

Brushless Motor and Driver Package

FBL II Series 

The **FBL II** series consists of a high performance, compact, brushless DC motor and driver. This product is available with 75W and 120W output power.

For easy installation, the motor and gearhead come pre-assembled.



■ Features

- The high power, compact brushless DC motor and driver allow the user to easily downsize applications.
- In addition to offering a wide speed control range from 300r/min to 3000r/min, the motor generates constant torque across the entire speed range.
- The driver is provided with an acceleration/deceleration function which makes it possible to start and stop the motor smoothly.
- Geared types use specially designed high-strength **GFB** gearheads that provide maximum permissible torques 30N·m.
- Excellent speed fluctuation characteristics of -1% maximum with load, $\pm 1\%$ maximum with voltage, and $\pm 1\%$ maximum with temperature.
- The distance between the motor and the driver can be extended up to 10.5m by using an optional extension cable.

■ Safety Standards and CE Marking

	Standards	Certification Body	Standards File No.	CE Marking
Motor	UL1004	UL	E62327	Low Voltage Directive EMC Directive
	CSA C22.2 No. 100			
	EN60950	DEMKO	Certificate No. 124888	
	EN60034-1 EN60034-5	Conform to EN Standards		
Driver	UL508C	UL	E171462	
	CSA C22.2 No.14			
	EN60950	Conform to EN Standards		
	EN50178	Conform to EN Standards		

Note: Recognized name and certified name of each safety standards are motor model name and driver name.

- For installation conditions for EN/IEC standards, refer to page D-2.

● Installation Conditions

- Overvoltage category II
- Pollution degree 2
- Class I equipment

● Applicable Standards

EMI

Emission Tests	EN50081-2
Radiated Emission Test	EN55011
Conducted Emission Test	EN55011

EMS

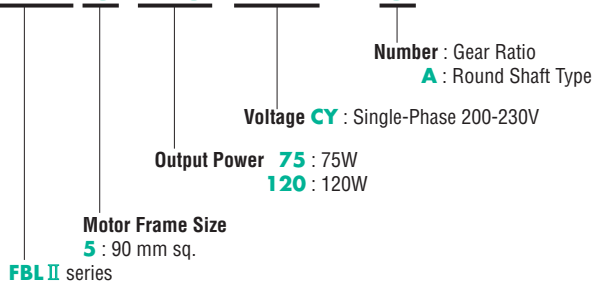
Immunity Tests	EN61000-6-2
Radiation Field Immunity Test	IEC61000-4-3
Electrostatic Discharge Immunity Test	IEC61000-4-2
Fast Transient/Burst Immunity Test	IEC61000-4-4
Conductive Noise Immunity Test	IEC61000-4-6
Power Frequency Magnetic Field Immunity Test	IEC61000-4-8
Surge Immunity Test	IEC61000-4-5
Voltage Dip Immunity Test	IEC61000-4-11
Voltage Interruption Immunity Test	IEC61000-4-11

EMC

For compliance with the EMC directive, the product must be verified in the final use conditions, it located in the enclosure. Please refer to your nearest Oriental Motor office if EMC information is required.

■ Product Number Code

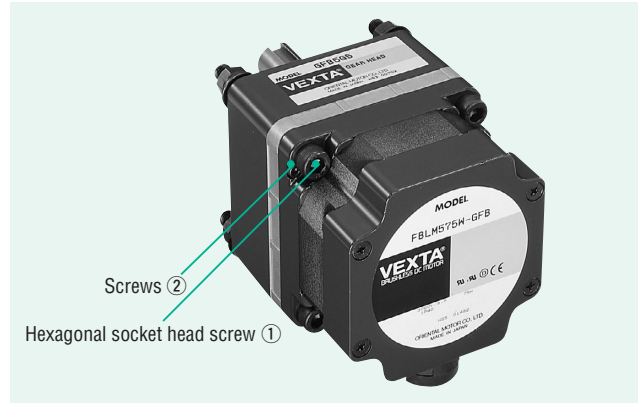
FBL 5 75 C Y - 5



* Approved product names under all safety standards will refer to motor units and driver units.

Combination type

The combination type comes with the motor and its dedicated gearhead already assembled. This simplifies installation in equipment. Motors and gearheads are also available separately so they can be on hand to make changes or repairs.



Install the motor and gear combination using the four hexagonal socket head screws ①.
To replace the gearhead, remove the two small screws ②.

Product Lines

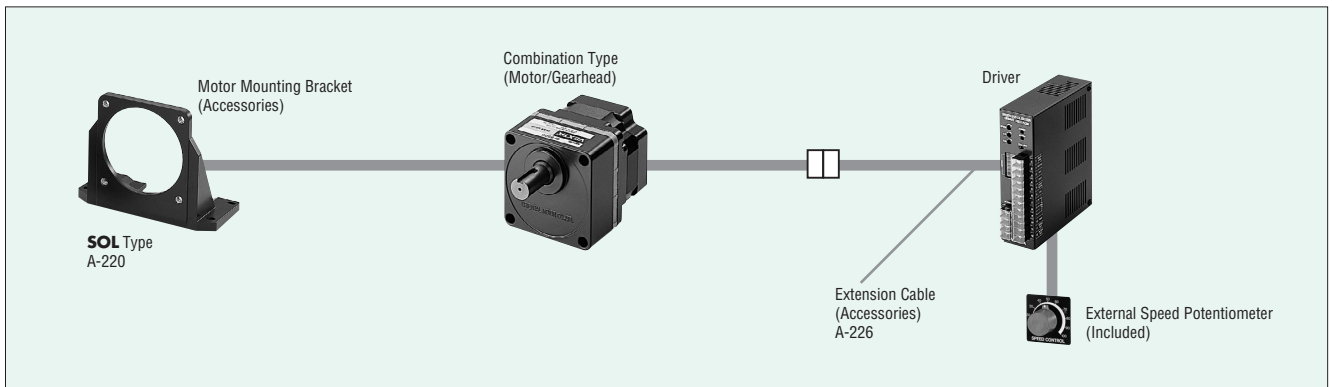
Combination Type

Voltage	Output Power	Model
Single-Phase 200-230V	75W	FBL575CY-5,10,15,20
		FBL575CY-30,50,100
		FBL575CY-200
	120W	FBL5120CY-5,10,15,20
		FBL5120CY-30,50,100
		FBL5120CY-200

Round Shaft Type

Voltage	Output Power	Model
Single-Phase 200-230V	75W	FBL575CY-A
	120W	FBL5120CY-A

Construction



List of Motor and Driver Combinations

Model numbers for motor/driver combinations are shown below.

Combination Type

Output Power	Model	Motor Model	Gearhead Model	Driver Model
75W	FBL575CY-□	FBLM575W-GFB	GFB5G□	FBLD75CY
120W	FBL5120CY-□	FBLM5120W-GFB	GFB5G□	FBLD120CY

Enter the gear ratio in the box (□) within the model number.

Round Shaft Type

Output Power	Model	Motor Model	Driver Model
75W	FBL575CY-A	FBLM575W-A	FBLD75CY
120W	FBL5120CY-A	FBLM5120W-A	FBLD120CY

Specifications

Output Power		75W	120W
Model	Combination Type	FBL575CY-□	FBL5120CY-□
	Round Shaft Type	FBL575CY-A	FBL5120CY-A
Rated Speed	r/min	3000	
Rated Torque	N·m	0.25	0.4
Starting Torque	N·m	0.32	0.5
Variable Speed Range	r/min	300~3000	
Permissible Inertial Load *1	$J \times 10^{-4} \text{kg} \cdot \text{m}^2$	3.75	5.6
Acceleration/Deceleration Time		0.5~15 s (at 3000 r/min)	
Speed Regulation	Load	-1% max. (0~rated torque, at 3000 r/min)	
	Voltage	$\pm 1\%$ max. (Power supply voltage $\pm 10\%$, at 3000 r/min with no load)	
	Temperature	$\pm 1\%$ max. (0°C~+50°C, at 3000 r/min with no load)	
Input Power	Voltage	Single-Phase 200-230V $\pm 10\%$	Single-Phase 200-230V $\pm 10\%$
	Frequency	50/60Hz	
	Maximum Input Current	2.0A	2.7A
Input Power for Signals		DC24V $\pm 10\%$, 50mA min.	
Motor Insulation Class		Class E (120°C) *3	
Speed Control Method		1. By built-in potentiometer 2. By external potentiometer (20 k Ω , 1/4W) 3. By DC voltage (0~5V DC)	
Input Signal		Photocoupler Input Input Impedance 4.8 k Ω , DC24V $\pm 10\%$ EXT. VR., CW, CCW, SLOW DOWN	
Output Signal		PNP transistor Output(Source type) External Use Condition DC26.4V max. 10mA max. SPEED OUT, ALARM OUT	
Protection Functions *2		<p>When the following are activated, the alarm signal will be output and the motor will come to a stop:</p> <ul style="list-style-type: none"> ●Overload Protection : This will be activated within approximately 5 seconds of the motor load exceeding rated torque. ●Overheat Protection : This will be activated when internal temperature of driver exceeds 90°C. ●Overvoltage Protection : This will be activated when driving a load exceeding the permissible load inertia, or when motor speed is increased due to gravitational forces. ●Under Voltage Protection : This will be activated when a input voltage to the driver is less than specifications voltage. ●Out-of-phase Protection : This will be activated when the sensor wire inside the motor cable is disconnected during operation. 	
Rating		Continuous	

*1: The permissible Inertial load specified above is only applicable for the Round shaft type.

*2: With the **FBL II** series, motor speed cannot be controlled in applications where the motor's shaft is turned by the load, as in lowering operations. Also, to prevent damage to the driver during lowering operations, the motor comes to a natural stop if the primary voltage of the driver's inverter exceeds the permissible value.

*3: Motor insulation is recognized as class A (105°C) by UL and CSA standards.

General Specifications

Item		Motor	Driver
Insulation Resistance		100M Ω or more when 500V DC is applied between the windings and the frame.	100M Ω or more when 500V DC is applied between the P.E. terminal (I/O terminals) and the power supply terminals.
Dielectric Strength		Sufficient to withstand 1.5kV at 50Hz applied between the windings and the frame for 1 minute.	Sufficient to withstand 1.8kV (3kV)AC at 50Hz applied between the P.E. terminal (I/O terminal) and the power supply input terminal for 1 minute.
Operating Environmental Conditions	Ambient Temperature	0°C~+50°C, nonfreezing	0°C~+50°C, nonfreezing
	Ambient Humidity	85% max. noncondensing	
	Atmosphere	No corrosive gases or dust	
Degree of Protection		IP40	IP10

Combination Type — Torque Table

Unit= N·m

Gear Ratio		5	10	15	20	30	50	100	200
Model	Speed Range r/min	60~600	30~300	20~200	15~150	10~100	6~60	3~30	1.5~15
FBL575CY-□		1.1	2.3	3.4	4.5	6.5	11	22	30
FBL5120CY-□		1.8	3.6	5.4	7.2	10	17	30	30

● Enter the gear ratio in the box (□) within the model number. A colored background indicates gear shaft rotation in the same direction as the motor shaft; a white background indicates rotation in the opposite direction.

Permissible Overhung Load · Permissible Thrust Load

Unit= N

Model	Gear Ratio	5	10	15	20	30	50	100	200
FBL575CY-□ FBL5120CY-□	Permissible Thrust Load	150							
	Permissible Overhung Load (10mm from shaft end)	300		400				500	
	Permissible Overhung Load (20mm from shaft end)	400		500				650	

Enter the gear ratio in the box (□) within the model number.

Permissible Inertial Load (J)

Unit= $\times 10^{-4} \text{kg}\cdot\text{m}^2$

Model	Gear Ratio	5	10	15	20	30	50	100	200
FBL575CY-□ FBL5120CY-□		25	100	225	400	900	2500	2500	2500

Enter the gear ratio in the box (□) within the model number.

Torque—Speed Characteristics

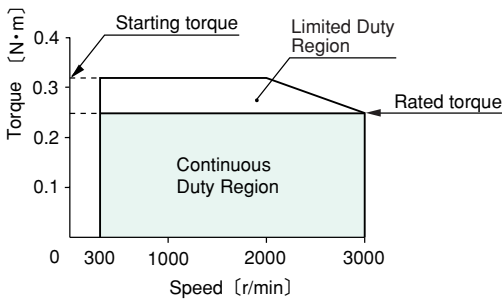
Continuous Duty Region

Continuous operation is possible in this region.

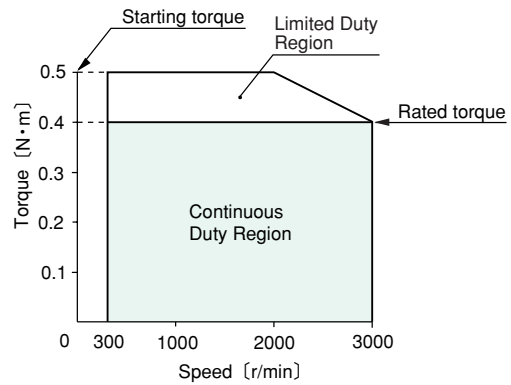
Limited Duty Region

This region is used primarily when accelerating. When a load that exceeds the rated torque is applied continuously for approximately 5 seconds, overload protection is activated and the motor comes to a stop.

FBL575CY-□/FBL575CY-A



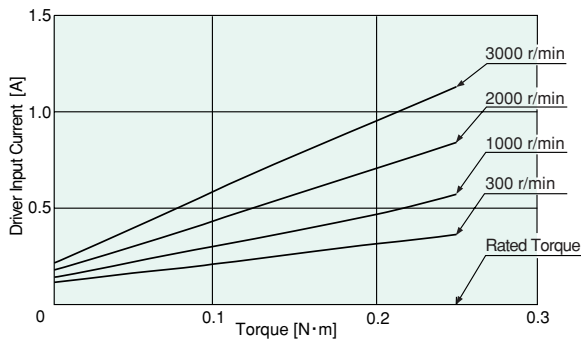
FBL5120CY-□/ FBL5120CY-A



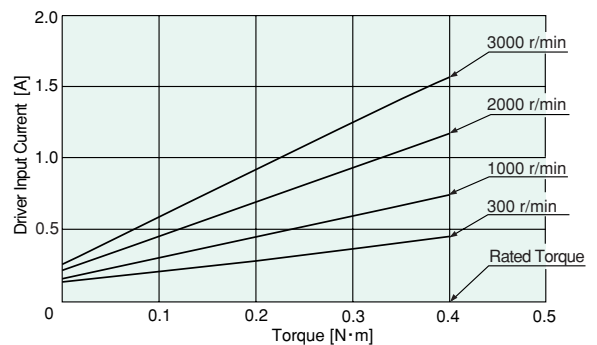
Load Torque—Driver Input Current Characteristics

Driver input current of the FBL II Series motor varies with the load torque. Load torque is roughly proportional to driver input current. These characteristic may be used to estimate load torque from the driver input current. It holds only when the motor is rotating at a steady speed. Starting and bi-directional motions require greater current input, so the relationship does not apply under these operations.

FBL575CY-□



FBL5120CY-□



Operation of FBL II Series

Driver Functions

Built-in Potentiometer	
Display	Function
SPEED	Speed Potentiometer
SS	Timing Potentiometer for Acceleration
SD	Timing Potentiometer for Deceleration

Input/Output Signal Terminals		
Display	Signal	Function and Operation
① 24V $\overline{\text{IN}}$	I/O Power Supply DC24V \ominus	Connect the minus wire of an I/O power supply DC24V.
② EXT. VR	Speed Potentiometer Selection Input	Input signal for selecting built-in or external speed potentiometer. (DC power supply)
③ CW	CW Rotation Input	Input signal for selecting CW rotation/stop.
④ CCW	CCW Rotation Input	Input signal for selecting CCW rotation/stop.
⑤ SLOW DOWN	Deceleration Input	Input terminal for decelerating the motor to a stop.
⑥ N.C.	—	Not used.
⑦ H ⑧ M ⑨ L	Speed Control Input	Used when controlling the speed by the external potentiometer or DC voltage without use of the built-in potentiometer.
⑩ 24V $\text{IN} \oplus$	I/O Power Supply DC24V \oplus	Connect the plus wire of an I/O power supply DC24V.
⑪ SPEED OUT	Speed Signal Output (PNP transistor Output-Source type)	Used when monitoring the rate of rotation; 12 pulses are output for each motor rotation.
⑫ ALARM OUT	Alarm Signal Output (PNP transistor Output-Source type)	This signal is output when the protection functions are activated. The ALARM LED lights and the motor comes to a stop. To reset, cut the power for 1 minute, then turn motor on again. This signal is normally ON (high level) and turns OFF (low level) if any abnormality occurs.

BRUSHLESS DC MOTOR DRIVER FBLD120CY

SPEED POWER
 S.S. ALARM
 S.D.

MOTOR terminals: 1-12

I/O terminals: 1-12

AC200-230V~
 L N N.C. FG

VEXTA

Driver Front panel

LED Display		
Display	Function	Lighting Condition
POWER	Power Indicator	Lights when the power is ON.
ALARM	Alarm Indicator	<ul style="list-style-type: none"> When a load exceeding the rated torque is applied to the motor for 5 seconds or more. When the driver's internal temperature exceeds approximately 90°C. When the motor is driving an inertial load exceeding the permissible inertial load, or when the motor shaft is turned by the load (during lowering operation). When an input voltage to the driver is less than specified voltage. When there is an abnormality in the motor's feedback signals due to disconnection of the motor cable, etc.

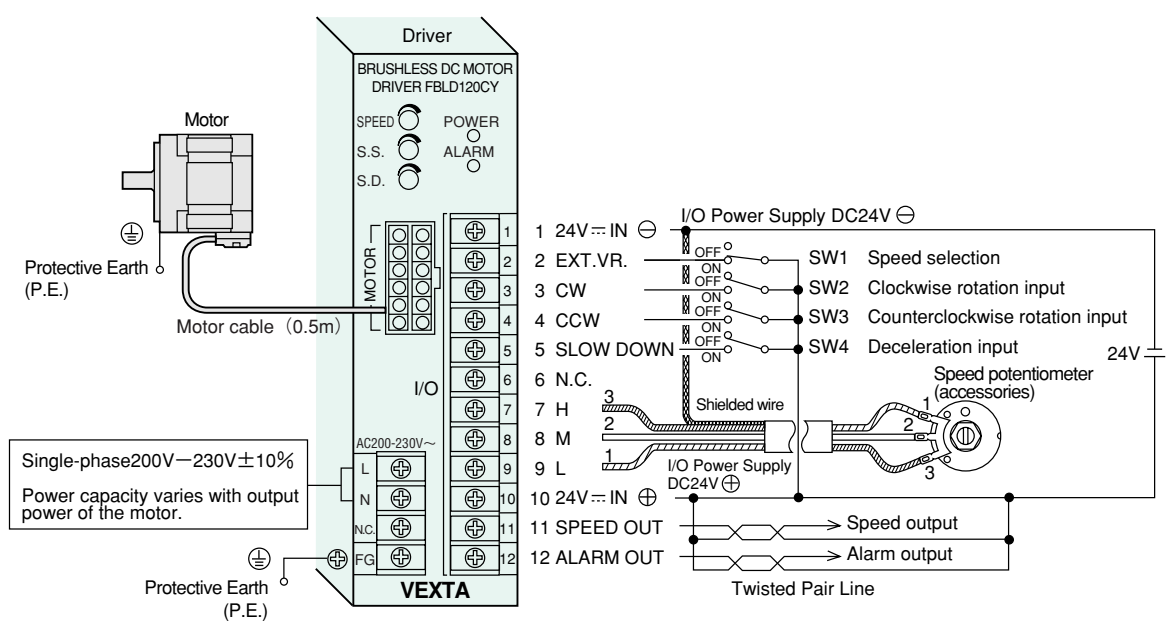
For Motor Connector	
Terminal 1	Terminal 2
Terminal 3	Terminal 4
Terminal 5	Terminal 6
Terminal 7	Terminal 8
Terminal 9	Terminal 10
Terminal 11	Terminal 12

Power Supply Terminals	
Terminal L	Terminal N
Terminal N.C.	Terminal FG

Frame Ground Terminal	
Terminal FG	Terminal FG

Protective Earthing Terminal (Screw Size : M4)	
Terminal FG	Terminal FG

Wiring Diagram



1. Motor cable should be no more than 10.5m in length. The motor is supplied with a 0.5m long connector-equipped cable which can be extended by using an optional extension cable.

Extension Cable Model Name

- CC01FBL** (1m) **CC02FBL** (2m) **CC03FBL** (3m)
- CC05FBL** (5m) **CC07FBL** (7m) **CC10FBL** (10m)

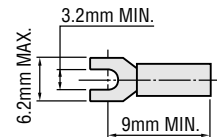
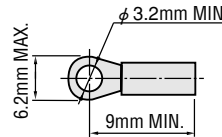
Tests using a noise simulator have confirmed that the motor will operate without error even if a noise of 500V, 1μs is applied to the motor lead wires. However, protection against external noise is recommended.

2. Signal wires and motor cable should be kept away from equipment, power cables and other sources of magnetic noise.

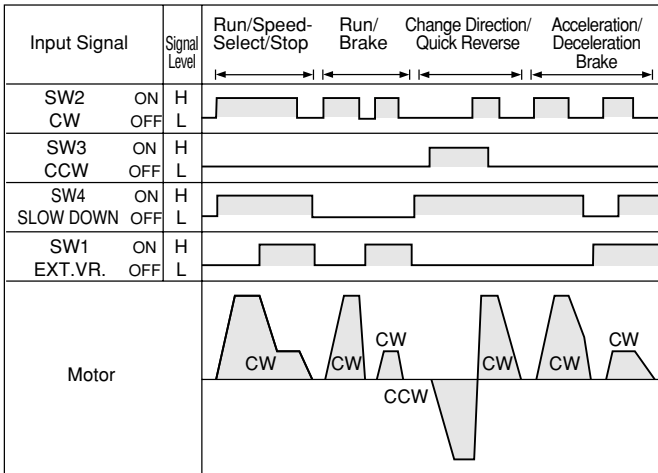
● **Suitable crimp-style terminals**

Ring type terminal with insulation

U type terminal with insulation



■ **Signal Input Timing Chart**



The switch numbers shown in the timing chart (e.g. SW2) correspond to SW1-4 in the wiring diagram on page A-97.

● All operations of run, stop, direction change, deceleration and instantaneous stop can be controlled by the input signals of CW, CCW and SLOW DOWN.

● If the CW input is set to "H" level, the motor rotates in a clockwise direction as viewed from the shaft end of the motor; if the CW input is set to "L" level, the motor stops. If the CCW input is set to "H" level, the motor rotates in the counterclockwise direction as viewed from the shaft end of the motor; if the CCW input is set to "L" level, the motor stops. If both of the CW and CCW input are set to "H" level, the motor rotates in the clockwise direction.

The acceleration time is set by the built-in acceleration potentiometer (S.S.).

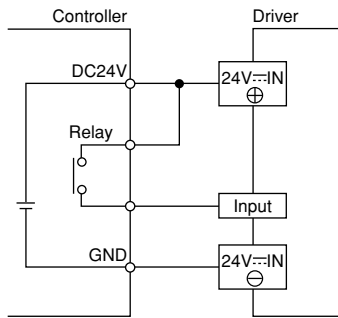
● If the SLOW DOWN input is set to "H" level, the deceleration time is the value set by the built-in deceleration potentiometer (S.D.); if this input is set to "L" level, the motor stops instantaneously.

● If the EXT. VR. input is set to "H" level, the external speed potentiometer or external DC voltage can be selected; if this input is set to "L" level, the built-in speed potentiometer is selected.

● **Precautions for Operation**

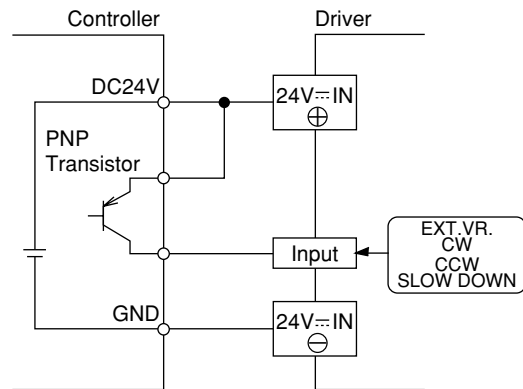
- Pay attention to the temperature rise of the motor when used in applications requiring short cycles or bi-directional operation.
- Operate the motor so that the temperature of the motor case remains below 90°C and the temperature of the driver remains below 80°C. If the temperature of the heat radiating plate in the driver exceeds 90°C, the overheat protection is activated and make the motor stop.
- FBL II** series motors cannot be used for lowering the load or other operations in which the load exerts a rotational force on the motor shaft, since this causes the inverter's primary voltage in the driver to exceed permissible levels, damaging the driver.

● **Controlled by Small Capacity Relays**



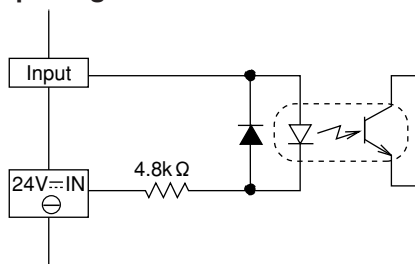
Use a small capacity contact point type relay capable of switching DC24V, 0.5 mA.

● **Controlled by Transistor type PLC**



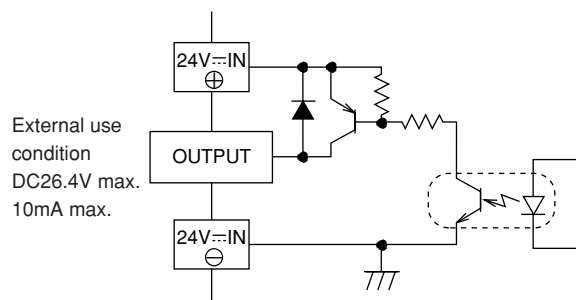
■ **Input/Output Signal Circuit**

● **Input Signal Circuit**



External use condition DC24V ± 10% 5mA max. per one circuit.

● **Output Signal Circuit**



External use condition
DC26.4V max.
10mA max.

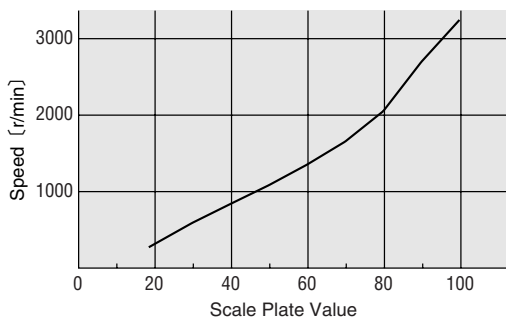
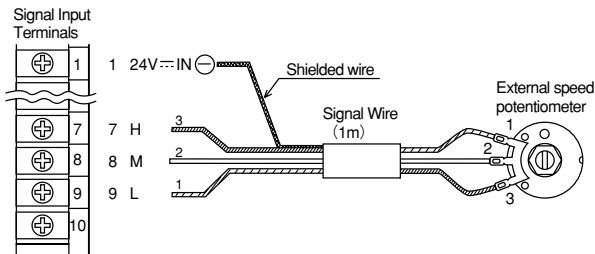
Speed Control

Speed Control by Built-in Potentiometer

Motor speed is adjusted by using a built-in potentiometer located on the front panel. The built-in potentiometer is selected when EXT. VR. input has been set to OFF ("L" level).

Speed Control by External Potentiometer

To control the speed of the motor, separate from the driver, connect the external potentiometer provided with the motor as follows. The EXT. VR. input should be set to ON ("H" level).

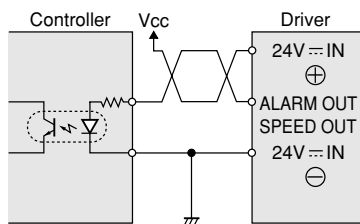


External Potentiometer Scale—Speed Characteristics (Representative Values)

Precautions for Connection

Signal wires provided with the products should be used. (ϕ 3.3mm×1m) The shielded wire of the signal line should be connected to the 24V \ominus IN terminal. Also ensure that the shielded wire does not come into contact with other terminals on the external potentiometer or DC voltage source.

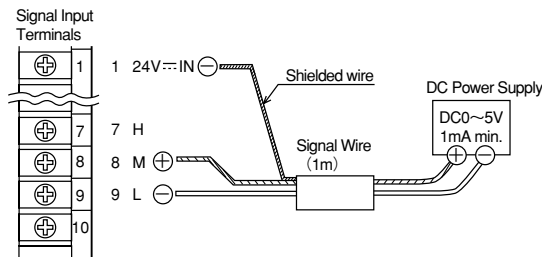
Connection of Output Signals



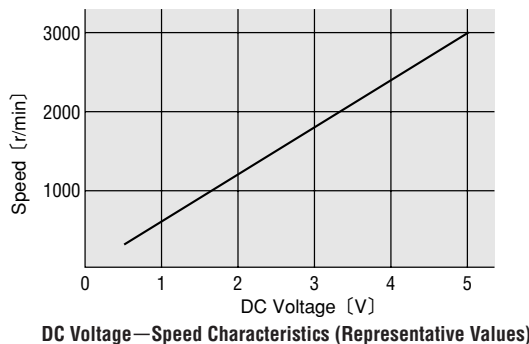
At 26.4V or less, a current of 10mA or less can be switched on and off at Vcc.

Speed Control by External DC Voltage

To control the speed of the motor by DC voltage, connect the DC power supply as follows. The EXT. VR. input should be set to ON ("H" level).



Do not allow the voltage to exceed 5V, and be sure there are no errors in polarity when making the connections.



DC Voltage—Speed Characteristics (Representative Values)

Speed Signal Output:

It is output at a rate of 12 pulses per motor rotation.

$$\text{Motor speed} = \frac{\text{Speed output cycle rate [Hz]} \times 60 [\text{r/min}]}{12}$$

Alarm Signal Output:

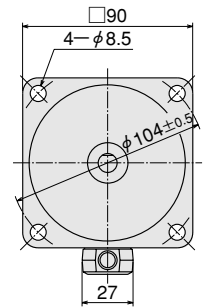
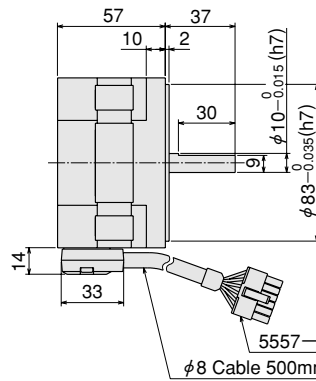
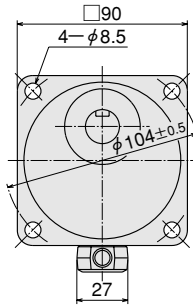
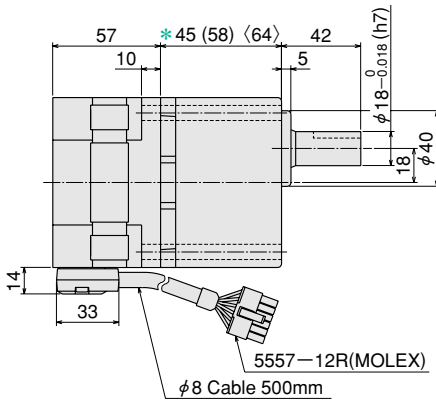
This signal is output when the protection function for overload, overheat, overvoltage, under voltage or out-of-phase has been activated.

This signal is normally ON (low level) and turn OFF (high level) if any abnormality occurs.

Dimensions (Scale 1/4, Unit=mm)

FBL575CY-□ (Combination Type) Mass: 3.0 kg
 Motor: FBLM575W-GFB
 Gearhead: GFB5G□

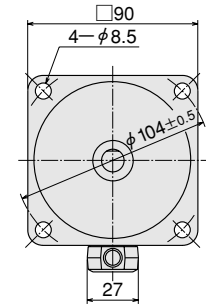
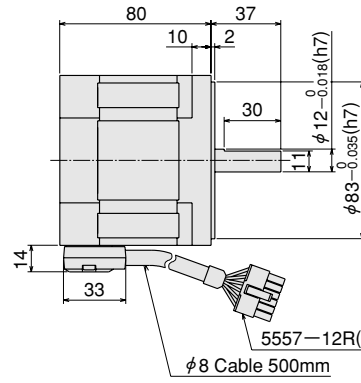
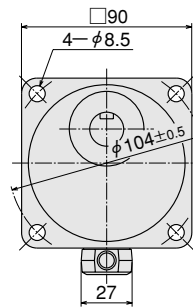
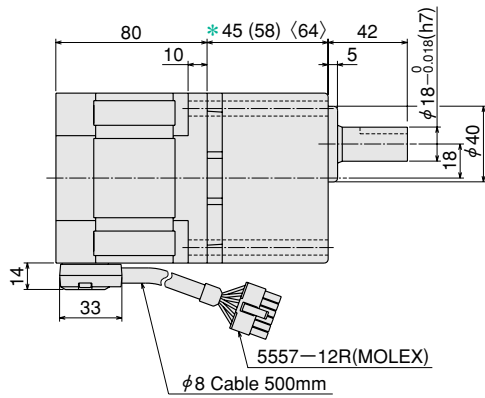
FBL575CY-A (Round Shaft Type) Mass: 1.5 kg
 Motor: FBLM575W-A



* for GFB5G5~GFB5G20
 () for GFB5G30~GFB5G100
 < > for GFB5G200

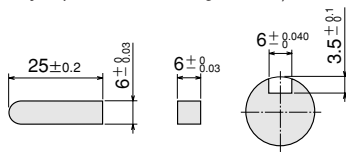
FBL5120CY-□ (Combination Type) Mass: 4.0 kg
 Motor: FBLM5120W-GFB
 Gearhead: GFB5G□

FBL5120CY-A (Round Shaft Type) Mass: 2.5 kg
 Motor: FBLM5120W-A

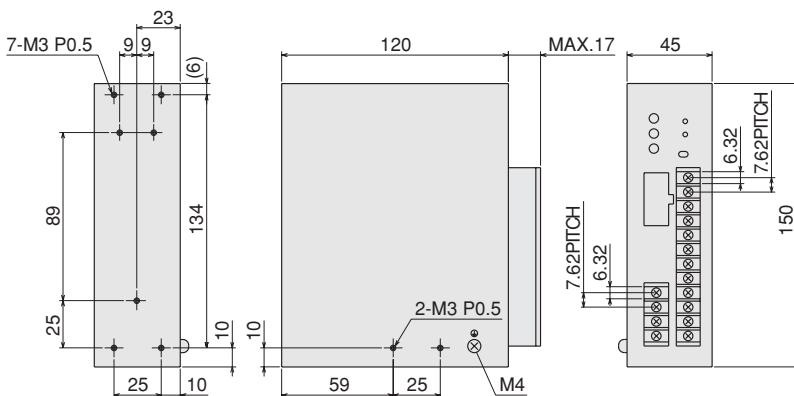


* for GFB5G5~GFB5G20
 () for GFB5G30~GFB5G100
 < > for GFB5G200

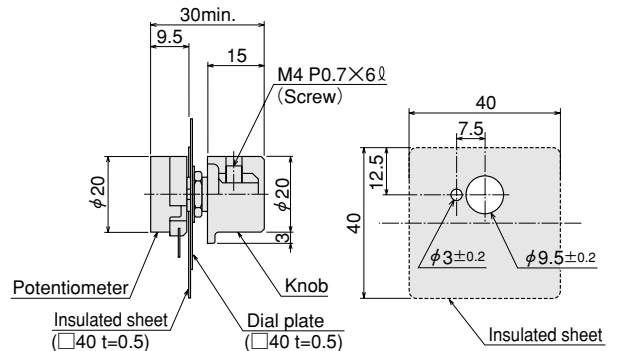
● **Key and Key Slot** (Scale 1/2)
 (The key is provided with the gearhead.)



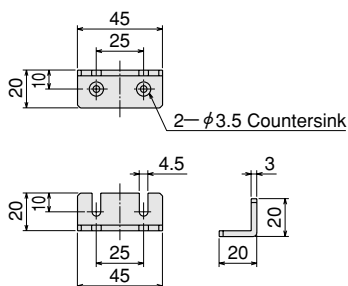
● **Driver**
 FBLD75CY
 FBLD120CY
 Mass: 0.8kg



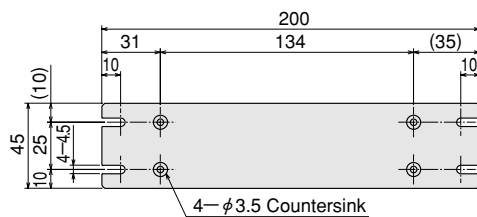
● **External Potentiometer** (included)



● **Driver Mounting Tab** (1 set of 2 pieces included)



● **Driver Mounting Tab** (1 piece included)



■ **Accessories (Sold separately)**

● **Motor Mounting Brackets**

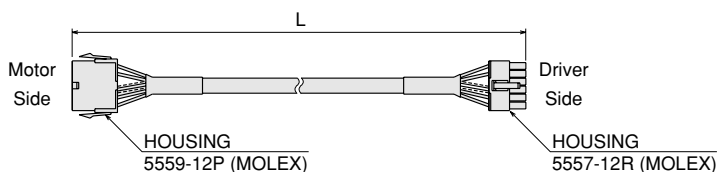
Optional die-cast aluminum mounting brackets are available. They can be used to install combination types and round shaft types. Refer to page A-220 for further detail.

Model: **SOL5M8**



● **Extension Cable**

The motor comes equipped with a 0.5m long cable which can be extended by using an optional extension cable up to 10.5m.



Cable Model	Length m
CC01FBL	1
CC02FBL	2
CC03FBL	3
CC05FBL	5
CC10FBL	10

● Not a standard certified product.

● **DIN Rail Mounting Plate**

This mounting plate is convenient for installing the speed control pack and driver on DIN rails with ease. Refer to page A-227 for further detail.

Model: **PADP01**

