Speed Control Systems

B

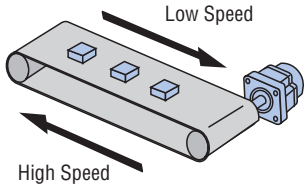
Features of Speed Control Systems

Speed Control Systems allow you to easily set and adjust the speed of a motor. The control system consists of a speed feedback system, a motor, a driver (or a speed controller) and a speed setting device. The motor for the speed control system is either a Brushless Motor or a standard AC Motor.

Brushless Motor Systems

Wide Speed Control Range

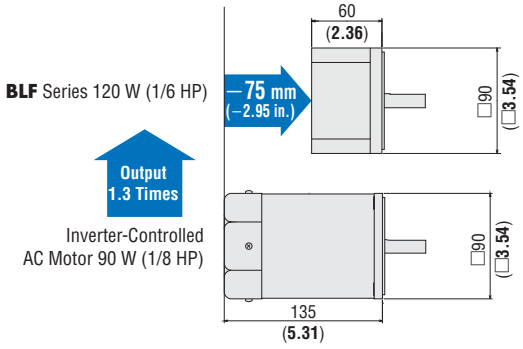
Brushless Motor: 80 to 4000 r/min*
(**BLF** Series)



Because of the different motor structure and control method, speed control range of the brushless motor is wider than that of the AC speed control motor.
Thanks to its flat torque characteristics, the brushless motor can be used over the entire speed range from low to high, even when the load fluctuates.

*The specific speed control range varies depending on the product.

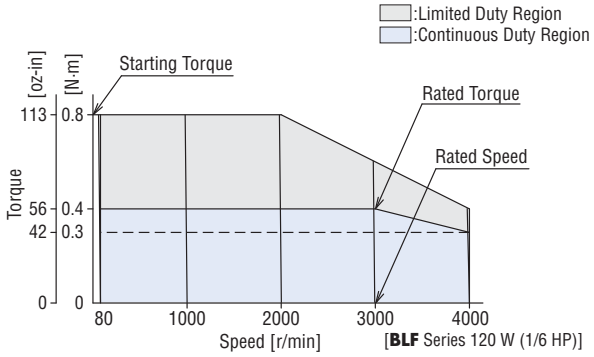
Compact yet Powerful



Comparison in models with a frame size of 90 mm (**3.54** in.)

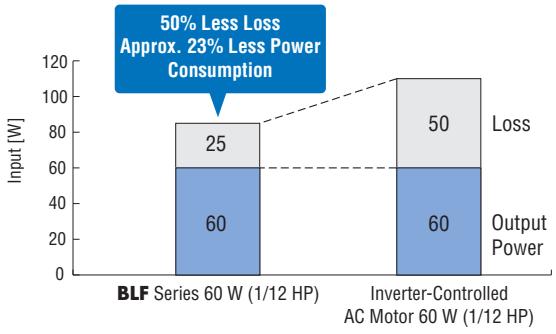
The compact yet powerful motor incorporates permanent magnets in the motor rotor. Compared with an AC motor having a frame size of 90 mm (3.54 in.), a brushless motor of the same specifications is 75 mm (2.95 in.) shorter and offers 1.3 times more output.
The compact motor structure lets you downsize your equipment.

Excellent Speed Stability, Flat Torque



The specified speed is compared against the feedback signal to adjust the motor supply voltage and frequency, in order to stabilize the speed.
This mechanism ensures that the motor drives at stable speed over its entire speed range from low to high, even when the load condition fluctuates.

Energy-Saving



Brushless motors, which incorporate permanent magnets in the rotor, generate little secondary loss from the rotor.
At an output power of 60 W (1/12 HP), for example, the power consumption of the **BLF** Series is approximately 23% less than that of an inverter-controlled AC motor, which enables the energy-saving operation of your equipment.

Electronic-Input Control

Brushless motor systems are available with electronic-input control. The driver can be connected directly to a programmable controller. As the motor requires no power relays, there is no need for periodic service or replacement of relays. This makes the machine highly reliable. Moreover, the time required to set up the motor is greatly reduced. Removing the relays eliminates the spark noise during opening and closing of the relay contact points.

●Conforms to Major Safety Standards

Each series consists of models recognized by UL and CSA, conforming to the EN Standards, and bearing a CE Mark. A range of models are available that support various voltage specifications used in major countries.

●RoHS RoHS-Compliant

Each series conforms to the RoHS Directive that prohibits the use of six chemical substances including lead and cadmium.

●Details of RoHS Directive ➜ Page G-38

■AC Motor Systems

Oriental Motor offers four different series of AC speed control as shown below. Select the best system depending upon your application.

- Multiple functions, 200 W (1/4 HP) speed control system with conformance to global power supply voltages ..... **BHF** Series
- Speed controller that enables speed control to be set easily, with a built-in digital display **FE100**/**FE200**
- Compact speed controller **ES01**/**ES02**
- Easy connection, easy handling ..... **US** Series

●Electronic-Input Control

The **BHF** Series and **FE100**/**FE200** are available with electronic-input control. The speed controller can be connected directly to a programmable controller. As the motor requires no power relays, there is no need for periodic service or replacement of relays. This makes the machine highly reliable. Moreover, the time required to set up the motor is greatly reduced. Removing the relays eliminates the spark noise during opening and closing of the relay contact points.

●Conforms to Major Safety Standards

Each series consists of models recognized by UL and CSA, conforming to the EN Standards, and bearing a CE Mark. A range of models are available that support various voltage specifications used in major countries.
All models have a built-in overheat protection device and conform to major safety standards.

• Motor Overheat Protection Device

Thermal protector, Impedance protected

●RoHS RoHS-Compliant

Each series conforms to the RoHS Directive that prohibits the use of six chemical substances including lead and cadmium.

●Details of RoHS Directive ➜ Page G-38

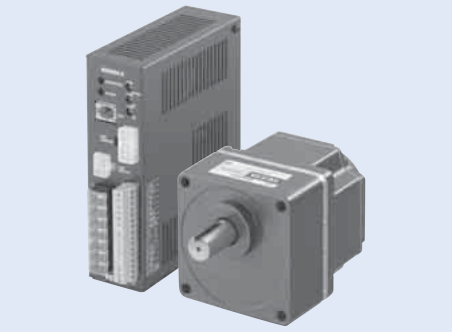
Product Line of Speed Control Systems

Brushless Motor Systems

AC Input Type

BX Series ➜ Page B-16

The BX Series brushless motor and driver packages offer high performance and high function. You can implement various other functions using an optional control module.

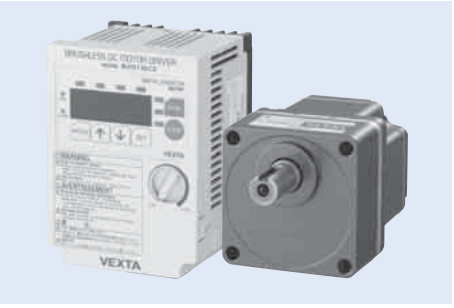


Features

- Speed control range: 30 (3*)~3000 r/min.
  *When a control module **OPX-1A** is used
- Speed regulation: ±0.05% max. (with respect to load)
- Electromagnetic brake types allow for speed control during vertical drive (gravitational operation).
- Using with the control module (sold separately), it is possible to obtain advanced speed control, torque limiting function and position control.
  - Position Control···A maximum of six points of positioning data can be set.
  - Torque Limiting···Torque limiting function suppresses the motor output torque in accordance with the application and use condition.
- Adopting the long life gearhead, rated life of 10000 hours has been achieved.
- Use of the hollow shaft flat gearhead, which is stronger than the parallel shaft gearhead, enables a space-saving design for your equipment.

BLF Series ➜ Page B-60

Maximum Speed of 4000 r/min
With a digital operator, digital setting and display are possible.



Features

- Speed control range: 80~4000 r/min.
- Speed regulation: ±0.2% max. (with respect to load)
- The digital operator makes setting and operation easy.
- In addition to the motor speed, the conveyor speed and load factor can be displayed.
- By using the digital operator, you can set up to eight speed levels to choose from.
- The motor and digital operator conform to IP65.
- Adopting the long life gearhead, rated life of 10000 hours has been achieved.
- Use of the hollow shaft flat gearhead, which is stronger than the parallel shaft gearhead, enables a space-saving design for your equipment.

BLU Series ➜ Page B-86

The motor speed can be set easily by using the potentiometer on the front panel.

Features

- Speed control range: 100~2000 r/min.
- Speed regulation: ±0.5% max. (with respect to load)
- Easy speed control by means of the potentiometer on the front panel of the driver
- Easy driver connection using a connector
- Start/stop, rotation direction switching and instantaneous stop can be controlled using external signals.
- IP65 motor structure
- Adopting the long life gearhead, rated life of 10000 hours has been achieved.
- Use of the hollow shaft flat gearhead, which is stronger than the parallel shaft gearhead, enables a space-saving design for your equipment.

FBLⅡ Series ➜ Page B-104

The FBLⅡ Series consists of a high performance, compact, brushless motor and driver.

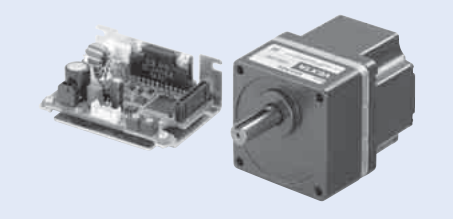
Features

- Speed control range: 300~3000 r/min.
- Speed regulation: −1% max. (with respect to load)
- All motor operations such as CW operation/stop, CCW operation/stop, instantaneous stop switching control are possible.

●DC Input Type

BLH Series ➜ Page B-118

With a compact board driver, BLH Series meets your space-saving needs.



●Features

- Speed control range: 100~3000 r/min.
- Speed regulation: ±0.5% max. (with respect to load)
- The compact package equipped with a small board driver is ideal for installation within equipment.
- A wide output range from 15 W to 100 W (1/50 HP to 1/8 HP)
- IP65 motor structure
- Adopting the long life gearhead, rated life of 10000 hours* has been achieved.
- Use of the hollow shaft flat gearhead, which is stronger than the parallel shaft gearhead, enables a space-saving design for your equipment.

*5000 hours for 15 W (1/50 HP) type

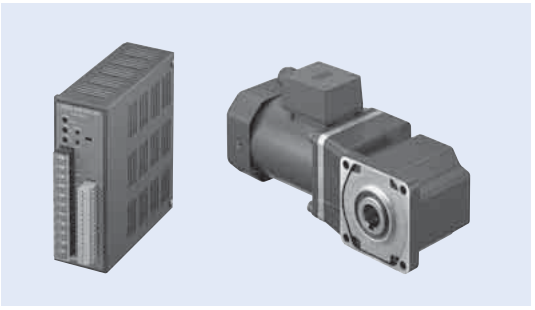
■Product Line RoHS

Series	Output Power					Power Supply Input*				Combination Type	
	Frame Size 42 mm (1.65 in.)	Frame Size 60 mm (2.36 in.)	Frame Size 80 mm (3.15 in.)	Frame Size 90 mm (3.54 in.)	Frame Size 104 mm (4.09 in.)	Single-Phase 100-115 VAC	Single-Phase 200-230 VAC	Three-Phase 200-230 VAC	24 VDC	Parallel Shaft Gearhead	Hollow Shaft Flat Gearhead
BX Series		30 W (1/25 HP)				●	●	●		●	●
			60 W (1/12 HP)			●	●	●		●	●
				120 W (1/6 HP)		●	●	●		●	●
					200 W (1/4 HP)	●	●	●		●	
					400 W (1/2 HP)			●		●	
BLF Series		30 W (1/25 HP)				●	●	●		●	●
			60 W (1/12 HP)			●	●	●		●	●
				120 W (1/6 HP)		●	●	●		●	●
					200 W (1/4 HP)	●	●	●		●	
					400 W (1/2 HP)			●		●	
BLU Series		20 W (1/38 HP)				●	●	●		●	●
			40 W (1/19 HP)			●	●	●		●	●
				90 W (1/8 HP)		●	●	●		●	●
FBLⅡ Series				75 W (1/10 HP)		●	●	●		●	
				120 W (1/6 HP)		●	●	●		●	
BLH Series	15 W (1/50 HP)								●	● Geared	
		30 W (1/25 HP)							●	●	●
			50 W (1/15 HP)						●	●	●
				100 W (1/8 HP)					●	●	●

*Single-Phase 100-120 VAC, Single-Phase 200-240 VAC and Three-Phase 200-240 VAC for **BLF** Series.

AC Motor Systems

BHF Series → Page B-138



- **Speed Control Range:** 100～2400 r/min
- **Output Power:** 200 W (1/4 HP)
- **Features**

• With a dedicated speed controller, the **BHF** Series achieves speed stability with a fluctuation of only ±3%. The speed controller is already optimized for use with the gearmotor, so detailed adjustments are not required.
• Enables automatic on/off control of the electromagnetic brake on the speed controller side, which allows for vertical drive (gravitational operation).

FE100/FE200 → Page B-156

- **Speed Setting Range:** 200～2400 r/min
  (Set frequency range: 6.6～80 Hz)
- **Applicable Motors:** Three-phase induction motors
  - World **K** Series 6 W～90 W (1/125 HP～1/8 HP)
  - **V** Series 25 W～90 W (1/30 HP～1/8 HP)
  - **FPW** Series 25 W～90 W (1/30 HP～1/8 HP)
  - **BH** Series 200 W (1/4 HP)
- **Features**

• The set speed is digitally displayed.
• Factory setting parameters are optimized for the output of each motor, which means the speed controller can be set simply by changing the switches according to the motor output.
• The motor speed can be changed easily with the speed potentiometer on the front panel of the speed controller.

ES01/ES02 → Page B-172

- **Variable Speed Range:** 50 Hz 90～1400 r/min
  60 Hz 90～1600 r/min
- **Applicable Speed Control Motors:** Induction & reversible motors
  - World **K** Series 6 W～60 W (1/125 HP～1/12 HP)
  - **V** Series 6 W～90 W (1/125 HP～1/8 HP)
- **Features**

• A compact controller offering a selected set of functions required for speed control
• Conforms to major safety standards

US Series → Page B-202

- **Variable Speed Range:** 50 Hz 90～1400 r/min
  60 Hz 90～1600 r/min
- **Output Power:** 6 W～90 W (1/125 HP～1/8 HP)
- **Features**

• Easy wiring by connectors
• The speed can be changed easily with the potentiometer on the front panel of the control unit.
• Conforms to major safety standards

Product Line RoHS

Series	Applicable Motor	Power Supply Input	Motor Type	Output Power						
				6 W (1/125 HP)	15 W (1/50 HP)	25 W (1/30 HP)	40 W (1/19 HP)	60 W (1/12 HP)	90 W (1/8 HP)	200 W (1/4 HP)
BHF Series	–	Single-Phase 100-115 VAC Single-Phase 200-230 VAC Three-Phase 200-230 VAC	Induction Motors							●
			Electromagnetic Brake Motors							●
FE100/FE200	World **K** Series	Single-Phase 100-120 VAC Single-Phase 200-240 VAC Three-Phase 200-240 VAC	Three-Phase Induction Motors	●		●	●	●	●	
	V Series					●	●	●	●	
	FPW Series					●	●	●	●	
	BH Series									●
ES01/ES02	World **K** Series	Single-Phase 100/115 VAC Single-Phase 200/230 VAC	Induction Motors	●	●	●	●	●		
			Reversible Motors	●	●	●	●	●		
	V Series	Single-Phase 100/115 VAC Single-Phase 200/230 VAC	Induction Motors	●	●	●	●	●	●	
			Reversible Motors	●	●	●	●	●	●	
US Series	–	Single-Phase 110/115 VAC Single-Phase 220/230 VAC	Induction Motors	●	●	●	●	●	●	

Speed Control Systems Selection Guide

Speed control systems offer different speed control ranges and functions depending on the model. This section explains how to select a model based on the characteristics and functions required by your specific speed control systems application.

Selection by Speed Control Range

The speed control ranges shown below apply to the motor only.
Gearheads are available for each model, enabling you to use them for speed reduction. For details, refer to the page where each product is listed.

Model		Page	Speed Control Range*2		Speed Ratio
Brushless Motor Systems	**BX** Series	B-16	3 r/min*1 / 30 r/min – 3000 r/min	30～3000 r/min (3～3000 r/min)	100:1 (1000:1)
	BLF Series	B-60	80 r/min – 4000 r/min	80～4000 r/min	50:1
	BLU Series	B-86	100 r/min – 2000 r/min	100～2000 r/min	20:1
	FBLII Series	B-104	300 r/min – 3000 r/min	300～3000 r/min	10:1
	BLH Series	B-118	100 r/min – 3000 r/min	100～3000 r/min	30:1
AC Motor Systems	**BHF** Series	B-138	100 r/min – 2400 r/min	100～2400 r/min	24:1
	FE100/FE200	B-156	200 r/min – 2400 r/min	200～2400 r/min	12:1
	ES01/ES02 **US** Series	B-172 B-202	90 r/min – 1400 r/min (50 Hz) / 1600 r/min (60 Hz)	90～1400 r/min (50 Hz) 90～1600 r/min (60 Hz)	15:1

*1 With the **BX** Series and the control module **OPX-1A** (sold separately), speed range increases to 3～3000 r/min.
*2 Speed control range indicates a variable speed range for **ES01/ES02**, **US** Series and a speed setting range for **FE100/FE200**. The speed range and speed ratio vary in accordance with the load condition.

Selection by Speed Setting Method

Model		Page	Potentiometer Setting	Digital Setting	External DC Voltage
Brushless Motor Systems	**BX** Series	B-16	●	●*	●
	BLF Series	B-60	●	●	●
	BLU Series	B-86	●		
	FBLII Series	B-104	●		●
	BLH Series	B-118	●		●
AC Motor Systems	**BHF** Series	B-138	●		●
	FE100/FE200	B-156	●		●
	ES01/ES02	B-172	●		
	US Series	B-202	●		

*Possible when used with the control module **OPX-1A** (sold separately)

Speed Control Systems Function Comparison

Brushless Motor Systems

Model		Page	Digital Speed Indicator	Instantaneous Stop	Multi-Speed Operation	Acceleration/ Deceleration Operation	Load Holding/ Gravitational Operation	Multi-Motor Control	Extension Distance of Wiring between Motor and Circuit	Torque Limiting	Alarm Output	Safety Standards
AC Input Type	**BX** Series	B-16	●*1	●	8-speed*1	●	● With Electromagnetic Brake	●	20 m (65.6 ft.)	●*1	●	●
	BLF Series	B-60	●	●	8-speed*2	●*2		●	20 m (65.6 ft.)		●	●
	BLU Series	B-86	OP	●		●			10 m (32.8 ft.)		●	●
	FBLII Series	B-104	OP	●	2-speed*3	●		●	10 m (32.8 ft.)		●	●
DC Input Type	**BLH** Series	B-118	OP	●	2-speed*3	●		●	2 m (6.6 ft.)		●	●

*1 Possible when used with the control module **OPX-1A** (sold separately)
*2 Acceleration time and deceleration time can be set separately.
*3 Possible by switching between the internal/external speed potentiometer.
OP: Possible by using with Motor Speed Indicator **SDM496** (accessories).

AC Motor Systems

Model	Page	Digital Speed Indicator	Instantaneous Stop	Multi-Speed Operation	Acceleration/ Deceleration Operation	Load Holding/ Gravitational Operation	Multi-Motor Control	Extension Distance of Wiring between Motor and Circuit	Alarm Output	Safety Standards
BHF Series	B-138	OP	●*1	2-speed*2	●	● With Electromagnetic Brake	●	50 m (164 ft.)	●	●
FE100/FE200	B-156	●	●*1		●			20 m (65.6 ft.)	●	●
ES01/ES02	B-172	OP	●	2-speed*2	●			10 m (32.8 ft.)		●
US Series	B-202	OP						4.75 m (15.6 ft.)		●

*1 Although the instantaneous stop function is not available, the deceleration time can be set to as short as 0.1 second.
*2 Possible by switching between the internal/external speed potentiometer.
OP: Possible by using with Motor Speed Indicator **SDM496** (accessories).

Types and Features of Gearhead for Brushless Motor Systems

A gearhead is used in situations where you want to get high torque in a small space or rotate a large inertial load.
We offer the following two direct-coupling gearhead models for use with brushless motors.

Types	Features
Parallel Shaft Gearhead* RoHS RoHS-Compliant 	A dedicated high-strength gearhead for brushless motors that also supports high-speed rotation. Incorporating a long life design, this gearhead has a rated life of 10000 hours, which is twice as long as the rated life of a conventional gearhead. ● The □80 mm (□3.15 in.) □90 mm (□3.54 in.) and □104 mm (□4.09 in.) gearheads come with a tapped hole at the tip of the shaft.
Hollow Shaft Flat Gearhead RoHS RoHS-Compliant 	This gearhead adopts a hollow shaft that can be directly coupled with the drive shaft of your equipment without using any coupling part. The flat structure embodies higher strength and higher permissible torque than conventional parallel shaft gearheads.

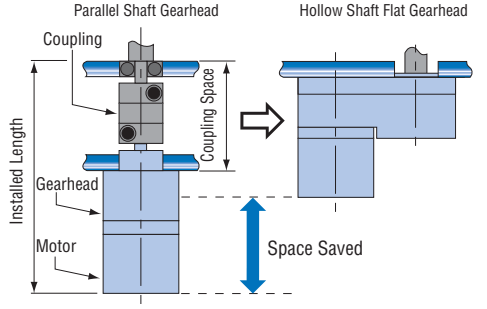
*GFS gearhead

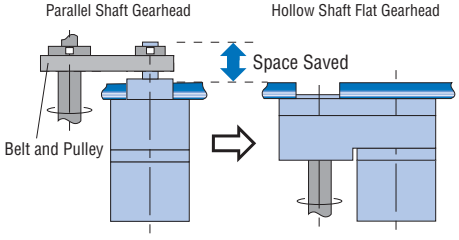
●Features of Hollow Shaft Flat Gearhead

Our hollow shaft flat gearhead for brushless motors incorporates a special structure offering space-saving solutions for your equipment and realizing high permissible torque.

◇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, allow you to reduce the size and installation space of your equipment. Since no shaft-coupling parts are needed, the parts cost and labor will also decrease.



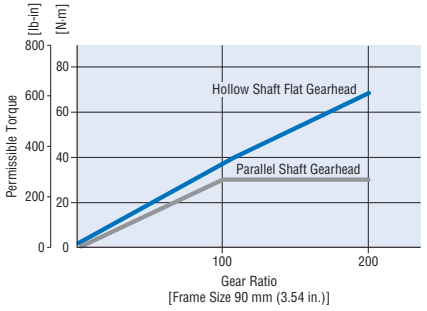


◇High Reliability

Use of a belt and pulley, chain and sprocket as shaft-coupling parts may necessitate maintenance due to elongation of the belt or chain, dust or loss of lubrication oil. The hollow shaft flat gearhead adopts a sealed gear transmission structure, which embodies high reliability while eliminating the need for maintenance. This gearhead also lasts long, as its rated life is 10000 hours.

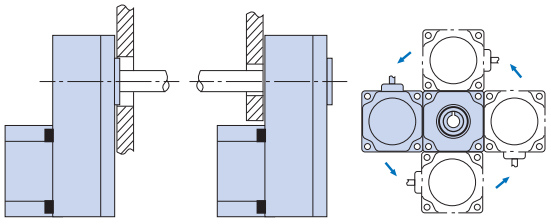
◇High Permissible Torque

While the permissible torque of the parallel shaft gearhead saturates at high gear ratios, the hollow shaft flat gearhead enables the motor torque to be fully utilized.



◇Selectable Installation Direction

If you are installing the hollow shaft flat gearhead, the gearhead can be oriented in any of the four directions according to the equipment.



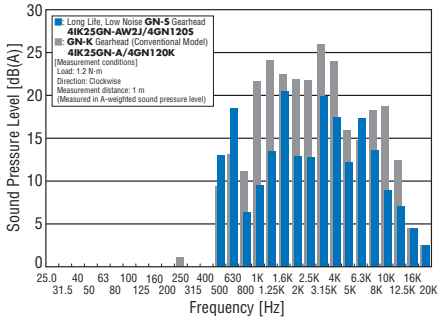
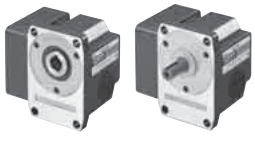
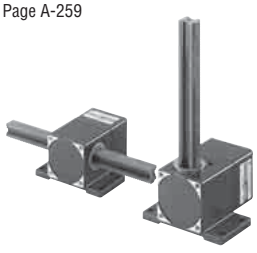
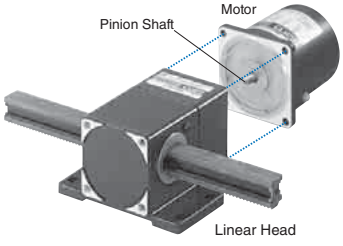
Types and Features of Gearheads and Linear Heads for AC Motor Systems

●Gearheads: Easy Reduction and Torque Increase

Combination with a gearhead allows the motor to reduce to a required speed or generate higher torque. Gearheads come in various types including the long life, low noise gearhead and right-angle gearhead.

●Linear Heads: Convert Motor Rotation to Linear Motion

Combination with a linear head allows the motor to convert rotation to linear motion with great ease. Linear heads are available with a square sectioned rack.

Types	Features
Parallel Shaft Gearhead RoHS RoHS-Compliant Long Life, Low Noise **GN-S** Gearhead 	●Long Rated Life of 10000 Hours The **GN-S** gearhead achieves a long rated life of 10000 hours, twice the level of a conventional gearhead, by adopting a large, specially designed bearing and reinforced gears. ●Low Noise Design The **GN-S** gearhead generates less noise thanks to gears with a special shape and surface machining assembled with the use of advanced technology. ●Applicable Products 6 W (1/125 HP), 15 W (1/50 HP), 25 W (1/30 HP) or 40 W (1/19 HP) **GN** pinion motor  
Parallel Shaft Gearhead RoHS RoHS-Compliant Long Life **GE-S** Gearhead 	●Long Rated Life of 10000 Hours The **GE-S** gearhead achieves a long rated life of 10000 hours, twice the level of a conventional gearhead, by adopting a large, specially designed bearing and reinforced gears. ● The **GE-S** gearhead comes with a tapped hole at the tip of the shaft. ●Applicable Products 60 W (1/12 HP) or 90 W (1/8 HP) **GE** pinion motor (Applicable motors for **FE100**/**FE200**)
Parallel Shaft Gearhead RoHS RoHS-Compliant **GU** Gearhead	●Applicable Products 60 W (1/12 HP) or 90 W (1/8 HP) **GU** pinion motor (Applicable motors for **ES01**/**ES02**, **US** Series)
RoHS RoHS-Compliant Right-Angle Gearhead ➜ Page A-239 	●Ideal Space-Saving Solution The gear shaft is positioned at right angles with the motor shaft, enabling space-saving. ●Hollow Shaft and Solid Shaft Types are Available Select an appropriate type that suits your specific application. ● Solid shaft type of **GE** pinion gearhead comes with a tapped hole at the tip of the shaft. ●Applicable Products 25 W (1/30 HP) or 40 W (1/19 HP) **GN** pinion motor 60 W (1/12 HP) or 90 W (1/8 HP) **GE** pinion motor 60 W (1/12 HP) or 90 W (1/8 HP) **GU** pinion motor (Applicable motors for **FE100**/**FE200**, **ES01**/**ES02** and **US** Series)
Rack-and-Pinion Mechanism RoHS RoHS-Compliant **LS** Linear Heads ➜ Page A-259 	●Easy to Achieve Linear Motion A rack-and-pinion mechanism is combined with a reduction mechanism, which allows the motor to convert rotation to linear motion with great ease.  ●Applicable Products 6 W (1/125 HP), 25 W (1/30 HP) **GN** pinion motor (Applicable motors for **ES01**/**ES02**)

How to Read Specifications

Brushless Motor Systems

How to Read Specifications

Specifications Table (Example) **BLF** Series

	Model	Combination Type – Parallel Shaft Gearhead		**BLF460A-□**	**BLF460C-□**	**BLF460S-□**
		Combination Type – Hollow Shaft Flat Gearhead		**BLF460A-□FR**	**BLF460C-□FR**	**BLF460S-□FR**
		Round Shaft Type		**BLF460A-A**	**BLF460C-A**	**BLF460S-A**
①	Rated Output Power (Continuous)		W (HP)	60 (1/12)		
	Power Source	Rated Voltage	VAC	Single-Phase 100-120	Single-Phase 200-240	Three-Phase 200-240
		Permissible Voltage Range		±10%		
		Rated Frequency	Hz	50/60		
		Permissible Frequency Range		±5%		
		Rated Input Current	A	2.0	1.2	0.7
②		Maximum Input Current	A	4.5	3.0	1.5
③	Rated Torque		N·m (oz-in)	0.2 (28)		
④	Starting Torque		N·m (oz-in)	0.4 (56)		
⑤	Rated Speed		r/min	3000		
⑥	Speed Control Range		r/min	80～4000		
⑦	Round Shaft Type Permissible Load Inertia J		×10^{-4} kg·m^2 (oz-in^2)	3.75 (21)		
	Rotor Inertia J		×10^{-4} kg·m^2 (oz-in^2)	0.236 (1.29)		
⑧	Speed Regulation (When digital operator is used)	Load		±0.2% max. (0～Rated torque, at rated speed, at rated voltage, at normal ambient temperature)		
		Voltage		±0.2% max. (Rated voltage ±10%, at rated speed, with no load, at normal ambient temperature)		
		Temperature		±0.2% max. [0～+50°C (+32～+122°F), at rated speed, with no load, at rated voltage]		

① Rated Output Power: This refers to, with the combination of motor and driver, the amount of work that can be performed by a motor in a given period of time. It also expresses the maximum output that can be generated continuously.
② Maximum Input Current: This refers to, with the combination of motor and driver, the maximum current sent into the driver.
③ Rated Torque: This refers to, with the combination of motor and driver, the maximum torque created when they are in continuous operation.
④ Starting Torque: This refers to, with the combination of motor and driver, the limit of torque that can be generated instantaneously.
⑤ Rated Speed: This refers to, with the combination of motor and driver, the speed at rated output.
⑥ Speed Control Range: This refers to, with the combination of motor and driver, the range of variable speed.
⑦ Round Shaft Type Permissible Load Inertia J: This refers to, with the combination of motor and driver, the maximum load inertia that can be driven. The permissible load specified here is applicable only to round shaft type.
⑧ Speed Regulation: This shows how much the speed is affected by the change in load, voltage and temperature.

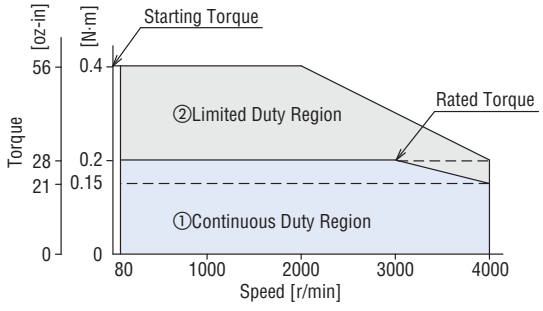
◇Permissible Overhung Load and Permissible Thrust Load of Motors

Similar to standard AC motors. Refer to "How to Read Motor Specifications" of constant speed motors.

● How to read motor specifications of constant speed motors ➜ Page A-12

How to Read Speed – Torque Characteristics

Speed – Torque Characteristics (Example) **BLF460A-A**



① Continuous Duty Region: This refers to the region where a motor can be operated continuously. The area is also used for the frictional load torque at the sliding portion of equipment.
② Limited Duty Region: This refers to the region which can be used for a short period of time. If operated for more than about five seconds in the limited duty region, the driver's overload protective function engages and the motor is automatically stopped. This area is also used as the acceleration torque which accelerates the inertial load up to the set speed at motor start-up.

How to Read Gearhead Specifications

Similar to standard AC motors. Refer to "How to Read Gearhead Specifications" of constant speed motors.

● How to read gearhead specifications of constant speed motors ➜ Page A-13

AC Motor Systems

How to Read Specifications

Specifications Table (Example) **ES01/ES02/World K Series Speed Control Motors**

Model		① Max. Output Power	Voltage	Frequency	② Variable Speed Range	③ Permissible Torque		④ Starting Torque	⑤ Current	Power Consumption	Capacitor
						1200 r/min	90 r/min				
Pinion Shaft Type	Round Shaft Type	W (HP)	VAC	Hz	r/min	mN·m (oz-in)	mN·m (oz-in)	mN·m (oz-in)	A	W	μF
TP 4IK25RGN-AW2U	4IK25RA-AW2U	25 (1/30)	Single-Phase 110	60	90～1600	185 (26)	50 (7.1)	120 (17.0)	0.75	58	6.5
			Single-Phase 115							69	

① Maximum Output Power: This refers to, with the combination of motor and speed controller, the amount of work that can be performed by a motor in a given period of time. It also expresses the maximum output that can be generated within the safe-operation line on the speed – torque characteristics diagram.

② Variable Speed Range: This refers to, with the combination of motor and speed controller, the range of variable speed. For speed control motors, the variable speed range varies with the load torque. Refer to page F-42 for details.

③ Permissible Torque: This refers to, at the typical set speed at 1200 r/min and 90 r/min, the maximum torque that can be generated below the safe-operation line or the permissible torque when gearhead is attached.

④ Starting Torque: This refers to, with the combination of motor and speed controller, the torque generated the instant the motor starts.

⑤ Current: This refers to the current sent into the speed controller at the maximum output.

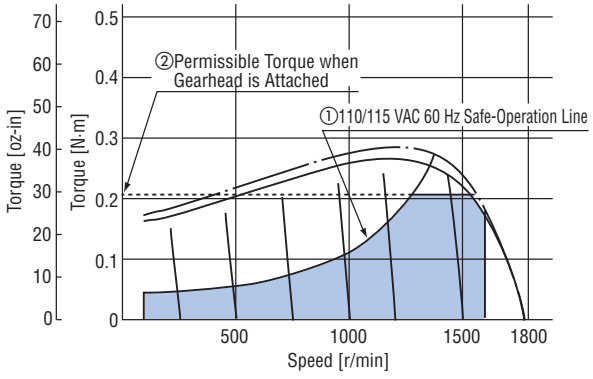
◇Permissible Overhung Load and Permissible Thrust Load of Motors

Similar to standard AC motors. Refer to "How to Read Motor Specifications" of constant speed motors.

● How to read motor specifications of constant speed motors ➜ Page A-12

How to Read Speed – Torque Characteristics

Speed – Torque Characteristics (Example) **ES01/4IK25RGN-AW2U**



① Safe-Operation Line: The safe-operation line, measured by motor's temperature, indicates its limit for continuous operation (30 minutes operation for a reversible motor) with the temperature level below the permissible maximum. Whether the motor can be operated continuously or not, is judged by measuring the temperature of the motor case. When the temperature of the case is 90°C (194°F) or less, the motor is capable of continuous operation.

② Permissible Torque When Gearhead is Attached: When using a gearhead attached to motor, be aware that it is necessary to operate below the maximum permissible torque. If the actual torque required should exceed the maximum permissible torque, it may cause damage to the gearhead and/or may reduce its life.

How to Read Gearhead Specifications

Similar to standard AC motors. Refer to "How to Read Gearhead Specifications" of constant speed motors.

● How to read gearhead specifications of constant speed motors ➜ Page A-13