



## Brushless DC Motor and Driver Package

# BLV Series

## Standard Type, Electromagnetic Brake Type

### USER MANUAL Basic Function



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.

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# 1 Introduction

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## ■ Before using the motor

Only qualified personnel should work with the product.

Use the product correctly after thoroughly reading the "2 Safety precautions" on p.3.

The product described in this manual has been designed and manufactured for use in general industrial machinery, and must not be used for any other purpose.

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

## ■ Product overview

The **BLV** Series is a motor and driver package combining a slim, high-power brushless motor with a high-performance box-type driver with DC power input.

With the accessory data setter **OPX-2A** (sold separately), you can improve the performance and set operation data/parameters and motor operations with ease.

## ■ Operating manuals for the BLV Series

Operating manuals for the **BLV** Series are listed below. Read the manuals carefully before using your **BLV** Series unit.

- **BLV Series** OPERATING MANUAL (Supplied with the product.)

This manual explains the motor and driver functions as well as installation method, and others.

- **BLV Series** USER MANUAL Basic Function (This document)

This manual explains the motor and driver functions, how to install/connect and troubleshooting, among others. Also, it explains operations using an accessory data setter **OPX-2A**.

- **BLV Series** USER MANUAL RS-485 Communication Mode

This manual explains how to control the motor via RS-485 communication using a programmable controller.

## ■ CE Marking

This product has been certified under the CE Marking requirements (EMC Directive) based on the EN Standard. Because the input power supply voltage of this product is 24 VDC/48 VDC, it is not subject to the Low Voltage Directive. However, install and connect this product as follows.

- **Installation conditions**

Motor and driver are to be used as a component within other equipment.

Overvoltage category: I

Pollution degree: 2

- **EMC Directive**

This product has received EMC compliance under the conditions specified in "Example of motor and driver installation and wiring" on p.20 The compliance of the final machinery with the EMC Directive will depend on such factors as the configuration, wiring, layout and risk involved in the control-system equipment and electrical parts.

### Applicable Standards



EMI	Emission Tests	EN 61000-6-4, EN 61800-3 C3
EMS	Immunity Tests	EN 61000-6-2, EN 61800-3 C3

## ■ Hazardous substances

RoHS (Directive 2002/95/EC 27Jan.2003) compliant

## 2 Safety precautions

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

 <b>Warning</b>	Handling the product without observing the instructions that accompany a "Warning" symbol may result in serious injury or death.
 <b>Caution</b>	Handling the product without observing the instructions that accompany a "Caution" symbol may result in injury or property damage.
<b>Note</b>	The items under this heading contain important handling instructions that the user should observe to ensure safe use of the product.

### **Warning**

#### General

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. Failure to do so may result in fire, electric shock or injury.
- Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Failure to do so may result in fire, electric shock, injury or damage to equipment.
- Do not use a non-electromagnetic brake type motor in a vertical application. If the driver protection function is activated, the motor will stop and the moving part of the equipment will drop, thereby causing injury or equipment damage.
- Do not use the brake mechanism of the motor with an electromagnetic brake as a safety brake. It is intended to hold the movable parts and motor position. This caution is to avoid personal injury or damage to the equipment.
- When the driver's protection function is triggered, first remove the cause and then clear the protection function. Continuing the operation without removing the cause of the problem may cause malfunction of the motor and driver, leading to injury or damage to equipment.

#### Installation

- Install the motor (gearhead) and driver in the enclosure in order to prevent injury.

#### Connection

- Keep the driver's input-power voltage within the specified range to avoid fire.
- For the power supply, use a DC power supply with reinforced insulation on its primary and secondary sides. Failure to do so may cause electric shock.
- Connect the cables securely according to the wiring diagram in order to prevent fire.
- Do not forcibly bend, pull or pinch the cable. Doing so may cause fire.
- Do not machine or modify the motor cable or extension cable. Doing so may result in fire.
- Be sure to observe the specified cable sizes. Use of unspecified cable sizes may result in fire.
- Observe the specified screw tightening torque when connecting terminals to the connector. Failure to do so may result in fire or equipment damage.

#### Operation

- Use a specified motor (gearhead) and driver combination. Failure to do so may result in fire or equipment damage.

#### Maintenance/inspection

- Always turn off the power before performing maintenance/inspection. Failure to do so may result in injury.
- Do not touch the motor or driver when measuring insulation resistance or performing a dielectric strength test. Accidental contact may result in electric shock.
- Regularly check the openings in the driver for accumulated dust. Accumulated dust may cause fire.

#### Repair, disassembly and modification

- Do not disassemble or modify the motor (gearhead) and driver. This may cause electric shock or injury. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.

 **Caution**

**General**

- Do not use the motor (gearhead) and driver beyond its specifications, or injury or damage to equipment may result.
- Keep your fingers and objects out of the openings in the driver, or fire or injury may result.
- Do not touch the motor (gearhead) and driver during operation or immediately after stopping. The surface is hot and may cause a skin burn(s).

**Installation**

- To prevent the risk of damage to equipment, leave nothing around the motor and driver that would obstruct ventilation.
- Do not hold the motor (gearhead) output shaft or cable. This may cause injury.
- Do not touch the motor output shaft (key groove 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.
- Securely affix the motor (gearhead) and driver to their respective mounting plates. Inappropriate installation may cause the motor/driver to detach and fall, resulting in injury or equipment damage.
- Provide a cover over the rotating parts (output shaft) of the motor (gearhead) to prevent injury.
- When installing the motor (gearhead) in the equipment, exercise caution not to pinch your fingers or other parts of your body between the equipment and motor or gearhead. Injury may result.
- Securely install the load on the motor (gearhead) output shaft. Inappropriate installation may result in injury.

**Operation**

- Do not shut off the negative side of the power supply during operation. Also, note that the wiring for the power supply does not disconnect. Doing so may cause damage to equipment.
- Provide an emergency stop device or emergency stop circuit external to the equipment so that the entire equipment will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury.
- Immediately when trouble has occurred, stop running and turn off the driver power. Failure to do so may result in fire, electrical shock or injury.
- Do not touch the rotating part (output shaft) during operation. This may cause injury.
- The motor surface temperature may exceed 70 °C even under normal operating conditions. If the operator is allowed to approach the running motor, attach a warning label as shown below in a conspicuous position. Failure to do so may result in skin burn(s).



Warning label

**Disposal**

- To dispose of the motor (gearhead) and driver, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste.

## 3 Precautions for use

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

- **Regeneration energy**

When using the motor in operation such as vertical drive (gravitational operation) or sudden starting/stopping of a inertial load, regeneration energy may generate. Since the driver has no function to consume regeneration energy, if the output capacity or overvoltage allowance of the DC power supply is small, the protective function for the power supply or driver may activate and the motor may stop. When performing these operations, use a DC power supply or battery that has a large output capacity or overvoltage allowance.

Also, use an electromagnetic brake motor not to drop the moving part in vertical drive (gravitational operation). If protective function for the power supply or driver is activated, contact your nearest Oriental Motor sales office.

- **Do not use a solid-state relay (SSR) to turn on/off the power**

A circuit that turns on/off the power via a solid-state relay (SSR) may damage the motor and driver.

- **Conduct the insulation resistance measurement or withstand voltage test separately on the motor and the driver.**

Conducting the insulation resistance measurement or withstand voltage test with the motor and driver connected may result in injury or damage to equipment.

- **Grease measures**

On rare occasions, a small amount of grease may ooze out from the gearhead. If there is concern over possible environmental damage resulting from the leakage of grease, check for grease stains during regular inspections.

Alternatively, install an oil pan or other device to prevent leakage from causing further damage. Oil leakage may lead to problems in the customer's equipment or products.

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

If you are 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.

- **Preventing electrical noise**

Provide noise elimination measures to prevent a motor or driver malfunction caused by external noise.

For more effective elimination of noise, use a shielded I/O signal cable or attach ferrite cores if a non-shielded cable is used. Refer to p.19 for the noise elimination measures.

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

The driver's main power supply input terminal (CN1), I/O signal connector (CN3), communication connector (CN5/CN6/CN7) and control power supply input terminal (TB1) 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 these equipment to short, damaging both.

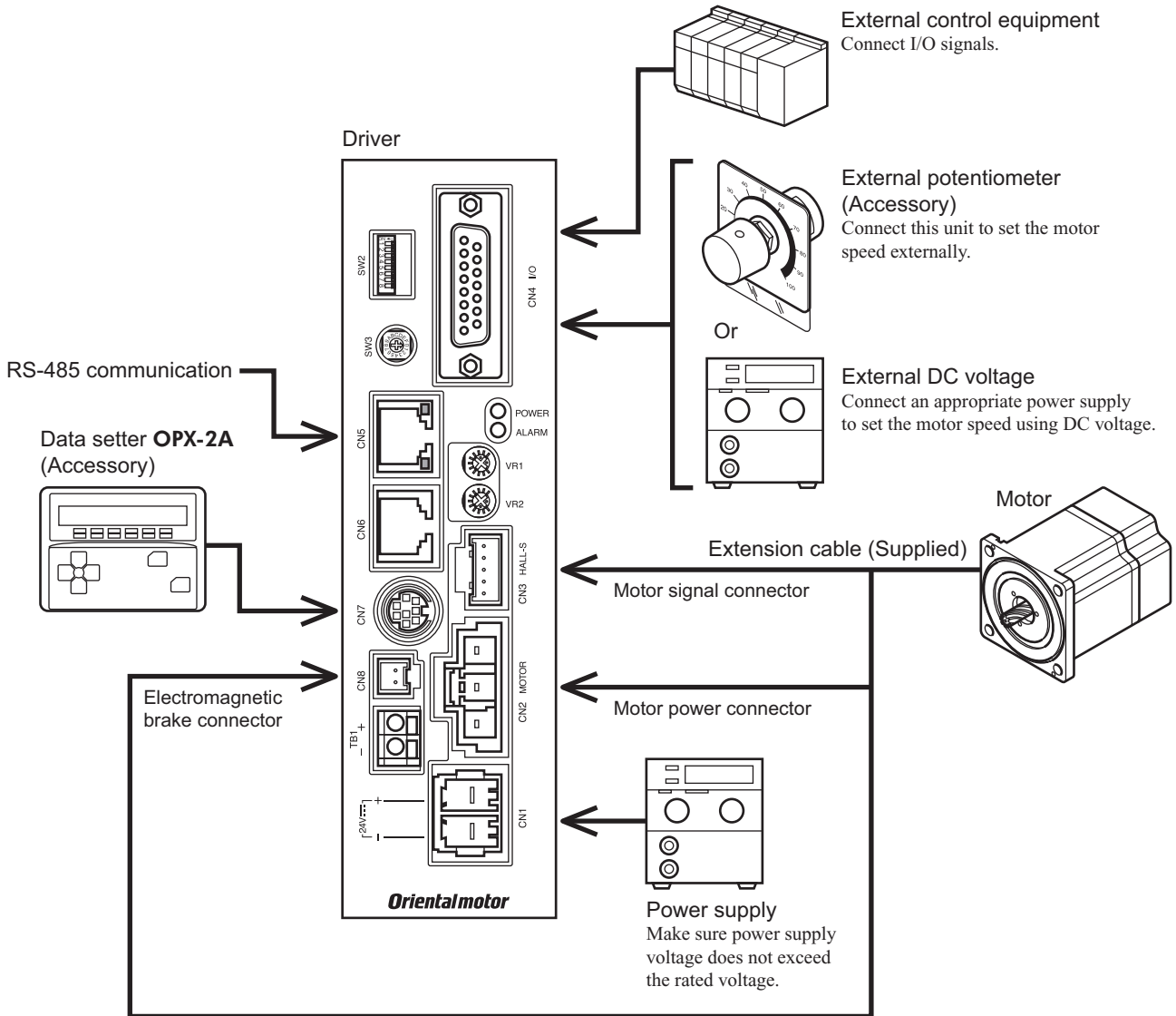
- **The driver uses semiconductor elements. Handle the driver with care.**

The driver uses parts that are sensitive to electrostatic charge. Before touching the driver, turn off the power to prevent electrostatic charge from generating. If an electrostatic charge is impressed on the driver, the driver may be damaged.

- **Use an extension cable (supplied) when extending the wiring distance between the motor and driver**

# 4 System configuration

An example of system configuration using the **BLV** Series electromagnetic brake type 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.

Verify the model number of the purchased unit against the number shown on the package label.

Check the model number of the motor and driver against the number shown on the nameplate.

The unit models and corresponding motor/driver combinations are listed in section 5.2.

- Motor (with a gearhead, only for combination type) ..... 1 unit
- Driver ..... 1 unit
- Extension cable ..... 1 pc.
- CN1 connector ..... 1 pc.
- OPERATING MANUAL ..... 1 copy

### Accessories for combination type

- Hexagonal socket head screw set ..... 1 set
- Parallel key ..... 1 pc. (Secured to the gearhead output shaft on the parallel shaft gearhead)
- Safety cover ..... 1 pc. (Supplied with the hollow shaft flat gearhead)
- Safety cover mounting screw ..... 2 pcs. (Supplied with the hollow shaft flat gearhead)

## 5.2 Combinations of motors and drivers

- □ in the model names indicates a number representing the gear ratio.
- ■ indicates a number representing the length of an extension cable.
- The combination types come with the motor and gearhead pre-assembled.

### ■ Standard type

- Combination type parallel shaft gearhead

Unit model	Motor model	Gearhead model	Driver model
<b>BLV620K□S-■</b>	BLVM620K-GFS	GFS6G□	BLVD20KM
<b>BLV640N□S-■</b>	BLVM640N-GFS		BLVD40NM

- Combination type hollow shaft flat gearhead

Unit model	Motor model	Gearhead model	Driver model
<b>BLV620K□F-■</b>	BLVM620K-GFS	GFS6G□FR	BLVD20KM
<b>BLV640N□F-■</b>	BLVM640N-GFS		BLVD40NM

- Round shaft type

Unit model	Motor model	Driver model
<b>BLV620KA-■</b>	BLVM620K-A	BLVD20KM
<b>BLV640NA-■</b>	BLVM640N-A	BLVD40NM

### ■ Electromagnetic brake type

- Combination type parallel shaft gearhead

Unit model	Motor model	Gearhead model	Driver model
<b>BLV620KM□S-■</b>	BLVM620KM-GFS	GFS6G□	BLVD20KM
<b>BLV640NM□S-■</b>	BLVM640NM-GFS		BLVD40NM

- Combination type hollow shaft flat gearhead

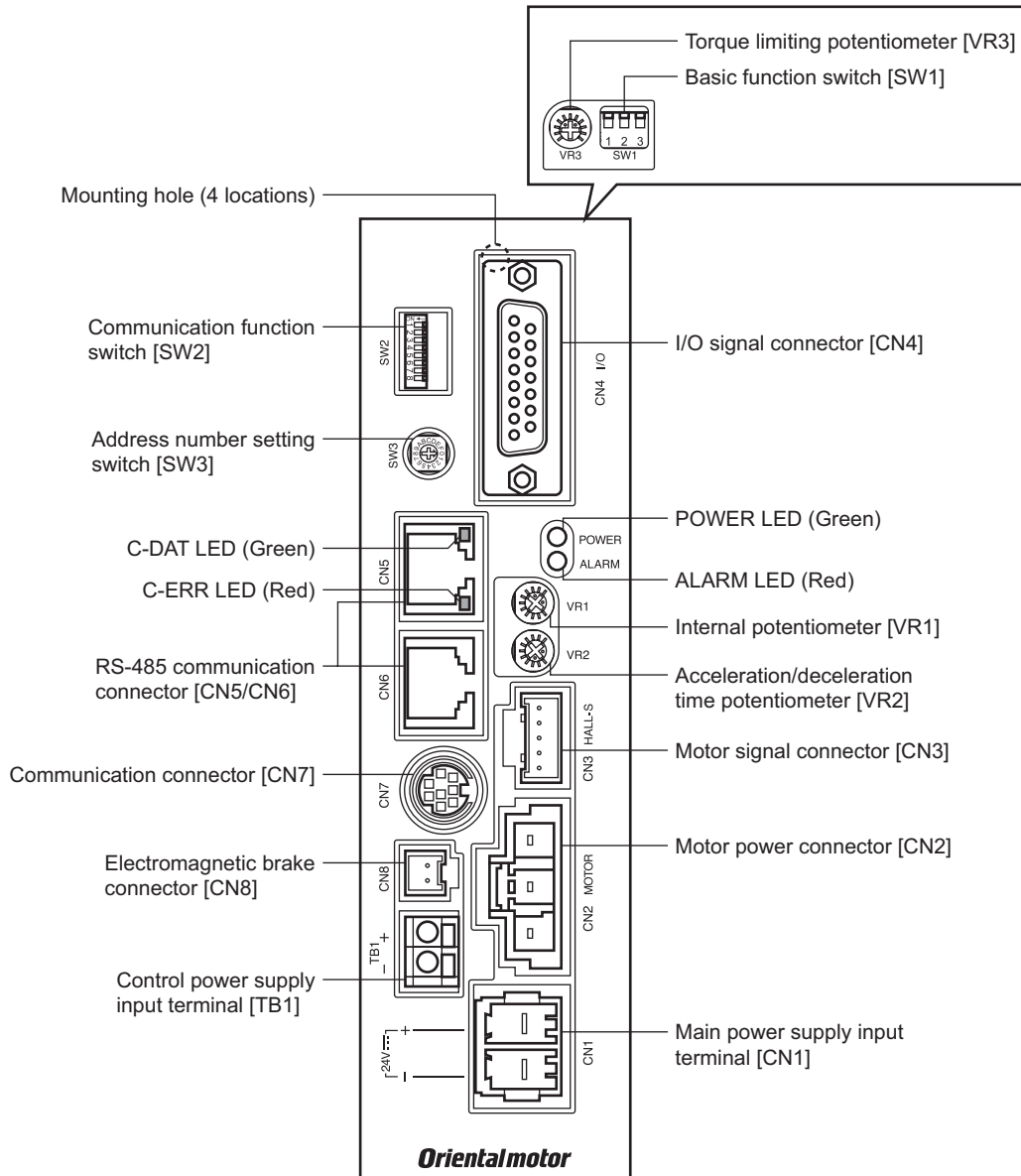
Unit model	Motor model	Gearhead model	Driver model
<b>BLV620KM□F-■</b>	BLVM620KM-GFS	GFS6G□FR	BLVD20KM
<b>BLV640NM□F-■</b>	BLVM640NM-GFS		BLVD40NM

- Round shaft type

Unit model	Motor model	Driver model
<b>BLV620KMA-■</b>	BLVM620KM-A	BLVD20KM
<b>BLV640NMA-■</b>	BLVM640NM-A	BLVD40NM

### 5.3 Names and functions of parts

#### ■ Driver



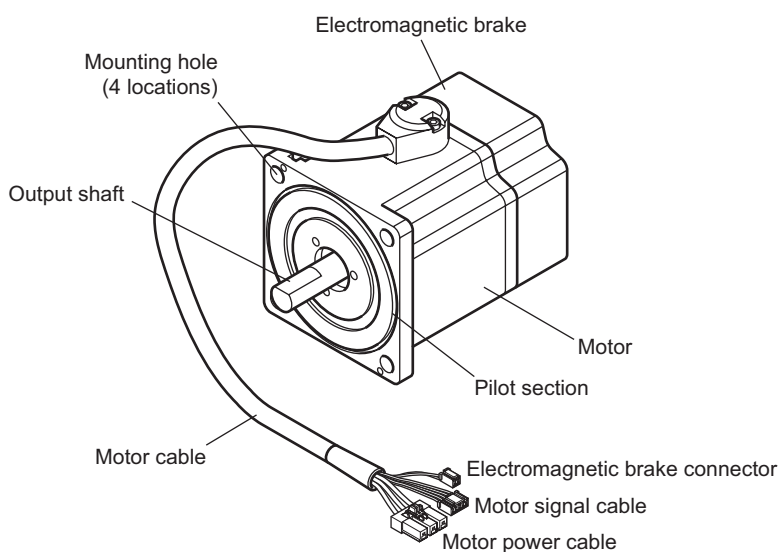


Name	Description	Ref.
POWER LED (Green)	This LED lit while the main power or control power is input.	-
ALARM LED (Red)	This LED will blink when an alarm generates (a protective function is triggered). You can check the generated alarm by counting the number of times the LED blinks.	P.44
Internal potentiometer [VR1]	Set the operating speed of the motor.	P.29
Acceleration/deceleration time potentiometer [VR2]	Set the acceleration time and deceleration time for the motor.	P.31
Torque limiting potentiometer [VR3]	Set the torque limiting value of the motor.	P.33
Main power supply input terminal [CN1]	Connect the main power supply. <b>BLV620:</b> +24 V, <b>BLV640:</b> +48 V	P.21
Motor power connector [CN2]	Connect the motor power connector.	P.22
Motor signal connector [CN3]	Connect the motor signal connector.	
Electromagnetic brake connector [CN8]	Connect the electromagnetic brake connector. (Electromagnetic brake type only)	
I/O signal connector [CN4]	Use this connector when using an external control device (programmable controller) or inputting a operation command.	P.23
Basic function switches [SW1]	Select type of speed response, external DC voltage and sink logic/source logic.	P.29, P.32, P.34
Communication connector [CN7]	Connect the <b>OPX-2A</b> .	P.26
Control power supply input terminal* [TB1]	Connect the driver control power supply.	Refer to the <a href="#">USER MANUAL RS-485 Communication Mode</a> .
RS-485 communication connector* [CN5/CN6]	Connect the RS-485 communication cable.	
C-DAT LED (Green) *	This LED will illuminate when the driver is communicating with the master station properly via RS-485 communication.	
C-ERR LED (Red) *	This LED will illuminate when a RS-485 communication error occurs with the master station.	
Communication function switch * [SW2]	Set the baud rate, communication protocol and termination resistor of RS-485 communication.	
Address number setting switch* [SW3]	This switch set the address number (slave address) of RS-485 communication.	
Mounting hole (4 locations)	4 locations on the back surface and side surface	

\* Use these switches when controlling the system via RS-485 communication.

## ■ Motor

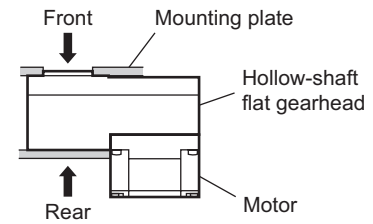
Illustration shows electromagnetic brake type.





## ■ Installing the combination type hollow shaft flat gearhead

A combination type hollow shaft flat gearhead can be installed by using either its front or rear side as the mounting surface. Install the supplied hexagonal socket head screw set in the four mounting holes you drilled and tighten the nuts until no gaps remain between the motor and mounting plate. Also, attach the supplied safety cover to the hollow output shaft on the end opposite from the one where the load shaft is installed. Refer to p.12 for the installation method and how to install/remove the gearhead.



### Hexagonal socket head screw set (supplied)

Nominal size	Tightening torque [N·m (lb-in)]	Maximum applicable plate thickness [mm (in.)] *
M8	15.5 (137)	12 (0.47)

\* When the supplied hexagonal socket head screw set is used.

## ■ Installing the driver

The driver can be installed in two different ways. Refer to p.17 for the specific installation methods.

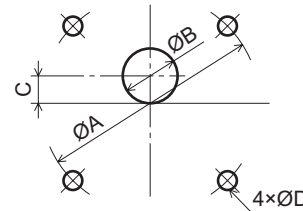
- Use screws (M4: not supplied) to affix the driver through the mounting holes (two locations) provided at the back of the driver.
- Affix the driver on a DIN rail using the accessory DIN rail mounting plate (sold separately).

## 6.3 Installing the combination type parallel shaft gearhead

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

ØA	ØB*	C	ØD
120 (4.72)	42 (1.65)	20 (0.79)	8.5 (0.335)

\* B indicates the external dimensions of the product. Drill holes with a minimum diameter of  $\text{ØB} + 1 \text{ mm}$  (0.04 in.).

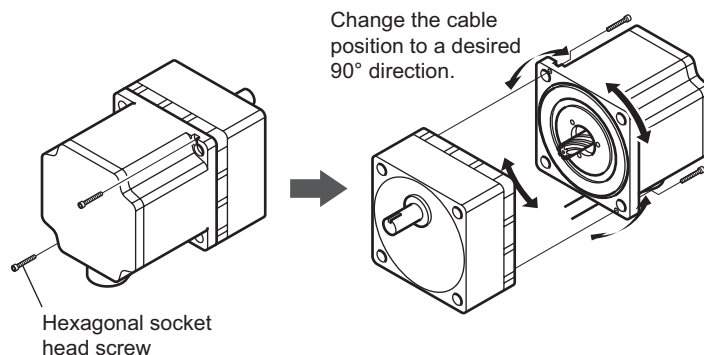


## ■ Removing/Installing the gearhead

To replace the gearhead or change the cable outlet direction, remove the screws assembling the gearhead. The gearhead can be removed and the motor cable position changed to a desired 90° direction.

1. Remove the hexagonal socket head screws (2 pcs.) assembling the motor and gearhead and detach the motor from the gearhead.
2. Using the pilot sections of the motor and gearhead as guides, install the gearhead to the motor and tighten the hexagonal socket head screws.

At this time, the motor cable position can be changed to a desired 90° direction. When installing the gearhead, slowly rotate it clockwise/counterclockwise to prevent the pinion of the motor output shaft from contacting the side panel or gear of the gearhead. Also confirm that no gaps remain between the motor flange surface and the end face of the gearhead's pilot section.



### Assembly screws

Nominal size	Tightening torque [N·m (lb-in)]
M3	0.6 (5.3)

**Note**

- Do not forcibly assemble the motor and gearhead. Also, do not let metal objects or other foreign matter enter the gearhead. The pinion or gear of the motor output shaft 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's pilot section. If the O-ring is crushed or severed, grease may leak from the gearhead.
- The hexagonal socket head screws assembling the motor and gearhead are affixing the motor and gearhead only temporarily. When installing the gearhead, be sure to use the supplied hexagonal socket head screws. (4 pcs.)

### 6.4 Installing the round shaft type

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

Unit model	Size of mounting plate [mm (in.)]	Thickness [mm (in.)]	Material
<b>BLV620</b>	200×200 (7.87×7.87)	5 (0.2)	Aluminum
<b>BLV640</b>	250×250 (9.84×9.84)	6 (0.24)	

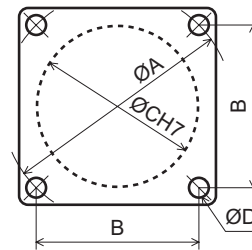
Mounting hole dimensions [Unit: mm (in.)]

ØA	B	ØCH7*	ØD
120 (4.72)	84.85 (3.341)	$94^{+0.035}_0$ (3.7008 <sup>+0.0014</sup> )	8.5 (0.335)

\* ØC indicates the pilot diameter on the flange.

**Note**

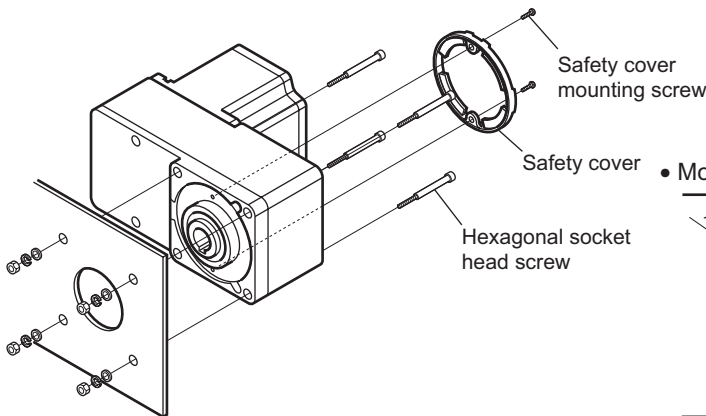
Fit the boss on the gearhead mounting surface into a pilot receiving hole.



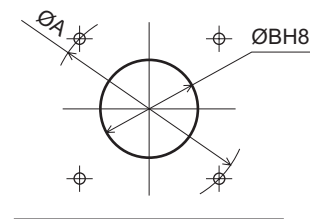
### 6.5 Installing the combination type hollow shaft flat gearhead

#### ■ Using the front side as the mounting surface

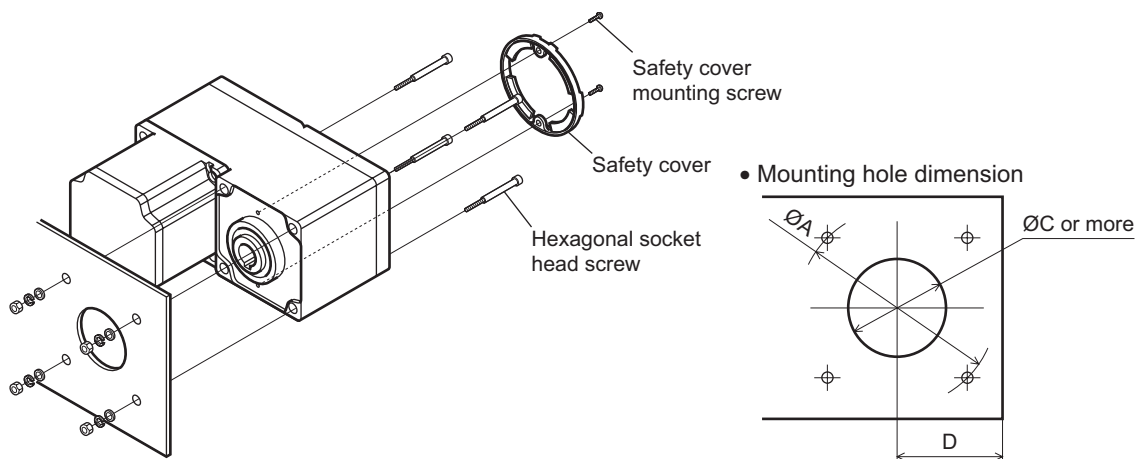
When the gearhead is installed by using its front side as the mounting surface, use the boss of the output shaft to align the center.



• Mounting hole dimension



## ■ Using the rear side as the mounting surface



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

Since hexagonal nuts are not included with the product, provide them separately or drill tapped holes in the mounting plate.

ØA	ØBH8	ØC	D	Nominal size
120 (4.72)	$58^{+0.046}_0$ ( $2.28^{+0.0018}_0$ )	42 (1.65)	57 (2.24)	M8

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

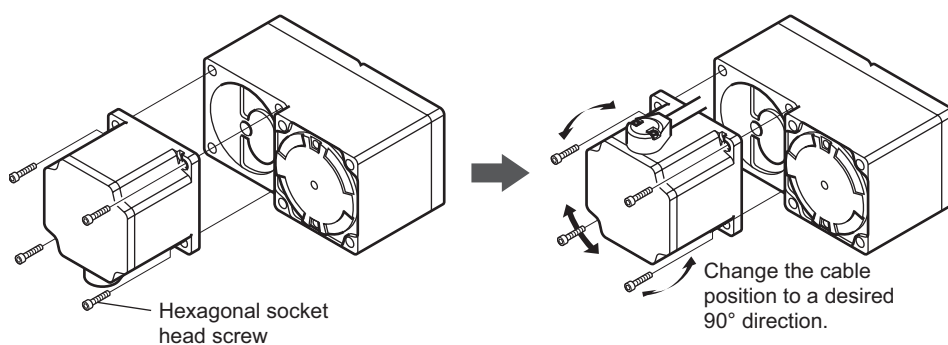
## ■ Removing/Installing the gearhead

To replace the gearhead or change the cable outlet direction, remove the screws assembling the gearhead.

The gearhead can be removed and the motor cable position changed to one of three 90° directions.

Note that the motor cable cannot be positioned in the direction where the cable faces the gearhead output shaft.

1. Remove the hexagonal socket head screws (4 pcs.) attaching the gearhead and motor and detach the motor from the gearhead.
2. Using the pilot sections of the motor and gearhead as guides, install the motor to the gearhead and tighten the hexagonal socket head screws.  
At this time, the motor cable position can be changed to one of three 90° directions. Install the motor carefully to prevent the pinion of the motor output shaft from contacting the casing or gear of the gearhead. Also confirm that no gaps remain between the motor flange surface and the end face of the gearhead's pilot section.



### Assembly screws

Nominal size	Tightening torque [N·m (lb-in)]
M8	15.5 (137)

- Note**
- Do not forcibly assemble the motor and gearhead. Also, do not let metal objects or other foreign matter enter the gearhead. The pinion or gear of the motor output shaft 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 carefully by not pinching the O-ring at the motor's pilot section. If the O-ring is pinched, the coupling strength will drop and grease may leak from the gearhead.
  - The motor cable position cannot be changed to the direction where the cable faces the gearhead output shaft, because the gearhead case will obstruct the cable.

## 6.6 Installing a load to the combination type parallel gearhead or round shaft type

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

### Note

- When coupling the motor (gearhead) with a load, pay attention to centering, belt tension, parallelism of pulleys, etc. Also, securely affix 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 motor (gearhead) output shaft. The bearing may be damaged or motor (gearhead) may break.

### ■ Output shaft shape

#### • Combination type parallel shaft gearhead

A key groove is provided on the output shaft of each combination type parallel shaft gearhead. Form a key groove on the load side and affix the load using the supplied 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 securely affix the load and prevent it from spinning.

### ■ How to install a load

#### • Using a coupling

Align the centerline of the motor (gearhead) output shaft with the centerline of the load shaft.

#### • Using a belt

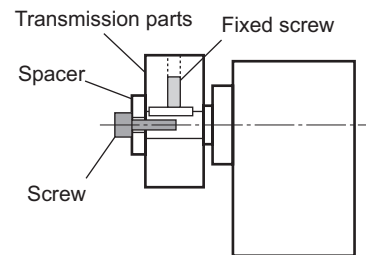
Adjust the motor (gearhead) output shaft to lie parallel with the load shaft and form right angles between the output shaft/load shaft and the line connecting the centers of both pulleys.

#### • Using a gear

Adjust the motor (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 axis tip screw hole of a gearhead

Use a screw hole [M6; Effective depth 12 mm (0.47 in)] provided at the tip of the output shaft as an auxiliary means for preventing the transfer mechanism from disengaging.



## 6.7 Installing a load to the 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.

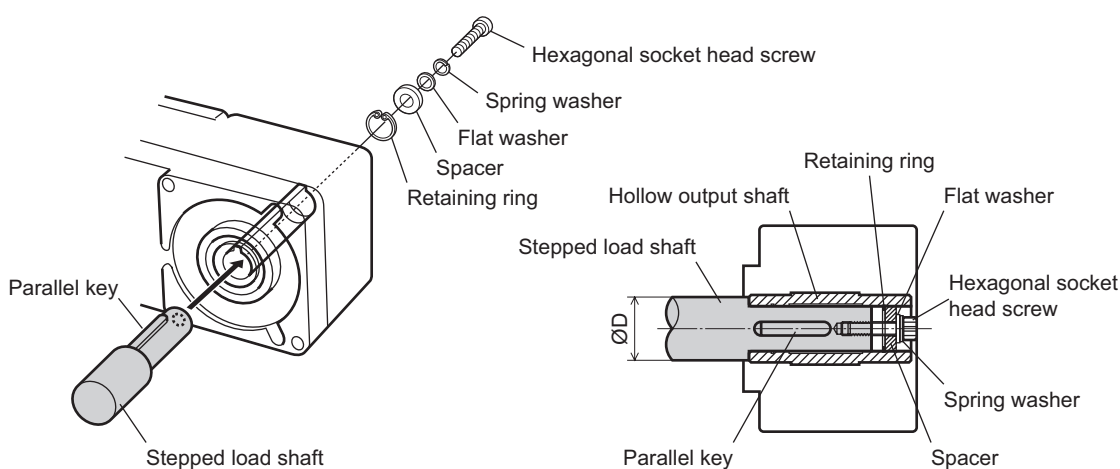
### Recommended load shaft installation dimensions [Unit: mm (in.)]

Inner diameter of hollow shaft (H8)	Recommended diameter of load shaft (h7)	Nominal diameter of retaining ring	Applicable screw	Spacer thickness	Outer diameter of stepped shaft (ØD)
$\text{Ø}25^{+0.033}_0$ ( $0.9843^{+0.0013}_0$ )	$\text{Ø}25^0_{-0.021}$ ( $0.9843^0_{-0.0008}$ )	Ø25 (0.98)	M10	6 (0.24)	40 (1.57)

### Stepped load shaft

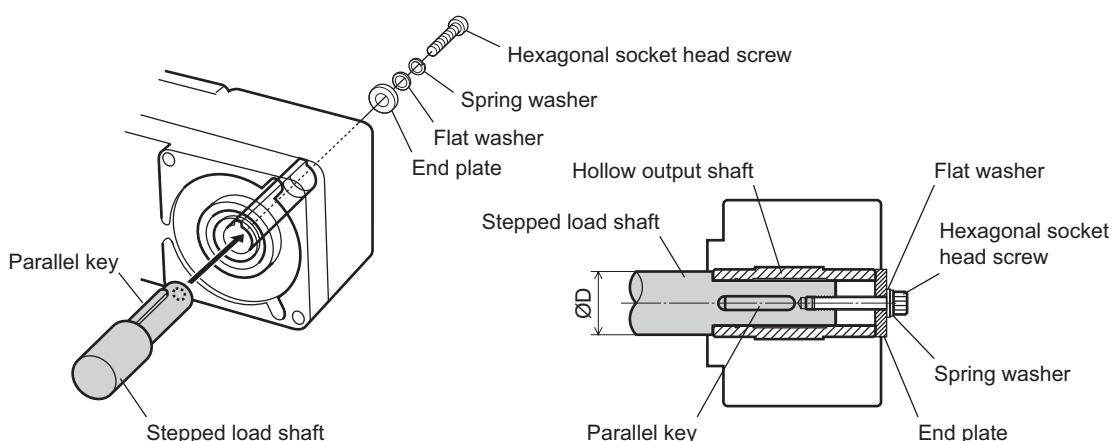
#### Affixing method using retaining ring

Install each hexagonal socket head screw over a retaining ring, spacer, flat washer and spring washer and securely affix the ring.



#### Affixing method using end plate

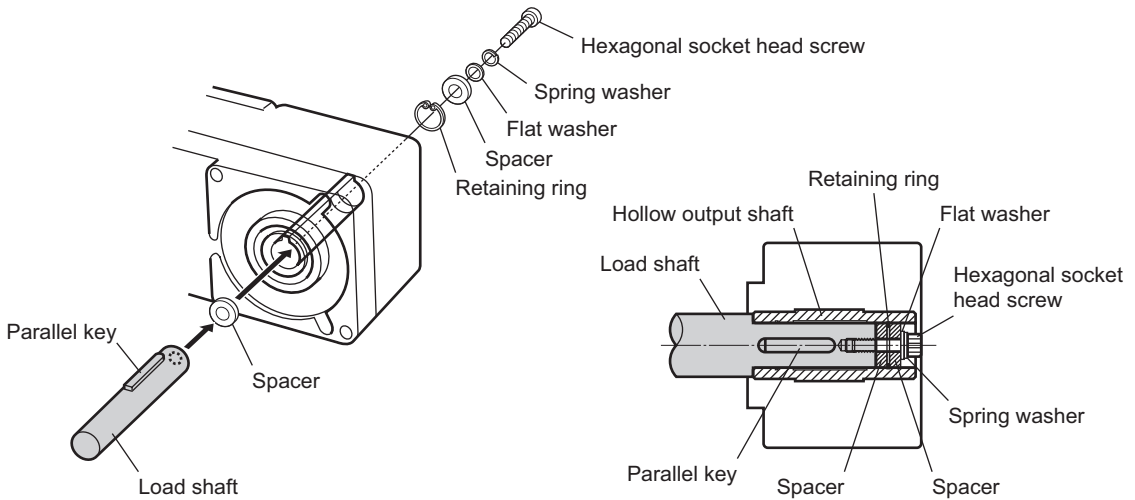
Affix the load shaft by tightening the hexagonal socket head screw over an end plate, flat washer and spring washer.



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

### ■ Non-stepped load shaft

Install each hexagonal socket head screw over a retaining ring, spacer, flat washer and spring washer and securely affix the ring. Also insert a spacer on the load shaft side.



## 6.8 Permissible overhung load and permissible thrust load

Make sure the overhung load and thrust load received by the motor (gearhead) output shaft will not exceed the allowable values shown in the table below.

**Note** If the overhung load or thrust load exceeds the specified allowable value, repeated load applications may cause the bearing or output shaft of the motor (gearhead) to undergo a fatigue failure.

- Combination type parallel shaft gearhead

Gear ratio	Distance from tip of gearhead output shaft and permissible overhung load* [N (lb.)]		Permissible thrust load [N (lb.)]
	10 mm (0.39 in.)	20 mm (0.79 in.)	
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 assume a rated speed of 3000 r/min or below. The values in <> are based on a rated speed of 4000 r/min.

- Combination type hollow shaft flat gearhead

Gear ratio	Distance from gearhead mounting surface and permissible overhung load* [N (lb.)]		Permissible thrust load [N (lb.)]
	10 mm (0.39 in.)	20 mm (0.79 in.)	
5 (BLV640 only)	1230 (270)	1070 (240)	800 (180)
10	<1130 (250)>	<990 (220)>	
15, 20	1680 (370) <1550 (340)>	1470 (330) <1360 (300)>	
30 to 100	2040 (450) <1900 (420)>	1780 (400) <1660 (370)>	

\* The values assume a rated speed of 3000 r/min or below. The values in <> are based on a rated speed of 4000 r/min.

- Round shaft type

Distance from tip of motor output shaft and permissible overhung load [N (lb.)]		Permissible thrust load [N (lb.)]
10 mm (0.39 in.)	20 mm (0.79 in.)	
197 (44)	221 (49)	Not to exceed one-half the motor's mass*

\* Minimize the thrust load. If a thrust load must be applied, do not let it exceed one-half the motor's mass.



## 6.9 Installing the driver

The driver is designed so that heat is dissipated via air convection and conduction through the enclosure.

Install the driver on a flat metal plate having excellent vibration resistance and heat conductivity.

When two or more drivers are to be installed side by side, provide 20 mm (0.79 in.) and 25 mm (0.98 in.) clearances in the horizontal and vertical directions, respectively.

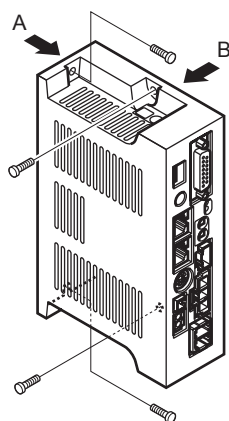
### Note

- Install the driver in an enclosure whose pollution degree is 2 or better environment, or whose degree of protection is IP54 minimum.
- Do not cover the radiation vent of the driver.
- Do not install any equipment that generates a large amount of heat or noise near the driver.
- If the ambient temperature of the driver exceeds 40 °C (104 °F), revise the ventilation condition or force-cool the area around the driver using a fan.

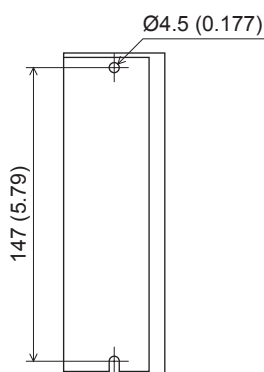
### ■ Installing with screws

Affix the driver through the mounting holes using two screws (M4: not supplied).

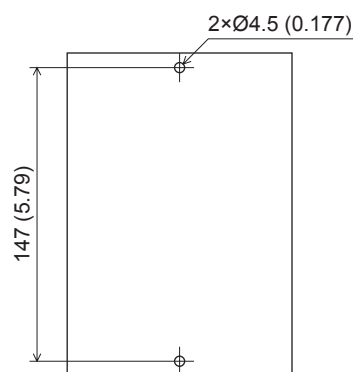
- When mounting in vertical direction [Unit: mm (in.)]



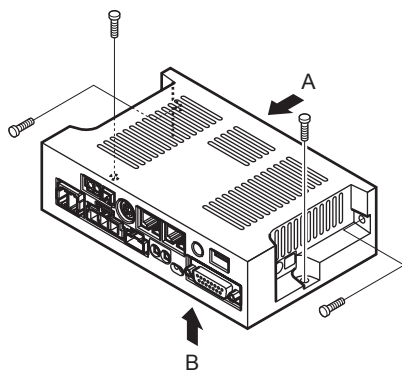
- When using side surface A



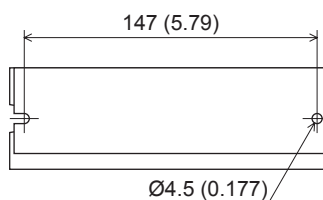
- When using side surface B



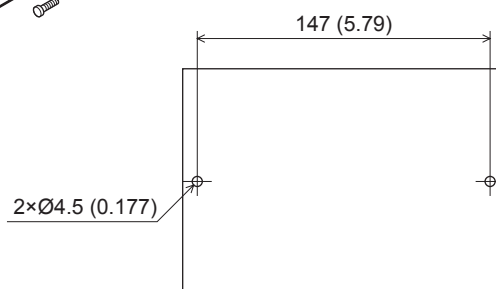
- When mounting in horizontal direction [Unit: mm (in.)]



- When using side surface A



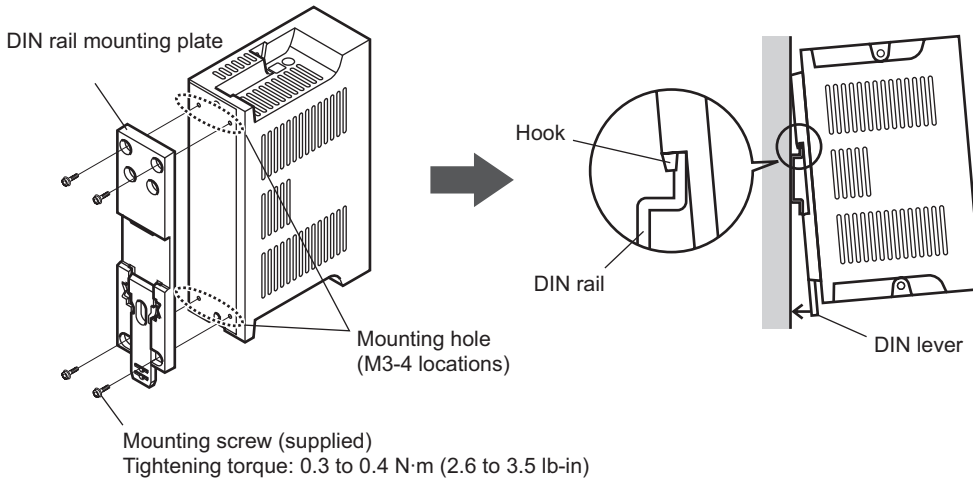
- When using side surface B



## ■ Mounting to DIN rail

When mounting the driver to a DIN rail, use a separately sold DIN rail mounting plate (model number: **PADP03**) and attach it to a 35 mm (1.38 in.) wide DIN rail.

After installation, fix the both sides of the driver with the end plate (not supplied).



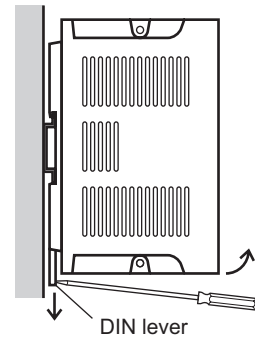
**Note**

- Do not use the mounting holes (M3, four locations) for the DIN rail mounting plate for any purpose other than securing the DIN rail mounting plate.
- Be sure to use the supplied screws when securing the DIN rail mounting plate. 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.

### • Removing from DIN rail

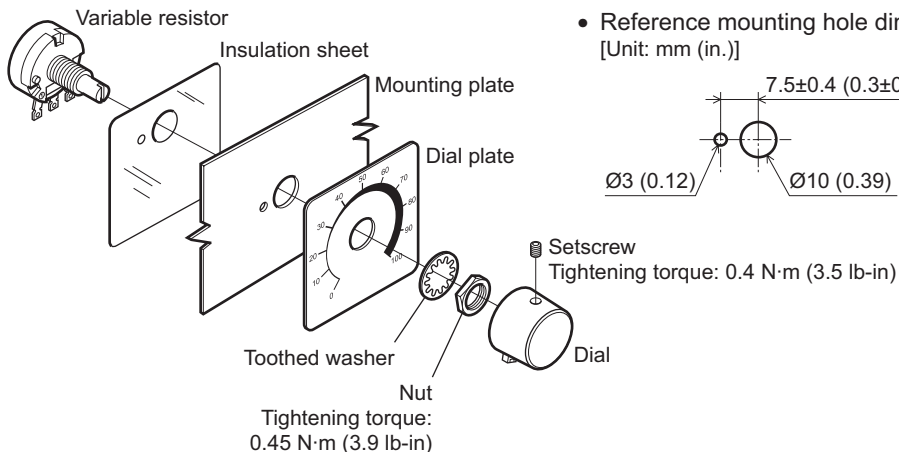
Pull the DIN lever down until it locks using a flat tip screwdriver, and lift the bottom of the driver to remove it from the rail.

Use force of about 10 to 20 N (2.2 to 4.5 lb.) to pull the DIN lever to lock it. Excessive force may damage the DIN lever.



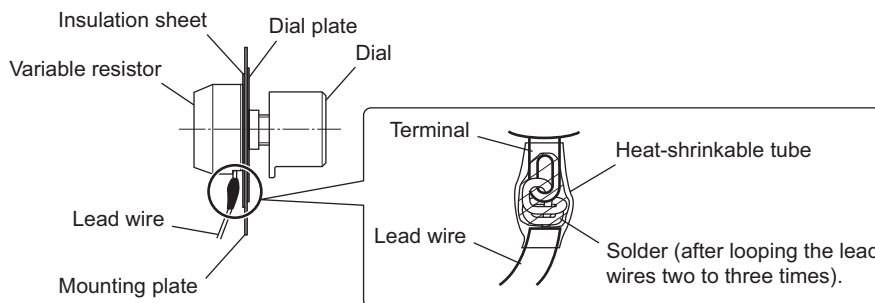
## 6.10 Installing the external potentiometer (Accessory)

1. Insert the variable resistor over the insulation sheet into the hole provided in the mounting plate.
2. Set the dial plate and toothed washer, and tighten with the nut.  
Tightening torque: 0.45 N·m (3.9 lb-in)
3. Install the dial and secure it with the setscrew (M4).  
Tightening torque: 0.4 N·m (3.5 lb-in)



## ■ Soldering the variable resistor terminals and the lead wires

1. Guide the lead wires through the terminal hole and loop them two to three times.
2. Solder the lead wires to the terminal.  
Soldering condition: 235 °C (455 °F), less than 5 sec.
3. Cover a heat-shrinkable tube over the soldered part to insulate.



## 6.11 Installing and wiring in compliance with EMC Directive

The **BLV** Series is designed and manufactured for use as an internal component of equipment. The EMC Directives require that your mechanical equipment in which the **BLV** Series is installed satisfy 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 Directives. The final level of conformance of your mechanical equipment to the EMC Directives will vary depending on the control system equipment used with the motor/driver, configuration of electrical parts, wiring, layout, hazard level, and the like. Therefore, you must conduct the EMC tests on your mechanical equipment to confirm compliance.

### ■ Applicable Standards

EMI	Emission Tests	EN 61000-6-4, EN 61800-3 C3
EMS	Immunity Tests	EN 61000-6-2, EN 61800-3 C3

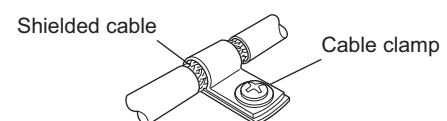
Effective measures must be taken against the EMI that the **BLV** Series may give to adjacent control-system equipment, as well as the EMS of the **BLV** Series itself, in order to prevent a serious functional impediment in the machinery. The use of the following installation and wiring methods will enable the **BLV** Series to be compliant with the EMC Directive.

### ■ Connecting a mains filter

- Install a mains filter in the power line in order to prevent the noise generated within the driver or control system from propagating outside via the DC input line.
- When using a power supply transformer, be sure to connect a noise filter to the AC input side of the power supply transformer.
- For a mains filter, use MC1210 (TDK-Lambda Corporation) or equivalent product. Install the mains filter as close to the AC input terminal of DC power supply as possible.
- Connect the ground terminal of the mains filter to the grounding point, using as thick and short a wire as possible.
- Use a shielded cable of AWG18 to 14 (0.75 to 2.0 mm<sup>2</sup>) for the AC input cables and output cables.  
Use cable clamps and other means to secure the AC input cables and output cables firmly to the surface of the enclosure.
- Do not place the AC input cable parallel with the mains filter output cable. 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.

### ■ Wiring the power supply cable and signal cable

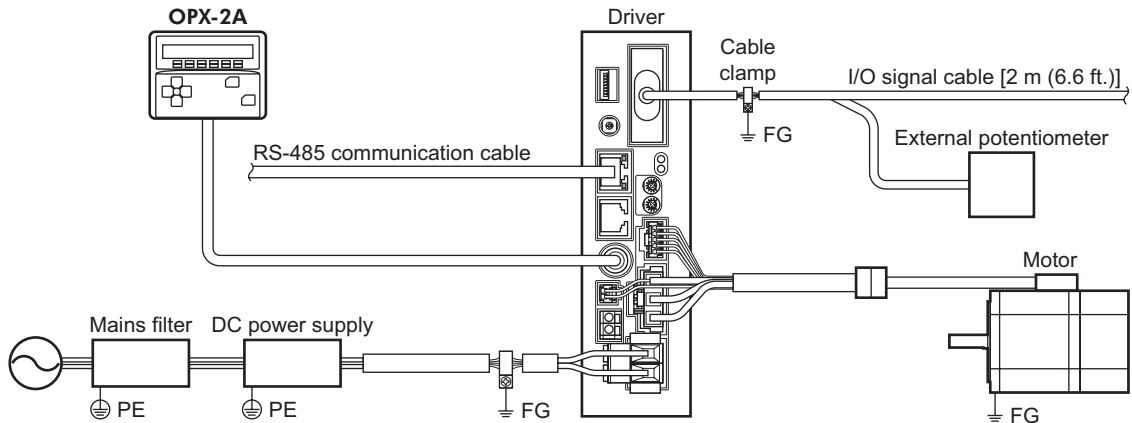
- Use a shielded cable of AWG16 to 10 (1.25 to 6 mm<sup>2</sup>) for the power supply cable, and keep it as short as possible.
- Use a shielded cable for the I/O signals cable, and keep it as short as possible.
- Strip a part of the shielded cable and ground the stripped part using a metal cable clamp that contacts the stripped cable around its entire circumference, or use a drain wire to make the ground connection.
- Attach a cable clamp as close to the end of the cable as possible, and connect it as shown in the figure.



## ■ Notes about installation and wiring

- Connect the motor, driver and other peripheral control equipment directly to the grounding point so as to prevent a potential difference from developing between grounds.
- When relays or electromagnetic switches are used together with the system, use mains filters and 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.
- Use a supplied extension cable when extending the wiring distance between the motor and driver. The EMC measures are conducted using the Oriental Motor extension cable.

## ■ Example of motor and driver installation and wiring



## ■ Precautions about static electricity

Static electricity may cause the driver to malfunction or suffer damage. While the driver is receiving power, handle the driver with care and do not come near or touch the driver.

Always use an insulated screwdriver to adjust the driver's potentiometers or switches.

**Note** The driver uses parts that are sensitive to electrostatic charge. Before touching the driver, turn off the power to prevent electrostatic charge from generating. If an electrostatic charge is impressed on the driver, the driver may be damaged.

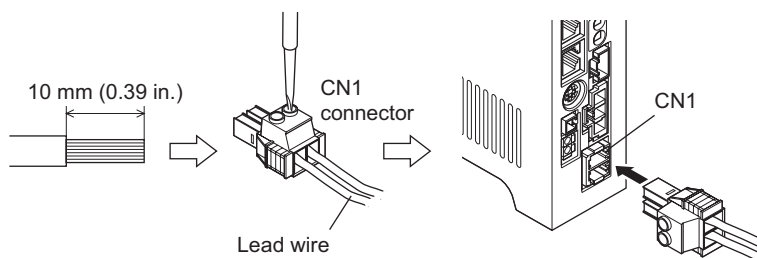
# 7 Connection

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

## 7.1 Connecting the power supply

### ■ Connecting method

1. Strip the insulation cover of the lead wire by 10 mm (0.39 in.)  
Applicable lead wire: AWG16 to 10 (1.25 to 6 mm<sup>2</sup>)
2. Insert each lead wire into the CN1 connector and tighten the screw.  
Tightening torque: 0.7 to 0.8 N·m (6.1 to 7.0 lb-in)
3. Insert the CN1 connector into CN1.



#### Note

- For the driver's power supply use a DC power supply with reinforced insulation on its primary and secondary sides.
- When connecting, check the indication of the driver case and pay attention to the polarity of the power supply. Reverse-polarity connection may cause damage to the driver.
- Do not wire the power supply cable of the driver in the same cable duct with other power line or motor cable. Doing so may cause malfunction due to noise.
- When cycling the power or plugging/unplugging the connector, turn off the power and wait for the POWER LED to turn off.
- When unplugging the CN1 connector, do so after pressing the lever (orange) on the CN1.

### ■ Applicable crimp terminal

If crimp terminals are used, select the following terminals.

Manufacturer	Model	Applicable lead wire
PHOENIX CONTACT GmbH & Co. KG	AI 1.5-10	AWG16 (1.25 mm <sup>2</sup> )
	AI 2.5-10	AWG14 (2 mm <sup>2</sup> )
	AI 4-10	AWG12 (3.5 mm <sup>2</sup> )
	AI 6-10	AWG10 (6 mm <sup>2</sup> )

### ■ Recommended power supply capacity

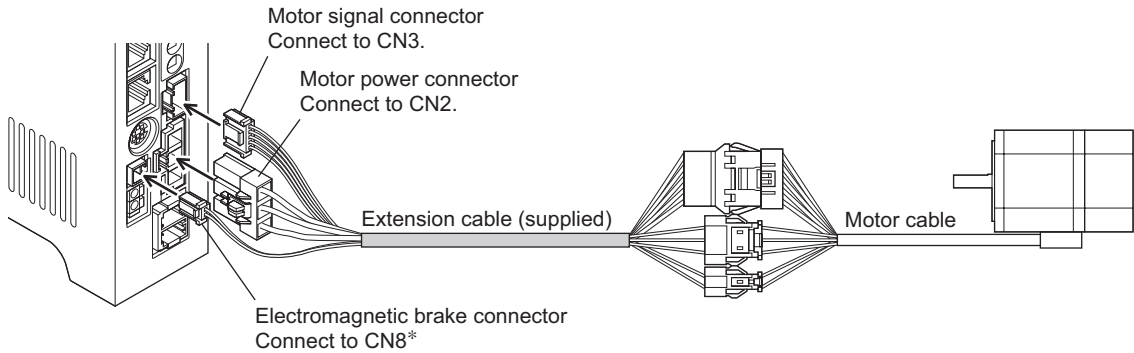
Unit model	Input power supply voltage	Current capacity
<b>BLV620</b>	24 VDC±10%	800 W or more
<b>BLV640</b>	48 VDC±10%	1 kW or more

## 7.2 Connecting the motor and driver

Connect the motor cable to the motor power connector (CN2) and motor signal connector (CN3) of the driver.

When using a electromagnetic brake motor, also connect to the electromagnetic brake connector (CN8).

To expand connection between the motor and driver, use the supplied extension cable. Connection can be extended to a maximum of 3.5 m (11.5 ft.).



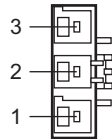
\* Electromagnetic brake type only.

**Note** | Ensure that the connector plugged in securely. Insecure connection may cause malfunction or damage to the motor or driver.

### ■ Connector of the motor cable

#### ● Motor power connector

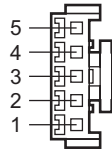
Pin No.	Lead color	Lead size
1	Blue	AWG14 (2.0 mm <sup>2</sup> )
2	Purple	
3	Gray	



Housing: DF22CR-3S-7.92C (HIROSE ELECTRIC CO., LTD.)  
Terminal: DF22-1416SCFA (HIROSE ELECTRIC CO., LTD.)

#### ● Motor signal connector

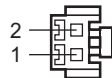
Pin No.	Lead color	Lead size
1	Yellow	AWG24 (0.2 mm <sup>2</sup> )
2	Green	
3	Orange	
4	Red	
5	Brown	



Housing: 51103-0500 (Molex)  
Terminal: 50351-8000 (Molex)

#### ● Electromagnetic brake connector

Pin No.	Lead color	Lead size
1	Black	AWG24 (0.2 mm <sup>2</sup> )
2	White	



Housing: 51103-0200 (Molex)  
Terminal: 50351-8000 (Molex)

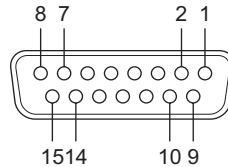
## 7.3 Connecting the I/O signals

Connecting the I/O signals to the I/O connector (CN4). Keep the wiring distance as short as possible [less than 2 m (6.6 ft.)] to suppress the effect of noise.

### Note

- The connector for connecting the I/O signals is not included. Please prepare as follows;
  - D-Sub connector (15-pin)
  - Hood (the screw: No.4-40UNC)
- Wire the signal cable at a distance of 100 mm (3.94 in) or more from the inductive load (electromagnetic relay etc.), power supply or power cable (motor cable etc.).

### Connector function table



This figure is the CN4 connector viewed from the driver front side.

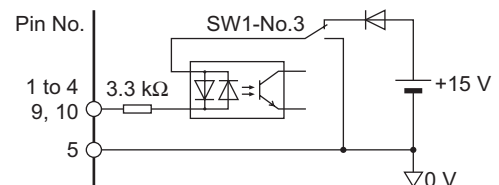
Pin No.	Signal type	Terminal name	Signal name	Description
1	Input	X0*1	FWD	The motor turns in the clockwise direction.
2		X1*1	REV	The motor turns in the counterclockwise direction.
3		X2*1	STOP-MODE	Select instantaneous stop or deceleration stop.
4		X3*1	M0	Select the internal potentiometer or external potentiometer (external DC voltage).
5	GND	C0	IN-COM	-
6	Output	Y2	SPEED-OUT	30 pulses are output with each revolution of the motor output shaft.
7		Y1-*1	WNG (-)	-
8		Y0-*1	ALARM-OUT (-)	-
9	Input	X4*1	ALARM-RESET	Alarms are reset.
10		X5*1	MB-FREE*2	Select how the electromagnetic brake would operate when the motor stops.
11	Analog input	VL	VL	External speed setting input Set the speed of the external potentiometer (external DC voltage).
12		VM	VM	
13		VH	VH	
14	Output	Y1+*1	WNG (+)	This signal is output when a warning generates.
15		Y0+*1	ALARM-OUT (+)	This signal is output when an alarm generates (normally closed).

\*1 The **OPX-2A** can be used to change the assignments of I/O signals.

\*2 Electromagnetic brake type only.

### 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



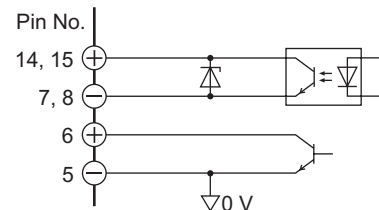
### Output signals circuit

The driver outputs signals are photocoupler/open-collector output.  
The ON voltage of the output circuit is max. 1.5 V (0.5 V for SPEED-OUT output). When driving each element using the output signal circuit, give consideration to this ON voltage.

**BLV620**: 30 VDC or less, 100 mA or less

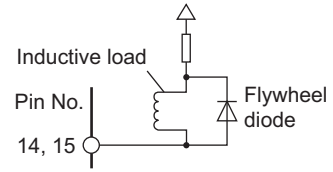
**BLV640**: 53 VDC or less, 100 mA or less

(For the SPEED-OUT output, supply at least 10 mA of current.)



**Note**

- Always connect a current-limiting resistor. If the power supply voltage is connected to the output circuit directly without connecting a current-limiting resistor in between, the driver will be damaged.
- When connecting a relay (inductive load), etc., to detect alarm outputs, use a relay with built-in flywheel diode, or provide a fly-back voltage control measure based on diode, etc., for the inductive load.



**Input signals**

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.

• **FWD input and REV input**

When the FWD input is turned ON, the motor turns in the clockwise direction according to the time set by the acceleration time potentiometer. When the FWD input is turned OFF, the motor stops. When the REV input is turned ON, the motor turns in the counterclockwise direction according to the time set by the acceleration time potentiometer. When the REV input is turned OFF, the motor stops. If both the FWD input and REV input are turned ON, the motor stops instantaneously.

• **STOP-MODE input**

Select how the motor should stop when the FWD input or REV input is turned OFF. When the STOP-MODE input is ON, the motor stops according to the time set by the deceleration time potentiometer. STOP-MODE input is OFF, the motor stops instantaneously.

**Note**

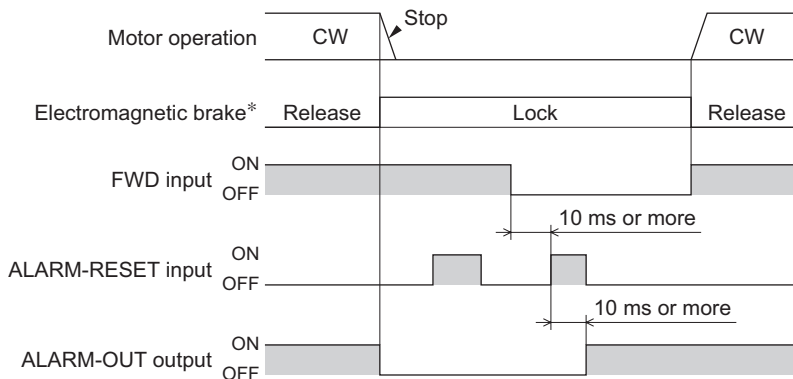
When the electromagnetic brake motor is used for vertical drive (gravitational operation), be sure to stop the motor after turning the STOP-MODE input ON. If the motor is stopped while the STOP-MODE input is OFF, the moving part may drop.

• **M0 input**

Select how the motor speed is set. When the M0 input is ON, the motor turns at the speed set by the external potentiometer or external DC voltage. When the M0 input is OFF, the motor turns at the speed set by the internal potentiometer. By switching the M0 input, the motor can be operated at two speeds through use of both the external potentiometer and internal potentiometer. Refer to p.32 for details. You can set a maximum of eight speeds by changing the assignments of M0 to M2 inputs using the **OPX-2A**.

• **ALARM-RESET input**

This input resets the present alarm that the protective function of the driver was actuated. To reset each alarm, be sure to remove the cause of the alarm before switching the ALARM-RESET input. To reset an alarm, turn both the FWD input and REV input OFF, remove the cause of the alarm, and then turn the ALARM-RESET input ON (and keep it ON for 10 ms or more). The ALARM-RESET input will not be received if the FWD input or REV input is ON. If the alarm cannot be reset with the ALARM-RESET input, cycle the main power. If a control power is used, also cycle the control power.



\* The electromagnetic brake locks the moment an alarm generates. You can also use the **OPX-2A** to cause the electromagnetic brake to lock after a free-run stop of the motor.

**Note**

- Continuing the operation without removing the cause of the alarm may cause damage to equipment.
- Overcurrent and EEPROM errors cannot be reset using the ALARM-RESET input.



● MB-FREE input

This input signal is used with electromagnetic brake types. Select how the electromagnetic brake would operate when the motor stops.

If the MB-FREE input is ON, the electromagnetic brake will be released.

If the MB-FREE input is OFF, the electromagnetic brake will actuate and hold the shaft in position.

**Note** | The MB-FREE input is not accepted while an alarm is present.

■ Output signals

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.

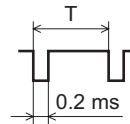
● SPEED-OUT output

30 pulses are output with each revolution of the motor output shaft synchronously with the motor operation.

The pulse width of output pulse signals is 0.2 ms. You can use the SPEED-OUT output to calculate the motor speed.

$$\text{SPEED-OUT output frequency (Hz)} = \frac{1}{T}$$

$$\text{Motor shaft speed (r/min)} = \frac{\text{SPEED-OUT output frequency}}{30} \times 60$$



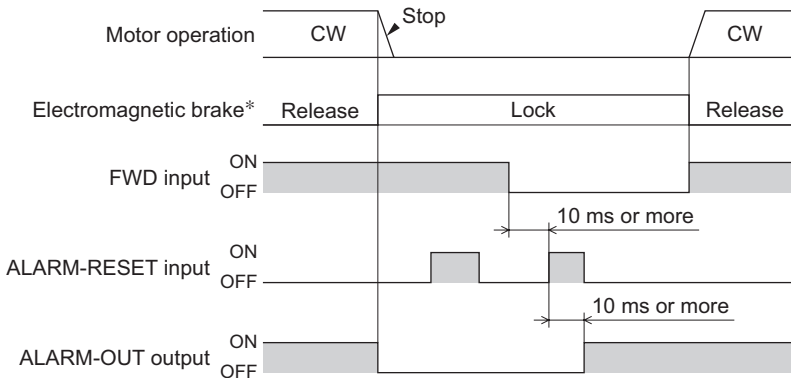
To display/monitor the speed of the motor output shaft or reduced speed of the gearhead output shaft, connect an accessory digital speed indicator **SDM496** (sold separately). See p.47 for details.

● ALARM-OUT output

When the driver's protective function actuates, the ALARM-OUT output turns OFF and the ALARM LED blinks (normally closed). In the case of a standard type, the motor stops naturally. In the case of an electromagnetic brake type, on the other hand, the motor stops instantaneously, upon which the electromagnetic brake actuates and holds the shaft in position.

To reset an alarm, turn both the FWD input and REV input OFF, remove the cause of the alarm, and then turn the ALARM-RESET input ON (and keep it ON for 10 ms or more). The ALARM-RESET input will not be received if the FWD input or REV input is ON.

If the alarm cannot be reset with the ALARM-RESET input, cycle the main power. If a control power is used, also cycle the control power.

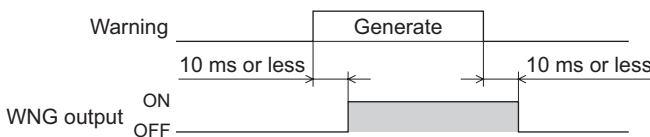


\* The electromagnetic brake locks the moment an alarm generates. You can also use the **OPX-2A** to cause the electromagnetic brake to lock after a free-run stop of the motor.

● WNG output

This signal is output when a warning generates. However, the operation will continue.

The WNG output will turn OFF automatically once the cause of the warning is removed.



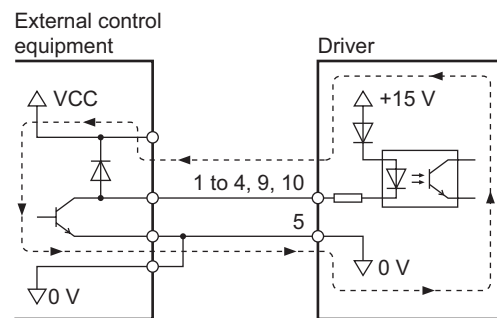
Warning list

Warning type	Cause	Remedial action
Main circuit overheat	The temperature inside the driver exceeded the overheat warning level.	Review the ventilation condition in the enclosure.
Undervoltage*	The main power supply voltage dropped by approx. 10% or more from the rated voltage.	<ul style="list-style-type: none"> <li>• Check the input voltage of the power supply.</li> <li>• Check the power supply cable wiring.</li> </ul>
Overload*	The load torque of the motor e exceeded the overload warning level.	<ul style="list-style-type: none"> <li>• Reduce the load.</li> <li>• Change the operation pattern including the acceleration/ deceleration time.</li> </ul>
Operation error	<ul style="list-style-type: none"> <li>• When performing test operation using the <b>OPX-2A</b>, any of the input signal for operation was ON.</li> <li>• When changing the assignment of the input terminal using the <b>OPX-2A</b>, the assigned terminal was ON.</li> </ul>	Turn the input signals OFF.

\* The detection level can be changed using the **OPX-2A**.

■ Using a controller with a built-in clamp diode

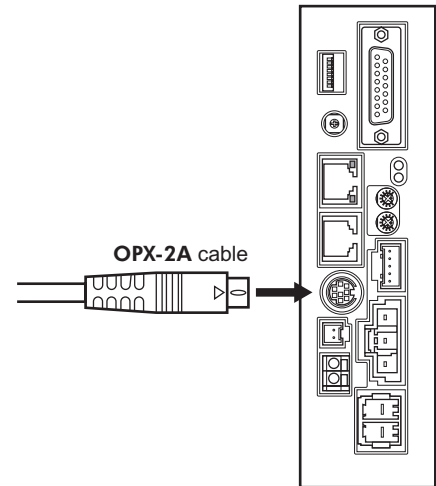
If a controller with a built-in clamp diode is used, a leakage path may form and cause the motor to operate even when the controller power is off, as long as the driver power is on. Since the power capacity of the controller is different from that of the driver, the motor may operate when the controller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



7.4 Connecting the communication cable

Connect the cable of the **OPX-2A** to the communication connector (CN7).

Refer to the [USER MANUAL RS-485 Communication Mode](#) for connection of RS-485 communication.

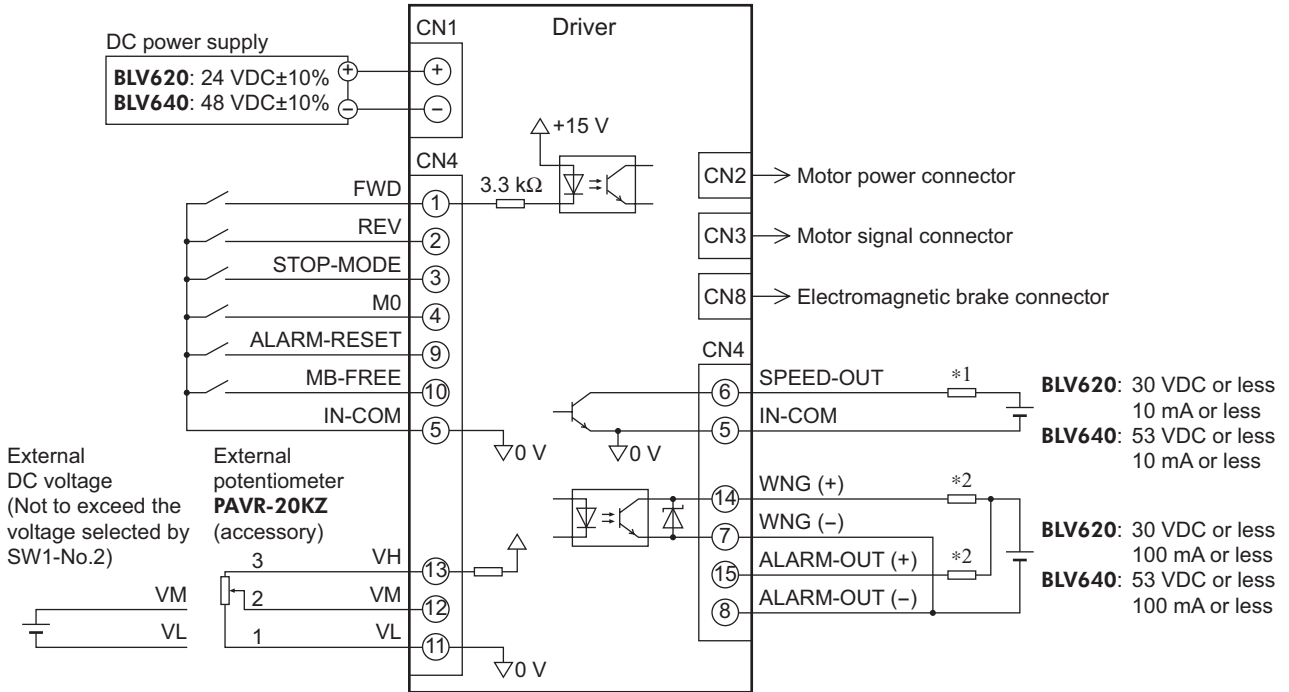


## 7.5 Connection diagram (Example)

Each connection diagram (example) applies to an electromagnetic brake type. With a standard type, the electromagnetic brake need not be connected and the MB-FREE input need not be connected or input.

### ■ Sink logic

In the connection example given below, the motor is operated with relays, switches and other contact switches.

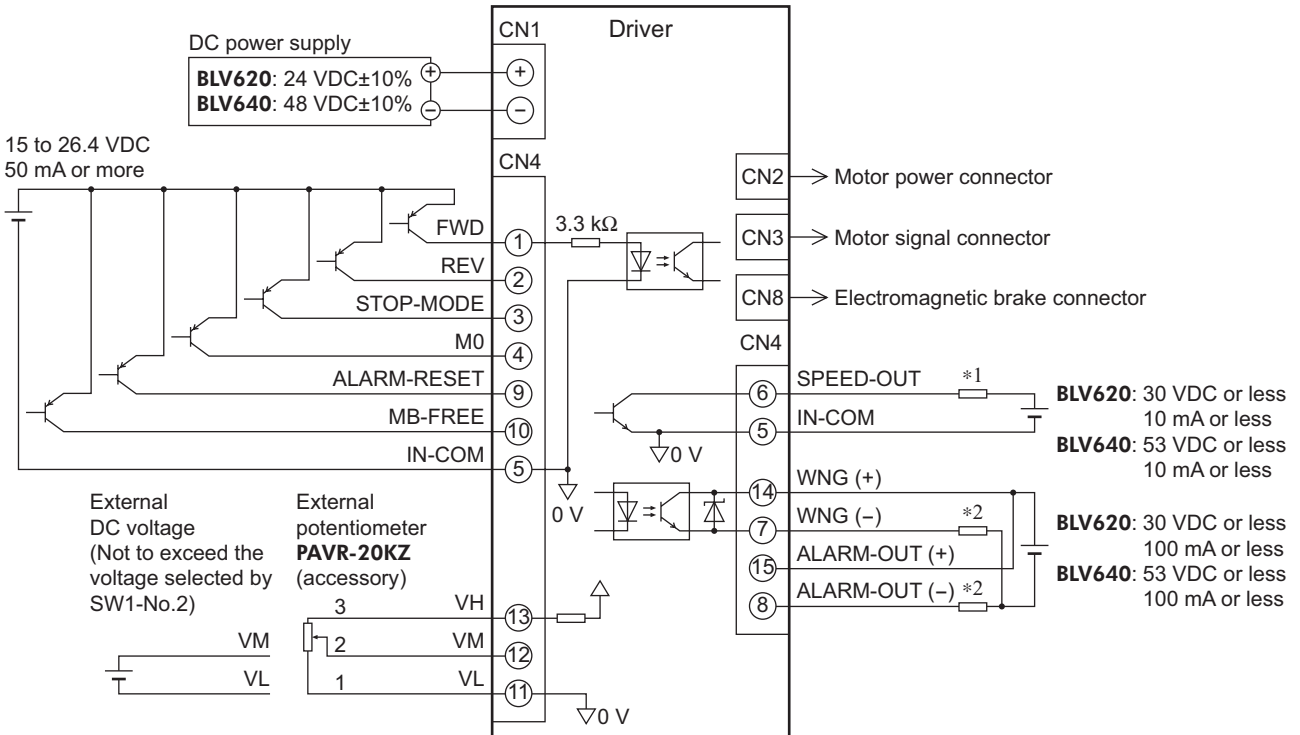


\*1 Connect a current-limiting resistor based on the power supply voltage if the current exceeds 10 mA.

\*2 Connect a current-limiting resistor based on the power supply voltage if the current exceeds 100 mA.

### ■ Source logic

In the connection example given below, the motor is operated with sequence connection of transistor type.



\*1 Connect a current-limiting resistor based on the power supply voltage if the current exceeds 10 mA.

\*2 Connect a current-limiting resistor based on the power supply voltage if the current exceeds 100 mA.

# 8 Operation

This chapter explains the operations that can be performed with the **BLV** Series.

## 8.1 Operation overview

With the **BLV** Series, you can perform three types of operations including basic operations, extended operations using the **OPX-2A** and operation via RS-485 communication. The table below shows the details of each operation and the reference pages.

Type of operation	What you can do		Description	Ref.
Basic operation	Speed setting	Internal potentiometer	Set the speed using the internal potentiometer.	P.29
		External potentiometer	Set the speed using the external potentiometer.	
		External DC voltage	Set the speed using an external DC voltage.	
	Run/stop		Run/stop the motor.	P.30
	Setting the acceleration time and deceleration time		You can set the acceleration time and deceleration time for starting and stopping.	P.31
	2-speed operation		Operation can be performed at two speeds through use of both the external potentiometer (external DC voltage) and internal potentiometer.	P.32
	Examples of operation patterns		Examples of run/stop are explained using timing charts.	P.33
	Multi-motor control		A single external potentiometer (external DC voltage) can be used to set the same speed for multiple motors.	P.35
	Function	Speed response selection	Select the compliance with respect to commanded speed.	P.32
		Torque limiting	The output torque of the motor can be limited.	P.33
Sink logic/Source logic selection		Switches the input logic between sink logic and source logic.	P.34	
Extended operations using <b>OPX-2A</b>	<p>The following functions are extended when the <b>OPX-2A</b> is used. Refer to p.38 for the assignments of I/O signals as well as operation patterns when eight speeds are set:</p> <ul style="list-style-type: none"> <li>• Operating speed (maximum of 8 speeds)</li> <li>• Acceleration time, Deceleration time (Individual setting)</li> <li>• Torque limiting (Individual setting)</li> <li>• Change of I/O signal assignments</li> <li>• Function of analog setting/digital setting</li> <li>• Various displays (speed, alarm code, load factor)</li> <li>• I/O monitor</li> <li>• Warning output</li> <li>• Test operation</li> <li>• Data copy</li> <li>• Setting the operation input mode</li> </ul>		P.38	
Control via RS-485 communication	<p>Modbus protocol can be used in RS-485 communication. Refer to the <a href="#">USER MANUAL RS-485 Communication Mode</a> for details.</p>		-	

## 8.2 Basic operation

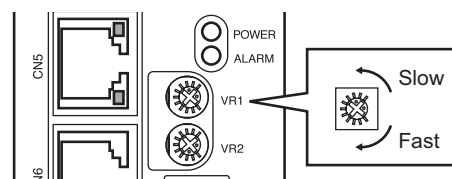
### ■ Speed setting

The setting range is 100 to 4000 r/min.

#### ● Setting by internal potentiometer

Use a precision screwdriver to turn the internal potentiometer.  
Turn the potentiometer clockwise to increase the speed.

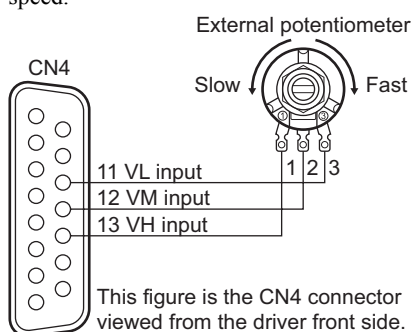
Factory setting: 0 r/min



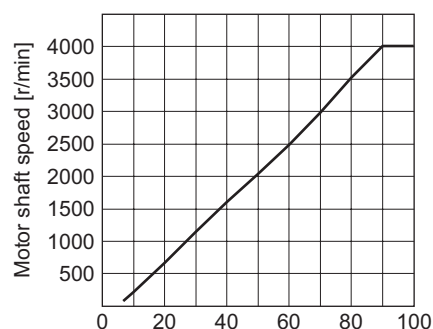
#### ● Setting by the external potentiometer (accessory)

Connect the accessory external potentiometer (sold separately) to the I/O signal connector (CN4) of the driver.

When the M0 input is turned ON, the external potentiometer is enabled. Turn the potentiometer clockwise to increase the speed.



#### ● External potentiometer position vs. speed characteristics (representative values)



**Note** When using an external potentiometer, turn the basic function switch (SW1-No.2) OFF.

#### ● Setting with external DC voltage

Set either 5 or 10 VDC for the external DC voltage.

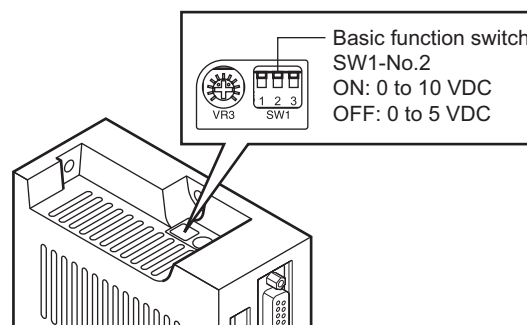
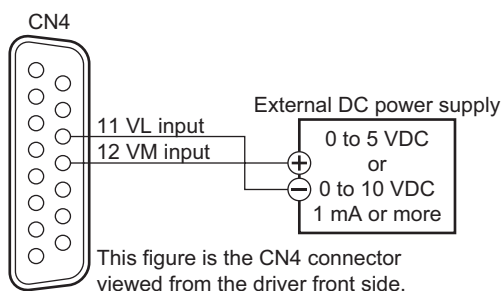
Select the basic function switch (SW1-No.2) to set which voltage to be used. 5 VDC is set when the switch is set to the OFF position, and 10 VDC is set when the switch is set to the ON position.

Factory setting: 5 VDC (OFF)

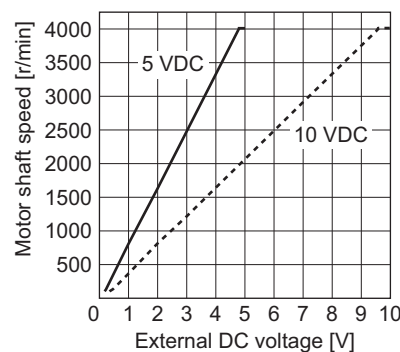
For the external voltage, use a DC power supply (0 to 5 VDC or 0 to 10 VDC) with reinforced insulation on both the primary side and secondary side, and connect it to the I/O signal connector (CN4).

The input impedance between the VM input and VL input is approx. 14 k $\Omega$  when the basic function switch (SW1-No.2) is ON, and approx. 47 k $\Omega$  when OFF.

The VL input is connected to IN-COM1 inside the driver.



#### ● External DC voltage vs. speed characteristics (representative values)



**Note** Be sure to set the external DC voltage to either 5 VDC or less, or 10 VDC or less. When connecting the external DC power supply, make sure the polarities are correct. If the polarities are reversed, the driver may be damaged.

## ■ Running/stopping the motor

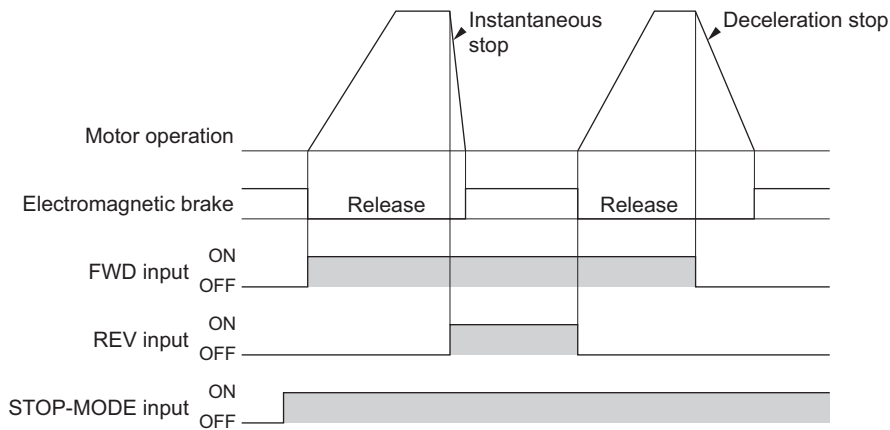
Run/stop the motor by inputting operation control signals.

### ● Operation

When the FWD input is turned ON, the motor turns in the clockwise direction according to the time set by the acceleration time potentiometer. When the FWD input is turned OFF, the motor stops.

When the REV input is turned ON, the motor turns in the counterclockwise direction according to the time set by the acceleration time potentiometer. When the REV input is turned OFF, the motor stops.

If the FWD input and REV input are turned ON at the same time, the motor stops instantaneously.



**Note** If the motor unit is used in a vertical application, operating the device based on the following settings may cause the shaft to reverse momentarily at start or stop depending on the load conditions (approx. 1/4 rotation at the motor output shaft):

- Low motor speed
- Long acceleration time or deceleration time

### ● Stop

Select how the motor should stop when the FWD input or REV input is turned OFF.

When the STOP-MODE input is ON, the motor stops according to the time set by the deceleration time potentiometer.

STOP-MODE input is OFF, the motor stops instantaneously.

FWD input	REV input	STOP-MODE input	Motor status
ON	OFF	-	Clockwise rotation
OFF	ON	-	Counterclockwise rotation
ON	ON	-	Instantaneous stop
-	-	OFF	Instantaneous stop
-	-	ON	Deceleration stop

**Note** When the electromagnetic brake motor is used for vertical drive (gravitational operation), be sure to stop the motor after turning the STOP-MODE input ON. If the motor is stopped while the STOP-MODE input remains OFF status, the moving part may drop.

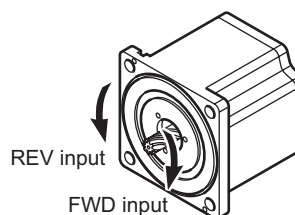
## ■ Rotating direction of the motor output shaft

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

### • Combination type parallel shaft gearhead

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

Gear ratio	Rotating direction of gearhead output shaft
5, 10, 15, 20, 100, 200	Same as the motor output shaft
30, 50	Opposite to the motor output shaft

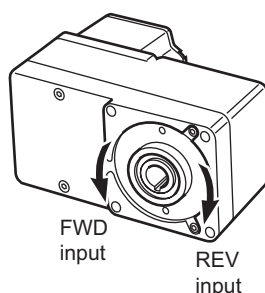


### • Combination type hollow shaft flat gearhead

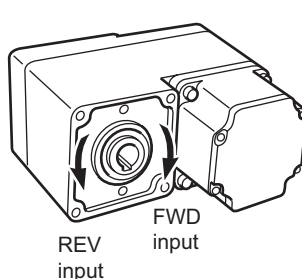
For all gear ratios, the output shaft turns in the opposite direction to the motor.

The direction is different depending on whether the motor/gearhead assembly is viewed from the front side or rear side.

#### • Viewed from Front



#### • Viewed from Rear



## 8.3 Setting the acceleration time and deceleration time

You can set the acceleration time and deceleration time for starting and stopping. The acceleration time and deceleration time are effective for all speed settings.

The acceleration time and deceleration time are same value. It cannot be set individually.

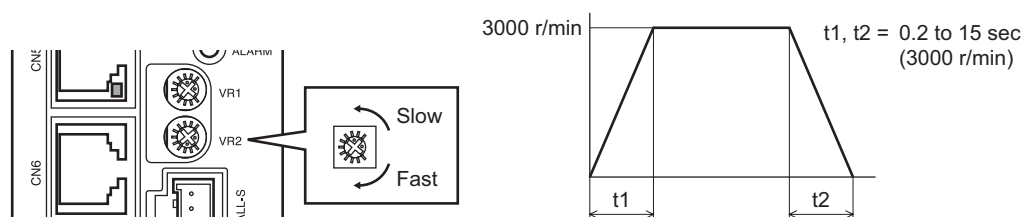
Set the acceleration/deceleration time using the acceleration/deceleration time potentiometer (VR2). Turning the potentiometer clockwise increases the time.

Acceleration time refers to the time needed for the motor to reach the rated speed (3000 r/min) from the stationary state.

Deceleration time refers to the time needed for the motor to stop from the rated speed (3000 r/min).

Setting range: 0.2 to 15 sec

Factory setting: 0.2 sec

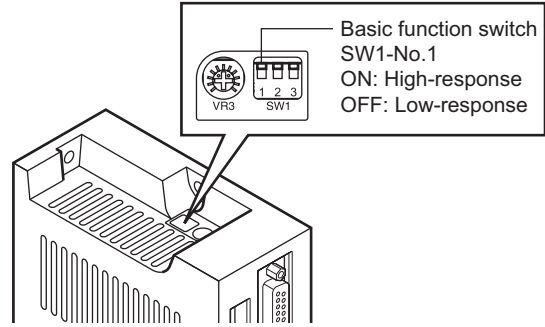
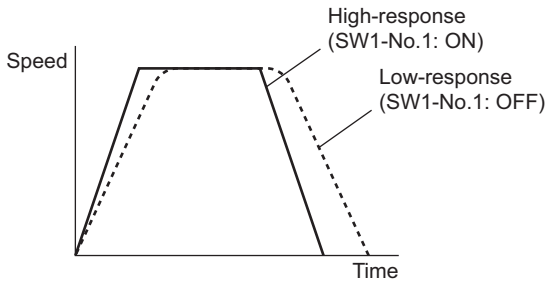


The actual acceleration time and deceleration time vary depending on the conditions of use, load inertia, load torque, etc. If smooth acceleration operation or deceleration operation is not possible, increase the acceleration time or deceleration time.

## 8.4 Speed response selection

Select the motor response in reaction to the command speed using the basic function switch (SW1-No.1).  
When operating a large inertial load, hunting at starting a motor can be eliminated with the low-response setting.

Setting range: OFF (Low-response)  
ON (High-response)  
Factory setting: OFF (Low-response)



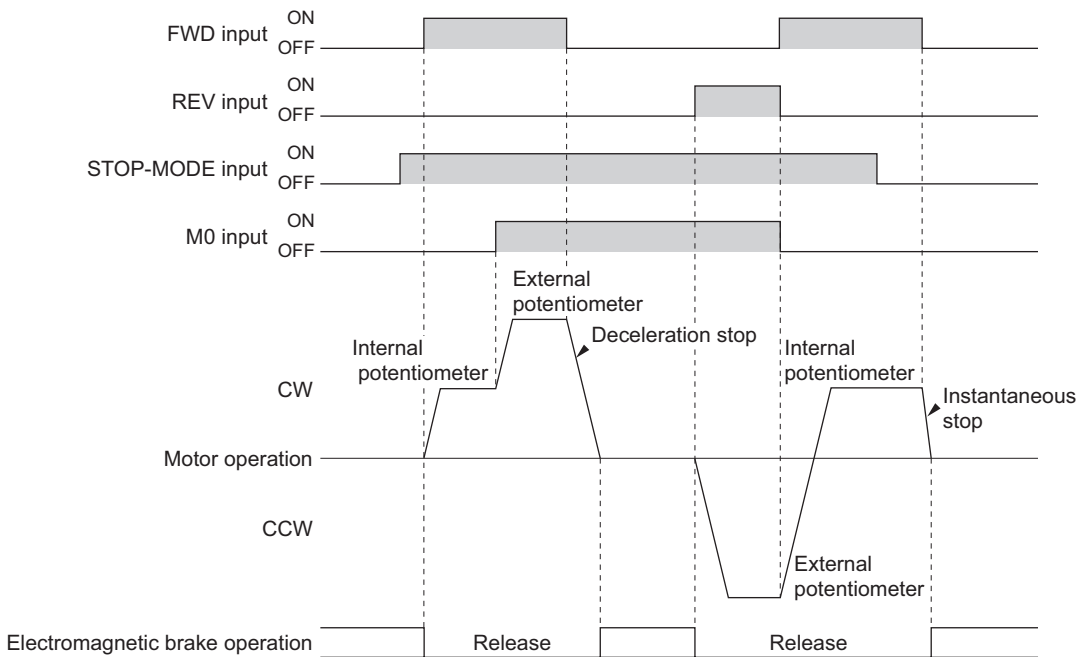
**Note**

- Cycle the main power after switching the basic function switch (SW1-No.1). If a control power is used, also cycle the control power.
- When using the electromagnetic brake motor in vertical drive (gravitational operation), set the basic function switch to high-response (ON).

## 8.5 2-speed operation

Operation can be performed at two speeds through use of both the internal potentiometer and external potentiometer (external DC voltage).

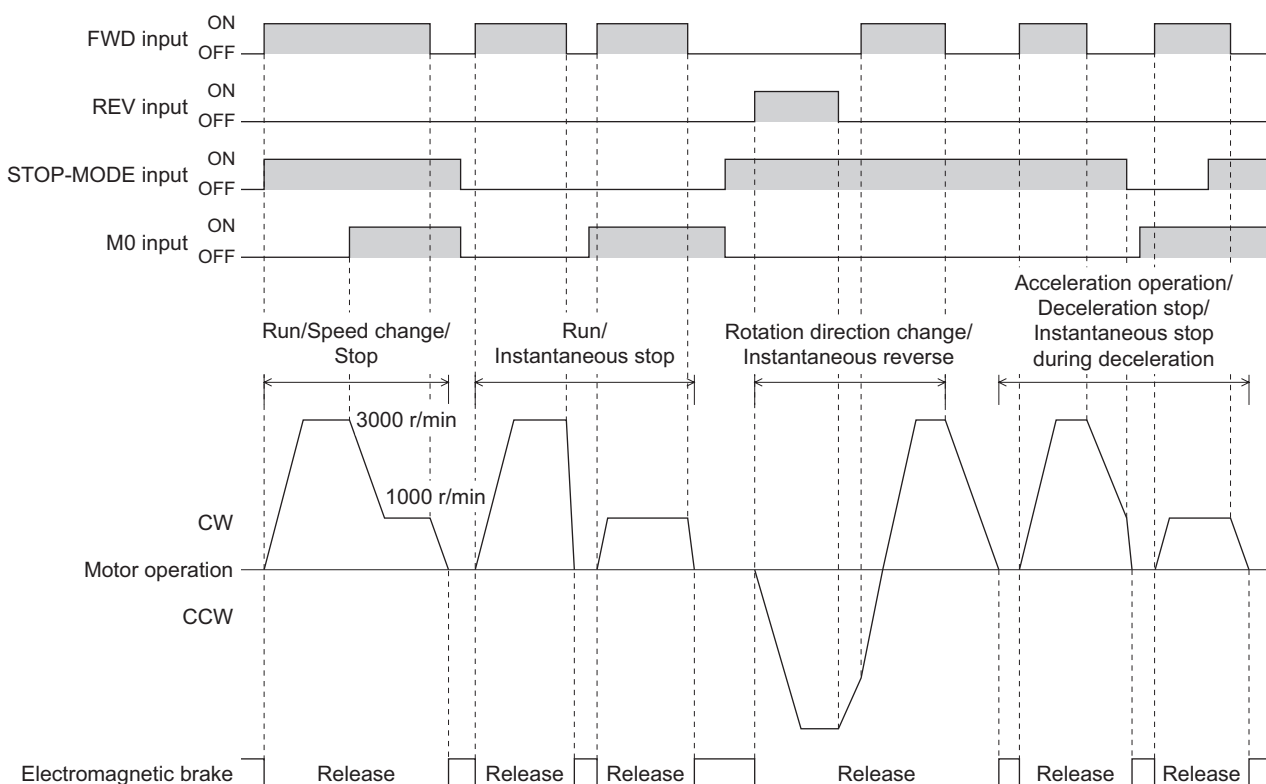
When the M0 input is ON, the motor turns at the speed set by the external potentiometer or external DC voltage.  
When the M0 input is OFF, the motor turns at the speed set by the internal potentiometer.





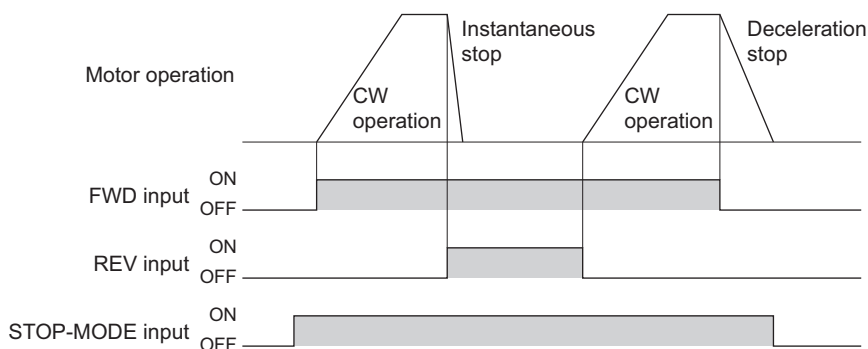
## 8.6 Examples of operation patterns

The charts below are examples of setting the internal potentiometer to 3000 r/min and external potentiometer to 1000 r/min and switching the speed between these two levels.



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

If the FWD input and REV input are turned ON at the same time, the motor stops instantaneously regardless of the status of the STOP-MODE input.



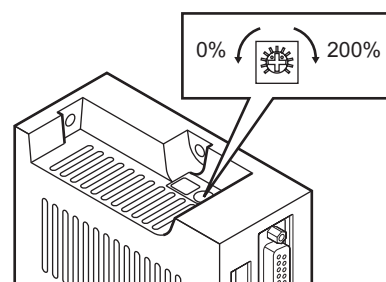
## 8.7 Torque limiting function

Set the torque limiting value using the torque limiting potentiometer (VR3). A desired torque limiting value can be set as a percentage (%) of the motor rated torque of 100%.

When performing the torque limiting operation continuously such as push-motion operation or winding-control operation, set the torque limiting value at 100% or less.

Setting range: 0 to 200%

Factory setting: 200%



## 8.8 Sink logic/Source logic selection

With the basic function switch (SW1-No.3), the input circuit of the driver can be switched between sink logic and source logic.

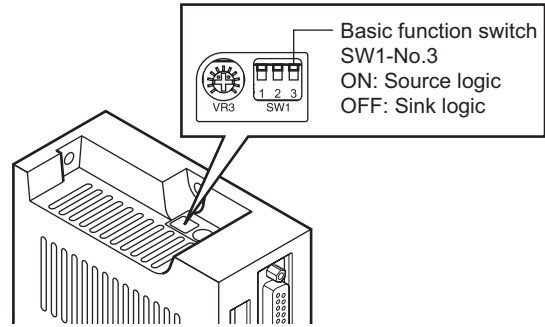
The output circuit of the driver can be switched between sink logic and source logic by changing the wiring connection.

In the sink logic input circuit, a signal will be turned ON when the current flows out of the input terminal.

In the source logic input circuit, a signal will be turned ON when the current flows into the input terminal.

Factory setting is sink logic (OFF).

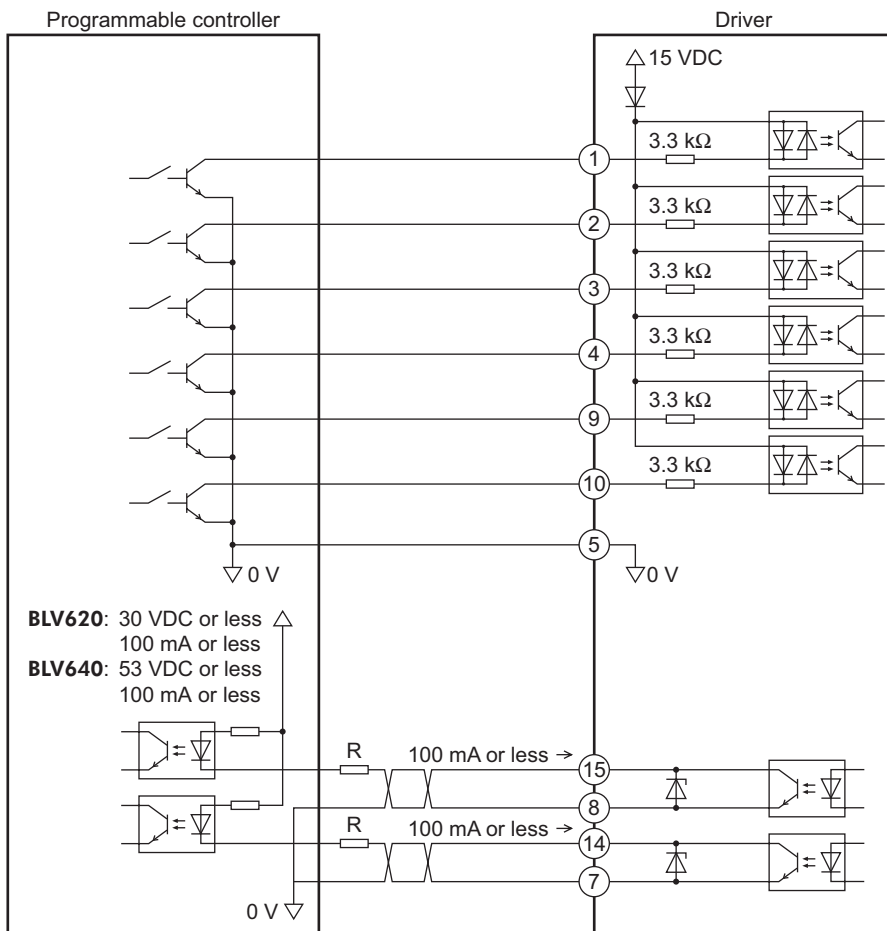
Switch sink logic or source logic based on the output circuit of the external control device (programmable controller).



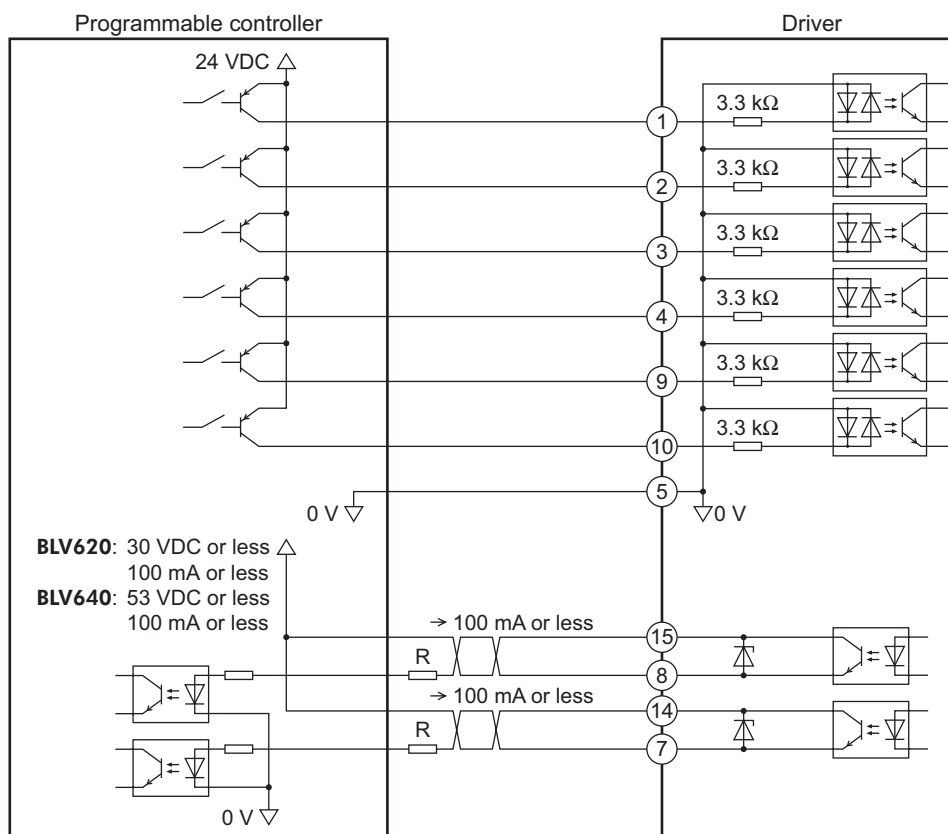
### Example of connection with I/O signal circuit

**Note** | If the current exceeds 100 mA, connect an external resistor R.

- Sink logic circuit



- Source logic circuit



## 8.9 Multi-motor control

If two or more motors are to be operated at the same speed by using a single external potentiometer (external DC voltage), this type of operation is called “multi-motor control.”

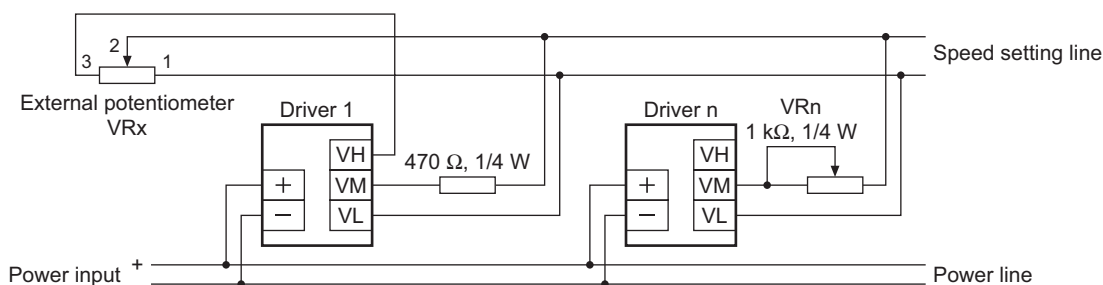
Multi-motor control is achieved by allowing multiple drivers to share the power line and speed setting line.

- Connect the external I/O signals to each driver.
- To perform multi-motor control using the external potentiometer, set the basic function switch (SW1-No.2) to OFF.
- Set the basic function switch (SW1-No.2) the same way for all the drivers.

### ■ Using an external potentiometer

Connect the drivers as shown below.

When performing multi-motor control using the external potentiometer, the number of drivers should not exceed 20 units.



Resistance (VRx) when the number of drivers is n:

$$\text{Resistance (VRx)} = 20/n \text{ (k}\Omega\text{)}, n/4 \text{ (W)}$$

**Example:** If two drivers are used

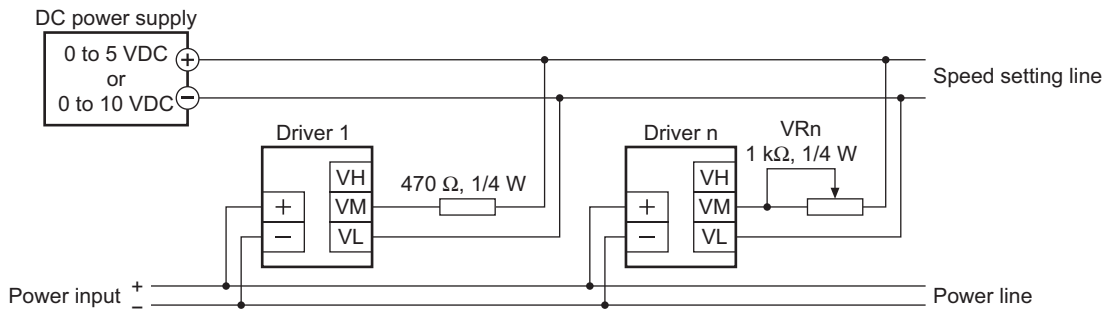
Resistance (VRx) = 20/2 (kΩ), 2/4 (W), resistance (VRx) is calculated as 10 kΩ, 1/2 W.

(Use a resistor of the calculated wattage or more.)

If the speed will vary among the respective motors, make adjustments by connecting a resistor of 470 Ω, 1/4 W to terminal VM on driver 1 and connecting a variable resistor VRn of 1 kΩ, 1/4 W to driver 2 and subsequent drivers.

## ■ Using external DC voltage

Connect the drivers as shown below.



Current capacity (I) of external DC power supply when the number of drivers is n:

$$\text{Current capacity (I)} = 1 \times n \text{ (mA)}$$

**Example:** If two drivers are used

Current capacity (I) =  $1 \times 2$  (mA), current capacity (I) is calculated as 2 mA or more.

If the speed will vary among the respective motors, make adjustments by connecting a resistor of 470 Ω, 1/4 W to terminal VM on driver 1 and connecting a variable resistor VRn of 1 kΩ, 1/4 W to driver 2 and subsequent drivers.

## 9 Extended functions

When an accessory data setter **OPX-2A** (sold separately) is used, the specifications and functions are extended and various operation can be performed.

For details, refer to the operating manual for the **OPX-2A**. This section explains extended functions using the **OPX-2A**.

### 9.1 Extended items

#### ■ Specification

Item	Standard specification	Specification when using <b>OPX-2A</b>
Speed setting range	100 to 4000 r/min Set with the potentiometer VR1	80 to 4000 r/min Set digitally in 1 r/min increments.
Speed control accuracy	±0.5%	±0.2%
Acceleration time	The time needed to reach the rated speed (3000 r/min).	The time needed to reach the target speed from the current speed
Deceleration time	The time needed for the motor to stop from the rated speed (3000 r/min).	

#### ■ Function

Function	Description	<b>OPX-2A</b> mode
Various displays	<ul style="list-style-type: none"> <li>• Operating speed</li> <li>• Transfer speed</li> <li>• ON/OFF status of each I/O signal</li> <li>• Load factor</li> <li>• Alarm code</li> <li>• Warning code</li> </ul>	Monitor mode
Multi-speed setting	Up to 8 operation data can be set. Set the rotation speed, torque limiting value, acceleration time and deceleration time in operation data.	Data mode
Torque limit	The motor torque limiting value can be set in operation data.	
Various functions	<ul style="list-style-type: none"> <li>• Speed reduction ratio</li> <li>• Speed increasing ratio</li> <li>• Conveyor speed reduction ratio</li> <li>• Conveyor speed increasing ratio</li> <li>• Rotating speed attainment band</li> <li>• Motor direction selection</li> </ul>	Parameter mode
Change of I/O signal assignments	I/O signal assignments can be changed.	
Warning output	Warning functions can be set to output a warning signal before the corresponding alarms generate.	
Digital/Analog input switching	The functions assigned to the potentiometers of the driver can be changed, and also the setting method of the operation data can be switched between analog setting and digital setting (p.41).	
Test function	<ul style="list-style-type: none"> <li>• I/O test</li> <li>• Test operation (JOG operation)</li> </ul>	Test mode
Copy function	<ul style="list-style-type: none"> <li>• Data copy</li> <li>• Initializing the setting</li> </ul>	Copy mode

# 10 Operation using a data setter OPX-2A

This chapter explains the setting and operation using a data setter **OPX-2A**.

Refer to the **OPX-2A OPERATING MANUAL** for details of setting contents and operation.

## 10.1 Setting the operation data

Up to eight sets of operation data can be set in the data mode.

Set the rotation speed, torque limiting value, acceleration time and deceleration time in operation data.

Setting item	Initial value	Setting range	Setting unit	Description
Operating speed	0	0 r/min, or 80 to 4000 r/min	1	Set the operating speed.
Torque limiting value	200	0 to 200%	1	When limiting the operation torque, set the torque limiting value as a percentage (%) of the rated torque. The rated torque is being 100%. The initial setting is motor starting torque.
Acceleration time* Deceleration time*	0.5	0.2 to 15.0 s	0.1	Set the time needed to reach the target speed from the current speed.

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

## 10.2 Multi-speed operation

A multi-speed operation using up to eight speeds can be performed by setting desired speeds in operation data No.1 to 8 and then switching the speed using the M0 to M2 inputs.

### ■ Assignments of I/O signals

To perform the multi-speed operation, assign the M0 to M2 inputs to the driver input terminals.

Change the assignments with the parameter mode of the **OPX-2A**.

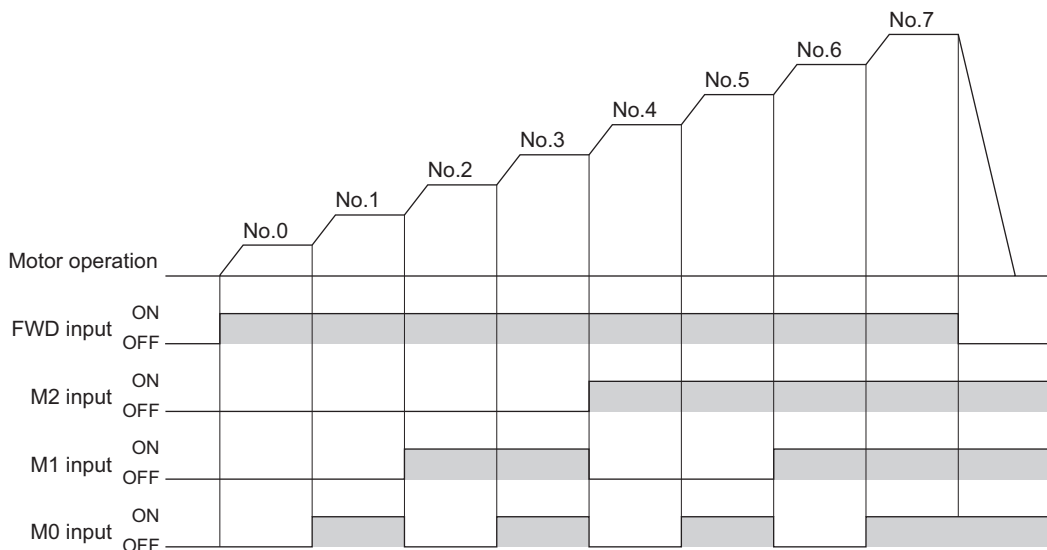
Input terminal	Signal name	Description	
X0 to X5	FWD	2-wire input mode	The motor turns in the FWD direction.
	REV		The motor turns in the REV direction.
	STOP-MODE		Select instantaneous stop or deceleration stop.
	START/STOP	3-wire input mode	The motor rotates when turning the signal ON. The motor decelerates and stops when turning the signal OFF.
	RUN/BRAKE		The motor stops instantaneously when turning the signal OFF.
	FWD/REV		The motor rotates in the FWD direction when turning the signal ON, while in the REV direction when turning the signal OFF.
	MB-FREE	The electromagnetic brake is released at motor standstill when turning the signal ON.	
	EXT-ERROR	The motor stops when turning the signal OFF.	
	ALARM-RESET	Alarms are reset.	
	HMI	Operation of the <b>OPX-2A</b> is disabled. The <b>OPX-2A</b> can be used as a display.	
	M0	Select a operation data number based on a combination of ON/OFF states of M0, M1 and M2 inputs.	
	M1		
M2			

## ■ Select the operation data

Desired operation data number can be selected by a combination of ON/OFF statuses of M0, M1 and M2 inputs.

Operation data No.	M0 input	M1 input	M2 input
0	OFF	OFF	OFF
1	<b>ON</b>	OFF	OFF
2	OFF	<b>ON</b>	OFF
3	<b>ON</b>	<b>ON</b>	OFF
4	OFF	OFF	<b>ON</b>
5	<b>ON</b>	OFF	<b>ON</b>
6	OFF	<b>ON</b>	<b>ON</b>
7	<b>ON</b>	<b>ON</b>	<b>ON</b>

To turn ON the M0, M1 and M2 inputs, wait for at least 10 ms after the FWD input or REV input has turned ON. If an attempt is made to turn ON the M0 to M2 inputs within 10 ms, the M0 to M2 inputs will not be accepted.



## 10.3 Setting the operation input mode

Signal input mode can be switched between 2-wire input mode and 3-wire input mode.

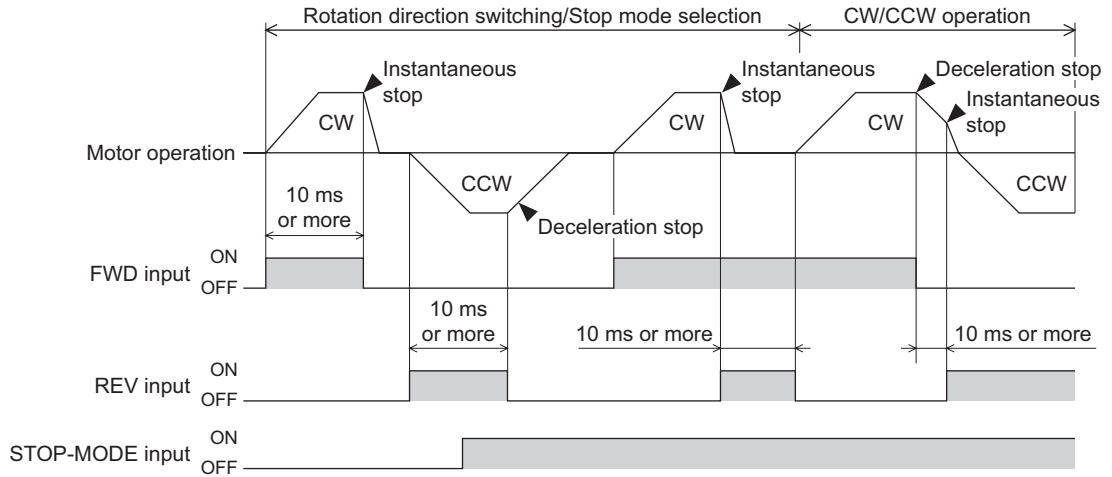
The operation input mode is a method to select the motor rotation direction and operation signal. FWD input and REV input are used in 2-wire input mode. START/STOP input, RUN/BRAKE input and FWD/REV input are used in 3-wire input mode.

In each operation input mode, signal functions will be changed as follows.

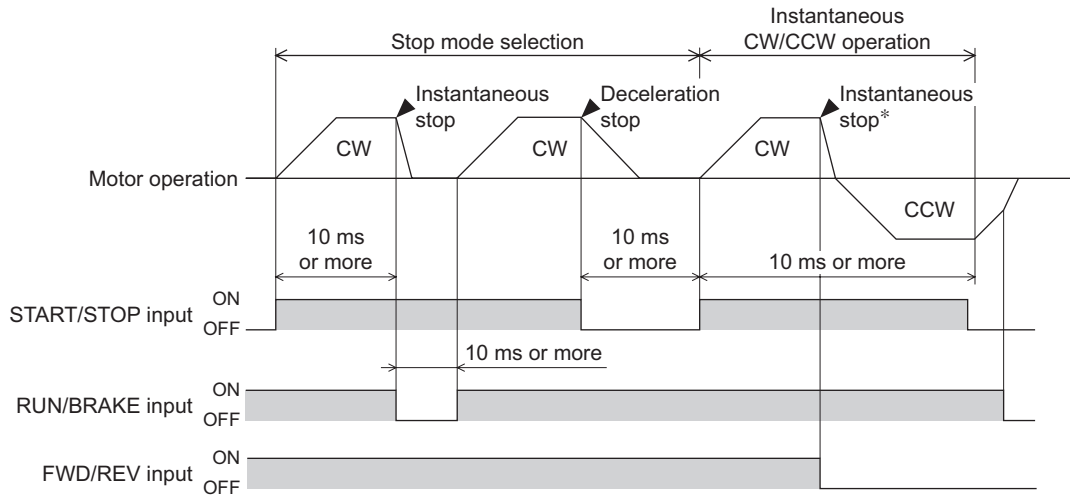
2-wire input mode	3-wire input mode
FWD input	START/STOP input (ON: Operation, OFF: Deceleration stop)
REV input	RUN/BRAKE input (ON: Operation, OFF: Instantaneous stop)
STOP-MODE input	FWD/REV input (ON: Rotate to clockwise, OFF: Rotate to counter clockwise)

**Note** When the electromagnetic brake motor is used for vertical drive (gravitational operation), set the operation input mode to 2-wire input mode. If 3-wire input mode is selected, the moving part may drop when stopping the motor.

### ■ Timing chart in the 2-wire input mode



### ■ Timing chart in the 3-wire input mode



\* If the rotation direction is changed during operation, the rotation direction will be changed after instantaneous stop.



## 10.4 Analog setting/digital setting

Analog setting is a method to set the rotation speed or acceleration/deceleration time using the internal potentiometers of the driver or external potentiometer. Digital setting is a method to set them using a data setter **OPX-2A**.

When selecting the mode No. using the parameter mode of the **OPX-2A**, functions assigned to the driver potentiometers can be changed, and also the setting method of operation data can be switched between analog setting and digital setting.

See a combination of the mode No. and analog setting/digital setting as shown below. Others except the following combination are not available to set.

To use this function conveniently, assign the function which value may change frequently to VR1 and VR2, while assign the function which value may fix to VR3.

Mode No.	Operation data No.	VR1	VR2	VR3	External potentiometer	Digital setting
Mode 0 (initial setting)	0	Operating speed	Acceleration/ deceleration time	Torque limiting value	-	-
	1	-	Acceleration/ deceleration time	Torque limiting value	Operating speed	-
	2 to 7	-	-	-	-	Operating speed Acceleration time Deceleration time Torque limiting value
Mode 1	0 to 7	-	-	-	-	Operating speed Acceleration time Deceleration time Torque limiting value
Mode 2	0 to 7	-	-	-	Torque limiting value	Operating speed Acceleration time Deceleration time
Mode 3	0	Acceleration time	Deceleration time	Operating speed	-	Torque limiting value
	1	Acceleration time	Deceleration time	-	Operating speed	Torque limiting value
	2 to 7	-	-	-	-	Operating speed Acceleration time Deceleration time Torque limiting value
Mode 4	0	Operating speed	Torque limiting value	Acceleration/ deceleration time	-	-
	1	-	Torque limiting value	Acceleration/ deceleration time	Operating speed	-
	2 to 7	-	-	-	-	Operating speed Acceleration time Deceleration time Torque limiting value
Mode 5	0	Torque limiting value	Acceleration/ deceleration time	Operating speed	-	-
	1	Torque limiting value	Acceleration/ deceleration time	-	Operating speed	-
	2 to 7	-	-	-	-	Operating speed Acceleration time Deceleration time Torque limiting value

**Note**

The factory setting of the torque limiting potentiometer (VR3) is set to the maximum value. When selecting the mode No.3, No.4 or No.5, check the setting value well before operating a motor because the rotation speed and acceleration/deceleration value are set to the maximum value initially.

Setting example of each mode No. is shown below.

Mode No.	Setting example
Mode 0	When setting the operating speed and acceleration/deceleration time with analog setting
Mode 1	When setting all operation data with digital setting
Mode 2	When setting the torque limiting value using the external potentiometer and setting others with digital setting
Mode 3	When setting the acceleration/deceleration time individually using the internal potentiometers
Mode 4	When fixing the acceleration/deceleration time, and setting the operating speed and torque limiting value with analog setting
Mode 5	When setting the acceleration/deceleration time and torque limiting value using the internal potentiometers

# 11 Inspection

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It is recommended that periodic inspections be conducted for the items listed below after each operation of the motor. If an abnormal condition is noted, discontinue any use and contact your nearest office.

## ■ During inspection

- The motor/gearhead mounting screws are not loose.
- Check for any unusual noises in the motor's bearings (ball bearings) or other moving parts.
- The bearing (ball bearing) and gear meshing parts of the gearhead are not generating noise.
- The motor/gearhead output shaft is not misaligned with the load shaft.
- Are there any scratches, signs of stress or loose driver connections in the cable?
- The openings in the driver are not blocked.
- The driver mounting screws and power connection terminal screws are not loose.
- Are there any strange smells or appearances within the driver?

### Note

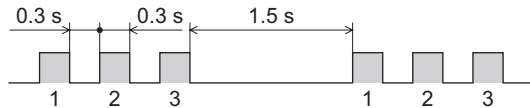
- Conduct the insulation resistance measurement or withstand voltage test separately on the motor and the driver. Conducting the insulation resistance measurement or withstand voltage test with the motor and driver connected may result in injury or damage to equipment.
- The driver uses semiconductor elements, so be extremely careful when handling them. Static electricity may damage the driver.

# 12 Protective function

When an alarm generates and the driver's protective function is actuated, the ALARM-OUT output will turn OFF. In the case of a standard type, the motor stops naturally and once the motor has stopped, the motor output shaft becomes free. In the case of an electromagnetic brake type, on the other hand, the motor stops instantaneously, upon which the electromagnetic brake actuates and holds the shaft in position.

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

**Blinking pattern example: Sensor error (number of blinks: 3)**



To reset an alarm, be sure to remove the cause of the alarm and then perform one of the following operations:

- Turn the ALARM-RESET input ON for at least 10 ms. (Refer to p.24 for details.)
- Cycle the main power.

If a control power is used, also cycle the control power.

**Note**

- Alarms cannot be reset if the FWD input or REV input is ON. Be sure to stop the motor before resetting any alarm.
- Alarms caused by damage to the motor or driver itself cannot be reset using the method explained above. Please contact your nearest office.
- Make sure the ALARM-RESET input remains ON for at least 10 ms. If the ON period is too short, the alarm may not be reset.
- The undervoltage alarm is released automatically when the driver main power supply voltage exceeds the undervoltage detection level. If the FWD input or REV input remains ON status, the motor will rotate concurrently with releasing the alarm.
- If an external stop alarm generates, the motor stops instantaneously.

## ■ Alarm list

No. of ALARM LED blinks	Alarm type	Cause	Remedial action	Reset using the ALARM-RESET input
2	Overload	A load exceeding the rated torque was applied to the motor for 5 seconds or more.	<ul style="list-style-type: none"> <li>Decrease the load.</li> <li>Review the operation pattern such as acceleration/deceleration time.</li> </ul>	Possible
3	Sensor error	The motor sensor signal line experienced an open circuit during operation, or the motor signal connector came off.	Check the connection between the driver and motor.	
	Initial sensor error	The motor sensor signal line broke or motor signal connector came off before the main power supply was turned on.		
4	Overvoltage	<ul style="list-style-type: none"> <li>The main power supply voltage exceeded the overvoltage detection level. [Detection level] <b>BLV620</b>: approx. 40 VDC <b>BLV640</b>: approx. 72 VDC</li> <li>Sudden starting/stopping of a large inertia load was performed.</li> </ul>	<ul style="list-style-type: none"> <li>Check the main power supply voltage.</li> <li>If this alarm occurs during operation, reduce the load or increase the acceleration time or deceleration time.</li> <li>When generating the alarm in acceleration, set the speed response to low-response. (p.32)</li> <li>When generating the alarm at stopping the motor, set the STOP-MODE to instantaneous stop.</li> </ul>	
5	Undervoltage	The main power supply voltage dropped the undervoltage detection level. [Detection level] <b>BLV620</b> : approx. 10 VDC <b>BLV640</b> : approx. 20 VDC	<ul style="list-style-type: none"> <li>Check the main power supply voltage.</li> <li>Check the wiring of the power supply cable.</li> </ul>	
6	Overspeed	The rotating speed of the motor output shaft exceeded approx. 4800 r/min.	<ul style="list-style-type: none"> <li>Decrease the load.</li> <li>Review the operation pattern such as acceleration/deceleration time.</li> </ul>	
7	Overcurrent	Excessive current has flown through the driver due to ground fault, etc.	Check the wiring between the driver and motor for damage, and cycle the power.	Not possible
8	EEPROM error	<ul style="list-style-type: none"> <li>Stored data was damaged.</li> <li>Data became no longer writable or readable.</li> </ul>	Initialize the parameters using the <b>OPX-2A</b> , and cycle the power.	
9	Main circuit overheat	The temperature inside the driver exceeded the main circuit overheat level.	Review the ventilation condition in the enclosure.	
10	External stop*1	The EXT-ERROR input turned OFF.	Check the EXT-ERROR input.	Possible
11	Initial operation error*2	The main power supply was cycled when the FWD input or REV input was ON.	Turn the FWD input and REV input OFF, and then cycle the main power supply.	
12	Communication switch setting error	The communication function switch (SW2-No.4) was turned ON.	Turning the communication function switch (SW2-No.4) OFF and then cycle the power. When using RS-485 communication function, refer to the <u>USER MANUAL RS-485 Communication Mode</u> .	Not possible
14	Main circuit output error*3	The motor drive wire broke or motor power connector came off.	Check the connection between the driver and motor.	Possible

\*1 Only when EXT-ERROR is assigned using the **OPX-2A**.

\*2 This alarm generates when the "Initial operation error" function has been enabled using the **OPX-2A**.

\*3 This alarm does not generate when the torque limiting value is set to less than 200% .

### Note

Cycle the power to reset the overcurrent and EEPROM error alarms. If the unit does not operate properly after the power is cycled, internal circuit damage is suspected. Please contact your nearest office.

# 13 Troubleshooting and remedial actions

During motor operation, the motor or driver may fail to function properly due to an improper speed setting or wiring. When the motor cannot be operated correctly, refer to the contents provided in this section and take appropriate action. If the problem persists, contact your nearest office.

Phenomenon	Possible cause	Remedial action
The motor does not operate.	Connection error in the power supply.	Check the connections between the driver and power supply.
	Both the FWD input and REV input are OFF.	Turn either FWD input or REV input ON.
	Both the FWD input and REV input are ON.	Turn either FWD input or REV input ON.
	The internal potentiometer is not adjusted.	The factory setting is 0 r/min. Turn the internal potentiometer clockwise.
	The potentiometer is not selected correctly.	Turn the M0 input OFF when using the internal potentiometer. Turn the M0 input ON when using the external potentiometer.
	The external potentiometer or external DC voltage is not connected correctly.	Check the connection of the external potentiometer or external DC voltage.
	The ALARM LED (red) is blinking.	An alarm generated due to a protective function being triggered. Refer to p.44 to reset the alarm.
The motor rotates in the direction opposite to the specified direction.	The FWD input and REV input are connected wrongly or otherwise not connected correctly.	Check the connection of the FWD input and REV input. The motor turns in the clockwise direction when the FWD input is ON, and in the counterclockwise direction when the REV input is ON.
	The combination type parallel shaft gearhead is using a gear with a gear ratio of 30 or 50.	When the gear ratio of the combination type parallel shaft gearhead is 30 or 50, the rotating direction of the gear output shaft is opposite of the motor output shaft. Accordingly, reverse the FWD input and REV input operations.
	A combination type hollow shaft flat gearhead is used.	<ul style="list-style-type: none"> <li>With a combination type hollow shaft flat gearhead, the rotating direction of the gear output shaft is opposite of the motor output shaft. Accordingly, reverse the FWD input and REV input operations.</li> <li>Is the gearhead viewed in the correct direction? 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.</li> </ul>
<ul style="list-style-type: none"> <li>Motor operation is unstable.</li> <li>Motor vibration is too great.</li> </ul>	The motor (gearhead) output shaft is not misaligned with the load shaft.	Check the coupling condition of the motor (gearhead) output shaft and 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: <ul style="list-style-type: none"> <li>· Move the unit farther away from noise generation sources.</li> <li>· Review the wiring.</li> <li>· Change the signal cables to a shielded type.</li> <li>· Install ferrite cores.</li> </ul>
The motor doesn't stop instantaneously.	The STOP-MODE input is ON.	To cause the motor to stop instantaneously, turn the STOP-MODE input OFF.
	The inertial load is large.	Reduce the load inertia.
The electromagnetic brake does not hold the load in position.	The MB-FREE input is turned ON.	Turn the MB-FREE input OFF.

# 14 Accessories (Sold separately)

## ■ Digital speed indicator

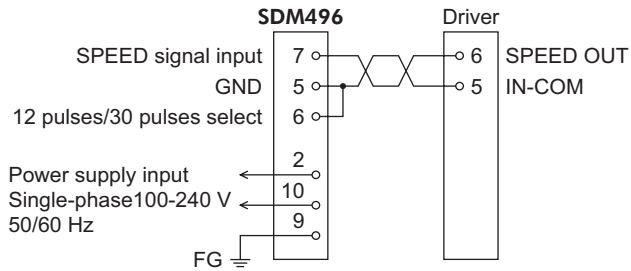
This device displays the speed of the motor output shaft and reduced speed of the gearhead output shaft.

Model: **SDM496**

### Note

- The **SDM496** is not certified under safety standards. If the **SDM496** is combined with a **BLV** Series unit, the **BLV** Series unit does not conform to safety standards, either.
- The **SDM496** cannot be used with the source logic.

- Basic connection (30 pulse/rotation)



## ■ Data setter

This data setter can be used to set or monitor operation data and parameters.

Model: **OPX-2A**

## ■ DIN rail mounting plate

When mounting the driver to a DIN rail, use a DIN rail mounting plate.  
Use a DIN rail 35 mm (1.38 in.) wide.

Model: **PADP03**

## ■ External potentiometer

The motor speed can be set externally.

Model: **PAVR-20KZ**

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