ORIENTAL MOTOR

VEXTA

Speed Control Systems

B

Features of Speed Control Systems

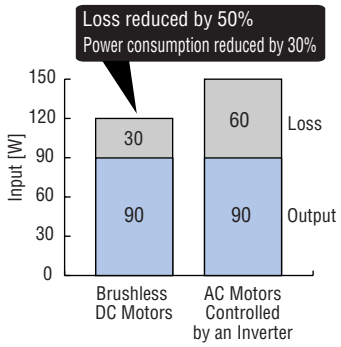
Speed Control Systems allow you to easily set and adjust the speed of a motor. The control system consists of a speed feedback system, a motor, a driver (or a speed control pack) and a speed setting device. The motor for the speed control system is either a Brushless DC Motor or a standard AC Motor.

Brushless DC Motor Systems

Energy-Saving

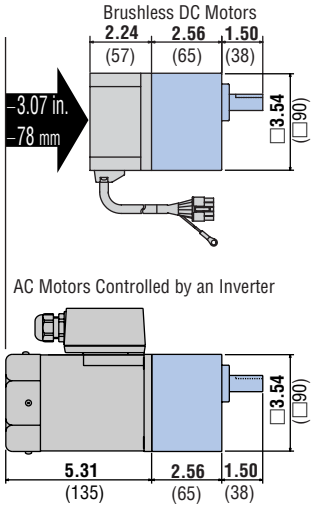
These units use brushless DC motors. Since the efficiency is higher than for an inverter-driven three-phase motor, the electricity consumption is greatly reduced. This contributes to energy savings for the factory.

✻ **AXU** Series 90 W



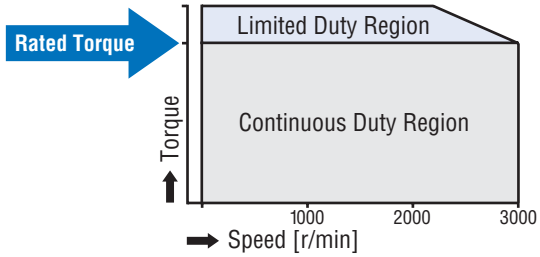
Small, High Power and Compact

The use of a brushless DC motor enables a smaller and more powerful motor than an AC speed control motor. This product will save space and enables downsizing.
AXU Series outputs 90 W (1/8 HP) with □3.54 in. (□90 mm), 2.24 in. (57 mm) length.



Flat Torque Characteristics

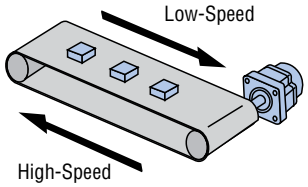
The brushless motor and driver package outputs a constant torque from low speed to high speed. Unlike an AC speed control motor, the torque does not drop in the low-speed region.



Wide Variable Speed Range

In addition to feedback control, this system was designed to achieve a speed range of 3~3000✻ r/min (speed ratio 1:1000) in comparison to a speed range of 200~2400 r/min (speed ratio 1:12) by inverter controlled AC motors.

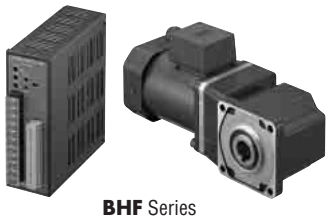
✻ Using the **BX** Series with optional **OPX-1A** control module.



AC Motor Systems

Oriental Motor offers three 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
- Compact speed controller **ES01/ES02**
- Easy connection, easy handling ..... **US** Series



BHF Series

ES01/ES02

US Series

Electronic-Input Control

For brushless motor and driver packages and the **BHF** Series of AC Motor Systems, electronic-input control is possible. The motor 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.

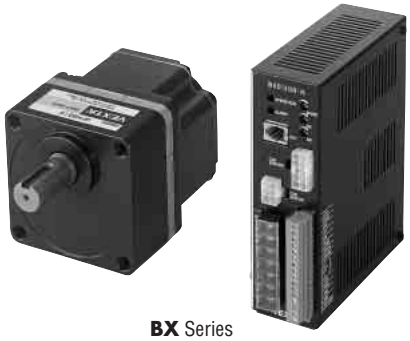
Product Line of Speed Control Systems

Brushless DC Motor Systems

AC Input

BX Series Page B-10

- **Variable Speed Range: 30～3000 r/min**
  with OPX-1A (optional): 3～3000 r/min
- **Output Power: 30 W, 60 W, 120 W, 200 W, 400 W**
  (1/25 HP, 1/12 HP, 1/6 HP, 1/4 HP, 1/2 HP)
- **Speed Regulation: ±0.05% Max. (Relative to load, with optional OPX-1A)**

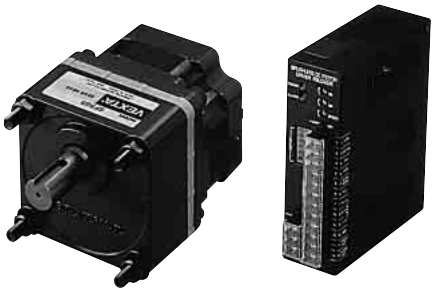


BX Series

- **Features**
- High performance and functionality Brushless DC Motor system
- High-Output Power 200 W, 400 W types. Electromagnetic brake type is also available.
- Electromagnetic brake types allow for vertical applications.
- Combined with the **OPX-1A** (sold separately), it is possible to obtain advanced speed control, torque limiting functionality and position control.
- This product conforms to most global safety standards

FBLⅡ Series Page B-34

- **Variable Speed Range: 300～3000 r/min**
- **Output Power: 75 W, 120 W (1/10 HP, 1/6 HP)**
- **Speed Regulation: −1% Max. (Relative to load)**



FBLⅡ Series

- **Features**
- Slim and powerful Brushless DC Motor and driver system.
- The combination type with a dedicated high-strength gearhead
- This product conforms to most global safety standards.

AXU Series Page B-46

- **Variable Speed Range: 100～2000 r/min**
- **Output Power: 10 W, 25 W, 40 W, 90 W**
  (1/75 HP, 1/30 HP, 1/19 HP, 1/8 HP)
- **Speed Regulation: −2% Max. (Relative to load)**

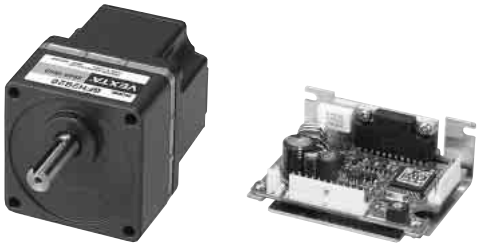
AXU Series

- **Features**
- Thin and compact Brushless DC Motor and Control Unit package.
- The motor and the control unit can be connected easily through the connector. When setting the speed, all you have to do is adjust the potentiometer on the front surface of the control unit.
- This product conforms to most global safety standards.
- Run/Stop, rotation direction, and instantaneous stop can be controlled with external signals.

DC Input

AXH Series Page B-58

- **Variable Speed Range: 100～3000 r/min**
- **Output Power: 15 W, 30 W, 50 W, 100 W**
  (1/50 HP, 1/25 HP, 1/15 HP, 1/8 HP)
- **Speed Regulation: ±1% Max. (Relative to load)**



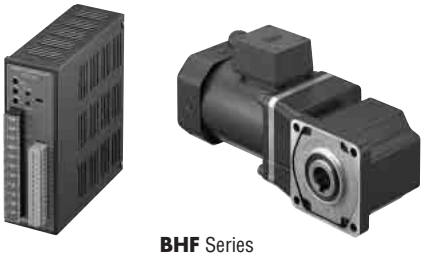
AXH Series

- **Features**
- Thin and powerful Brushless DC Motor and driver system.
- Compact circuit-board type driver (as small as a business card)
- This product conforms to most global safety standards.

AC Motor Systems

BHF Series Page B-70

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



BHF Series

- **Features**

• With a dedicated inverter, the **BHF** Series achieves speed stability with a fluctuation of only ±3%. The inverter 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 inverter side, which allows for vertical applications.
• Motor and gearhead come pre-assembled.
• Wide product variation such as a right-angle shaft (hollow shaft, solid shaft) and a parallel shaft.

Speed Controller

ES01/ES02 Page B-86

- **Variable Speed Range:**
  60 Hz 90～1600 r/min, 50 Hz 90～1400 r/min
- **Output Power: World K Series 6 W, 15 W, 25 W, 40 W, 60 W**
  (1/125 HP, 1/50 HP, 1/30 HP, 1/19 HP, 1/12 HP),
  V Series 6W, 15 W, 25 W, 40 W, 60 W, 90 W
  (1/125 HP, 1/50 HP, 1/30 HP, 1/19 HP, 1/12 HP, 1/8 HP)

ES01/ES02

- **Features**

• Designed for ultimate ease of use of functions and operations.
• Enables multi-functions within the controller, such as speed control, immediate stopping and smooth start and stop.

US Series Page B-116

- **Variable Speed Range:**
  60 Hz 90～1600 r/min, 50 Hz 90～1400 r/min
- **Output Power:**
  Induction Motor 6W, 15 W, 25 W, 40 W, 60 W, 90 W
  (1/125 HP, 1/50 HP, 1/30 HP, 1/19 HP, 1/12 HP, 1/8 HP)

US Series

- **Features**

• Unit consists of a compact control unit with a dedicated motor (component type). One-step connectors make for easy wiring.
• This product conforms to most global safety standards.

Speed Control Systems Selection Guide

There are many different characteristics and functions to consider when selecting a speed control system.

Selection by Speed Control Range

The speed control ranges shown below are for motors only. When adding a gearhead, refer to the page number for the appropriate series as indicated below.

Model			Page	Speed Control Range
Brushless DC Motor Systems	AC Power Input	**BX** Series	B-10	(3 r/min)* 30 r/min – 3000 r/min: 30～3000 r/min (3～3000 r/min)*
		FBLII Series	B-34	300 r/min – 3000 r/min: 300～3000 r/min
		AXU Series	B-46	100 r/min – 2000 r/min: 100～2000 r/min
	DC Power Input	**AXH** Series	B-58	100 r/min – 3000 r/min: 100～3000 r/min
AC Motor Systems	AC Power Input	**BHF** Series	B-70	100 r/min – 2400 r/min: 100～2400 r/min
		ES01/ES02	B-86	90 r/min – 1600 r/min: 90～1600 r/min (60 Hz)
		US Series	B-116	90～1400 r/min (50 Hz)

✻ With the **BX** Series and **OPX-1A** (sold separately), speed range increases to 3～3000 r/min.

Selection by Speed Setting

Model \ Setting Method			Potentiometer Control	External DC Voltage	Digital Control
Brushless DC Motor Systems	AC Power Input	**BX** Series	●	●	●*
		FBLII Series	●	●	
		AXU Series	●		
	DC Power Input	**AXH** Series	●	●	
AC Motor Systems	AC Power Input	**BHF** Series	●	●	
		ES01/ES02	●		
		US Series	●		

✻ **OPX-1A** is required.

Speed Control System Function Comparison

		Series	Page	Slow Start/ Slow Down	Instantaneous Stop	Electronic Input Control	Alarm Output	Multiple Speed Operation	Load Holding	Torque Limiting	Digital Speed Indicator	Safety Standards
Brushless DC Motor Systems	AC Power Input	**BX** Series (Single-Phase 100-115 VAC, Single-Phase 200-230 VAC, Three-Phase 200-230 VAC)	B-10	●	●	●	●	8-speed✻1	●	●✻1	▲✻1	●
		FBLII Series (Single-Phase 100-115 VAC, Single-Phase 200-230 VAC, Three-Phase 200-230 VAC)	B-34	●	●	●	●	2-speed✻2			OP	●
		AXU Series (Single-Phase 100-115 VAC, Single-Phase 200-230 VAC, Three-Phase 200-230 VAC)	B-46	●	●	●	●				OP	●
	DC Power Input	**AXH** Series (24 VDC)	B-58		●	●	●	2-speed✻2			OP	●
AC Motor Systems	AC Power Input	**BHF** Series (Single-Phase 100-115 VAC, Single-Phase 200-230 VAC, Three-Phase 200-230 VAC)	B-70	●	●✻3	●	●	2-speed✻2	●		OP	●
		ES01/ES02 (Single-Phase 100-115 VAC, Single-Phase 200-230 VAC)	B-86	●	●			2-speed✻2			OP	●
		US Series (Single-Phase 110-115 VAC, Single-Phase 220-230 VAC)	B-116								OP	●

✻1 Possible when used with the **OPX-1A** (sold separately).
✻2 Possible by switching between the internal/external potentiometer.
✻3 No instantaneous stop function, however possible to stop within 0.1 second by speed setting.
OP: Possible by using with Motor Speed Indicator, **SDM496** (sold separately).
In addition to the functions shown above,
Multi-Motor Control: **BX** Series, **FBLII** Series, **AXH** Series, **BHF** Series,
Gravitational Operation: **BX** Series, **BHF** Series,
are possible.

How to Read Specifications and Speed–Torque Characteristics

Shown below is an explanation of how to read some important specifications for Speed Control Motors.

Brushless DC Motor Systems

■ How to Read Specifications

	Model	Pinion Shaft Type	AXU210A-GN	AXU210C-GN	AXU210S-GN	AXU425A-GN	AXU425C-GN	AXU425S-GN
		Round Shaft Type	AXU210A-A	AXU210C-A	AXU210S-A	AXU425A-A	AXU425C-A	AXU425S-A
①	Rated Output Power	HP (W)	1/75 (10)			1/30 (25)		
	Power Source Voltage		Single-Phase 100-115 VAC±10%	Single-Phase 200-230 VAC±10%	Three-Phase 200-230 VAC±10%	Single-Phase 100-115 VAC±10%	Single-Phase 200-230 VAC±10%	Three-Phase 200-230 VAC±10%
	Power Source Frequency		50/60 Hz					
	Power Source Rated Input Current	A	0.7	0.4	0.25	1.1	0.65	0.4
②	Power Source Maximum Input Current	A	0.9	0.6	0.4	1.5	0.9	0.7
③	Rated Torque	oz-in (N·m)	7.1 (0.05)			17.7 (0.125)		
④	Starting Torque	oz-in (N·m)	8.5 (0.06)			21 (0.15)		
⑤	Permissible Load Inertia J	oz-in^2 ($\times 10^{-4}$ kg·m^2)	2.7 (0.5)			9.8 (1.8)		
⑥	Rated Speed	r/min	2000					
⑦	Variable Speed Range	r/min	100~2000 (speed ratio 20:1)					
⑧	Speed Regulation Load		−2% Max. (0~rated torque, at rated speed)					
⑧	Speed Regulation Voltage		±1% Max. (power supply voltage ±10 %, at rated speed with no load)					
⑧	Speed Regulation Temperature		±1% Max. (32°F~104°F [0°C~+40°C] at rated speed with no load)					

① Rated output power: This refers to, with the combination of motor and driver (control unit), 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 produced continuously.

② Maximum input current: This refers to, with the combination of motor and driver (control unit), the maximum current sent into the driver (control unit).

③ Rated torque: This refers to, with the combination of motor and driver (control unit), the maximum torque created when they are in continuous operation.

④ Starting torque: This refers to, with the combination of motor and driver (control unit), the limit of torque that can be generated instantaneously.

⑤ Permissible load inertia: This refers to, with the combination of motor and driver (control unit), the maximum load inertia that can be driven. The permissible load specified here is applicable only to round shaft type.

⑥ Rated speed: This refers to, with the combination of motor and driver (control unit), the maximum (limit)* speed. It is the speed at rated output.

✻ For **AXH** series, the maximum speed is the limit of speed.

⑦ Variable speed range: This refers to, with the combination of motor and driver (control unit), the range of variable speed.

⑧ Speed regulation: This shows how much the speed is affected by the change in load, voltage and temperature.

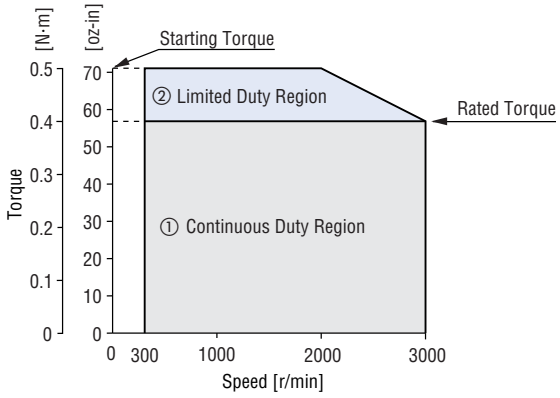
● Permissible Overhung Load and Permissible Thrust Load for Motors

Similar to Standard AC Motors. Refer to “How to Read Specifications” for Standard AC Motors. → Page A-7

■ How to Read Speed–Torque Characteristics

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 5 seconds in the limited duty region, the driver's overload protection function engages and the motor is automatically stopped. This area is also used as the acceleration torque which accelerates the load inertia up to the set speed at motor start-up.



■ How to Read Gearhead Specifications

Similar to Standard AC Motors. Refer to “How to Read Specifications” for Standard AC Motors. → Page A-8

AC Motor Systems

How to Read Specifications

Model		① Maximum Output Power		Voltage	Frequency	② Speed Range	③ Permissible Torque oz-in		mN·m		④ Starting Torque		⑤ Current	Power Consumption
Pinion Shaft	Round Shaft	HP	W	VAC	Hz	r/min	1200r/min		90r/min		oz-in	mN·m	A	W
TP US425-401U	US425-001U	1/30	25	Single-Phase 110	60	90～1600	28	200	7.1	50	14.9	105	0.74	70
				Single-Phase 115	60	90～1600	28	200	7.1	50	14.9	105	0.74	73

① Maximum output power: This refers to, with the combination of motor and control pack, the amount of work that can be performed in a given period of time. It also expresses the maximum output that can be produced within the usage limit line on the speed-torque characteristics graph.

② Speed range: This refers to, with the combination of motor and control pack, the range of variable speed. For Speed Control Motors, the variable speed range varies with the size of load torque.

③ Permissible torque: This refers to, at the most commonly used speeds (1200 r/min, 90 r/min), the maximum torque that can be produced below the safe-operation line or the permissible torque with gearhead attached.

④ Starting torque: This refers to, with the combination of motor and control pack, the size of torque that can be produced instantaneously at motor start-up.

⑤ Current: This refers to the current sent into the control pack at the maximum output.

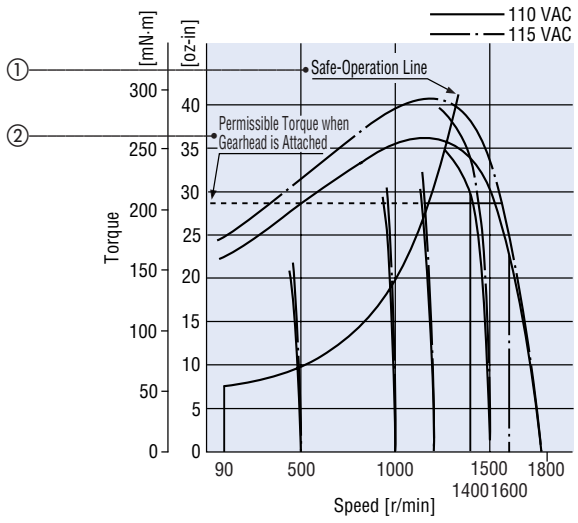
Permissible Overhung Load and Permissible Thrust Load for Motors

Similar to Standard AC Motors. Refer to “How to Read Specifications” for Standard AC Motors. → Page A-7

How to Read Speed–Torque Characteristics

① Safe-operation line: The safe-operation line, measured by the motor’s temperature, indicates its operational limit for continuous usage with the temperature level below the permissible maximum (In case of using a reversible motor, it is measured by 30 minutes operation). 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 below 194°F (90°C), the motor is capable of continuous operation.

② Permissible torque when gearhead is attached: When using a gearhead, 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 possible damage to the motor and/or may shorten its life span.



How to Read Gearhead Specifications

Similar to Standard AC Motors. Refer to “How to Read Specifications” for Standard AC Motors. → Page A-8