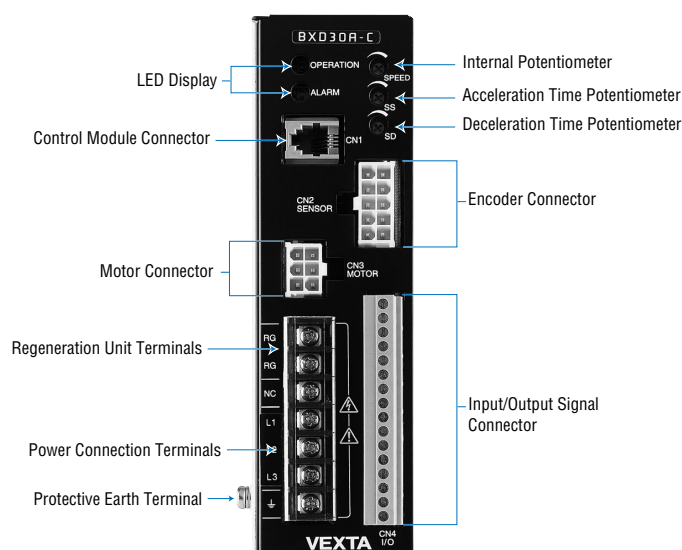


■ Connection and Operation



● LED Display

The **BX** Series offers a wide range of protection functions. As shown in the table below, the protection function that is currently active can be identified from the number of LED blinks. By counting the number of blinks, the host controller can determine the type of alarm.

◆ LED Display

Display	Color	Function	Condition
Operation	Green	Power Input Indication	When current is applied
Alarm	Red	Alarm Output Indication	When the protection function has activated

◆ Alarm Functions

Number of ALARM LED blinks	Protection Function	Cause
2	Overload protection	Load in excess of the rated torque is applied to the motor for about five seconds or more.
3	Overvoltage protection	Primary voltage of the driver inverter has exceeded the upper limit of the specified voltage range.
4	Excessive displacement	The motor in the position control mode* cannot follow the command during operation.
5	Overcurrent protection	Excessive current has flowed to driver inverter power element.
6	Excessive speed	The speed has exceeded 4000 r/min on the motor shaft.
7	EEPROM data error	The data has been corrupted.
8	Encoder failure	A problem has occurred with the feedback signal of the encoder.
9	Low voltage protection	Power supply voltage has dropped below the specified voltage range.

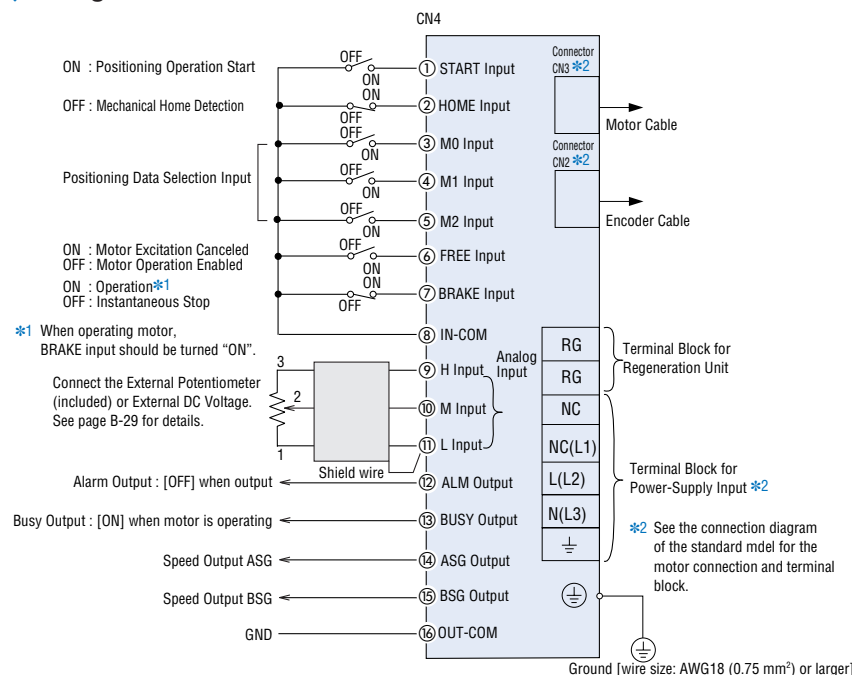
* The position control mode is enabled when the control module (**OPX-1A**) is connected.

● Input and Output Signals

Terminal Number	Signal	Standard Model	With Control Module	
		Speed Control Mode	Speed Control Mode	Position Control Mode
1	Input	CW	CW	START
2		CCW	CCW	HOME-LS
3		M0	M0	M0
4		NC	M1	M1
5		NC	M2	M2
6		FREE	FREE	FREE
7		BRAKE/ACL	BRAKE/ACL	BRAKE/ACL
8	Input Signal Common	IN-COM	IN-COM	IN-COM
9	Analog Input	H	H	H
10		M	M	M
11		L	L	L
12	Output	ALM	ALM	ALM
13		BUSY/ALP	BUSY (TLM)*/ALP	BUSY (TLM)*/ALP
14		ASG	ASG	ASG
15		BSG	BSG	BSG
16	Output Signal Common	OUT-COM	OUT-COM	OUT-COM

* The BUSY output can be changed to the torque-limiting output only when a torque limit is set. Details of Input and Output Signals → Page B-27

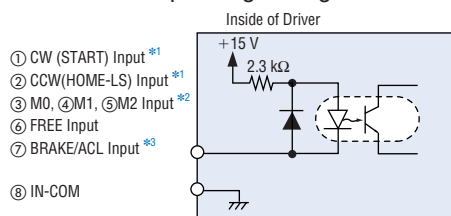
◆ Using the OPX-1A Control Module — Position Control Mode



● Driver Internal Circuits

◆ Input Circuit

The circled number located in front of each signal represents the number of the corresponding I/O signal terminal.



*1 The CW and CCW inputs function in the speed control mode on the standard model and when the **OPX-1A** control module is used.

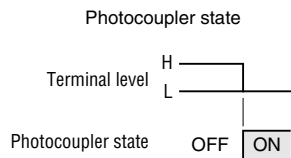
The START and HOME-LS inputs function in the position control mode when the **OPX-1A** control module is used.

*2 The M0 input is the only operation data selection input available on the standard model. The M0, M1 and M2 inputs function on the when the **OPX-1A** control module is used.

*3 This input functions as the BRAKE input during normal operation, and as the ACL input when a driver protection is active.

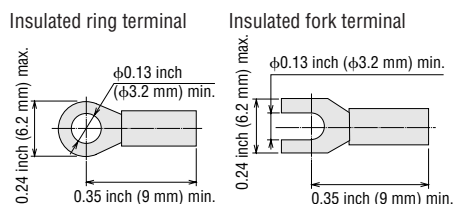
● Photocoupler State

The signal state represents the "ON: Carrying current" or "OFF: Not carrying current" state of the internal photocoupler rather than the voltage level of the signal.



■ Terminals

● Power Supply Terminals



● I/O Terminals (CN4)

When using a crimp terminal for connection, use one of the terminals listed below. The applicable crimp terminal varies, depending on the wire size. When the following terminals are used, the applicable wire size will be between AWG 26 and 18.

Manufacturer: Phoenix Contact

AI 0.25-6

Applicable wire size: AWG26~24 (0.14~0.2 mm²)

AI 0.34-6

Applicable wire size: AWG22 (0.35 mm²)

AI 0.5-6

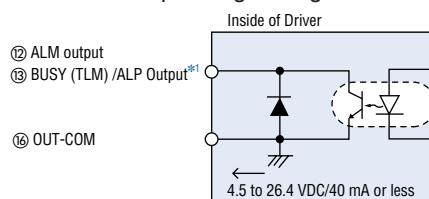
Applicable wire size: AWG20 (0.5 mm²)

AI 0.75-6

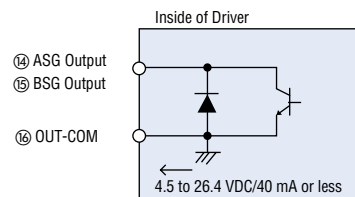
Applicable wire size: AWG18 (0.75 mm²)

◆ Output Circuit

The circled number located in front of each signal represents the number of the corresponding I/O signal terminal.



*1 This output functions as the BUSY output during normal operation, and as the ALP output when a driver protection is active. When the **OPX-1A** control module is used, the BUSY output can be changed to the TLM output.



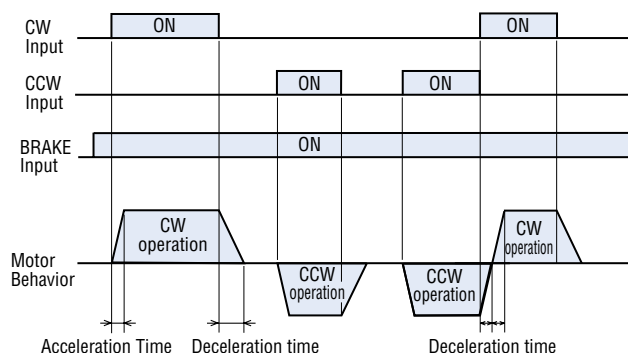
● Standard Model Input Signals

◆ Clockwise Rotation (CW) Input

This input functions in the speed control mode on the standard model and when the **OPX-1A** control module is used. When the BRAKE input is ON, motor operation is enabled. If the CW input is turned ON, acceleration and operation are performed in the clockwise direction at the rate set by the acceleration time potentiometer. If it is turned OFF, the motor decelerates and the operation stops at the rate set by the deceleration time potentiometer.

◆ Counterclockwise Rotation (CCW) Input

This input functions in the speed control mode on the standard model and when the **OPX-1A** control module is used. When the BRAKE input is ON, motor operation is enabled. If the CCW input is turned ON, acceleration and operation are performed in the counterclockwise direction at the rate set by the acceleration time potentiometer. If it is turned OFF, the motor decelerates and the operation stops at the rate set by the deceleration time potentiometer.



* If the direction of rotation has been changed, acceleration and deceleration will be performed at the rate set by time potentiometers.

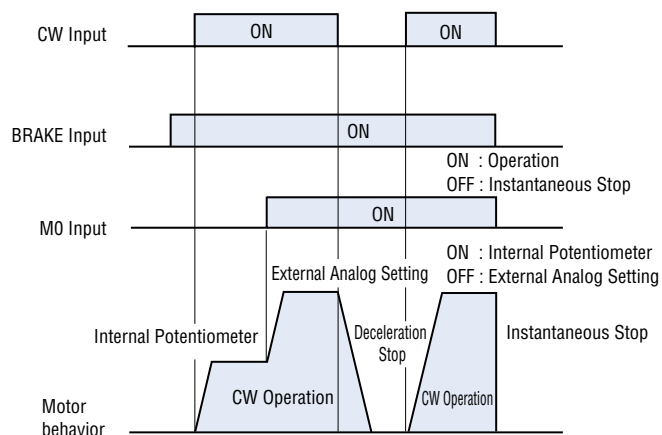
Note:

The direction of rotation indicates the direction as viewed from the motor's output shaft. With the pre-assembled gearmotor, the direction of rotation varies in according to the gearhead ratio. See the table of permissible torques on page B-14 for details.

◆ Speed Control Data Selection (M0) Input

With the M0 input, the speed can be controlled by either the external potentiometer or an external analog setting.

M0	Speed Data
OFF	Internal Potentiometer
ON	External Analog Setting



* The deceleration time potentiometer is effective upon speed change.

◆ Motor Control Release (FREE) Input

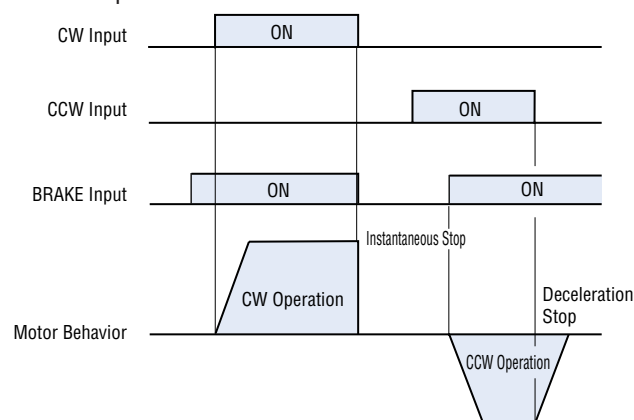
When the photocoupler is turned ON, the motor excitation is cancelled and the electromagnetic brake is released. The FREE input is given the highest priority regardless of the condition of other inputs. The FREE input functions even when a protection function is activated.

◆ Brake (BRAKE)/Alarm Clear (ACL) Input

This input functions as the BRAKE input during normal operation, and as the ACL input when a driver protection is active.

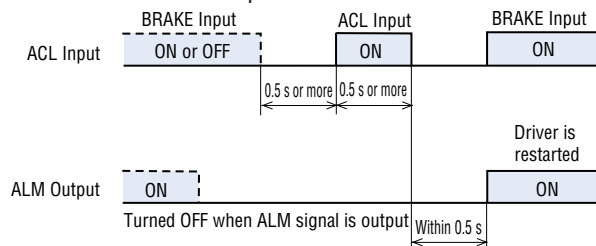
During Normal Operation (BRAKE Input)

When the BRAKE input is turned ON, motor operation is enabled. If it is turned OFF, the motor is stopped instantaneously. To start motor operation, be sure to set the BRAKE input to ON.



Upon Activation of a Protection Function (ACL Input)

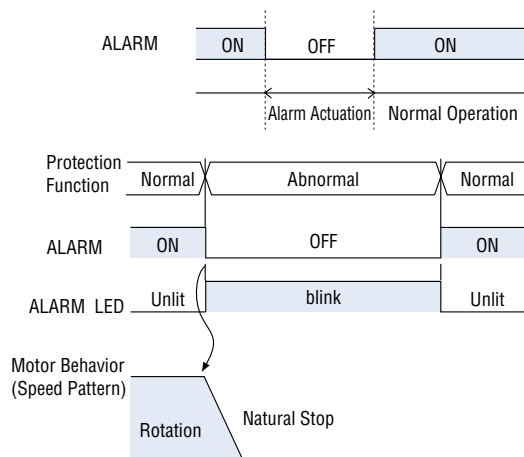
The activated protection function is reset and the driver is restarted. This input is used to reset protection functions while power is supplied. Note, however, that if the protection function is for overcurrent, EEPROM data failure, system failure or encoder failure have been activated, they cannot be reset. If any of these protection functions have been activated, call our Technical Support Line or contact your nearest Oriental Motor representative.



● Standard Model Output Signals

◆ Alarm (ALM) Output

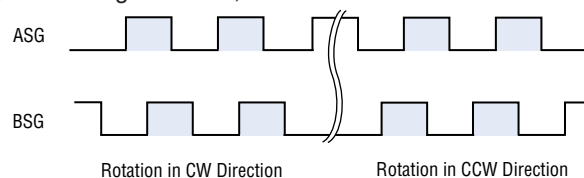
The photocoupler turns OFF when a driver protection function is active. When overload, overcurrent or other abnormality is detected, the alarm signal is output and the ALARM LED on the driver is blinked and the motor stops naturally. The electromagnetic brake will be activated. To reset the alarm signal output, remove the cause of the problem and ensure the safety of the equipment and load. Then turn on the ACL input or reconnect the power. When reconnecting the power, turn off the power and then wait for at least three seconds before turning it back on.



Note: The alarm output logic is opposite that of other signal outputs (positive logic output).

◆ Phase difference (ASG/BSG) Output

Feedback pulses are output from the encoder (500 p/r). This output is used when monitoring the motor speed and position by connecting a counter, etc.



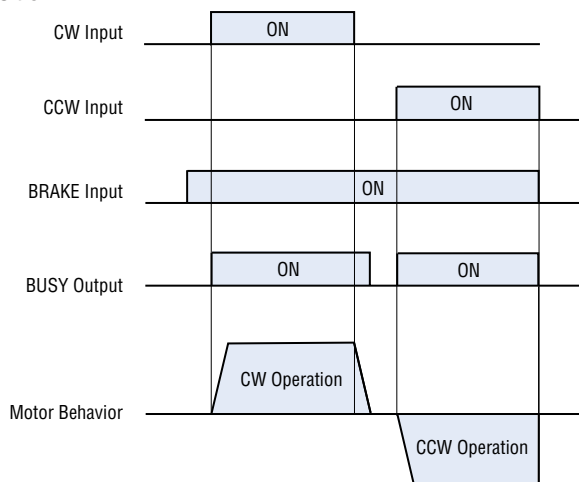
◆ Busy (BUSY) [Torque-Limiting (TLM)]/Alarm Pulse (ALP) Output

This output functions as the BUSY output during normal operation, and as the ALP output when a driver protection function is active. When the torque-limiting function is set when the **OPX-1A** control module is used. This output can be changed to the TLM output, which indicates that the torque limit has been reached.

During Normal Operation (Busy Output)

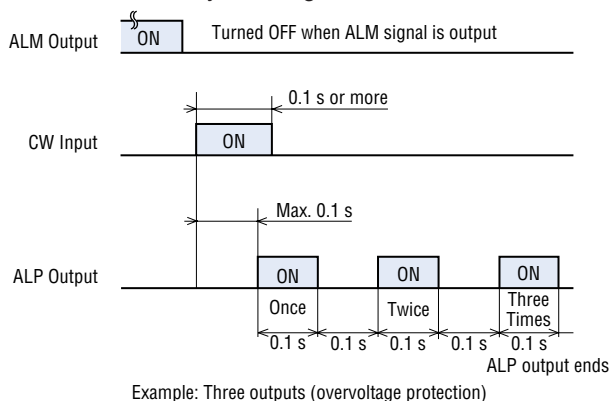
Speed control mode: The photocoupler turns ON during motor operation.

Position control mode: The photocoupler turns ON during rotation, and turns OFF upon stopping at the set stop position.



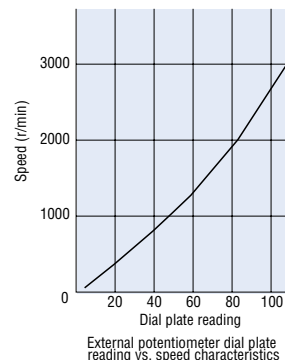
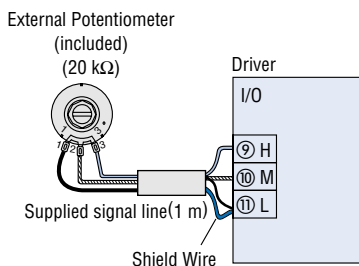
Upon Activation of a Protection Function (ALP Output)

If a one shot input (0.1s or more) is given to the rotational direction or START input, the ALARM LED will blink a number of times corresponding to the protective function that has been activated. This blinking pattern will be repeated every five seconds. This makes it possible for a PLC or other controller to determine the type of protective function that has been activated by counting the number of blinks.



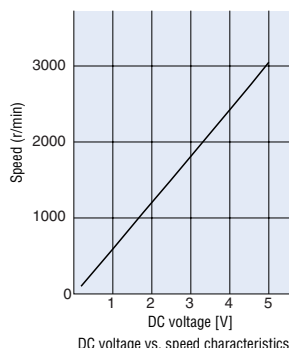
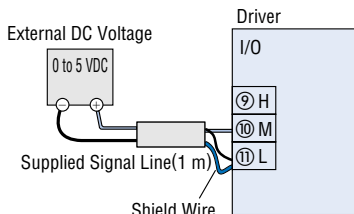
● Using the External Potentiometer (included)

When the motor speed is to be set remotely, connect the supplied external potentiometer as shown below. When the external potentiometer is used, set the M0 terminal to "Photocoupler ON."



● Speed Setting via External DC Voltage

When the motor speed needs to be set using external DC voltage, connect as follows. In this case, set the M0 terminal to "Photocoupler ON."



Note:

When setting speeds using the external potentiometer or via external DC voltage, be sure to use the supplied signal line (3.3 mm O.D. × 1 m). Connect the shield wire for the signal line to terminal L. Ensure proper connection on the external potentiometer or external DC voltage side so that the shield wire will not contact with another terminal. The input impedance between terminals M and L is approx. 15 kΩ.

OPX-1A Control Module Speed Control Modes

Input/Output signals and operation for speed control when using the **OPX-1A** control module are as follows:

● Input Signals

- Clockwise Rotation (CW) Input (same as Standard Model → Page B-27)
- Counterclockwise Rotation (CCW) Input (same as Standard Model → Page B-27)
- ◆ Output Signals (same as Standard Model → Page B-28)

◆ Operation Data Selection

The M0, M1 and M2 inputs will function. A maximum of eight different data sets can be selected.

M0	M1	M2	Speed data number in speed control or position control mode
OFF	OFF	OFF	No. 0 (internal potentiometer or digital setting)
ON	OFF	OFF	No. 1 (external analog setting or digital setting)
OFF	ON	OFF	No. 2 (digital setting)
ON	ON	OFF	No. 3 (digital setting)
OFF	OFF	ON	No. 4 (digital setting)
ON	OFF	ON	No. 5 (digital setting)
OFF	ON	ON	No. 6 (digital setting)
ON	ON	ON	No. 7 (digital setting)

OPX-1A Control Module Position Control Mode

Input/Output signals and operation for position control when using the **OPX-1A** control module are as follows:

◆ Input Signals

• Start (START) Input

This input functions in the position control mode when the **OPX-1A** control module is used. It starts the positioning, continuous, return to mechanical home or return to electrical home operations. Operation will start when the START input is turned ON after selecting the operation data via the combination of M0, M1 and M2 inputs.

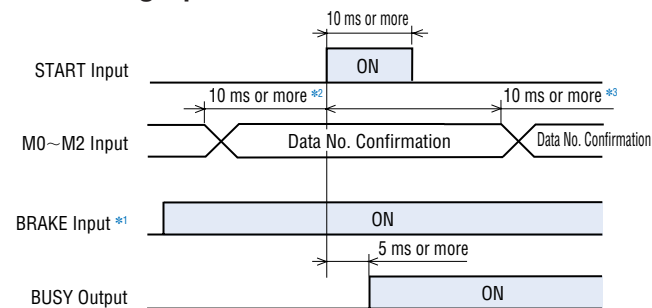
Data No. 0, 1: Positioning operation data / Continuous operation data

Data No. 2 to 5: Positioning operation data

Data No. 6: Return to electrical home operation

Data No. 7: Return to mechanical home operation

Positioning Operation

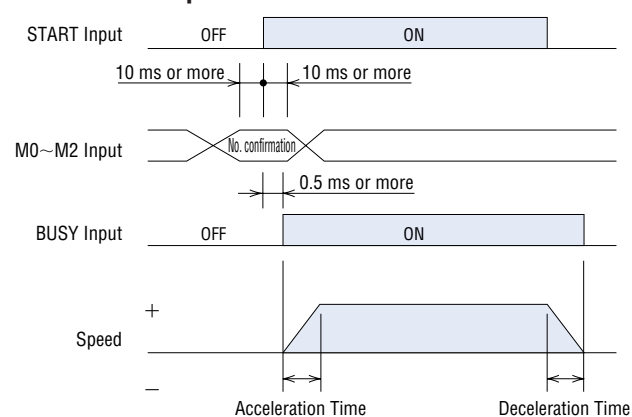


*1 The motor stops when the BRAKE input is turned OFF. Before starting motor operation, be sure to turn the BRAKE input to ON.

*2 Input the operation data confirmation signal at least 10 ms before the input of START signal.

*3 When confirming the data number for the next travel amount following input of the START signal, input the confirmation signal at least 10 ms after the input of that signal.

Continuous Operation



* When the digital independent torque-limit function is set, the data numbers will be reflected as necessary even during an index operation.

• Operation Data Selection (M0, M1, M2) Inputs

The M0, M1 and M2 inputs will function. The particular combination of these inputs selects travel amount data during positioning or continuous operation, as well as the return to mechanical or electrical home operation. The speed follows the settings in the table below.

M0	M1	M2	Travel amount data number in position control mode
OFF	OFF	OFF	No. 0 (digital setting) Positioning operation 0 / Continuous operation 0
ON	OFF	OFF	No. 1 (digital setting) Positioning operation 1 / Continuous operation 1
OFF	ON	OFF	No. 2 (digital setting) Positioning operation 2
ON	ON	OFF	No. 3 (digital setting) Positioning operation 3
OFF	OFF	ON	No. 4 (digital setting) Positioning operation 4
ON	OFF	ON	No. 5 (digital setting) Positioning operation 5
OFF	ON	ON	Return to electrical home operation
ON	ON	ON	Return to mechanical home operation

* No. 0 and No. 1 allow the switching of positioning operation and continuous operation.

• Mechanical Home Sensor (HOME-LS) Input

The HOME-LS input functions in the position control mode when the **OPX-1A** control module is used. It is used during the return to mechanical home operation.

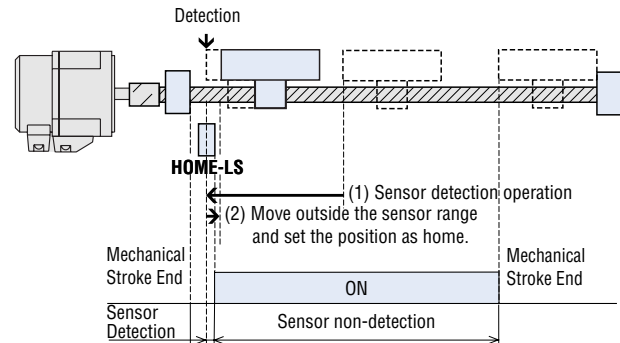
Return to Mechanical Home Operation

The mechanical home sensor (HOME-LS input) installed on the equipment is detected with the motor operated in the set detection start direction. Upon detection of the home sensor, the motor reverses its direction and stops at a position just outside the range of the home sensor.

Mechanical home detection method: 1-sensor mode (contact B input)

Starting direction of home detection: May be set as CW or CCW

Speed Input in data No. 7: No slow-start/slowdown time is set.



Note:

Install the home sensor (HOME-LS) before the stroke-end sensor on the detection starting side.

◆ Output Signals (same as Standard Model →Page B-28)

Torque-Limiting Function When Using the OPX-1A Control Module

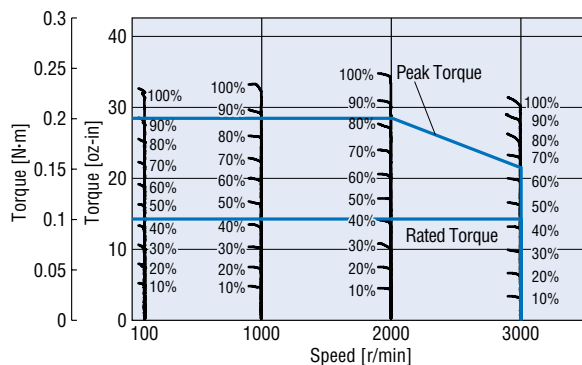
The **BX** Series permits the setting of a motor output torque limit when the **OPX-1A** control module is used in both the speed control mode and position control mode. The torque limit is set relative to the peak torque being 100 percent. When torque needs to be limited continuously during push-motion operation or gravitational operation, set the limit to 50 percent or less. Calculate the output torque for the pre-assembled gearmotor based on the applicable speed and torque, using the speed vs. torque limit characteristics graphs and formulas shown below.

Gearhead output shaft speed $N_G = \text{Motor speed} \times 1 / \text{Gearhead ratio}$

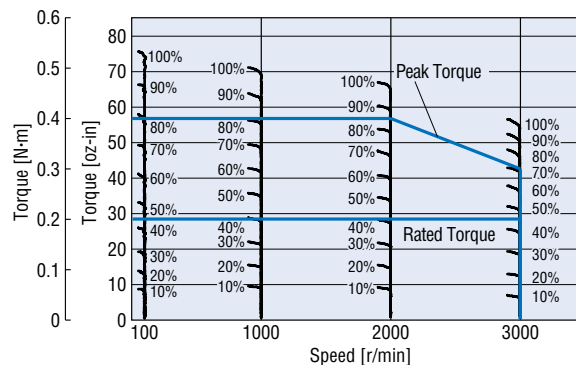
Gearhead output shaft torque $T_G = \text{Motor torque} \times \text{Gearhead ratio} \times 0.9$ (coefficient)

Speed — Torque Limit Characteristics (Reference Values)

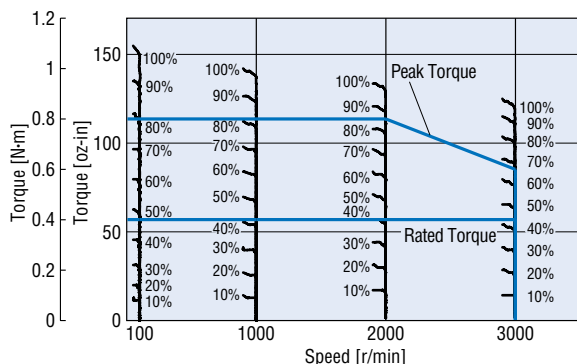
BX230□-A/BX230□-□
BX230□M-A/BX230□M-□



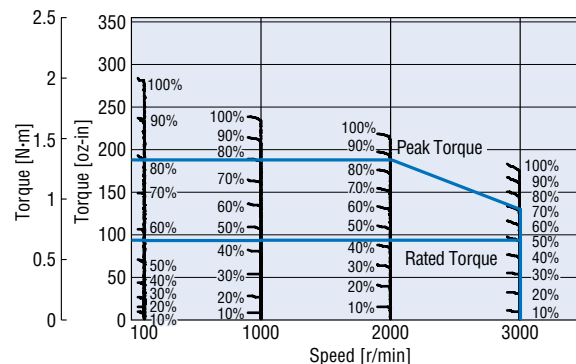
BX460□-A/BX460□-□
BX460□M-A/BX460□M-□



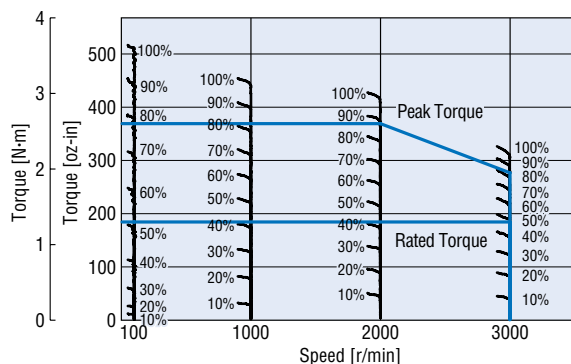
BX5120□-A/BX5120□-□
BX5120□M-A/BX5120□M-□



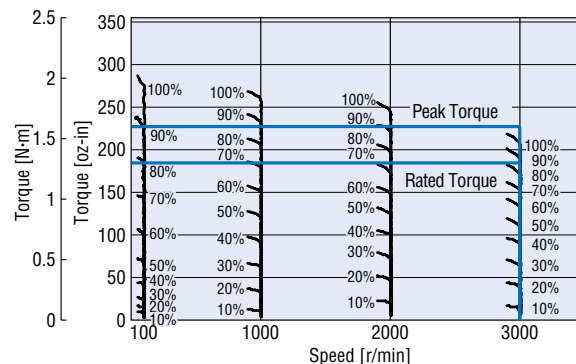
BX6200□-A/BX6200□-□
BX6200□M-A/BX6200□M-□



BX6400S-A
BX6400SM-A Round Shaft



BX6400S-□
BX6400SM-□ Combination type



Note:

An error of up to approximately 20 percent may occur between the set value and generated torque due to the speed setting, power-supply voltage and distance of motor cable extension. Repeatability under the same condition is approximately 10 percent. We recommend that the torque limit be set to approximately 20 percent or more.

- Enter the letter representing the voltage (**A** or **C**) in the first box (□) within the model name. Enter the gear ratio in the second box (□) within the model name.