Constant Speed Operation

- **Uni-directional Continuous Operation**
  - Induction Motors
  - Page C-21
  - Three-phase high efficiency induction motors → Page C-23

- **Instant Switching of Rotational Direction**
  - Reversible Motors
  - Page C-147

- **Synchronous and Instant Switching of Rotation Direction. Instantaneous Stopping.**
  - Low-Speed Synchronous Motors
  - Page C-167

Constant Speed Operation + Easy Positioning

- **Vertical Operation and Load Holding**
  - Electromagnetic Brake Motors
  - Page C-155
  - Three-phase high efficiency induction motors with electromagnetic brake → Page C-23

- **High-Frequency Start, Stop, Positioning, Indexing and Intermittent Inching Feeding**
  - Clutch & Brake Motors
  - Page C-163

- **Instantaneous Stopping Motor with Specialized Circuit**
  - Brake Pack
  - Page C-191

Peripheral Products

- Easy Assembly of the Motor & Linear Motion Mechanism
  - Linear Heads → Page C-185

- For Greater Speed Stability, Higher Speeds, and a Wider Speed Range:
  - AC Speed Control Motors
  - Brushless Motors
  - Servo Motors

For High Accuracy Positioning

- BXII Series → Page D-86

- Stepper Motors
- Servo Motors
- Linear & Rotary Actuators
Operation under Specific Applications or Environments

- **Tension, Torque Control**
  - Torque Motors
  - Page C-171

- **Watertight, Dust-Resistant**
  - Watertight, Dust-Resistant Motors
  - Page C-177

Variable Speed Operation

- **Easy and Affordable Speed Control of AC Motors**
  - AC Speed Control Motors
  - Page D-135
  - Inverter controllable three-phase high efficiency induction motors
    - Page C-23

- **Highly Accurate Speed Stability and a Wide Speed Control Range**
  - Brushless Motors
  - Page D-11

High Positioning Accuracy and Fine Feed Operation

- **Compact High Torque Motor for High Response Positioning**
  - Stepper Motor and Driver Packages
    - AC Input Type Page A-136
    - Stepper Motor and Driver Packages (1.8°/0.9° and 0.72°/0.36°)
      - AC Input Type Page A-84
      - DC Input Type Page A-206

- **Constant (Flat) Torque Characteristic from Low Speed to High Speed**
  - Servo Motors
  - Page B-1

Peripheral Products

- For Further High-Speed Performance
  - Servo Motors
  - Page B-1

- A Ball Screw, Hollow Table and Other Mechanisms are Incorporated in the Stepper Motor.
  - Linear & Rotary Actuators
  - Page E-2
Time-saving Ready-made Combination of Motor and Linear Motion/Rotation Components

- **Transferring Loads**
  - Ball Screw
  - Electric Linear Slides
    - Page E-16

- **Pushing and Pulling Loads**
  - Ball Screw
  - Electric Cylinders
    - Page E-56

- **Pushing and Pulling Small Loads or Fine-Tuning**
  - Ball Screw
  - Compact Linear Actuators
    - Page E-108

- **Index Drive**
  - Hollow Rotary Table
  - Hollow Rotary Actuators
    - Page E-118

Motor Control via Network

- Programmable Controller (Master)
  - Various Network Units
    - CPU Unit
    - Power Supply

- Network Converter
  - Motor and Driver Package
  - Various Network Communication
  - RS-485 Communication

- Motor and Driver Package
  - Electric Linear Slides and Cylinders
  - Network Converter-Compatible Products
  - RS-485 Communication-Compatible Products

- The network converter is a transducer for FA network protocol and RS-485 communication protocol used for Oriental Motor products. Network Converters → Page F-8

Cooling Measures

- **Cooling, Drying and Ventilation**
  - Cooling Fans
    - Page G-2

- **Optimized Cooling for Control Boxes**
  - Enclosure Fan Modules
    - Page G-95

- **Energy Saving: Only Operates when Needed**
  - Thermostat
    - Page G-103

This is an operation in which cooling heat sources, drying loads or ventilation is required.
Motors are classified according to their differences in basic principles of operation and their structures.

### Classification Based on Motor Characteristics

**Motors Suitable for Constant Speed**

The induction motor is operated merely by connection to an AC power supply and has a rated speed of approximately 1450 r/min (60 Hz), which is constant. It is ordinarily used with a gearhead connected directly for a lower speed. Reversible motors (30 minutes rating) are capable of instantaneous bi-directional operation. Products with electromagnetic brake on the back of the motor are also available. These motors can be equipped with a brake pack for instantaneous stopping and switching the rotation direction.

**Standard AC Motors**

- **Induction Motors (6 W~200 W)**
- **Reversible Motors (1 W~90 W)**
- **Electromagnetic Brake Motors (6 W~200 W)**
- **Clutch & Brake Motors (6 W~90 W)**
- **Low-Speed Synchronous Motors**

**Motors with Other Functions**

- **Torque Motors (3~20 W)**
- **Watertight, Dust-Resistant Motors (25~90 W)**
- **Brake Pack**

**Speed Control Motors**

For motors intended for speed control, there are high-efficiency brushless motors and AC speed control motors with controllers for controlling induction motors.

**AC Speed Control Motor and Driver Packages**

- **BMU Series**
- **BLE Series**
- **DSC Series**
- **BHF Series**

**Position Control Motors**

Position control motors are compact, have a wide speed range with high torque and provide superior control. The pulse signal from the controller (pulse generator) specifies the rotation angle and speed for accurate positioning operation. Stepper motors do not require tuning, have superior synchronization and position holding and can be used in simple system configurations. Servo motors follows up on commands, providing high speed and superior responsiveness.

**Stepper Motor vs. Servo Motor**

The stepper motor generates a high torque at low-speed range and the servo motor differs in having a flat characteristic at high-speed range. Therefore, in a positioning operation, the positioning time becomes shorter for stepper motors at short distances and shorter for servo motors at long distances (characteristics vary depending on a product).
Speed, speed control range, positioning function and resolution are important points in making a selection. The following explains how to select a suitable motor based on the performance using representative motors as examples.

### Motor Performance Comparison

#### Speed and Speed Control Range

Standard AC motors (constant speed motors), such as induction motors, vary their speed according to the power supply frequency, and the rated speed is approximately 1450 r/min at 60 Hz. If the required speed exceeds 1200 r/min, select a brushless motor. If the required speed is 5000 r/min, select a servo motor.

![Speed and Speed Control Range Graph](image)

**Induction Motors**
- Approx. 1450 r/min : 60 Hz

**AC Speed Control Motors**
- DSC Series: 80~1600 r/min : 60 Hz
- BHF Series: 100~2400 r/min

**Brushless Motors**
- BMU Series: 80~4000 r/min

**Servo Motors**
- NX Series: 80~5500 r/min

#### Stopping and Positioning Performance

An electromagnetic brake type motor, brake pack, AC speed control motor or brushless motor uses sensors to stop the load with the instantaneous stop function, and they are therefore subject to overrun (overshoot). If the equipment must perform high accuracy positioning operations, a stepper motor or servo motor offering excellent stopping accuracy is required. The stopping accuracy of stepper motors is ±0.05° (RKII Series, No-load state). The stopping accuracy of servo motors is ±0.05° (NX Series).

![Stopping and Positioning Performance Graph](image)

**Number of Rotations until Motor Stops (Reference value for no-load state)**

<table>
<thead>
<tr>
<th>Motor Type</th>
<th>Number of Rotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Induction Motors</td>
<td>30~40 Rotations</td>
</tr>
<tr>
<td>Reversible Motors</td>
<td>5~6 Rotations</td>
</tr>
<tr>
<td>Electromagnetic Brake Motors</td>
<td>1~1.5 Rotations</td>
</tr>
<tr>
<td>Instantaneous Stop Using Brake Pack</td>
<td>2~3 Rotations</td>
</tr>
<tr>
<td>AC Speed Control Motors*1</td>
<td>0.3 Rotations</td>
</tr>
<tr>
<td>DSC Series</td>
<td></td>
</tr>
<tr>
<td>Brushless Motors*1</td>
<td></td>
</tr>
<tr>
<td>BMU Series**2</td>
<td></td>
</tr>
</tbody>
</table>

*1 The overrun amount varies depending on the product or whether a speed reduction mechanism is equipped.

**Note**

- The above values are measured at the motor shaft under no load. Use this data only as a reference since the actual values will vary depending on the specific load condition.

#### Resolution

For high-precision positioning, select a stepper motor or a servo motor. For stepper motors, Oriental Motor offers 0.72°/0.36° and 1.8°/0.9° stepper motor and driver packages. Compared to the 1.8°/0.9°, the 0.72°/0.36° stepper motor and driver packages offer higher resolution and are capable of finer positioning operation. The resolution of a 0.72°/0.36° stepper motor and driver package is nearly equivalent to a servo motor (with their initial settings), but stepper motors generally have the basic characteristic of generating high torque in the low-speed range, and servo motors generally have the basic characteristic of generating high torque in the high-speed range. This is a factor that should be assessed when selecting a motor.

**Resolution Graph**

<table>
<thead>
<tr>
<th>Motor Type</th>
<th>Resolution [°/step]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stepper Motors</td>
<td>0.36° (Initial Setting)</td>
</tr>
<tr>
<td>RKII Series</td>
<td>0.72° (Initial Setting)</td>
</tr>
<tr>
<td>RBK Series</td>
<td>1.8° (Initial Setting)</td>
</tr>
<tr>
<td>NX Series</td>
<td>0.36° (Initial Setting)</td>
</tr>
</tbody>
</table>

* The resolution can be changed freely. The available values and range vary depending on the product.