

# 2-Phase Stepping Motors

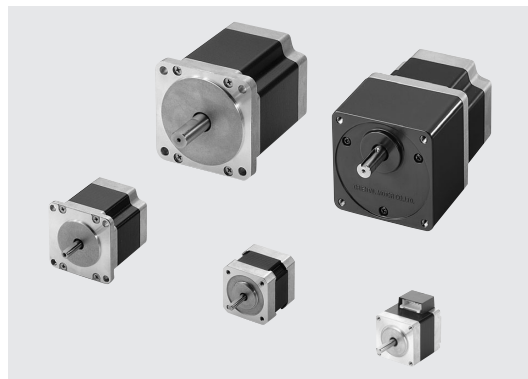
### Additional Information

- Technical Reference .....F-1
- General Information .....G-1

Introduction	AS	AS PLUS	ASC	RK	CFK II	CSK	PMC	UMK	CSK	2-Phase Stepping Motors without Encoder	PK/PV	PK	Driver with Indexer	Controllers	SMK	Low-Speed Synchronous Motors	Accessories	Before Using a Stepping Motor
	Closed Loop <i>Qstep</i> AC Input		DC Input	5-Phase Microstep AC Input		DC Input	5-Phase Full/Half DC Input		AC Input									

## 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 standard **P** type (high torque), **PV** Series (high inertia capability), high-resolution type and **SH** geared type. The motor windings also come in various specifications.



### Wide Variety

Series/Type	Size	Motor Frame Size: in. (mm)					
		□1.10 in. (□28 mm)	□1.38 in. (□35 mm)	□1.65 in. (□42 mm)	□2.22 in. (□56.4 mm) <sup>*1</sup>	□2.65 in. (□60 mm)	□3.35 in. (□85 mm) <sup>*2</sup>
PK Series	Standard Type	—	—	 Page C-202	 Page C-214 with Encoder page → C-233	—	 Page C-227
	Standard <b>P</b> Type (High Torque)	 Page C-196	 Page C-200	 Page C-204	—	—	—
	High Resolution Type	—	—	 Page C-208	 Page C-218 with Encoder page → C-239	—	—
	<b>SH</b> Geared Type	 Page C-198	—	 Page C-212	 Page C-222 <sup>*1</sup>	—	 Page C-231 <sup>*2</sup>
<b>PV</b> Series (High Inertia Capability)	—	—	—	—	 Page C-224	—	

<sup>\*1</sup> Gearhead frame size is 2.65 in. sq. (60 mm sq.)

<sup>\*2</sup> Gearhead frame size is 3.54 in. sq. (90 mm sq.)



## 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

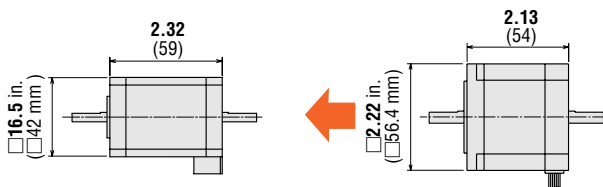
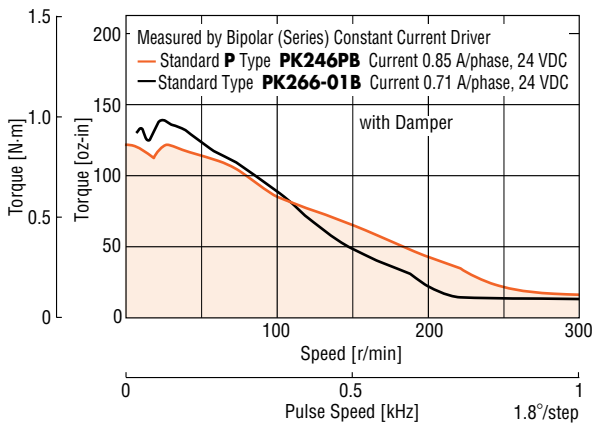
The **PK Series** 2-phase stepping motor with encoder offers high torque and precise feedback capability.

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

### Standard P Type (High Torque)

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.

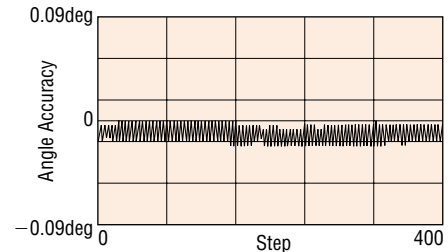
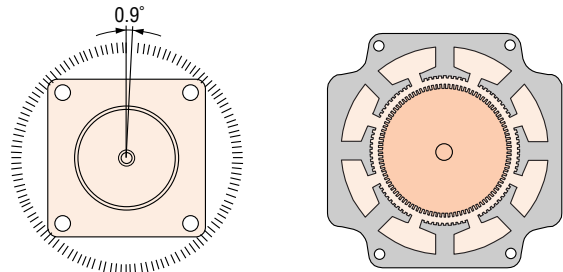
For example, Standard **P** type **PK246PB** [motor frame size 1.65 in. (42 mm)] has the same holding torque as the standard type **PK266-01B** [motor frame size 2.22 in. (56.4 mm)]. This means a smaller size motor will maintain the same torque. This allows for downsized and lightweight equipment.



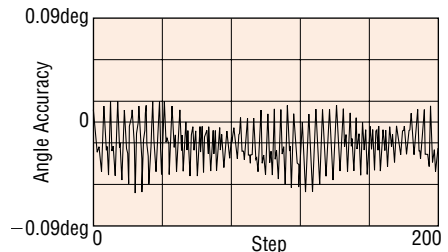
Standard <b>P</b> Type <b>PK246PB</b>	Type Model	Standard Type <b>PK266-01B</b>
132 oz-in (0.93 N·m)	<b>Holding Torque</b>	166 oz-in (1.17 N·m)
0.77 oz-in <sup>2</sup> (114×10 <sup>-7</sup> kg·m <sup>2</sup> )	<b>Rotor Inertia</b>	1.64 oz-in <sup>2</sup> (300×10 <sup>-7</sup> kg·m <sup>2</sup> )

### High Resolution Type

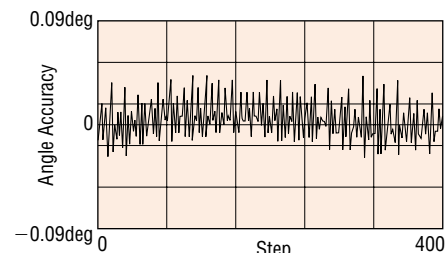
These 2-phase, high resolution stepping motors have half the step angle of standard stepping motors. The high resolution type increases motor resolution from 200 steps/revolution to 400 steps/revolution. Smaller step-angles can be achieved by half-step driving or microstep driving. Such options, however, 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.



(1) High Resolution Type (0.9°/Step)



(2) Standard Type (1.8°/Step)



(3) Standard Type (0.9°/Step)

Angle Accuracy

## 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.

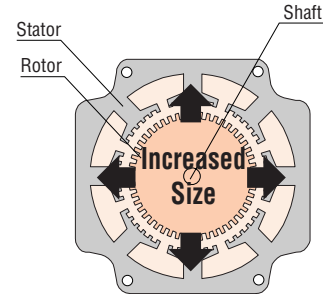
### ● Ideal for High Inertia Drive

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.

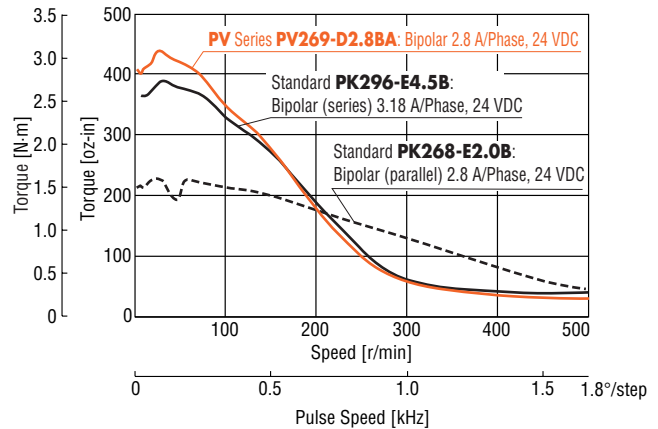
## PV Series

### High Inertia Capability

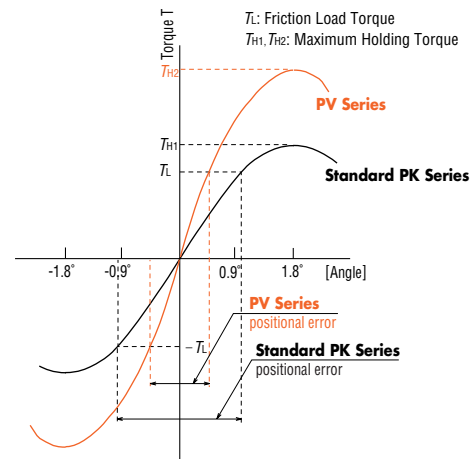
The **PV** Series provides, on average, 1.5 times higher torque than a standard stepping motor. By utilizing a larger rotor diameter, larger magnets can be used to significantly increase the output torque.



Motor structure  
(Cross section perpendicular to shaft)



### 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.

Introduction

AS

AS PLUS

ASC

RK

RK II

CSK

PMC

UMK

CSK

PK/PV

PK

UI2120G

EMP401

SC8800

SC8800E

SG8030J

SMK

Accessories

Before Using a Stepping Motor

Driver

with Indexer

Controller

Low-Speed Synchronous Motors

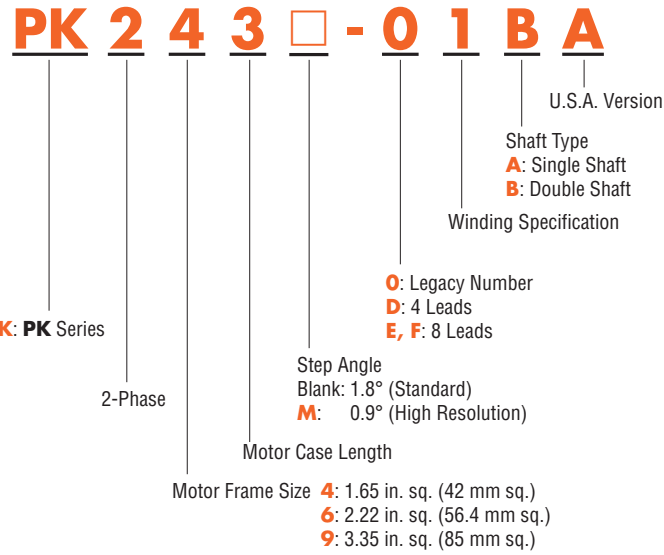
Accessories

Before Using a Stepping Motor

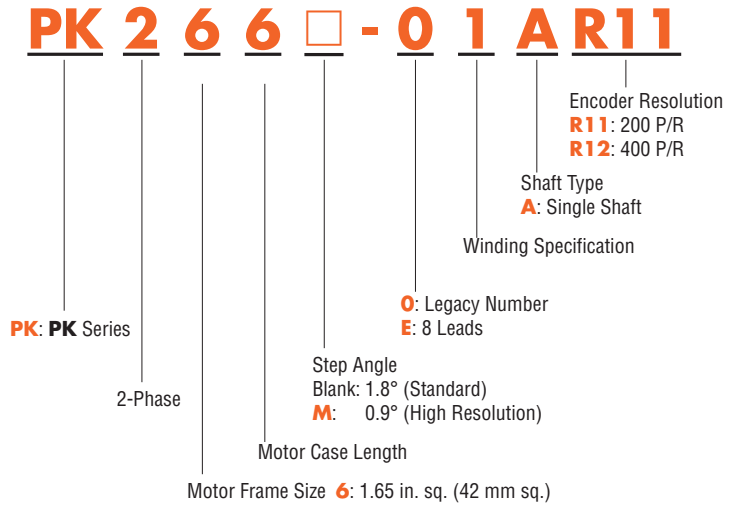
■ Product Number Code

● PK Series

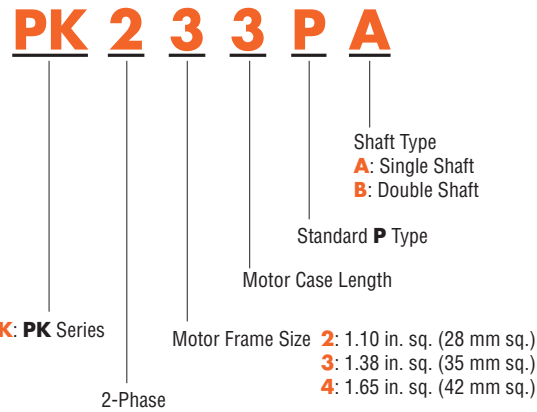
◆ Standard Type, High Resolution Type



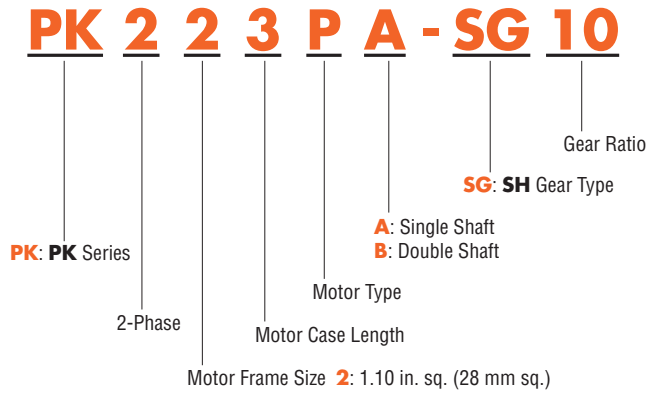
◆ Standard Type, High Resolution Type with Encoder



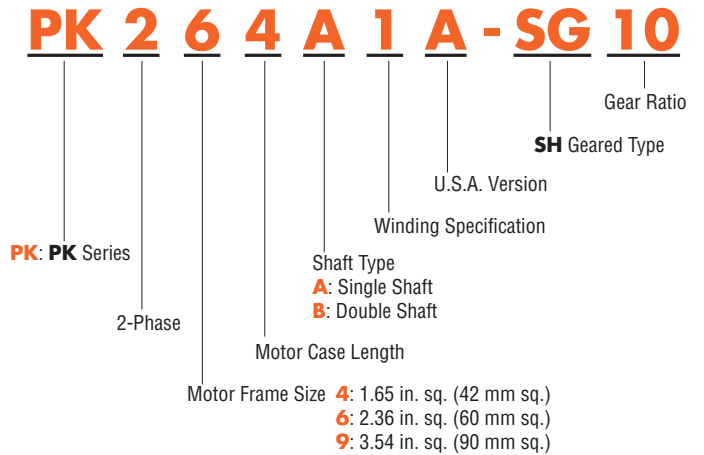
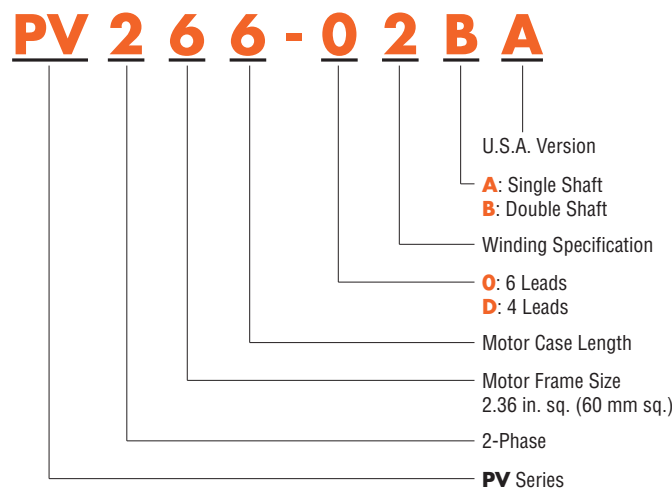
◆ Standard P Type (High Torque)



◆ SH Geared Type

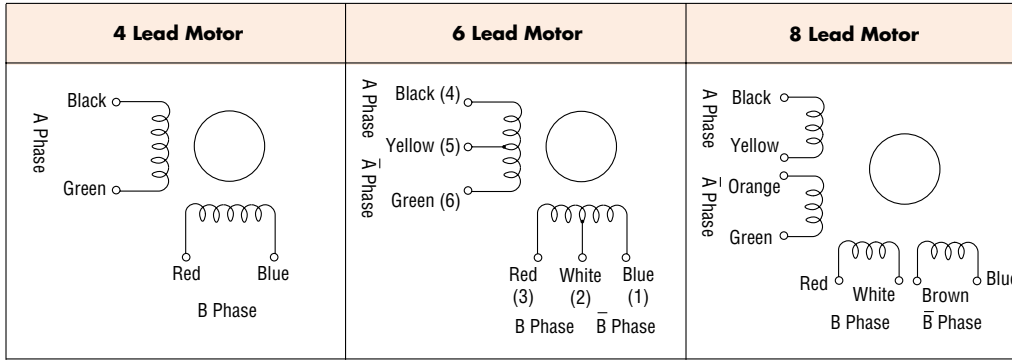


● PV Series (High Inertia Capability)

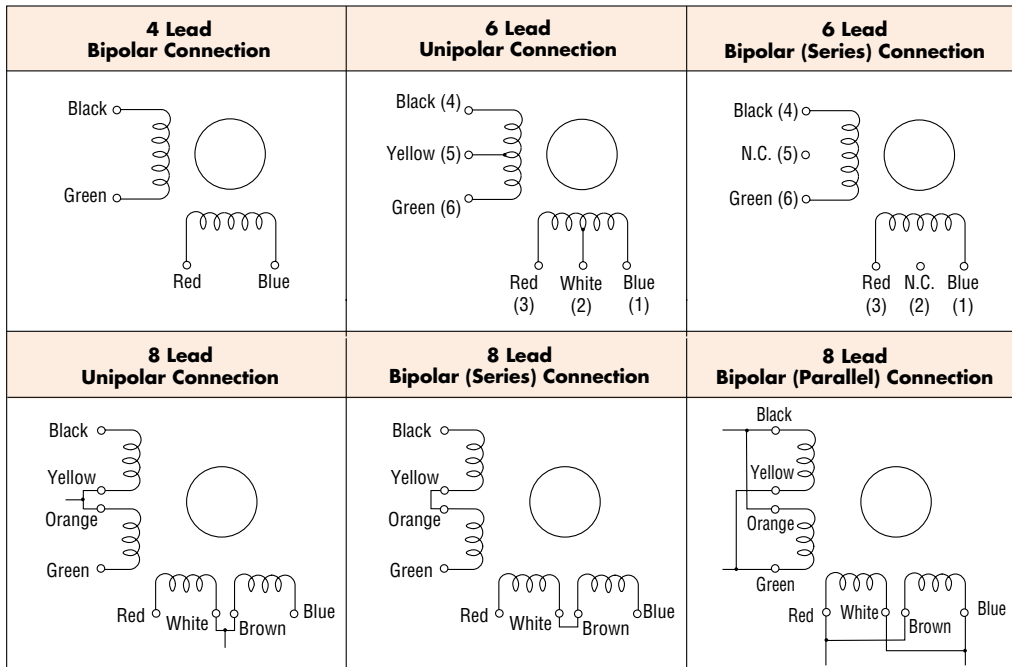


## Connection Diagrams

### Motor Wiring Diagrams



### Wire Connection Diagrams



- The numbers inside the parentheses indicate the connector pin No. of the standard **P** 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.

Introduction

AS

AS PLUS

ASC

RK

CFK II

CSK

PMC

UMK

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PK

with Indexer

without Encoder

with Encoder

with Indexer

EMP401

EMP402

SC8800

SC8800E

SG8030J

SMK

Accessories

Before Using a Stepping Motor

Low-Speed Synchronous Motors

Accessories

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