2-Phase Stepping Motors
2-Phase Stepping Motors

Six frame sizes are available in a range from 1.10 in. (28 mm) to 3.35 in. (85 mm). In addition to the standard type, we offer high torque type, PV Series (high inertia capability), high-resolution type and SH geared type. The motor windings also come in various specifications.

### Wide Variety

<table>
<thead>
<tr>
<th>Series/Type</th>
<th>Size</th>
<th>Motor Frame Size: in. (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>▪1.10 in.</td>
<td>▪1.38 in.</td>
</tr>
<tr>
<td></td>
<td>(28 mm)</td>
<td>(35 mm)</td>
</tr>
<tr>
<td></td>
<td>▪1.65 in.</td>
<td>▪2.22 in.</td>
</tr>
<tr>
<td></td>
<td>(42 mm)</td>
<td>(56.4 mm)</td>
</tr>
<tr>
<td></td>
<td>▪2.65 in.</td>
<td>▪3.35 in.</td>
</tr>
<tr>
<td></td>
<td>(60 mm)</td>
<td>(85 mm)</td>
</tr>
</tbody>
</table>

- **PK Series**
  - Standard Type
    - Page C-202
    - Page C-214
    - Page C-227
  - High Torque Type
    - Page C-196
    - Page C-200
    - Page C-204
  - High Resolution Type
    - Page C-208
    - Page C-218

- **SH Geared Type**
  - Page C-198
  - Page C-212
  - Page C-222

- **PV Series** (High Inertia Capability)
  - Page C-214
  - Page C-224

1. Gearhead frame size is 2.65 in. sq. (60 mm sq.)
2. Gearhead frame size is 3.54 in. sq. (90 mm sq.)
**Accessories (Sold Separately)**

- **Motor Mounting Brackets**
  - Page → C-291
  - Mounting brackets cannot be used with SH geared types.

- **Clean Dampers**
  - Page → C-289
  - Effective at suppressing motor vibration and improving performance.

- **Flexible Couplings**
  - MC Motor Couplings
  - Page → C-284
  - MCL Gearmotor Couplings
  - Page → C-286

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**2-Phase Stepping Motor and Driver Packages**

To achieve maximum performance, motors with dedicated drivers are available.

- **AC Input**
  - UMK Series
  - Page C-149

- **DC Input**
  - CSK Series
  - Page C-161

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**2-Phase Stepping Motor Driver with Built-in Indexer UI2120G**

Combines a high performance stepping motor driver with microprocessor intelligence and an integrated pulse generator.

- Page C-241
**PK Series**

**Standard Type**

The standard PK Series 2-phase stepping motor offers balanced performance enhanced by high torque, low vibration and low noise. Optimal motor size and winding specification can be selected from a wide range of motor variations.

**With Encoder**

The PK Series 2-phase stepping motor with encoder offers high torque and precise feedback capability.

- Encoder Feedback Type: Incremental
- Two feedback resolutions: 200 and 400 pulses/rev.
- Provides closed loop system capability

**High Torque Type**

This motor type combines high torque and a compact size. Three frame sizes, 1.10 in. (28 mm), 1.38 in. (35 mm) and 1.65 in. (42 mm), are available. Each specification provides torque equivalent to a motor of the next larger frame size, supporting high-torque operation even in the high-speed range.

For example, high torque type PK246PB [motor frame size 1.65 in. (42 mm)] has the same holding torque as the standard type PK266-01B [motor frame size 2.22 in. (56.4 mm)]. This means a smaller size motor will maintain the same torque. This allows for downsized and lightweight equipment.

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**High Resolution Type**

These 2-phase, high resolution stepping motors have half the step angle of standard stepping motors. The high resolution type increases motor resolution from 200 steps/revolution to 400 steps/revolution. Smaller step-angles can be achieved by half-step driving or microstep driving. Such options, however, do not improve accuracy. Other than having twice as many rotor teeth as standard stepping motors, all other structures are exactly the same as the standard motors.
**SH Geared Type**

Incorporating SH gears with high permissible torque, these models offer the full benefit of the speed reducing capability of geared motors, delivering high resolution, high torque and smooth low-speed rotation. With performance like this, the SH Geared type can easily satisfy the requirements of various kinds of low-speed positioning applications.

- **Smooth Rotation at Low Speeds**
  Stepping motors at low speed produce a relatively high amount of vibration. Use of a gearhead allows for an increase in the speed of the motor which results in a smoother motion while maintaining the low output speed required by the application.

- **Six Gear Ratios**
  SH geared motors are available with six different gear ratios: 3.6:1, 7.2:1, 9:1, 10:1, 18:1, 36:1. The low ratios of these gearheads can greatly facilitate speed control of the 2-phase stepping motors.

  - **PK223-SG** type is not available in a gear ratio of 3.6:1.

- **Ideal for High Inertia Drive**
  The stepping motor itself can drive an inertia of 10 times the rotor inertia. The geared type can reduce the load inertia by the square of the gear ratio. Therefore, the geared type is suitable for driving larger inertial loads.

**PV Series**

**High Inertia Capability**

The PV Series provides, on average, 1.5 times higher torque than a standard stepping motor. By utilizing a larger rotor diameter, larger magnets can be used to significantly increase the output torque.

- **Angle–Torque Characteristics**
  All equipment has a friction load, and the motor stops when the motor output torque and friction load torque are balanced. As shown in the characteristics above, the larger the output torque per step angle, the less the motor is influenced by the friction load, so positioning accuracy is improved. Stop positioning displacement by external force does not occur as often.
Connection Diagrams

Motor Wiring Diagrams

<table>
<thead>
<tr>
<th>4 Lead Motor</th>
<th>6 Lead Motor</th>
<th>8 Lead Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Phase</td>
<td>A Phase</td>
<td>A Phase</td>
</tr>
<tr>
<td>Black</td>
<td>Black (4)</td>
<td>Black</td>
</tr>
<tr>
<td>Green</td>
<td>Yellow (5)</td>
<td>Orange</td>
</tr>
<tr>
<td>Red</td>
<td>White (2)</td>
<td>Blue</td>
</tr>
<tr>
<td>Blue</td>
<td>Blue (1)</td>
<td>Brown</td>
</tr>
<tr>
<td>B Phase</td>
<td>B Phase</td>
<td>B Phase</td>
</tr>
</tbody>
</table>

Wire Connection Diagrams

<table>
<thead>
<tr>
<th>4 Lead Bipolar Connection</th>
<th>6 Lead Unipolar Connection</th>
<th>6 Lead Bipolar (Series) Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Black (4)</td>
<td>Black (4)</td>
</tr>
<tr>
<td>Green</td>
<td>Yellow (5)</td>
<td>N.C. (5)</td>
</tr>
<tr>
<td>Red</td>
<td>White (2)</td>
<td>Green (6)</td>
</tr>
<tr>
<td>Blue</td>
<td>Blue (1)</td>
<td>Red (3)</td>
</tr>
<tr>
<td>Orange</td>
<td>Black</td>
<td>White</td>
</tr>
<tr>
<td>Yellow</td>
<td>Black</td>
<td>Blue</td>
</tr>
<tr>
<td>Green</td>
<td>Yellow</td>
<td>Brown</td>
</tr>
<tr>
<td>Blue</td>
<td>Green</td>
<td>Blue</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8 Lead Unipolar Connection</th>
<th>8 Lead Bipolar (Series) Connection</th>
<th>8 Lead Bipolar (Parallel) Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Black</td>
<td>Black</td>
</tr>
<tr>
<td>Yellow</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
<tr>
<td>Orange</td>
<td>Orange</td>
<td>Orange</td>
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<tr>
<td>White</td>
<td>White</td>
<td>White</td>
</tr>
<tr>
<td>Brown</td>
<td>Brown</td>
<td>Brown</td>
</tr>
</tbody>
</table>

- The numbers inside the parentheses indicate the connector pin No. of the high torque type motor.
- N.C.: No Connection

Notes on the Speed–Torque Characteristics Diagrams

The speed-torque characteristics featured in this catalog are as measured with a constant-current driver or a constant-voltage driver. The actual characteristics will vary depending on the driver used. Please use these diagrams only for reference purposes when selecting a motor. You should also conduct a thorough evaluation with the actual driver to be used.