial load

Make sure a radial load and axial load applied to the output shaft of the motor and gearhead will not exceed the permissible values shown in the table below.

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

■ Combination type-parallel shaft gearhead

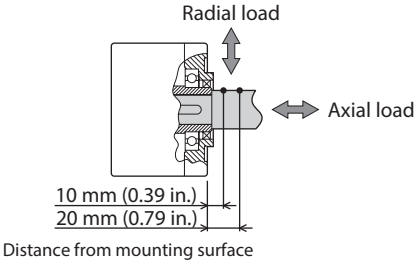
Model		Permissible radial load [N (lb.)]∗ Distance from output shaft end of the gearhead		Permissible axial load [N (lb.)]
	Gear ratio	10 mm (0.39 in.)	20 mm (0.79 in.)	
BXM230	**5**	100 (22) [90 (20)]	150 (33) [110 (24)]	40 (9)
	10 to **20**	150 (33) [130 (29)]	200 (45) [170 (38)]	
	30 to **200**	200 (45) [180 (40)]	300 (67) [230 (51)]	
BXM460	**5**	200 (45) [180 (40)]	250 (56) [220 (49)]	100 (22)
	10 to **20**	300 (67) [270 (60)]	350 (78) [330 (74)]	
	30 to **200**	450 (101) [420 (94)]	550 (123) [500 (112)]	
BXM5120	**5**	300 (67) [230 (51)]	400 (90) [300 (67)]	150 (33)
	10 to **20**	400 (90) [370 (83)]	500 (112) [430 (96)]	
	30 to **200**	500 (112) [450 (101)]	650 (146) [550 (123)]	
BXM6200 BXM6400	**5** to **20**	550 (123) [500 (112)]	800 (180) [700 (157)]	200 (45)
	30, **50**	1000 (220) [900 (200)]	1250 (280) [1100 (240)]	300 (67)
	100, **200**	1400 (310) [1200 (270)]	1700 (380) [1400 (310)]	400 (90)



∗ The values is a rated speed of 3000 r/min or below. The value in brackets [ ] is that when the speed is 4000 r/min.

■ Combination type-hollow shaft flat gearhead

Model		Permissible radial load [N (lb.)]∗1 Distance from gearhead mounting surface		Permissible axial load [N (lb.)]
	Gear ratio	10 mm (0.39 in.)	20 mm (0.79 in.)	
BXM230	**5**, **10**	450 (101) [410 (92)]	370 (83) [330 (74)]	200 (45)
	15 to **200**	500 (112) [460 (103)]	400 (90) [370 (83)]	
BXM460	**5**, **10**	800 (180) [730 (164)]	660 (148) [600 (135)]	400 (90)
	15 to **200**	1200 (270) [1100 (240)]	1000 (220) [910 (200)]	
BXM5120	**5**, **10**	900 (200) [820 (184)]	770 (173) [700 (157)]	500 (112)
	15, **20**	1300 (290) [1200 (270)]	1110 (240) [1020 (220)]	
	30 to **200**	1500 (330) [1400 (310)]	1280 (280) [1200 (270)]	
BXM6200 BXM6400	**5** ∗2	1230 (270) [1130 (250)]	1070 (240) [990 (220)]	800 (180)
	10			
	15, **20**	1680 (370) 1550 (340)]	1470 (330) [1360 (300)]	
	30 to **100**	2040 (450) [1900 (420)]	1780 (400) [1660 (370)]	



∗1 The values is a rated speed of 3000 r/min or below. The value in brackets [ ] is that when the speed is 4000 r/min.

∗2 **BXM6400** only

■ Round shaft type

Model	Permissible radial load [N (lb.)] Distance from output shaft end of the motor		Permissible axial load [N (lb.)]
	10 mm (0.39 in.)	20 mm (0.79 in.)	
BXM230	87.2 (19.6)	107 (24)	10 (2.2)
BXM460	117 (26)	137 (30)	20 (4.5)
BXM5120	156 (35)	176 (39)	25 (5.6)
BXM6200 BXM6400	197 (44)	221 (49)	

1.8 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.

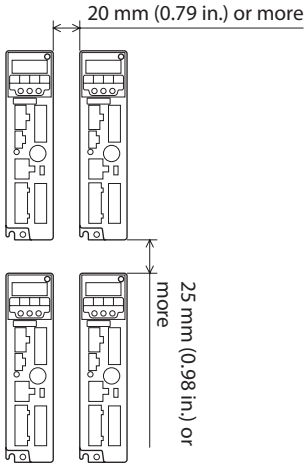
Note

- 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)



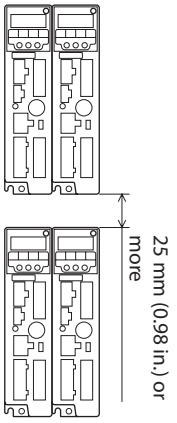
- When drivers are installed in a close contact state

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]

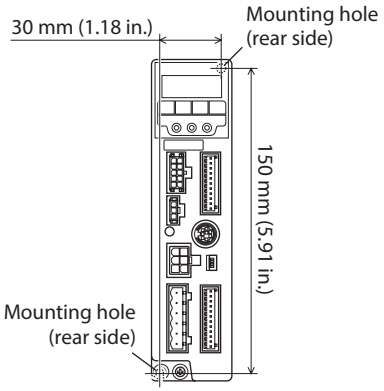
- Operating ambient temperature: 0 to +40 °C (+32 to +104 °F)
- When using a DIN-rail or a mounting bracket, use in a state where the load factor is 90% or less.



■ Installation methods

- Installation with screws

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



- Installation to DIN rail

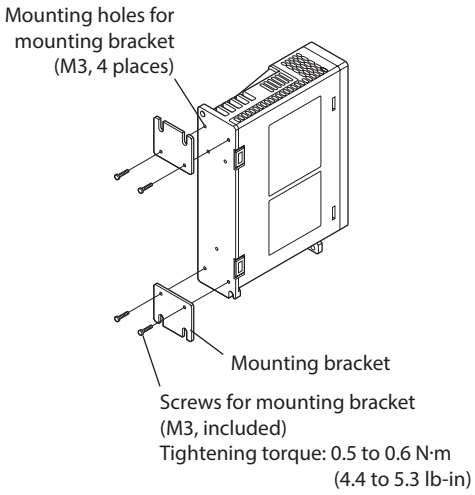
  When installing the driver to a DIN-rail, use the DIN rail mounting plate **MADP02** (sold separately) and mount it to a 35 mm (1.38 in.) wide DIN rail. Refer to "**MADP02** handling guideline" for installation method.

- 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

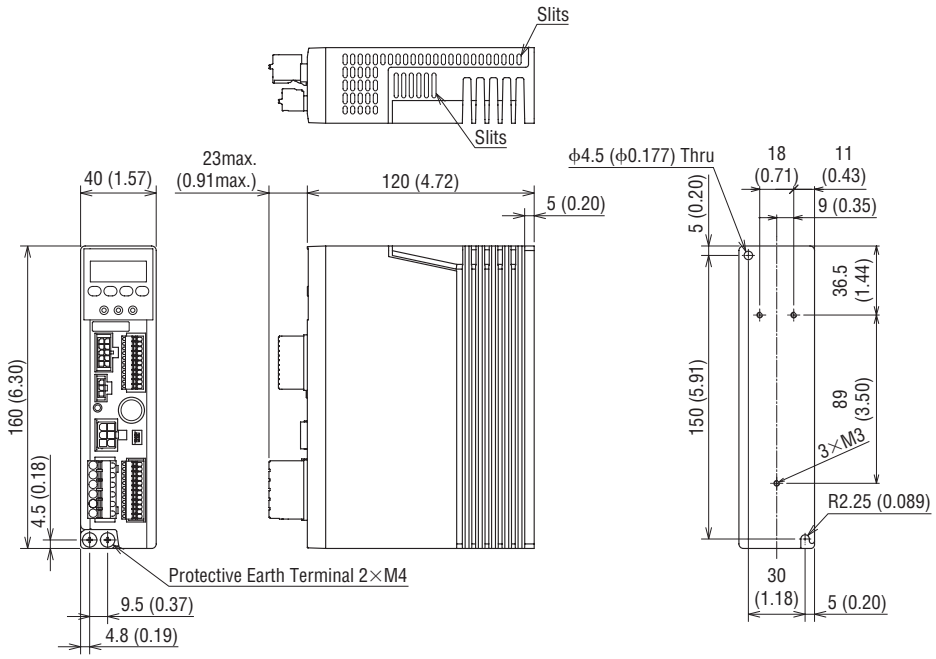
- Do not use the mounting holes of the driver mounting bracket for any other purpose.
- Be sure to secure the driver mounting bracket using the included screws. The use of screws that would penetrate 3 mm (0.12 in.) or more through the surface of the driver may cause damage to the driver.



■ Dimensions

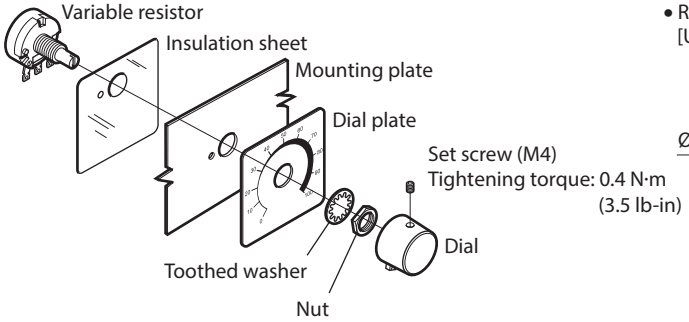
Mass: 0.8 kg (1.76 lb.)

[Unit: mm (in.)]



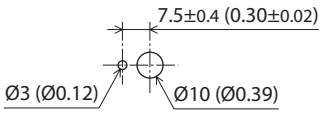
1.9 Installing the external potentiometer (sold separately)

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



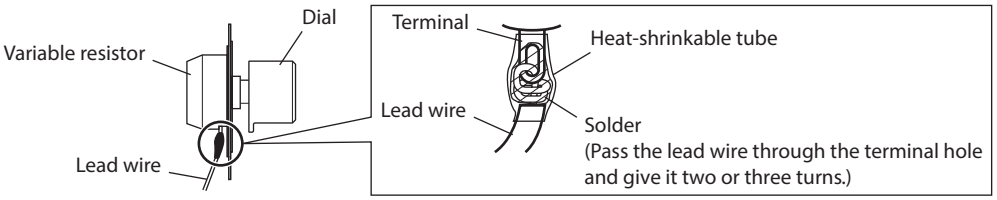
Tightening torque: 0.45 N·m (3.9 lb-in)

• Reference mounting hole dimensions
[Unit: mm (in.)]



Soldering the variable resister terminals and the lead wires

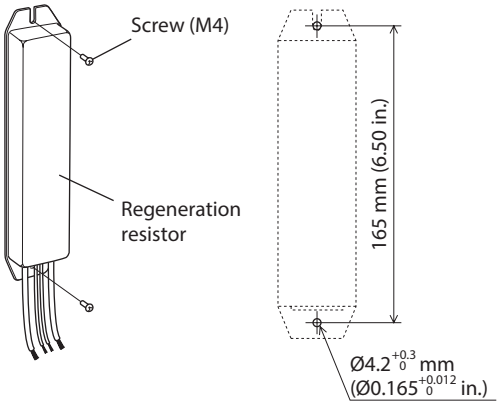
Cover a heat-shrinkable tube over the soldered part to insulate. (Soldering condition: 235 °C (455 °F), less than 5 s)



1.10 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 p.44 for details.

• Mounting hole dimensions

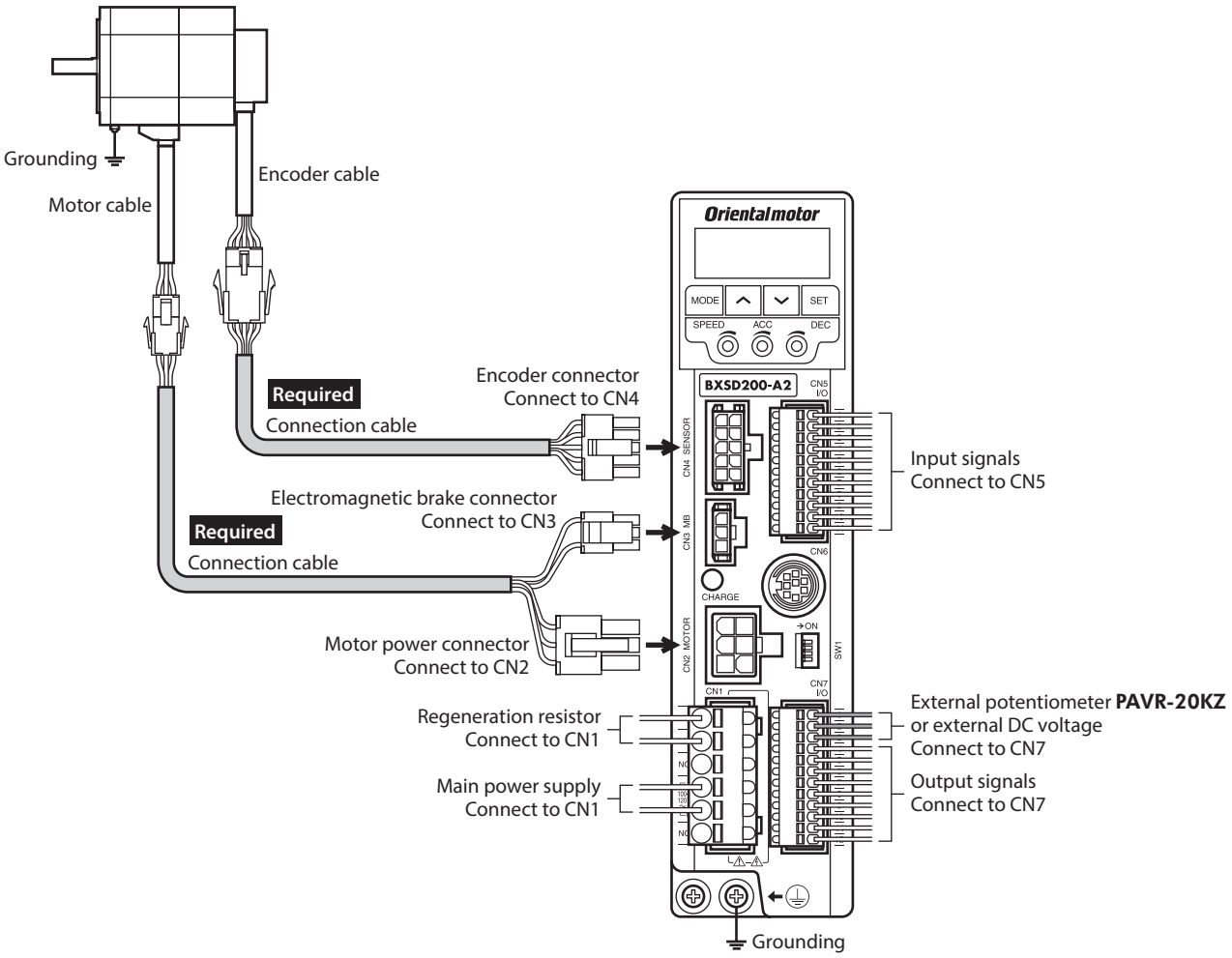


2 Connection

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

2.1 Connection example

A connection example shown below applies to the electromagnetic brake motor (200 W, 400W).

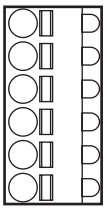


Note

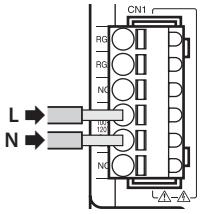
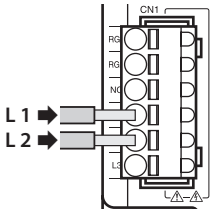
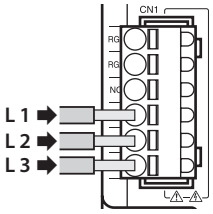
- Be sure to use the dedicated connection cable (sold separately) to connect the motor.
- Regardless of whether an electromagnetic brake is equipped or not, always connect the electromagnetic brake connector to CN3.
- Connect the connectors securely. Insecure connections may cause malfunction or damage 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 for the CHARGE LED to turn off. Residual voltage may cause electric shock.

2.2 Connecting the power supply

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



Manufacturer: PHOENIX CONTACT GmbH & Co. KG
Model: FKCT2,5/6-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.

■ Applicable lead wire

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

■ 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)]

■ 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: Single-phase input 15 A, Three-phase input 10 A
Circuit breaker: Mitsubishi Electric Corporation NF30

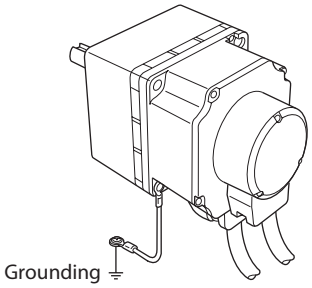
2.3 Grounding

■ Grounding the motor

Ground the Protective Earth Terminal of the motor at a position close to the motor. Wire it with the shortest distance. The grounding method varies depending on the motor output power.

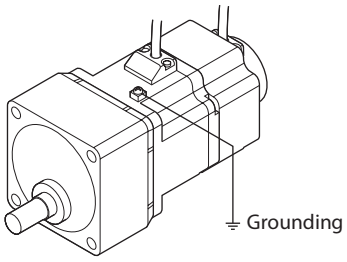
- 30 W, 60 W, 120 W

  Ground the motor using one of the four mounting holes on the motor frame.
  At this time, insulate the frame ground terminal that come out of the motor cable without grounding it.



- 200 W, 400 W

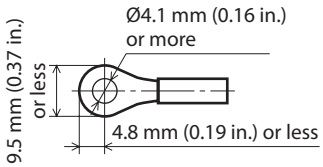
  Be sure to ground the Protective Earth Terminal of the motor (screw size: M4).



- Protective Earth Terminal of the motor

  Use a round terminal which is larger than the following size, and secure it with a mounting screw over a shakeproof washer.

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



- Lead wire for Protective Earth Terminal of the motor

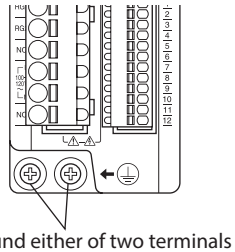
  Use a lead wire of AWG 18 (0.75 mm^2) or thicker for grounding.

■ Grounding the driver

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

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

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 at a position close to the driver.

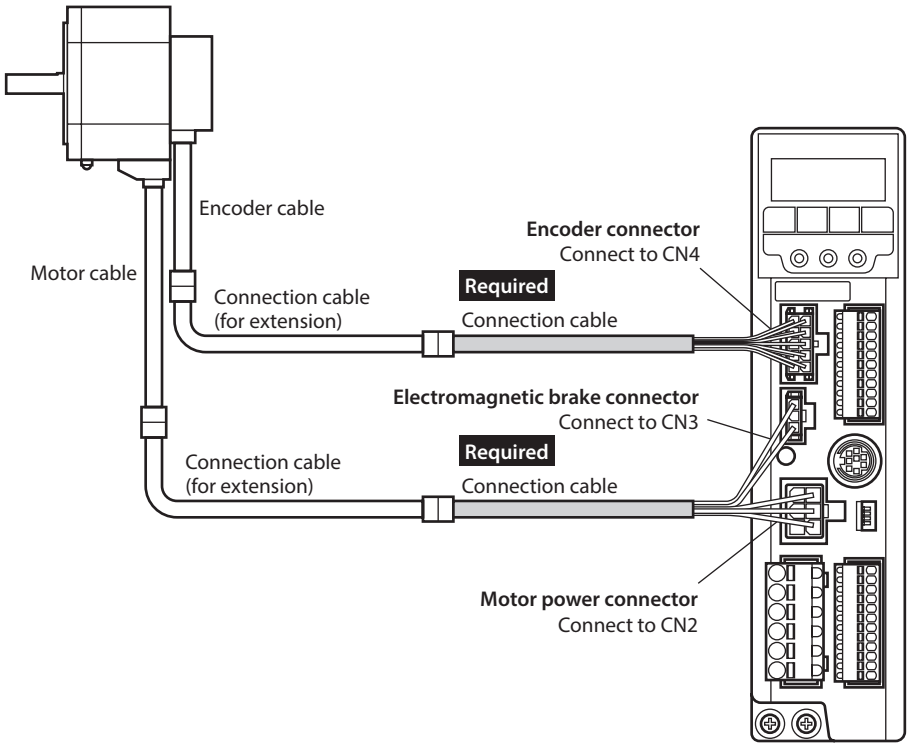


■ Precautions about static electricity

Static electricity may cause the driver to malfunction or suffer damage.
Be sure to ground the motor and driver to prevent them from being damaged by static electricity.

2.4 Connecting the motor and driver

Connect the motor to the driver via the dedicated connection cable (sold separately) or flexible 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) or flexible connection cable (for extension), each sold separately.
The wiring distance can be extended to a maximum of 30.3 m (99.4 ft.).

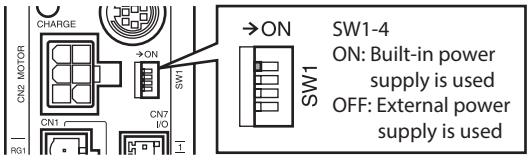


Note

- Be sure to use the dedicated connection cable (sold separately) to connect the motor.
- Firmly insert the connector in position. Insecure connections may cause malfunction or damage to the motor or driver.
- Do not insert or pull out the connector while the power is supplied. Doing so may cause malfunction or electric shock.

2.5 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)

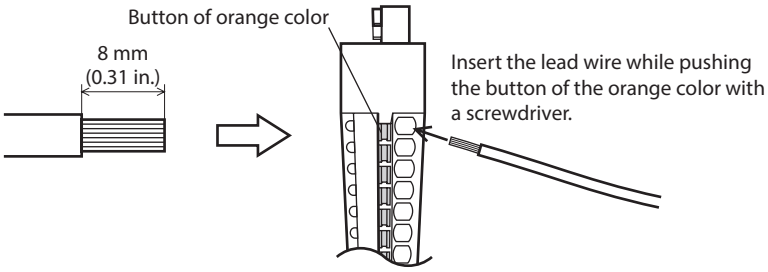


Note The built-in power supply cannot be used in the case of source logic. Do not turn the switch ON.

2.6 Connecting the I/O signals

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.)



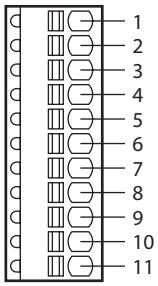
Applicable crimp terminal

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)

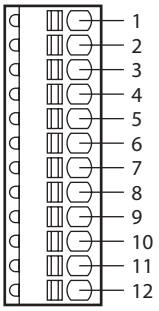


Manufacturer: PHOENIX CONTACT GmbH & Co. KG
Model: FK-MC0,5/11-ST-2,5

∗ 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

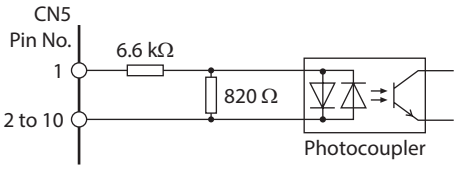


Manufacturer: PHOENIX CONTACT GmbH & Co. KG
Model: FK-MC0,5/12-ST-2,5

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

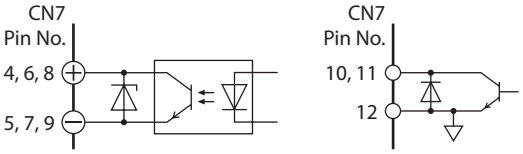
■ Input signals circuit

All input signals of the driver are photocoupler inputs.
When an external power supply is used: 24 VDC −15 to +20%, 100 mA or more



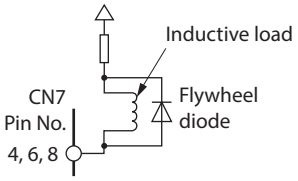
■ Output signals circuit

There are two types of driver output signals, photocoupler/ open-collector outputs and transistor/open-collector outputs.



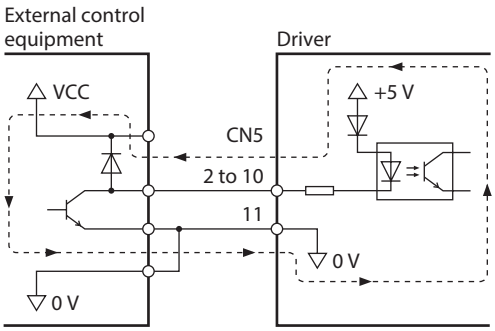
Pin No.	Signal name	Description
4 to 9	OUT0 to OUT2	Photocoupler/open collector output ON voltage: 1.6 VDC maximum 4.5 to 30 VDC, 100 mA or less
10, 11	ASG, BSG	Transistor/open-collector output ON voltage: 0.5 VDC maximum 4.5 to 30 VDC, 20 mA or less

Note When connecting a relay (inductive load), etc., to detect alarm outputs, provide a fly-back voltage control measure based on diode, etc., for the inductive load. Or use a relay with built-in flywheel diode.



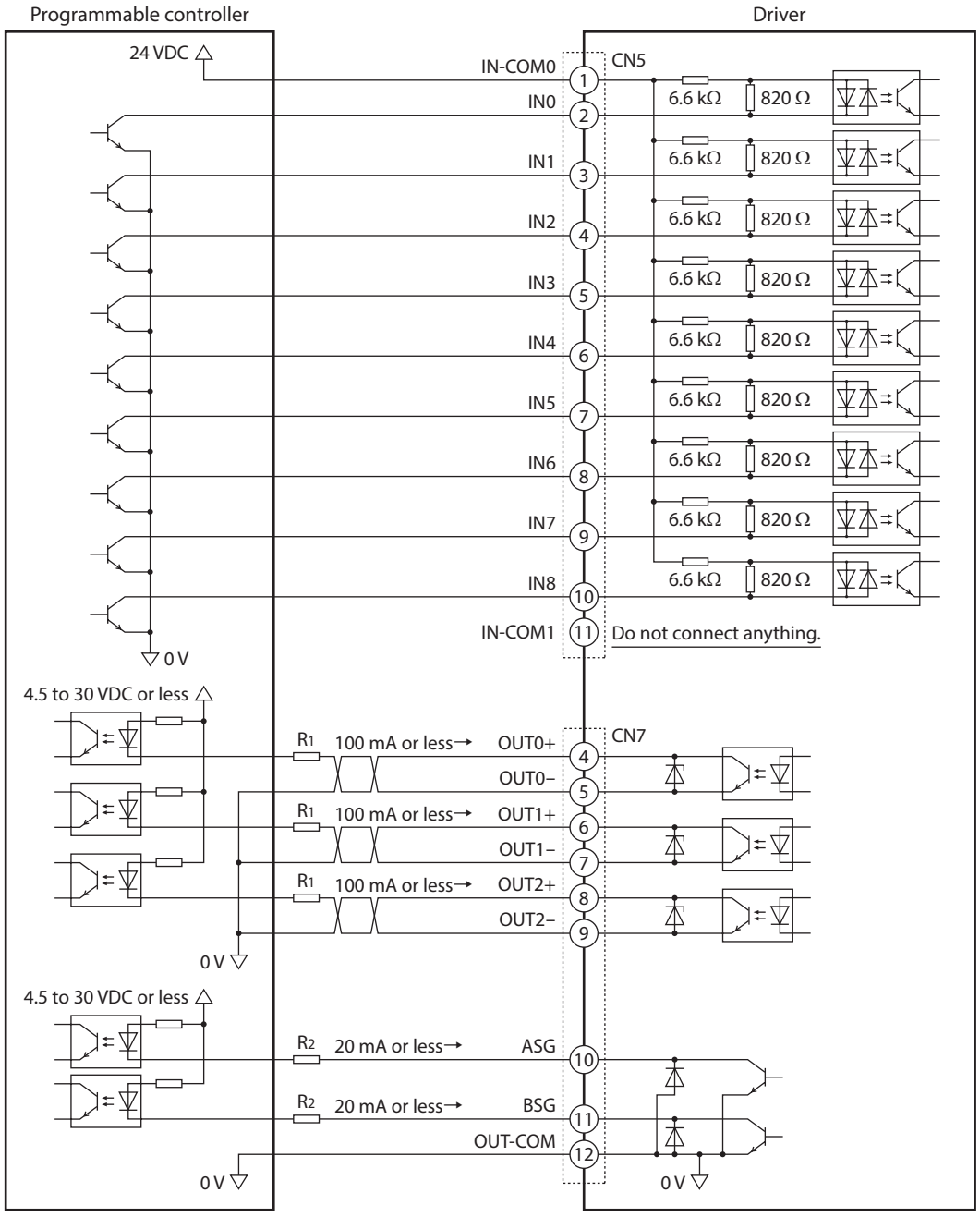
■ When using a controller with a built-in clamp diode

If a controller with a built-in clamp diode is used, a leakage path may form and cause the motor to operate even when the controller power is off, as long as the driver power is on. Since the power capacity of the controller is different from that of the driver, the motor may operate when the controller and driver powers are turned on or off simultaneously.
When powering down, turn off the driver power first, followed by the controller power, and when powering up, turn on the controller power first, followed by the driver power.



■ Example of connection with I/O signal circuit

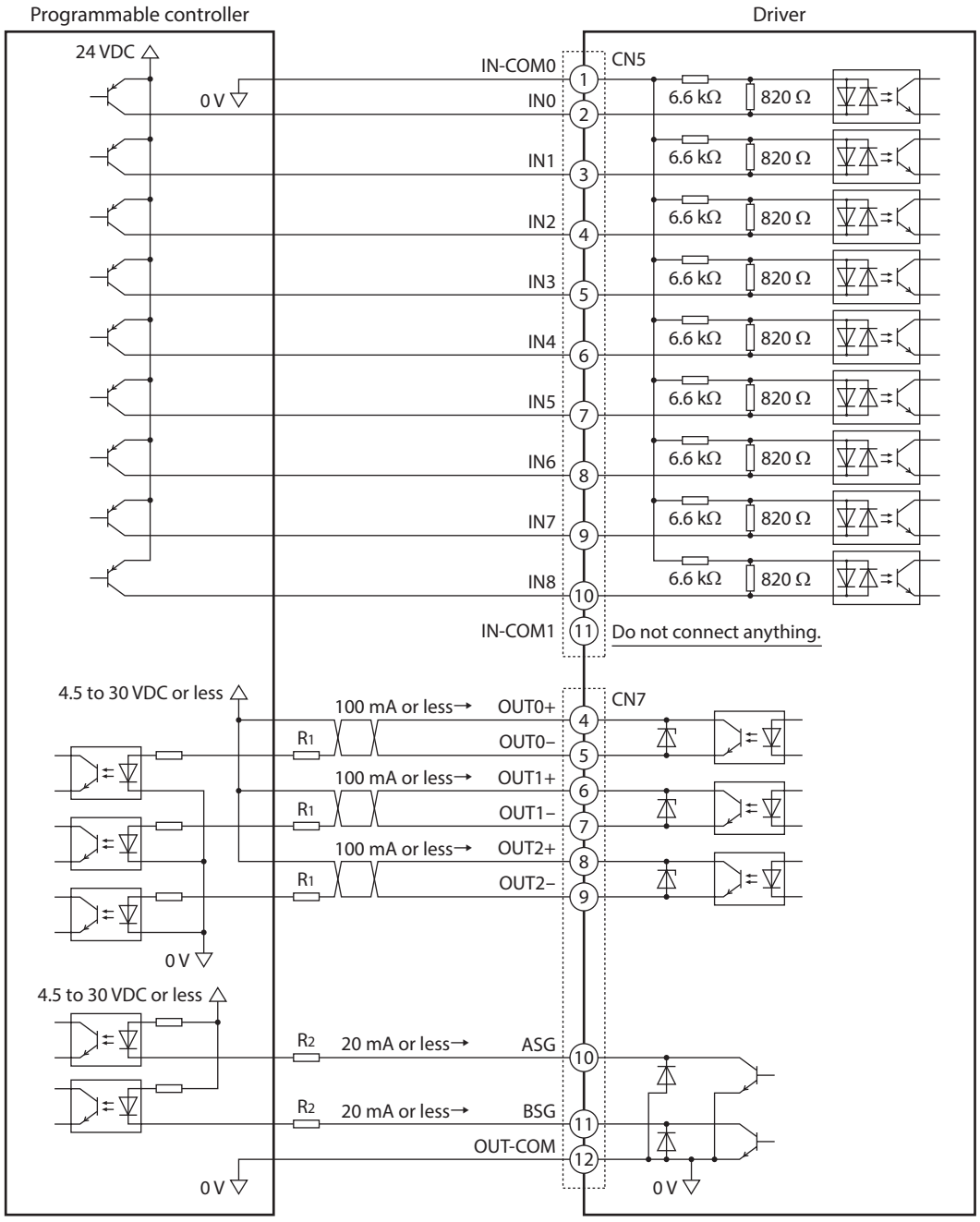
- Sink logic circuit



Note

- Use output signals at 4.5 VDC to 30 VDC.
- Be sure to use the current of OUT0 to OUT2 at 100 mA or less.
  Connect a limiting resistor R_1 externally if the current exceeds this specified value.
- Be sure to use the current of ASG and BSG at 20 mA or less.
  Connect a limiting resistor R_2 externally if the current exceeds this specified value.

- Source logic circuit



Note

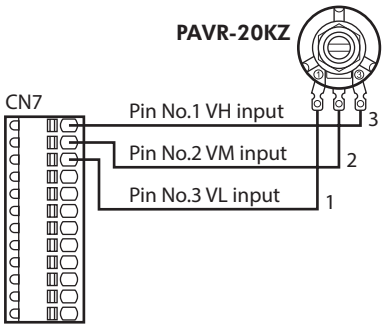
- Use output signals at 4.5 VDC to 30 VDC.
- Be sure to use the current of OUT0 to OUT2 at 100 mA or less.
  Connect a limiting resistor R_1 externally if the current exceeds this specified value.
- Be sure to use the current of ASG and BSG at 20 mA or less.
  Connect a limiting resistor R_2 externally if the current exceeds this specified value.
  The ASG and BSG signals cannot connect to devices of source logic.

2.7 Connecting analog external setting devices

If the external potentiometer **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. Refer to p.104 to p.106 for how to set.

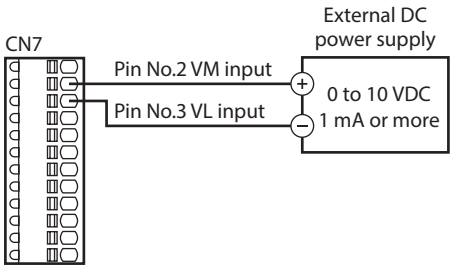
■ Using an external potentiometer

Connect to the pin Nos.1 to 3 of CN7.



■ Using external DC voltage

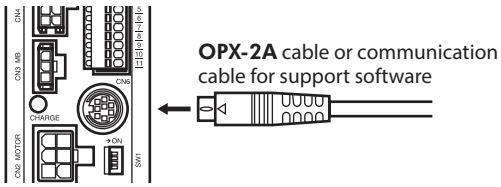
For external voltage, use a DC power supply (0 to 10 VDC) with reinforced insulation on its primary and secondary sides, and connect to the pin No.2 and No.3 of CN7.
The input impedance between the VM input and VL input is approximately 41.8 kΩ.
The VL input is connected to IN-COM1 inside the driver.



Note Be sure to use the external DC voltage at 10 VDC 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.

2.8 Connecting the data setter

Connect the **OPX-2A** cable (sold separately) or the communication cable for support software to CN6.



⚠ CAUTION 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.

2.9 Connecting the regeneration resistor

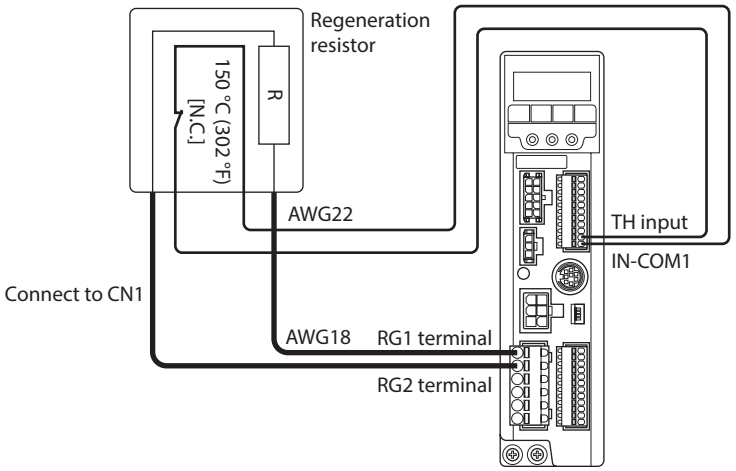
If vertical drive (gravitational operation) such as elevator applications is performed or if sudden start-stop operation of a large inertia is repeated frequently, use the regeneration resistor **EPRC-400P** (sold separately) or **RGB100** (sold separately).
Install the regeneration resistor in a location 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.

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

■ Connection method

Connecting to I/O terminals varies depending on the control mode or method of use. Refer to p.45 to p.47 and p.52 to p.54 for connection.

- 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 p.100 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 connection diagram 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 p.100 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.

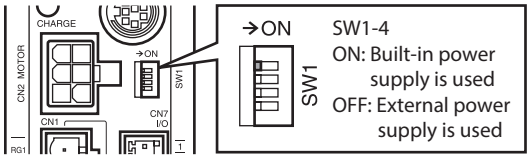
■ Regeneration resistor specifications

Output power	30 W, 60 W, 120 W	200 W, 400 W
Model	**EPRC-400P**	**RGB100**
Continuous regenerative power	100 W	100 W
Resistance value	400 Ω	150 Ω
Thermostat operating temperature	Operation: Open at 150±7 °C (302±13 °F) Reset: Close at 145±12 °C (293±22 °F) [normally closed]	
Thermostat electrical rating	120 VAC 4 A, 30 VDC 4A (minimum current 5 mA)	

2.10 Connection diagram (example)

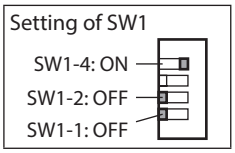
This section explains connection diagrams with the speed control mode (factory setting) as an example.

When using the built-in power supply, set the switch SW1-4 to the ON side. It is set to the OFF side (use an external power supply) at the time of shipment. When using an external power supply, use the switch with the factory setting as it is.

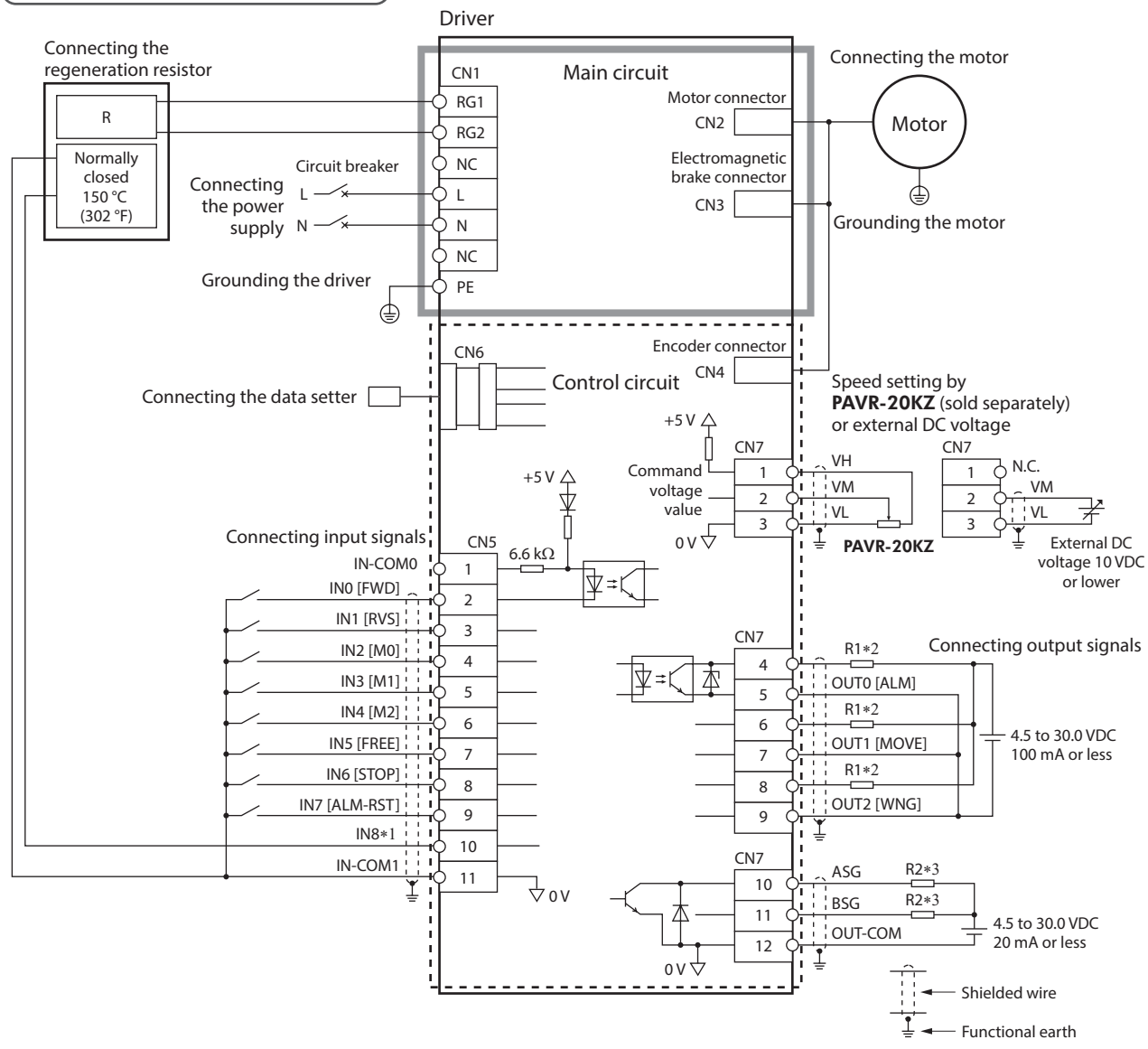


Speed control mode Sink logic: When using the built-in power supply

This is a connection example that the power supply is single-phase 100-120 VAC, the speed is set using an analog external setting device to operate the motor with relays, switches and other contact switches. The I/O signal in the brackets [ ] is the initial value.
Refer to p.99 for the assignment of I/O signals.



Connect the thermostat output of the regeneration resistor to the terminal that the TH input was assigned by changing the "IN input function selection" parameter.
→ How to change: p.100



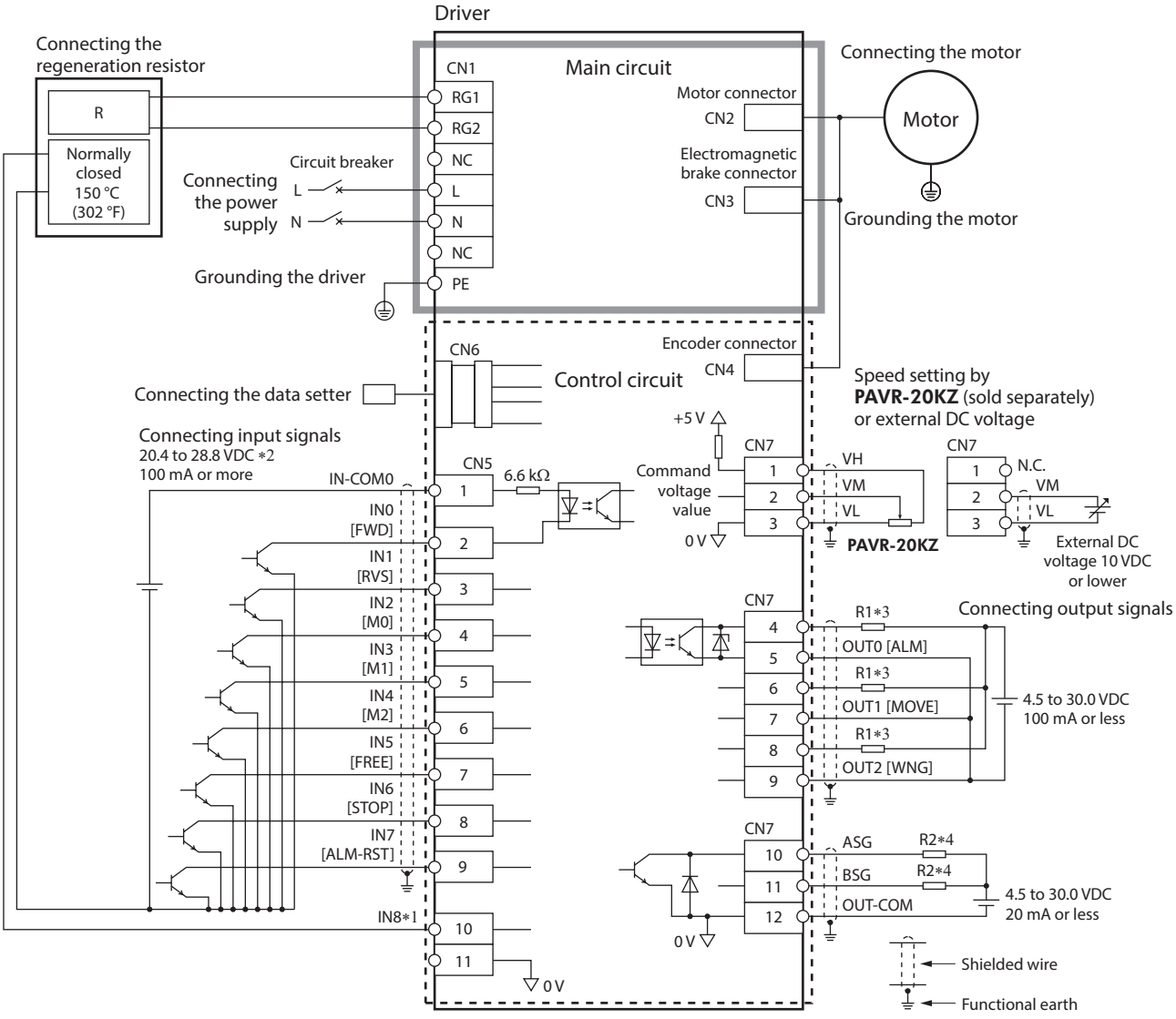
*1 This is a connection when the TH input is assigned to IN8. The initial value is [Not used].
*2 Connect a current-limiting resistor R1 according to the power supply voltage used so that the current will not exceed 100 mA.
*3 Connect a current-limiting resistor R2 according to the power supply voltage used so that the current will not exceed 20 mA.

Speed control mode Sink logic: When using an external power supply

This is a connection example that the power supply is single-phase 100-120 VAC, the speed is set using an analog external setting device to operate the motor with sequence connection of transistor type. The I/O signal in the brackets [ ] is the initial value.
Refer to p.99 for the assignment of I/O signals.

Setting of SW1
SW1-4: OFF
SW1-2: OFF
SW1-1: OFF

Connect the thermostat output of the regeneration resistor to the terminal that the TH input was assigned by changing the "IN input function selection" parameter.
→ How to change: p.100



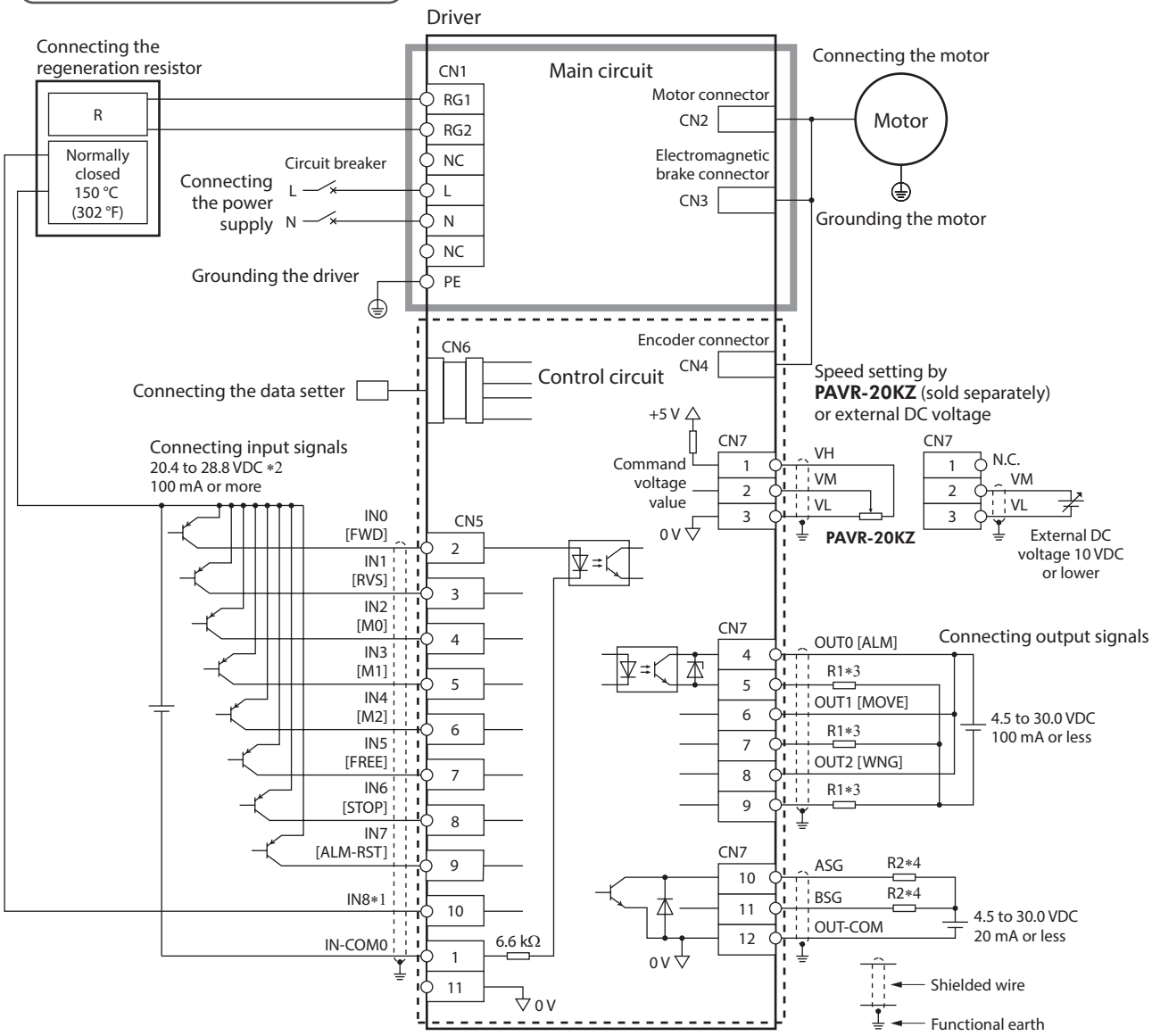
∗1 This is a connection when the TH input is assigned to IN8. The initial value is [Not used].
∗2 Turn on the external power supply before turning on the driver main power supply.
∗3 Connect a current-limiting resistor R1 according to the power supply voltage used so that the current will not exceed 100 mA.
∗4 Connect a current-limiting resistor R2 according to the power supply voltage used so that the current will not exceed 20 mA.

Speed control mode　Source logic: When using an external power supply

This is a connection example that the power supply is single-phase 100-120 VAC, the speed is set using an analog external setting device to operate the motor with sequence connection of transistor type. The I/O signal in the brackets [ ] is the initial value.
Refer to p.99 for the assignment of I/O signals.
The ASG and BSG signals cannot connect to devices of source logic.

Setting of SW1
SW1-4: OFF
SW1-2: OFF
SW1-1: OFF

Connect the thermostat output of the regeneration resistor to the terminal that the TH input was assigned by changing the "IN input function selection" parameter.
→ How to change: p.100



∗1 This is a connection when the TH input is assigned to IN8. The initial value is [Not used].
∗2 Turn on the external power supply before turning on the driver main power supply.
∗3 Connect a current-limiting resistor R1 according to the power supply voltage used so that the current will not exceed 100 mA.
∗4 Connect a current-limiting resistor R2 according to the power supply voltage used so that the current will not exceed 20 mA.

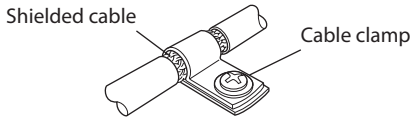
2.11 Noise elimination measures

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 equipment 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.
Refer to p.175 for "Installing and wiring in compliance with EMC Directive."

■ 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.
  - When extending the wiring distance between the motor and the driver, use the connection cable (for extension) which is sold separately. This is effective in suppressing the electrical noise emitted from the motor.
  - Cover the driver by a metal plate such as aluminum. This is effective in shielding the electrical noise emitted from the driver.
- Prevention of noise propagation
  - Connect a noise filter to the power supply cable of the driver.
  - 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.
  - For more effective elimination of noise, use a shielded I/O signal cable or attach ferrite cores if a non-shielded cable is 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.



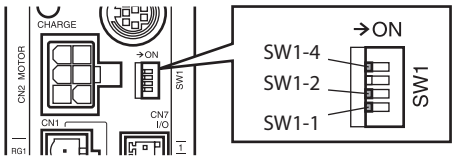
  - Grounding multiple points will increase effect to block electrical noise because impedance on the grounding points is decreased. However, ground them so that a potential difference does not occur among the grounding points.
- Suppression of effect by noise propagation
  - Loop the noise propagated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

3 Connection method for each control mode

Four control modes are provided in the **BX**Ⅱ Series. This section explains the assignment of I/O signals and connection method for each control mode.

3.1 Switching of control mode

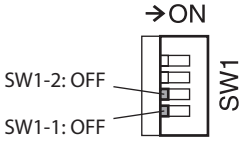
Four control modes are provided in the **BX**Ⅱ Series and can be switched using SW1-1, SW1-2, and SW1-4.



Note

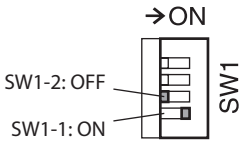
- Switch the control mode before turning on the power supply. The setting will not be enabled if the control mode is switched after the power supply is turned on.
- Switch the control mode before changing the parameter. Since the initial settings of parameters for each control mode are different, if the control mode is switched, parameters will be changed to the initial values of the control mode switched.

■ Speed control mode (factory setting)



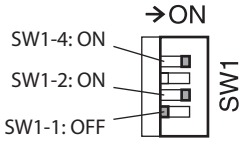
Set SW1-1 and SW1-2 to the OFF side.
Speed control operation can be performed.
Up to 16 operation data can be set.

■ Position control mode



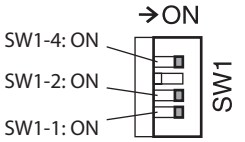
Set SW1-1 to the ON side and SW1-2 to the OFF side.
Position control operation can be performed.
Up to 16 operation data can be set.

■ BX-compatible mode (speed control)



Set SW1-1 to the OFF side and SW1-2 and SW1-4 to the ON side.
If the motor of the **BX** Series is used in the speed control mode, the wirings and functions of I/O signals can be changed based on the **BX** Series.

■ BX-compatible mode (position control)



Set SW1-1, SW1-2, and SW1-4 to the ON side.
If the motor of the **BX** Series is used in the position control mode, the wirings and functions of I/O signals can be changed based on the **BX** Series.

■ About reference page

For more information for how to use each control mode, refer to the following pages.

Control mode	Connection method	Operating method
Speed control mode	p.45	p.102
Position control mode	p.52	p.116
BX-compatible mode (speed control)	p.147	p.138
BX-compatible mode (position control)	p.149	p.138

3.2 Assignment of I/O signals for each control mode

■ Speed control mode (factory setting)

• CN5

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

• CN7

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

■ Position control mode

• CN5

Pin No.	Signal name	Function
1	IN-COM0	Input signals common (for external power supply)
2	IN0	HOME
3	IN1	START
4	IN2	M0
5	IN3	M1
6	IN4	M2
7	IN5	FREE
8	IN6	STOP
9	IN7	ALM-RST
10	IN8	HOMES
11	IN-COM1	0 V (for built-in power supply)

• CN7

Pin No.	Signal name	Function
1	VH	Analog external setting input
2	VM	
3	VL	
4	OUT0+	ALM
5	OUT0–	
6	OUT1+	READY
7	OUT1–	
8	OUT2+	HOME-P
9	OUT2–	
10	ASG	Phase A output
11	BSG	Phase B output
12	OUT-COM	Common for ASG/BSG

■ BX-compatible mode (speed control)

• CN5

Pin No.	Signal name	Function
1	IN-COM0	Input signals common (for external power supply)
2	IN0	CW
3	IN1	CCW
4	IN2	M0
5	IN3	M1
6	IN4	M2
7	IN5	FREE
8	IN6	BRAKE/ACL ∗1
9	IN7	Not used (possible to assign)
10	IN8	
11	IN-COM1	0 V (for built-in power supply)

• CN7

Pin No.	Signal name	Function
1	VH	Analog external setting input
2	VM	
3	VL	
4	OUT0+	ALM
5	OUT0–	
6	OUT1+	BUSY (TLM)/ALP ∗2
7	OUT1–	
8	OUT2+	Not used (possible to assign)
9	OUT2–	
10	ASG	Phase A output
11	BSG	Phase B output
12	OUT-COM	Common for ASG/BSG

∗1 This signal is used as the BRAKE input in normal condition, but it functions as the ACL input if the driver protective function is activated.

∗2 This signal is used as the BUSY output in normal condition, but it functions as the ALP output if the driver protective function is activated. The BUSY output can be changed to the TLM output using the parameter.

■ BX-compatible mode (position control)

• CN5

Pin No.	Signal name	Function
1	IN-COM0	Input signals common (for external power supply)
2	IN0	START
3	IN1	HOME-LS
4	IN2	M0
5	IN3	M1
6	IN4	M2
7	IN5	FREE
8	IN6	BRAKE/ACL ∗1
9	IN7	Not used (possible to assign)
10	IN8	
11	IN-COM1	0 V (for built-in power supply)

• CN7

Pin No.	Signal name	Function
1	VH	Analog external setting input
2	VM	
3	VL	
4	OUT0+	ALM
5	OUT0–	
6	OUT1+	BUSY (TLM)/ALP ∗2
7	OUT1–	
8	OUT2+	Not used (possible to assign)
9	OUT2–	
10	ASG	Phase A output
11	BSG	Phase B output
12	OUT-COM	Common for ASG/BSG

∗1 This signal is used as the BRAKE input in normal condition, but it functions as the ACL input if the driver protective function is activated.

∗2 This signal is used as the BUSY output in normal condition, but it functions as the ALP output if the driver protective function is activated. The BUSY output can be changed to the TLM output using the parameter.

3.3 Connection diagram for each control mode

■ Speed control mode (factory setting)

Refer to p.45.

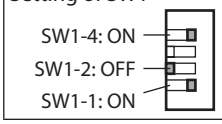
■ BX-compatible mode

Refer to p.147.

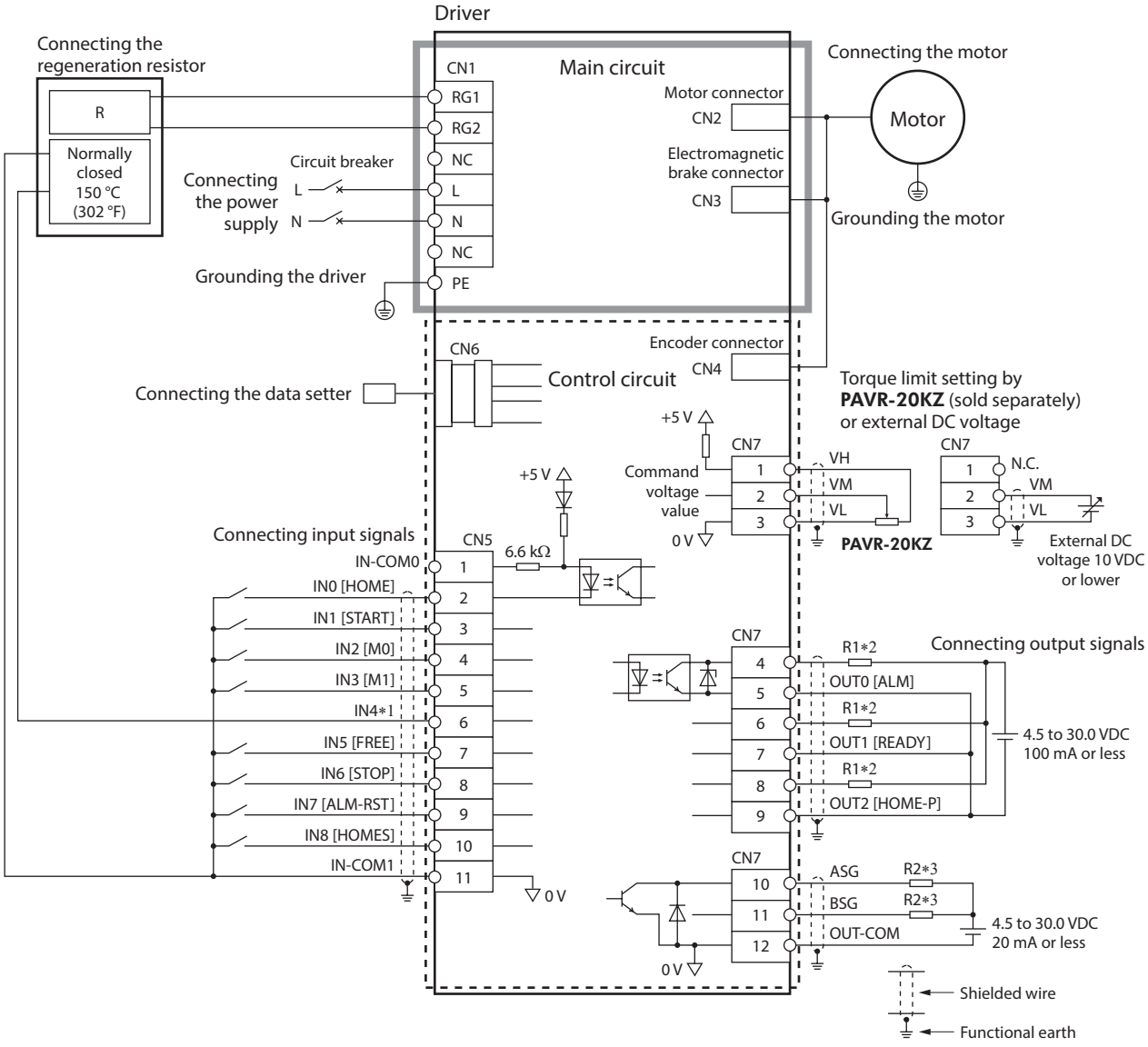
Position control mode Sink logic: When using the built-in power supply

This is a connection example that the power supply is single-phase 100-120 VAC, the torque limiting function is set using an analog external setting device to operate the motor with relays, switches and other contact switches. The I/O signal in the brackets [ ] is the initial value.
Refer to p.99 for the assignment of I/O signals.

Setting of SW1



Connect the thermostat output of the regeneration resistor to the terminal that the TH input was assigned by changing the "IN input function selection" parameter.
→ How to change: p.100



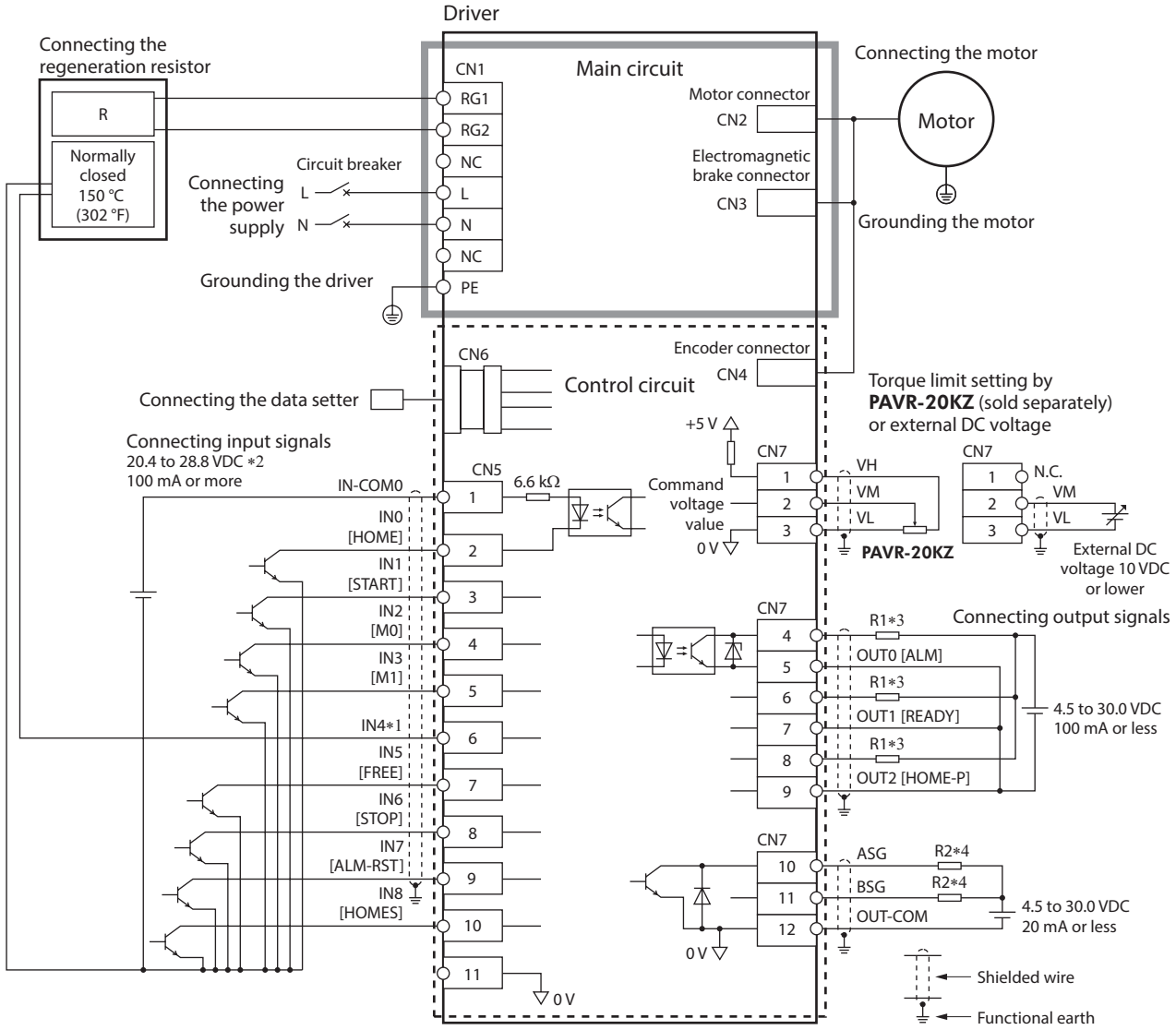
∗1 This is a connection when the TH input is assigned to IN4. The initial value is [M2].
∗2 Connect a current-limiting resistor R1 according to the power supply voltage used so that the current will not exceed 100 mA.
∗3 Connect a current-limiting resistor R2 according to the power supply voltage used so that the current will not exceed 20 mA.

Position control mode　Sink logic: When using an external power supply

This is a connection example that the power supply is single-phase 100-120 VAC, the torque limiting function is set using an analog external setting device to operate the motor with sequence connection of transistor type. The I/O signal in the brackets [ ] is the initial value. Refer to p.99 for the assignment of I/O signals.

Setting of SW1
SW1-4: OFF
SW1-2: OFF
SW1-1: ON

Connect the thermostat output of the regeneration resistor to the terminal that the TH input was assigned by changing the "IN input function selection" parameter.
→ How to change: p.100



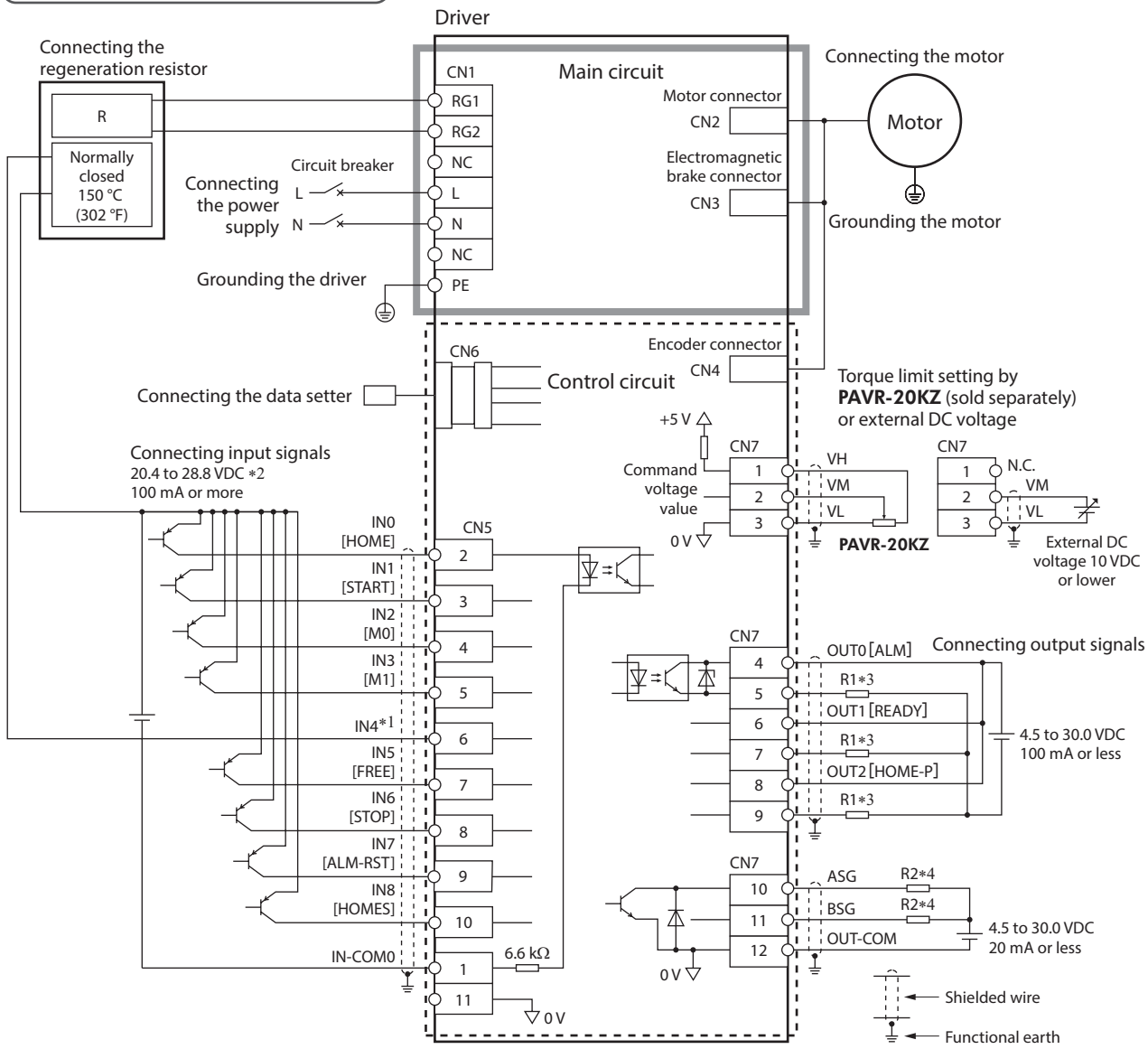
∗1 This is a connection when the TH input is assigned to IN4. The initial value is [M2].
∗2 Turn on the external power supply before turning on the driver main power supply.
∗3 Connect a current-limiting resistor R1 according to the power supply voltage used so that the current will not exceed 100 mA.
∗4 Connect a current-limiting resistor R2 according to the power supply voltage used so that the current will not exceed 20 mA.

Position control mode Source logic: When using an external power supply

This is a connection example that the power supply is single-phase 100-120 VAC, the torque limiting function is set using an analog external setting device to operate the motor with sequence connection of transistor type. The I/O signal in the brackets [ ] is the initial value. Refer to p.99 for the assignment of I/O signals.
The ASG and BSG signals cannot connect to devices of source logic.

Setting of SW1
SW1-4: OFF
SW1-2: OFF
SW1-1: ON

Connect the thermostat output of the regeneration resistor to the terminal that the TH input was assigned by changing the "IN input function selection" parameter.
→ How to change: p.100



∗1 This is a connection when the TH input is assigned to IN4. The initial value is [M2].
∗2 Turn on the external power supply before turning on the driver main power supply.
∗3 Connect a current-limiting resistor R1 according to the power supply voltage used so that the current will not exceed 100 mA.
∗4 Connect a current-limiting resistor R2 according to the power supply voltage used so that the current will not exceed 20 mA.

4 Explanation of I/O signals

Parameters described here can be set using any of the operation panel, **MEXE02**, or **OPX-2A**.

4.1 Overview of I/O signals

With the **BXII** Series, signals that can be assigned vary depending on the control mode.
Refer to the following pages for details of signals.

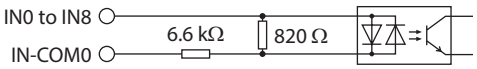
Note Make sure each input signal remains ON for at least 10 ms.

■ Input signals list

Signal name	Speed control	Position control	**BX**-compatible		Reference page
			Speed control	Position control	
FWD input	○	○	–	–	p.56
CW input	–	–	○	–	p.141
RVS input	○	○	–	–	p.56
CCW input	–	–	○	–	p.141
M0 to M3 inputs	○	○	○	○	p.56
FREE input	○	○	○	○	p.57
STOP input	○	○	–	–	p.57
BRAKE input	–	–	○	○	p.142
ALM-RST input	○	○	○	○	p.57
TH input	○	○	○	○	p.58
TL input	○	○	○	○	p.58
S-ON input	○	○	○	○	p.58
HMI input	○	○	○	○	p.58
START input	–	○	–	○	p.58
HOME input	–	○	–	○	p.58
HOMES input	–	○	–	–	p.59
HOME-LS input	–	–	–	○	p.141
SSTART input	–	○	–	○	p.59
MS0 to MS5 inputs	–	○	–	○	p.59
+JOG, −JOG input	–	○	–	○	p.59
P-PRESET input	–	○	–	○	p.59

■ Internal input circuit

All input signals of the driver are photocoupler inputs. They are turned "ON" when the current flows to the photocoupler, and they are turned "OFF" when the current does not flow.



■ Changing the logic level setting of input signals

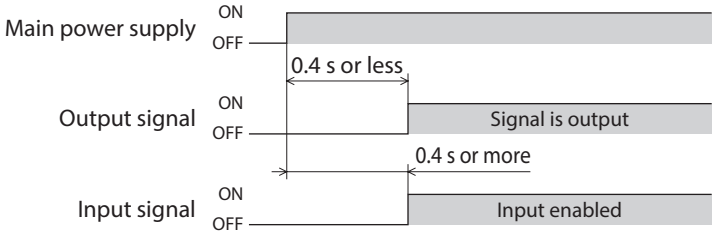
The logic level setting for input terminals IN0 to IN8 can be changed using the parameter.

Related parameters

ID	Parameter name	Description	Setting range	Initial value
2192	IN0 input logic level setting	Changes the logic level setting for the input terminals IN0 to IN8.	0: Normal 1: Invert	0
2193	IN1 input logic level setting			
2194	IN2 input logic level setting			
2195	IN3 input logic level setting			
2196	IN4 input logic level setting			
2197	IN5 input logic level setting			
2198	IN6 input logic level setting			
2199	IN7 input logic level setting			
2200	IN8 input logic level setting			

■ Timing chart when power is input

This timing chart describes the timing of input signals and output signals when the power supply is turned on.



4.2 Descriptions of input signals

■ FWD input, RVS input

- Speed control mode

These are operation signals to rotate or stop the motor.
When the operation data number is selected and the FWD input or the RVS input is turned ON, the motor rotates at the operating speed corresponding to the operation data number selected. When the operation signal having turned ON is turned OFF, the motor decelerates to a stop.
This rotation direction is based on the setting of the "Motor rotation direction" parameter (ID: 450).

Related parameter

ID	Parameter name	Description	Setting range	Initial value
450	Motor rotation direction	Sets the rotation direction of the motor output shaft.	0: Positive direction=CCW 1: Positive direction=CW	1

- Position control mode

These are signals to start continuous operation.
When the operation data number is selected and the FWD input or the RVS input is turned ON, continuous operation is started at the operating speed corresponding to the operation data number selected. Turning the FWD input ON rotates the motor in the positive direction. Turning the RVS input ON rotates the motor in the negative direction.
If both the FWD and RVS inputs are turned ON or OFF, the motor decelerates to a stop.
While the motor is decelerating to a stop after the signal having turned ON is turned OFF, if the same signal is turned ON, the motor will accelerates again to continue the operation.

■ M0 to M3 inputs

A desired operation data number can be selected by a combination of ON-OFF status of the M0 to M3 inputs.

Operation data number	M3	M2	M1	M0
0	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	OFF	OFF	ON	ON
4	OFF	ON	OFF	OFF
5	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF
7	OFF	ON	ON	ON
8	ON	OFF	OFF	OFF
9	ON	OFF	OFF	ON
10	ON	OFF	ON	OFF
11	ON	OFF	ON	ON
12	ON	ON	OFF	OFF
13	ON	ON	OFF	ON
14	ON	ON	ON	OFF
15	ON	ON	ON	ON

■ FREE input

- Speed control mode

When the FREE input is turned ON, the motor current is cut off.
If the "Operation selection after stopping" parameter (ID: 2069) is set to "1: Servo lock," the motor puts into an excitation state at motor standstill and generates the holding torque. At this time, since the motor holding torque is lost if the FREE input is turned ON, the motor output shaft can be rotated manually. When an electromagnetic brake motor is used, the electromagnetic brake is also released.
While the FREE input is being ON, the motor will not rotate even if the FWD input or the RVS input is turned ON.
The time after turning the FREE input ON until the motor excitation is cut off and that after turning the FREE input OFF until the motor is excited are both equal to 10 ms or less.

Note When a load is installed vertically, do not turn the FREE input ON. The motor loses its holding torque, and the load may fall.

Related parameter

ID	Parameter name	Description	Setting range	Initial value
2069	Operation selection after stopping	Uses in the speed control mode. If the holding force is required while the motor stops, set to "1" to enable the servo lock.	0: Free (disable servo lock) 1: Servo lock	0

- Position control mode

When the FREE input is turned ON, the motor current is cut off. The motor loses its holding torque, and the motor output shaft can be rotated manually. When an electromagnetic brake motor is used, the electromagnetic brake is also released.
While the FREE input is being ON, the motor cannot be operated.
The time after turning the FREE input ON until the motor excitation is cut off and that after turning the FREE input OFF until the motor is excited are both equal to 10 ms or less.

Note When a load is installed vertically, do not turn the FREE input ON. The motor loses its holding torque, and the load may fall.

■ STOP input

- Speed control mode

When the STOP input is turned ON, the motor stops according to the setting of the "STOP input action" parameter (ID: 256).
If it is set to "1: Deceleration stop" or "3: Deceleration stop + current OFF," the motor stops according to the deceleration time of the operation data number selected when the STOP input is turned ON.
If the "Operation selection after stopping" parameter (ID: 2069) is set to "0: Free (disable servo lock)," the setting range of the "STOP input action" parameter is "0, 2: Immediate stop" or "1, 3: Deceleration stop."
While the STOP input is being ON, the motor will not rotate even if the FWD input or the RVS input is turned ON.

Related parameters

ID	Parameter name	Description	Setting range	Initial value
256	STOP input action	Sets how to stop the motor when the STOP input is turned ON.	0: Immediate stop 1: Deceleration stop 2: Immediate stop + current OFF 3: Deceleration stop + current OFF	0
2069	Operation selection after stopping	Uses in the speed control mode. If the holding force is required while the motor stops, set to "1" to enable the servo lock.	0: Free (disable servo lock) 1: Servo lock	0

- Position control mode

When the STOP input is turned ON, the motor stops according to the setting of the "STOP input action" parameter (ID: 256).
If it is set to "1: Deceleration stop" or "3: Deceleration stop + current OFF," the motor stops according to the deceleration time of the operation data number selected when the STOP input is turned ON.
If the STOP input is turned ON during positioning operation, the remaining travel amount is cleared.
While the STOP input is being ON, the motor will not rotate even if an operation signal is turned ON.

■ ALM-RST input

If an alarm is generated, the motor will stop. If the ALM-RST input is turned from ON to OFF at this time, the alarm will be reset (the alarm will be reset at the OFF edge of the ALM-RST input).
Before resetting an alarm, always remove the cause of the alarm and ensure safety.

Note Some alarms cannot be cleared with the ALM-RST input. Check on p.166.

■ TH input

The TH input is normally closed.
When a regeneration resistor is used, connect the thermostat output of the regeneration resistor.
The TH input is normally in the ON state and will be turned OFF if the thermostat of the regeneration resistor is activated, thereby causing an alarm of the regeneration resistor overheat to generate.

Note

- Do not switch the logic level setting. An alarm of the regeneration resistor overheat is generated when the thermostat output is connected.
- When the TH input is not assigned to the input terminal, this input will be always set to ON. And if it is assigned to multiple input terminals, the function will be performed when all of the terminals are turned ON.

■ TL input

The TL input is normally closed.
When the TL input is turned ON, the torque limiting function is enabled. The motor output torque is limited based on the setting value of the "Torque limit" parameter (ID: 896 to 911). Refer to p.106 for how to set.
When the TL input is turned OFF, the torque limiting function is disabled, and the maximum value of the motor output torque will be the peak torque.

Note

When the TL input is not assigned to the input terminal, this input will be always set to ON. And if it is assigned to multiple input terminals, the function will be performed when all of the terminals are turned ON.

■ S-ON input

This is a signal to excite the motor.
It is enabled when the "Operation selection after stopping" parameter (ID: 2069) is set to "1: Servo lock" in the speed control mode.
The S-ON input is normally closed.
If the S-ON input is turned ON, the motor puts into an excitation state. If it is turned OFF, the motor puts into a non-excitation state.
In the case of an electromagnetic brake motor, when the S-ON input is turned ON, the electromagnetic brake is released after the motor puts into an excitation state. When the S-ON input is turned OFF, the motor puts into a non-excitation state after the electromagnetic brake is activated to hold the position.
The motor cannot be operated while it is in a non-excitation state.

Note

When the S-ON input is not assigned to the input terminal, this input will be always set to ON. And if it is assigned to multiple input terminals, the function will be performed when all of the terminals are turned ON.

■ HMI input

The HMI input is normally closed.
When the HMI input is turned ON, the function limitation of the **MEXE02** or **OPX-2A** is released. When the HMI input is turned OFF, the function limitation is imposed. The following functions will be limited.

- I/O test
- Test operation
- Teaching function
- Writing parameters, downloading, initializing

Note

When the HMI input is not assigned to the input terminal, this input will be always set to ON. And if it is assigned to multiple input terminals, the function will be performed when all of the terminals are turned ON.

■ START input (for position control mode only)

This is a signal to start positioning operation.
When the operation data number is selected and the START input is turned ON, positioning operation is started.

■ HOME input (for position control mode only)

This is a signal to start return-to-home operation.
When the HOME input is turned ON, return-to-home operation is started. When return-to-home operation is completed and the motor stops, the HOME-P output is turned ON. Refer to p.126 for return-to-home operation.

Related parameters

ID	Parameter name	Description	Setting range	Initial value
353	Operating speed of home-seeking	Sets the operating speed for return-to-home operation.	0 to 4000 r/min	300
354	Acceleration/deceleration of home-seeking	Sets the acceleration and deceleration time for return-to-home operation.	0.000 to 30.000 s	0.100
356	Position offset of home-seeking	Sets the amount of offset from the home. The motor shaft rotates by 0.72° per one step.	−8,388,608 to +8,388,607 steps	0
357	Starting direction of home-seeking	Sets the starting direction for home detection.	0: Negative direction 1: Positive direction	1

■ HOMES input (for position control mode only)

This is a sensor input to connect the mechanical home in return-to-home operation.

■ SSTART input (for position control mode only)

This is a signal to start sequential positioning operation.
Positioning operation based on the next operation data number is performed every time the SSTART input is turned ON. This function is useful when multiple positioning operations are performed sequentially because there is no need to repeatedly select each operation data number.
Refer to p.120 for sequential positioning operation.

■ MS0 to MS5 inputs (for position control mode only)

This is a signal to start direct positioning operation.
When any of the MS0 to MS5 inputs is turned ON, positioning operation of the operation data number corresponding to the input signal is performed. Since positioning operation can be performed by turning any of the MS0 to MS5 inputs ON, the steps of selecting the operation data number can be saved. Refer to p.120 for direct positioning operation.

Related parameters

ID	Parameter name	Description	Setting range	Initial value
2048	MS0 operation number selection	Sets the operation data number corresponding to the MS0 to MS5 inputs.	Operation data No.0 to No.15	0
2049	MS1 operation number selection			1
2050	MS2 operation number selection			2
2051	MS3 operation number selection			3
2052	MS4 operation number selection			4
2053	MS5 operation number selection			5

■ +JOG input, −JOG input (for position control mode only)

These are signals to start JOG operation.
When the +JOG input is turned ON, JOG operation is performed in the positive direction, and when the −JOG input is turned ON, JOG operation is performed in the negative direction.
Refer to p.131 for JOG operation.

Related parameters

ID	Parameter name	Description	Setting range	Initial value
323	JOG operating speed	Sets the operating speed for JOG operation.	0 to 4000 r/min	300
324	JOG acceleration	Sets the acceleration/deceleration time for JOG operation.	0.000 to 30.000 s	0.100
2081	Operating torque of JOG operation	Sets the torque limiting value for JOG operation. Sets the maximum torque based on the rated torque being 100%.	0 to 250%	100
2084	JOG travel amount	Sets the travel amount for JOG operation. The motor shaft rotates by 0.72° per one step.	1 to 8,388,607 steps	1

■ P-PRESET input (for position control mode only)

This is a signal to preset the present position
When the P-PRESET input is turned from OFF to ON, the command position is set to the value in the "Preset position" parameter (ID: 454). However, the preset is not executed in the following conditions.

- While an alarm is present
- While the motor is operating

Related parameter

ID	Parameter name	Description	Setting range	Initial value
454	Preset position	Sets the preset position. The motor shaft rotates by 0.72° per one step.	−8,388,608 to +8,388,607 steps	0

4.3 Overview of I/O signals

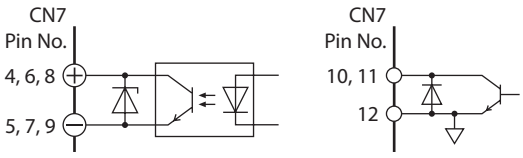
With the **BX**Ⅱ Series, signals that can be assigned vary depending on the control mode.
Refer to the following pages for details of signals.

■ Output signals list

Signal name	Speed control	Position control	**BX**-compatible		Reference page
			Speed control	Position control	
ALM output	○	○	○	○	p.60
WNG output	○	○	○	○	p.61
MOVE output	○	○	○	○	p.61
TLC output	○	○	–	–	p.61
TLM output	–	–	○	○	p.142
VA output	○	○	○	○	p.62
READY output	–	○	–	○	p.61
HOME-P output	–	○	–	○	p.61
END output	–	○	–	○	p.61
ZSG output	○	○	○	○	p.62

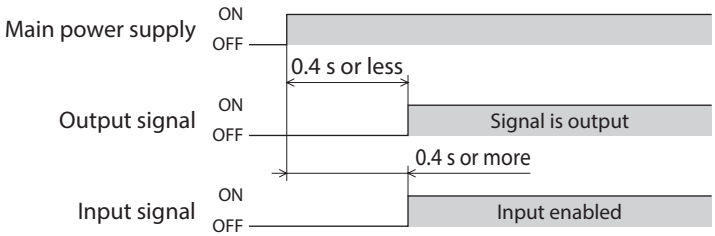
■ Internal input circuit

For the output signals of the driver, the OUT0 to OUT2 signals are photocoupler/open-collector outputs, and the ASG and BSG signals are transistor/open-collector outputs.



■ Timing chart when power is input

This timing chart describes the timing of input signals and output signals when the power supply is turned on.



4.4 Descriptions of output signals

■ ALM output

If an alarm is generated, the ALM output is turned OFF. The current supplied to the motor is cut off to stop the motor. At the same time, the alarm code is displayed on the operation panel on the driver. Refer to p.166 for alarm codes.

Related parameters

ID	Parameter name	Description	Setting range	Initial value
385	Excessive position deviation alarm	Sets the condition in which the excessive position deviation alarm is generated.	0.01 to 300.00 rev	20.00
2113	Alarm initial drive	Sets whether to enable or disable the alarm initial drive.	0: Disable 1: Enable	0

■ WNG output

If a warning is generated, the WNG output is turned ON. Refer to p.168 for warning in details.

Related parameters

ID	Parameter name	Description	Setting range	Initial value
419	Overvoltage warning	Sets the condition in which the overvoltage warning is generated.	120 to 440 V	435
421	Excessive position deviation warning	Sets the condition in which the excessive position deviation warning is generated.	0.01 to 300.00 rev	20.00
2129	Overload warning enable	Sets whether to enable or disable the overload warning enable is generated.	0: Disable 1: Enable	0
2133	Overload warning level	Sets the condition in which the overload warning is generated.	50 to 100%	100

■ MOVE output

The MOVE output is turned ON while the motor operates. Even when the motor cable is being pulled off, the MOVE output will be turned ON.

■ READY output (for position control mode only)

When the driver is ready to operate, the READY output is turned ON. Input an operation signal to driver after the READY output is turned ON.
The READY output is turned ON when all of the following conditions are satisfied.

- The driver power is turned on.
- All inputs which start operation are OFF.
- The FREE input and the STOP input are OFF.
- The S-ON input is ON (When the S-ON input is assigned).
- An alarm is not present.
- The motor is not operated.
- Test function, downloading, or teaching function was not executed using the **MEXE02**.
- Test function, downloading, initializing, or teaching function was not executed using the **OPX-2A**.

■ END output (for position control mode only)

The END output is turned ON when the motor operation is completed. When the motor was converged in a position of the "END signal range" parameter (ID: 259) against the command position while the MOVE output is in an OFF state, the END output is turned ON.

Related parameter

ID	Parameter name	Description	Setting range	Initial value
259	END signal range	Sets an output range that the END output is turned ON. The motor shaft rotates by 0.72° per one step.	1 to 100 steps	1

■ HOME-P output (for position control mode only)

The HOME-P output is turned ON according to the setting of the "HOME-P output function selection" parameter (ID: 2054). Refer to p.133 for setting the position coordinate.

When "HOME-P output function selection" parameter is set to "0: Home output"

When the command position of the driver is at the home while the MOVE output is OFF, the HOME-P output is turned ON. However, the HOME-P output is remained OFF when the position coordinate for the driver is not set.

When "HOME-P output function selection" parameter is set to "1: Return-to-home complete output"

Regardless of the command position by the driver, if the position coordinate for the driver is set, the HOME-P output is turned ON. Therefore, it is turned ON after return-to-home operation is completed or the preset is performed. Once the HOME-P output is turned ON, it will not be turned OFF until the position coordinate is changed to an unset state.

Related parameter

ID	Parameter name	Description	Setting range	Initial value
2054	HOME-P output function selection	Sets the timing to output the HOME-P output.	0: Home output 1: Return-to-home complete output	0

■ TLC output

When the motor torque reaches the torque limiting value, the TLC output is turned ON.

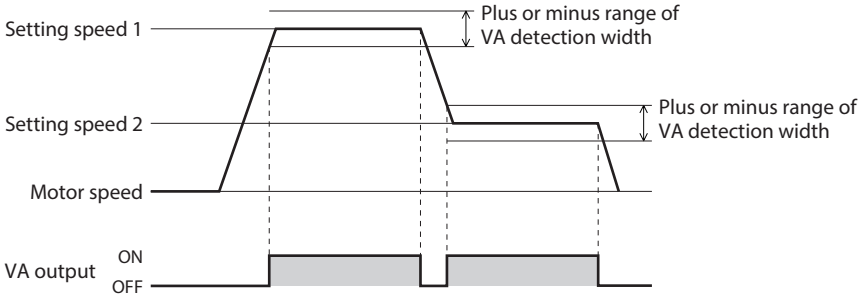
■ VA output

When the detected speed reaches the "plus or minus range of speed attainment band with respect to the command speed," this output is turned ON.
A range that the VA output is turned ON can be set using the "Attained speed output band" parameter (ID: 2215). If the parameter is set to 0, the VA output is not turned ON.

Related parameter

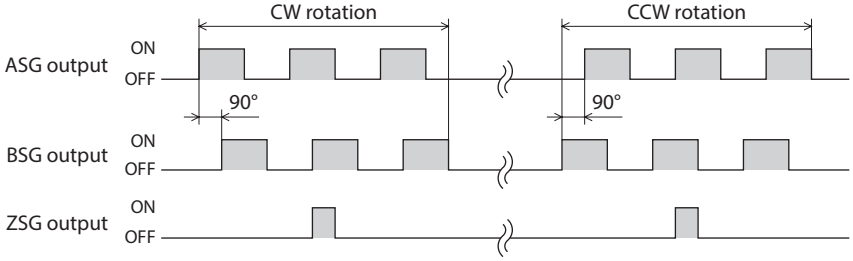
ID	Parameter name	Description	Setting range	Initial value
2215	Attained speed output band	Sets the output range for the VA output.	0 to 400 r/min	200

Example: When the motor speed changes from the setting speed 1 to the setting speed 2



■ Encoder output

Three signals of the ASG, BSG and ZSG outputs are output from the encoder.
The ZSG output can be checked if it is assigned to any of OUT0 to OUT2.
500 pulses are output with each revolution of the motor shaft for both the ASG output and BSG output.



- ASG output

  The ASG output is the pulse output according to the motor rotation amount.

- BSG output

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

- ZSG output

  The ZSG output is output once every revolution of the motor output shaft.

Note The minimal output range of the ZSG output is about 1 ms.

3 How to use the operation panel

This part explains how to set data and how to operate a motor using the operation panel on the driver.

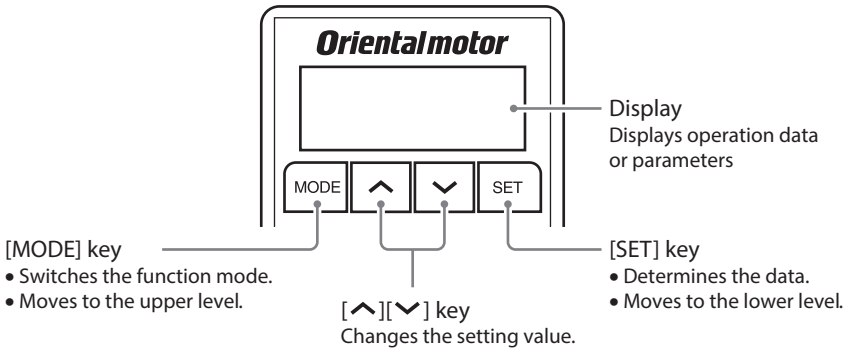
Table of contents

1 Overview of the operation panel

This chapter explains the name and function of each part of the operation panel as well as function modes.

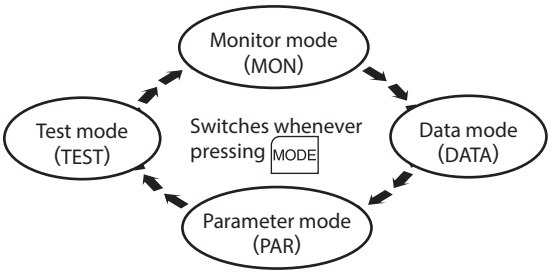
1.1 Names and functions of parts

The operation panel cannot be removed from the driver.



1.2 Function mode types

Multiple function modes are available in the **BXII** Series, and the mode is switched every time the [MODE] key is pressed.
The monitor mode is always displayed when the power supply is turned on.

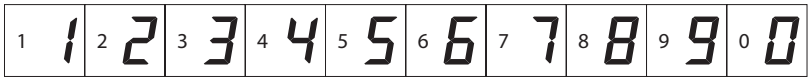


Function mode types	Description
Monitor mode	This is a mode to be displayed when the power supply is turned on. The motor rotation speed is displayed at the factory setting. Use the monitor mode when operating the motor.
Data mode	Sets the operation data.
Parameter mode	Sets the parameter.
Test mode	The connection status of each I/O signal can be checked. Also, the operation can be checked only by connecting the motor and driver.

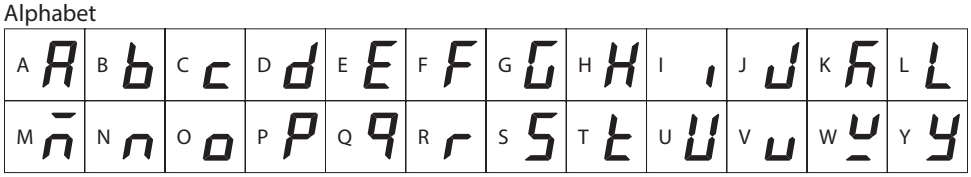
1.3 How to read the display

The display on the driver is a 7-segment LED. ("5" in Arabic numeral and "S" in the alphabet are the same indication.)

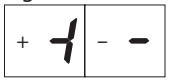
• Arabic numeral



• Alphabet



• Sign

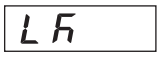


1.4 Edit lock function

This is a function to prohibit the data editing or erasing by the operation panel.
It is not allowed to change or delete data while the edit lock function is enabled.

- Setting of the edit lock function

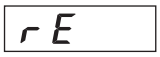
Press the [MODE] key for minimum five seconds on the top screen of each mode.
"LA" is displayed, and the edit lock function will be enabled.



- Resetting the edit lock function

Again, press the [MODE] key for minimum five seconds on the top screen of each mode.
"UnLA" is displayed and the edit lock function will be released.

1.5 Display when MEXE02 or OPX-2A is connected

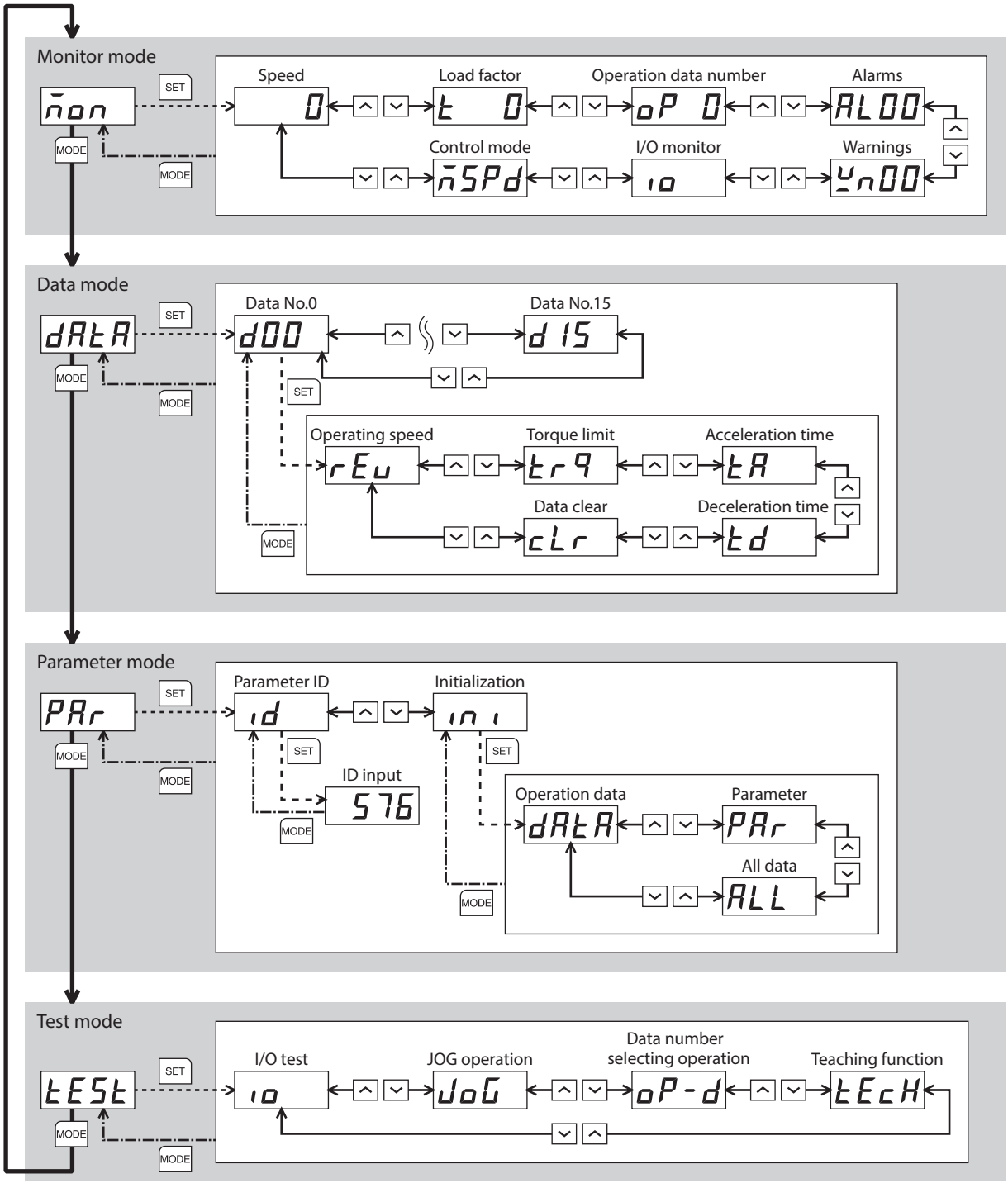


When the **MEXE02** or the **OPX-2A** is connected to the driver, "rE" is displayed with blinking three times on the display of the driver.
Only display switching in the monitor mode is allowed with the operation panel of the driver while the **MEXE02** or the **OPX-2A** is connected.
"rE" is displayed if you try to switch from the monitor mode to other mode, and the operation is not allowed.

"Lo" is displayed with blinking three times if the connection between the driver and the **MEXE02** or **OPX-2A** is disconnected. This represents operations such as data setting using the operation panel of the driver can be performed.

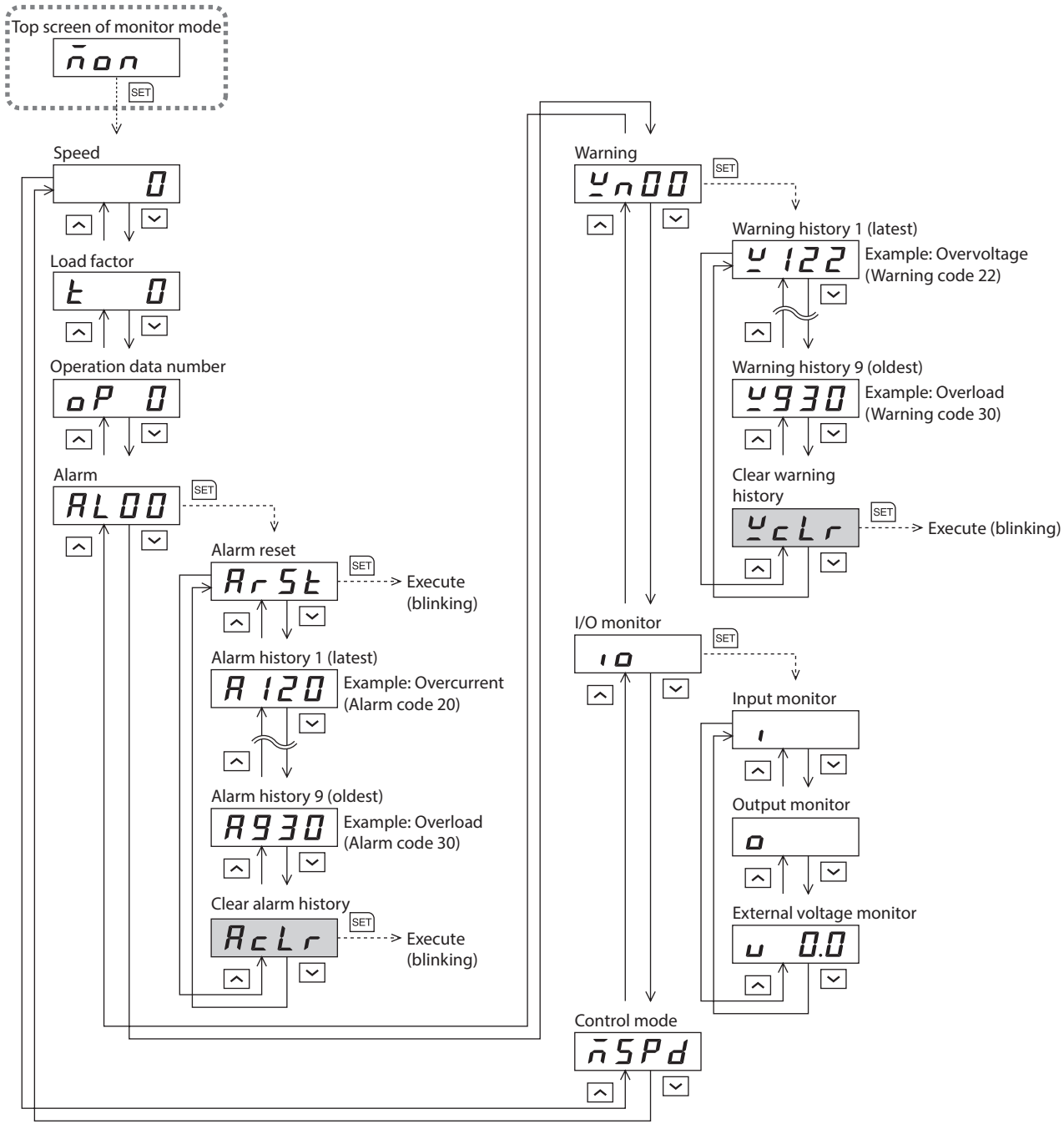
2 Explanation of the function mode (speed control mode)

2.1 Screen transitions



2.2 Monitor mode

This is a mode to be displayed when the power supply is turned on. The motor rotation speed is displayed at the factory setting.
Use the monitor mode when operating the motor.



- In the lower level except the top screen, press MODE key to return to the previous level.
- When operations are limited by the edit lock function, the screens in gray color are not displayed.

■ Speed

The motor operating speed can be checked.
The operating speed can also be displayed as the rotation speed of the gear output shaft. Set with the "Gear ratio" parameter (ID: 2085) and "Decimal place for gear ratio" parameter (ID: 2086).
It is also possible to increase the rotation speed and display the increased speed. Set with the "Multiplying gear" parameter (ID: 2087).

■ Load factor

The motor generated torque can be checked. It indicates based on the rated torque being 100%.

■ Operation data number

The operation data number presently being operated can be checked.

■ Alarm

If an alarm is generated, 2-digit alarm code is displayed.
The present alarm can be reset, and also the alarm history can be checked and cleared.
Refer to p.165 for the causes or remedial actions of alarms.

Note When operations are limited by the edit lock function, clearing the alarm history cannot be executed.

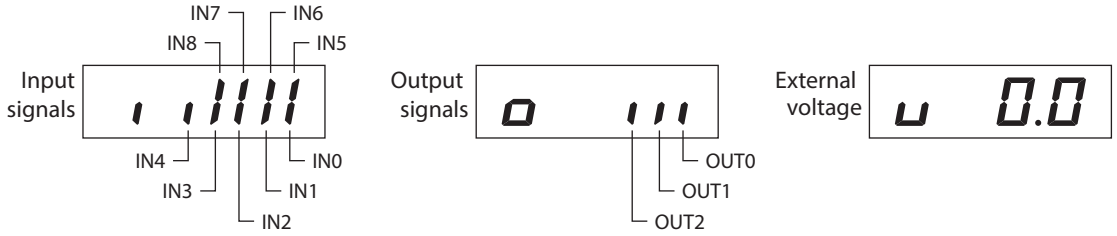
■ Warning

When a warning is generated, 2-digit warning code will be displayed.
The warning history can be checked and cleared.

Note When operations are limited by the edit lock function, clearing the warning history cannot be executed.

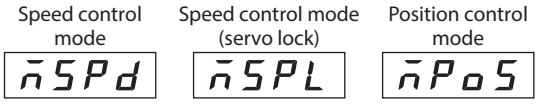
■ I/O monitor

The ON-OFF status of I/O signals for the driver can be checked.
Each digit on the 7-segment LED display corresponds to a signal. The corresponding digit is lit when the signal is ON, and the digit is unlit when the signal is OFF.
The voltage value input by the analog external setting device can also be checked.



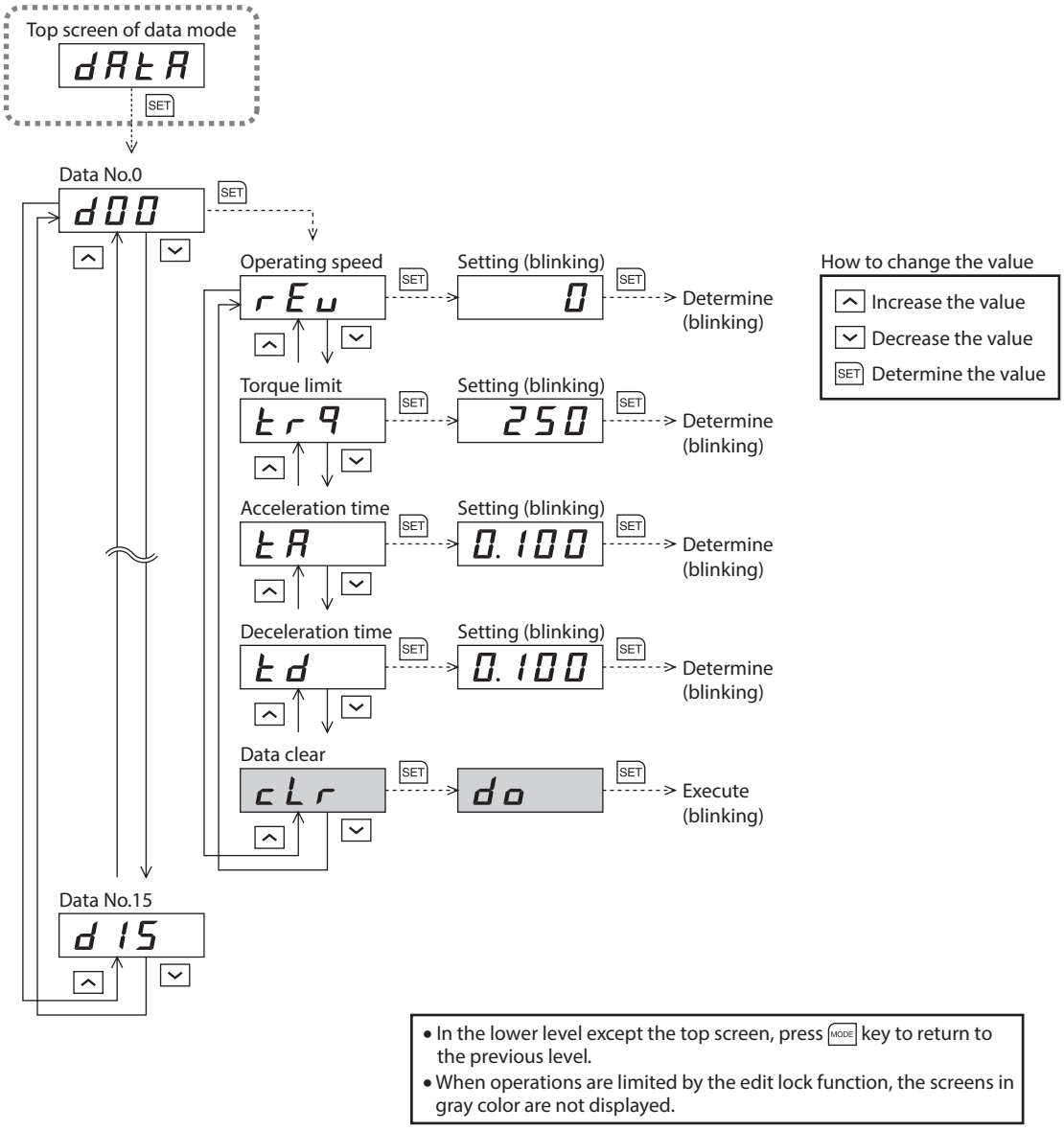
■ Control mode

The present control mode can be checked.



2.3 Data mode

This mode is used to set the operation data.



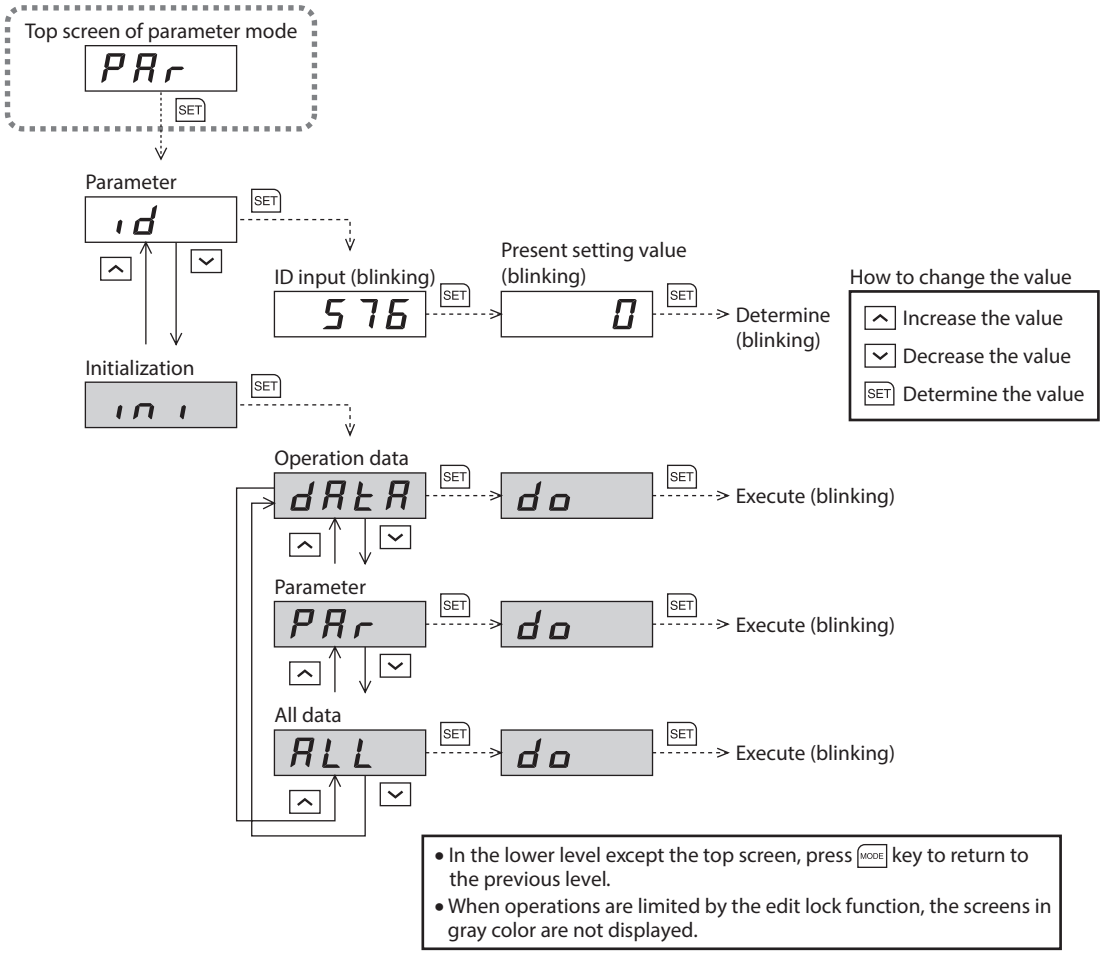
■ Setting item

Item	Description	Setting range	Initial value
Operating speed	Sets the operating speed for the speed control operation. Set as the rotation speed of the motor output shaft.	0 to 4000 r/min	0
Torque limit	Sets when limiting the motor output torque. The peak torque can be set based on the rated torque being 100%.	0 to 250%	250
Acceleration time	Sets the acceleration time as a time needed for the motor to reach the rated rotation speed (3000 r/min) from the standstill state.	0.000 to 0.999 s and 1.00 to 30.00 s	0.100
Deceleration time	Sets the deceleration time as a time needed for the motor to stop from the rated rotation speed (3000 r/min).		
Data clear	Restores the operation data to the initial value.	–	–

Note When operations are limited by the edit lock function, the data clear cannot be executed.

2.4 Parameter mode

This mode is used to set the parameter.



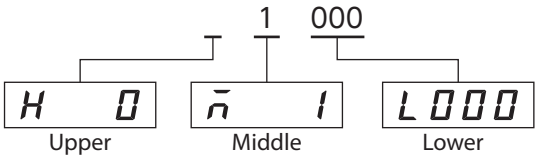
■ Parameter ID

There is a unique ID in each parameter. Input the ID and set.
Refer to p.89 for parameter ID.

Setting method of the "Analog speed command offset" parameter (ID: 2257)

After inputting an ID, press the [SET] key to display the screen to select a sign.
The data setting screen appears after a sign is selected. Input the data separately for "Upper," "Middle," and "Lower."

Example: When inputting 1000



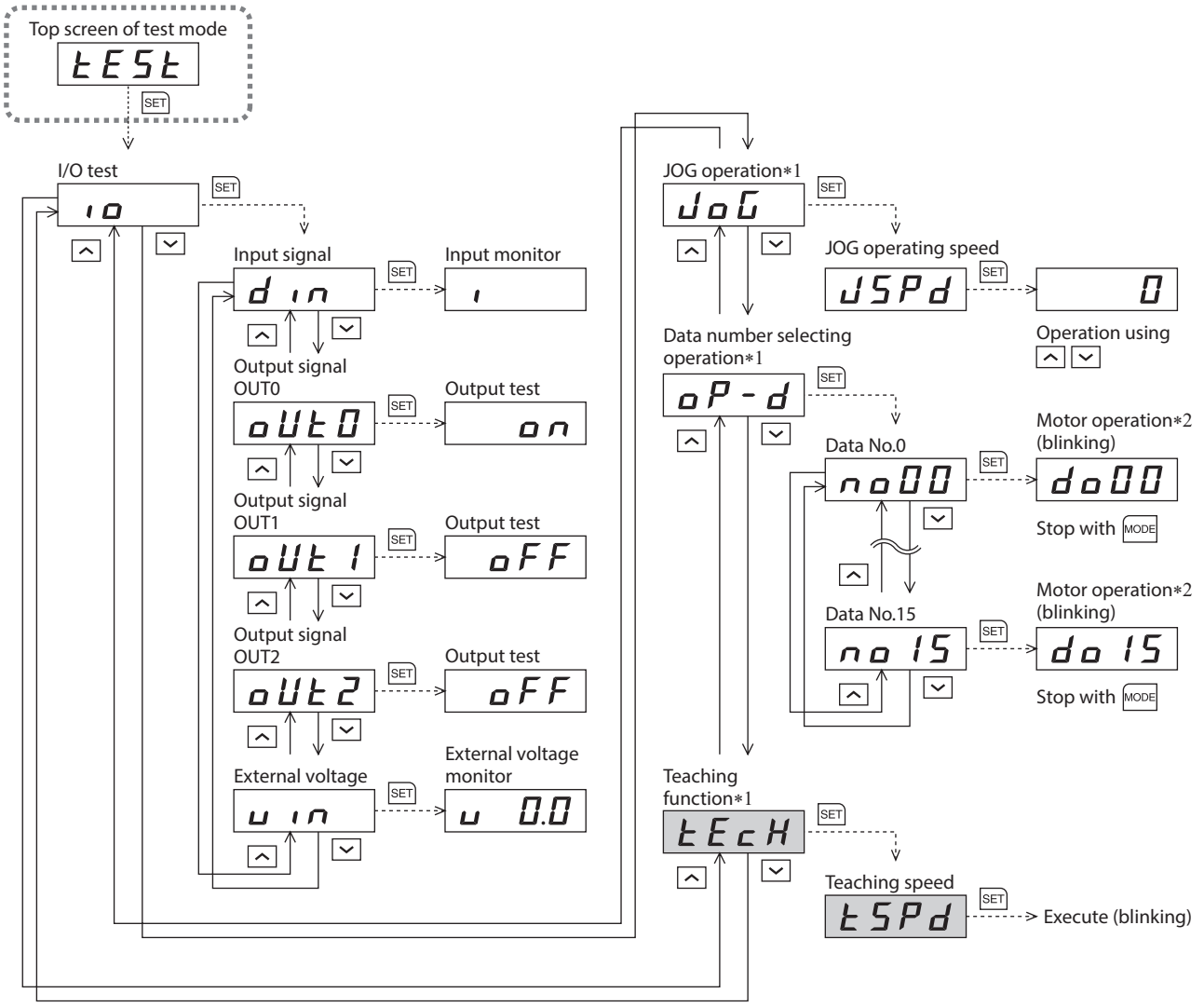
■ Initialization

Restores the data saved in the driver to the initial value. Initialization can be performed by selecting any of operation data, parameter, or all data.

Note When operations are limited by the edit lock function, the initialization cannot be executed.

2.5 Test mode

The connection status of each I/O signal can be checked. Also, the operation can be checked only by connecting the motor and driver.



- In the lower level except the top screen, press MODE key to return to the previous level.
- When operations are limited by the edit lock function, the screens in gray color are not displayed.

*1 These operations cannot be executed while the FREE input or the STOP input is being ON. Be sure to execute after turning the signal OFF.

*2 When the "Operation selection after stopping" parameter (ID: 2069) is set to "1: Servo lock," it will blink even if the rotation speed is 0 r/min.

Note In operation, the motor rotates at the set speed while the operation button is pressed. Execute the test operation after confirming thoroughly that the motor rotation will not cause any dangerous situation.

When pressing the [SET] key while operating a motor

The screen cannot move to the setting screen of the test mode while operating.
An error will occur even when the [SET] key is pressed, and "Err" will be displayed.
Be sure to stop operating the motor before pressing the [SET] key.

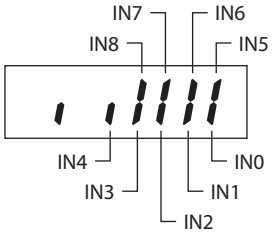
If operation is performed in a state where the BRAKE input is OFF when the **BX**-compatible mode is used, "Err" is displayed and the operation cannot be performed.

■ I/O test

The ON-OFF status of each input signal can be checked and the ON-OFF status of each output signal can be switched.
The voltage value input by the analog external setting device can also be checked.

- Input signal

Each digit on the 7-segment LED display corresponds to a signal.
The corresponding digit is lit when the signal is ON, and the digit is unlit when the signal is OFF.



- Output signal

The ON-OFF status of each output signal can be switched with the [∧] [∨] keys.

- External voltage

The voltage value input by the analog external setting device can be checked.

■ JOG operation

The motor can be operated with the [∧] [∨] keys.
The motor rotates in the forward direction while pressing the [∧] key.
The motor rotates in the reverse direction while pressing the [∨] key.
The rotation speed is displayed while JOG operation is executed.

Set the operation data for JOG operation using the following parameters.
- "JOG operating speed" parameter (ID: 323)
- "JOG acceleration" parameter (ID: 324)
- "Operating torque of JOG operation" parameter (ID: 2081)

Note JOG operation cannot be executed while the FREE input or the STOP input is being ON.
Be sure to execute after turning the signal OFF.

■ Data number selecting operation

Test operation can be executed by selecting the operation data number.
A method selected by the "Analog speed torque" parameter (ID: 2161) is applied to the setting method of the operating speed.
The motor rotates in the direction set in the "Motor rotation direction" parameter (ID: 450).

Note The data number selecting operation cannot be executed while the FREE input or the STOP input is being ON.
Be sure to execute after turning the signal OFF.

■ Teaching function

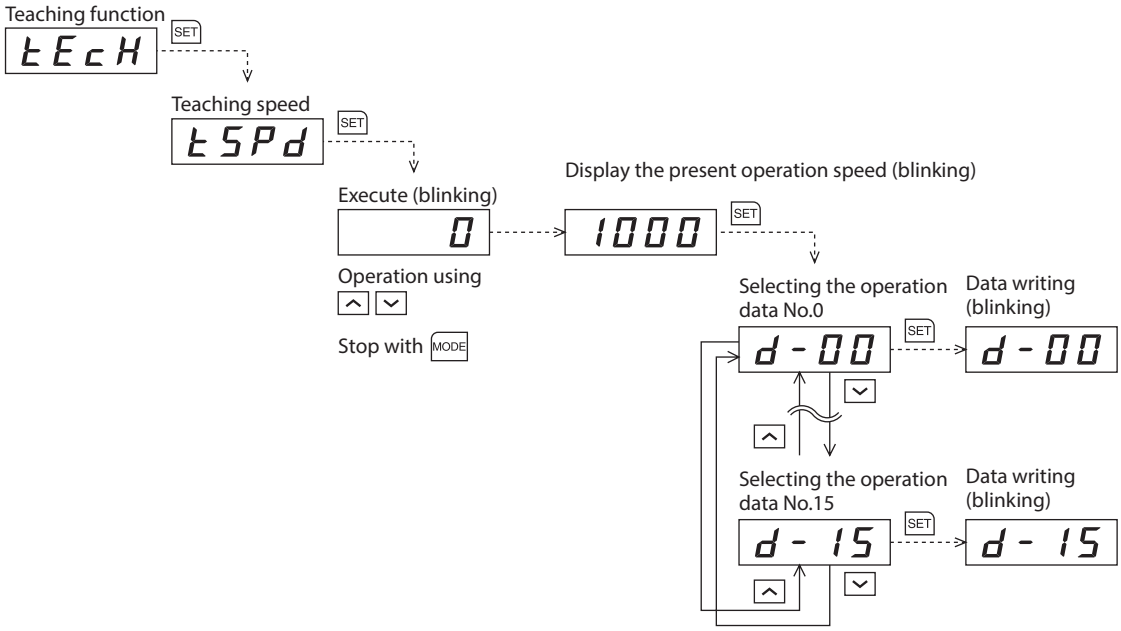
The motor operating speed can be changed with the [∧] [∨] keys, and the new value can be updated to the operation data.
The speed is maintained if a hand is released from the key.

Set the operation data for teaching function using the following parameters.
- "JOG acceleration" parameter (ID: 324)
- "Operating torque of JOG operation" parameter (ID: 2081)

Note
- When operations are limited by the edit lock function, teaching function cannot be executed.
- Teaching function cannot be executed while the FREE input or the STOP input is being ON.
  Be sure to execute after turning the signal OFF.

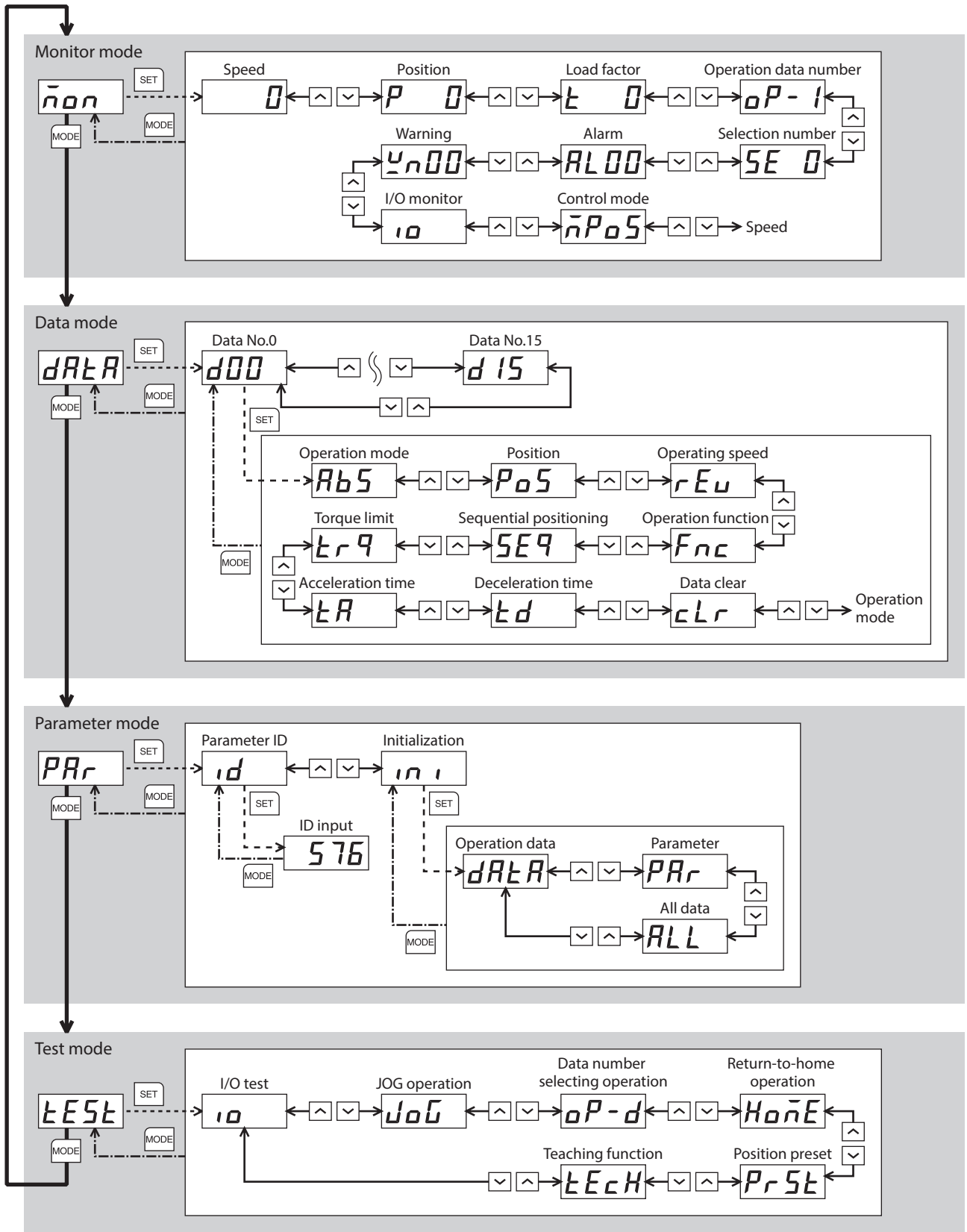
Example of teaching function

The motor rotates in the forward direction while the [∧] key is pressed. When decelerating the speed, press the [∨] key. If the [∨] key is pressed when the operating speed is 0 r/min, the motor rotates in the reverse direction and increases the speed. When decelerating the speed, press the [∧] key.



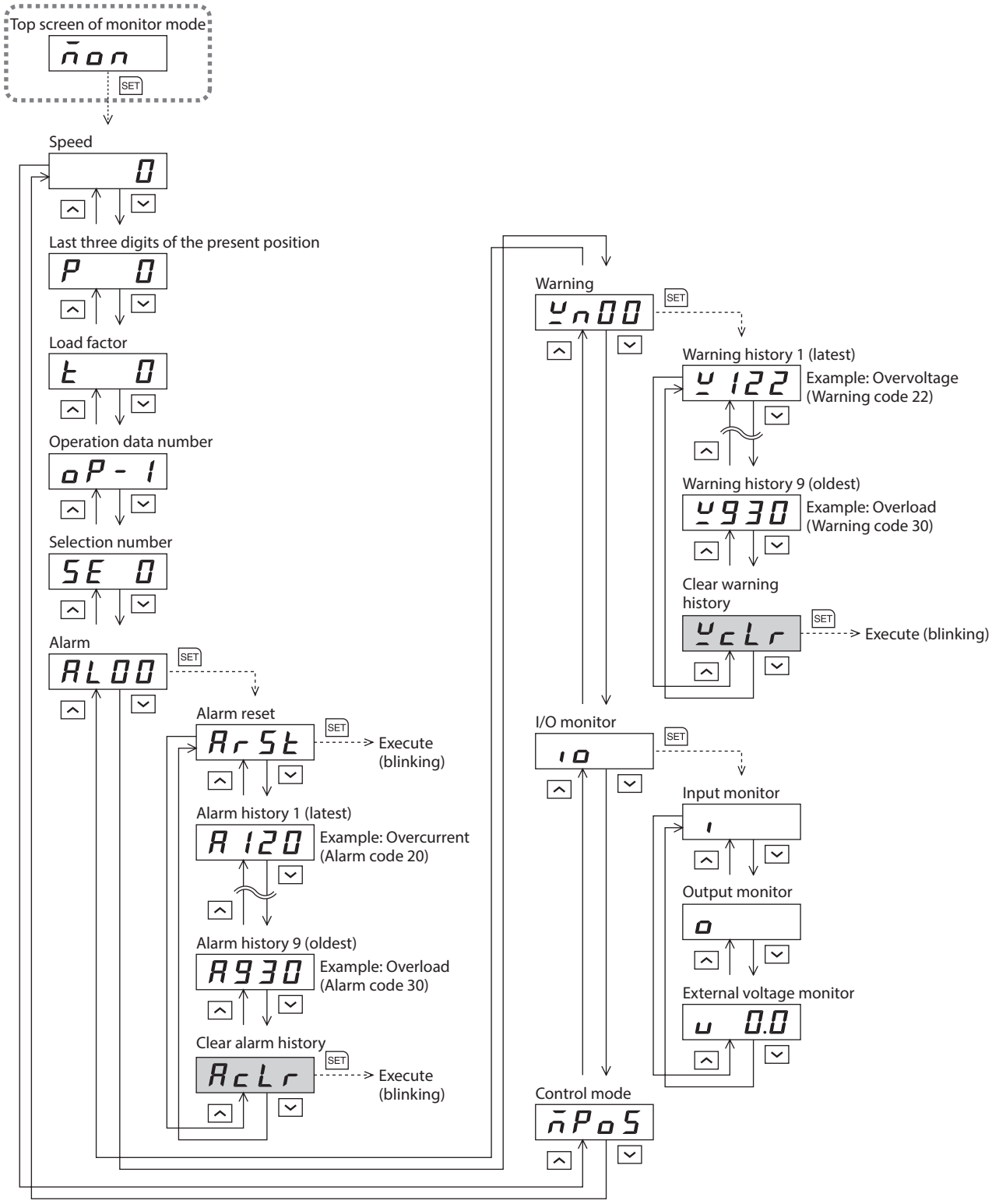
3 Explanation of the function mode (Position control mode)

3.1 Screen transitions



3.2 Monitor mode

This is a mode to be displayed when the power supply is turned on. The motor rotation speed is displayed at the factory setting.
Use the monitor mode when operating the motor.



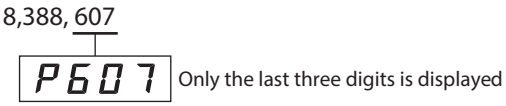
- In the lower level except the top screen, press MODE key to return to the previous level.
- When operations are limited by the edit lock function, the screens in gray color are not displayed.

■ Speed

The motor operating speed can be checked.
The operating speed can also be displayed as the rotation speed of the gear output shaft. Set with the "Gear ratio" parameter (ID: 2085) and "Decimal place for gear ratio" parameter (ID: 2086).
It is also possible to increase the rotation speed and display the increased speed. Set with the "Multiplying gear" parameter (ID: 2087).

■ Last three digits of the present position

Only the last three digits are displayed among the present position of the motor with reference to the home.
The display range is 0 to 999. When the number on the display reaches "999," the next number will bring back to "0."

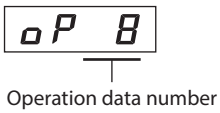


■ Load factor

The motor generated torque can be checked. The present load factor is displayed based on the rated torque being 100%.

■ Operation data number

The operation data number corresponding to the present positioning operation can be checked.



When "oP- 1" is displayed

If the operation data number is checked immediately when the power supply is input in the position control mode, "oP- 1" will be displayed. In addition, if the operation data number is checked by executing the following operation, the "oP- 1" will be displayed.

- While return-to-home operation, continuous operation, or JOG operation is being executed
- When an alarm was generated and reset
- When an operation was stopped by the BRAKE(STOP) input
- When the motor excitation was turned off by the FREE input or the S-ON input
- When the position preset was executed

■ Selection number

The operation data number presently selected can be checked.

■ Alarm

If an alarm is generated, 2-digit alarm code is displayed.
The present alarm can be reset, and also the alarm history can be checked and cleared.
Refer to p.165 for the causes or actions of the alarm.

Note When operations are limited by the edit lock function, clearing the alarm history cannot be executed.

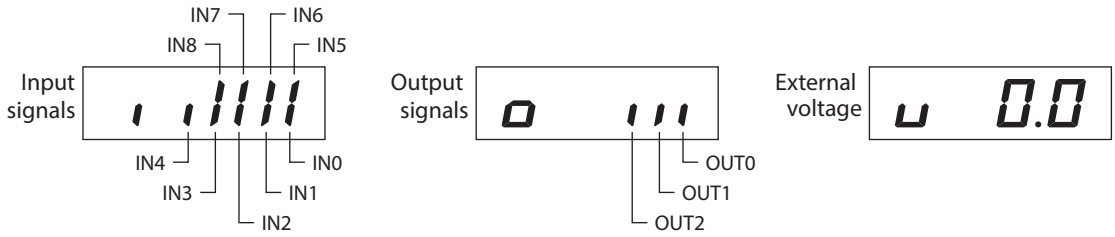
■ Warning

When a warning is generated, 2-digit warning code will be displayed.
The warning history can be checked and cleared.

Note When operations are limited by the edit lock function, clearing the warning history cannot be executed.

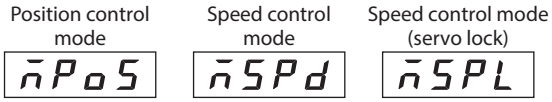
■ I/O monitor

The ON-OFF status of I/O signals for the driver can be checked.
Each digit on the 7-segment LED display corresponds to a signal. The corresponding digit is lit when the signal is ON, and the digit is unlit when the signal is OFF.
The voltage value input by the analog external setting device can also be checked.



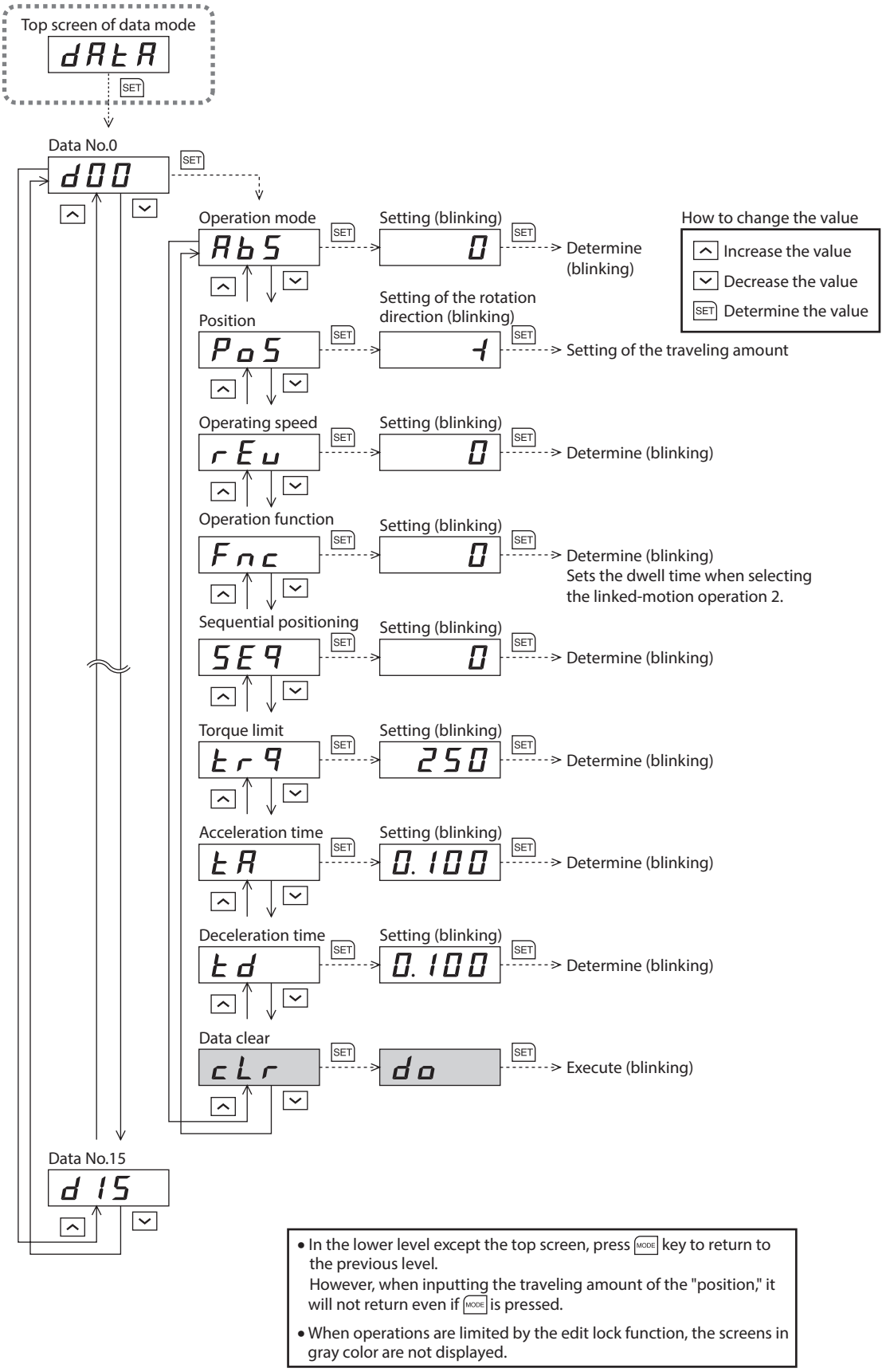
■ Control mode

The present control mode can be checked.



3.3 Data mode

This mode is used to set the operation data.



- In the lower level except the top screen, press MODE key to return to the previous level.
  However, when inputting the traveling amount of the "position," it will not return even if MODE is pressed.
- When operations are limited by the edit lock function, the screens in gray color are not displayed.

■ Setting item

In the case of the position control mode, all setting items other than the torque limit are set by the digital setting.
When the torque limit is set by the analog setting, change the "Analog speed torque" parameter (ID: 2161) to "2: Torque."

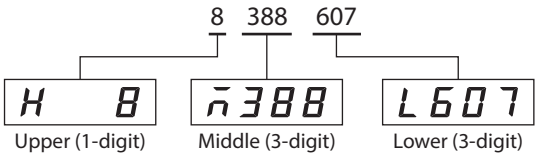
Item	Description	Setting range	Initial value
Operation mode	Selects how to specify the position (travel amount) for positioning operation (absolute mode or incremental mode).	0: Incremental 1: Absolute	0
Position	Sets the position (travel amount) for positioning operation. The motor shaft rotates by 0.72° per one step.	–8,388,608 to +8,388,607 steps	0
Operating speed	Sets the operating speed for positioning operation and continuous operation. Set as the rotation speed of the motor output shaft.	0 to 4000 r/min	0
Operation function	Sets to execute positioning operation as single-motion or linked-motion operation.	0: Single-motion 1: Linked-motion 2: Linked-motion 2	0
Dwell time	Sets the waiting time at standstill between the first operation data and the second operation data in linked-motion operation 2.	0.000 to 0.999 s and 1.00 to 50.00 s	0.000
Sequential positioning	Sets whether to enable or disable sequential positioning operation.	0: Disable 1: Enable	0
Torque limit	Sets when limiting the motor output torque. The peak torque can be set based on the rated torque being 100%.	0 to 250%	250
Acceleration time	Sets the acceleration time for positioning operation and continuous operation. The acceleration time is set as a time needed for the motor to reach the rated rotation speed (3000 r/min) from the standstill state.	0.000 to 0.999 s and 1.00 to 30.00 s	0.100
Deceleration time	Sets the deceleration time for positioning operation and continuous operation. The deceleration time is set as a time needed for the motor to stop from the rated rotation speed (3000 r/min).		
Data clear	Restores the operation data to the initial value.	–	–

Note When operations are limited by the edit lock function, the data clear cannot be executed.

■ Setting method of travel amount

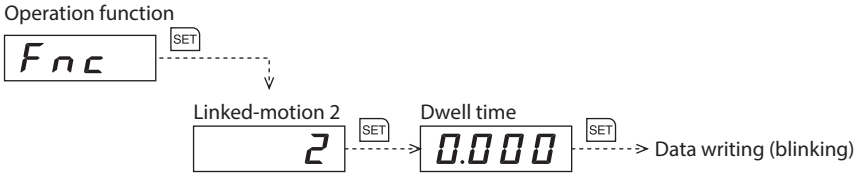
The travel amount of "position" can be set up to 8 digits. However, up to 3 digits each can be displayed because the 4-digit LED is used on the operation panel. Therefore, input the travel amount by dividing a maximum of 8 digits into an "upper," "middle" and "lower."

Example: When inputting 8,388,607 steps



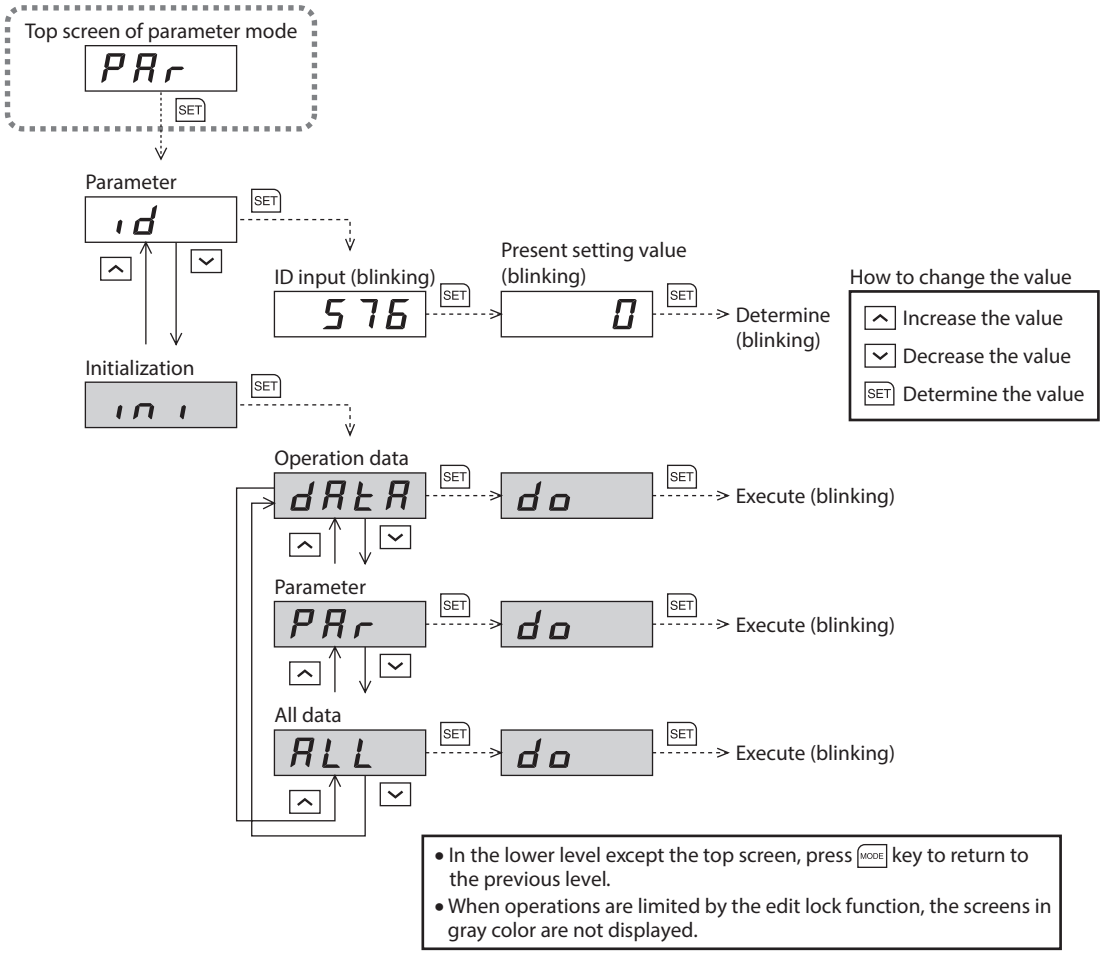
■ Setting method of dwell time

Select "Linked-motion 2" in "Operation function" and press the [SET] key to display the setting screen of the dwell time. Input the dwell time with the [∧] [∨] keys and set by pressing the [SET] key.



3.4 Parameter mode

This mode is used to set the parameter.



■ Parameter ID

There is a unique ID in each parameter. Input the ID and set.
Refer to p.89 for parameter ID.

[Setting method of the parameter to select a sign]

After inputting an ID, press the [SET] key to display the screen to select a sign.
The data setting screen appears after a sign is selected.

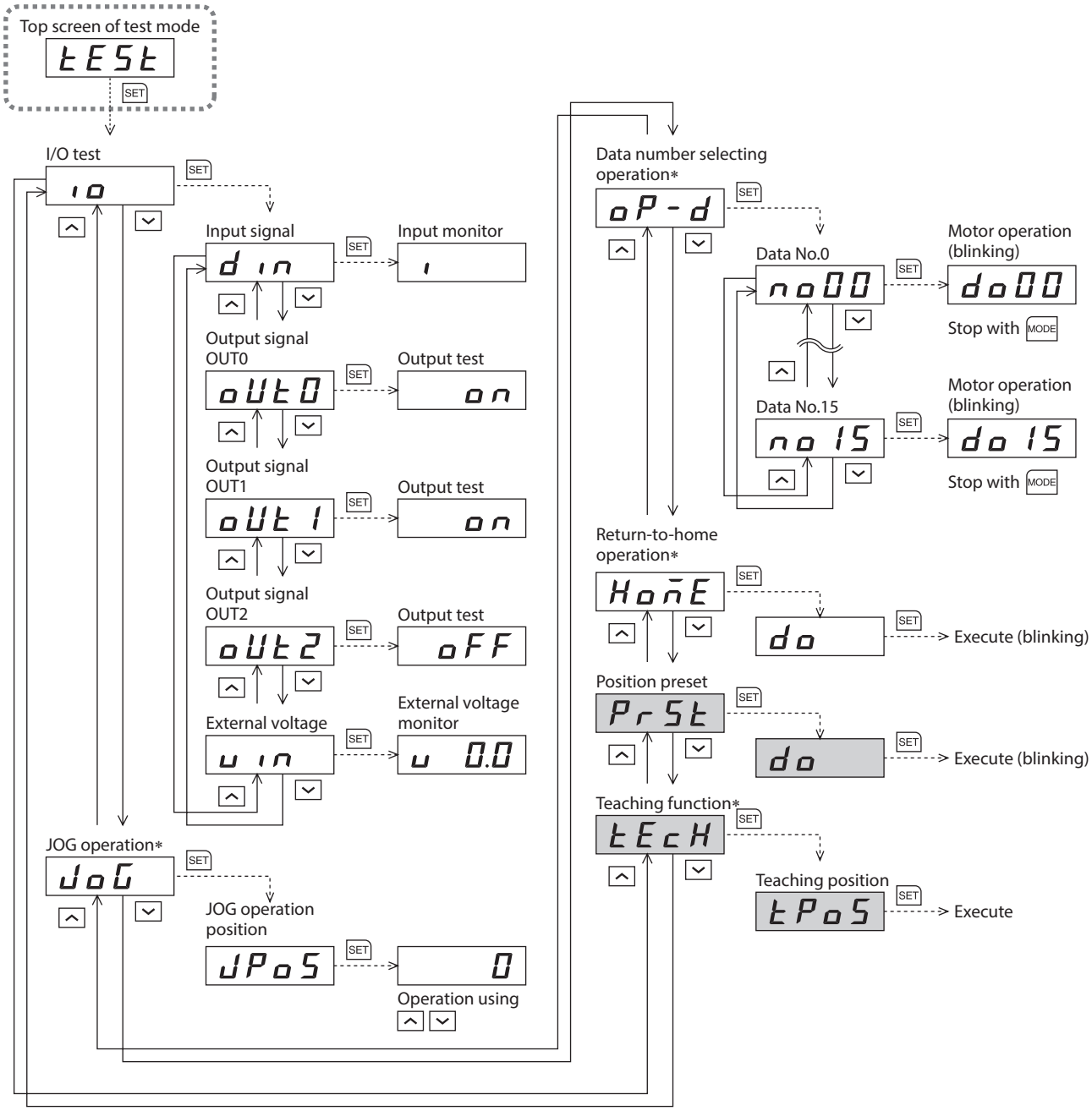
■ Initialization

Restores the data saved in the driver to the initial value. Initialization can be performed by selecting any of operation data, parameter, or all data.

Note When operations are limited by the edit lock function, the initialization cannot be executed.

3.5 Test mode

The connection status of each I/O signal can be checked. Also, test operation of the motor or position preset can be performed.



- In the lower level except the top screen, press MODE key to return to the previous level.
- When operations are limited by the edit lock function, the screens in gray color are not displayed.

* These operations cannot be executed while the FREE input, the STOP input, or the S-ON input is being ON. Be sure to execute after turning the signal OFF.

Note In operation, the motor rotates at the set speed while the operation button is pressed. Execute the test operation after confirming thoroughly that the motor rotation will not cause any dangerous situation.

When pressing the [SET] key while operating a motor

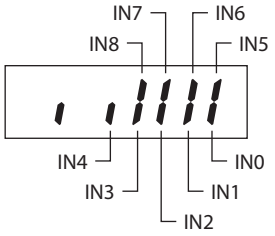
The screen cannot move to the setting screen of the test mode while operating.
An error will occur even when the [SET] key is pressed, and "Err" will be displayed.
Be sure to stop operating the motor before pressing the [SET] key.

■ I/O test

The ON-OFF status of each input signal can be checked and the ON-OFF status of each output signal can be switched.
The voltage value input by the analog external setting device can also be checked.

- Input signal

Each digit on the 7-segment LED display corresponds to a signal.
The corresponding digit is lit when the signal is ON, and the digit is unlit when the signal is OFF.



- Output signal

The ON-OFF status of each output signal can be switched with the [∧] [∨] keys.

- External voltage

The voltage value input by the analog external setting device can be checked.

■ JOG operation

The motor can be operated with the [∧] [∨] keys.
When pressing the [∧] key once, the motor rotates by one step in the forward direction. If the key is kept pressing, the motor rotates in the forward direction continuously.
When pressing the [∨] key once, the motor rotates by one step in the reverse direction. If the key is kept pressing, the motor rotates in the reverse direction continuously.
The present position is displayed while JOG operation is executed.

Set the operation data for JOG operation using the following parameters.
- "JOG operating speed" parameter (ID: 323)
- "JOG acceleration" parameter (ID: 324)
- "Operating torque of JOG operation" parameter (ID: 2081)

Note JOG operation cannot be executed while the FREE input or the STOP input is being ON.
Be sure to execute after turning the signal OFF.

■ Data number selecting operation

Positioning operation can be executed by selecting the operation data number.
When the operating speed of the selected operation data is 0 r/min, an alarm of the abnormal operation data will be generated.

Note The data number selecting operation cannot be executed while the FREE input or the STOP input is being ON.
Be sure to execute after turning the signal OFF.

■ Return-to-home operation

Return-to-home operation can be executed.
The operating speed can be set using the "Operating speed of home-seeking" parameter (ID: 353).

Note Return-to-home operation cannot be executed while the FREE input or the STOP input is being ON.
Be sure to execute after turning the signal OFF.

■ Position preset

The position preset is used to renew the command position (present position) to the value of the "Preset position" parameter (ID: 454).

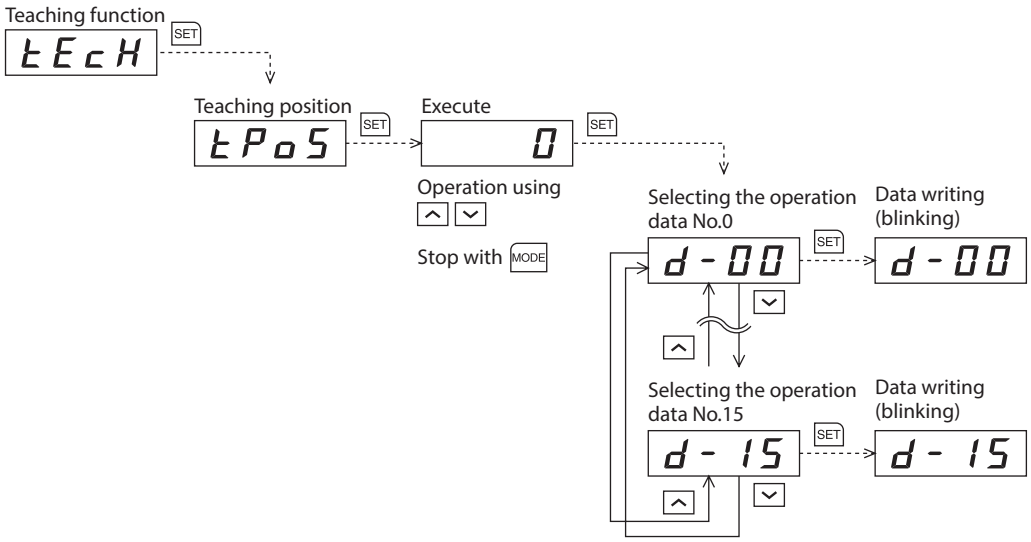
Note When operations are limited by the edit lock function, the position preset cannot be executed.

■ Teaching function

The new position can be updated in the operation data by changing the travel amount of the motor with the [∧] [∨] keys.
When pressing the [∧] key once, the motor rotates by one step in the forward direction. If the key is kept pressing, the motor rotates in the forward direction continuously.
When pressing the [∨] key once, the motor rotates by one step in the reverse direction. If the key is kept pressing, the motor rotates in the reverse direction continuously.
The absolute mode will be automatically selected as the operation mode of any position data set by teaching function.

Set the operation data for teaching function using the following parameters.

- "JOG operating speed" parameter (ID: 323)
- "JOG acceleration" parameter (ID: 324)
- "Operating torque of JOG operation" parameter (ID: 2081)



Note

- When operations are limited by the edit lock function, teaching function cannot be executed.
- Teaching function cannot be executed while the FREE input or the STOP input is being ON. Be sure to execute after turning the signal OFF.

4 Parameter list

This part explains data and parameters that are required to operate a product.

Table of contents

1 Operation data

The data described here can be set using any of the operation panel, **MEXE02**, or **OPX-2A**.
Up to 16 operation data can be set (operaton data No.0 to No.15).

1.1 Speed control mode

■ Operation data types

The following operation data is required for speed control operation.

Item	Description	Setting range	Initial value
Operating speed	Sets the operating speed for the speed control operation. Set as the rotation speed of the motor output shaft.	0 to 4000 r/min	0
Acceleration time	Sets the acceleration time as a time needed for the motor to reach the rated rotation speed (3000 r/min) from the standstill state.	0.000 to 30.000 s	0.100
Deceleration time	Sets the deceleration time as a time needed for the motor to stop from the rated rotation speed (3000 r/min).		
Torque limit	Sets when limiting the motor output torque. The peak torque can be set based on the rated torque being 100%.	0 to 250%	250

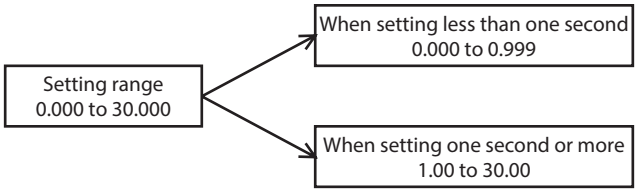
■ Operation data ID

When setting the operation data with the operation panel or the parameter mode of the **OPX-2A**, check the ID in the table below.

Operation data number	ID			
	Operating speed	Acceleration time	Deceleration time	Torque limit
0	576	768	832	896
1	577	769	833	897
2	578	770	834	898
3	579	771	835	899
4	580	772	836	900
5	581	773	837	901
6	582	774	838	902
7	583	775	839	903
8	584	776	840	904
9	585	777	841	905
10	586	778	842	906
11	587	779	843	907
12	588	780	844	908
13	589	781	845	909
14	590	782	846	910
15	591	783	847	911

■ Note for inputting the value by the operation panel

Set in the following range when inputting the acceleration time or the deceleration time because the operation panel can display 4-digit only.



1.2 Position control mode

If the data is changed while the motor operates, a recalculation and setup will be performed after the operation is stopped, and the data will be updated.

■ Operation data types

The following data is required for positioning operation.

Item	Description	Setting range	Initial value
Position	Sets the position (travel amount) for positioning operation. The motor shaft rotates by 0.72° per one step.	−8,388,608 to +8,388,607 steps	0
Operating speed∗	Sets the operating speed for positioning operation and continuous operation. Set as the rotation speed of the motor output shaft.	0 to 4000 r/min	0
Operation mode	Sets how to specify the position (travel amount) for positioning operation.	0: Incremental 1: Absolute	0
Operation function	Sets the operation function to execute positioning operation.	0: Single-motion 1: Linked-motion 2: Linked-motion 2	0
Acceleration time∗	Sets the acceleration time for positioning operation. The acceleration time is set as a time needed for the motor to reach the rated rotation speed (3000 r/min) from the standstill state.	0.000 to 30.000 s	0.100
Deceleration time∗	Sets the deceleration time for positioning operation. The deceleration time is set as a time needed for the motor to stop from the rated rotation speed (3000 r/min).		
Torque limit	Sets when limiting the motor output torque. The peak torque can be set based on the rated torque being 100%.	0 to 250%	250
Sequential positioning	Sets whether to enable or disable sequential positioning operation.	0: Disable 1: Enable	0
Dwell time	Sets the waiting time at standstill between the first operation data and the second operation data in linked-motion operation 2.	0.000 to 50.000 s	0.000

∗ These items are set by the digital setting.

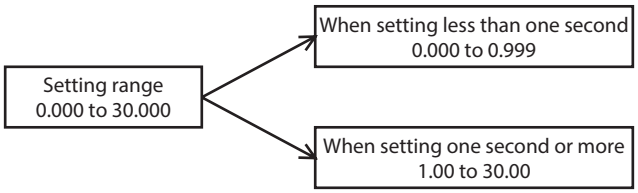
■ Operation data ID

When setting the operation data with the operation panel or the parameter mode of the **OPX-2A**, check the ID in the table below.

Operation data number	ID								
	Position	Operating speed	Operation mode	Operation function	Acceleration time	Deceleration time	Torque limit	Sequential positioning	Dwell time
0	512	576	640	704	768	832	896	960	1024
1	513	577	641	705	769	833	897	961	1025
2	514	578	642	706	770	834	898	962	1026
3	515	579	643	707	771	835	899	963	1027
4	516	580	644	708	772	836	900	964	1028
5	517	581	645	709	773	837	901	965	1029
6	518	582	646	710	774	838	902	966	1030
7	519	583	647	711	775	839	903	967	1031
8	520	584	648	712	776	840	904	968	1032
9	521	585	649	713	777	841	905	969	1033
10	522	586	650	714	778	842	906	970	1034
11	523	587	651	715	779	843	907	971	1035
12	524	588	652	716	780	844	908	972	1036
13	525	589	653	717	781	845	909	973	1037
14	526	590	654	718	782	846	910	974	1038
15	527	591	655	719	783	847	911	975	1039

■ Note for inputting the value by the operation panel

Set in the following range when inputting the acceleration time, the deceleration time, or the dwell time because the operation panel can display 4-digit only.



2 Parameter

The parameters can be set using any of the operation panel, **MEXE02**, or **OPX-2A**.

When writing parameters to the driver, they are saved in the non-volatile memory. The parameters saved in the non-volatile memory are stored even after the power supply is turned off. When a parameter is changed, the timing to update the new value varies depending on the parameter. See the following three types.

- Update immediately.....Recalculation and setup are immediately executed when the parameter is written.
- Update after operation stop.....Recalculation and setup are executed when the operation is stopped.
- Update after turning on the power again .....Recalculation and setup are executed after the power supply is turned on again.

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

2.1 Parameter list

All parameters can be set in both the speed control mode and position control mode.
Parameters that can be used vary depending on the control mode.

ID	Parameter name	Setting range	Initial value	Reference page	Control mode∗1	
					Speed control	Position control
256	STOP input action	0: Immediate stop 1: Deceleration stop 2: Immediate stop + current OFF 3: Deceleration stop + current OFF Speed control mode (disable servo lock) 0, 2: Immediate stop 1, 3: Deceleration stop	0	p.92	○	○
258	Overtravel action	0: Immediate stop 1: Deceleration stop	0		×	
259	END signal range	1 to 100 steps The motor shaft rotates by 0.72° per one step.	1			
290	Position loop gain	1 to 100 Hz	7	p.94	○∗2	
291	Speed loop gain	1 to 1000 Hz	200		○	
292	Speed loop integral time constant	0 to 1000 ms	33			
293	Speed filter	0 to 200 ms	1		○∗2	
294	Moving average time	1 to 200 ms	1			
323	JOG operating speed	0 to 4000 r/min	300	p.93	○	
324	JOG acceleration	0.000 to 30.000 s	0.100			
353	Operating speed of home-seeking	0 to 4000 r/min	300	p.96	×	○∗3
354	Acceleration/deceleration of home-seeking	0.000 to 30.000 s	0.100			
356	Position offset of home-seeking	−8,388,608 to +8,388,607 steps The motor shaft rotates by 0.72° per one step.	0			
357	Starting direction of home-seeking	0: Negative direction 1: Positive direction	1			○
385	Excessive position deviation alarm	0.01 to 300.00 rev	20.00	p.96		
419	Overvoltage warning	120 to 440 V	435		○	
421	Excessive position deviation warning	0.01 to 300.00 rev	20.00		×	
450	Motor rotation direction	0: Positive direction=CCW 1: Positive direction=CW	1	p.97	○	
451	Software overtravel	0: Disable 1: Enable	1		×	

∗1 ○: Possible to use.
×: Not possible to use.
∗2 It is enabled when the "Operation selection after stopping" parameter (ID: 2069) is set to "1: Servo lock."
∗3 It cannot be used in the **BX**-compatible mode.

ID	Parameter name	Setting range	Initial value	Reference page	Control mode*1	
					Speed control	Position control
452	Positive software limit	–8,388,608 to +8,388,607 steps The motor shaft rotates by 0.72° per one step.	+8,388,607	p.97	×	○
453	Negative software limit		–8,388,608			
454	Preset position		0			
455	Wrap setting	0: Disable 1: Enable	0			
456	Wrap setting range	1 to 8,388,607 steps The motor shaft rotates by 0.72° per one step.	1000			
480	Data setter speed display	0: Signed [indicates "minus sign (–)" at RVS input] 1: Absolute value 2: Inverse signed [indicates "minus sign (–)" at FWD input]	0	p.98	○	
512 to 527	Position No.0 to Position No.15	–8,388,608 to +8,388,607 steps The motor shaft rotates by 0.72° per one step.	0	p.87	×	
576 to 591	Operating speed No.0 to Operating speed No.15	0 to 4000 r/min	0	p.86 p.87	○	
640 to 655	Operation mode No.0 to Operation mode No.15	0: Incremental 1: Absolute	0	p.87	×	
704 to 719	Operation function No.0 to Operation function No.15	0: Single-motion 1: Linked-motion 2: Linked-motion 2	0			
768 to 783	Acceleration time No.0 to Acceleration time No.15	0.000 to 30.000 s	0.100	p.86 p.87	○	
832 to 847	Deceleration time No.0 to Deceleration time No.15		0.100			
896 to 911	Torque limit No.0 to Torque limit No.15	0 to 250%	250			
960 to 975	Sequential positioning No.0 to Sequential positioning No.15	0: Disable 1: Enable	0	p.87	×	
1024 to 1039	Dwell time No.0 to Dwell time No.15	0.000 to 50.000 s	0.000			
2048	MS0 operation number selection	0 to 15	0	p.92		
2049	MS1 operation number selection		1			
2050	MS2 operation number selection		2			
2051	MS3 operation number selection		3			
2052	MS4 operation number selection		4			
2053	MS5 operation number selection		5			
2054	HOME-P output function selection	0: Home output 1: Return-to-home complete output	0			
2064	Filter selection	0: No filter 1: Speed filter 2: Moving average filter	0	p.94	○*2	
2069	Operation selection after stopping	0: Free (disable servo lock) 1: Servo lock	0	p.93	○	×
2081	Operating torque of JOG operation	0 to 250%	100			○
2084	JOG travel amount	1 to 8,388,607 steps The motor shaft rotates by 0.72° per one step.	1		×	
2085	Gear Ratio	100 to 9999	100		○	

*1 ○: Possible to use.
×: Not possible to use.

*2 It is enabled when the "Operation selection after stopping" parameter (ID: 2069) is set to "1: Servo lock."

ID	Parameter name	Setting range	Initial value	Reference page	Control mode∗1	
					Speed control	Position control
2086	Decimal place for gear ratio	0: ×1 1: ×0.1 2: ×0.01	2	p.93	○	○
2087	Multiplying gear	1 to 5	1			
2113	Alarm initial drive	0: Disable 1: Enable	0	p.96		
2129	Overload warning enable		0			
2133	Overload warning level	50 to 100%	100			
2160	Initial display of OPX-2A	0: Speed 1: Detected position 2: Load factor 3: Operation data number 4: Selection number 5: Top screen of monitor mode	0	p.98		
2161	Analog speed torque	• Speed control mode 0: Digital 1: Analog speed 2: Torque • Position control mode 0 or 1: Digital 2: Torque	1			
2162	Analog acceleration deceleration	0: Digital 1: Analog	1			×
2164	Panel initial view	0: Speed 1: Detected position 2: Load factor 3: Operation data number 4: Selection number 5: Top screen of monitor mode	0			○
2176	IN0 input function selection	Refer to p.100 for details.	1 [3]∗2	p.99		
2177	IN1 input function selection		2 [4]∗2			
2178	IN2 input function selection		48			
2179	IN3 input function selection		49			
2180	IN4 input function selection		50			
2181	IN5 input function selection		16			
2182	IN6 input function selection		18			
2183	IN7 input function selection		24			
2184	IN8 input function selection		0 [62]∗2			
2192	IN0 input logic level setting	0: Normal 1: Invert	0			
2193	IN1 input logic level setting					
2194	IN2 input logic level setting					
2195	IN3 input logic level setting					
2196	IN4 input logic level setting					
2197	IN5 input logic level setting					
2198	IN6 input logic level setting					
2199	IN7 input logic level setting					
2200	IN8 input logic level setting					
2208	OUT0 output function selection	Refer to p.100 for details.	65			
2209	OUT1 output function selection		68 [67]∗2			
2210	OUT2 output function selection		66 [70]∗2			
2215	Attained speed output band	0 to 400 r/min	200	p.92		
2256	Analog speed command gain	0 to 4000 r/min/V	850 (635)∗3	p.97		×
2257	Analog speed command offset	−2000 to +2000 r/min	0			

∗1 ○: Possible to use.
×: Not possible to use.

∗2 This is the initial value for the speed control mode. The value in the brackets [ ] is applied for the position control mode.
When using the product in the **BX**-compatible mode, refer to the part 7 "**BX**-compatible mode."

∗3 When the **BX**-compatible mode is used

ID	Parameter name	Setting range	Initial value	Reference page	Control mode∗1	
					Speed control	Position control
2258	Analog torque limit gain	0 to 250%/V	54	p.97	○	○
2259	Analog torque limit offset	−50 to +50%	0			
2261	Analog speed command maximum value	0 to 4000 r/min	4000 (3150)∗2			
2263	Analog torque limit maximum value	0 to 250%	250			
2289	Compatible command - continuous operation	0: Disable 1: Enable	0	p.93	×	○∗2
2290	Compatible command - BUSY/ TLM output select	0: BUSY 1: TLM (TLC)	0	p.92	○∗2	

∗1 ○: Possible to use.
×: Not possible to use.
∗2 When the **BX**-compatible mode is used

2.2 I/O parameters

All parameters can be set in both the speed control mode and position control mode.
Parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Update∗1	Control mode∗2	
						Speed control	Position control
256	STOP input action	Sets how to stop the motor when the motor is stopped by turning the STOP input ON.	0: Immediate stop 1: Deceleration stop∗3 2: Immediate stop + current OFF 3: Deceleration stop + current OFF∗3 Speed control mode (disable servo lock) 0, 2: Immediate stop 1, 3: Deceleration stop∗3	0	A	○	○
258	Overtravel action	Sets how to stop the motor when the overtravel occurs.	0: Immediate stop 1: Deceleration stop	0		×	
259	END signal range	Sets an output range that the END output is turned ON. The motor shaft rotates by 0.72° per one step.	1 to 100 steps	1			
2048	MS0 operation number selection	Sets the operation data number corresponding to the MS0 to MS5 inputs.	0 to 15	0	B		
2049	MS1 operation number selection			1			
2050	MS2 operation number selection			2			
2051	MS3 operation number selection			3			
2052	MS4 operation number selection			4			
2053	MS5 operation number selection			5			
2054	HOME-P output function selection	Sets the timing to output the HOME-P output.	0: Home output 1: Return-to-home complete output	0	A		
2215	Attained speed output band	Sets the output range for the VA output.	0 to 400 r/min	200		○	
2290	Compatible command - BUSY/ TLM output select	Uses in the **BX**-compatible mode. Switches between the BUSY output and the TLM output.	0: BUSY 1: TLM (TLC)	0	C		

∗1 It indicates the timing for the data to update. (A: Update immediately, B: Update after operation stop, C: Update after turning on the power again)
∗2 ○: Possible to use.
×: Not possible to use.
∗3 The motor stops according to the deceleration time of the operation data number selected when the STOP input is turned ON.

2.3 Operation parameters

All parameters can be set in both the speed control mode and position control mode.
Parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Update*1	Control mode*2	
						Speed control	Position control
323	JOG operating speed	Sets the operating speed for JOG operation.	0 to 4000 r/min	300	B	○	○
324	JOG acceleration	Sets the acceleration/deceleration time for JOG operation.	0.000 to 30.000 s	0.100			
2069	Operation selection after stopping	Uses in the speed control mode. If the holding force is required to generate while the motor stops, set this parameter to "1" to enable the servo lock. However, when the "STOP input action" parameter (ID: 256) is set to 2 or 3, the holding force will not generate even if "1: Servo lock" is set.	0: Free (disable servo lock) 1: Servo lock	0	C	○	×
2081	Operating torque of JOG operation	Sets the maximum torque based on the rated torque being 100% during JOG operation.	0 to 250%	100	B		○
2084	JOG travel amount	Sets the travel amount for JOG operation. The motor shaft rotates by 0.72° per one step.	1 to 8,388,607 steps	1		×	
2085	Gear Ratio	If the gear ratio is set, the rotation speed that is calculated based on the actual speed of the motor will be displayed. The gear ratio can be set by multiplying the value in "Gear ratio" parameter by the value in "Decimal place for gear ratio" parameter.	100 to 9999	100	A	○	
2086	Decimal place for gear ratio		0: ×1 1: ×0.1 2: ×0.01	2			
2087	Multiplying gear	If the multiplying gear is set, the rotation speed that is calculated based on the actual speed of the motor will be displayed.	1 to 5	1			
2289	Compatible command - continuous operation	Uses in the **BX**-compatible mode (position control). Sets whether to enable or disable continuous operation.	0: Disable 1: Enable	0	C	×	

*1 It indicates the timing for the data to update. (A: Update immediately, B: Update after operation stop, C: Update after turning on the power again)

*2 ○: Possible to use.
×: Not possible to use.

■ How to set the gear ratio

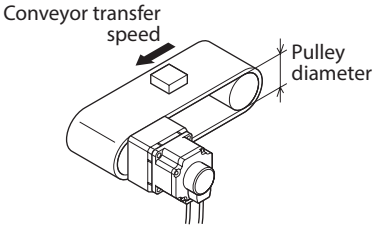
Set the gear ratio as a combination of the "Gear ratio" parameter (ID: 2085) and "Decimal place for gear ratio" parameter (ID: 2086).
The relationships between the gear ratio and the decimal position are explained shown in the table below.

Actual gear ratio	"Gear ratio" parameter	"Decimal place for gear ratio" parameter
1.00 to 9.99	100 to 999	2
10.0 to 99.9		1
100 to 999		0
10.00 to 99.99	1000 to 9999	2
100.0 to 999.9		1
1000 to 9999		0

■ When displaying the conveyor transfer speed

To display the conveyor transfer speed, set the conveyor speed reduction ratio using the formula below.

$$\text{Conveyor speed reduction ratio} = \frac{1}{\text{Feed rate per motor revolution}} = \frac{\text{Gearhead gear ratio}}{\text{Pulley diameter [m]} \times \pi}$$



When the calculated conveyor speed reduction ratio is used, the conveyor transfer speed is converted as follows.

$$\text{Conveyor transfer speed [m/min]} = \frac{\text{Rotation speed of motor output shaft [r/min]}}{\text{Conveyor speed reduction ratio}}$$

Example: The pulley diameter is 0.1 m and the gear ratio of the gearhead is 20

$$\text{Conveyor speed reduction ratio} = \frac{\text{Gearhead gear ratio}}{\text{Pulley diameter [m]} \times \pi} = \frac{20}{0.1\text{[m]} \times \pi} \cong 63.7$$

From the conversion formula, the conveyor speed reduction ratio is calculated as 63.7 in this example. This means that the "Gear ratio" parameter is 637, and the "Decimal place for gear ratio" parameter is 1.
If the speed reduction ratio is 63.7 and the rotation speed of the motor is 1300 r/min, the conveyor transfer speed is converted as follows:

$$\text{Conveyor transfer speed [m/min]} = \frac{1300}{63.7} \cong 20.4$$

"20.4" is displayed on the panel.

2.4 Motor parameters

All parameters can be set in both the speed control mode and position control mode.
Parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Update∗1	Control mode∗2	
						Speed control	Position control
290	Position loop gain	Adjusts the motor response in reaction to the position deviation.	1 to 100 Hz	7	A	○∗3	○
291	Speed loop gain	Adjusts the motor response in reaction to the speed deviation.	1 to 1000 Hz	200		○	
292	Speed loop integral time constant	Adjusts the deviation that cannot be adjusted with the speed loop gain.	0 to 1000 ms	33			
293	Speed filter	Adjusts the motor response.	0 to 200 ms	1	B	○∗3	
294	Moving average time	Sets the time constant for the moving average filter.	1 to 200 ms	1			
2064	Filter selection	Sets the filter function to adjust the motor response.	0: No filter 1: Speed filter 2: Moving average filter	0	C		

∗1 It indicates the timing for the data to update. (A: Update immediately, B: Update after operation stop, C: Update after turning on the power again)
∗2 ○: Possible to use.
×: Not possible to use.
∗3 It is enabled when the "Operation selection after stopping" parameter (ID: 2069) is set to "1: Servo lock."

■ Position loop gain, speed loop gain, speed loop integral time constant

Vibration that occurs while the motor is accelerating/decelerating or at standstill can be adjusted to an optimal value. (The optimal value varies depending on the equipment or operating conditions.)

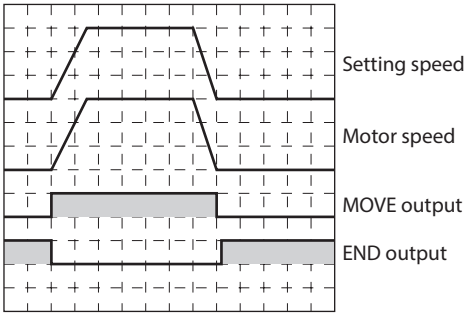
Related parameters

Position loop gain	Adjusts the motor response in reaction to the position deviation. Increasing the value will make the deviation between the command position and the actual position smaller. An excessively high value may increase the motor overshoot or cause the motor vibration.
Speed loop gain	Adjusts the motor response in reaction to the speed deviation. Increasing the value will make the deviation between the command speed and the actual speed smaller. An excessively high value may increase the motor overshoot or cause the motor vibration.
Speed loop integral time constant	This decreases the deviation that cannot be adjusted with the speed loop gain. An excessively long value may slow the motor response. Too short value may cause the motor to vibrate.

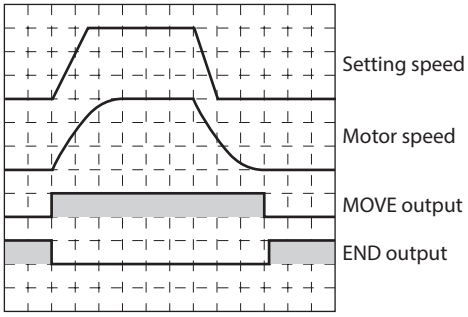
■ Speed filter

If the "Filter selection" parameter (ID: 2064) is set to "1: Speed filter" and the "Speed filter" parameter (ID: 293) is set, the command position is filtered and the motor response can be adjusted.
When the speed filter level is increased, the motor operation at starting/stopping will become smooth. Note, however, that an excessively long filter level will result in lower synchronization against the commands. Set an appropriate value according to a load or an application.

• When the "Speed filter" parameter is set to 0 ms



• When the "Speed filter" parameter is set to 200 ms



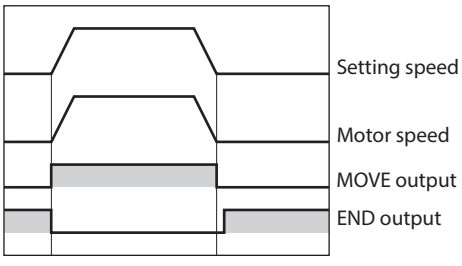
Note

- If the "Speed filter" parameter (ID: 293) is set to 0, the speed filter will be disabled.
- When the "Operation selection after stopping" parameter (ID: 2069) is set to "0: Free" in the speed control mode, the speed filter will be disabled.

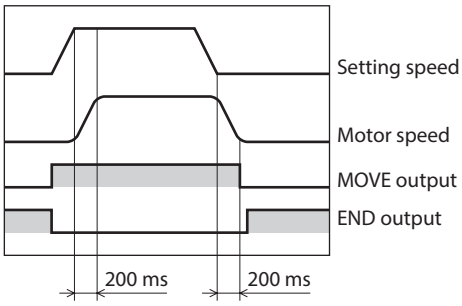
■ Moving average filter

When the "Filter selection" parameter (ID: 2064) is set to "2: Moving average filter" and the "Moving average time" parameter (ID: 294) is set, the motor response can be adjusted. The positioning time can be shortened by suppressing the residual vibration in positioning operation.
The optimal value for the "Moving average time" parameter varies depending on a load or an operating condition. Set an appropriate value according to a load or an operating condition.

• When the "Moving average filter" is not used



• When the "Moving average filter" parameter is set to 200 ms



2.5 Alarm and warning parameters

All parameters can be set in both the speed control mode and position control mode.
Parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Update∗1	Control mode∗2	
						Speed control	Position control
385	Excessive position deviation alarm	Sets the condition in which the excessive position deviation alarm is generated.	0.01 to 300.00 rev	20.00	A	×	○
419	Overvoltage warning	Sets the condition in which the overvoltage warning is generated.	120 to 440 V	435		○	
421	Excessive position deviation warning	Sets the condition in which the excessive position deviation warning is generated.	0.01 to 300.00 rev	20.00		×	
2113	Alarm initial drive	Sets whether to enable or disable the function of the alarm initial drive.	0: Disable 1: Enable	0		○	
2129	Overload warning enable	Sets whether to enable or disable the function of the overload warning enable.		0			
2133	Overload warning level	Sets the condition in which the overload warning is generated.	50 to 100%	100			

∗1 It indicates the timing for the data to update. (A: Update immediately)
∗2 ○: Possible to use.
×: Not possible to use.

2.6 Return-to-home parameters

All parameters can be set in both the speed control mode and position control mode.
Parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Update∗1	Control mode∗2	
						Speed control	Position control
353	Operating speed of home-seeking	Sets the operating speed for return-to-home operation.	0 to 4000 r/min	300	B	×	○∗3
354	Acceleration/deceleration of home-seeking	Sets the acceleration/deceleration time for return-to-home operation.	0.000 to 30.000 s	0.100			
356	Position offset of home-seeking	Sets the amount of offset from the home. The motor shaft rotates by 0.72° per one step.	−8,388,608 to +8,388,607 steps	0			
357	Starting direction of home-seeking	Sets the starting direction for home detection.	0: Negative direction 1: Positive direction	1			○

∗1 It indicates the timing for the data to update. (B: Update after operation stop)
∗2 ○: Possible to use.
×: Not possible to use.
∗3 It cannot be used in the **BX**-compatible mode.

2.7 Position coordinate parameters

All parameters can be set in both the speed control mode and position control mode.
Parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Update∗1	Control mode∗2	
						Speed control	Position control
450	Motor rotation direction	Sets the rotation direction of the motor output shaft.	0: Positive direction=CCW 1: Positive direction=CW	1	C	○	○
451	Software overtravel	Sets whether to enable or disable software overtravel detection using software limits.	0: Disable 1: Enable	1	A	×	○
452	Positive software limit	Sets the value of software limit in the positive direction. The motor shaft rotates by 0.72° per one step.	−8,388,608 to +8,388,607 steps	+8,388,607			
453	Negative software limit	Sets the value of software limit in the negative direction. The motor shaft rotates by 0.72° per one step.		−8,388,608			
454	Preset position	Sets the preset position. The motor shaft rotates by 0.72° per one step.		0			
455	Wrap setting	Sets whether to enable or disable the wrap function.	0: Disable 1: Enable	0	C		
456	Wrap setting range	Sets the wrap setting range. The motor shaft rotates by 0.72° per one step.	1 to 8,388,607 steps	1000			

∗1 It indicates the timing for the data to update. (A: Update immediately, C: Update after turning on the power again)
∗2 ○: Possible to use.
×: Not possible to use.

2.8 Analog adjustment parameters

All parameters can be set in both the speed control mode and position control mode.
Parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Update∗1	Control mode∗2	
						Speed control	Position control
2256	Analog speed command gain	Sets the speed command per 1 VDC of the input voltage by the analog external setting device.	0 to 4000 r/min/V	850 (635)∗3	A	○	×
2257	Analog speed command offset	Sets the offset of the speed command input by the analog external setting device.	−2000 to +2000 r/min	0			
2258	Analog torque limit gain	Sets the torque limiting value per 1 VDC of the input voltage by the analog external setting device.	0 to 250%/V	54			○
2259	Analog torque limit offset	Sets the offset of the torque limiting input by the analog external setting device.	−50 to +50%	0			
2261	Analog speed command maximum value	Sets the maximum value of the rotation speed by the analog external setting device.	0 to 4000 r/min	4000 (3150)∗3			×
2263	Analog torque limit maximum value	Sets the maximum value of the torque limit by the analog external setting device.	0 to 250%	250			○

∗1 It indicates the timing for the data to update. (A: Update immediately)
∗2 ○: Possible to use.
×: Not possible to use.
∗3 When the **BX**-compatible mode is used

2.9 Common parameters

All parameters can be set in both the speed control mode and position control mode.
Parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Update∗1	Control mode∗2	
						Speed control	Position control
480	Data setter speed display	Sets the display method of the speed monitor for the **OPX-2A**.	0: Signed [indicates "minus sign (–)" at RVS input] 1: Absolute value 2: Inverse signed [indicates "minus sign (–)" at FWD input]	0	A	○	○
2160	Initial display of OPX-2A	Sets the initial screen to display on the **OPX-2A** when the driver power is turned on.	0: Speed 1: Detected position 2: Load factor 3: Operation data number 4: Selection number 5: Top screen of monitor mode	0			
2161	Analog speed torque	Changes the setting method of operating speed and torque limit. Refer to the next clause for details.	• Speed control mode 0: Digital 1: Analog speed 2: Torque • Position control mode 0 or 1: Digital 2: Torque	1	C		
2162	Analog acceleration deceleration	Changes the setting method of acceleration/deceleration time. Refer to the next page for details.	0: Digital 1: Analog	1			×
2164	Panel initial view	Sets the initial screen to display on the operation panel when the driver power is turned on.	0: Speed 1: Detected position 2: Load factor 3: Operation data number 4: Selection number 5: Top screen of monitor mode	0	A		○

∗1 It indicates the timing for the data to update. (A: Update immediately, C: Update after turning on the power again)
∗2 ○: Possible to use.
×: Not possible to use.

■ "Analog speed torque" parameter (ID: 2161)

The setting method of operation data can be changed using the "Analog speed torque" parameter (ID: 2161) and the "Analog acceleration deceleration" parameter (ID: 2162).

- Analog setting ..... Internal potentiometer (SPEED), **PAVR-20KZ** (sold separately), external DC voltage
- Digital setting ..... Operation panel, **MEXE02**, **OPX-2A** (sold separately)

- Speed control mode

The setting method of operating speed and torque limit can be changed between the analog setting and digital setting.

Operation data	When the parameter is 0		When the parameter is 1		When the parameter is 2	
	Operating speed	Torque limit	Operating speed	Torque limit	Operating speed	Torque limit
No.0	Digital setting	Digital setting	Internal potentiometer	Digital setting	Digital setting	**PAVR-20KZ** External DC voltage
No.1			**PAVR-20KZ** External DC voltage			
No.2 to No.15			Digital setting			

Setting example

- When setting all operation data by the digital setting: Set the "Analog speed torque" parameter to 0.
- When setting the operating speed of the operation data Nos. 0 and 1 by the analog setting: Set the "Analog speed torque" parameter to 1.

- Position control mode

The operating speed is set by the digital setting. Note, however, that the torque limit can also be set by the analog setting.

Operation data	When the parameter is 0		When the parameter is 1		When the parameter is 2	
	Operating speed	Torque limit	Operating speed	Torque limit	Operating speed	Torque limit
No.0 to No.15	Digital setting	Digital setting	Digital setting	Digital setting	Digital setting	**PAVR-20KZ** External DC voltage

Setting example
- When setting all operation data by the digital setting: Set the "Analog speed torque" parameter to 0 or 1.
- When setting the torque limit by the analog setting: Set the "Analog speed torque" parameter to 2.

■ "Analog acceleration deceleration" parameter (ID: 2162)

This parameter is enabled in the speed control mode.
The setting method of acceleration time and deceleration time can be changed between the analog setting and digital setting.
- Analog setting ..... Acceleration time potentiometer (ACC), Deceleration time potentiometer (DEC)
- Digital setting ..... Operation panel, **MEXE02**, **OPX-2A** (sold separately)

Operation data	When the parameter is 0		When the parameter is 1	
	Acceleration time	Deceleration time	Acceleration time	Deceleration time
No.0 No.1	Digital setting	Digital setting	Analog setting	Analog setting
No.2 to No.15			Digital setting	Digital setting

2.10 I/O function parameters

All parameters can be set in both the speed control mode and position control mode.
Parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Update∗1	Control mode∗2	
						Speed control	Position control
2176	IN0 input function selection	Assigns the input signals to the input terminals IN0 to IN8.	Refer to the next table.	1 [3]∗3	C	○	○
2177	IN1 input function selection			2 [4]∗3			
2178	IN2 input function selection			48			
2179	IN3 input function selection			49			
2180	IN4 input function selection			50			
2181	IN5 input function selection			16			
2182	IN6 input function selection			18			
2183	IN7 input function selection			24			
2184	IN8 input function selection			0 [62]∗3			
2192	IN0 input logic level setting	Changes the logic level setting for the input terminals IN0 to IN8.	0: Normal 1: Invert	0			
2193	IN1 input logic level setting						
2194	IN2 input logic level setting						
2195	IN3 input logic level setting						
2196	IN4 input logic level setting						
2197	IN5 input logic level setting						
2198	IN6 input logic level setting						
2199	IN7 input logic level setting						
2200	IN8 input logic level setting						
2208	OUT0 output function selection	Assigns the output signals to the output terminals OUT0 to OUT2.	Refer to the next table.	65			
2209	OUT1 output function selection			68 [67]∗3			
2210	OUT2 output function selection			66 [70]∗3			

∗1 It indicates the timing for the data to update. (C: Update after turning on the power again)
∗2 ○: Possible to use.
×: Not possible to use.
∗3 This is the initial value for the speed control mode. The value in the brackets [ ] is applied for the position control mode.
When using the product in the **BX**-compatible mode, refer to the part 7 "**BX**-compatible mode."

■ Setting range of the function selection parameter

- IN input function selection parameter

0: Not used	7: –JOG	16: FREE	48: M0
1: FWD ∗	8: MS0	17: S-ON	49: M1
2: RVS ∗	9: MS1	18: STOP ∗	50: M2
3: HOME	10: MS2	22: TH	51: M3
4: START	11: MS3	24: ALM-RST	54: TL
5: SSTART	12: MS4	25: P-PRESET	62: HOMES ∗
6: +JOG	13: MS5	27: HMI	

∗ In the **BX**-compatible mode, the name of each signal changes as follows.
FWD → CW, RVS → CCW, STOP → BRAKE, HOMES → HOME-LS

Setting example

- When assigning the TH input to the IN8 terminal of the input signal connector CN5 in the speed control mode:
Change the "IN8 input function selection" parameter (ID: 2184) from "0: Not used" ∗ to "22: TH"

∗ The initial value assigned to each input terminal varies depending on the control mode. Check the assigned signal and change the signal of the input terminal that is not used.

- OUT output function selection parameter

0: Not used	69: END
65: ALM	70: HOME-P
66: WNG	71: TLC ∗
67: READY	77: VA
68: MOVE	85: ZSG

∗ In the **BX**-compatible m ode, the name of each signal changes as follows.
TLC → TLM

Note The signals that can be used vary depending on the control mode. Set the signals correctly to use.

5 Operation in speed control mode

This part explains how to operate in the speed control mode.

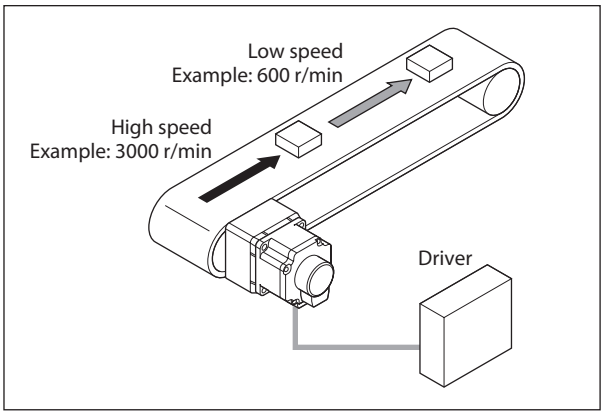
Table of contents

1 Overview of speed control mode

Operation

【Setting with operation data and parameters】

Speed control operation



Multi-speed operation

Acceleration/deceleration operation

Multi-motor control

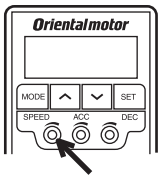
Other operations

- JOG operation
- Test operation

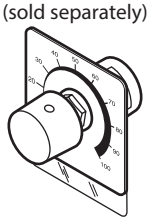
Speed setting method

【Analog setting】

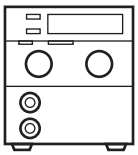
Internal potentiometer



External potentiometer
PAVR-20KZ
(sold separately)

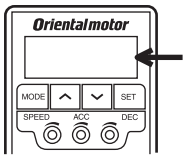


External DC voltage

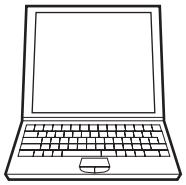


【Digital setting】

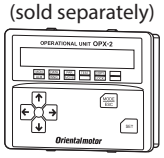
Operation panel



Support software
MEXE02



Data setter
OPX-2A
(sold separately)



Function

【Setting with parameters】

- I/O
  - Movement when inputting STOP input
- Alarm/warning
  - Alarm detection
  - Warning detection
- Operation function
  - JOG operation
  - Speed reduction ratio/speed increasing ratio
  - Servo lock at motor standstill
  - Motor rotation direction
- Analog adjustment
  - Analog speed/torque
  - Analog acceleration/deceleration
  - Analog command gain
  - Analog command offset
- Motor function
  - Speed loop gain
  - Speed loop integral time constant
- I/O function
  - Input function
  - Input logic level
  - Output function
  - Rotation speed attainment band

2 Setting the operation data

2.1 Operation data types

Operation data can be set up to 16 data (operation data No.0 to No.15), and it is set using the analog setting or the digital setting.

- Analog setting: Internal potentiometer (SPEED), **PAVR-20KZ** (sold separately), external DC voltage
- Digital setting: Operation panel, **MEXE02**, **OPX-2A** (sold separately)

The following operation data is required for speed control operation.

Item	Description	Setting method		Setting range	Initial value
Operating speed	Sets the operating speed for speed control operation. Set as the rotation speed of the motor output shaft.	Analog	Internal potentiometer (SPEED)∗, **PAVR-20KZ** (accessory), external DC voltage	0 r/min or 30 to 4000 r/min	0
		Digital	Operation panel, **MEXE02**, **OPX-2A**	0 to 4000 r/min	
Acceleration time	Sets the acceleration time as a time needed for the motor to reach the rated rotation speed (3000 r/min) from the standstill state.	Analog	Acceleration time potentiometer (ACC)∗	0.1 to 30.0 s	0.1
		Digital	Operation panel, **MEXE02**, **OPX-2A**	0.000 to 30.000 s	
Deceleration time	Sets the deceleration time as a time needed for the motor to stop from the rated rotation speed (3000 r/min).	Analog	Deceleration time potentiometer (DEC)∗	0.1 to 30.0 s	0.1
		Digital	Operation panel, **MEXE02**, **OPX-2A**	0.000 to 30.000 s	
Torque limit	Sets when limiting the motor output torque. The peak torque can be set based on the rated torque being 100%.	Analog	**PAVR-20KZ**, External DC voltage	0 to 250%	250
		Digital∗	Operation panel, **MEXE02**, **OPX-2A**		

∗ This is the setting method being selected at the time of shipment.

2.2 Analog setting and digital setting

The setting method of operation data can be changed using the "Analog speed torque" parameter (ID: 2161) and the "Analog acceleration deceleration" parameter (ID: 2162).

■ When changing the setting method of operating speed and torque limit

Use the "Analog speed torque" parameter (ID: 2161).

Operation data	When the parameter is 0		When the parameter is 1		When the parameter is 2	
	Operating speed	Torque limit	Operating speed	Torque limit	Operating speed	Torque limit
No.0	Digital setting	Digital setting	Internal potentiometer	Digital setting	Digital setting	**PAVR-20KZ** External DC voltage
No.1			**PAVR-20KZ** External DC voltage			
No.2 to No.15			Digital setting			

Related parameter

ID	Parameter name	Description	Setting range	Initial value
2161	Analog speed torque	Changes the setting method of operating speed and torque limit.	0: Digital 1: Analog speed 2: Torque	1

■ When changing the setting method of acceleration time and deceleration time

Use the "Analog acceleration deceleration" parameter (ID: 2162).

Operation data	When the parameter is 0		When the parameter is 1	
	Acceleration time	Deceleration time	Acceleration time	Deceleration time
No.0 No.1	Digital setting	Digital setting	Analog setting	Analog setting
No.2 to No.15			Digital setting	Digital setting

Related parameter

ID	Parameter name	Description	Setting range	Initial value
2162	Analog acceleration deceleration	Changes the setting method of acceleration/ deceleration time.	0: Digital 1: Analog	1

■ Setting example

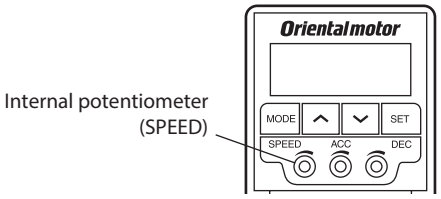
- When setting all operation data by the digital setting:
  Set the "Analog speed torque" parameter (ID: 2161) to 0.
  Set the "Analog acceleration deceleration" parameter (ID: 2162) to 0.
- When setting the operating speed for the operation data No.0 and No.1 by the analog setting and the acceleration/ deceleration time by the digital setting:
  Set the "Analog speed torque" parameter (ID: 2161) to 1.
  Set the "Analog acceleration deceleration" parameter (ID: 2162) to 0.

2.3 Setting the operating speed

Setting range: Analog setting 0 r/min or 30 to 4000 r/min
Digital setting 0 to 4000 r/min

■ Setting by the internal potentiometer

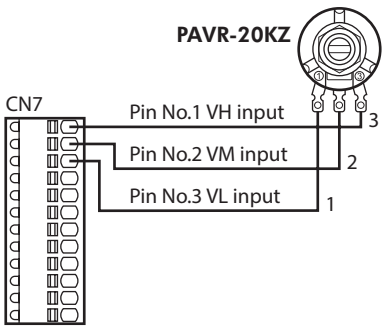
When using the internal potentiometer, set the "Analog speed torque" parameter (ID: 2161) to "1: Analog speed."
Turning the internal potentiometer (SPEED) in the clockwise direction with an insulated screwdriver will increase the speed.
Factory setting: 0 r/min



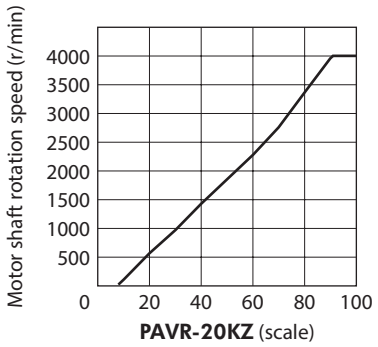
Note Be sure not to turn the internal potentiometer too much since it rotates lightly. Doing so may damage the product.

■ Setting by the external potentiometer (sold separately)

When using the **PAVR-20KZ** (sold separately), set the "Analog speed torque" parameter (ID: 2161) to "1: Analog speed." Also, turn the M0 input ON.
Turning the **PAVR-20KZ** (sold separately) in the clockwise direction will increase the speed.

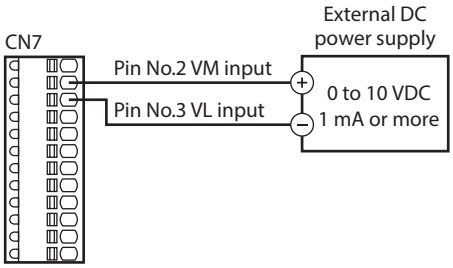


- **PAVR-20KZ** scale - Speed characteristics (representative value)

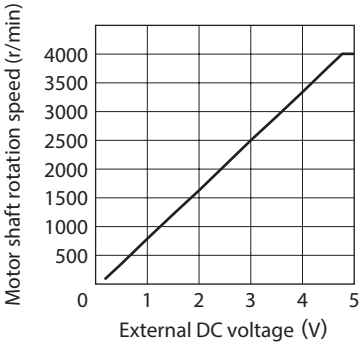


■ Setting by external DC voltage

When using external DC voltage, set the "Analog speed torque" parameter (ID: 2161) to "1: Analog speed."
Also, turn the M0 input ON.



- External DC voltage - Speed characteristics (representative values)



Note Be sure to use the external DC voltage at 10 VDC 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.

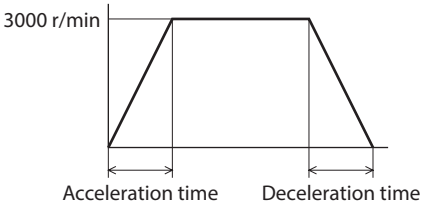
■ Digital setting by the operation panel

The operating speed of the operation data can be directly set with the operation panel. Set the "Analog speed torque" parameter (ID: 2161) to "0: Digital."

2.4 Setting the acceleration/deceleration time

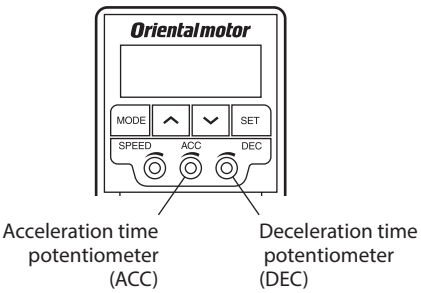
Setting range: Analog setting 0.1 to 30.0 s
Digital setting 0.000 to 30.000 s

The acceleration time refers to a time needed for the motor to reach the rated speed (3000 r/min) from the standstill state.
The deceleration time refers to a time needed for the motor to stop from the rated speed (3000 r/min).
The actual acceleration time and deceleration time vary depending on the conditions of use, load inertia, load torque, etc. If smooth acceleration or deceleration cannot be performed, reconsider the acceleration time or deceleration time.



■ Setting by the acceleration time potentiometer and deceleration time potentiometer

When using these potentiometers, set the "Analog acceleration deceleration" parameter (ID: 2162) to "1: Analog."
Turning the potentiometer in the clockwise direction with an insulated screwdriver will increase the time.
Factory setting: 0.1 s



Note Be sure not to turn the acceleration time potentiometer and deceleration time potentiometer too much since they rotate lightly. Doing so may damage the product.

■ Digital setting by the operation panel

The acceleration time and deceleration time of the operation data can be directly set with the operation panel. Set the "Analog acceleration deceleration" parameter (ID: 2162) to "0: Digital."

2.5 Setting the torque limit

The maximum output torque of the motor can be limited. Set when the motor torque is suppressed for safe uses or it is limited according to a load.
Setting range: 0 to 250%

This section explains how to set the torque limit by external DC voltage as an example.

Note The motor may not start operating with the set torque limiting value depending on variations in load torque, individual differences in motors, gearheads or drivers, as well as operating environment.
Set the torque limiting value with providing a margin of 20% or more as a guide.

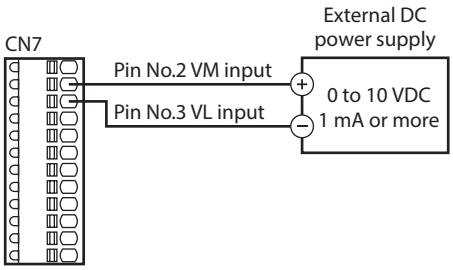
■ Assignment of the TL input

When the TL input is assigned to any of the input terminals, the torque will be limited by the ON-OFF status of the TL input.
When the TL input is ON: The torque limiting function is enabled, and the maximum output torque of the motor is limited.
When the TL input is OFF: The torque limiting function is disabled, and the maximum output torque of the motor is the peak torque.

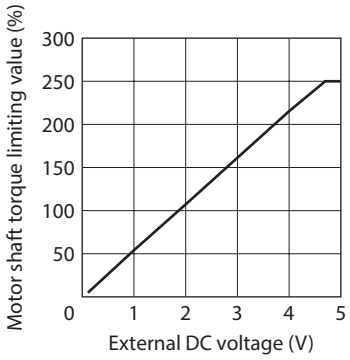
Note When the TL input is not assigned to the input terminal, this input will be always set to ON. If the TL input is assigned to multiple input terminals, the function will be performed when all of the terminals are turned ON.

■ Setting by external DC voltage

When using external DC voltage, set the "Analog speed torque" parameter (ID: 2161) to "2: Torque."



- External DC voltage - Torque limiting characteristics (representative values)



Note Be sure to use the external DC voltage at 10 VDC 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.

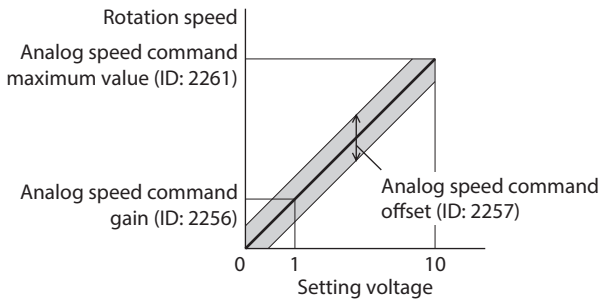
2.6 Gain adjustment and offset adjustment for analog external setting device

If parameters are adjusted when the operating speed or the torque limiting value is set using an analog external setting device, the slope of the speed command or the offset can be changed.

Note For the operating speed and the torque limiting value, an amount of variation with respect to the setting voltage varies depending on a product.

■ Gain adjustment and offset adjustment for operating speed

Adjust using the following parameters.

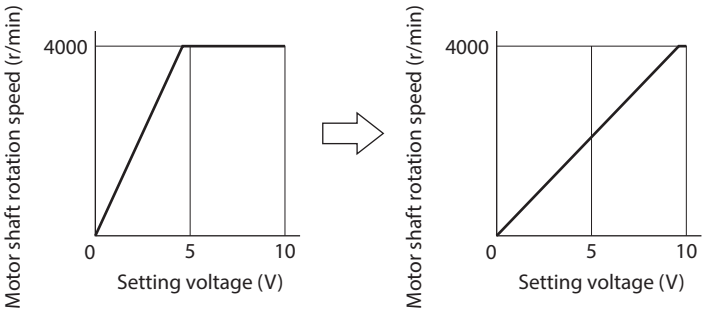


- Related parameters

ID	Parameter name	Description	Setting range	Initial value
2256	Analog speed command gain	Sets the speed command per 1 VDC of the input voltage by the analog external setting device.	0 to 4000 r/min/V	850
2257	Analog speed command offset	Sets the offset of the speed command input by the analog external setting device.	–2000 to +2000 r/min	0
2261	Analog speed command maximum value	Sets the maximum value of the operating speed by the analog external setting device.	0 to 4000 r/min	4000

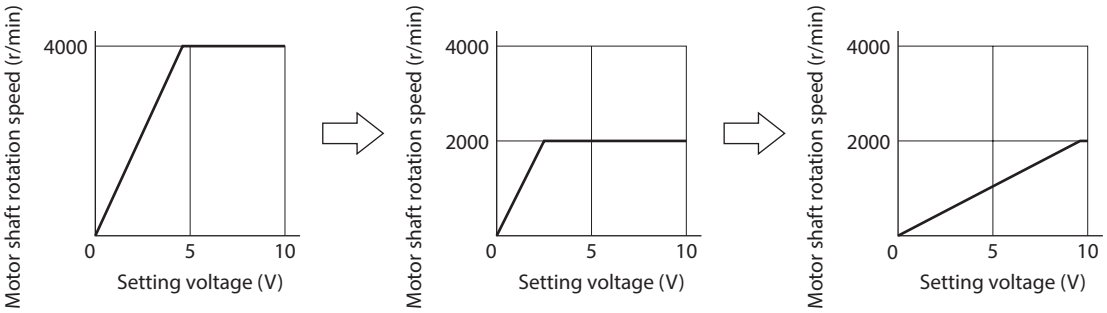
- Setting example 1:
  When the motor is operated linearly by setting the maximum rotation speed to 4000 r/min using the external DC voltage of 0 to 10 VDC

  Set the "Analog speed command gain" parameter (ID: 2256) to 425.



- Setting example 2:
  When the motor is operated linearly by setting the maximum rotation speed to 2000 r/min using the external DC voltage of 0 to 10 VDC

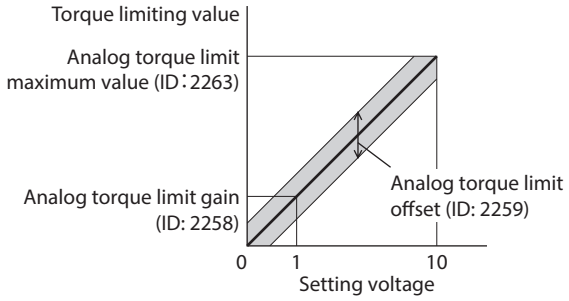
  Set the "Analog speed command maximum value" parameter (ID: 2261) to 2000 first, and set the "Analog speed command gain" parameter (ID: 2256) to 213.



Refer to "How to adjust the speed difference" on p.112 for how to use the "Analog speed command offset" parameter (ID: 2257).

■ Gain adjustment and offset adjustment for torque limiting value

Adjust using the following parameters.

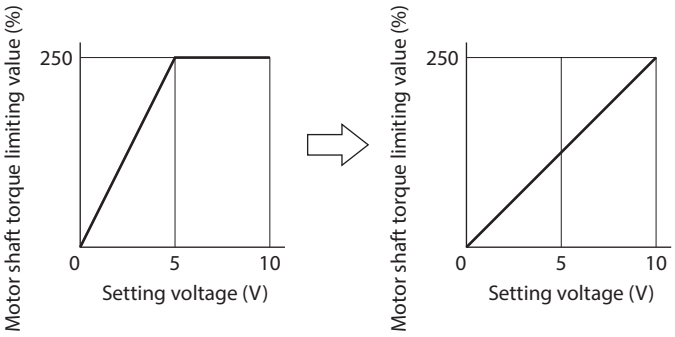


- Related parameters

ID	Parameter name	Description	Setting range	Initial value
2258	Analog torque limit gain	Sets the torque limiting value per 1 VDC of the input voltage by the analog external setting device.	0 to 250%/V	54
2259	Analog torque limit offset	Sets the offset of the torque limiting input by the analog external setting device.	−50 to +50%	0
2263	Analog torque limit maximum value	Sets the maximum value of the torque limit by the analog external setting device.	0 to 250%	250

- Setting example:
  When adjusting the torque limiting value up to 250% using the external DC voltage of 0 to 10 VDC

  Set the "Analog torque limit gain" parameter (ID: 2258) to 27.



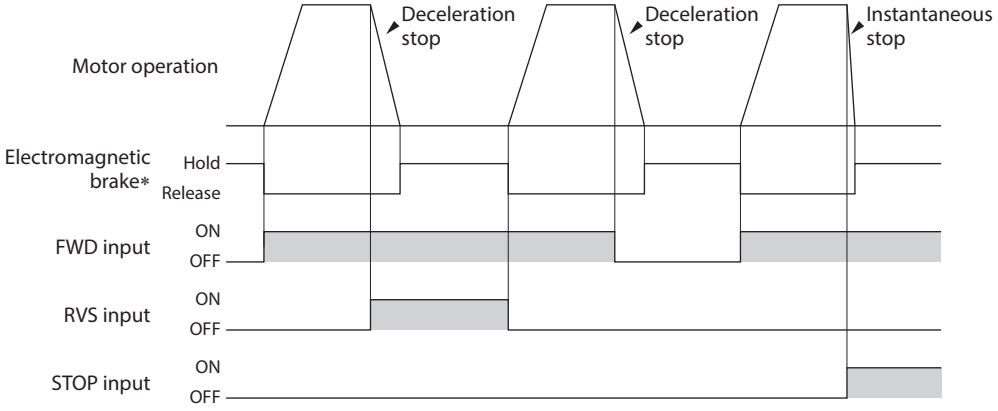
3 Operation

The motor operation can be started or stopped by inputting signals to control operation.

3.1 Start operation and stop operation

■ Start operation

When the FWD input is turned ON, the motor rotates in the forward direction. When it is turned OFF, the motor stops.
When the RVS input is turned ON, the motor rotates in the reverse direction. When it is turned OFF, the motor stops.
If both the FWD and RVS inputs are turned ON, the motor decelerates to a stop.
If the STOP input is turned ON while operating the motor, the motor will stop instantaneously. The stopping method can be changed by the "STOP input action" parameter (ID: 256).



* When the electromagnetic brake motor is used

■ Stop operation

When the STOP input is turned ON, the motor stops according to the setting of the "STOP input action" parameter.
If the "Operation selection after stopping" parameter (ID: 2069) is set to 0, either of "immediate stop" or "deceleration stop" can be selected. And if it is set to 1, the holding force is generated when the motor stops (excitation ON).

Related parameters

ID	Parameter name	Description	Setting range	Initial value
256	STOP input action	Sets how to stop the motor when the STOP input is turned ON.	0: Immediate stop 1: Deceleration stop 2: Immediate stop + current OFF 3: Deceleration stop + current OFF	0
2069	Operation selection after stopping	Uses in the speed control mode. If the holding force is required to generate while the motor stops, set this parameter to "1" to enable the servo lock.	0: Free (disable servo lock) 1: Servo lock	0

Note The "Operation selection after stopping" parameter will be enabled after the power is turned on again.

3.2 Rotation direction

■ 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 rotation direction can be changed by the parameter.

Related parameter

ID	Parameter name	Description	Setting range	Initial value
450	Motor rotation direction	Sets the motor rotation direction of the motor output shaft.	0: Positive direction=CCW 1: Positive direction=CW	1

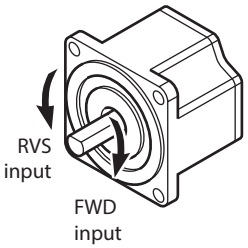
Note The "Motor rotation direction" parameter will be enabled after the power is turned on again.

■ Rotation direction of the gearhead output shaft

The rotation direction for the FWD input and RVS input shown here is the initial value of the "Motor rotation direction" parameter.

- Combination type-parallel shaft gearhead

The rotation direction of the gearhead output shaft may vary with that of the motor output shaft depending on the gear ratio of the gearhead.

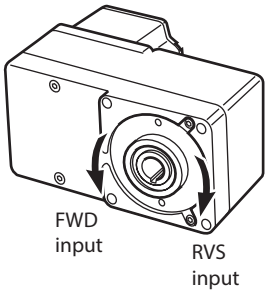


Model	Gear Ratio	Rotation direction of the gearhead output shaft
BXM230 **BXM460** **BXM5120**	**5**, **10**, **15**, **20**, **200**	Same as the motor output shaft
	30, **50**, **100**	Opposite to the motor output shaft
BXM6200 **BXM6400**	**5**, **10**, **15**, **20**, **100**, **200**	Same as the motor output shaft
	30, **50**	Opposite to the motor output shaft

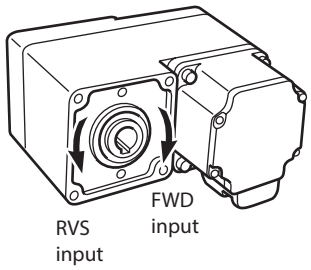
- Combination type-hollow shaft flat gearhead

For all gear ratios, the output shaft of the gearhead rotates in the opposite direction to that of the motor.
The rotation direction is different depending on whether the pre-assembled motor/gearhead is viewed from the front side or rear side.

Viewed from front side

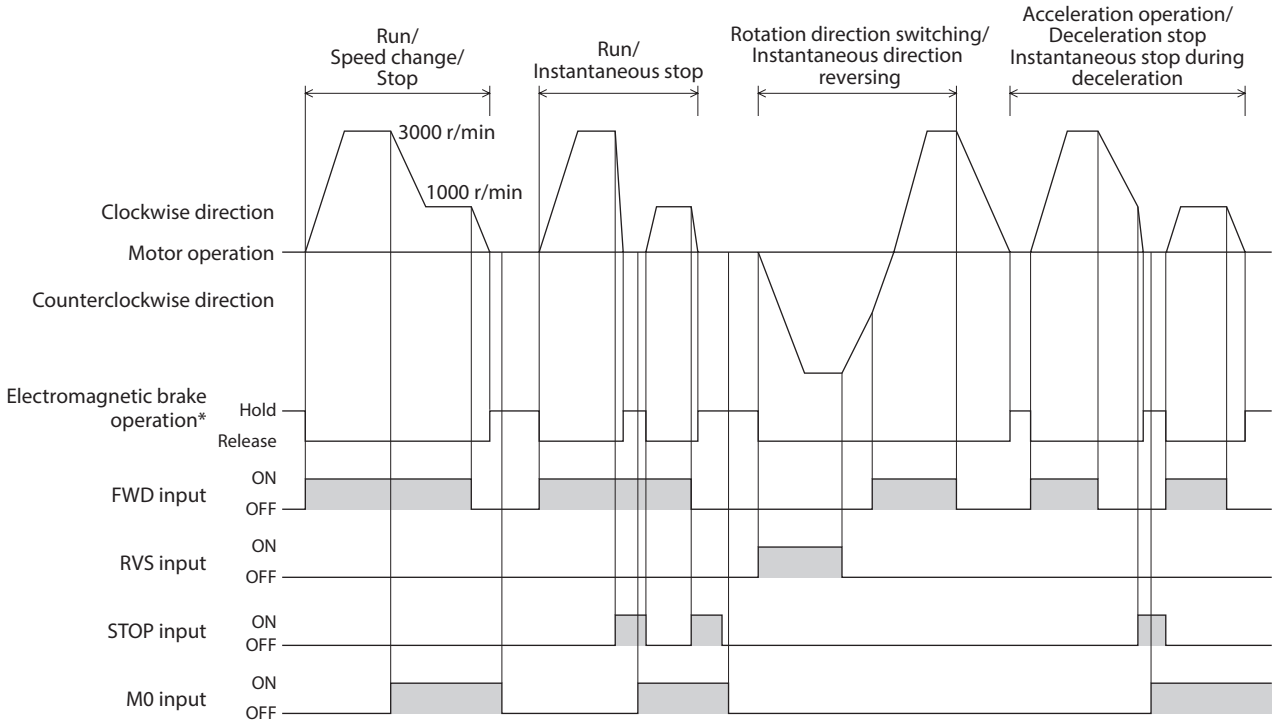


Viewed from rear side



3.3 Example of operation pattern

The figure below is an example when setting the internal potentiometer to 3000 r/min and external DC voltage to 1000 r/min and switching the speed between these two levels.
The rotation direction for the FWD input and RVS input shown here is the initial value of the "Motor rotation direction" parameter (ID: 450).



∗ When the electromagnetic brake motor is used

Note

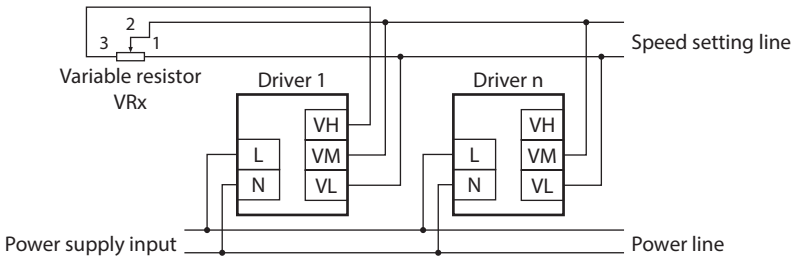
- Make sure each signal remains ON for at least 10 ms.
- When switching between the FWD input and the RVS input, provide an interval of at least 10 ms.

3.4 Multi-motor control

Multiple motors can be operated at the same speed using a single variable resistor or external DC voltage.
A connection example shown below applies to products for the single-phase specifications. In the case of products for the three-phase specifications, connect the power supply line to three-phase power supply.
Connections of motors and I/O signals are omitted in the figure.

■ When using a variable resistor

Connect the drivers as shown below. When using a variable resistor, operate products of 20 units or less.



Calculation method of resistance (VRx) when the number of drivers is n

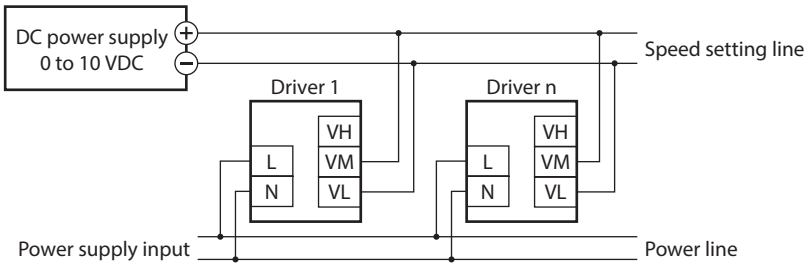
Resistance (VRx) = 20/n (kΩ), n/4 (W)

Example: If two drivers are used

Resistance (VRx) = 20/2 (kΩ), 2/4 (W) The resistance (VRx) is calculated as 10 kΩ, 1/2 W.

■ When using external DC voltage

Connect the drivers as shown below.



Calculation method of current capacity (I) of external DC power supply when the number of drivers is n

Current capacity (I) = 1 × n (mA)

Example: If two drivers are used

Current capacity (I) = 1 × 2 (mA) The current capacity (I) is calculated as 2 mA or more.

■ How to adjust the speed difference

To adjust the speed difference among the first motor and the second and subsequent motors, change the parameter or connect a resistor to adjust.

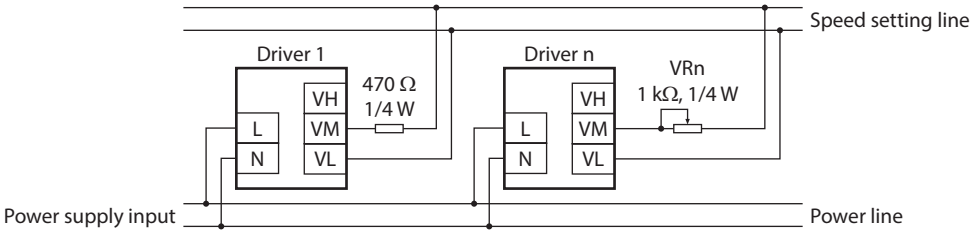
- Adjustment by the parameter

The speed difference can be adjusted by changing the "Analog speed command gain" parameter (ID: 2256) and "Analog speed command offset" parameter (ID: 2257) for the second and subsequent drivers. This section explains how to adjust by the "Analog speed command offset" parameter. Refer to p.106 for details.

- When the speed of the second motor is slower than that of the first motor:
  Set the offset value to rotate faster (positive side) by the "Analog speed command offset" parameter.
- When the speed of the second motor is faster than that of the first motor:
  Set the offset value to rotate slower (negative side) by the "Analog speed command offset" parameter.

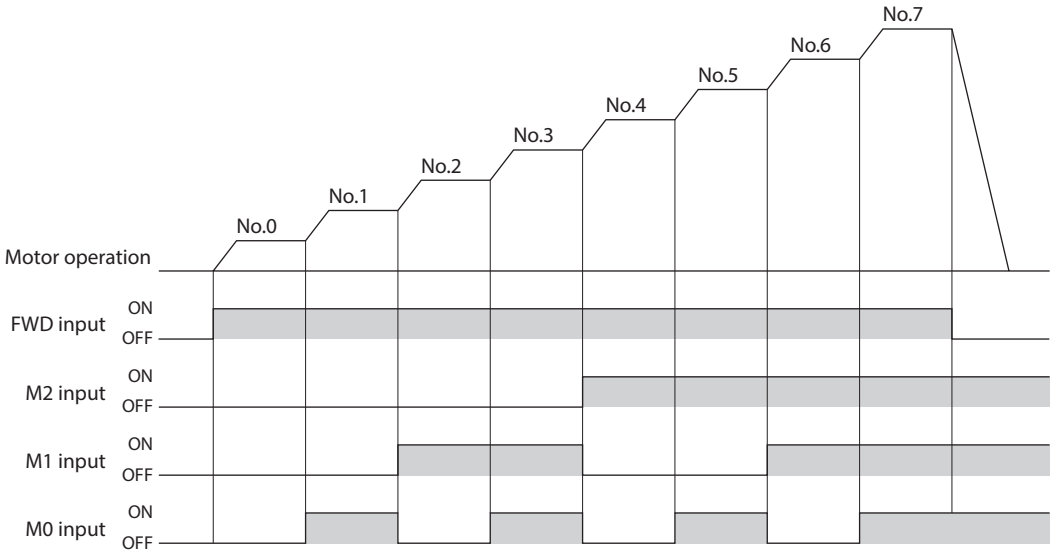
- Adjustment by a resistor

Connect a resistor of 470 Ω, 1/4 W to the terminal VM on the driver 1 and connect a variable resistor VRn of 1 kΩ 1/4 W to the driver 2 and subsequent drivers.



3.5 Multi-speed operation

When assigning the M0 to M3 inputs to the CN5 input terminals, the variable-speed operation of the motor can be performed using maximum 16 operation data.
This section shows an example in which variable-speed operation is performed with eight operation data using the M0 to M2 inputs.
Refer to the table below for a combination of the M0 to M3 inputs and how to select the operating data.



Combination of the M0 to M3 inputs and operation data

Operation data No.	M3	M2	M1	M0
0	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	OFF	OFF	ON	ON
4	OFF	ON	OFF	OFF
5	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF
7	OFF	ON	ON	ON
8	ON	OFF	OFF	OFF
9	ON	OFF	OFF	ON
10	ON	OFF	ON	OFF
11	ON	OFF	ON	ON
12	ON	ON	OFF	OFF
13	ON	ON	OFF	ON
14	ON	ON	ON	OFF
15	ON	ON	ON	ON

6 Operation in position control mode

This part explains how to operate in the position control mode.

Table of contents

1 Overview of position control mode

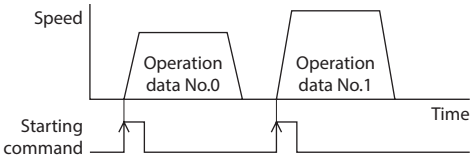
Operation

【Setting with operation data and parameters】

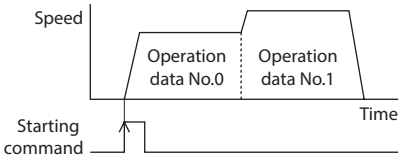
Positioning operation

Operation function

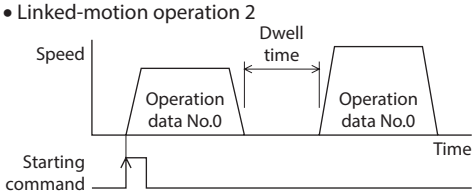
• Single-motion operation



• Linked-motion operation



• Linked-motion operation 2



+

Operation method

- Operation data selection
- Direct positioning
- Sequential positioning

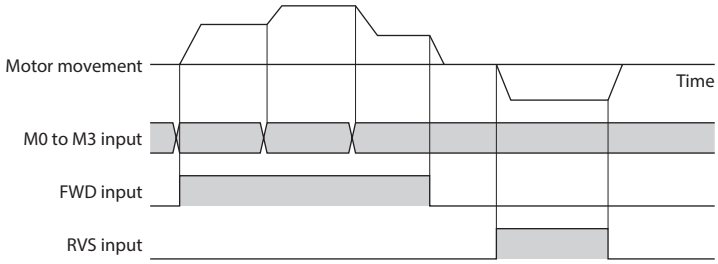
Return-to-home operation

- Return-to-home operation
- Position preset

Other operations

- JOG operation
- Test operation

Continuous operation



Function

【Setting with parameters】

- I/O
  - Operation when inputting the STOP signal
  - Overtravel
  - Direct positioning
- Operation function
  - JOG operation
  - Speed reduction ratio/speed increasing ratio
  - Continuous operation
- Coordinate setting
  - Wrap function
  - Motor rotation direction
  - Software limit
  - Preset position
- Return-to-home function
  - Position offset
  - Return-to-home speed
  - Return-to-home starting direction
- Motor function
  - Position loop gain
  - Speed loop gain
  - Speed loop integral time constant
  - Speed filter
  - Moving average filter
- Alarm/warning
  - Alarm detection
  - Warning detection
- I/O function
  - Input function
  - Input logic level
  - Output function

When "oP- 1" is displayed on the operation panel

If the operation data number is checked immediately when the power supply is turned on in a state where the position control mode is set, "oP- 1" will be displayed. In addition, if the operation data number is checked by executing the following operation, "oP- 1" will be displayed.

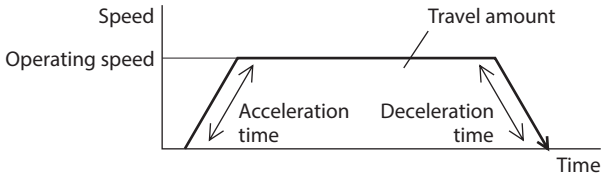
- While return-to-home operation, continuous operation, or JOG operation is being executed
- When an alarm was generated and reset
- When an operation was stopped by the BRAKE(STOP) input
- When the motor excitation was turned off by the FREE input or the S-ON input
- When the position preset was executed

2 Positioning operation

This chapter explains positioning operation that is executed with setting the motor operating speed, position (travel amount), operation function, and other items to operation data. When positioning operation is executed, the motor starts rotating and accelerates until the operating speed is reached. Once it reaches the operating speed, the speed is maintained. Then, it decelerates when the stopping position is approached, and finally comes to a stop.
The operation function refers to a method to execute positioning operation. Positioning operation can be executed using a single operation data and can also be executed by linking multiple continuous operation data.

2.1 Operation data

Operation data can be set up to 16 data (operation data No.0 to No.15), and it is set using any of the operation panel, **MEXE02**, or **OPX-2A** (sold separately).
The following data is required for positioning operation.



Item	Description	Setting range	Initial value
Position	Sets the position (travel amount) for positioning operation. The motor shaft rotates by 0.72° per one step.	−8,388,608 to +8,388,607 steps	0
Operating speed∗1	Sets the operating speed for positioning operation. Set as the rotation speed of the motor output shaft.	0 to 4000 r/min	0
Operation mode	Sets how to specify the position (travel amount) for positioning operation.	0: Incremental 1: Absolute	0
Operation function	Sets the operation method to execute positioning operation.	0: Single-motion 1: Linked-motion 2: Linked-motion 2	0
Acceleration time∗1	Sets the acceleration time for positioning operation. The acceleration time is set as a time needed for the motor to reach the rated rotation speed (3000 r/min) from the standstill state.	0.000 to 30.000 s	0.100
Deceleration time∗1	Sets the deceleration time for positioning operation. The deceleration time is set as a time needed for the motor to stop from the rated rotation speed (3000 r/min).		
Torque limit∗2	Sets when limiting the motor output torque. The peak torque can be set based on the rated torque being 100%.	0 to 250%	250
Sequential positioning	Sets whether to enable or disable sequential positioning operation.	0: Disable 1: Enable	0
Dwell time	Sets the waiting time at standstill between the first operation data and the second operation data in linked-motion operation 2.	0.000 to 50.000 s	0.000

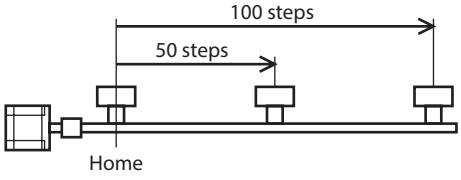
∗1 These items are set by the digital setting.
∗2 The torque limit can be changed to the analog setting by the "Analog speed torque" parameter (ID: 2161).
Refer to p.98 for details.

■ Operation mode

There are the following two types in the operation mode.

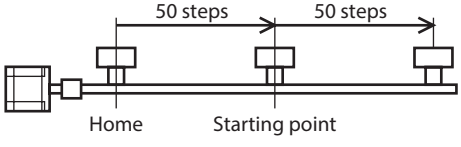
- Absolute mode (ABS)

The position (travel amount) from the home is set [Absolute positioning].



- Incremental mode (INC)

Each motor destination becomes the starting point for the next movement. This mode is suitable when the same position (travel amount) is repeatedly used [Incremental positioning].



■ Operation function, dwell time

There are the following three types in the operation function.

Item	Description	Ref.
Single-motion operation	A single operation data set is used to execute positioning operation.	p.122
Linked-motion operation	Multiple sets of operation data are linked to execute multi-speed positioning operation.	p.123
Linked-motion operation 2	Dwell time refers to a waiting time at standstill between the present operation data and the next operation data. Multiple operation data of different directions can also be linked.	p.124

2.2 Starting method of positioning operation

There are the following three starting methods.

Item	Description
Operation data number selection mode	Turning the START input ON while selecting the operation data number with the M0 to M3 inputs executes positioning operation.
Direct positioning	Turning any of the MS0 to MS5 inputs ON executes positioning operation of the operation data number corresponding to the input signal.
Sequential positioning	Positioning operation is executed to the next operation data number every time the SSTART input signal is input.

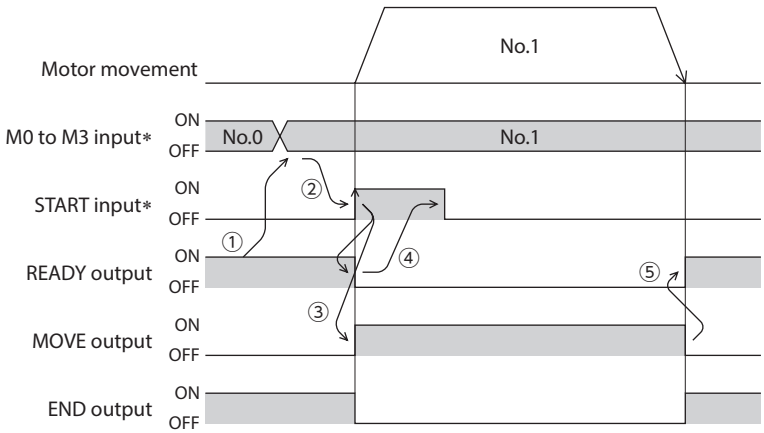
■ Operation data number selection mode

Select the operation data based on a combination of ON-OFF status of the M0 to M3 inputs. Refer to p.56 for details.

Operation data No.	M3	M2	M1	M0
0	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
. . .	. . .	. . .	. . .	. . .
13	ON	ON	OFF	ON
14	ON	ON	ON	OFF
15	ON	ON	ON	ON

Operating method

1) Check the READY output is being ON.
2) Select the operation data number using the M0 to M3 inputs, and turn the START input ON.
3) The motor starts positioning operation.
4) Check the READY output has been turned OFF and turn the START input OFF.
5) When the positioning operation is completed, the READY output is turned ON.



* After setting the M0 to M3 inputs, wait at least 10 ms before turning the START input ON.

■ Direct positioning

When any of the MS0 to MS5 inputs is turned ON, positioning operation of the operation data number corresponding to the input signal is performed. Since positioning operation can be performed by turning any of the MS0 to MS5 inputs ON, the steps of selecting the operation data number can be saved. Set the operation data assigning the MS0 to MS5 inputs with parameters.

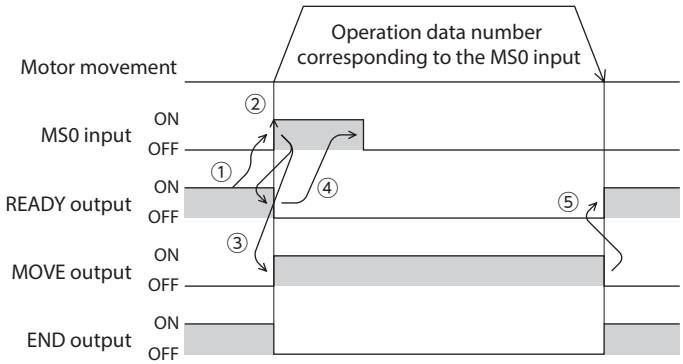
Note In the case of torque limit, the torque limiting value in the operation data number selected by the M0 to M3 inputs will be applied.

Related parameters

ID	Item	Description	Setting range	Initial value
2048	MS0 operation number selection	Sets the operation data number corresponding to the MS0 to MS5 inputs.	0 to 15	0
2049	MS1 operation number selection			1
2050	MS2 operation number selection			2
2051	MS3 operation number selection			3
2052	MS4 operation number selection			4
2053	MS5 operation number selection			5

Operating method

1) Check the READY output is being ON.
2) Turn the MS0 input ON.
3) The motor starts positioning operation.
4) Check the READY output has been turned OFF and turn the MS0 input OFF.
5) When the positioning operation is completed, the READY output is turned ON.



■ Sequential positioning operation

In sequential positioning operation, positioning operation based on the next operation data number is executed every time the SSTART input is turned ON. This function is useful when multiple positioning operations are performed sequentially because there is no need to repeatedly select each operation data number.
Sequential positioning operation is started. When the operation reaches the operation data number that "Disable" is set in the "Sequential positioning" of operation data, it returns to the first data number selected, and sequential positioning operation is started again.
If the starting point for sequential positioning operation is changed using the M0 to M3 inputs or the MS0 to MS5 inputs, sequential positioning operation with multiple patterns can be set. This is useful when setting a different operation pattern for each load.

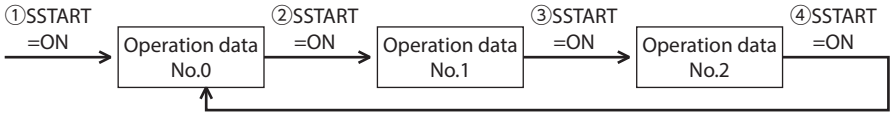
Note In the case of torque limit, the torque limiting value in the operation data number selected by the M0 to M3 inputs will be applied.

- One type of operation pattern

1) Turning the SSTART input ON executes positioning operation of the operation data No.0.
2) After the operation 1) is completed, turning the SSTART input ON again executes positioning operation of the operation data No.1.
3) After the operation 2) is completed, turning the SSTART input ON again executes positioning operation of the operation data No.2.
4) After the operation 3) is completed, when turning the SSTART input ON again, the operation will return to the operation data No.0 to perform positioning operation because the sequential positioning of the operation data No.3 is set to "Disable."

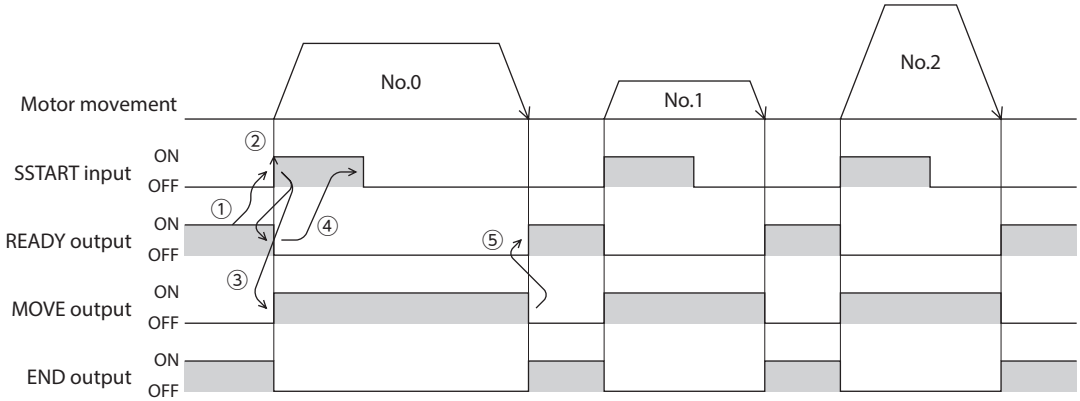
• Setting example

Operation data	Sequential positioning
No.0	Enable
No.1	
No.2	
No.3	Disable



• Operating method

1) Check the READY output is being ON.
2) Turn the SSTART input ON.
3) The motor starts positioning operation.
4) Check the READY output has been turned OFF and turn the SSTART input OFF.
5) When the positioning operation is completed, the READY output is turned ON.
6) 1) to 5) is repeated.

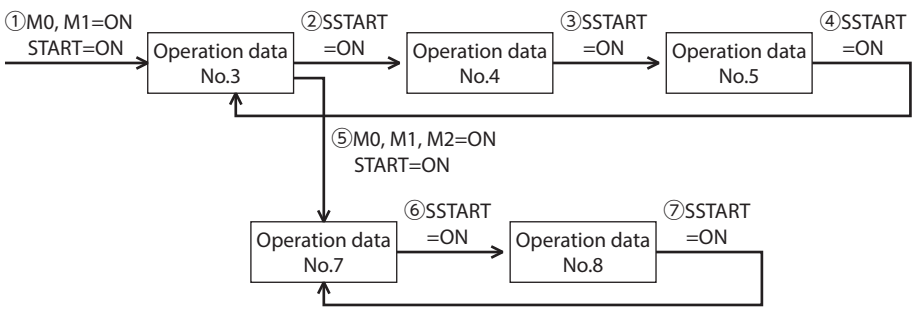


• Multiple types of operation patterns

1) Selecting the operation data No.3 that is the starting point of sequential positioning and turning the START input ON executes positioning operation.
2) After the operation 1) is completed, turning the SSTART input ON again executes positioning operation of the operation data No.4.
3) After the operation 2) is completed, turning the SSTART input ON again executes positioning operation of the operation data No.5.
4) After the operation 3) is completed, when turning the SSTART input ON again, the operation will return to the operation data No.3 to perform positioning operation because the sequential positioning of the operation data No.6 is set to "Disable."
5) After the operation 4) is completed, selecting the operation data No.7 and turning the START input ON executes positioning operation.
   The operation data No.7 will become the new starting point of sequential positioning operation.
6) After the operation 5) is completed, turning the SSTART input ON again executes positioning operation of the operation data No.8.
7) After the operation 6) is completed, when turning the SSTART input ON again, the operation will return to the operation data No.7 to perform positioning operation because the sequential positioning of the operation data No.9 is set to "Disable."

• Setting example

Operation data	Sequential positioning
No.3	Enable
No.4	
No.5	
No.6	Disable
No.7	Enable
No.8	
No.9	Disable



- Notes about sequential positioning operation

If the following operations are performed while sequential positioning operation is executed, the starting point of the sequential positioning operation will be changed to the operation No.0.
And the present operation data number will be set to "−1."

- When the power supply was turned on
- When any of operations other than positioning operation was executed
- When an alarm was generated and reset
- When the BRAKE (STOP) input was turned ON
- When a command to turn off the motor excitation, such as the FREE input or S-ON input, was input
- When the position preset was executed

Note When sequential positioning operation of the operation data which "Operation function" is set to "Linked-motion" or "Linked-motion 2" is performed, set the "Sequential positioning" to "Enable."

2.3 Operation function

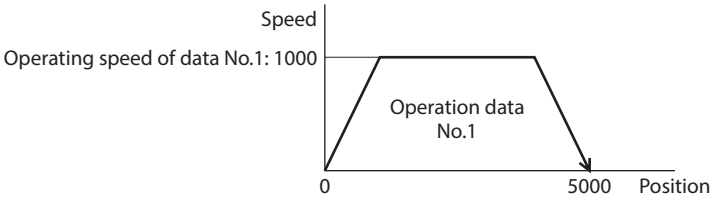
■ Single-motion operation

Positioning operation is executed only once using a single operation data set.

- Example of single-motion operation

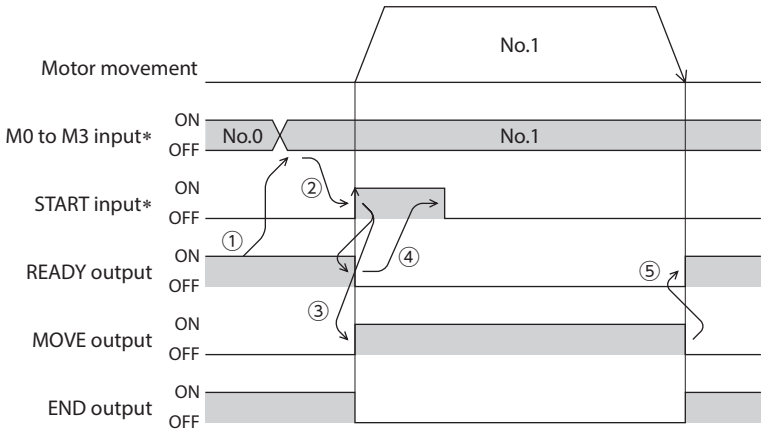
Operation data	Position	Operating speed	Operation mode	Operation function	Acceleration time	Deceleration time	Torque limit
No.1	5000	1000	INC	Single-motion	1.000	1.000	250

Operation image



Operating method

1) Check the READY output is being ON.
2) Turn the M0 input ON to select the operation data No.1, and turn the START input ON.
3) The motor starts positioning operation of the operation data No.1.
4) Check the READY output has been turned OFF and turn the START input OFF.
5) When the positioning operation is completed, the READY output is turned ON.



* After setting the M0 to M3 inputs, wait at least 10 ms before turning the START input ON.

■ Linked-motion operation

When the operation function of operation data is set to "Linked-motion," positioning operation based on the next data number is continuously executed without stopping the motor.
If there is an operation data for which "Single-motion" is set, the motor will stop after the positioning operation with respect to the operation data of "Single-motion" is completed.
Note that up to four sets of operation data can be linked and only operation data of the same direction can be linked.

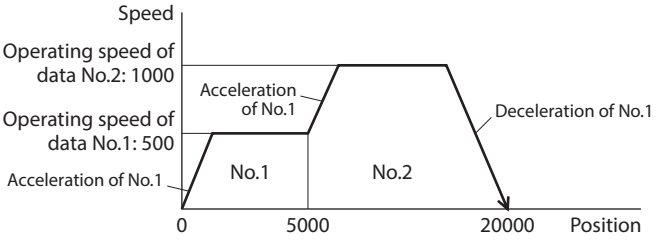
Note

- Multiple operation data of different directions cannot be linked. An alarm of the abnormal operation data will be generated when operated.
- Up to four sets of operation data can be linked. When combining the linked-motion operation and the linked-motion operation 2, make sure the total number of linked operation data sets does not exceed four sets. When linked-motion operation is performed with five or more sets of operation data linked together, an alarm of the abnormal operation data will be generated when the operation is executed.
- Even if "Linked-motion" is set in the data No.15, No.0 will not be linked. The operation pertaining to No.15 will be processed independently.
- The acceleration/deceleration in linked-motion operation corresponds to the acceleration/deceleration specified to the operation data number with which the linked-motion operation is started.
- For the torque limit of linked-motion operation, the torque limiting value in the operation data number (selecting by the M0 to M3 inputs) that the linked-motion operation was started will be applied. However, if the M0 to M3 inputs are switched while operating the motor, the torque limiting value will be changed to the value in the operation data number that is selected by the M0 to M3 inputs.

- Example of linked-motion operation

Operation data	Position	Operating speed	Operation mode	Operation function	Acceleration time	Deceleration time
No.1	5000	500	INC	Linked-motion	1.000	1.000
No.2	20000	1000	INC	Single-motion	Not applied	Not applied

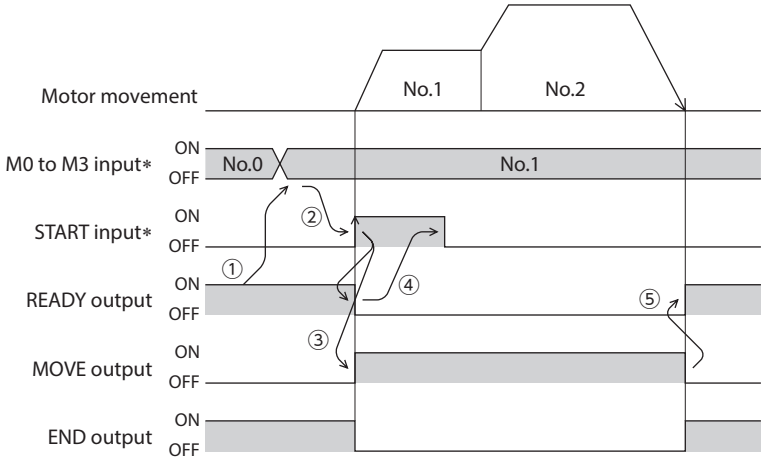
Operation image



Torque limit
The torque limiting value in the operation data number selected by the M0 to M3 inputs will be applied.

Operating method

1) Check the READY output is being ON.
2) Turn the M0 input ON to select the operation data No.1, and turn the START input ON.
3) The motor starts positioning operation that the operation data No.1 and No.2 are linked.
4) Check the READY output has been turned OFF and turn the START input OFF.
5) When the positioning operation is completed, the READY output is turned ON.



* After setting the M0 to M3 inputs, wait at least 10 ms before turning the START input ON.

■ Linked-motion operation 2

When the operation function of operation data is set to "Linked-motion 2," operation data whose rotation direction is different can be linked. In this case, the motor stops for the dwell time after each positioning operation is completed, and operates according to the next operation data. If there is an operation data for which "Single-motion" is set, the motor will stop after the positioning operation with respect to the operation data of "Single-motion" is completed.

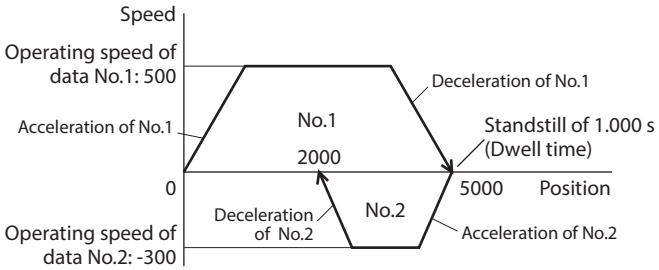
Note

- Up to four sets of operation data can be linked. When combining the linked-motion operation and the linked-motion operation 2, make sure the total number of linked operation data sets does not exceed four sets. When linked-motion operation is performed with five or more sets of operation data linked together, an alarm of the abnormal operation data will be generated when the operation is executed.
- Even if "Linked-motion 2" is set in the data No.15, No.0 will not be linked. The operation pertaining to No.15 will be processed independently.
- For the torque limit of linked-motion operation, the torque limiting value in the operation data number (selecting by the M0 to M3 inputs) that the linked-motion operation was started will be applied. However, if the M0 to M3 inputs are switched while operating the motor, the torque limiting value will be changed to the value in the operation data number that is selected by the M0 to M3 inputs.

- Example of linked-motion operation 2

Operation data	Position	Operating speed	Operation mode	Operation function	Acceleration time	Deceleration time	Dwell time
No.1	5000	500	INC	Linked-motion 2	1.000	1.000	1.000
No.2	−3000	300	INC	Single-motion	1.000	1.000	Not used

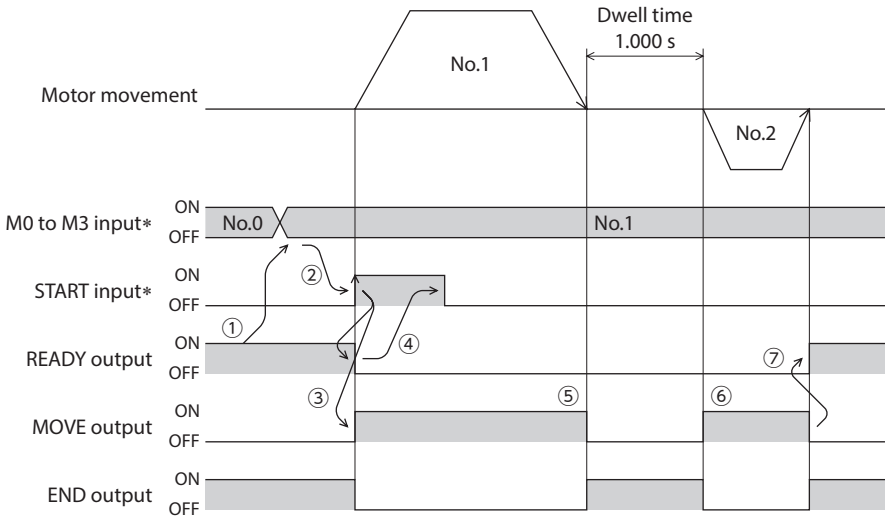
Operation image



Torque limit
The torque limiting value in the operation data number selected by the M0 to M3 inputs will be applied.

Operating method

1) Check the READY output is being ON.
2) Turn the M0 input ON to select the operation data No.1, and turn the START input ON.
3) The motor starts positioning operation of the operation data No.1.
4) Check the READY output has been turned OFF and turn the START input OFF.
5) When the positioning operation 3) is completed, the MOVE output is turned OFF.
6) When the dwell time has been passed, positioning operation of the operation data No.2 is automatically started. The MOVE output is simultaneously turned ON.
7) When the positioning operation of the operation data No.2 is completed, the READY output is turned ON.

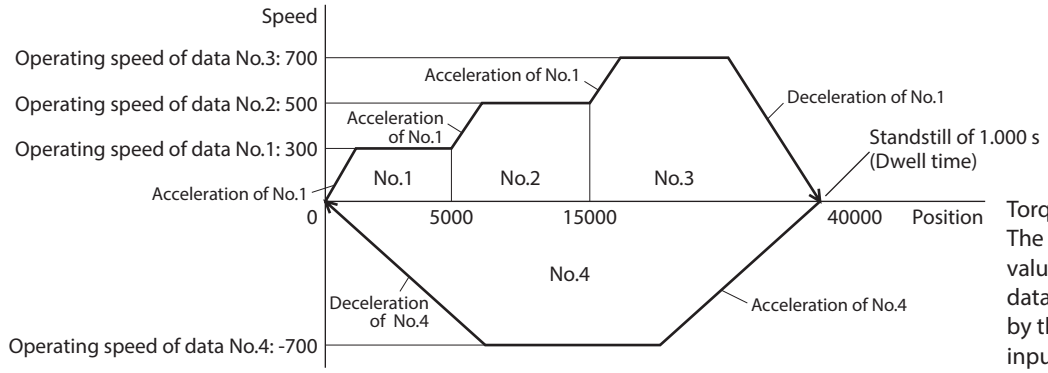


* After setting the M0 to M3 inputs, wait at least 10 ms before turning the START input ON.

- Example of linked-motion operation 2: When combining the linked-motion operation and the linked-motion operation 2

Operation data	Position	Operating speed	Operation mode	Operation function	Acceleration time	Deceleration time	Dwell time
No.1	5000	300	INC	Linked-motion	1.000	1.000	Not used
No.2	10000	500	INC	Linked-motion	Not applied	Not applied	Not used
No.3	25000	700	INC	Linked-motion 2	Not applied	Not applied	1.000
No.4	0	700	ABS	Single-motion	2.000	2.000	Not used

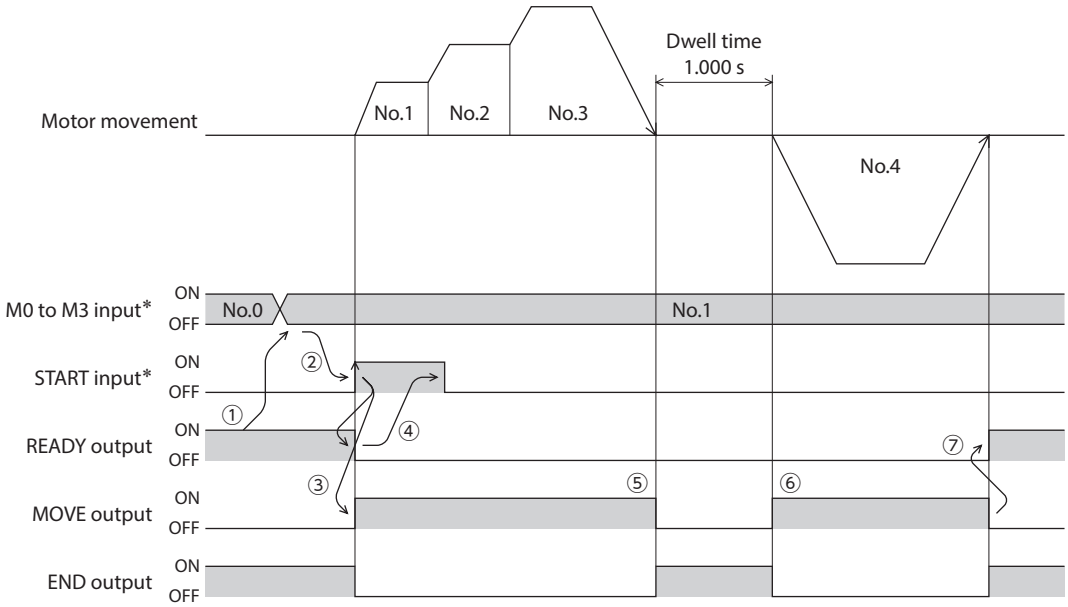
Operation image



Torque limit
The torque limiting value in the operation data number selected by the M0 to M3 inputs will be applied.

Operating method

1) Check the READY output is being ON.
2) Turn the M0 input ON to select the operation data No.1, and turn the START input ON.
3) The motor starts positioning operation that the operation data No.1 to No.3 are linked.
4) Check the READY output has been turned OFF and turn the START input OFF.
5) When the positioning operation 3) is completed, the MOVE output is turned OFF.
6) When the dwell time has been passed, positioning operation of the operation data No.4 is automatically started. The MOVE output is simultaneously turned ON.
7) When the positioning operation of the operation data No.4 is completed, the READY output is turned ON.



* After setting the M0 to M3 inputs, wait at least 10 ms before turning the START input ON.

3 Return-to-home operation

This chapter explains return-to-home operation to set the position (home) that becomes the starting point when positioning operation is performed.
Execute when returning the motor position to the home at the time of turning on the power supply or completing positioning operation.

3.1 Return-to-home operation types

For return-to-home operation, two types such as the 1-sensor mode and the position preset are available.

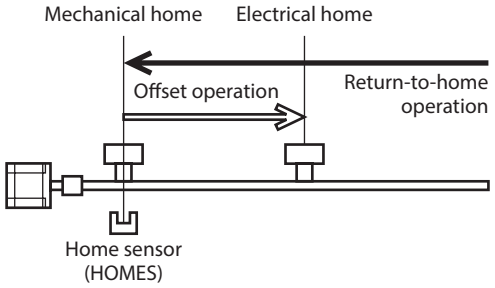
Item	Description	Features
1-sensor mode	Operates at the speed of return-to-home operation. The motor stops when the ON edge of the HOME sensor is detected and the position at which the motor stopped will become the home.	• A sensor is required externally.
Position preset	If the position preset is executed at the position where the motor stops, the command position (present position) will be the value of the "Preset position" parameter (ID: 454). The home can also be set as desired.	• An external sensor is not required. • A desired position can be set to the home.

3.2 Additional function

Item	1-sensor mode	Position preset	Related parameter
Position offset	Possible	Not possible	Position offset of home-seeking (ID: 356)
Command position after return-to-home operation	Becomes 0	Desired position	Preset position (ID: 454)

■ Position offset

This is a function that performs positioning operation of the offset value set in the parameter after return-to-home operation and sets the stopped position as the home.
The home set by the position offset is called "electrical home" in distinction from the home in normal cases.
If the value of the position offset is 0, the electrical home and mechanical home will become the same position.



■ Command position after return-to-home operation

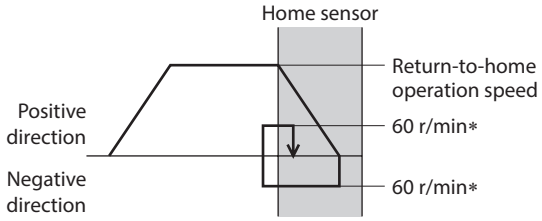
If the position preset is executed at the position where the motor stops, the command position (present position) will be the value of the "Preset position" parameter (ID: 454).

3.3 Parameters for return-to-home operation

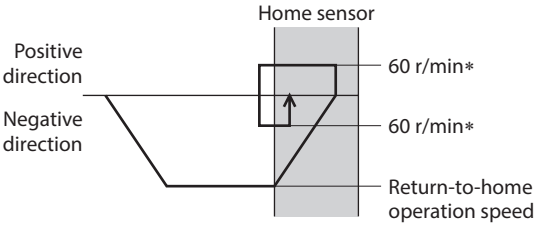
ID	Parameter name	Description	Setting range	Initial value
353	Operating speed of home-seeking	Sets the operating speed for return-to-home operation.	0 to 4000 r/min	300
354	Acceleration/deceleration of home-seeking	Sets the acceleration/deceleration time for return-to-home operation.	0.000 to 30.000 s	0.100
356	Position offset of home-seeking	Sets the amount of offset from the home. The motor shaft rotates by 0.72° per one step.	−8,388,608 to +8,388,607 steps	0
357	Starting direction of home-seeking	Sets the starting direction for home detection.	0: Negative direction 1: Positive direction	1

3.4 Operation image

• Starting direction of return-to-home operation: Positive direction



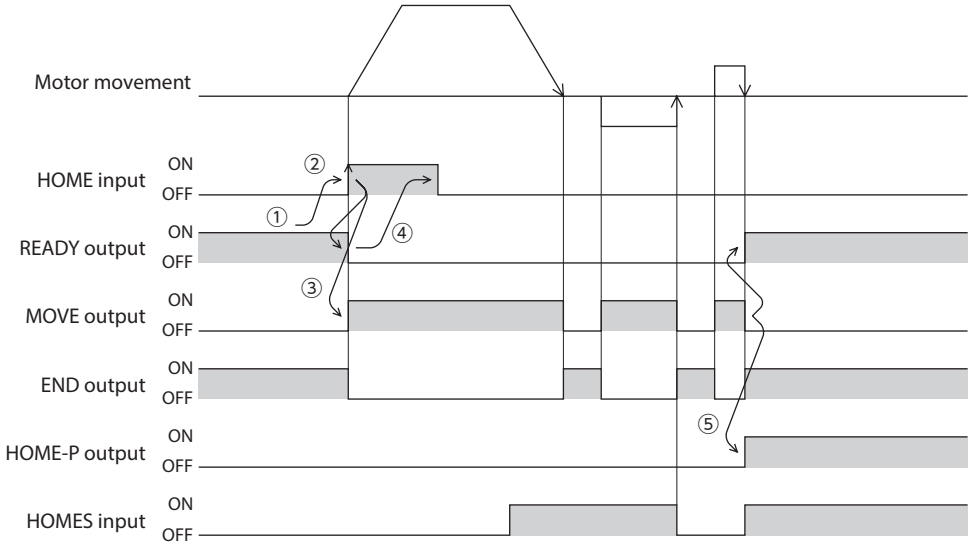
• Starting direction of return-to-home operation: Negative direction



* When the return-to-home operation speed is set to 60 r/min or lower, the set return-to-home operation speed will be applied.

Operating method

1) Check the READY output is being ON.
2) Turn the HOME input ON.
3) Return-to-home operation is started.
4) Check the READY output has been turned OFF and turn the HOME input OFF.
5) When the return-to-home operation is completed, the HOME-P output is turned ON.



Note Return-to-home operation cannot be executed while the FREE input or the STOP input is being ON. Be sure to execute after turning the signal OFF.

3.5 Position preset

When the position preset is executed, the command position (present position) will be the value of the “Preset position" parameter (ID: 454).
However, the preset will not be executed in the following conditions.

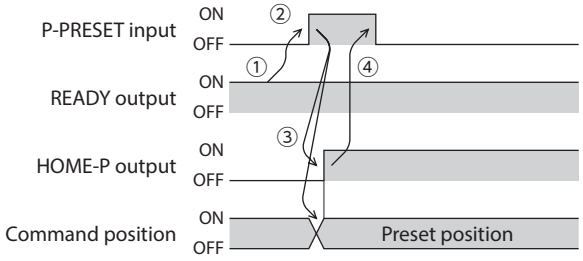
- While the motor is operating
- While an alarm is present

Related parameter

ID	Parameter name	Description	Setting range	Initial value
454	Preset position	Sets the preset position. The motor shaft rotates by 0.72° per one step.	−8,388,608 to +8,388,607 steps	0

Operating method

1) Check the READY output is being ON.
2) Turn the P-PRESET input ON.
3) When the internal processing in the driver is completed, the HOME-P output is turned ON.
4) Check the HOME-P output has been turned ON and turn the P-PRESET input OFF.



If a value of the “Preset position” parameter is set to a value other than 0, the HOME-P output is not output.

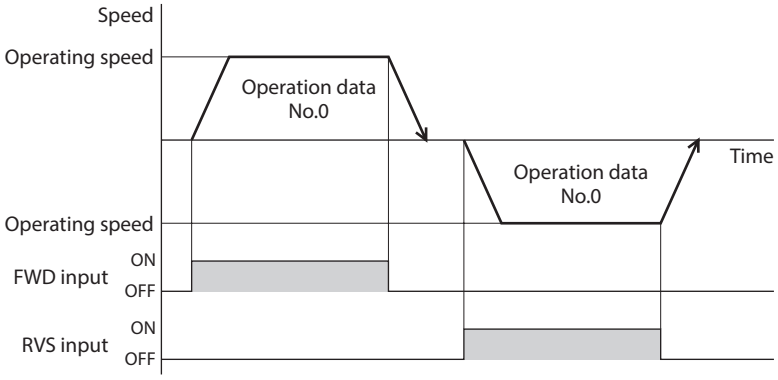
4 Continuous operation

When the FWD input or the RVS input is assigned, continuous operation can be executed.
The motor operates continuously while the FWD input or the RVS input is being ON.
For both the FWD and RVS inputs, the operation is performed at the operating speed of the operation data number being selected. When the operation data number is changed during continuous operation, the speed will be changed.
When the FWD input or the RVS input having turned ON is turned OFF, the motor decelerate to a stop. If the signal of the same direction is turned ON while decelerating, the motor will accelerate again and continue continuous operation.
If the FWD and RVS inputs are turned ON simultaneously, the motor will decelerate to a stop.

4.1 Operation data

Operation data can be set up to 16 data (operation data No.0 to No.15), and it is set using any of the operation panel, **MEXE02**, or **OPX-2A** (sold separately).
The following operation data is required for continuous operation. Set each item by the digital setting.

Item	Description	Setting range	Initial value
Operating speed	Sets the operating speed for continuous operation. Set as the rotation speed of the motor output shaft.	0 to 4000 r/min	0
Acceleration time	Sets the acceleration time for continuous operation. The acceleration time is set as a time needed for the motor to reach the rated rotation speed (3000 r/min) from the standstill state.	0.000 to 30.000 s	0.100
Deceleration time	Sets the deceleration time for continuous operation. The deceleration time is set as a time needed for the motor to stop from the rated rotation speed (3000 r/min).		



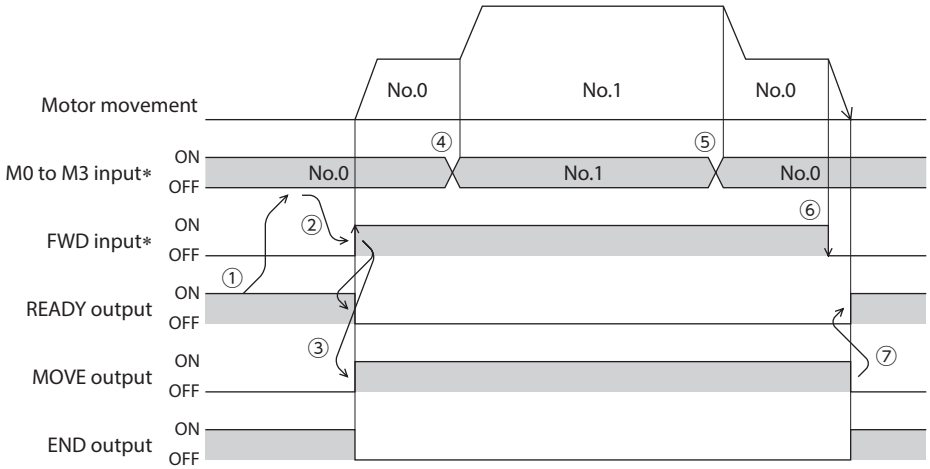
4.2 Starting method of continuous operation

When the operation data number is selected to turn the FWD input or the RVS input ON, continuous operation is started.
Select the operation data based on a combination of ON-OFF status of the M0 to M3 inputs. Refer to p.56 for details.

Operation data No.	M3	M2	M1	M0
0	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
. . .	. . .	. . .	. . .	. . .
13	ON	ON	OFF	ON
14	ON	ON	ON	OFF
15	ON	ON	ON	ON

- Operating method

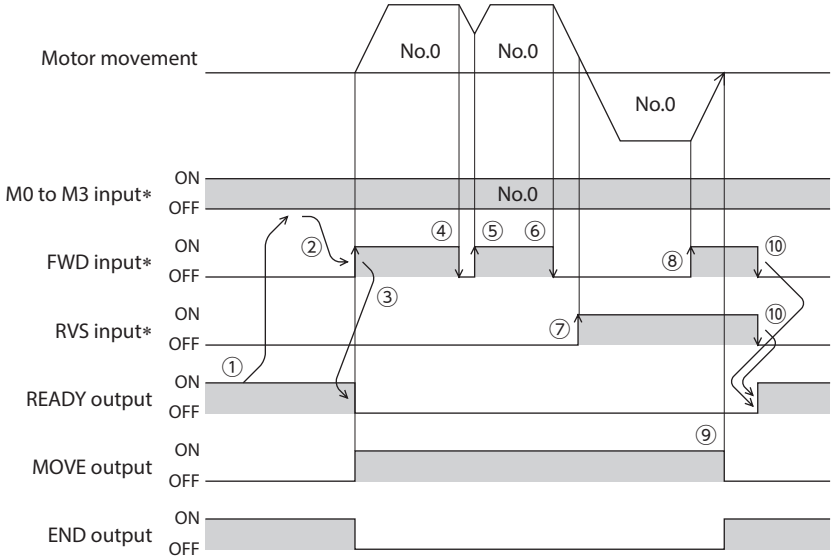
1) Check the READY output is being ON.
2) Select the operation data number using the M0 to M3 inputs, and turn the FWD input ON.
3) The motor starts continuous operation. The READY output is turned OFF.
4) Turn the M0 input ON to select the operation data No.1. The motor accelerates to the operating speed of the operation data No.1.
5) Turn the M0 input OFF to select the operation data No.0. The motor decelerates to the operating speed of the operation data No.0.
6) Turn the FWD input OFF.
7) The motor decelerates to a stop, and the READY output is turned ON.



* After setting the M0 to M3 inputs, wait at least 10 ms before turning the FWD input or RVS input ON.

- Operating method: When combining the FWD and RVS inputs

1) Check the READY output is being ON.
2) Select the operation data number using the M0 to M3 inputs, and turn the FWD input ON.
3) The motor starts continuous operation. The READY output is turned OFF.
4) Turn the FWD input OFF. The motor decelerates.
5) Turn the FWD input ON while decelerating the motor. The motor accelerates again.
6) Turn the FWD input OFF. The motor decelerates.
7) Turn the RVS input ON while decelerating the motor. The motor stops once and rotates in the reverse direction.
8) If the FWD input is turned ON while the RVS input is being ON, the motor decelerates.
9) The motor decelerates to a stop, and the MOVE output is turned OFF.
10) If both the FWD and RVS inputs are turned OFF, the READY output is turned ON.



* After setting the M0 to M3 inputs, wait at least 10 ms before turning the FWD input or RVS input ON.

5 Other operations

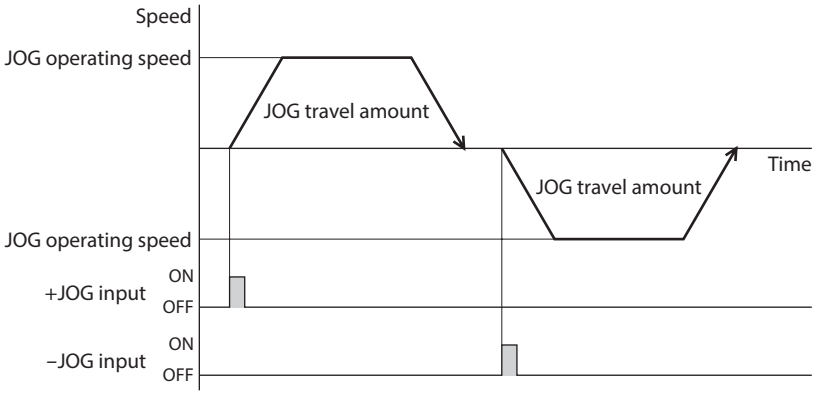
5.1 JOG operation

If the +JOG input or the –JOG input is assigned, JOG operation can be performed.
JOG operation is a function that executes positioning operation for the travel amount being set in the "JOG travel amount" parameter (ID: 2084).
When the +JOG input is turned ON, JOG operation is performed in the positive direction, and when the –JOG input is turned ON, JOG operation is performed in the negative direction.
This is a convenient function when the position is adjusted slightly.

Related parameters

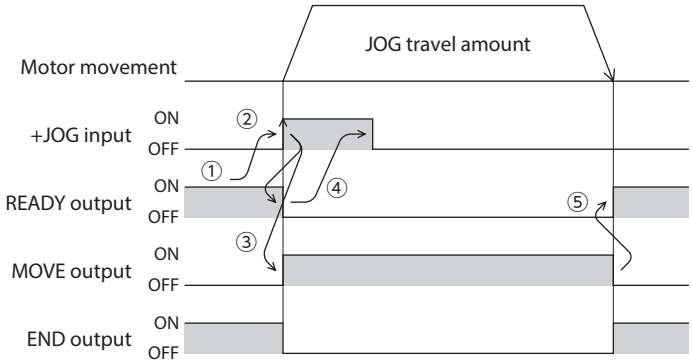
ID	Parameter name	Description	Setting range	Initial value
323	JOG operating speed	Sets the operating speed for JOG operation.	0 to 4000 r/min	300
324	JOG acceleration	Sets the acceleration/deceleration time for JOG operation.	0.000 to 30.000 s	0.100
2081	Operating torque of JOG operation	Sets the maximum torque based on the rated torque being 100% during JOG operation.	0 to 250%	100
2084	JOG travel amount	Sets the travel amount for JOG operation. The motor shaft rotates by 0.72° per one step.	1 to 8,388,607 steps	1

Operation image



Operating method

1) Check the READY output is being ON.
2) Turn the +JOG input ON.
3) The motor starts positioning operation.
4) Check the READY output has been turned OFF and turn the +JOG input OFF.
5) When the positioning operation is completed, the READY output is turned ON.



Note JOG operation cannot be executed while the FREE input or the STOP input is being ON.
Be sure to execute after turning the signal OFF.

5.2 Test operation

Test operation can be executed using any of the operation panel, **MEXE02**, or **OPX-2A**. JOG operation or teaching function can be executed in test operation.
When executing using the operation panel, refer to p.81.
When executing using the **MEXE02**, refer to the OPERATING MANUAL of the **MEXE02**.
When executing using the **OPX-2A**, refer to the OPERATING MANUAL of the **OPX-2A**.

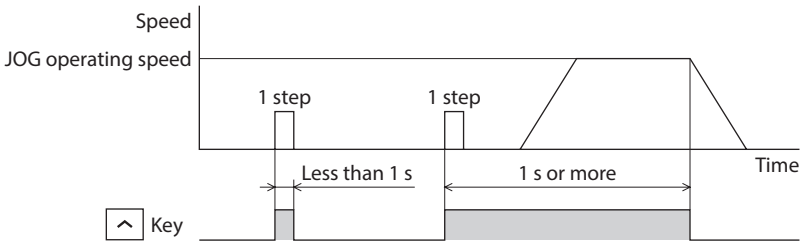
■ JOG operation

Wiring condition or operation status for the motor and driver can be checked using JOG operation.
Set the operation data for JOG operation using the following parameters.

- "JOG operating speed" parameter (ID: 323)
- "JOG acceleration" parameter (ID: 324)
- "Operating torque of JOG operation" parameter (ID: 2081)

Example: When executing JOG operation by the operation panel

The motor can be operated with the [∧] [∨] keys.
Pressing the [∧] key once rotates the motor by one step in the forward direction. If the key is kept pressing, the motor rotates in the forward direction continuously.
Pressing the [∨] key once rotates the motor by one step in the reverse direction. If the key is kept pressing, the motor rotates in the reverse direction continuously.



Note JOG operation cannot be executed while the FREE input or the STOP input is being ON.
Be sure to execute after turning the signal OFF.

■ Teaching function

This is a function that rotates the motor using the operation panel, **MEXE02**, or **OPX-2A** and sets the present position as the position (travel amount) of the operation data. When the position (travel amount) is set using teaching function, the absolute mode will be automatically selected as the operation mode.

Set the operation data for teaching function using the following parameters.

- "JOG operating speed" parameter (ID: 323)
- "JOG acceleration" parameter (ID: 324)
- "Operating torque of JOG operation" parameter (ID: 2081)

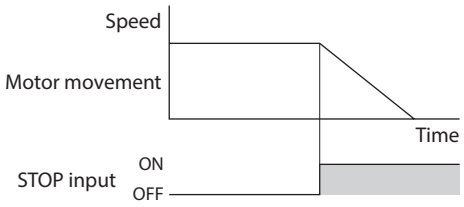
Note

- Perform teaching function while the position coordinate is set. Refer to p.133 for setting the position coordinate.
- Teaching function cannot be executed while the FREE input or the STOP input is being ON.
  Be sure to execute after turning the signal OFF.

5.3 Stop operation

■ STOP action

When the STOP input is turned ON while the motor is operating, the motor stops.
The stopping method is determined by the setting of the "STOP input action" parameter (ID: 256).
For example, the operation when the "STOP input action" parameter (ID: 256) is set to "1: Deceleration stop" is shown in the figure to the right.

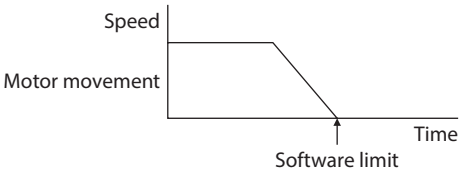


Related parameter

ID	Parameter name	Description	Setting range	Initial value
256	STOP input action	Sets how to stop the motor when the motor is stopped by turning the STOP input ON.	0: Immediate stop 1: Deceleration stop 2: Immediate stop + current OFF 3: Deceleration stop + current OFF	0

■ Software overtravel

The software overtravel is a function that sets the upper and lower limits of the moving range by the parameter and limits the range of movement.
If the "Software overtravel" parameter (ID: 451) is set to "1: Enable," the motor can be decelerated to a stop by the software limit.
The operation pattern is shown to the right.



Note Software overtravel is enabled while the position coordinate is set. Refer to the following for setting the position coordinate.

Related parameters

ID	Parameter name	Description	Setting range	Initial value
451	Software overtravel	Sets whether to enable or disable software overtravel detection using software limits.	0: Disable 1: Enable	1
452	Positive software limit	Sets the value of software limit in the positive direction. The motor shaft rotates by 0.72° per one step.	−8,388,608 to +8,388,607 steps	+8,388,607
453	Negative software limit	Sets the value of software limit in the negative direction. The motor shaft rotates by 0.72° per one step.		−8,388,608

5.4 Position coordinate for the driver

The position coordinate is set if one of the following operations is executed:
- Return-to-home operation is executed.
- Position preset is executed.

5.5 Wrap function

This is a function that resets the command position and the multi-rotation data to 0 whenever the command position exceeds the value set in the "Wrap setting range" parameter (ID: 456). Since the multi-rotation data is also reset to 0, the continuous rotating operation in the same direction can be performed.
The command position changes in a range between "0 and a value of (wrap setting value minus 1)."

Related parameters

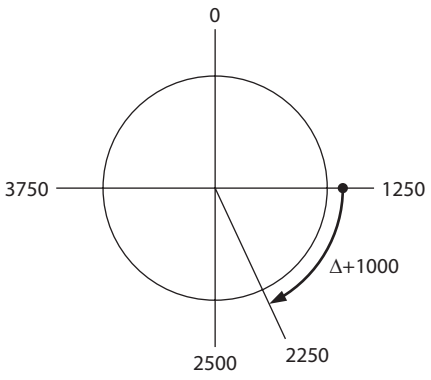
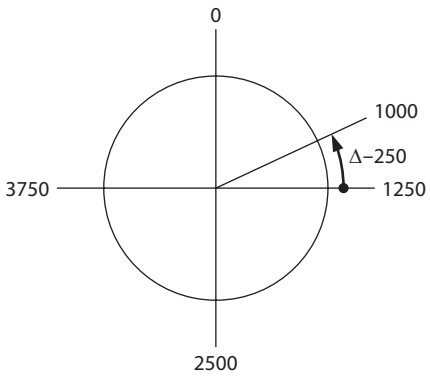
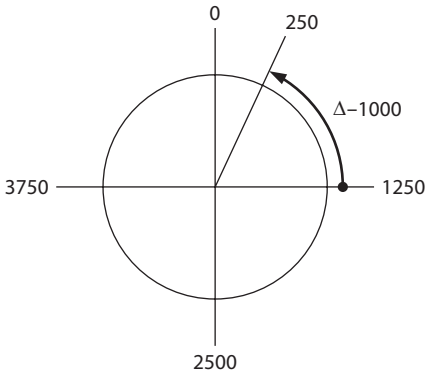
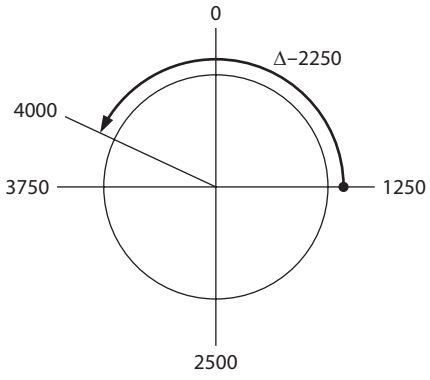
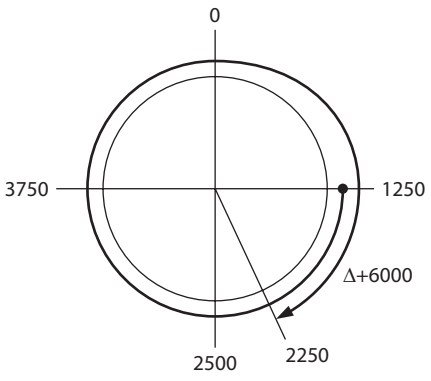
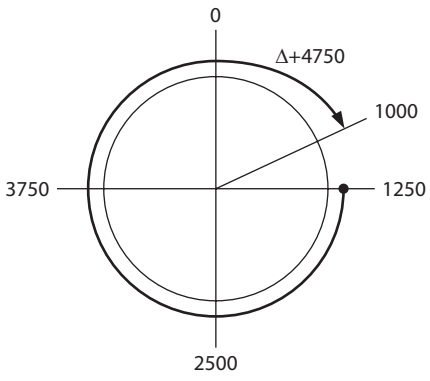
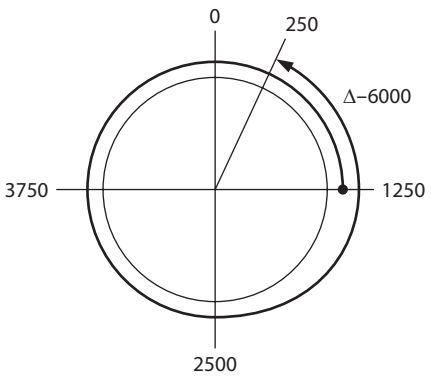
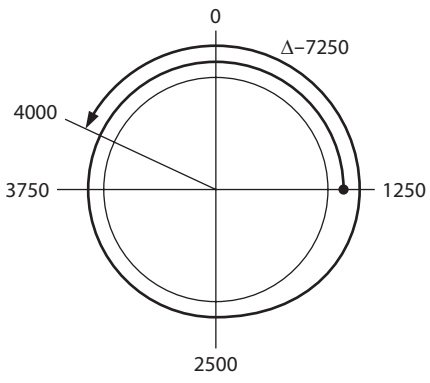
ID	Parameter name	Description	Setting range	Initial value
455	Wrap setting	Sets whether to enable or disable the wrap function.	0: Disable 1: Enable	0
456	Wrap setting range	Sets the wrap setting range. The motor shaft rotates by 0.72° per one step.	1 to 8,388,607 steps	1000

Note When the "Wrap setting" parameter (ID: 455) is set to "1: Enable," the software overtravel will be disabled. It will be disabled even when the "Software overtravel" parameter is set to "1: Enable (ID: 451)."

■ Example of wrap function

Operation examples when positioning operation is performed in the following conditions are shown in the next page.
- Wrap setting: 5000
- Command position: 1250
- Combination type motor/gearhead of the gear ratio 10

In the case of the combination type motor/gearhead of the gear ratio 10, when positioning operation is performed to start at the command position of 1250 steps on the gearhead output shaft, the movement will be as follows.

Position	Operation mode: Incremental	Operation mode: Absolute
+1000		
−1000		
+6000		
−6000		

7 BX-compatible mode

The **BXⅡ** Series has the BX-compatible mode so that users can use it in almost the same connection as the traditional **BX** Series.
This part explains about the **BX**-compatible mode.

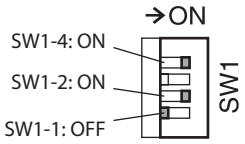
Table of contents

1 Descriptions of the BX-compatible mode

1.1 Switching of BX-compatible mode

Note Switch the control mode to the **BX**-compatible mode before turning on the power supply. The setting will not be enabled if the control mode is switched after the power supply is turned on.

■ BX-compatible mode (speed control)



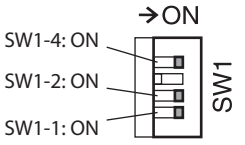
Set SW1-1 to the OFF side and SW1-2 and SW1-4 to the ON side.
When the **BX** Series is used in the speed control mode, the **BXⅡ** Series can be used in similar I/O conditions or functions as the **BX** Series with this control mode.

If the **BX** Series is used in the speed control mode, set the "Operation selection after stopping" parameter (ID: 2069) to "1: Servo lock." This generates the holding force when the motor stops.

Related parameter

ID	Parameter name	Description	Setting range	Initial value
2069	Operation selection after stopping	Uses in the speed control mode. If the holding force is required to generate while the motor stops, set this parameter to "1" to enable the servo lock.	0: Free (disable servo lock) 1: Servo lock	0

■ BX-compatible mode (position control)



Set SW1-1, SW1-2, and SW1-4 to the ON side.
When the **BX** Series is used in the position control mode, the **BXII** Series can be used in similar I/O conditions or functions as the **BX** Series with this control mode.

1.2 Operation data

■ Operating speed

- Analog setting: 0 r/min or 30 to 3000 r/min
- Digital setting: 0 to 4000 r/min

■ Acceleration/deceleration time

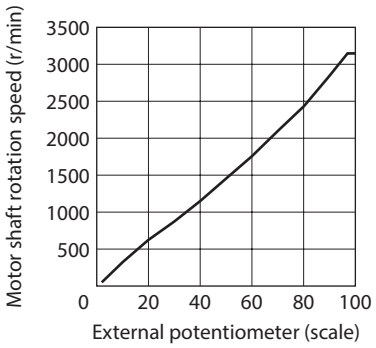
- Analog setting: 0.1 to 15 s
- Digital setting: 0.0 to 30.0 s

■ Torque limit

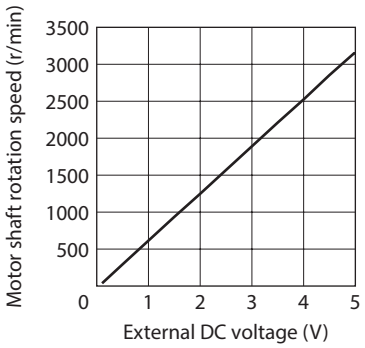
- 0 to 250%
  (Sets the torque limiting value based on the motor rated torque being 100%.)

■ Analog external setting device - Speed characteristics

- External potentiometer scale - Speed characteristics (representative values)



- External DC voltage - Speed characteristics (representative values)



1.3 Assignment of I/O signals

■ BX-compatible mode (speed control)

BXⅡ Series **BX**-compatible mode (speed control)				**BX** Series Speed control mode		
Connector No.	Pin No.	Signal name	Function	Connector No.	Pin No.	Signal name
CN5	1	IN-COM0	Input signals common (for external power supply)	CN4	1	CW
	2	IN0	CW		2	CCW
	3	IN1	CCW		3	M0
	4	IN2	M0		4	M1
	5	IN3	M1		5	M2
	6	IN4	M2		6	FREE
	7	IN5	FREE		7	BRAKE
	8	IN6	BRAKE/ACL ∗1		8	IN-COM
	9	IN7	Not used (possible to assign)∗3		9	H
	10	IN8	Not used (possible to assign)∗3		10	M
	11	IN-COM1	0 V (for built-in power supply)		11	L
CN7	1	VH	Analog external setting input		12	ALM
	2	VM			13	BUSY
	3	VL			14	ASG
	4	OUT0+	ALM		15	BSG
	5	OUT0–			16	OUT-COM
	6	OUT1+	BUSY (TLM)/ALP ∗2			
	7	OUT1–				
	8	OUT2+	Not used (possible to assign)∗3			
	9	OUT2–				
	10	ASG	Phase A output			
	11	BSG	Phase B output			
	12	OUT-COM	Common for ASG/BSG			

∗1 This signal is used as the BRAKE input in normal condition, but it functions as the ACL input if the driver protective function is activated.

∗2 This signal is used as the BUSY output in normal condition, but it functions as the ALP output if the driver protective function is activated.
The BUSY output can be changed to the TLM output using the parameter.

∗3 A signal can be assigned. The functions for IN0 to IN6, OUT0, and OUT1 cannot be changed.

■ BX-compatible mode (position control)

BXⅡ Series **BX**-compatible mode (position control)				**BX** Series Position control mode		
Connector No.	Pin No.	Signal name	Function	Connector No.	Pin No.	Signal name
CN5	1	IN-COM0	Input signals common (for external power supply)	CN4	1	START
	2	IN0	START		2	HOME-LS
	3	IN1	HOME-LS		3	M0
	4	IN2	M0		4	M1
	5	IN3	M1		5	M2
	6	IN4	M2		6	FREE
	7	IN5	FREE		7	BRAKE
	8	IN6	BRAKE/ACL ∗1		8	IN-COM
	9	IN7	Not used (possible to assign)∗3		9	H
	10	IN8	Not used (possible to assign)∗3		10	M
	11	IN-COM1	0 V (for built-in power supply)		11	L
CN7	1	VH	Analog external setting input		12	ALM
	2	VM			13	BUSY
	3	VL			14	ASG
	4	OUT0+	ALM		15	BSG
	5	OUT0—			16	OUT-COM
	6	OUT1+	BUSY (TLM)/ALP ∗2			
	7	OUT1—				
	8	OUT2+	Not used (possible to assign)∗3			
	9	OUT2—				
	10	ASG	Phase A output			
	11	BSG	Phase B output			
	12	OUT-COM	Common for ASG/BSG			

∗1 This signal is used as the BRAKE input in normal condition, but it functions as the ACL input if the driver protective function is activated.

∗2 This signal is used as the BUSY output in normal condition, but it functions as the ALP output if the driver protective function is activated.
The BUSY output can be changed to the TLM output using the parameter.

∗3 A signal can be assigned. The functions for IN0 to IN6, OUT0, and OUT1 cannot be changed.

2 Explanation of I/O signals

This chapter explains I/O signals specific to the **BX**-compatible mode.

2.1 Input signals

■ CW input, CCW input

These signals are enabled in the **BX**-compatible mode (speed control).
When the operation data number is selected and the CW input or the CCW input is turned ON, the motor rotates at the operating speed corresponding to the operation data number selected. When the operation signal having turned ON is turned OFF, the motor decelerates to a stop.
Turning the CW input ON will rotate the motor in the clockwise direction, and turning the CCW input ON will rotate the motor in the counterclockwise direction. If the CW and CCW inputs are turned ON simultaneously, the motor will decelerate to a stop.
"CW (FWD)" and "CCW (RVS)" are displayed on the **MEXE02**.

■ START input

This signal is enabled in the **BX**-compatible mode (position control).
This is a signal to start positioning operation.
When the operation data number is selected and the START input is turned ON, an operation will be started.

■ HOME-LS input

This signal is enabled in the **BX**-compatible mode (position control). The HOME-LS input is normally closed.
This is an input of the mechanical home sensor in return-to-mechanical home operation.
"HOME-LS (HOMES)" is displayed on the **MEXE02**.

■ M0 to M2 inputs

Desired operation type and operation data number can be selected by a combination of ON-OFF status of the M0 to M2 inputs.
Refer to p.144 for details.

Operation data No.	M2	M1	M0	Speed control	Position control
0	OFF	OFF	OFF	Internal potentiometer, Digital setting 0	Positioning operation 0, Continuous operation 0
1	OFF	OFF	ON	Analog external setting device, Digital setting 1	Positioning operation 1, Continuous operation 1
2	OFF	ON	OFF	Digital setting 2	Positioning operation 2
3	OFF	ON	ON	Digital setting 3	Positioning operation 3
4	ON	OFF	OFF	Digital setting 4	Positioning operation 4
5	ON	OFF	ON	Digital setting 5	Positioning operation 5
6	ON	ON	OFF	Digital setting 6	Return-to-electrical home operation
7	ON	ON	ON	Digital setting 7	Return-to-mechanical home operation

■ FREE input

When the FREE input is turned ON, the motor current is cut off. The motor output shaft can be rotated manually since the motor holding torque is lost. When an electromagnetic brake motor is used, the electromagnetic brake is also released.

Note When a load is installed vertically, do not turn the FREE input ON. The motor loses its holding torque, and the load may fall.

■ BRAKE input/ACL input

The BRAKE input and the ACL input are normally closed.
This signal is used as the BRAKE input in normal condition, but it functions as the ACL input if the driver protective function is activated.
"BRAKE (STOP)" is displayed on the **MEXE02**.

- BRAKE input

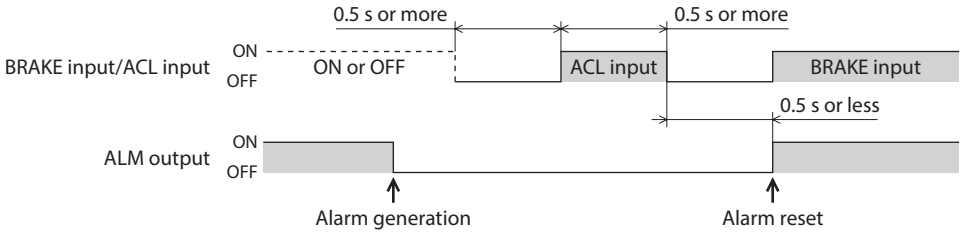
When operating the motor, turn the BRAKE input ON. If the same stop operation as the **BX** Series is required, set the "STOP input action" parameter (ID: 256) to 2 (Immediate stop + current OFF).
If the BRAKE input is turned OFF while operating the motor, the motor will stop instantaneously. When an electromagnetic brake motor is used, the electromagnetic brake will hold a load in position.

Related parameter

ID	Parameter name	Description	Setting range	Initial value
256	STOP input action	Sets how to stop the motor when the STOP input is turned ON.	0: Immediate stop 1: Deceleration stop 2: Immediate stop + current OFF 3: Deceleration stop + current OFF	0

- ACL input

If the driver protective function is activated to generate an alarm, the motor will stop and the ACL output will be turned OFF.
When turning the ACL input ON (keep it ON for 0.5 seconds or more) and then OFF, the ALM output is turned ON and the alarm can be reset.
Before resetting an alarm, always remove the cause of the alarm and ensure safety.
Refer to p.165 for alarms.



Note Some alarms cannot be reset with the ACL input. To reset these alarms, turn off the driver power and turn on again. Refer to p.166 for details.

2.2 Output signals

■ ALM output

The ALM output is normally closed.
If the driver protective function is activated to generate an alarm, the motor will stop and the ACL output will be turned OFF. At the same time, the alarm code is displayed on the operation panel on the driver.
Check the cause of the alarm with the alarm code.

■ BUSY output/TLM output/ALP output

This signal is used as the BUSY output in normal condition, but it functions as the ALP output if the driver protective function is activated. The BUSY output can be changed to the TLM output using the parameter.
"BUSY/TLM (TLC)/ALP" is displayed on the **MEXE02**.

Related parameter

ID	Parameter name	Description	Setting range	Initial value
2290	Compatible command - BUSY/TLM output select	Switches between the BUSY output and the TLM output.	0: BUSY output 1: TLM output	0

- BUSY output

The BUSY output is turned ON during motor operation. It will be turned OFF when the operation is completed.
When the motor has converged in a position of the "END signal range" parameter (ID: 259) against the command position, the BUSY output is turned OFF.

Related parameter

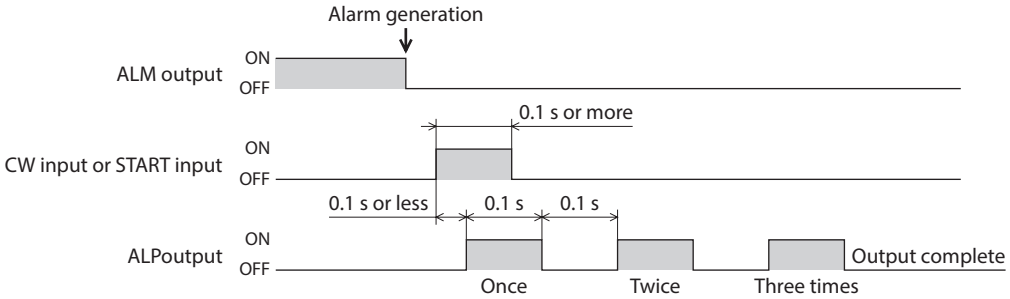
ID	Parameter name	Description	Setting range	Initial value
259	END signal range	Sets an output range that the END output is turned ON. The motor shaft rotates by 0.72° per one step.	1 to 100 steps	1

NOTE The ON-OFF status of the BUSY output will be unstable if hunting of the output shaft occurs when the motor stops.
It is possible to stably check that the operation was completed since the READY output (operation ready signal) remains an ON state even if the hunting occurs when the motor stops.
Therefore, for applications that the hunting of the motor output shaft occurs, it is recommended to assign the READY output to the OUT2 terminal and use it together with the BUSY output.

- ALP output

When the CW input or the START input is turned ON (keep it ON for 0.1 seconds or more) and then OFF while an alarm is present, the ALP output will be output multiple times according to the alarm content. The type of the generated alarm can be checked by counting the number of times the ALP output has output.

Example: When an alarm of the overvoltage was generated (3 times of ALP output)



Number of output times for the ALP output	Descriptions of alarms
2	Overload
3	Overvoltage
4	Excessive position deviation
5	Overcurrent
6	Overspeed
7	EEPROM error
8	Initial sensor error
9	Undervoltage
10	Other alarms than above

- TLM output

When the motor torque reaches the torque limiting value, the TLC output is turned ON.

3 Operation

This chapter explains operations specific to the **BX**-compatible mode (position control).
Extending the operation data, return-to-electrical home operation, and return-to-mechanical home operation in the **BX**-compatible mode are explained here. For other operations, refer to the next part.

- **BX**-compatible mode (speed control): Part 5 "Operation in speed control mode"
- **BX**-compatible mode (position control): Part 6 "Operation in position control mode"

3.1 Extending the operation data

If the M3 input is assigned to IN7 or IN8, the operation data No.8 to No.15 can be extended

Operation data No.	M3	M2	M1	M0	Speed control	Position control
0	OFF	OFF	OFF	OFF	Internal potentiometer, Digital setting 0	Positioning operation 0, Continuous operation 0
1	OFF	OFF	OFF	ON	Analog external setting device, Digital setting 1	Positioning operation 1, Continuous operation 1
2	OFF	OFF	ON	OFF	Digital setting 2	Positioning operation 2
3	OFF	OFF	ON	ON	Digital setting 3	Positioning operation 3
4	OFF	ON	OFF	OFF	Digital setting 4	Positioning operation 4
5	OFF	ON	OFF	ON	Digital setting 5	Positioning operation 5
6	OFF	ON	ON	OFF	Digital setting 6	Return-to-electrical home operation
7	OFF	ON	ON	ON	Digital setting 7	Return-to-mechanical home operation
8	ON	OFF	OFF	OFF	Digital setting 8	Positioning operation 8
9	ON	OFF	OFF	ON	Digital setting 9	Positioning operation 9
10	ON	OFF	ON	OFF	Digital setting 10	Positioning operation 10
11	ON	OFF	ON	ON	Digital setting 11	Positioning operation 11
12	ON	ON	OFF	OFF	Digital setting 12	Positioning operation 12
13	ON	ON	OFF	ON	Digital setting 13	Positioning operation 13
14	ON	ON	ON	OFF	Digital setting 14	Positioning operation 14
15	ON	ON	ON	ON	Digital setting 15	Positioning operation 15

■ For speed control

The setting method of operating speed and torque limit can be changed using the "Analog speed torque" parameter (ID: 2161).

- Analog setting: Internal potentiometer (SPEED), **PAVR-20KZ** (sold separately), external DC voltage
- Digital setting: Operation panel, **MEXE02**, **OPX-2A** (sold separately)

<table>
<tr><th rowspan="2">Operation data</th><th colspan="2">When the parameter is 0</th><th colspan="2">When the parameter is 1</th><th colspan="2">When the parameter is 2</th></tr>
<tr><th>Operating speed</th><th>Torque limit</th><th>Operating speed</th><th>Torque limit</th><th>Operating speed</th><th>Torque limit</th></tr>
<tr><td>No.0</td><td rowspan="3">Digital setting</td><td rowspan="3">Digital setting</td><td>Internal potentiometer</td><td rowspan="3">Digital setting</td><td rowspan="3">Digital setting</td><td rowspan="3">PAVR-20KZ
External DC voltage</td></tr>
<tr><td>No.1</td><td>PAVR-20KZ
External DC voltage</td></tr>
<tr><td>No.2 to No.15</td><td>Digital setting</td></tr>
</table>

- Setting example
  - When setting all operation data by the digital setting: Set the "Analog speed torque" parameter to 0.
  - When setting the operating speed of the operation data No.0 with the internal potentiometer:
    Turn all of the M0 to M2 inputs OFF to select the operation data No.0, and set the "Analog speed torque" parameter to 1.
- Related parameter

ID	Parameter name	Description	Setting range	Initial value
2161	Analog speed torque	Changes the setting method of operating speed and torque limit.	0: Digital 1: Analog speed 2: Torque	1

■ For position control

The operation data No.0 and No.1 can be changed to continuous operation using the "Compatible command - continuous operation" parameter (ID: 2289).
Selecting the operation data No.6 makes return-to-electrical home operation, and selecting the operation data No.7 makes return-to-mechanical home operation.

- Related parameter

ID	Parameter name	Description	Setting range	Initial value
2289	Compatible command - continuous operation	Sets whether to enable or disable continuous operation.	0: Disable 1: Enable	0

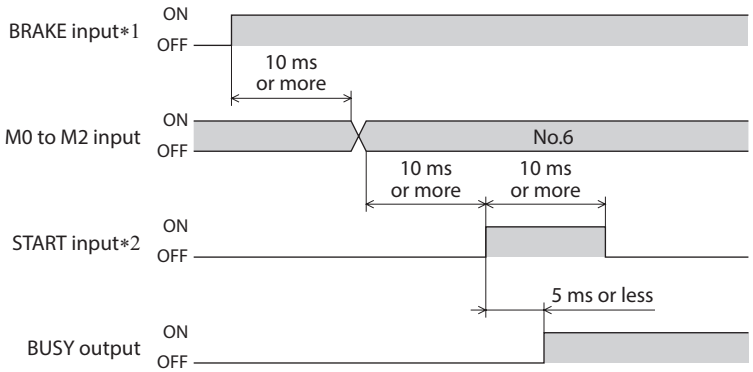
- When the "oP- 1" is displayed on the operation panel

If the operation data number is checked immediately when the power supply is input in the position control mode, "oP- 1" will be displayed. In addition, if the operation data number is checked by executing the following operation, "oP- 1" will be displayed.

- While return-to-home operation, continuous operation, or JOG operation is being executed
- When an alarm was generated and reset
- When an operation was stopped by the BRAKE (STOP) input
- When the motor excitation was turned off by the FREE input or the S-ON input
- When the position preset was executed

3.2 Return-to-electrical home operation

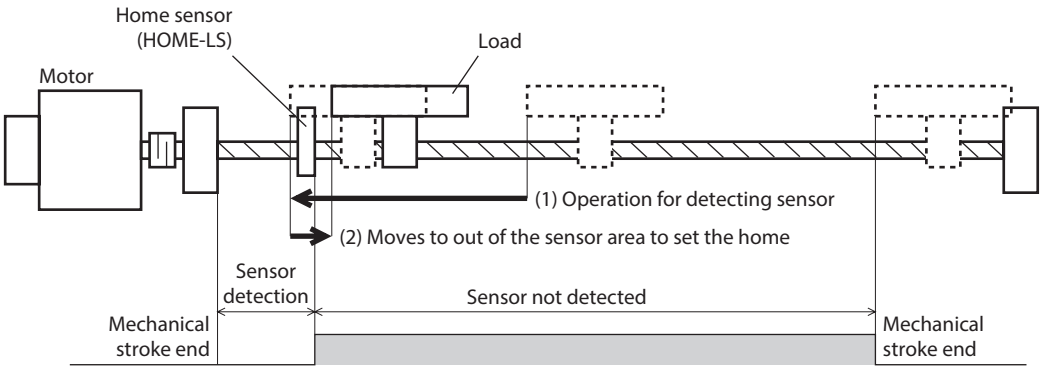
The electrical home refers to the motor position effective when the driver power is turned on.
Select the operation data No.6 using the M0 to M2 inputs and turn the START input ON to start return-to-electrical home operation.



*1 Be sure to turn the BRAKE input ON before operating the motor.
*2 Turn the START input ON after setting the operation data with the M0 to M2 inputs.

3.3 Return-to-mechanical home operation

This is an operation in which the reference point of positioning (mechanical home) is detected automatically.
An external sensor is required.
Select the operation data No.7 using the M0 to M2 inputs and turn the START input ON to start return-to-mechanical home operation.
The motor initially rotates in the starting direction set in the "Starting direction of home-seeking" parameter (ID: 357).
When the home sensor is detected, the motor rotates in the backward direction and stops.



Note

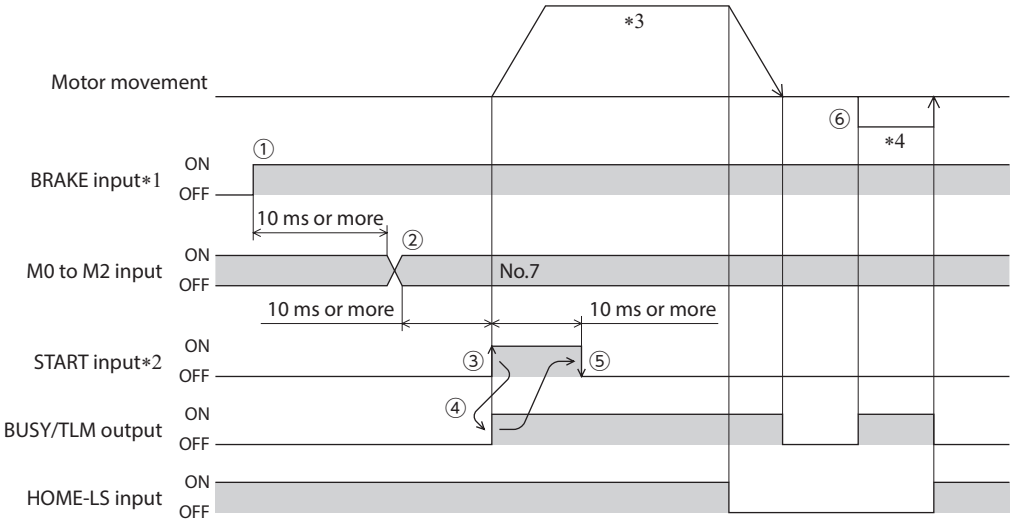
- Install the home sensor just before the stroke end in the detection direction.
- Unless the operating speed is set to the operation data No.7, an alarm of the abnormal operation data will be generated when the operation is executed.

- Related parameter

ID	Parameter name	Description	Setting range	Initial value
357	Starting direction of home-seeking	Sets the starting direction for home detection.	0: Negative direction 1: Positive direction	1

- Operating method

1) Turn the BRAKE input ON.
2) Select the operation data No.7 using the M0 to M2 inputs.
3) Turn the START input ON.
4) Return-to-home operation is started.
5) Turn the START input OFF.
6) The motor rotates in the backward direction when detecting the OFF position of the HOME-LS input and it stops when detecting the ON position of the HOME-LS input.



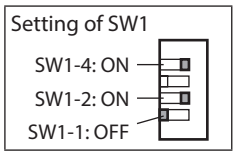
∗1 Be sure to turn the BRAKE input ON before operating the motor.
∗2 Turn the START input ON after setting the operation data with the M0 to M2 inputs.
∗3 The motor operates according to the operating speed set in the operation data No.7.
∗4 The operating speed during reverse operation is 60 r/min. If the operating speed of the operation data No.7 is set to 60 r/min or lower, it will be applied to the operating speed during reverse operation.

4 Connection example

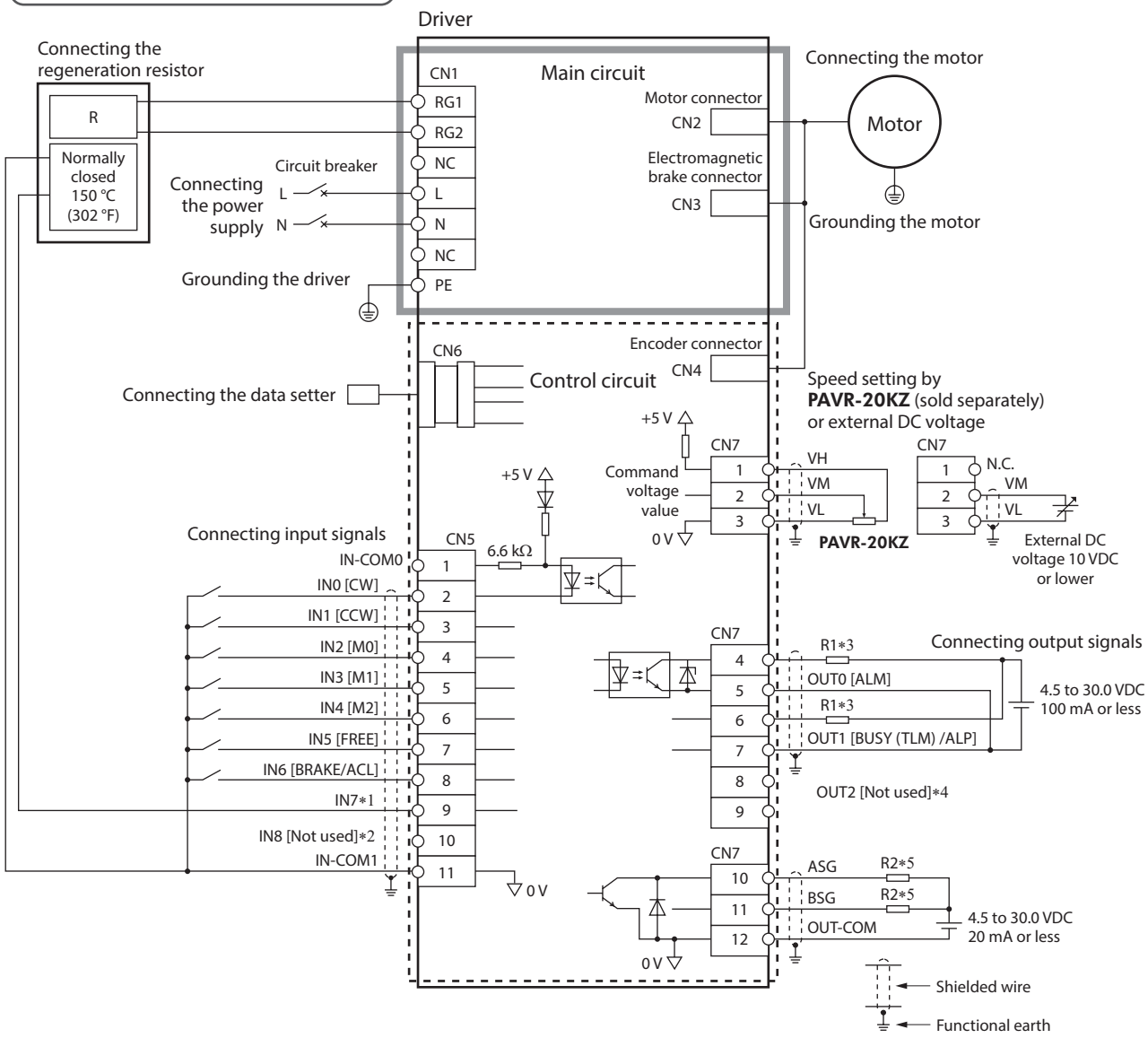
This chapter explains a connection example to replace the **BX** Series with the **BXII** Series.

BX-compatible mode (speed control): When the built-in power supply is used

This is a connection example that the power supply is single-phase 100-120 VAC, the speed is set using an analog external setting device to operate the motor with relays, switches and other contact switches. The I/O signal in the brackets [ ] is the initial value.
Refer to p.99 for the assignment of I/O signals.



Connect the thermostat output of the regeneration resistor to the terminal that the TH input was assigned by changing the "IN input function selection" parameter.
→ How to change: p.100

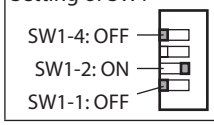


∗1 This is a connection when the TH input is assigned to IN7. The initial value is [Not used].
∗2 When assigning a signal to IN8 to use, connect in the same way as IN0 to IN6.
∗3 Connect a current-limiting resistor R1 according to the power supply voltage used so that the current will not exceed 100 mA.
∗4 When assigning a signal to OUT2 to use, connect in the same way as OUT0 and OUT1.
∗5 Connect a current-limiting resistor R2 according to the power supply voltage used so that the current will not exceed 20 mA.

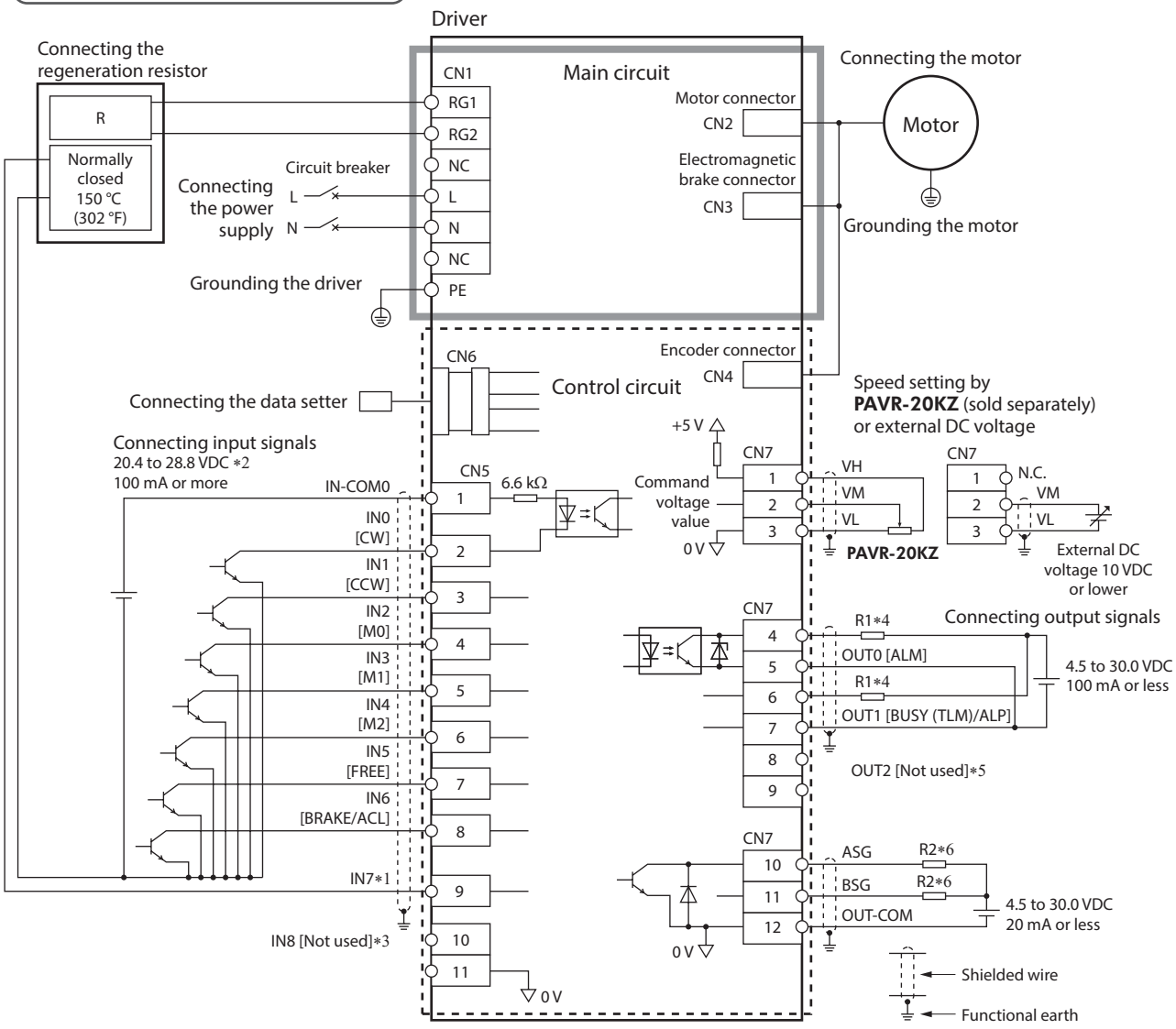
BX-compatible mode (speed control): When an external power supply is used

This is a connection example that the power supply is single-phase 100-120 VAC, the speed is set using an analog external setting device to operate the motor with sequence connection of transistor type. The I/O signal in the brackets [ ] is the initial value.
Refer to p.99 for the assignment of I/O signals.

Setting of SW1



Connect the thermostat output of the regeneration resistor to the terminal that the TH input was assigned by changing the "IN input function selection" parameter.
→ How to change: p.100



∗1 This is a connection when the TH input is assigned to IN7. The initial value is [Not used].
∗2 Turn on the external power supply before turning on the driver main power supply.
∗3 When assigning a signal to IN8 to use, connect in the same way as IN0 to IN6.
∗4 Connect a current-limiting resistor R1 according to the power supply voltage used so that the current will not exceed 100 mA.
∗5 When assigning a signal to OUT2 to use, connect in the same way as OUT0 and OUT1.
∗6 Connect a current-limiting resistor R2 according to the power supply voltage used so that the current will not exceed 20 mA.

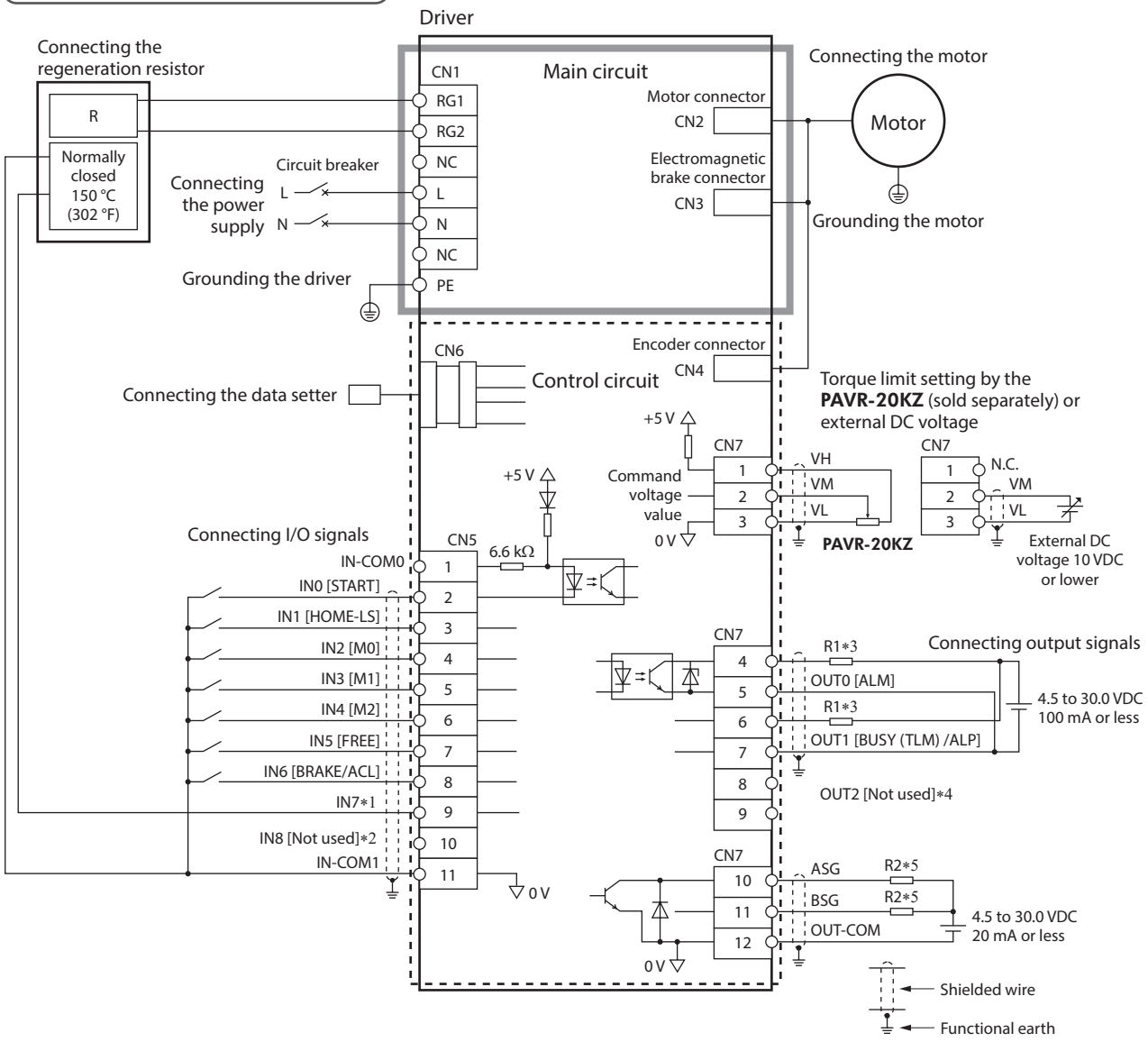
BX-compatible mode (position control): When the built-in power supply is used

This is a connection example that the power supply is single-phase 100-120 VAC, the torque limiting function is set using an analog external setting device to operate the motor with relays, switches and other contact switches. The I/O signal in the brackets [ ] is the initial value. Refer to p.99 for the assignment of I/O signals.

Setting of SW1

SW1-4: ON
SW1-2: ON
SW1-1: ON

Connect the thermostat output of the regeneration resistor to the terminal that the TH input was assigned by changing the "IN input function selection" parameter.
→ How to change: p.100



*1 This is a connection when the TH input is assigned to IN7. The initial value is [Not used].
*2 When assigning a signal to IN8 to use, connect in the same way as IN0 to IN6.
*3 Connect a current-limiting resistor R1 according to the power supply voltage used so that the current will not exceed 100 mA.
*4 When assigning a signal to OUT2 to use, connect in the same way as OUT0 and OUT1.
*5 Connect a current-limiting resistor R2 according to the power supply voltage used so that the current will not exceed 20 mA.

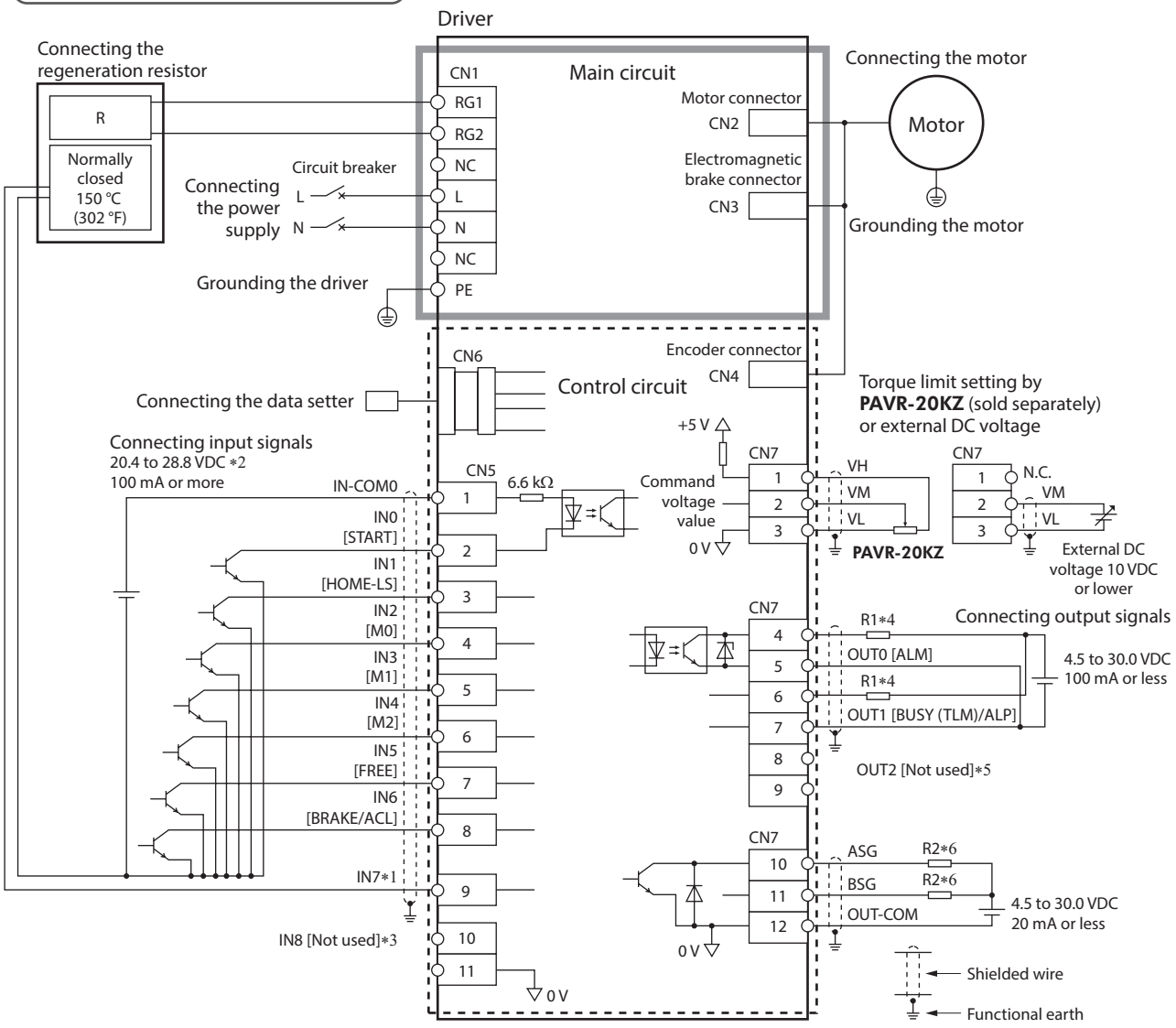
BX-compatible mode (position control): When the external power supply is used

This is a connection example that the power supply is single-phase 100-120 VAC, the torque limiting function is set using an analog external setting device to operate the motor with sequence connection of transistor type. The I/O signal in the brackets [ ] is the initial value. Refer to p.99 for the assignment of I/O signals.

Setting of SW1

SW1-4: OFF
SW1-2: ON
SW1-1: ON

Connect the thermostat output of the regeneration resistor to the terminal that the TH input was assigned by changing the "IN input function selection" parameter.
→ How to change: p.100



∗1 This is a connection when the TH signal is assigned to IN7. The initial value is [Not used].
∗2 Turn on the external power supply before turning on the driver main power supply.
∗3 When assigning a signal to IN8 to use, connect in the same way as IN0 to IN6.
∗4 Connect a current-limiting resistor R1 according to the power supply voltage used so that the current will not exceed 100 mA.
∗5 When assigning a signal to OUT2 to use, connect in the same way as OUT0 and OUT1.
∗6 Connect a current-limiting resistor R2 according to the power supply voltage used so that the current will not exceed 20 mA.

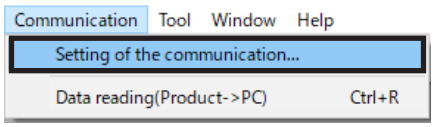
8 How to use MEXE02

This part explains how to set and edit parameters and data with the support software **MEXE02**.

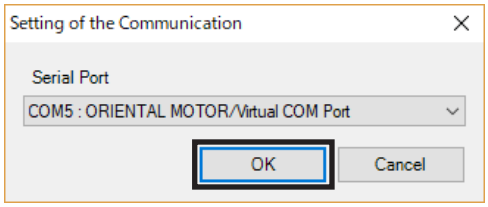
Table of contents

1 Starting MEXE02

1. Connect a driver with a PC in which the **MEXE02** has been installed.
   1) Start the **MEXE02**.
   2) Connect a driver and a PC with the communication cable for support software (sold separately).
   3) Turn on the driver power.
2. Set the communication port.
   1) Click [Setting of the communication...] from the [Communication] menu.

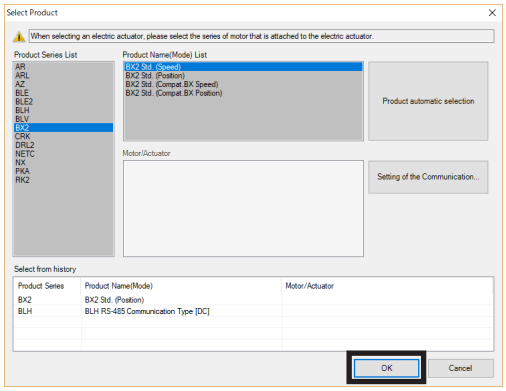


   2) Select "ORIENTAL MOTOR/Virtual COM Port" to click [OK].



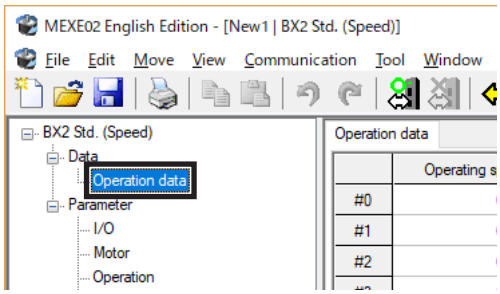
3. Select the product.
   1) Click the [New] icon in the toolbar.

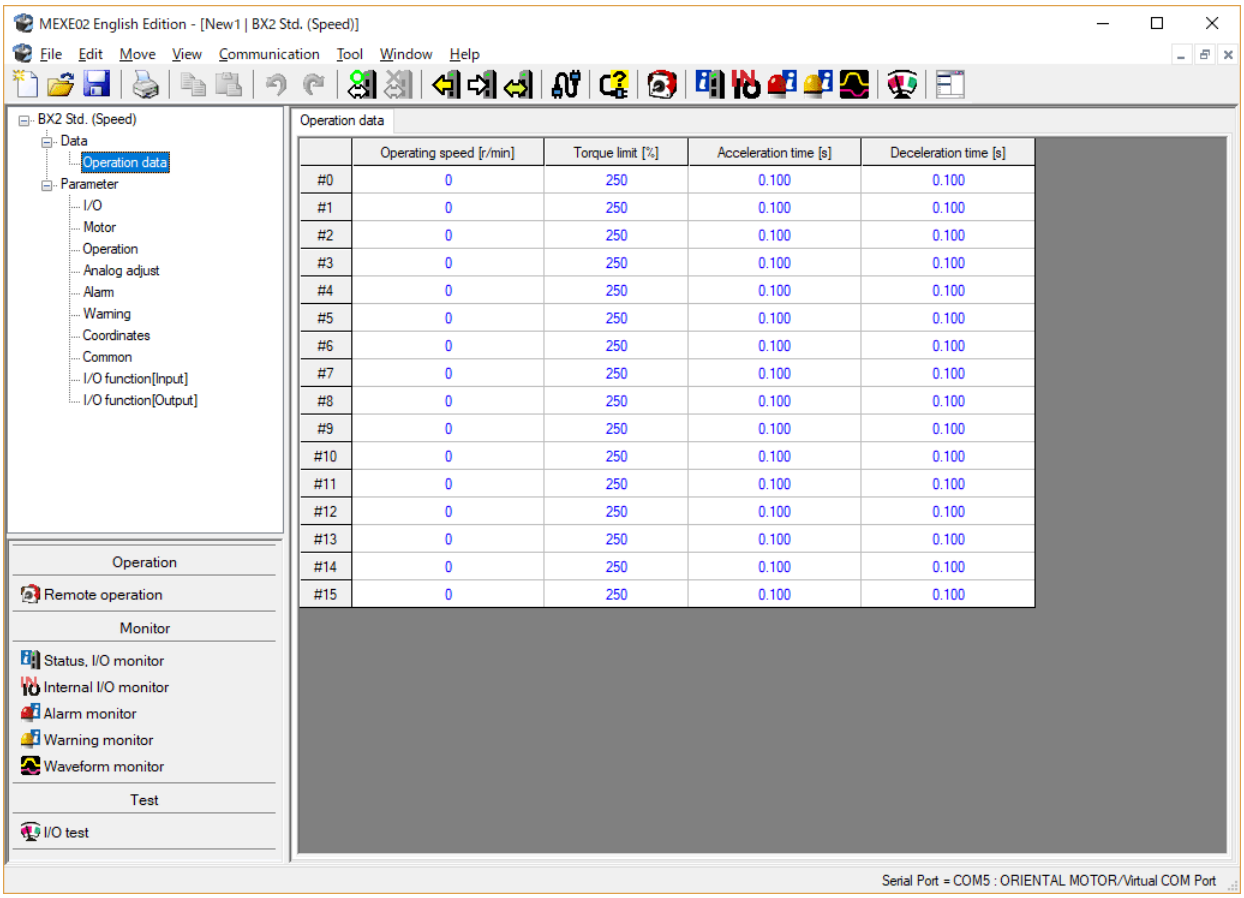
   Select "BX2."
   Four control modes are available in the **BX**Ⅱ Series.
   Select according to the control mode you have used.
   - Speed control mode: BX2 Std. (Speed)
   - Position control mode: BX2 Std. (Position)
   - **BX**-compatible mode (speed control): BX2 Std. (Compat.BX Speed)
   - **BX**-compatible mode (position control): BX2 Std. (Compat.BX Position)



2 Setting the operation data

Click "Operation data" in TreeView.
The operation data edit window appears.





■ Data entry

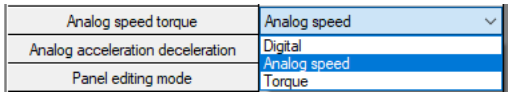
The background color of a cell is initially white. When the value in the cell is changed, the color of the cell changes to yellow.
The color of characters in the cell is initially blue. When the value in the cell is changed, the color of characters changes to black.

- Entering a numeric value

  Click a desired cell, and enter a value using the keyboard.

- Selecting a value from a pull-down menu

  Double-clicking a desired cell displays a pull-down menu. Select a desired value from the pull-down menu.

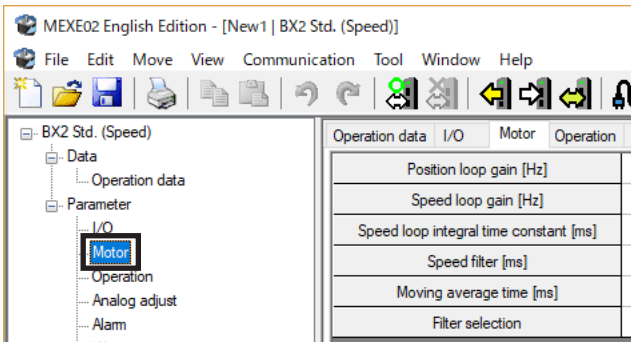


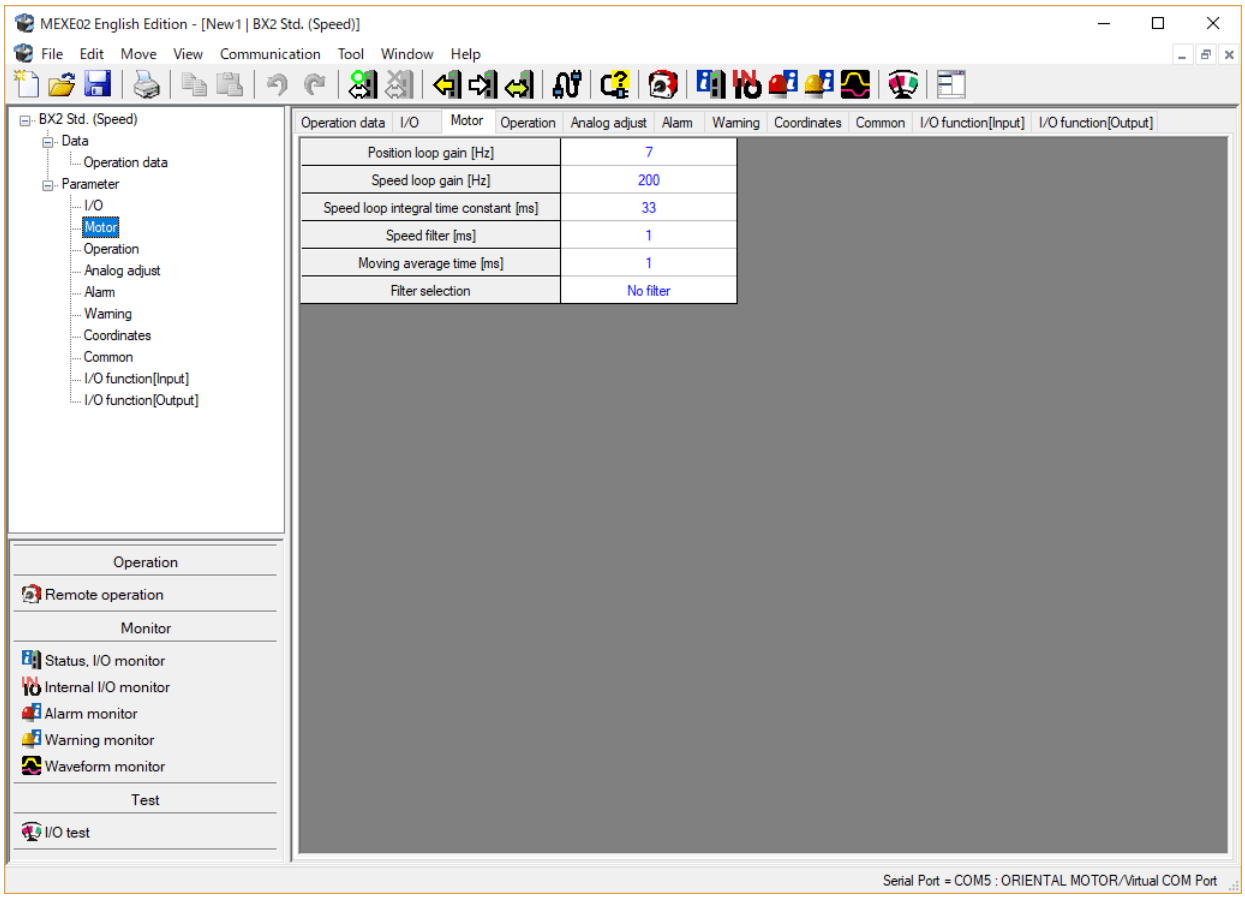
memo Moving a cursor over a cell to be input the data can check the description, the setting range, and the update timing.

Refer to the operating manual of the **MEXE02** for how to use such as data editing method and others.

3 Setting the parameters

1. The data edit window opens.
2. Click the parameter to be edited in TreeView.
   The parameter edit window appears.





Refer to the operating manual of the **MEXE02** for how to edit the data and others.

3. Write the data to the driver after editing.
   Click "Data writing" in the toolbar.

4 Monitor

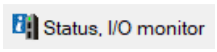
The motor operating status, alarm condition, and I/O signals can be monitored.
In the waveform monitor, the motor operating speed and I/O signal switching status can be checked in a waveform format.
This section explains using the screen of the speed control mode as an example.

4.1 Status, I/O monitor

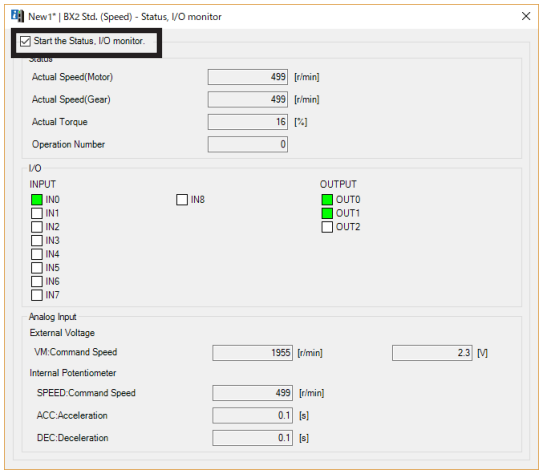
The motor operating status of the **BXII** Series, ON-OFF status of I/O, and setting values of the analog setting devices can be checked.

1. Start "Status, I/O monitor" using either of the following methods.
   Starting from the toolbar: Click the [Status, I/O monitor] icon
   Starting from the shortcut button: Click [Status, I/O monitor]

Or



2. Click "Start the Status, I/O monitor."
   The status, I/O monitor starts.



The ON-OFF status is indicated as follows.

Indication	Energized state
ON (green)	Conductive state
OFF (white)	Non-conductive state

3. To exit the monitor, unselect "Start the Status, I/O monitor."

- Status monitor

Item	Description
Actual Speed (Motor)	Monitors the detected speed of the motor.
Actual Speed (Gearhead)	Monitors the detected speed converted by the set gear ratio.
Actual Torque	Monitors the output torque of the motor. (Indicates a ratio based on the rated torque being 100% as a load factor.)
Operation Number	Monitors the operation data number presently selected.

  - Indication items vary depending on the control mode.

- I/O monitor

Item	Description
INPUT	Monitors each ON-OFF status of the assigned input signals.
OUTPUT	Monitors each ON-OFF status of the assigned output signals.

- Analog input

Item	Description
External Voltage	Monitors the rotation speed* and the voltage set with the external potentiometer or external DC voltage.
Internal Potentiometer	Monitors the rotation speed set with the internal potentiometer (SPEED) and the time set with the acceleration time potentiometer (ACC) and deceleration time potentiometer (DEC).

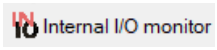
* The torque limiting value is monitored when the "Analog speed torque" parameter (ID: 2161) is set to "2: Torque."

4.2 Internal I/O monitor

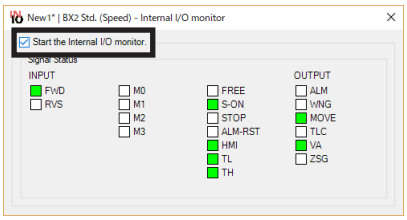
All I/O signals of the **BXⅡ** Series can be monitored. (Including signals not assigned to I/O)

1. Start the "Internal I/O monitor" using either of the following methods.
   Starting from the toolbar: Click the "Internal I/O monitor" icon
   Starting from the shortcut button: Click "Internal I/O monitor"

Or



2. Click "Start the Internal I/O monitor."
   The internal I/O monitor starts.



The ON-OFF status is indicated as follows.

Indication	Internal signal status
ON (green)	Active state
OFF (white)	Non-active state

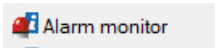
3. To exit the monitor, unselect "Start the Internal I/O monitor."

4.3 Alarm monitor

Alarm information of the **BXⅡ** Series can be monitored.

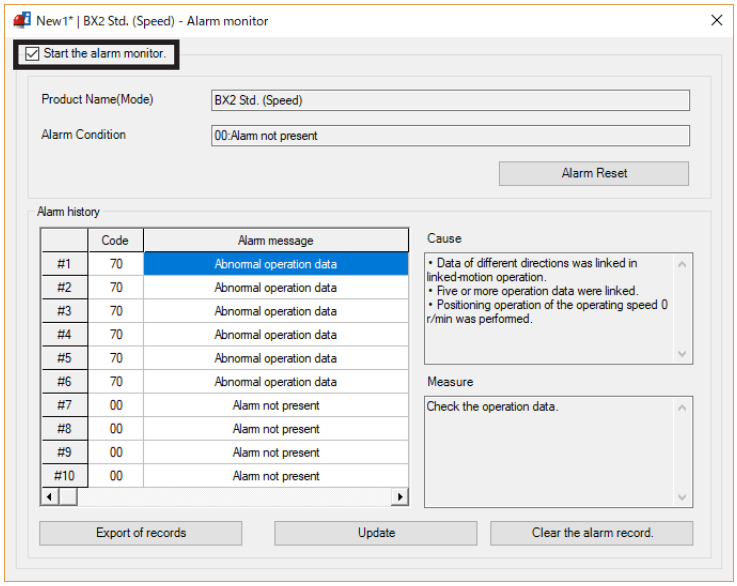
1. Start the "Alarm monitor" using either of the following methods.
   Starting from the toolbar: Click the "Alarm monitor" icon
   Starting from the shortcut button: Click "Alarm monitor"

Or



   The window of the alarm monitor appears.

2. Click "Start the alarm monitor."
   The alarm monitor starts.



3. To exit the monitor, unselect "Start the alarm monitor."

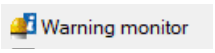
NOTE Data cannot be written to the driver from the **MEXE02** during operation.

4.4 Warning monitor

Warning information of the **BXII** Series can be monitored.

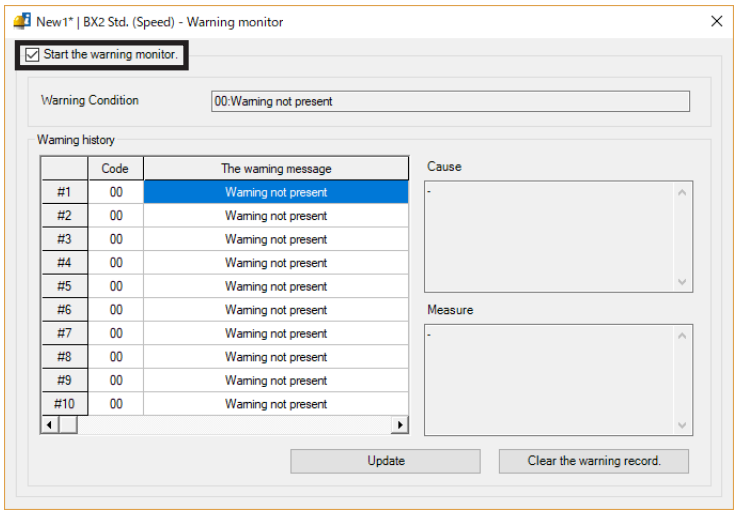
1. Start the "Warning monitor" using either of the following methods.
   Starting from the toolbar: Click the [Warning monitor] icon
   Starting from the shortcut button: Click [Warning monitor]

Or



   The window of the warning monitor appears.

2. Click "Start the warning monitor."
   The warning monitor starts.



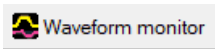
3. To exit the monitor, unselect "Start the warning monitor."

4.5 Waveform monitor

The motor speed or the status of I/O signals can be checked in a waveform format.

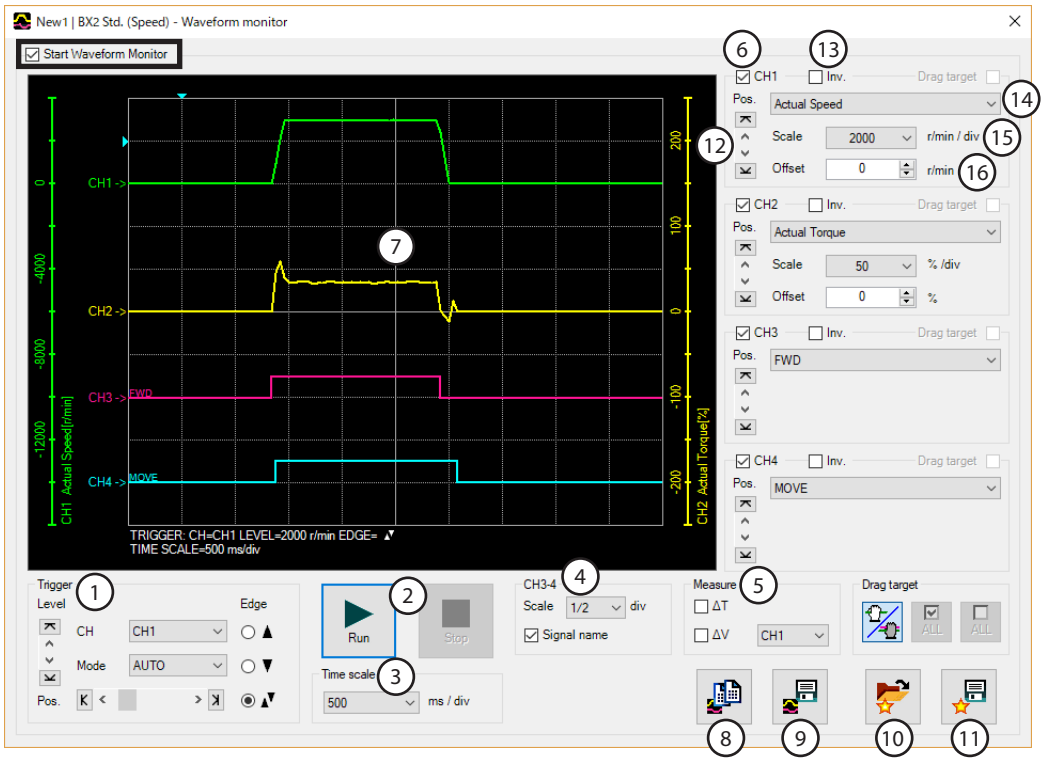
1. Start the "Waveform monitor" using either of the following methods.
   Starting from the toolbar: Click the [Waveform monitor] icon
   Starting from the shortcut button: Click [Waveform monitor]

Or



   The window of the waveform monitor appears.

2. Click "Start Waveform Monitor."
   The buttons on the window are enabled, allowing you to prepare for measurement of the waveform monitor.



1	Sets the Pos (trigger position), Level, CH, Mode, and Edge (detection condition) that are used when a waveform is measured. For "CH," only those CHs displayed on ⑦ can be used.
2	Run: This button is used to start measurement. Stop: This button is used to stop measurement.
3	Sets the measurement time range (width).
4	Sets the display method for CH3 to CH4. Scale: Selects the display size from 1/1 (100%), 1/2 (50%), or 1/4 (25%). Signal name: Shows or hides the signal name.
5	Shows or hides measures for measurement. Also, selects the CH to be measured.
6	Shows or hides each CH.
7	Measurement results are drawn in this area.
8	Copies the waveform presently shown to the clipboard.
9	Saves the waveform presently shown to an external file.
10	Reads the setting for measurement from "Favorites."
11	The setting for measurement can be saved as "Favorites."
12	The display position of a waveform can be moved up or down.
13	Inverts the display of measured signal.
14	Selects the signal to be measured. CH1, CH2: Command speed, Actual speed, Actual torque, Main Power Internal DC Volt. CH3, CH4: I/O signals
15	Selects a display scale for signals. Using this in combination with ⑯ can zoom in on signals.
16	Adds the set offset value to the signal display. Using this in combination with ⑮ can zoom in on signals.

3. Click "Run."
   Waveform measurement starts.
4. During measurement, click "Stop" to exit the waveform measurement.
   If "SINGLE" is selected for Mode in Trigger, measurement automatically ends when the waveform drawing ends.
5. To exit the waveform monitor, unselect "Start Waveform monitor."

4.6 Test operation

■ Remote operation

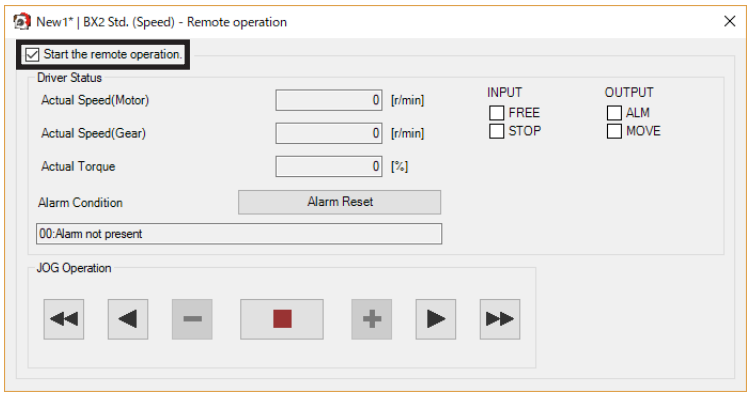
A motor can be operated using the **MEXE02**. The motor operation can be checked before connecting to a host controller. Also, the teaching function of the operation data can be performed in the position control mode. (Teaching, remote operation)

- Speed control mode

1. Start the "Remote operation" using either of the following methods.
   Starting from the toolbar: Click the "Remote operation" icon
   Starting from the shortcut button: Click "Remote operation"

   The window of the remote operation appears.

2. Click "Start the remote operation."



JOG operation

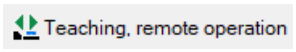
Type of button	Description
	Operates continuously in the negative direction at the JOG operating speed.
	Operates continuously in the negative direction at the speed of one-tenth of the JOG operating speed.
	Operates continuously in the positive direction at the speed of one-tenth of the JOG operating speed.
	Operates continuously in the positive direction at the JOG operating speed.
	Not used.

3. To end the operation, unselect "Start the remote operation."

- Position control mode

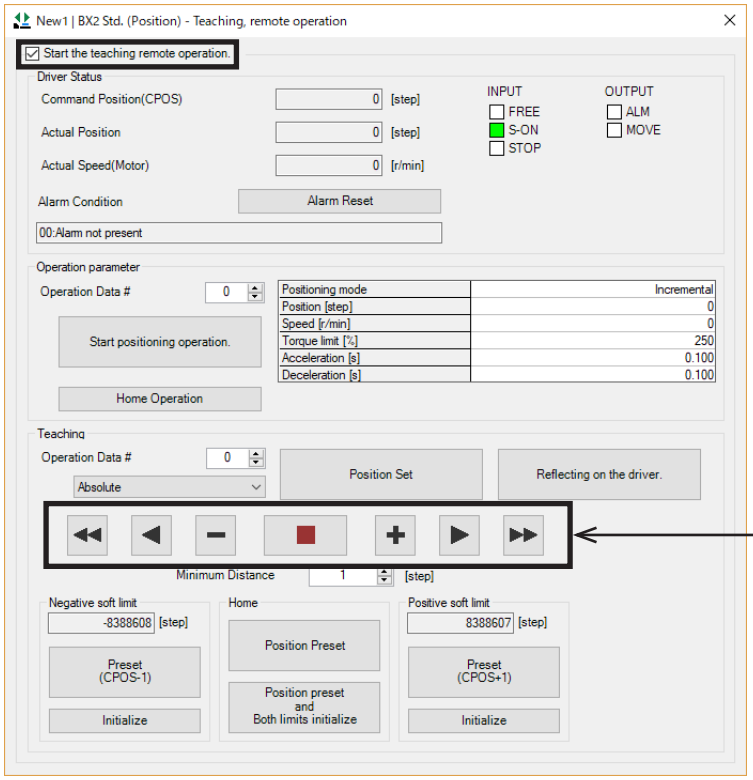
1. Start the "Teaching, remote operation" using either of the following methods.
   Starting from the toolbar: Click the "Teaching, remote operation" icon
   Starting from the shortcut button: Click "Teaching, remote operation"

Or



   The window of the teaching, remote operation appears.

2. Click "Start the teaching remote operation."
   Positioning operation or return-to-home operation can be executed.



JOG operation buttons

Teaching function

Type of button	Description
◀◀	Operates continuously in the negative direction at the JOG operating speed.
◀	Operates continuously in the negative direction at the speed of one-tenth of the JOG operating speed.
▶	Operates continuously in the positive direction at the speed of one-tenth of the JOG operating speed.
▶▶	Operates continuously in the positive direction at the JOG operating speed.
+	Moves a minimum travel amount in the positive direction.
−	Moves a minimum travel amount in the negative direction.
■	Stops the operation immediately.

   The position at which the motor has moved in JOG operation can be transferred to the operation data.

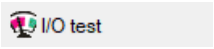
3. To end the operation, unselect "Start the teaching remote operation."

4.7 I/O test

The I/O signals of D-I/O can be tested.
Input signals can be monitored, and output signals can forcibly be turned ON or OFF to check the connection with a host controller.

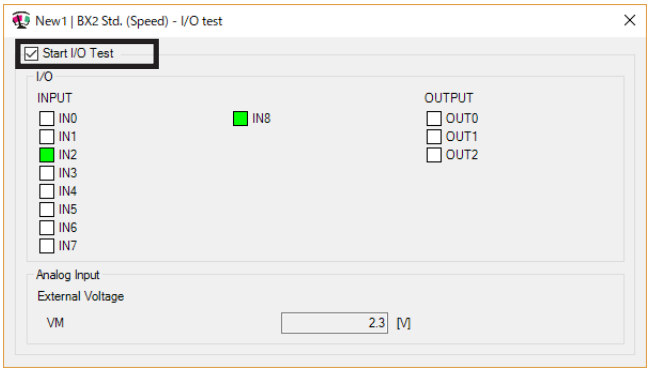
1. Start the "I/O test" using either of the following methods.
   Starting from the toolbar: Click the "I/O test" icon.
   Starting from the shortcut button: Click "I/O test."

Or



   The window of the I/O test appears.

2. Click "Start I/O Test."



Note

- Output signals can forcibly be turned ON or OFF with I/O test. Therefore, other devices connected to the applicable product may operate. Before operation, check the condition of the surrounding area to ensure safety.
- Remote operation (teaching, remote operation) and I/O test cannot be executed at the same time.

3. To end the test, unselect "Start I/O Test."

9 Inspection, troubleshooting and remedial actions

This part explains how to perform the periodical inspection and how to check and take remedial actions when a problem occurs.

Table of contents

1 Maintenance and inspection

1.1 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

- Are the mounting screws of the motor/gearhead loose?
- Are there any abnormal noises in the motor bearings (ball bearings)?
- Are there any abnormal noises in the bearing (ball bearing) and gear meshing parts of the gearhead?
- Is the motor/gearhead output shaft misaligned with the load shaft?
- Are there any scratches, signs of stress or loose driver connections in the cable?
- Are the openings in the driver blocked?
- Are any of the mounting screws or main power input unit of the driver loose?
- Are there any strange smells or appearances within the driver?

1.2 Warranty

Check on the Oriental Motor Website for the product warranty.

1.3 Disposal

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

2 Alarms, warnings

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).

2.1 Alarms

If an alarm is generated, the ALM output is turned OFF to stop the motor. At the same time, the alarm code is displayed on the operation panel. The alarm code can also be checked using the **MEXE02** or the **OPX-2A**.

■ Alarm reset

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

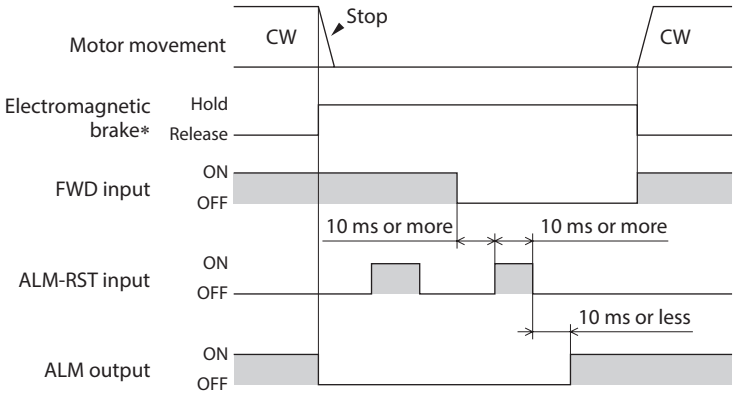
- Turn the ALM-RST input from ON to OFF. (It is enabled at the OFF edge of the input.)
- Execute the alarm reset in the monitor mode of the operation panel.
- Execute an alarm reset using the **MEXE02** or **OPX-2A**.
- Turn on the power again.

Note

- Continuing the operation without removing the cause of the alarm may cause damage to equipment.
- Some alarms cannot be reset by other than turning on the power again. Check the table on and after the next page.
- Wait at least 30 seconds after turning off the power before turning it back on again.

- When an alarm is reset by the ALM-RST input

When resetting an alarm with the ALM-RST input, turn the operation signal OFF and remove the cause of the alarm before turning the ALM-RST input ON (keep it ON for 10 ms or more) and then OFF. The ALM-RST input is disabled while the operation signal is being ON. The figure shows an example when the operation signal is the FWD input.



* The electromagnetic brake will hold the motor shaft at the moment an alarm is generated.

- Display on the operation panel when resetting an alarm

When an alarm is reset with the ALM-RST input, AL 00 is displayed on the operation panel. If the operation is resumed as it is, the display of AL 00 will not be cleared. When changing from the display of AL 00, change the display item using [∧] [∨] keys.

■ Alarm history

Up to 10 generated alarms are saved in the non-volatile memory in order of the latest to oldest. Alarm history stored in the non-volatile memory can be read and cleared when any of the following items is performed.

- Clear the alarm history in the monitor mode of the operation panel.
- Read and clear the alarm history using the **MEXE02** or **OPX-2A**.

■ Alarm lists

Alarm code	Alarm type	Cause	Remedial action	Reset by the ALM-RST input	Motor excitation∗1
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.	Possible	Excitation off
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 supply is turn off and on again, contact your nearest Oriental Motor sales office.	Not possible	
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.	Possible	
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.	Not possible	
AL2d	Main circuit output error∗2	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 approximately 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.	Possible	
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 supply is turn off and on again, contact your nearest Oriental Motor sales office.	Not possible	
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.		

∗1 When an alarm generates, the motor operates as follows.
Excitation off: When an alarm is generated, the motor current will be cut off and the motor will lose its holding torque. In the case of the electromagnetic brake motor, the electromagnetic brake automatically holds the position.
Excitation on: Even when an alarm is generated, the motor current will not be cut off and the motor excitation state will be continued.

∗2 This alarm is not generated when the torque limiting value is set to less than 250%.

Alarm code	Alarm type	Cause	Remedial action	Reset by the ALM-RST input	Motor excitation∗1
AL46	Alarm initial drive∗3	The main power supply was turned on when an operation signal was being ON.	Turn the operation signal OFF.	Possible	Excitation off
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.	Not possible	
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.	Possible	Excitation on
AL70	Abnormal operation data	• Operation data of different directions was linked in linked-motion operation. • The operation data was linked five data or more. • Positioning operation of the operating speed 0 r/min was performed. • Positioning operation was performed at the operating speed 0 r/min for the operation data No.7. **BX**-compatible mode (Position control)	Check the operation data.		

∗1 When an alarm is generated, the motor operates as follows.
Excitation off: When an alarm is generated, the motor current will be cut off and the motor will lose its holding torque. In the case of the electromagnetic brake motor, the electromagnetic brake automatically holds the position.
Excitation on: Even when an alarm is generated, the motor current will not be cut off and the motor excitation state will be continued.
∗3 This alarm is generated when the "Alarm initial drive" function was set to enable.

2.2 Warnings

If a warning is generated, the WNG output is turned ON. The motor will continue to operate.
Once the cause of the warning is removed, the WNG output will be turned OFF automatically.

■ Warning list

Warning code	Warning type	Cause	Remedial action
n10	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.
n22	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.
n30	Overload	A load exceeding the value set in the "Overload warning level" parameter was applied.	Check the load condition.
n6c	Operation prohibited	When an operation signal is being ON, the function mode was changed from the test mode to other mode.	Turn the operation signal OFF.

■ Warning history

Up to 10 generated warnings are saved in the RAM in order of the latest to oldest. The warning history saved in the RAM can be read and cleared when any of the following items is performed.

- Clear the warning history in the monitor mode of the operation panel.
- Read and clear the warning history using the **MEXE02** or the **OPX-2A**.

Note The warning history is cleared when the driver power is turned off.

3 Troubleshooting and remedial actions

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

Phenomenon	Possible cause	Remedial action
The motor does not operate.	The power supply is not connected properly.	Check the connection between the driver and power supply.
	Both the FWD input and RVS input are being OFF.	Turn either the FWD input or RVS input ON.
	Both the FWD input and RVS input are being ON.	
	An alarm is present.	An alarm is generated due to a protective function being triggered. Refer to p.166 to reset the alarm.
	A load exceeding the setting of the torque limiting value is being applied.	If the setting of the torque limiting value is low, the motor may not start operating. Set the torque limiting value with providing a margin of 20% or more as a guide.
The motor rotates in the direction opposite to the specified direction.	The FWD input and RVS input are connected wrongly or otherwise not connected correctly.	Check the connection of the FWD input and RVS input. The motor rotates in the clockwise direction when the FWD input is ON, and rotates in the counterclockwise direction when the RVS input is ON.
	The gear ratio that the gearhead output shaft rotates in the opposite direction against the motor rotation direction is used. (Refer to p.110 for the rotation direction of the gearhead output shaft)	Accordingly, reverse the FWD input and RVS input operations.
	A combination type hollow shaft flat gearhead is used.	• With a combination type-hollow shaft flat gearhead, the rotation direction of the gearhead output shaft is opposite of the motor output shaft. Accordingly, reverse the FWD input and RVS input operations. • Check the direction from which the gearhead is viewed. With a combination type-hollow shaft flat gearhead, the rotating direction of the gearhead changes according to the direction in which the gearhead is viewed.
• Motor operation is unstable. • Motor vibration is too large.	The motor and gearhead output shaft is misaligned with a load shaft.	Check the coupling condition of the motor and gearhead output shaft and the load shaft.
	Effect of electrical noise.	Check the operation only with the motor, driver and other external equipment required for operation. If an effect of noise has been confirmed, implement the following countermeasures: • Move the motor and driver farther away from noise generation sources. • Reconsider the wiring. • Change the signal cable to a shielded cable. • Install ferrite cores.

Note

- Check the alarm message when the alarm is generated.
- The I/O signals can be monitored using the operation panel, **MEXE02**, or **OPX-2A**. Use when checking the wiring condition of the I/O signals and others.

10 Appendix

This part explains cables and peripheral equipment (sold separately) used in combination with the products in addition to the regulations and standards.

Table of contents

1 Specifications

1.1 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." Refer to "5.3 Lists of combinations" on p.16 for the motor model name.

- 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

Model	Motor	BXM5120		BXM6200	
	Driver	**BXSD120-A2**	**BXSD120-C2**	**BXSD200-A2**	**BXSD200-C2**
Rated output power (Continuous)		120 W		200 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: 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
	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
Rated torque		0.4 N·m (56 oz-in)		0.65 N·m (92 oz-in)	
Maximum instantaneous torque		0.8 N·m (113 oz-in)		1.3 N·m (184 oz-in)	
Rated speed		3000 r/min			

- 400 W

Model	Motor	**BXM6400**
	Driver	**BXSD400-C2**
Rated output power (Continuous)		400 W
Power supply input	Rated voltage	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: 4.7 A Three-phase: 2.8 A
	Maximum input current	Single-phase: 9.8 A Three-phase: 6.4 A
Rated torque		1.3 N·m (184 oz-in)
Maximum instantaneous torque		2.6 N·m (360 oz-in)
Rated speed		3000 r/min

1.2 General specifications

		Motor	Driver
Operating environment	Ambient temperature	0 to +50 °C [+32 to +122 °F] (non-freezing)	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 or oil. Cannot be used in radioactive materials, magnetic field, vacuum or other special environment. (For details about installation locations, refer to p.22.)	
	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	−20 to +60 °C [−4 to +140 °F] (non-freezing)	−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		IP54 (Excluding the mounting surface of the round shaft type and the connector part)	IP20

2 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.
The product names that conform to relevant standards are the motor model names and driver model names.

■ UL Standards, CSA Standards

		Applicable Standards	Certification body	Standards File No.
Motor*	30 W 60 W 120 W	UL 60950-1 CSA C22.2 No.60950-1	UL	E208200
	200 W 400 W	UL 1004-1 CSA C22.2 No.100		E335369
Driver		UL 61800-5-1 CSA C22.2 No.274		E171462

* Thermal class UL/CSA Standards: 105(A)

■ 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

Motor: EN 60034-1, EN 60034-5, EN 60664-1
Driver: EN 61800-5-1

Installation conditions (EN Standards)

Motor*	Driver
For incorporating in equipment Overvoltage category: Ⅲ Pollution degree: 3 Protection against electric shock: Class Ⅰ equipment	For incorporating in equipment Overvoltage category: Ⅱ Pollution degree: 2 Protection against electric shock: Class Ⅰ equipment

* Thermal class EN Standards: 120 (E)

- EMC Directive

This product has received EMC compliance under the conditions specified in "Example of installation and wiring" on p.176.
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.

■ Republic of Korea, Radio Waves Act

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

■ RoHS Directive

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

3 Installing and wiring in compliance with EMC Directive

The **BXⅡ** Series has been designed and manufactured to be incorporated in equipment. The EMC Directive requires that your mechanical equipment in which the product is installed satisfies the applicable requirements.
The installation/wiring methods of the motor and driver explained here represent the basic methods that are effective in helping your mechanical equipment conform to the EMC Directive.
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.

Effective measures must be taken against the EMI that the **BXⅡ** Series product may give to adjacent control system equipment, as well as the EMS of the **BXⅡ** Series product itself, in order to prevent a serious functional impediment in the mechanical equipment.
The use of the following installation and wiring methods will enable the **BXⅡ** Series product to be compliant with the EMC directive.

■ Connecting a mains filter

Install a mains filter in the AC input line in order to prevent the noise generated within the driver from propagating outside via the power line. For a mains filter, use the products as shown in the table, or an equivalent.

Manufacturer	Single-phase 100-120 VAC Single-phase 200-240 VAC	Three-phase 200-240 VAC
Soshin Electric Co., Ltd.	HF2010A-UPF	HF3010C-SZA, NFU3010C-Z1
Schaffner EMC	FN2070-10-06	FN3025HP-10-71

- Overvoltage category II applies to mains filters.
- Install the mains filter as close to the driver as possible.
- Use cable clamps and other means to secure the input and output cables firmly to the surface of the enclosure.
- Connect the ground terminal of the mains filter to the grounding point, using as thick and short wire as possible.
- Do not place the AC input cable (AWG18 to 14: 0.75 to 2.0 mm^2) parallel with the mains-filter output cable (AWG18 to 14: 0.75 to 2.0 mm^2). Parallel placement will reduce mains filter effectiveness if the enclosure's internal noise is directly coupled to the power supply cable by means of stray capacitance.

■ Connecting the external power supply

Use an external power supply conforming to the EMC Directive. Use a shielded cable for wiring the external power supply over the shortest possible distance. Refer to "Wiring of the power supply cable" for how to ground the shielded cable.
"Wiring of the power supply cable"

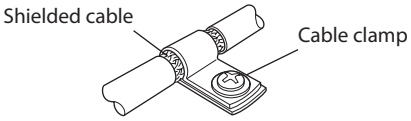
■ Grounding method

The cable used to ground the motor, driver, mains filter and power supply cable (shielded cable) must be as thick and short as possible so that no potential difference is generated among the grounding points. Choose a large, thick and uniformly conductive surface for the grounding point. Refer to the p.37 for how to ground.

■ Wiring of the power supply cable

Use a shielded cable of AWG18 to 14 (0.75 to 2.0 mm^2) in diameter for the power supply cable and keep it as short as possible. Strip a part of the shielded cable and ground the stripped part using a metal cable clamp that contacts the stripped cable around its entire circumference, or use a drain wire to make the ground connection.

Connect both ends (mains filter side and power supply side) of the shielded cable to the grounding points so that no potential difference is generated between grounds.

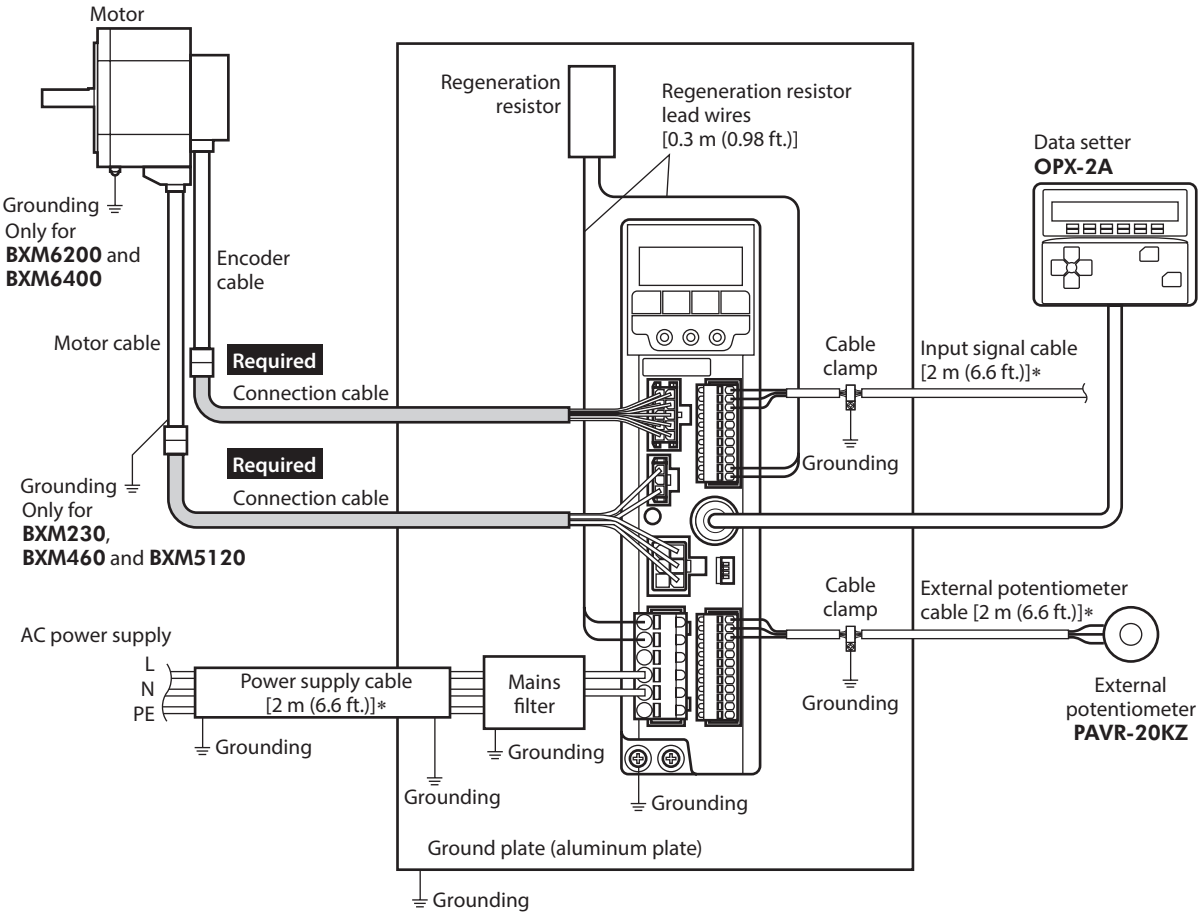


■ Notes about installation and wiring

- 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 product, use mains filters or CR circuits to suppress surges generated by them.
- Keep cables as short as possible without coiling and bundling extra lengths.
- Wire the power lines such as the motor cable and power cable away from the signal cables by providing a minimum clearance of 100 mm (3.94 in.) between them. If they have to cross, cross them at a right angle. Place the AC input cable and output cable of a mains filter separately from each other.
- When extending the wiring distance between the motor and the driver, use the connection cable (for extension) which is sold separately.
- The EMC testing is conducted using the Oriental Motor connection cable.

■ Example of installation and wiring

The figure shown below is the standard type.



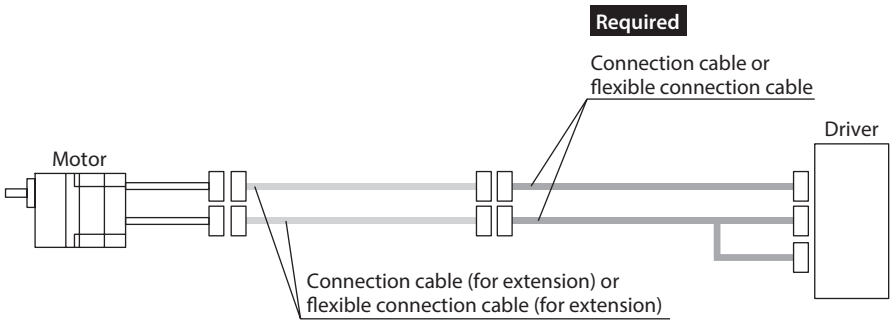
* Shielded cable

■ Precautions about static electricity

Static electricity may cause the driver to malfunction or suffer damage.
Be sure to ground the product in order to prevent electric shock or product damage by static electricity.
Except when operating the driver front panel, do not come near or touch the driver while the driver power is supplied.
Use an insulated screwdriver to change the switches on the driver.

4 Cable and peripheral equipment (sold separately)

■ Cable



- Connection cable

To connect a motor and a driver, always use the dedicated connection cable.
Both connection cables and flexible connection cables are a set of two cables consisting a cable for motor and a cable for encoder.

Length	Model	
	Connection cable	Flexible connection cable
0.3 m (1.0 ft.)	**CC003SBF2**	–
1.3 m (4.3 ft.)	**CC013SBF2**	**CC013SBR2**
2.3 m (7.5 ft.)	**CC023SBF2**	**CC023SBR2**
3.3 m (10.8 ft.)	**CC033SBF2**	**CC033SBR2**
5.3 m (17.4 ft.)	**CC053SBF2**	**CC053SBR2**
7.3 m (24.0 ft.)	**CC073SBF2**	**CC073SBR2**
10.3 m (33.8 ft.)	**CC103SBF2**	**CC103SBR2**
15.3 m (50.2 ft.)	**CC153SBF2**	**CC153SBR2**
20.3 m (66.6 ft.)	**CC203SBF2**	**CC203SBR2**
30.3 m (99.4 ft.)	**CC303SBF2**	**CC303SBR2**

- Connection cable (for extension)

This cable is used to extend the wiring distance between the motor and the driver. The wiring distance can be extended to a maximum of 30.3 m (99.4 ft.).
Both connection cables and flexible connection cables are a set of two cables consisting a cable for motor and a cable for encoder.

Length	Model	
	Connection cable	Flexible connection cable
1 m (3.3 ft.)	**CC01SBF**	**CC01SBR**
2 m (6.6 ft.)	**CC02SBF**	**CC02SBR**
3 m (9.8 ft.)	**CC03SBF**	**CC03SBR**
5 m (16.4 ft.)	**CC05SBF**	**CC05SBR**
7 m (23.0 ft.)	**CC07SBF**	**CC07SBR**
10 m (32.8 ft.)	**CC10SBF**	**CC10SBR**
15 m (49.2 ft.)	**CC15SBF**	**CC15SBR**
20 m (65.6 ft.)	**CC20SBF**	**CC20SBR**
30 m (98.4 ft.)	**CC30SBF**	**CC30SBR**

■ Regeneration resistor

If vertical drive (gravitational operation) such as elevator applications is performed or if sudden start-stop operation of a large inertia is repeated frequently, connect the regeneration resistor.

Model: **EPRC-400P** (for 30 W, 60 W, 120 W)
RGB100 (for 200 W, 400 W)

■ DIN rail mounting plate

When mounting the driver to a DIN rail, use the DIN rail mounting plate.
Use a DIN rail 35 mm (1.38 in.) wide.

Model: **MADP02**

■ External potentiometer

The operating speed of the motor can be set externally. The torque limiting value can also be set.

Model: **PAVR-20KZ**
PAVR2-20K

■ Data setter

The data setter lets you set data and parameters with ease and also functions as a monitor.

Model: **OPX-2A**

■ Communication cable for support software

Be sure to purchase the communication cable for support software when connecting a driver to a PC in which the **MEXE02** has been installed.
This is a set of a PC interface cable and USB cable. The cable is connected to the USB port on the PC.

Model: **CC05IF-USB** [5 m (16.4 ft.)]

The **MEXE02** can be downloaded from Oriental Motor Website Download Page.

You can check couplings and mounting brackets on the Oriental Motor Website.
Visit our website for details.

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Published in March 2022

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

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