AC Speed Control Motors
## Product Line of AC Speed Control Motors

The specifications and functions of each series are introduced with in the lists below. Use these for your series selection.

### Features
- **BHF Series**
  - Smallest Frame Size among 200 W Output Power
  - Speed Regulation ±3%
  - Vertical Operation (gravitational operation) Possible
- **FE100/FE200**
  - Panel-installation type Speed Controller
  - Digital Display of Setting Speed is Possible
  - Parameters Set in Accordance with Motor Output Combinations

### Power Supply Input
- **BHF Series**
  - Single-Phase 100-115 VAC
- **FE100/FE200**
  - Single-Phase 200-240 VAC

### Motor Types
- **Induction Motors**
- **Electromagnetic Brake Motors**

### Output Power

<table>
<thead>
<tr>
<th>Motor Type</th>
<th>Frame Size 60 mm (2.36 in.)</th>
<th>Frame Size 70 mm (2.76 in.)</th>
<th>Frame Size 80 mm (3.15 in.)</th>
<th>Frame Size 90 mm (3.54 in.)</th>
<th>Frame Size 104 mm (4.09 in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>200 W (1/4 HP)</td>
</tr>
</tbody>
</table>

### Speed Control Range

<table>
<thead>
<tr>
<th>r/min</th>
<th>0</th>
<th>1000</th>
<th>2000</th>
<th>3000</th>
</tr>
</thead>
</table>

### Speed Ratio
- 24 : 1
- 12 : 1

### Speed Setting Methods
- Potentiometer Control
  - Internal/External Speed Potentiometer
- Digital Setting
  - —
- External DC Voltage
  - —

### Functions
- Digital Speed Indicator
  - SDM496
- Instantaneous Stop
  - ✽4
- Acceleration/Deceleration Operation
  - —
- Multi-Speed Operation
  - 2 Speeds (Internal/External switching)
  - —
- Load Holding/Gravitational Operation
  - Electromagnetic Brake Type
  - —
- Multi-Motor Control
  - —
- Protective Function
  - —
- Sink/Source Select Input
  - —
- Maximum Extension Distance
  - 50 m (164 ft.)
  - 20 m (65.6 ft.)

### Gearheads
- Parallel Shaft Gearhead
- Right-Angle Gearhead

### Safety Standards

<table>
<thead>
<tr>
<th>ROHS Directive</th>
</tr>
</thead>
<tbody>
<tr>
<td>RoHS</td>
</tr>
</tbody>
</table>

### Notes
- 1 Frame Size 83 mm (3.27 in.)
- 2 Frame Size 91.5 mm (3.60 in.)
- 3 Frame Size 106.5 mm (4.19 in.)
- 4 Although the instantaneous stop function is not available, the deceleration time can be set to as short as 0.1 seconds.

**SDM496**: Possible when a speed indicator (SDM496, accessory) is used.
### Features
- Conforms to safety standards
- Simple Wiring
- Applicable Motors: World K Series, V Series

### Power Supply Input
- Single-Phase 110/115 VAC
- Single-Phase 220/230 VAC

### Motor Types
- Induction Motors
- Reversible Motors

### Output Power

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>Induction Motors</th>
<th>Induction Motors</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 mm (2.36 in.)</td>
<td>6 W (1/125 HP)</td>
<td>6 W (1/125 HP)</td>
</tr>
<tr>
<td>70 mm (2.76 in.)</td>
<td>15 W (1/50 HP)</td>
<td>15 W (1/50 HP)</td>
</tr>
<tr>
<td>80 mm (3.15 in.)</td>
<td>25 W (1/30 HP)</td>
<td>25 W (1/30 HP)</td>
</tr>
<tr>
<td>90 mm (3.54 in.)</td>
<td>40 W (1/19 HP)</td>
<td>40 W (1/19 HP)</td>
</tr>
<tr>
<td>90 mm (3.54 in.)</td>
<td>60 W (1/12 HP)</td>
<td>60 W (1/12 HP)</td>
</tr>
<tr>
<td>90 mm (3.54 in.)</td>
<td>90 W (1/8 HP)</td>
<td>90 W (1/8 HP)</td>
</tr>
</tbody>
</table>

### Variable Speed Range

<table>
<thead>
<tr>
<th>Speed Setting Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potentiometer Control</td>
</tr>
<tr>
<td>Digital Setting</td>
</tr>
<tr>
<td>External DC Voltage</td>
</tr>
</tbody>
</table>

### Functions
- Digital Speed Indicator
- Instantaneous Stop
- Acceleration/Deceleration Operation
- Multi-Speed Operation (2 Speeds, Internal/External switching)
- Load Holding/Gravitational Operation
- Multi-Motor Control
- Protective Function
- Maximum Extension Distance

### Gearheads
- Parallel Shaft Gearhead
- Right-Angle Gearhead
- Linear Heads

### Safety Standards
- UL, CE
- UL, cUL

### Gearheads
- Parallel Shaft Gearhead
- Right-Angle Gearhead
- Linear Heads

### Contact controller
- Simple potentiometer settings

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SDM496: Possible when a speed indicator (SDM496, accessory) is used.
Types and Features of Gearheads and Linear Heads for AC Speed Control Motors

● 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.

<table>
<thead>
<tr>
<th>Types</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel Shaft Gearhead</td>
<td>Long Rated Life of 10000 Hours&lt;br&gt;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.</td>
</tr>
<tr>
<td>Long Life, Low Noise&lt;br&gt;GN-S Gearhead</td>
<td>Low Noise Design&lt;br&gt;The GN-S gearhead generates less noise thanks to gears with a special shape and surface machining assembled with the use of advanced technology.</td>
</tr>
</tbody>
</table>
| Applicable Products<br>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 | Long Rated Life of 10000 Hours<br>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. |
| Long Life<br>GE-S Gearhead | The GE-S gearhead comes with a tapped hole at the tip of the shaft. |
| Applicable Products<br>60 W (1/12 HP) or 90 W (1/8 HP) GE pinion motor (Applicable motors for FE100/FE200) | }

| Parallel Shaft Gearhead | Applicable Products<br>60 W (1/12 HP) or 90 W (1/8 HP) GU pinion motor (Applicable motors for ES01/ES02, US Series) |
| GU Gearhead | }

| Right-Angle Gearhead | Ideal Space-Saving Solution<br>The gear shaft is positioned at right angles with the motor shaft, enabling space-saving. |
| Hollow Shaft and Solid Shaft Types are Available<br>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<br>25 W (1/30 HP) or 40 W (1/19 HP) GN pinion motor<br>60 W (1/12 HP) or 90 W (1/8 HP) GE pinion motor<br>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 | Easy to Achieve Linear Motion<br>A rack-and-pinion mechanism is combined with a reduction mechanism, which allows the motor to convert rotation to linear motion with great ease. |
| LS Linear Heads | Applicable Products<br>6 W (1/125 HP), 25 W (1/30 HP) GN pinion motor (Applicable motors for ES01/ES02) |
| ➔ Page C-247 | }
How to Read Specifications

Specifications Table (Example) World K Series/Speed Controller

<table>
<thead>
<tr>
<th>Motor Model</th>
<th>Applicable Speed Controller</th>
<th>Power Supply Input</th>
<th>Permissible Torque</th>
<th>Speed Setting Range Hz</th>
<th>Permissible Torque Speed Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Voltage VAC</td>
<td>Frequency Hz</td>
<td>Current A</td>
<td>Power W (HP)</td>
<td>Set Frequency Hz (Set Speed r/min)</td>
</tr>
<tr>
<td>TP 2IK6GN-SW2 (2IK6A-SW2)</td>
<td>FE100A Single-Phase 100−120 ±10%</td>
<td>0.68</td>
<td>6 (1/125)</td>
<td>15−50 (450−1500)</td>
<td>6.6 (200)</td>
</tr>
<tr>
<td>TP 3IK15GN-SW2 (3IK15A-SW2)</td>
<td>FE100C Single-Phase 200−240 ±10%</td>
<td>0.42</td>
<td>50−80 (2400)</td>
<td>6.6 (200)</td>
<td>49 (6.9)</td>
</tr>
<tr>
<td>TP 4IK25GN-SW2 (4IK25A-SW2)</td>
<td>FE100S Three-Phase 200−240 ±10%</td>
<td>0.23</td>
<td>15 (1/50)</td>
<td>20−60 (600−1800)</td>
<td>60 (8.5)</td>
</tr>
<tr>
<td>TP 5IK40GN-SW2 (5IK40A-SW2)</td>
<td>FE100A Single-Phase 100−120 ±10%</td>
<td>1.1</td>
<td>50 (1/150)</td>
<td>6.6 (200)</td>
<td>110 (15.6)</td>
</tr>
<tr>
<td>TP 5IK60GE-SW2 (5IK60A-SW2)</td>
<td>FE100C Single-Phase 200−240 ±10%</td>
<td>0.63</td>
<td>15 (1/50)</td>
<td>20−60 (600−1800)</td>
<td>70 (9.9)</td>
</tr>
<tr>
<td>TP 5IK60A-SW2 (5IK60A-SW2)</td>
<td>FE100S Three-Phase 200−240 ±10%</td>
<td>0.33</td>
<td>15 (1/50)</td>
<td>20−60 (600−1800)</td>
<td>70 (9.9)</td>
</tr>
<tr>
<td>TP 5IK90GE-SW2 (5IK90A-SW2)</td>
<td>FE100A Single-Phase 100−120 ±10%</td>
<td>1.3</td>
<td>25 (1/30)</td>
<td>6.6 (200)</td>
<td>60 (8.5)</td>
</tr>
<tr>
<td>TP 5IK90A-SW2 (5IK90A-SW2)</td>
<td>FE100C Single-Phase 200−240 ±10%</td>
<td>0.77</td>
<td>25 (1/30)</td>
<td>6.6 (200)</td>
<td>60 (8.5)</td>
</tr>
<tr>
<td>TP 5IK90A-SW2 (5IK90A-SW2)</td>
<td>FE100S Three-Phase 200−240 ±10%</td>
<td>0.43</td>
<td>25 (1/30)</td>
<td>6.6 (200)</td>
<td>60 (8.5)</td>
</tr>
</tbody>
</table>

1. Current: This refers to, with the combination of motor and speed controller, the maximum current value sent into the speed controller.
2. Output Power: This refers to, with the combination of motor and speed controller, the amount of work that can be performed in a given period of time. It also expresses the maximum output that can be generated within the permissible torque (continuous operation region) on the speed – torque characteristics diagram.
3. Permissible Torque: Maximum torque that can be used in a range of the specified frequency (or speed) with the applicable combination of motor and speed controller.
4. Speed Setting Range: Frequency (or speed) that can be set with the applicable combination of motor and speed controller. The actual speed varies depending on the load conditions.

How to Read Specifications

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

How to Read Gearhead Specifications

Similar to standard AC motors. Refer to “How to Read Gearhead Specifications” of constant speed motors.
# How to Read Specifications

## Specifications Table  (Example) E501/E502/World K Series Speed Control Motors

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinion Shaft Type</td>
<td>Round Shaft Type</td>
<td>W (HP)</td>
<td>Hz</td>
<td>r/min</td>
<td>mN·m (oz-in)</td>
<td>mN·m (oz-in)</td>
<td>A</td>
<td>W (μF)</td>
<td>μF</td>
</tr>
<tr>
<td>4IK25RGN-AW2U</td>
<td>4IK25RA-AW2U</td>
<td>25 (1/30)</td>
<td>Single-Phase 110</td>
<td>60</td>
<td>90~1600</td>
<td>185 (26)</td>
<td>50 (7.1)</td>
<td>120 (17.0)</td>
<td>0.75</td>
</tr>
</tbody>
</table>

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 G-62 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 C-12

## How to Read Speed – Torque Characteristics

### Speed – Torque Characteristics  (Example) E501/4IK25RGN-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 C-13