Brushless Motors/AC Speed Control Motors

Installation

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Handling the Motor

Handling

Always carry the motor by placing it in the original package. If the motor must be carried by itself during testing or for assembly into equipment, take note of the following points:

- Hold the motor so that the output shaft points upward.
- Hold the motor not by its output shaft or motor cable, but by the motor body.

Storage

Temperature and humidity are important considerations since the storage condition has an influence on the life of motors.
Storage in places where there are large temperature and humidity variations will reduce the stator's insulation performance.
Moreover, leaving the motor for extended periods in places with high temperature and humidity, is likely to lead to grease deterioration inside the ball bearing and corrosion. When storing for long periods, it is recommended to coat the output shaft with an anti-corrosion agent, seal the motor in a polyethylene bag and store in a place with normal temperature and humidity.

Installation Conditions

Install the motor, gearhead and control circuit in a location that meets the following conditions. Use in a location that does not satisfy these conditions could damage the product.

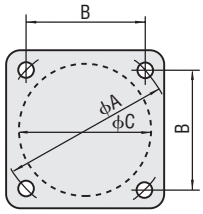
- Indoors (This product is designed and manufactured to be installed within another device.)
- Ambient temperature: 0～+50°C (+32～+122°F) (non-freezing)
  The ambient temperature range varies with each product. Refer to the pages where each product is listed.
- Ambient humidity: 85% or less (non-condensing)
- Not exposed to explosive, flammable or corrosive gases
- Not exposed to direct sunlight
- Not exposed to dust
- Not exposed to water, oil or other liquids
- A place where heat can escape easily
- Not exposed to continuous vibration or excessive impact
- Installation Category Ⅲ, Pollution Degree 2, Class Ⅰ Equipment
  Only for the products that are certified by EN/IEC Standards and conform to EN/IEC Standards.
  Installation Category Ⅱ, Pollution Degree 3 for some products

Gearhead and Motor Installation

Dimensions of Mounting Holes

◇For Parallel Shaft Gearhead, Round Shaft Type

The dimension of the four motor mounting holes is shown as pitch diameter in the dimensions of each product.
The distance between the mounting holes is shown in the table below.



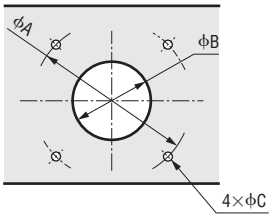
Unit = mm (in.)

Motor Frame Size	A	B	C*1
□42 (□1.65)	48 (1.89) [43.8 (1.72)]*2	33.94 (1.336) [31 (1.220)]*2	37.6 (1.4803)
□60 (□2.36)	70 (2.76)	49.50 (1.949)	54 (2.1260)
□70 (□2.76)	82 (3.23)	57.98 (2.283)	64 (2.5197)
□80 (□3.15)	94 (3.70)	66.47 (2.617)	73 (2.8740)
□90 (□3.54)	104 (4.09)	73.54 (2.895)	83 (3.2677)
□104 (□4.09) [□110 (□4.33)]*3	120 (4.72)	84.85 (3.341)	94 (3.7008)

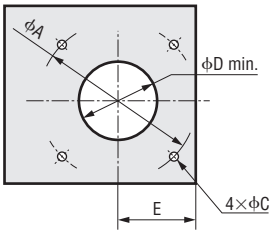
*1 "C" indicates the dimensions of flange pilot diameter of round shaft type.
*2 Figures in brackets [ ] indicate the dimensions for the geared type.
*3 The figure in brackets [ ] indicates the frame size for the gearhead.

◇For Hollow Shaft Flat Gearhead

• Front Face



• Rear Face



Mounting Hole Dimensions

Unit = mm (in.)

Gearhead Model	GFS2G□FR	GFS4G□FR	GFS5G□FR	GFS6G□FR
Nominal Bolt Size	M5	M6	M8	M8
ϕA	70 (2.76)	94 (3.70)	104 (4.09)	120 (4.72)
ϕB	$34^{+0.039}_{0}$ ($1.3386^{+0.0015}_{0}$)	$38^{+0.039}_{0}$ ($1.4961^{+0.0015}_{0}$)	$50^{+0.039}_{0}$ ($1.9685^{+0.0015}_{0}$)	$58^{+0.046}_{0}$ ($2.2835^{+0.0018}_{0}$)
ϕC	5.5 (0.217)	6.5 (0.256)	8.5 (0.335)	–
ϕD	25 (0.98)	30 (1.18)	35 (1.38)	42 (1.65)
E	29 (1.14)	39 (1.54)	44 (1.73)	57 (2.24)

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

Notes

- When installing the hollow shaft flat gearhead from the rear face, provide dimension "E" to prevent the mounting plate from contacting the motor.
- The **GFS6G□FR** does not come with hexagonal nuts. Provide hexagonal nuts separately or drill tapped holes in the mounting plate.

●Mounting the Load

◇For Parallel Shaft Gearhead, Round Shaft Type

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◇For Hollow Shaft Flat Gearhead

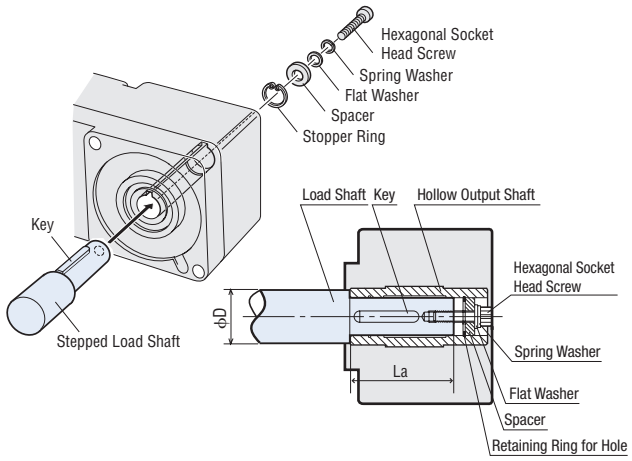
- Install the load shaft to the hollow output shaft by aligning the center of the hollow shaft with that of the load shaft.
- The hollow output shaft has a key slot. Machine a matching key slot on the load shaft and use the supplied key to affix the two shafts across the slots.
- If the motor is intended 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.

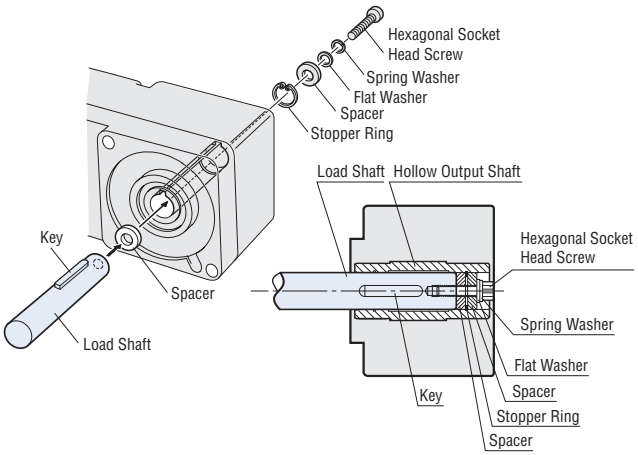
• Stepped Load Shaft

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



• Straight Load Shaft

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



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

Recommended Load Shaft Installation Dimensions

Unit = mm (in.)

Gearhead Model	GFS2G□FR	GFS4G□FR	GFS5G□FR	GFS6G□FR
Inner Diameter of Hollow Shaft	$\phi12^{+0.027}_{0}$ ($\phi0.4724^{+0.0011}_{0}$)	$\phi15^{+0.027}_{0}$ ($\phi0.5906^{+0.0011}_{0}$)	$\phi20^{+0.033}_{0}$ ($\phi0.7874^{+0.0013}_{0}$)	$\phi25^{+0.033}_{0}$ ($\phi0.9843^{+0.0013}_{0}$)
Recommended Tolerance of Load Shaft	$\phi12^{0}_{-0.018}$ ($\phi0.4724^{0}_{-0.0007}$)	$\phi15^{0}_{-0.018}$ ($\phi0.5906^{0}_{-0.0007}$)	$\phi20^{0}_{-0.021}$ ($\phi0.7874^{0}_{-0.0008}$)	$\phi25^{0}_{-0.021}$ ($\phi0.9843^{0}_{-0.0008}$)
Nominal Diameter of Stopper Ring	ϕ12 (ϕ0.47), C-shaped	ϕ15 (ϕ0.59), C-shaped	ϕ20 (ϕ0.79), C-shaped	ϕ25 (ϕ0.98), C-shaped
Applicable Screw	M4	M5	M6	M10
Spacer Thickness*	3 (0.12)	4 (0.16)	5 (0.20)	6 (0.24)
Outer Diameter of Step Part ϕD	20 (0.79)	25 (0.98)	30 (1.18)	40 (1.57)
Length of Stepped Shaft La	39～40 (1.54～1.57)	42～44 (1.65～1.73)	51～53 (2.01～2.09)	71～73 (2.80～2.87)

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

- Screws or other parts used to install the load shaft are not included. They must be purchased separately.

◇For Right-Angle Gearheads

Mounting method for right-angle, hollow shaft types

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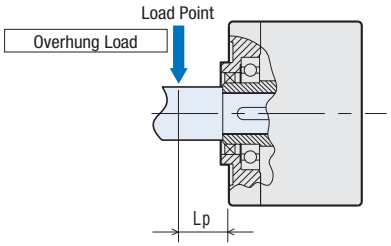
●Permissible Overhung Load Calculation

The formula for permissible overhung load varies depending on the mechanism.

◇When End of Shaft being Driven is Not Supported by a Bearing

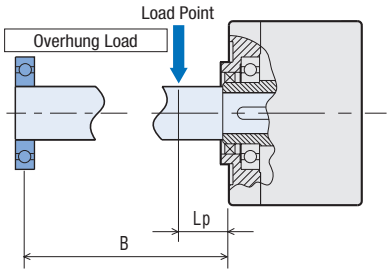
This mechanism experiences the highest amount of overhung load. The stepped type is recommended for the load shaft.



F_O [N (lb.)] : Permissible Overhung Load at the Flange-Mounting Surface
Lp [mm (in.)] : Distance from Flange-Mounting Surface to Overhung Load Point
B [mm (in.)] : Distance from Flange-Mounting Surface to Bearing Unit

Model	Permissible Overhung Load W [N (lb.)]
GFS2G□FR	$W = \frac{36\text{ mm (8.1 in.)}}{36\text{ mm (8.1 in.)} + Lp} \times F_O$ [N (lb.)]
GFS4G□FR	$W = \frac{40\text{ mm (9 in.)}}{40\text{ mm (9 in.)} + Lp} \times F_O$ [N (lb.)]
GFS5G□FR	$W = \frac{50\text{ mm (11.2 in.)}}{50\text{ mm (11.2 in.)} + Lp} \times F_O$ [N (lb.)]
GFS6G□FR	$W = \frac{60\text{ mm (13.5 in.)}}{60\text{ mm (13.5 in.)} + Lp} \times F_O$ [N (lb.)]

◇When End of Shaft being Driven is Supported by a Bearing



Model	Permissible Overhung Load W [N (lb.)]
GFS2G□FR **GFS4G□FR** **GFS5G□FR** **GFS6G□FR**	$W = \frac{B}{B - Lp} \times F_O$ [N (lb.)]

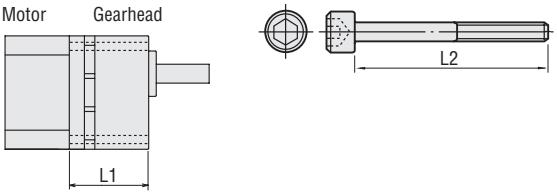
Model	Speed	Gear Ratio	F_O [N (lb.)]
GFS2G□FR	3~3000 r/min	**5, 10**	570 (128)
		15~200	630 (141)
	4000 r/min	**5, 10**	520 (117)
		15~200	580 (130)
GFS4G□FR	3~3000 r/min	**5, 10**	1000 (220)
		15~200	1500 (330)
	4000 r/min	**5, 10**	910 (200)
		15~200	1370 (300)
GFS5G□FR	3~3000 r/min	**5, 10**	1080 (240)
		15, 20	1550 (340)
		30~200	1800 (400)
	4000 r/min	**5, 10**	980 (220)
		15, 20	1430 (320)
		30~200	1680 (370)
GFS6G□FR	3~3000 r/min	**5, 10**	1430 (320)
		15, 20	1960 (440)
		30~100	2380 (530)
	4000 r/min	**5, 10**	1320 (290)
		15, 20	1810 (400)
		30~100	2210 (490)

●Dimensions for Mounting Screws

◇Parallel Shaft Gearhead

BX, **BLF**, **BLE**, **BLU** and **BLH** Series

The screw shown below is included with the motor.



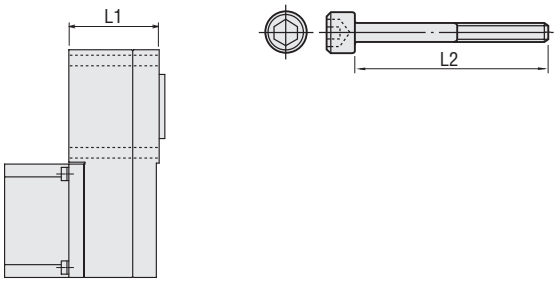
Gearhead		Mounting Screw	
Model	L1 [mm (in.)]	L2 [mm (in.)]	Screw Size
GFS2G5~20	42 (1.65)	50 (1.97)	M4 P0.7
GFS2G30~100	46 (1.81)	55 (2.17)	
GFS2G200	51 (2.01)	60 (2.36)	
GFS4G5~20	49 (1.93)	65 (2.56)	M6 P1.0
GFS4G30~100	54 (2.13)	70 (2.76)	
GFS4G200	59 (2.32)	75 (2.95)	
GFS5G5~20	55 (2.17)	75 (2.95)	M8 P1.25
GFS5G30~100	68 (2.68)	90 (3.54)	
GFS5G200	74 (2.91)	95 (3.74)	
GFS6G5~20	70 (2.76)	95 (3.74)	
GFS6G30, 50	82 (3.23)	110 (4.33)	
GFS6G100, 200	96 (3.78)	120 (4.72)	

● Mounting screws: 4 flat washers, spring washers and hexagonal nuts are included.

◇Hollow Shaft Flat Gearhead

BX, **BLF**, **BLE**, **BLU**, and **BLH** Series

The screw shown below is included with the motor.



Gearhead		Mounting Screw	
Model	L1 [mm (in.)]	L2 [mm (in.)]	Screw Size
GFS2G5~200FR	47.8 (1.88)	65 (2.56)	M5 P0.8
GFS4G5~200FR	53.2 (2.09)	70 (2.76)	M6 P1.0
GFS5G5~200FR	65.2 (2.57)	90 (3.54)	M8 P1.25
GFS6G5~100FR	83.5 (3.29)	100 (3.94)	M8 P1.25

● Mounting screws: 4 flat washers, spring washers and hexagonal nuts are included.

◇For **BHF** Series ➜ Page C-281

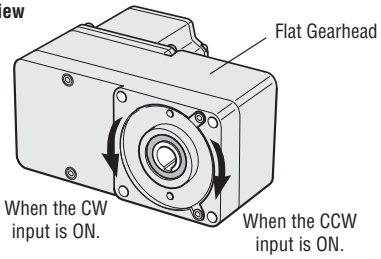
◇For **GN** Gearheads, **GE** Gearheads, **GU** Gearheads and Right-Angle Gearheads ➜ Page C-280

◇For **V** Series ➜ Page C-281

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