

**RoHS** RoHS-Compliant

Brushless DC Motor and Driver Package

## BLH Series

24 VDC Input 15W / 30W / 50W / 100W

The Brushless DC Motor and Driver Package **BLH** Series is a 24 VDC Power supply input type, offering a wide speed range of 100 to 3000 r/min. The series consists of various models offering four motor output power of 15 to 100 W. You can choose from a wide variety that meets your specific application.



# BLH Series: 24 VDC Input, Speed-Control

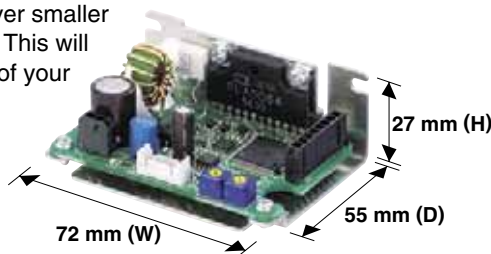
The **BLH** Series combines a slim, high-power brushless DC motor with a compact, needs. Choose from a wide variety offering different outputs of 15 to 100 W to meet The **BLH** Series is also available with a long-life, high-strength gearhead.



## Compact Board-Type Driver

The models with an output of 15 to 50 W adopt a compact, board-type driver smaller than the size of a business card. This will certainly help to reduce the size of your equipment.

The 100 W driver has dimensions of 71 mm (D) × 131 mm (W) × 37.5 mm (H)



### Full Range of Driver Functions

The compact driver is packed with a full range of functions.

- Instantaneous stop
- Speed control via potentiometer
- Speed control by DC voltage
- Acceleration/deceleration time setting
- Alarm output

## Wide Variety

The series offers a wide range of models from compact packages with a motor output of 15 W, to larger ones producing a high output of 100 W. Choose one that best suits your specific requirements.

## Long Life Gearhead Rating of 10000 Hours\*

The high-strength gearhead is designed to withstand high-speed revolutions. The rated life of the gearhead is 10000 hours, which is twice as long as that of a conventional gearhead.

\*5000 hours for gearhead equipped with 15 W geared motor.

## Features of Brushless DC Motor

### Excellent Speed Stability

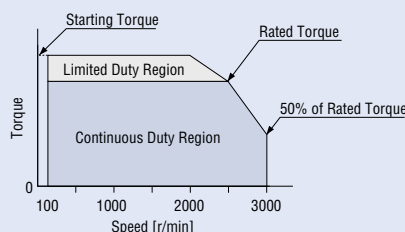
The driver adjusts the current flow to the motor by comparing the feedback signal of motor speed against the set speed, in order to stabilize the motor speed. This mechanism ensures stable driving speeds from low to high, even in situations where the load condition fluctuates.

With the **BLH** Series, the speed regulation is  $\pm 0.5\%$ .

### Wide Speed Control Range

In addition to feedback control, the **BLH** Series adopts a unique motor structure design to realize a wide speed variation range.

The motor in the **BLH** Series can be operated at varying speeds of 100 to 3000 r/min (speed ratio 1:30).



### Energy-Saving

The brushless DC motor has a permanent magnet assembled into the rotor, so it produces low secondary loss. The **BLH** will contribute to the energy-saving operation of your equipment.

## Motor

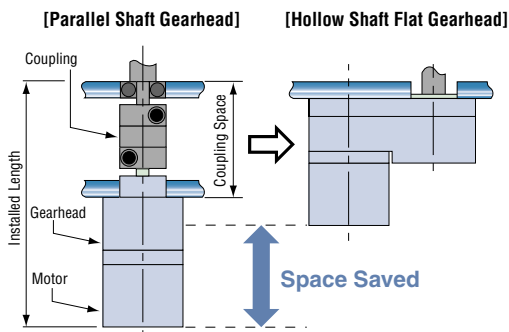
board-type driver to meet your space-saving your specific application.



### Features of Hollow Shaft Flat Gearhead

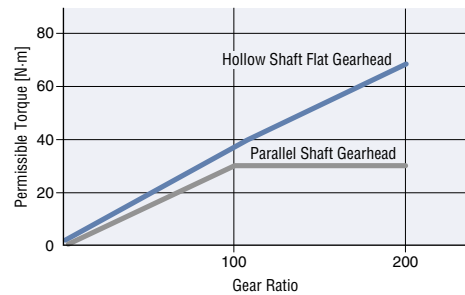
#### Space-Saving and Low-Cost

The output shaft can be coupled directly to your drive shaft without using a coupling. The flexible installation modes, such as installation on either the front or rear face or by using the center shaft, allows you to reduce the size and installation space of your equipment. Since no shaft-coupling parts are needed, the parts cost and assembly man-hours will also decrease.



#### High Permissible Torque

While the parallel shaft gearhead lets the permissible torque saturate at high gear ratios, the hollow shaft flat gearhead enables the motor torque to be utilized maximally.



### Lineup

● 15 W

● 30 W

● 50 W

● 100 W



Output	15 W	30 W	50 W	100 W
Frame Size	□42 mm	□60 mm	□80 mm	□90 mm
Power Supply Voltage	24 VDC			
Type	Parallel Shaft Gearhead	●	●	●
	Hollow Shaft Flat Gearhead		●	●
	Round Shaft	●	●	●

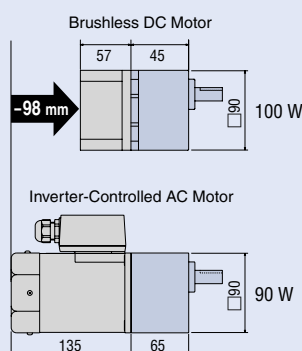
●The □90 mm parallel shaft gearhead has a tapped hole at the shaft tip.

#### Main Specifications

Speed Control Range: 100 to 3000 r/min (1:30)  
Speed Regulation: ±0.5%

#### Slim, Yet Powerful

A permanent magnet is assembled into the rotor, so the brushless DC motor can produce high power from its slim body. The compact unit fits perfectly in your small equipment.



#### RoHS RoHS-Compliant

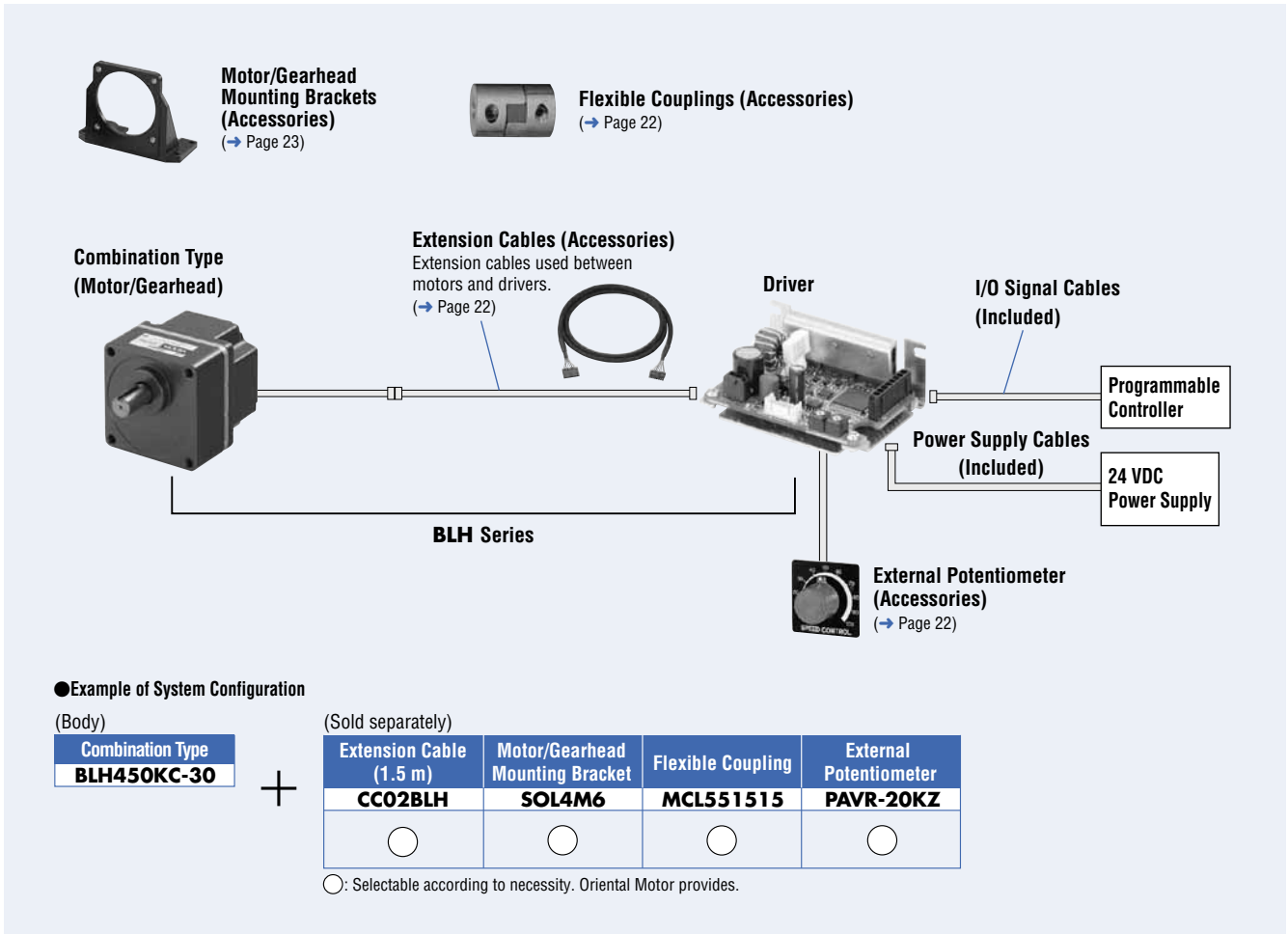
The BLH Series conforms to the RoHS Directive that prohibits the use of six chemical substances including lead and cadmium.

#### RoHS (Restriction of Hazardous Substances) Directive:

Directive on restriction of the use of certain hazardous substances in electrical and electronic equipment (2002/95/EC). The RoHS Directive prohibits the use of six chemical substances in electrical and electronic products sold in the E.U. member countries on or after July 1, 2006. The six controlled substances are: lead, hexavalent chromium, cadmium, mercury and two specific brominated flame-retardants (PBB and PBDE).

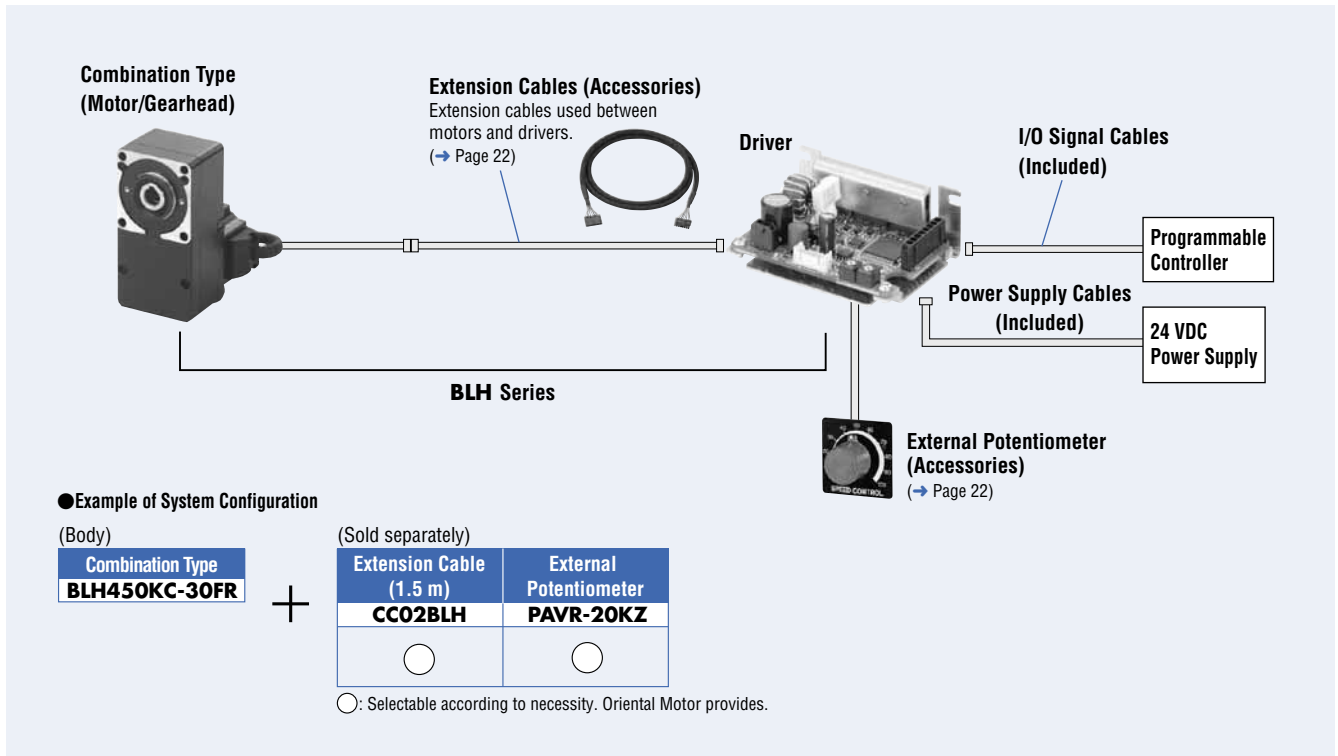
# System Configuration

## Geared Type/Combination Type – Parallel Shaft Gearhead/Round Shaft Type



\*The system configuration shown above is an example. Other combinations are available.

## ● Combination Type – Hollow Shaft Flat Gearhead



\*The system configuration shown above is an example. Other combinations are available.

## ■ Safety Standards and CE Marking

	Standards	Certification Body	Standards File No.	CE Marking
Motor	UL 60950-1	UL	E208200	EMC Directives
	CSA C22.2 No.60950-1			
Driver	UL 60950-1	UL	E208200	
	CSA C22.2 No.60950-1			

● When the system is approved under various safety standards, the model names on the motor and driver nameplates are the approved model names.

**List of Motor and Driver Combinations** → Page 21

● The EMC value changes according to the wiring and layout. Therefore, the final EMC level must be checked with the motor/driver incorporated in the user's equipment.

## Product Number Code

# LH 2 30 K C - 5 FR

①    ②    ③    ④    ⑤    ⑥    ⑦

①	Series	<b>BLH: BLH Series</b>
②	Motor Frame Size	<b>0:</b> 42 mm <b>2:</b> 60 mm <b>4:</b> 80 mm <b>5:</b> 90 mm
③	Output Power (W)	(Example) <b>30:</b> 30 W
④	Power Supply Voltage	<b>K:</b> 24 VDC
⑤		<b>C:</b> Cable Type
⑥	Gear Ratio/Shaft Type	Number: Gear ratio for combination types: 8 types from <b>5</b> to <b>200</b> Gear ratio for geared types: 7 types from <b>5</b> to <b>100</b> <b>A:</b> Round Shaft Type <b>GFS:</b> <b>GFS</b> Type Pinion Shaft
⑦		Blank: Combination Type–Parallel Shaft Gearhead <b>FR:</b> Combination Type–Hollow Shaft Flat Gearhead

## Product Line

<b>Combination Type</b>	The combination type comes with the motor and its dedicated gearhead already pre-assembled, which simplifies installation in equipment. Motors and gearheads are also available separately to facilitate changes or repairs.
<b>Geared Type</b>	The geared type has an integrated motor and gearhead. The combination of motor and gearhead cannot be changed.

### Geared Type/Combination Type–Parallel Shaft Gearhead

Type	Output Power	Package Model	Gear Ratio
Geared Type	15 W	<b>BLH015K-□</b>	<b>5, 10, 15, 20, 30, 50, 100</b>
Combination Type	30 W	<b>BLH230KC-□</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	50 W	<b>BLH450KC-□</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	100 W	<b>BLH5100KC-□</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>

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

### Round Shaft Type

Output Power	Package Model
15 W	<b>BLH015K-A</b>
30 W	<b>BLH230KC-A</b>
50 W	<b>BLH450KC-A</b>
100 W	<b>BLH5100KC-A</b>

### Pinion Shaft Type

(Gearheads are sold separately)

Output Power	Package Model
30 W	<b>BLH230KC-GFS</b>
50 W	<b>BLH450KC-GFS</b>
100 W	<b>BLH5100KC-GFS</b>

### Gearhead

#### ◇ Parallel Shaft Gearhead

Output Power of Applicable Motor (Pinion Shaft Type)	Gearhead Model	Gear Ratio
30 W	<b>GFS2G-□</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
50 W	<b>GFS4G-□</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
100 W	<b>GFS5G-□</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>

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

### Combination Type–Hollow Shaft Flat Gearhead

Output Power	Package Model	Gear Ratio
30 W	<b>BLH230KC-□FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
50 W	<b>BLH450KC-□FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
100 W	<b>BLH5100KC-□FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>

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

#### ◇ Hollow Shaft Flat Gearhead

Output Power of Applicable Motor (Pinion Shaft Type)	Gearhead Model	Gear Ratio
30 W	<b>GFS2G-□FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
50 W	<b>GFS4G-□FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
100 W	<b>GFS5G-□FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>

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

## Specifications

15 W, 30 W, 50 W, 100 W (RoHS)



Package Model	Geared Type/Combination Type—Parallel Shaft Gearhead		BLH015K-□	BLH230KC-□	BLH450KC-□	BLH5100KC-□
	Combination Type—Hollow Shaft Flat Gearhead		—	BLH230KC-□FR	BLH450KC-□FR	BLH5100KC-□FR
	Round Shaft Type		BLH015K-A	BLH230KC-A	BLH450KC-A	BLH5100KC-A
Rated Output Power (Continuous)	W		15	30	50	100
Power Source	Rated Voltage		24 VDC ±10%			
	Rated Input Current	A	1.0	2.1	3.1	6.0
	Maximum Input Current	A	2.4	3.7	5.4	9.8
Rated Torque	N·m		0.05	0.12	0.2	0.4
Starting Torque*	N·m		0.075	0.15	0.24	0.5
Rated Speed	r/min		3000	2500		
Variable Speed Range	r/min		100~3000			
Round Shaft Type Permissible Load Inertia J	×10 <sup>-4</sup> kg·m <sup>2</sup>		0.5	1.8	3.3	5.6
Rotor Inertia J	×10 <sup>-4</sup> kg·m <sup>2</sup>		0.032	0.086	0.234	0.611
Speed Regulation	Load	±0.5% max. (0~Rated torque, at rated speed, at rated voltage, at normal ambient temperature)				
	Voltage	±0.5% max. (Rated voltage ±10%, at rated speed, with no load, at normal ambient temperature)				
	Temperature	±0.5% max. (0°C~+50°C, at rated speed, with no load, at rated voltage)				

\*The time during which the starting torque is effective is no more than 5 seconds and at 2000 r/min or below.

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

● The values in the specifications are for the motor only.

## Common Specifications

Item	Specifications
Speed Setting Method	Select one of the following methods: <ul style="list-style-type: none"> <li>Set using the internal potentiometer</li> <li>Set using an optional external potentiometer: <b>PAVR-20KZ</b> (20 kΩ, 1/4 W)</li> <li>Set using external DC voltage: 0~5 VDC, 1 mA or more (Input impedance 47 kΩ)</li> </ul>
Acceleration/Deceleration Time	0.5~10 sec. <b>BLH015</b> : at 3000 r/min with no load <b>BLH230, BLH450, BLH5100</b> : at 2500 r/min with no load (The actual speed may change by load condition.) A common value is set using the acceleration/deceleration time potentiometer.
Multi-Speed Setting Method	Switching between 2 speeds One speed is set by the internal potentiometer (1 pc), while another speed is set by an external potentiometer (optional <b>PAVR-20KZ</b> ) or by external DC voltage (0~5 VDC).
Input Signal	C-MOS Negative Logic Input Operated by internal power supply Common to Start/Stop Input, Run/Brake Input, Direction of Rotation Input, Speed Control Method Input and Alarm Reset Input
Output Signal	Open Collector Output External Use Condition 26.4 VDC, 10 mA max. Common to Alarm Output and Speed Output
Protection Functions*	When the following are activated, the ALARM output will be OFF and the motor will come to a stop. The alarm LED on the driver will blink for the corresponding number of times shown in ( ). <ul style="list-style-type: none"> <li>Overload Protection (2): Activated when the motor load exceeds rated torque for a minimum of 5 seconds.</li> <li>Motor Sensor Error (3): Activated when the sensor wire inside the motor cable is disconnected during motor operation.</li> <li>Overvoltage Protection (4): Activated when the voltage applied to the driver exceeds 24 VDC by a minimum of 15%, a gravitational operation was performed or a load exceeding the allowable load inertia was driven.</li> <li>Undervoltage Protection (5): Activated when the voltage applied to the driver falls below 24 VDC by a minimum of 25%.</li> <li>Overspeed Protection (6): Activated when the motor speed exceeds 3500 r/min.</li> </ul>
Maximum Extension Distance	Motor/Driver Distance: 2 m (when an optional extension cable is used)
Rating	Continuous

\*With the **BLH** Series, the motor speed cannot be controlled in a gravitational operation or other application where the motor shaft is turned by the load. When a load exceeding the allowable load inertia is driven or a gravitational operation is performed, the overvoltage protection function will actuate to cause the motor to decelerate to a stop.

## General Specifications

Item	Motor	Driver
Insulation Resistance	100 MΩ or more when 500 VDC megger is applied between the windings and the frame after continuous operation under normal ambient temperature and humidity.	100 MΩ or more when 500 VDC megger is applied between the power supply terminal and heat radiation plate after continuous operation under normal ambient temperature and humidity.
Dielectric Strength	Sufficient to withstand 0.5 kVAC at 50 Hz applied between the windings and the frame for 1 minute after continuous operation under normal ambient temperature and humidity.	Sufficient to withstand 0.5 kVAC at 50 Hz applied between the power supply terminal and heat radiation plate for 1 minute after continuous operation under normal ambient temperature and humidity.
Temperature Rise	50°C or less in the windings, and 40°C or less in the frame <sup>*1</sup> , as measured by the thermocouple method after continuous operation under normal ambient temperature and humidity.	50°C or less in the heat radiation plate, as measured by the thermocouple method after continuous operation under normal ambient temperature and humidity.
Operating Environment Condition	Ambient Temperature	0°C ~ +50°C (nonfreezing)
	Humidity	85% max. (noncondensing)
	Altitude	1000 m max.
	Atmosphere	No corrosive gases or dust. Cannot be used in a radioactive area, magnetic field, vacuum or other special environment
	Vibration	Not subject to continuous vibration or excessive impact In conformance with JIS C 60068-2-6, "Sine-Wave Vibration Test Method" Frequency Range: 10~55 Hz Pulsating Amplitude: 0.15 mm Sweep Direction: 3 directions (X, Y, Z) Number of Sweeps: 20 times
Storage Condition <sup>*2</sup>	Ambient Temperature	-25°C ~ +70°C (nonfreezing)
	Humidity	85% max. (noncondensing)
	Altitude	3000 m max.
Insulation Class	UL, CSA: Class A (105°C) EN: Class E (120°C)	—
Degree of Protection	<b>15W: IP40; 30/50/100 W: IP65<sup>*3</sup></b>	IP00

\*1 For round shaft types, please attach to the following sizes of heat radiation plate (material: aluminum) to maintain a maximum motor frame temperature of 90°C. (Except for **BLH015K-A**)  
**BLH230KC-A**: 115 mm × 115 mm, 5 mm thick **BLH450KC-A**: 135 mm × 135 mm, 5 mm thick **BLH5100KC-A**: 200 mm × 200 mm, 5 mm thick

\*2 The storage condition applies to a short period such as a period during transportation.

\*3 Excluding the round shaft type mounting surface and connectors.

### Note

● Do not measure insulation resistance or perform the dielectric strength test while the motor and driver are connected.

## Gearmotor – Torque Table for Geared Type/Combination Type

### Geared Type/Combination Type – Parallel Shaft Gearhead

Unit = N·m

Package Model	Gear Ratio	5	10	15	20	30	50	100	200
		Speed Range	100~2500 r/min	20~500	10~250	6.7~167	5~125	3.3~83	2~50
<b>BLH015K-□</b>	3000 r/min	600	300	200	150	100	60	30	15
	100~3000 r/min	0.23	0.45	0.68	0.86	1.3	2	2	—
<b>BLH230KC-□</b>	100~2500 r/min	0.54	1.1	1.6	2.2	3.1	5.2	6	6
	3000 r/min	0.27	0.54	0.81	1.1	1.5	2.6	5.2	6
<b>BLH450KC-□</b>	100~2500 r/min	0.9	1.8	2.7	3.6	5.2	8.6	16	16
	3000 r/min	0.45	0.9	1.4	1.8	2.6	4.3	8.6	16
<b>BLH5100KC-□</b>	100~2500 r/min	1.8	3.6	5.4	7.2	10.3	17.2	30	30
	3000 r/min	0.9	1.8	2.7	3.6	5.2	8.6	17.2	30

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

● A colored background indicates gear shaft rotation in the same direction as the motor shaft; a white background indicates rotation in the opposite direction.

### Combination Type – Hollow Shaft Flat Gearhead

Unit = N·m

Package Model	Gear Ratio	5	10	15	20	30	50	100	200
		Speed Range	100~2500 r/min	20~500	10~250	6.7~167	5~125	3.3~83	2~50
<b>BLH230KC-□FR</b>	3000 r/min	600	300	200	150	100	60	30	15
	100~2500 r/min	0.48	1	1.5	2	3.1	5.1	10.2	17
<b>BLH450KC-□FR</b>	3000 r/min	0.24	0.51	0.77	1	1.5	2.6	5.1	10.2
	100~2500 r/min	0.85	1.7	2.6	3.4	5.1	8.5	17	34
<b>BLH5100KC-□FR</b>	3000 r/min	0.43	0.85	1.3	1.7	2.6	4.3	8.5	17
	100~2500 r/min	1.7	3.4	5.1	6.8	10.2	17	34	68
<b>BLH5100KC-□FR</b>	3000 r/min	0.85	1.7	2.6	3.4	5.1	8.5	17	34

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

● The flat gearhead rotates in the opposite direction to the motor when viewed from the front of the gearhead. It rotates in the same direction as the motor when viewed from the rear (motor mounting surface) of the gearhead. Rotation Direction of Hollow Shaft Flat Gearhead → Page 19

## Permissible Overhung Load and Permissible Thrust Load

### Geared Type/Combination Type – Parallel Shaft Gearhead

Package Model	Gear Ratio	Permissible Overhung Load		Permissible Thrust Load N
		10 mm from shaft end N	20 mm from shaft end N	
<b>BLH015K-□</b>	<b>5, 10, 15, 20, 30, 50, 100</b>	50	—	30
<b>BLH230KC-□</b>	<b>5</b>	100	150	40
	<b>10, 15, 20</b>	150	200	
	<b>30, 50, 100, 200</b>	200	300	
<b>BLH450KC-□</b>	<b>5</b>	200	250	100
	<b>10, 15, 20</b>	300	350	
	<b>30, 50, 100, 200</b>	450	550	
<b>BLH5100KC-□</b>	<b>5</b>	300	400	150
	<b>10, 15, 20</b>	400	500	
	<b>30, 50, 100, 200</b>	500	650	

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



## ● Combination Type–Hollow Shaft Flat Gearhead

Package Model	Gear Ratio	Permissible Overhung Load		Permissible Thrust Load N
		10 mm from mounting surface of hollow shaft gearhead N	20 mm from mounting surface of hollow shaft gearhead N	
<b>BLH230KC-□FR</b>	<b>5, 10</b>	450	370	200
	<b>15, 20, 30, 50, 100, 200</b>	500	400	
<b>BLH450KC-□FR</b>	<b>5, 10</b>	800	660	400
	<b>15, 20, 30, 50, 100, 200</b>	1200	1000	
<b>BLH5100KC-□FR</b>	<b>5, 10</b>	900	770	500
	<b>15, 20</b>	1300	1110	
	<b>30, 50, 100, 200</b>	1500	1280	

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

## ● Round Shaft Type

Package Model	Permissible Overhung Load		Permissible Thrust Load
	10 mm from shaft end N	20 mm from shaft end N	
<b>BLH015K-A</b>	50	—	The permissible thrust load shall be no greater than half the motor mass.
<b>BLH230KC-A</b>	70	100	
<b>BLH450KC-A</b>	120	140	
<b>BLH5100KC-A</b>	160	170	

## ■ Permissible Load Inertia J for Geared Type/Combination Type

### ● Geared Type/Combination Type–Parallel Shaft Gearhead

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

Package Model	Gear Ratio	5	10	15	20	30	50	100	200
		<b>BLH015K-□</b>	0.4	1.7	3.9	7	15.7	43.7	43.7
<b>BLH230KC-□</b>	1.55	6.2	14	24.8	55.8	155	155	155	
<b>BLH450KC-□</b>	5.5	22	49.5	88	198	550	550	550	
<b>BLH5100KC-□</b>	25	100	225	400	900	2500	2500	2500	

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

### ● Combination Type–Hollow Shaft Flat Gearhead

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

Package Model	Gear Ratio	5	10	15	20	30	50	100	200
		<b>BLH230KC-□FR</b>	1.55	6.2	14	24.8	55.8	155	155
<b>BLH450KC-□FR</b>	5.5	22	49.5	88	198	550	550	550	
<b>BLH5100KC-□FR</b>	25	100	225	400	900	2500	2500	2500	

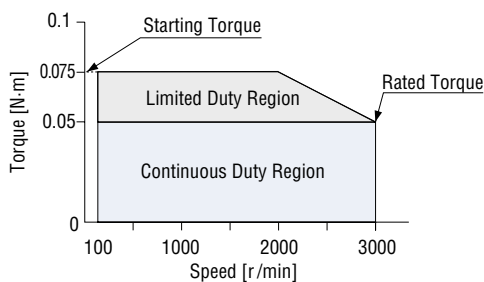
● Enter the gear ratio in the box (□) within the model name.

## ■ Speed–Torque Characteristics

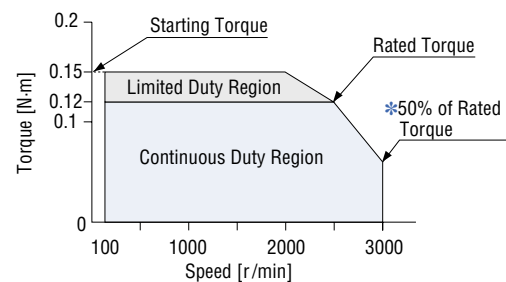
Continuous Duty Region: Continuous operation is possible in this region.

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.

### BLH015K-□/BLH015K-A

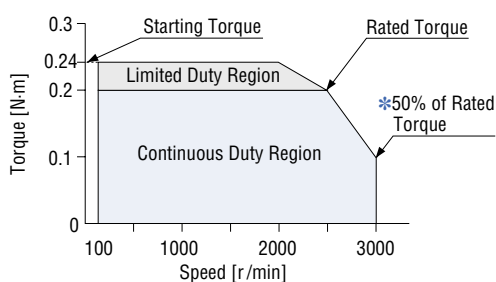


### BLH230KC-□/BLH230KC-□FR/BLH230KC-A

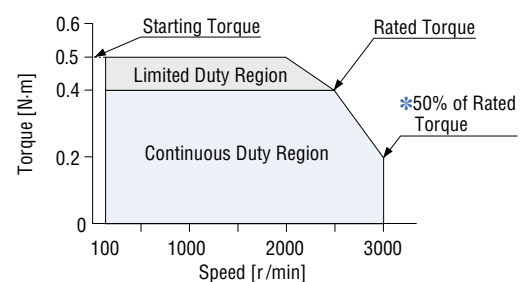


\*Value for 24 VDC with no extension cable

### BLH450KC-□/BLH450KC-□FR/BLH450KC-A



### BLH5100KC-□/BLH5100KC-□FR/BLH5100KC-A



\*Value for 24 VDC with no extension cable

\*Value for 24 VDC with no extension cable

● For geared types and combination types, the values are for the motor only.

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

## Dimensions (Unit = mm)

● Mounting screws are included with the combination type.

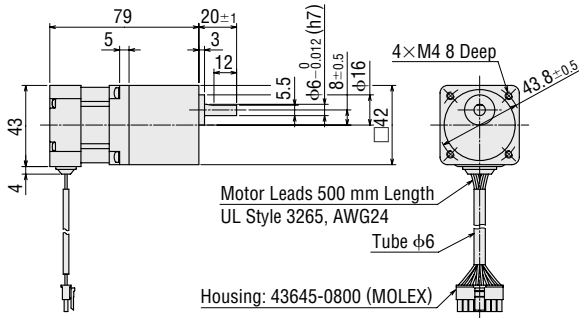
### 15 W

#### ◇ Geared Type

BLH015K-□

Geared Motor: BLHM015K-□

Mass: 0.5 kg

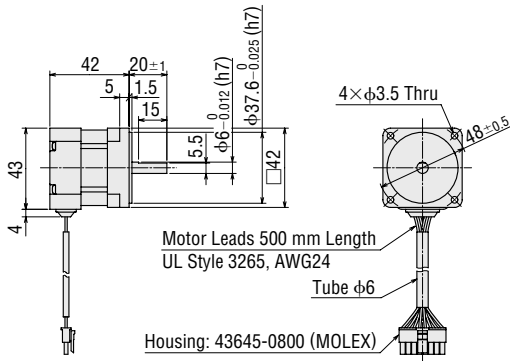


#### ◇ Round Shaft Type

BLH015K-A

Motor: BLHM015K-A

Mass: 0.25 kg

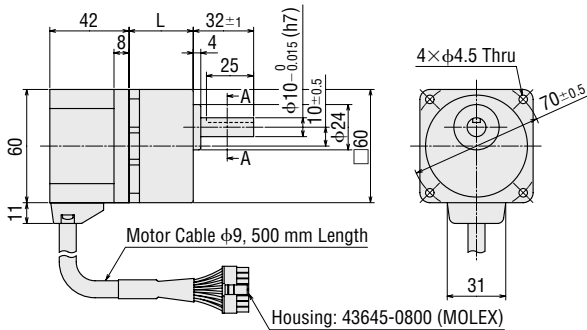


### 30 W

#### ◇ Motor/Parallel Shaft Gearhead

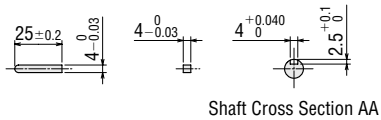
Package Model	Motor Model	Gearhead Model	Gear Ratio	L
BLH230KC-□	BLHM230KC-GFS	GFS2G-□	5~20	34
			30~100	38
			200	43

Mass: 1.0 kg (Including Gearhead)



#### ◇ Key and Key Slot

(The key is included with the gearhead)



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

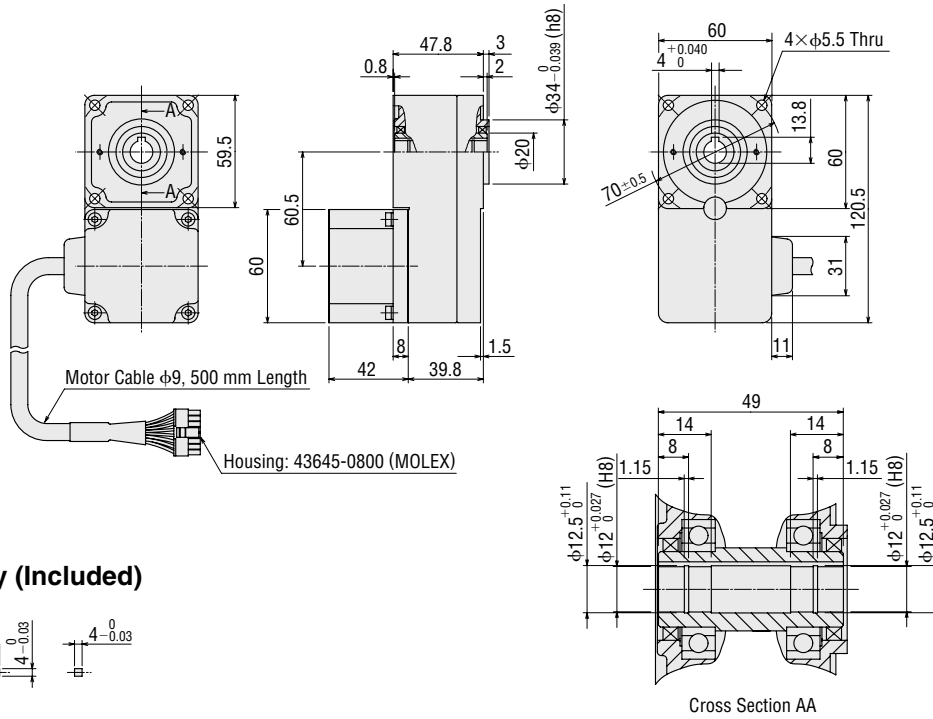
◆ **Motor/Hollow Shaft Flat Gearhead**

**BLH230KC-□FR**

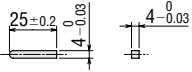
Motor: BLHM230KC-GFS

Gearhead: GFS2G□FR

Mass: 1.3 kg (Including Gearhead)



◆ **Key (Included)**

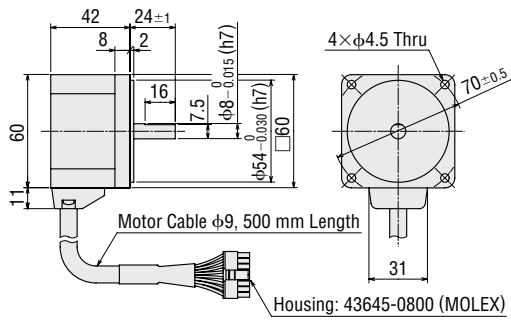


◆ **Round Shaft Type**

**BLH230KC-A**

Motor: BLHM230KC-A

Mass: 0.5 kg



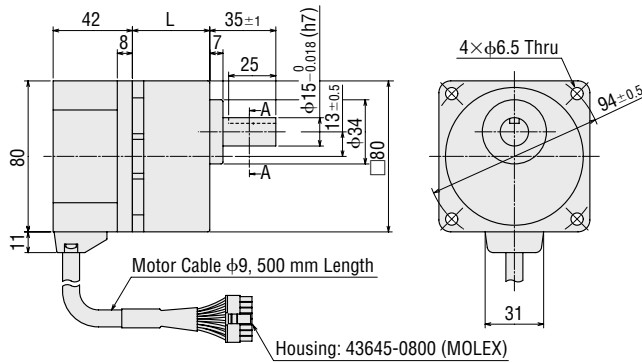
● Enter the gear ratio in the box (□) within the model name.

● 50 W

◇ Motor/Parallel Shaft Gearhead

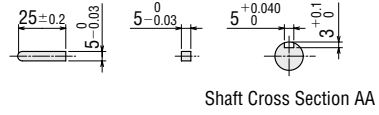
Package Model	Motor Model	Gearhead Model	Gear Ratio	L
BLH450KC-□	BLHM450KC-GFS	GFS4G□	5~20	41
			30~100	46
			200	51

Mass: 1.8 kg (Including Gearhead)



◇ Key and Key Slot

(The key is included with the gearhead)



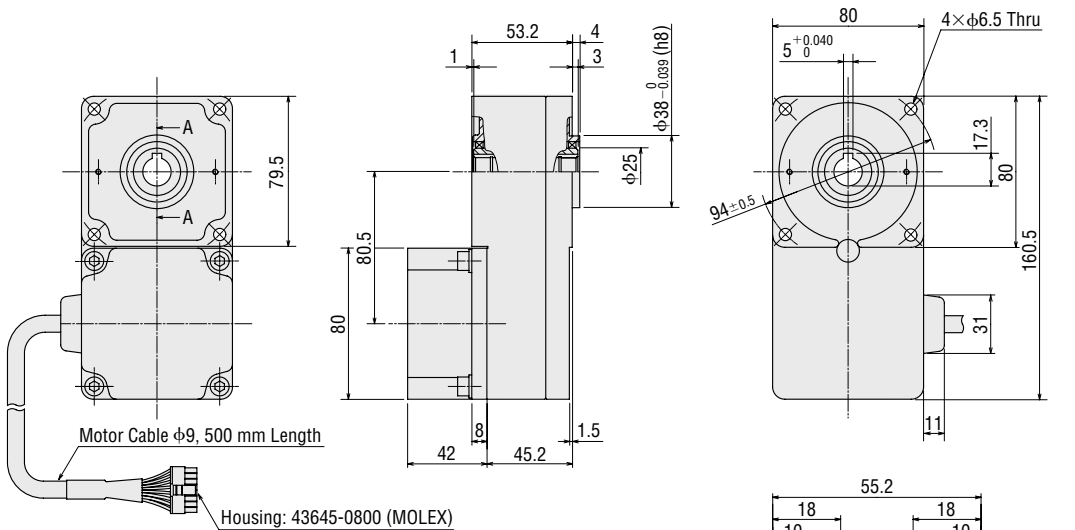
◇ Motor/Hollow Shaft Flat Gearhead

BLH450KC-□FR

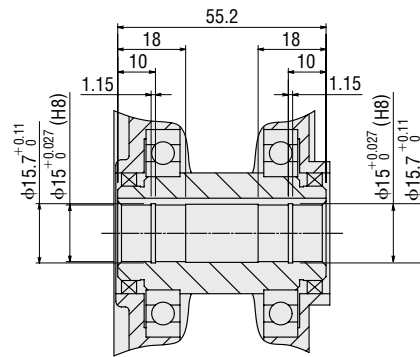
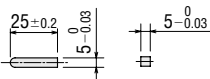
Motor: BLHM450KC-GFS

Gearhead: GFS4G□FR

Mass: 2.4 kg (Including Gearhead)



◇ Key (Included)



Cross Section AA

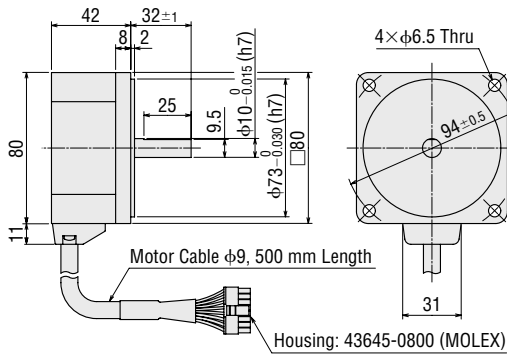
● Enter the gear ratio in the box (□) within the model name.

◆ Round Shaft Type

**BLH450KC-A**

Motor: BLHM450KC-A

Mass: 0.8 kg

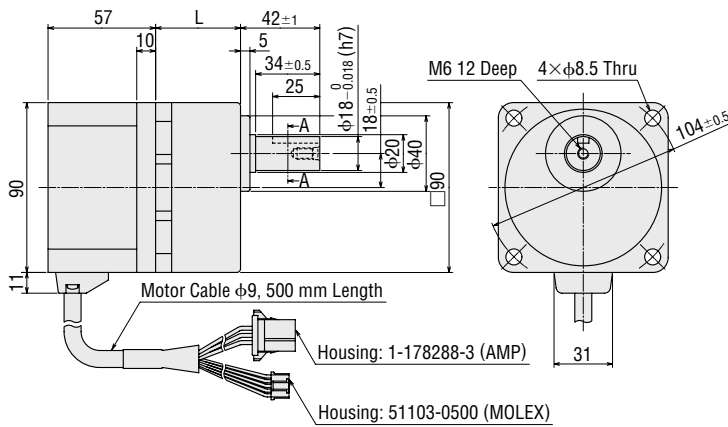


● 100 W

◆ Motor/Parallel Shaft Gearhead

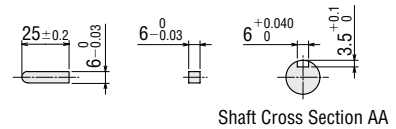
Package Model	Motor Model	Gearhead Model	Gear Ratio	L
<b>BLH5100KC-□</b>	BLHM5100KC-GFS	GFS5G□	<b>5~20</b>	45
			<b>30~100</b>	58
			<b>200</b>	64

Mass: 2.9 kg (Including Gearhead)



◆ Key and Key Slot

(The key is included with the gearhead)



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

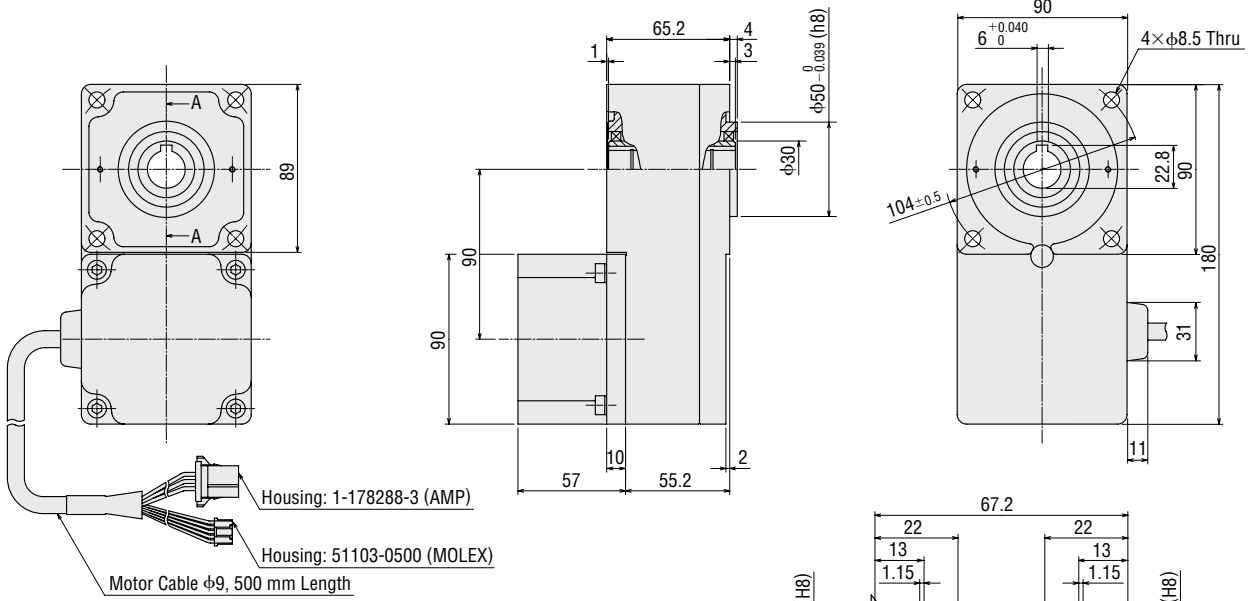
◆ **Motor/Hollow Shaft Flat Gearhead**

**BLH5100KC-□FR**

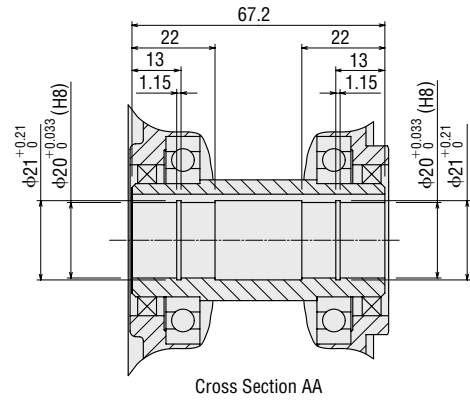
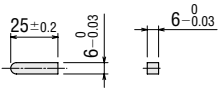
Motor: BLHM5100KC-GFS

Gearhead: GFS5G□FR

Mass: 3.6 kg (Including Gearhead)



◆ **Key (Included)**

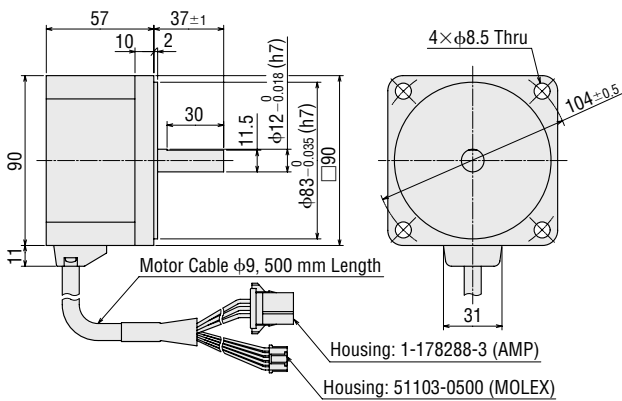


◆ **Round Shaft Type**

**BLH5100KC-A**

Motor: BLHM5100KC-A

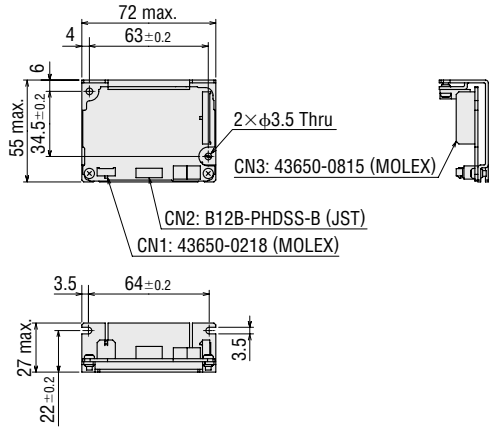
Mass: 1.4 kg



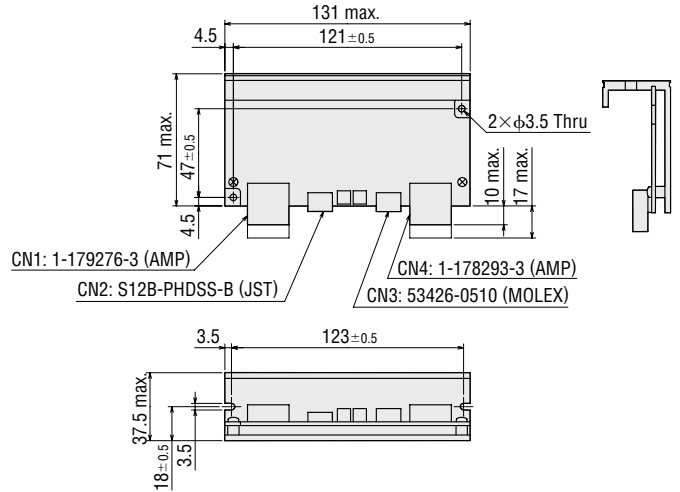
● Enter the gear ratio in the box (□) within the model name.

◇ **Driver**

BLHD15K, BLHD30K, BLHD50K  
Mass: 0.1 kg

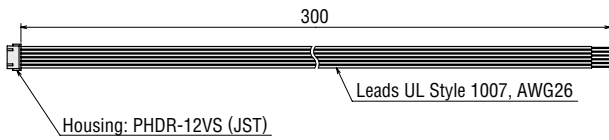


BLHD100K  
Mass: 0.3 kg



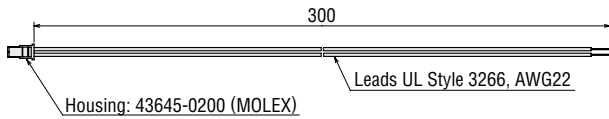
◇ **Driver Input Signal Cable (Included)**

● For 15W / 30W / 50W / 100W

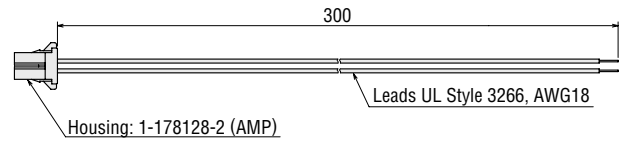


◇ **Driver Power Supply Cable (Included)**

● For 15W / 30W / 50W



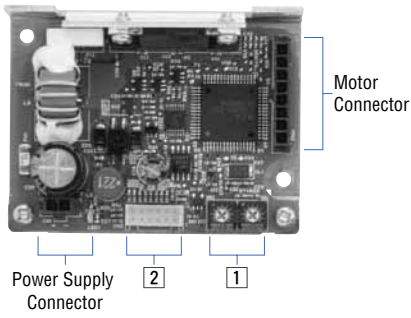
● For 100W



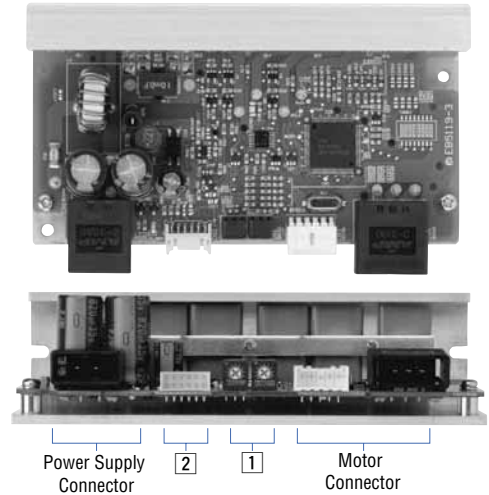
# Connection and Operation

## Names and Functions of Driver

◇15W / 30W / 50W



◇100W



### 1 Speed Potentiometers

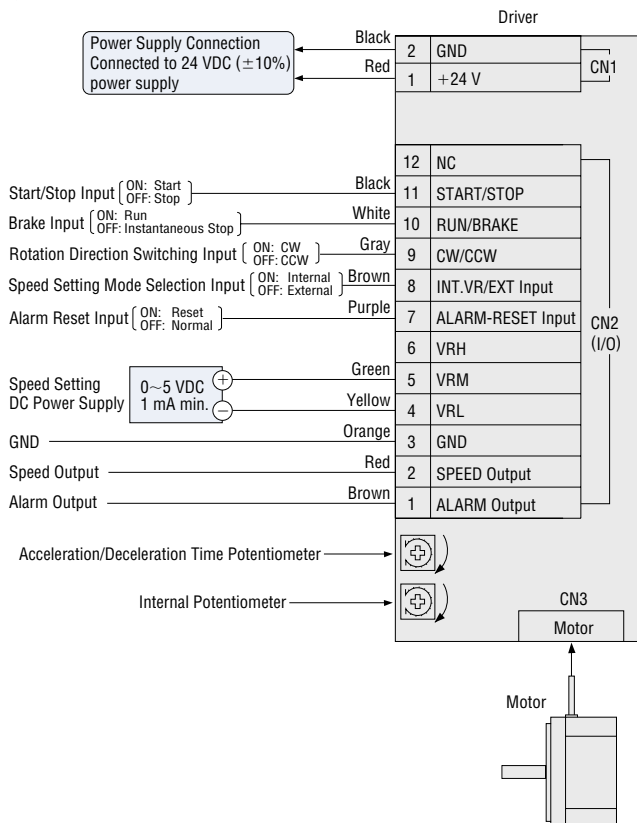
Display	Potentiometer Name	Function
VR1	Internal Potentiometer	Set and adjust the operating speed of the motor.
VR2	Acceleration/Deceleration Time Potentiometer	Set a common acceleration/deceleration time in a range of 0.5 to 10 seconds.

### 2 Input and Output Signals

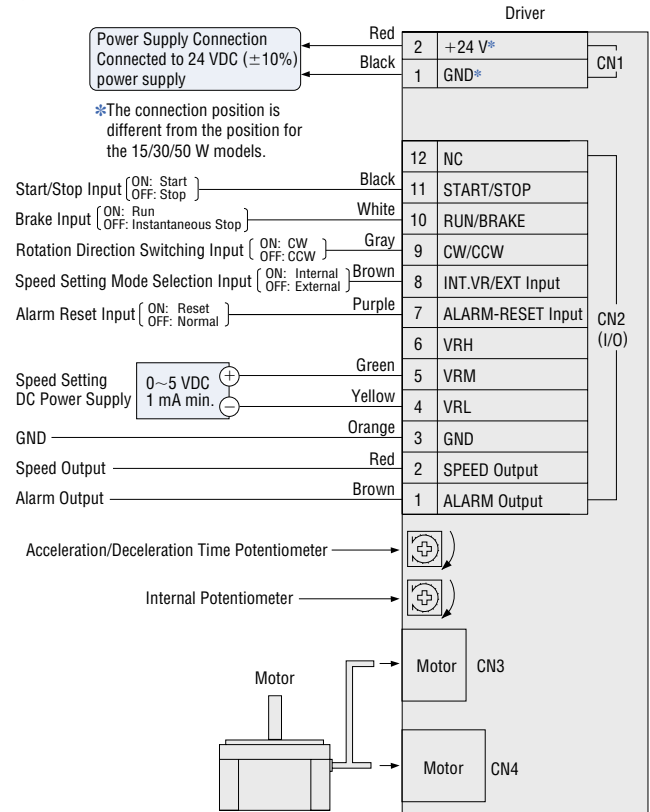
Display	Signal	Pin No.	Function
CN2	Output	1	ALARM Output
		2	SPEED Output
	I/O Signal Common	3	GND
		4	VRL Input
	Analog Input	5	VRM Input
		6	VRH Input
	Input	7	ALARM-RESET Input
		8	INT.VR/EXT Input
		9	CW/CCW Input
		10	RUN/BRAKE Input
		11	START/STOP Input
		12	NC

## Connection Diagrams

◇15W / 30W / 50W

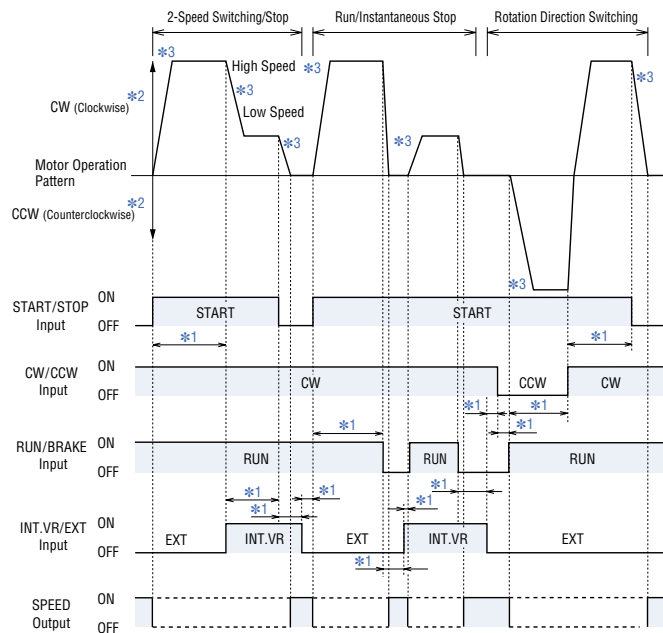


◇100W





## Timing Chart



\*1 At least 10 ms

\*2 The direction applies to the motor alone. The specific direction will vary depending on the gear ratio.

\*3 The motor will start/stop over the time set by the acceleration/deceleration time potentiometer.

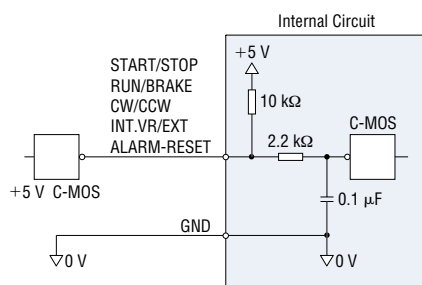
## Input/Output Signal Circuits

### Input Circuit

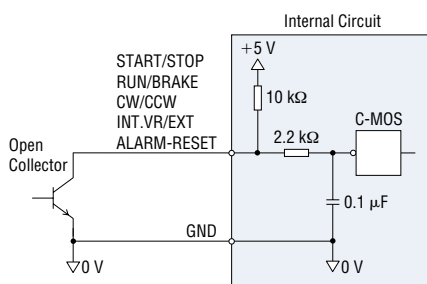
The driver's signal inputs use the C-MOS input method.

The signal status indicates a voltage level of 0 to 0.5 V when the signal is ON, or 4 to 5 V when it is OFF.

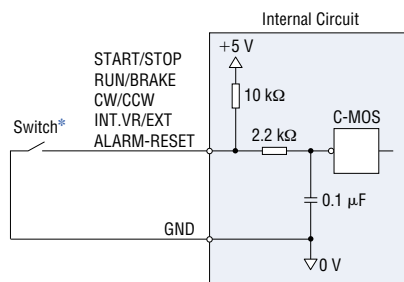
#### • 5V C-MOS output from controller



#### • Open collector output from controller



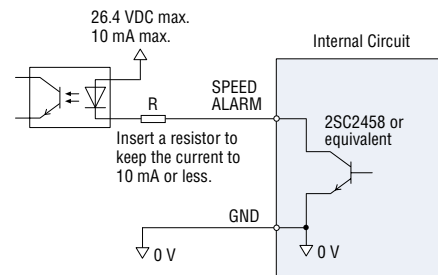
#### • Switch connection



\*Use a switch capable of opening/closing the current flow at 5 VDC, 1 mA maximum.

- All operations of run/stop, instantaneous stop and rotation direction switching operations can be controlled with the START/STOP, RUN/BRAKE and CW/CCW signals.
- If both the START/STOP signal and the RUN/BRAKE signal are set to ON, the motor rotates. The motor will accelerate over the time set by the acceleration/deceleration time potentiometer. During this time, if the CW/CCW signal is set to ON, the motor rotates clockwise as viewed from the shaft end from the motor; if the CW/CCW signal is set to OFF, the motor rotates in the counterclockwise direction.
- If the RUN/BRAKE signal is set to OFF while the START/STOP signal is ON, the motor stops instantaneously. If the START/STOP signal is set to OFF while the RUN/BRAKE signal is ON, the motor will stop with deceleration time set by the acceleration/deceleration time potentiometer.
- The duration of each input signal must be 10 msec or longer.
- Do not operate (turn ON/OFF) two or more input signals simultaneously. There must be a minimum interval of 10 msec before another input signal can be operated after an input signal had been operated.

### Output Circuit



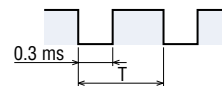
### SPEED Output

The system outputs pulse signals (with a width of 0.3 ms) at a rate of 30 pulses per revolution of the motor output shaft synchronized with the motor operation.

You can measure the SPEED output frequency and calculate the motor speed.

$$\text{Motor Speed (r/min)} = \frac{\text{SPEED Output Frequency [Hz]}}{30} \times 60$$

$$\text{SPEED Output Frequency (Hz)} = \frac{1}{T}$$



### ALARM Output

The ALARM output is normally ON and goes OFF when there is an alarm.

### ALARM-RESET

When the motor is stopped, setting this signal ON, then returning it to OFF resets the alarm.

Please return either the START/STOP input or the RUN/BRAKE input to OFF before inputting the ALARM-RESET. The ALARM-RESET is not accepted if both these signals are ON.

#### Notes

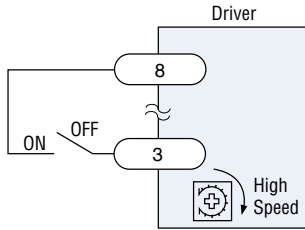
- Output signal is open collector output, so an external power supply (Vcc) is required.
  - Use a power supply of no more than 26.4 VDC and connect a limit resistor (R) such that the output current does not exceed 10 mA.
- When using neither the speed output function nor the alarm output function, this connection is not required.

## ● Speed Setting Method

### ◇ Internal Potentiometer

When INT.VR/EXT input is set to ON, the speed can be set with the internal potentiometer.

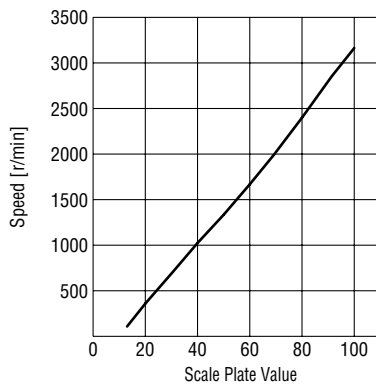
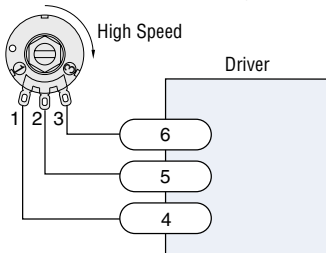
There is no need for this connection when the internal potentiometer is not used.



### ◇ External Potentiometer (Sold Separately)

When separating the motor speed setting from the driver, connect the optional external potentiometer as follows.

External Potentiometer **PAVR-20KZ** (Sold Separately)



**External Potentiometer Scale – Speed Characteristics (Representative Values)**

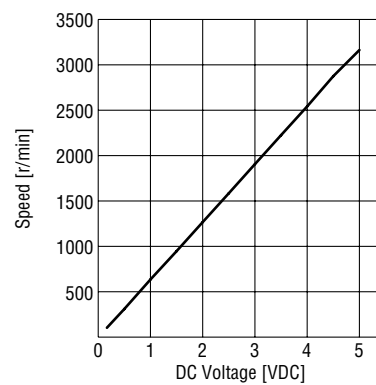
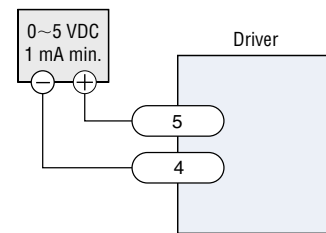
#### Note:

● The speed in the graph represents the speed of a motor alone. The gearhead output shaft speed of the combination type or geared type is calculated by dividing the graph speed by the gear ratio.

### ◇ External DC Voltage

When setting the motor speed with an external DC voltage, do so in the following manner.

External DC Power Supply



**External DC Voltage – Speed Characteristics (Representative Values)**

#### Note:

● The speed in the graph represents the speed of a motor alone. The gearhead output shaft speed of the combination type or geared type is calculated by dividing the graph speed by the gear ratio.

## ● Multi-Motor Control

Two or more sets of motor and driver can be operated at the same speed by using a DC power supply or an external potentiometer.

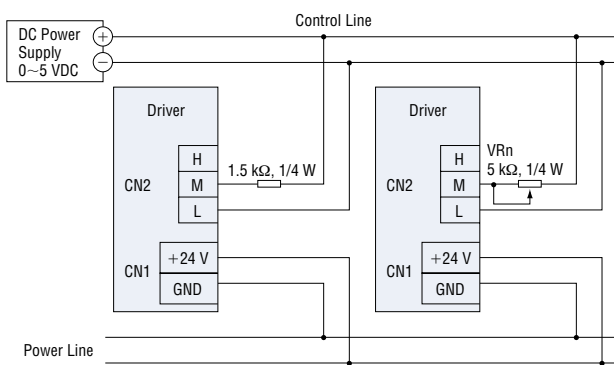
### ◇ When External DC Power Supply is Used

- Use a DC power supply with current capacity is equal to or greater than the value obtained by the following expression.

Current capacity (N is the number of drivers)  $I=1 \times N$  (mA)

Example: When two drivers are used, current capacity should be at least 2 mA.

- The lines for other input/output signals should be connected to each driver individually.
- Motor speed differences can be adjusted by connecting a resistor of 1.5 k $\Omega$ , 1/4 W to the M terminal of the first driver, and a 5 k $\Omega$ , 1/4 W variable resistor (VRn) to the M terminals of the other drivers.



### ◇ When External Potentiometer is Used

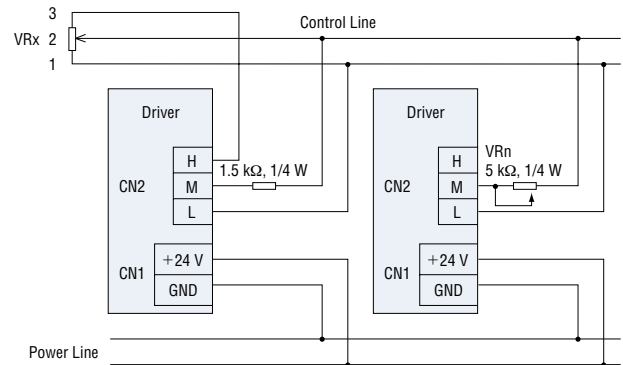
As shown below, make the power line and the speed control line common to set the speed at VRx.

- The required resistance of the external potentiometer is calculated by the following expression.

Resistance value (N is the number of drivers)  $VRx=20/N$  (k $\Omega$ ), N/4 (W)

Example: When two drivers are used, the resistance is 10 k $\Omega$ , 1/2 W.

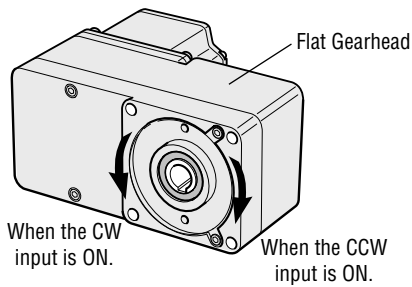
- Connect the other input/output lines to each driver individually.
- Motor speed differences can be adjusted by connecting a resistor of 1.5 k $\Omega$ , 1/4 W to the M terminal of the first driver, and a 5 k $\Omega$ , 1/4 W variable resistor (VRn) to the M terminals of the other drivers.
- No more than five motors should be operated simultaneously when using the external potentiometer.



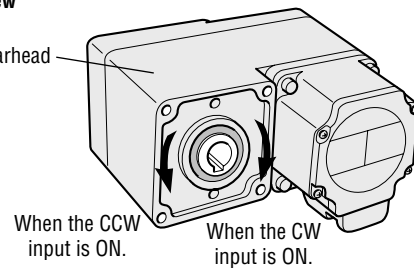
## ■ Rotation Direction of the Hollow Shaft Flat Gearhead

The hollow shaft flat gearhead of the combination type rotates in the direction as shown below, with respect to the direction input from the driver.

### Front View



### Rear View



## Installation of the Hollow Shaft Flat Gearhead

### Installing the Load Shaft

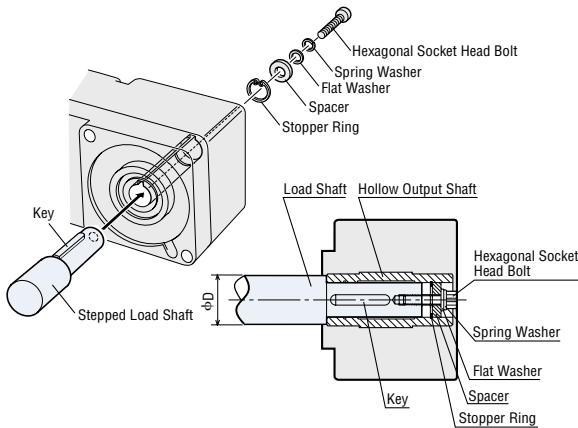
- Install the load shaft to the hollow output shaft by aligning the center of the hollow shaft with that of the load shaft.
- The hollow output shaft has a key slot. Machine a matching key slot on the load shaft and use the supplied key to affix the two shafts across the slots.
- A recommended tolerance of the load shaft is h7.
- If the motor is intended to receive large impacts due to frequent instantaneous stops or carry a large overhung load, use a stepped load shaft.

#### Notes:

- When installing the load shaft to the hollow output shaft, be careful not to damage the hollow output shaft or bearing.
- To prevent seizure, apply a coat of molybdenum disulfide grease on the exterior surface of the load shaft and interior surface of the hollow output shaft.
- Do not attempt to modify or machine the hollow output shaft. Doing so may damage the bearing and cause the hollow shaft flat gearhead to break.

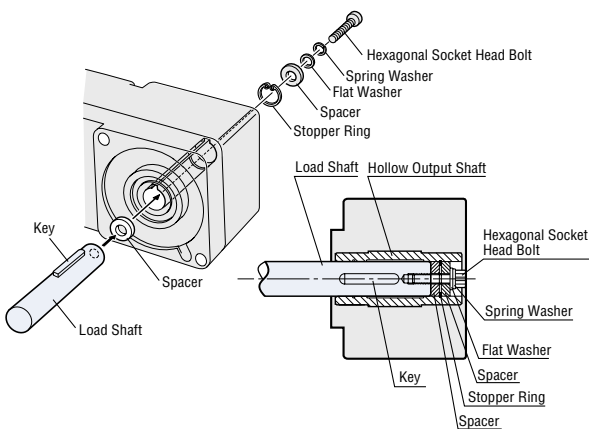
### Stepped Load Shaft

Install a hexagonal socket head bolt over a stopper ring, spacer, flat washer and spring washer, and tighten the bolt to affix the load shaft.



### Straight Load Shaft

Install a hexagonal socket head bolt over a stopper ring, spacer, flat washer and spring washer, with a spacer also inserted underneath the load shaft, and tighten the bolt to affix the load shaft.



## Recommended Load Shaft Installation Dimensions

Unit = mm

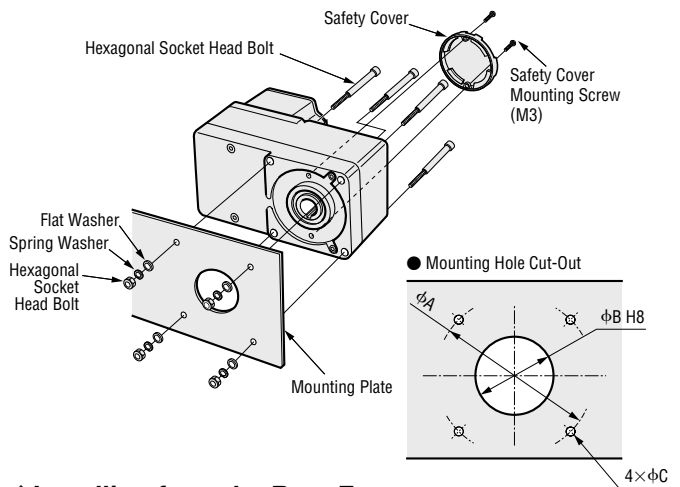
Model	BLH230	BLH450	BLH5100
Inner Diameter of Hollow Shaft (H8)	$\phi 12^{+0.027}_0$	$\phi 15^{+0.027}_0$	$\phi 20^{+0.033}_0$
Recommended Tolerance of Load Shaft (h7)	$\phi 12^{0}_{-0.018}$	$\phi 15^{0}_{-0.018}$	$\phi 20^{0}_{-0.021}$
Nominal Diameter of Stopper Ring	$\phi 12$ , C-shaped	$\phi 15$ , C-shaped	$\phi 20$ , C-shaped
Applicable Bolt	M4	M5	M6
Spacer Thickness*	3	4	5
Outer Diameter of Step Part $\phi D$	20	25	30

\*Determine the spacer thickness in conformance with the table. If the spacer is thicker than the specified dimension, the bolt will project from the surface and interfere with the safety cover.

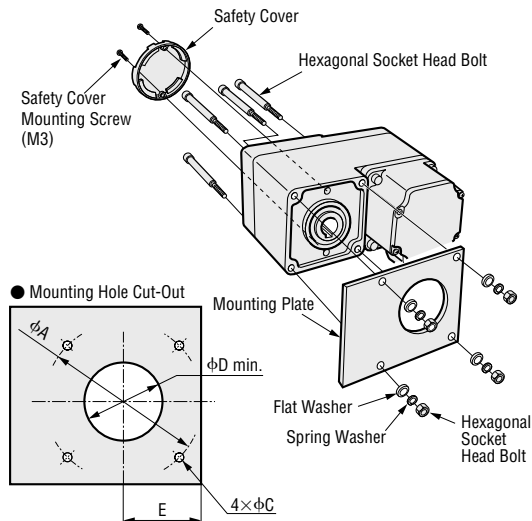
### Installing the Hollow Shaft

#### Installing from the Front Face

The output shaft boss (h8) can be used to align the shaft.



#### Installing from the Rear Face



#### Note:

- When installing the hollow shaft flat gearhead from the rear face, provide dimension E to prevent the mounting plate from contacting the motor.

## Mounting Hole Dimensions

Unit = mm

Model	BLH230	BLH450	BLH5100
Nominal Bolt Size	M5	M6	M8
$\phi A$	70	94	104
$\phi B$ H8	$34^{+0.039}_0$	$38^{+0.039}_0$	$50^{+0.039}_0$
$\phi C$	5.5	6.5	8.5
$\phi D$	25	30	35
E	29	39	44

## List of Motor and Driver Combinations

### Geared Type

The geared type has an integrated motor and gearhead. The combination of motor and gearhead cannot be changed.

Output Power	Package Model	Geared Motor Model	Driver Model
15 W	<b>BLH015K</b> -□	BLHM015K-□	BLHD15K

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

### Combination Type – Parallel Shaft Gearhead

The combination type comes with the motor and parallel shaft gearhead already assembled.

Output Power	Package Model	Motor Model	Gearhead Model	Driver Model
30 W	<b>BLH230KC</b> -□	BLHM230KC-GFS	GFS2G□	BLHD30K
50 W	<b>BLH450KC</b> -□	BLHM450KC-GFS	GFS4G□	BLHD50K
100 W	<b>BLH5100KC</b> -□	BLHM5100KC-GFS	GFS5G□	BLHD100K

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

### Combination Type – Hollow Shaft Flat Gearhead

The combination type comes with the motor and hollow shaft flat gearhead already assembled.

Output Power	Package Model	Motor Model	Gearhead Model	Driver Model
30 W	<b>BLH230KC</b> -□ <b>FR</b>	BLHM230KC-GFS	GFS2G□FR	BLHD30K
50 W	<b>BLH450KC</b> -□ <b>FR</b>	BLHM450KC-GFS	GFS4G□FR	BLHD50K
100 W	<b>BLH5100KC</b> -□ <b>FR</b>	BLHM5100KC-GFS	GFS5G□FR	BLHD100K

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

### Round Shaft Type

Output Power	Package Model	Gearhead Model	Driver Model
15 W	<b>BLH015K-A</b>	BLHM015K-A	BLHD15K
30 W	<b>BLH230KC-A</b>	BLHM230KC-A	BLHD30K
50 W	<b>BLH450KC-A</b>	BLHM450KC-A	BLHD50K
100 W	<b>BLH5100KC-A</b>	BLHM5100KC-A	BLHD100K

### Pinion Shaft Type

Output Power	Package Model	Gearhead Model	Driver Model
30 W	<b>BLH230KC-GFS</b>	BLHM230KC-GFS	BLHD30K
50 W	<b>BLH450KC-GFS</b>	BLHM450KC-GFS	BLHD50K
100 W	<b>BLH5100KC-GFS</b>	BLHM5100KC-GFS	BLHD100K

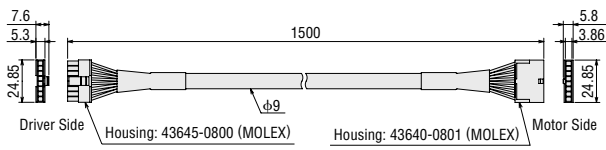
## Accessories (Sold Separately)

### Extension Cables (RoHS)

These cables are used to connect motor and driver. The maximum extension length is 2 meters.

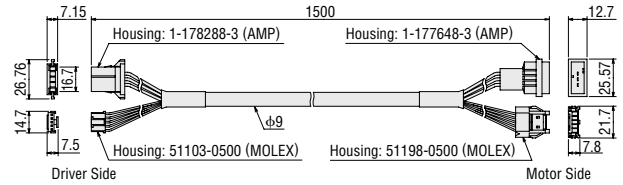
#### For 15W / 30W / 50W

**CC02BLH** (1.5 m)



#### For 100W

**CC02AXH2** (1.5 m)



### External Potentiometer (RoHS)

Motor speed can be set at a location away from the driver using an external potentiometer.

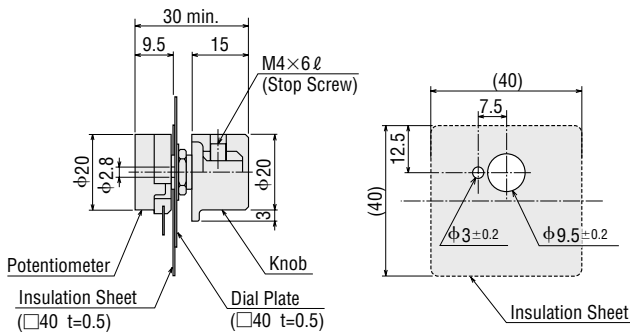
Model **PAVR-20KZ**

(20 kΩ, 1/4 W, with a linear resistance vs. angle curve)



### Dimensions (Unit = mm)

Mass: 20 g



Recommended thickness of a mounting plate is maximum 4.5 mm.

### Flexible Couplings (RoHS)

These products are the clamping type couplings to connect between the shaft of motor/gearhead and the shaft of the equipment to be connected. Couplings come with shaft holes and have standardized combinations for different diameter shaft holes.



Applicable Product	Shaft Diameter (mm)	Type of Load	Coupling Type
<b>BLH015K-□</b>	φ6	Regular Load	<b>MCL20</b>
		Shock Load	
<b>BLH015K-A</b>	φ6	Regular Load	<b>MCL20</b>
		Shock Load	
<b>BLH230KC-□</b>	φ10	Regular Load	<b>MCL30</b>
		Shock Load	
<b>BLH230KC-A</b>	φ8	Regular Load	<b>MCL20</b>
		Shock Load	
<b>BLH450KC-□</b>	φ15	Regular Load	<b>MCL40</b>
		Shock Load	
<b>BLH450KC-A</b>	φ10	Regular Load	<b>MCL30</b>
		Shock Load	
<b>BLH5100KC-□</b>	φ18	Regular Load	<b>MCL55</b>
		Shock Load	
<b>BLH5100KC-A</b>	φ12	Regular Load	<b>MCL30</b>
		Shock Load	

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

● Choose from a range of flexible couplings with various shaft hole diameters. These couplings can also be used with round-shaft motors having the corresponding shaft diameter.

## ● Motor/Gearhead Mounting Brackets (RoHS)

High-strength installation fittings are available for handling high-output motors and gearheads.

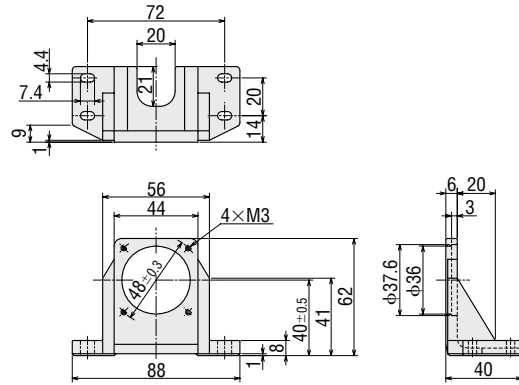


Model	Applicable Product
<b>SOLOB</b>	<b>BLH015K-□</b>
<b>SOL0M3</b>	<b>BLH015K-A</b>
<b>SOL2M4</b>	<b>BLH230KC-□</b> <b>BLH230KC-A</b>
<b>SOL4M6</b>	<b>BLH450KC-□</b> <b>BLH450KC-A</b>
<b>SOL5M8</b>	<b>BLH5100KC-□</b> <b>BLH5100KC-A</b>

- Enter the gear ratio in the box (□) within the model name.
- These brackets come with tapped holes. To mount the motor and gearhead, simply fasten with the screws provided to the gearhead. To mount the motor alone, mounting screws must be provided separately.
- Please note that these mounting brackets cannot be used with hollow shaft flat gearheads.

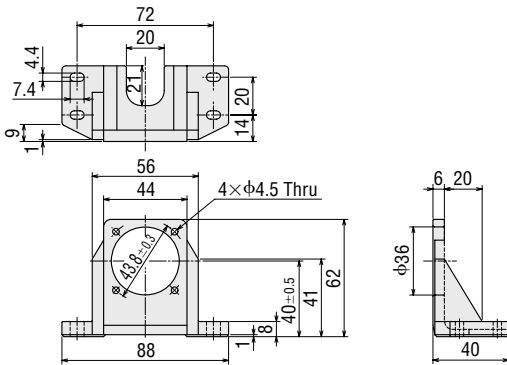
Model: **SOL0M3**

Mass: 85 g Material: Aluminum



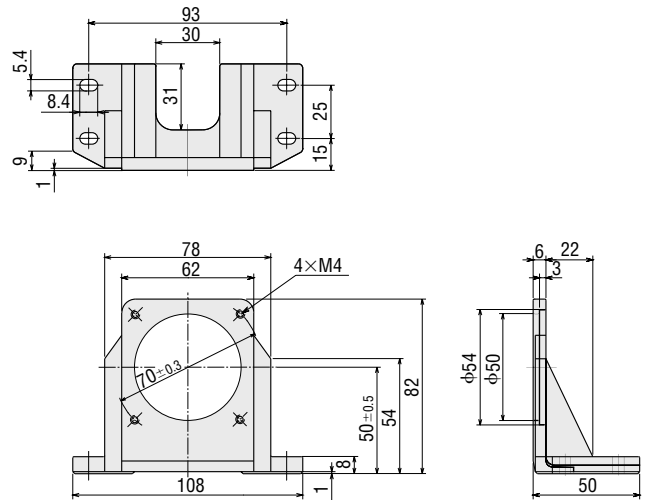
Model: **SOLOB**

Mass: 85 g Material: Aluminum



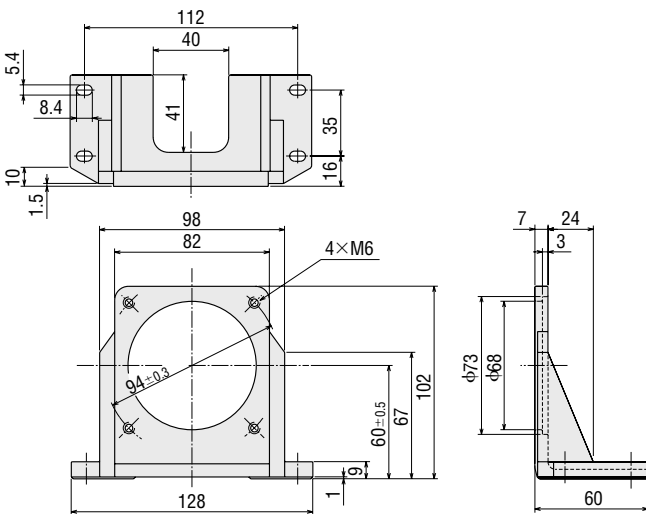
Model: **SOL2M4**

Mass: 135 g Material: Aluminum



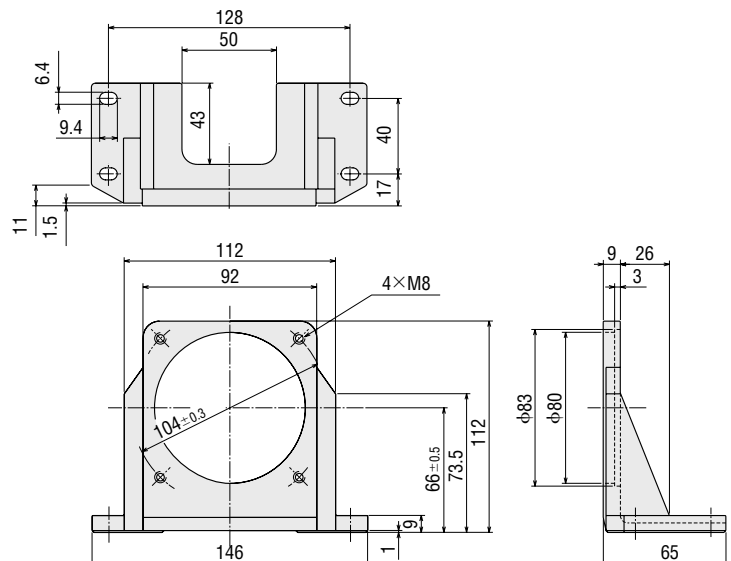
Model: **SOL4M6**

Mass: 210 g Material: Aluminum



Model: **SOL5M8**

Mass: 270 g Material: Aluminum



# Oriental Motor's Brushless DC Motor and Driver Packages Meeting All Your Motion Control Needs

## Built-In Digital Operator

### Brushless DC Motor and Driver Package **BLF Series**

This unit combines a brushless DC motor with a maximum speed of 4000 r/min with a driver offering built-in digital setting/display functions.



- Output: 30 to 120 W
- Speed Control Range: 80 to 4000 r/min

## Easy-Wiring, Easy-Operation

### Brushless DC Motor and Driver Package **BLU Series**

An easy-wiring, easy-operation unit combining a brushless DC motor with a panel-installation type driver.



- Output: 20 to 90 W
- Speed Control Range: 100 to 2000 r/min

This product is manufactured at a plant certified with the international standards **ISO 9001** (for quality assurance) and **ISO 14001** (for systems of environmental management).

Specifications are subject to change without notice.  
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