

Types of Stepping Motors

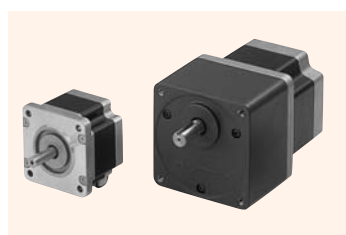
● **Package Products:** We offer a wide variety of motors and drivers.

Power Supply Input	AC Input		
	Single-Phase 100-115 VAC, 200-230 VAC, Three-Phase 200-230 VAC	Single-Phase 100-115 VAC, 200-230 VAC	Single-Phase 100/115 VAC
Series	<i>α</i>STEPAS Series	RK Series	UMK Series
Features			
	● High reliability due to closed loop control ● No gain tuning required ● High resolution control due to microstepping	● Low vibration, low noise due to smooth drive function ● High-resolution control is possible by microstepping	● 2-phase stepping motor and compact AC input driver in one package
Motor Type	Closed Loop Control Stepping Motors	5-Phase Stepping Motors	2-Phase Stepping Motors
Basic Step Angle	0.36°(Resolution Setting: 1000 P/R)	0.72°	1.8°
Resolution	Microstep 0.72°, 0.36°, 0.072°, 0.036°	Microstep 0.72°~ 0.00288° (16 steps)	Full Step/Half Step 1.8°/0.9°
Function	Closed loop control Resolution switch Pulse input mode switch Automatic current cutback Current Setting Speed Filter Protection Function	Smooth drive function Pulse input mode switch Automatic current cutback Automatic current off Electromagnetic brake switch function (Energy-saving mode) Resolution select All windings off input Timing output Overheat output	Pulse input mode switch Automatic current cutback Automatic current off Step angle switch All windings off input Timing output Overheat output logic switch
Safety Standards			—
Line up	Standard Motor	☐ 42, 60, 85 (mm)	☐ 42, 56.4 (mm)
	Electromagnetic Brake Motor	☐ 42, 60, 85 (mm)	—
	Geared Motor	☐ 42, 60, 90 (mm)	—
Pages	Page C-9	Page C-63	Page C-107

*For the motor frame size of 42mm type, only the driver conforms to the CSA standard.

● **Stepping Motor:** Wide-ranging motors ideal for different motor sizes and equipment specifications can be purchased individually.

◇ 2-Phase Stepping Motors



Page C-161

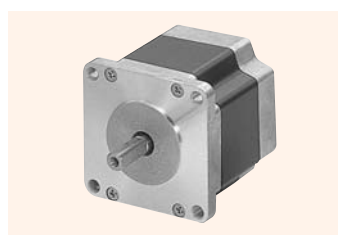
Motor Frame Size (mm):

☐ 28, 35, 42, 50, 56.4, 60, 85, 90

Line-up:

Standard Type
High-Torque Type
High-Resolution Type
SH Geared Type

◇ 5-Phase Stepping Motors



Page C-183

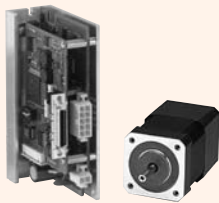
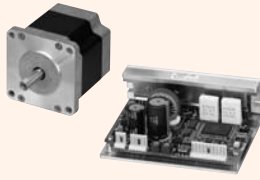
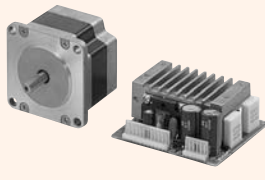
Motor Frame Size (mm):

☐ 42, 60, 85

Line-up:

Standard Type
High-Speed Type

● See page C-4 for Introduction of Stepping Motors

Power Supply Input	DC Input		
	24 VDC	24–36 VDC	24/36 VDC, 24 VDC
Series	<i>α</i> STEP ASC Series	Fine Step CFK II Series	CSK Series
Features			
	● High reliability due to closed loop control ● No gain tuning required ● High resolution control due to microstepping	● 5-phase stepping motor and compact DC input driver in one package ● High-resolution control is possible by microstepping	● 2-phase stepping motor and compact DC input driver in one package ● Wide variety of frame sizes and types
Motor Type	Closed Loop Control Stepping Motors	5-Phase Stepping Motors	2-Phase Stepping Motors
Basic Step Angle	0.36° (Resolution Setting: 1000 P/R)	0.72°	1.8°, 0.9° (High-Resolution Type)
Resolution	Microstep 0.72°, 0.36°, 0.072°, 0.036°	Microstep 0.72° ~ 0.00288° (16 steps)	Full Step/Half Step 1.8°/0.9°, 0.9°/0.45° (High-Resolution Type)
Function	Closed loop control Resolution switch Pulse input mode switch Automatic current cutback Current Setting Speed Filter Protection Function	Automatic current cutback Pulse input mode Resolution select switch All windings off input Timing output	Automatic current cutback Step angle switch Pulse input mode switch Input power supply voltage switch All windings off input Setting current monitor output Timing output
Safety Standards		—	—
Line up	Standard Motor	□ 28, 42, 60 (mm)	□ 20, 28, 42, 60, 85 (mm)
	Electromagnetic Brake Motor	□ 42, 60 (mm)	—
	Geared Motor	□ 28, 42, 60 (mm)	□ 28, 42, 60, 90 (mm)
Pages	Page C-43	Page C-115	Page C-133

Other Package Products

AC Input	5-Phase	UPK·W Series	Page C-97
DC Input		CSK Series	Page C-129

Low-Speed Synchronous Motor: the continuous rated synchronous motor driven by AC power supply.

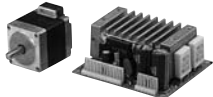
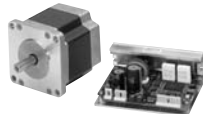
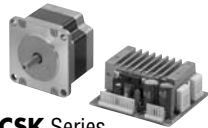
SMK Series → Page A-119

Introduction of Stepping Motors

αSTEP

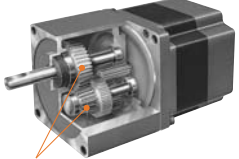
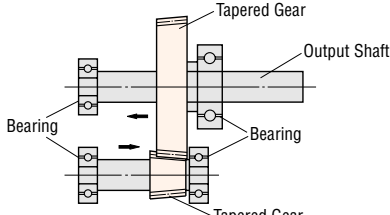
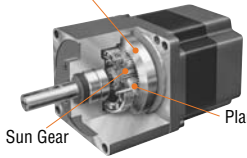
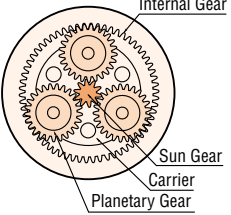
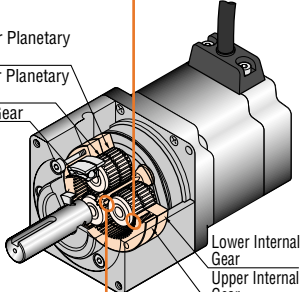
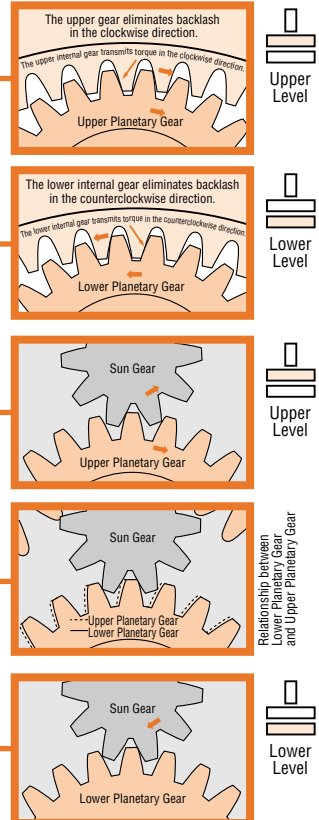
Type		Features	Series
Standard Type		The standard type combines the base <i>αSTEP</i> motor (round-shaft type) and a driver. The compact, high-response, tuning-free motor is easy to handle and offers excellent performance. The standard type comes in frame sizes from 28 mm sq. to 85 mm sq.	AS Series ASC Series
Electromagnetic Brake Type		The electromagnetic brake type incorporates a non-excitation brake into the motor. Since the brake operates without electrical current, the load can be held in position even in the event of a power failure, thereby preventing physical injury or damage to the equipment. (Some motor models do not offer this option.)	AS Series ASC Series
Geared Type		Various gears are available to further improve the performance of <i>αSTEP</i> motors. These models incorporate a highly accurate, non-backlash gear or low-backlash gear. The geared type comes in frame sizes from 28 mm sq. to 90 mm sq. The geared type generates high torque at low speed, drives a large inertial load and ensures higher resolution, all the while maintaining the high accuracy of the motor.	AS Series ASC Series

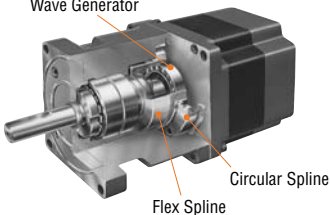
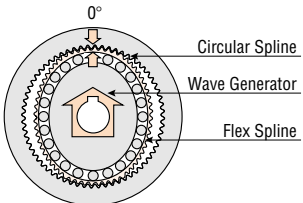
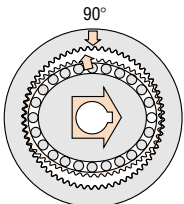
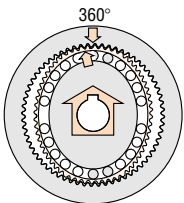
Stepping Motors

Type		Features	Series
Standard Type	 RK Series	The standard type motor offers balanced performance. These motors come in frame sizes from 28 mm sq. to 85 mm sq.	5-Phase RK Series 2-Phase UMK Series 5-Phase Fine Step CFK II Series 2-Phase CSK Series 2-Phase PK Series 5-Phase PK Series
High-Torque Type	 CSK Series	High-torque type is newly-designed motors offering an easy-handling connection by using a connector. (Except for motor frame size 60 mm.)	5-Phase Fine Step CFK II Series 2-Phase CSK Series 2-Phase PK Series
High-Speed Type	 CFK II Series	The high-speed type is ideal for driving a load not only at low speeds but also at high speeds. The higher rated current and enhanced high-speed characteristics of the motor are complemented by a larger drive capacity.	5-Phase Fine Step CFK II Series
High-Resolution Type	 CSK Series	The motor's basic step angle is reduced to half that of the standard type. These motors achieve high resolution, low vibration and improved stopping accuracy.	2-Phase CSK Series 2-Phase PK Series
Electromagnetic Brake Type		The electromagnetic brake type incorporates a non-excitation brake into the motor. Since the brake operates without electrical current, the load can be held in position even in the event of a power failure, thereby preventing physical injury or damage to the equipment. The RK series incorporates an electromagnetic-brake control function in the driver. Therefore, not only the ON/OFF of the electromagnetic brake can be controlled, but an energy-saving control can also be implemented where the electromagnetic brake is turned on automatically and motor current is cut off when the motor is stopped.	5-Phase RK Series
Geared Type	 RK Series	The geared-type motors combine a variety of gears that make the most of the high controllability afforded by a stepping motor. These models incorporate a highly accurate, non-backlash gear or low-backlash gear. The geared type drives a high friction load or large inertial load and ensures higher resolution, all the while maintaining the high accuracy of the motor.	5-Phase RK Series 2-Phase CSK Series 2-Phase PK Series

Introduction of Geared Type (α STEP/Stepping Motors)

Geared Motors using dedicated gears for control motors.

	Type	Principle and Structure	Series
Low backlash	TH Geared   Structure of TH Gear's Final Stage	In TH geared type, tapered gears are used for the spur gear's speed-reduction mechanism and the meshing gear. The tapered gear is produced through continuous profile shifting toward the shaft. The tapered gears are adjusted in the direction of the arrows, as shown in the figure, to reduce backlash.	AS Series ASC Series 5-Phase RK Series
	PL Geared   Cross Section of PL Gear Sun gear: The center gear integrated with the input shaft. Planetary gears: The multiple gears rotating around the sun gear. Each planetary gear meshes with the carrier, which is affixed to the gear output shaft. Internal gear: The cylindrical gear with teeth on its interior, affixed to the gear case.	The planetary gear mechanism consists of three key parts: the sun gear, planetary gears and internal gear. The sun gear is installed on the center shaft (this gear is installed on the motor shaft in single-stage motors). Multiple planetary gears are positioned in a manner surrounding the sun gear and rotate around the center shaft by meshing with the internal gear. The rotations of the planetary gears turn the output shaft via the carrier.	AS Series 5-Phase RK Series
Non-backlash	PN Geared   The upper gear eliminates backlash in the clockwise direction. The upper internal gear transmits torque in the clockwise direction. The lower internal gear eliminates backlash in the counterclockwise direction. The lower internal gear transmits torque in the counterclockwise direction. Upper Level Lower Level Relationship between Lower Planetary Gear and Upper Planetary Gear	The PN gear employs a planetary gear speed-reduction mechanism. The PN gear achieves the specified backlash of three arc minutes through the improved accuracy of its components and the backlash-elimination mechanism. That mechanism is comprised of two sets of internal and planetary gears on the upper and lower levels with the internal gear teeth twisted in the circumferential direction. The upper-level internal gears and planetary gears reduce clockwise backlash; the lower-level internal gears and planetary gear reduce counterclockwise backlash.	AS Series ASC Series 5-Phase RK Series

	Type	Principle and Structure	Series
Non-backlash	HG (Harmonic) Geared   Combines three basic parts. The flex spline is bent into an oval shape by the wave generator. The teeth at the long axis of the oval mesh with the circular spline, while the teeth at the short axis of the oval are completely separate from it.  Rotating the wave generator (input) clockwise while keeping the circular spline fixed in position will subject the flex spline to elastic deformation, causing a gradual shift in the point of engagement between the circular spline and flex spline.  When the wave generator completes one revolution, the flex spline has rotated two fewer teeth than the circular spline has, resulting in the movement of flex spline for the difference in the tooth count (two teeth) in the opposite direction of the wave generator's rotation (i.e., counterclockwise). This movement translates into output, thereby reducing the speed.	The HG (harmonic) gear offers unparalleled precision in positioning and features a simple construction utilizing the metal's elastomechanical property, comprising just three basic components: a wave generator, flex spline and circular spline.	AS Series ASC Series 5-Phase RK Series
	MG Geared SH Geared 	MG geared · SH geared type are for stepping motors with spur gear's speed reduction mechanism. Backlash value is 1° to 2°.	2-Phase CSK Series 2-Phase PK Series