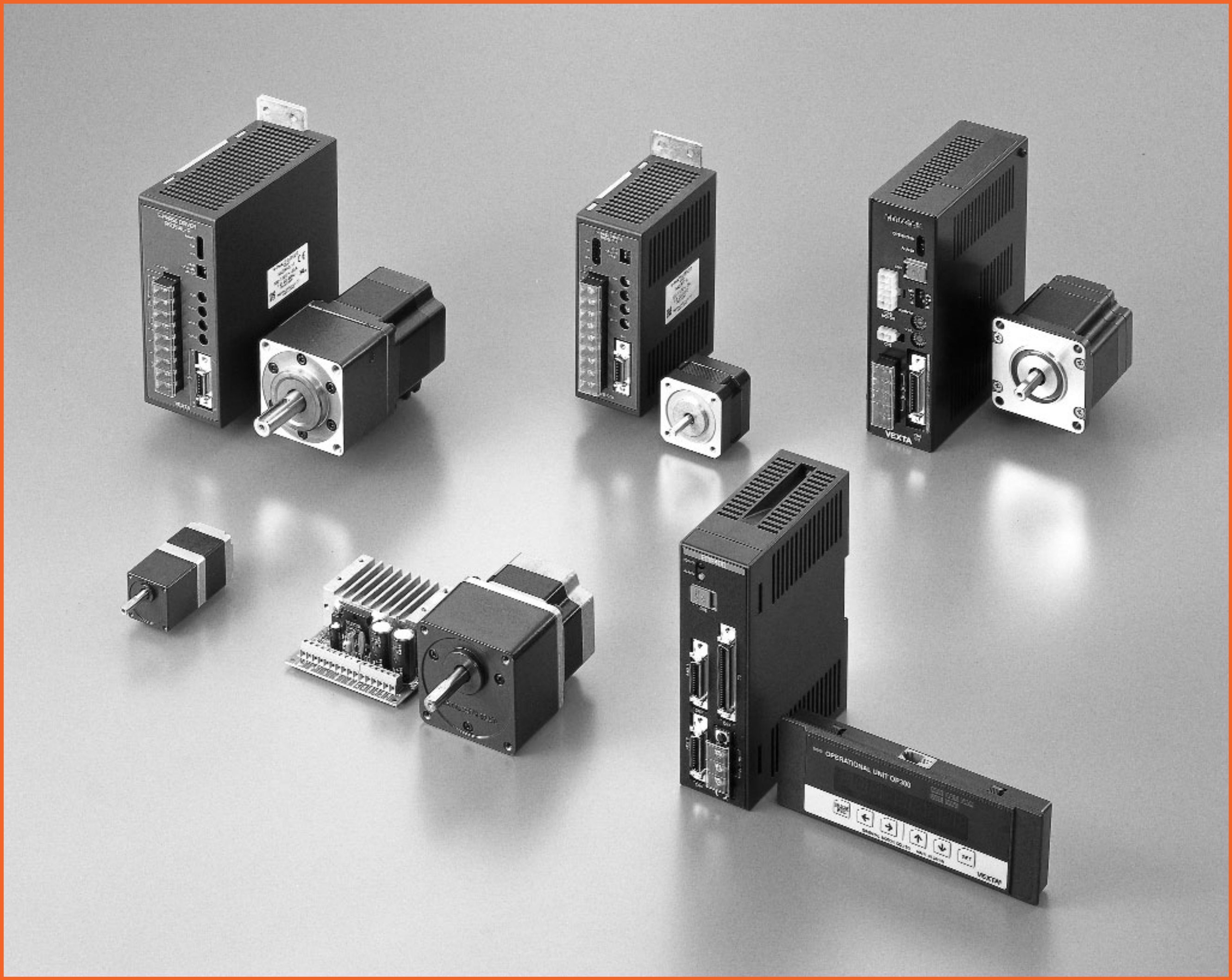
VEXTA® STEP.



Stepping Motors

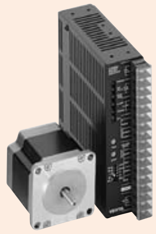
C

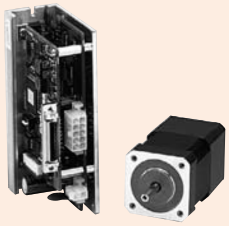
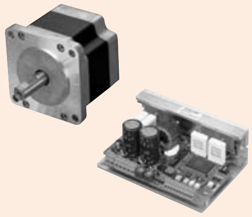
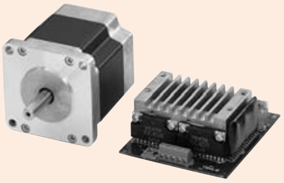
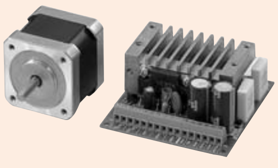
Introduction

Stepping Motors
Introduction
Motor & Driver Packages
Closed Loop αSTEP
AC Input: AS, AS PLUS
DC Input: ASC
5-Phase Microstep
AC Input: RK
DC Input: CFK II
5-Phase Full/Half
DC Input: CSK, PMC
2-Phase Full/Half
AC Input: UMK
DC Input: CSK
2-Phase Stepping Motors
without Encoder: PK/PV
with Encoder: PK
Driver with Indexer: UI2120G
Controllers: EMP401 EMP402, SC8800 SC8800E, SG8030J
Low-Speed Synchronous Motors: SMK
Accessories
Before Using a Stepping Motor

Types of Stepping Motors

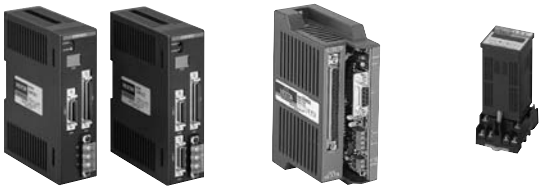
● Package Products: We offer a wide variety of motors and drivers.

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		*αSTEP* **AS** Series		**NanoStep RK** Series	**UMK** Series
		AS	**AS PLUS**		
Features					
		· High reliability due to closed loop control · No gain tuning required · High resolution control due to microstepping	· Controller and driver in one stand alone package · Programmable functions	· High-resolution control is possible by microstepping · Low vibration, low noise due to smooth drive function	· 2-phase stepping motor and compact AC input driver in one package · Driver with built-in pulse generator is available (**UI2120G**)
Motor Type		Closed Loop Control Stepping Motors	Closed Loop Control Stepping Motors	5-Phase Stepping Motors	2-Phase Stepping Motors
Basic Step Angle		0.36° (Resolution Setting: 1000 P/R)	0.36° (Resolution Setting: 1000 P/R)	0.72°	1.8° (Standard Type) 0.9° (High-Resolution Type)
Resolution		Microstep 0.72°, 0.36°, 0.072°, 0.036°	Microstep 0.72°~0.036°	Microstep 0.72°~0.00288° (16 steps)	Full Step/Half Step 1.8° / 0.9° (Standard Type) 0.9° / 0.45° (High-Resolution Type)
Function		Closed loop control Microstepping Resolution switch Pulse input mode switch Automatic current down at standstill Current Setting Speed Filter Protection Function	Closed loop control Microstepping Resolution selectable via software 14 programs · 64 lines/prog. · Conditional statements · IF/ELSE · SMP XX · WHILE/WEND · LOOP/ENDL I/O test Current setting Speed filter Protection function Resolution setting Automatic current down RS232 Control	Smooth drive function Pulse input mode switch Automatic current down Automatic current off Electromagnetic brake switch function (Energy-saving mode) Timing output Overheat output Resolution select All windings off input	Pulse input mode switch Automatic current down Automatic current off Timing output Overheat output Step angle switch All windings off input
Safety Standards		cURus CE	cURus CE	cURus CE	—
Line up	Standard Motor	□1.65 in. (□42 mm), □2.36 in. (□60 mm), □3.35 in. (□85 mm)		□1.65 in. (□42 mm), □2.36 in. (□60 mm), □3.35 in. (□85 mm)	□1.65 in. (□42 mm), □2.22 in. (□56.4 mm)
	Electro-magnetic Brake Motor	□1.65 in. (□42 mm), □2.36 in. (□60 mm), □3.35 in. (□85 mm)		—	—
	Geared Motor	□1.65 in. (□42 mm), □2.36 in. (□60 mm), □3.54 in. (□90 mm)		□1.65 in. (□42 mm), □2.36 in. (□60 mm), □3.54 in. (□90 mm)	—
Pages		Page C-11		Page C-77	Page C-149

DC Input			
24 VDC	24 VDC	24 VDC	24/36 VDC
ASC Series	**NanoStep CFK II** Series	5-Phase **CSK** / **PMC** Series	2-Phase **CSK** Series
			
· 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 possibly by microstepping	· 5-phase stepping motor and compact DC input driver in one package	· 2-phase stepping motor and compact DC input driver in one package · Wide variety of frame sizes and types
Closed Loop Control Stepping Motors	5-Phase Stepping Motors	5-Phase Stepping Motors	2-Phase Stepping Motors
0.36° (Resolution Setting: 1000 P/R)	0.72°	0.72°	1.8° (Standard Type), 0.9° (High-Resolution Type)
Microstep 0.72°, 0.36°, 0.072°, 0.036°	Microstep 0.72°~0.00288° (16 steps)	Full Step/Half Step 0.72° / 0.36°	Full Step/Half Step 1.8° / 0.9° (Standard Type) 0.9° / 0.45° (High-Resolution Type)
Closed loop control Microstepping Resolution switch Pulse input mode switch Automatic current down Current Setting Speed Filter Protection Functions	Automatic current down Timing output Step angle switch All windings off input Pulse input mode	Automatic current down Timing output Step angle switch All windings off input	Automatic current down Setting current monitor output Timing signal output Step angle switch Pulse input mode switch Input power supply voltage switch Power LED equipped All windings off input
cURus CE	—	cURus CE (5-Phase **CSK** only)	—
□1.10 in. (□28 mm), □1.65 in. (□42 mm), □2.36 in. (□60 mm)	□0.79 in. (□20 mm), □1.10 in. (□28 mm), □1.65 in. (□42 mm), □2.36 in. (□60 mm), □3.35 in. (□85 mm)	□1.10 in. (□28 mm), □1.65 in. (□42 mm), □2.36 in. (□60 mm), □3.35 in. (□85 mm)	□1.65 in. (□42 mm), □2.22 in. (□56.4 mm), □3.35 in. (□85 mm)
□1.65 in. (□42 mm), □2.36 in. (□60 mm)	—	—	—
□1.10 in. (□28 mm), □1.65 in. (□42 mm), □2.36 in. (□60 mm)	—	□1.10 in. (□28 mm), □1.65 in. (□42 mm), □2.36 in. (□60 mm)	□1.65 in. (□42 mm), □2.36 in. (□60 mm)
Page C-55	Page C-105	5-Phase **CSK**:Page C-119 **PMC**:Page C-135	Page C-161

◆ Controllers for Stepping Motors

These controllers are optimized to control stepping motors.
→Page C-251



◆ αSTEP PLUS

Stand alone closed loop driver/controller

◆ UI2120G

All-In-One Intelligent Driver/Controller for 2-Phase Stepping motors.
→Page C-241

◆ 2-Phase Stepping Motors

Motor Frame Size:
□1.10 in. (□28 mm), □1.38 in. (□35 mm), □1.65 in. (□42 mm), □2.22 in. (□56.4 mm), □2.36 in. (□60 mm), □3.35 in. (□85 mm), □3.54 in. (□90 mm)

Line-Up:
PK Series
  Standard **P** Type (High Torque)
  Standard Type (with Encoder also available)
  High-Resolution Type (with Encoder also available)
  SH Geared Type
PV Series

◆ Low-Speed Synchronous Motors (SMK Series)

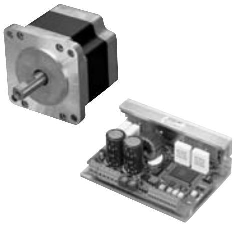
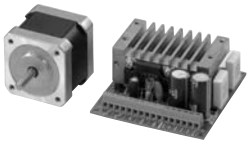
Synchronous motors can instantly switch between forward and reverse operation. They perform synchronous operation at 72 r/min at 60 Hz or 60 r/min at 50 Hz (**SMK014 MA-A** : 36 r/min at 60 Hz or 30 r/min at 50 Hz). They offer highly precise speed regulation and low-speed rotation. Gearheads in 20 gear ratios are available for use with pinion shaft models, offering up to 86 lb-in of torque.
→Page C-273

Introduction of Stepping Motors

αSTEP

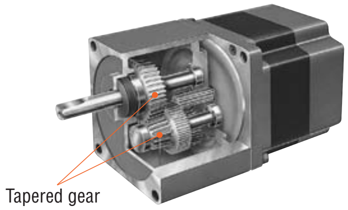
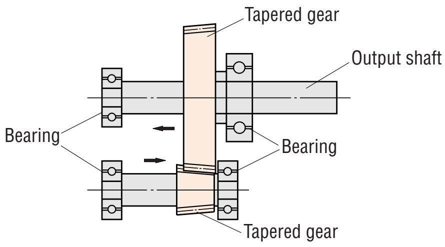
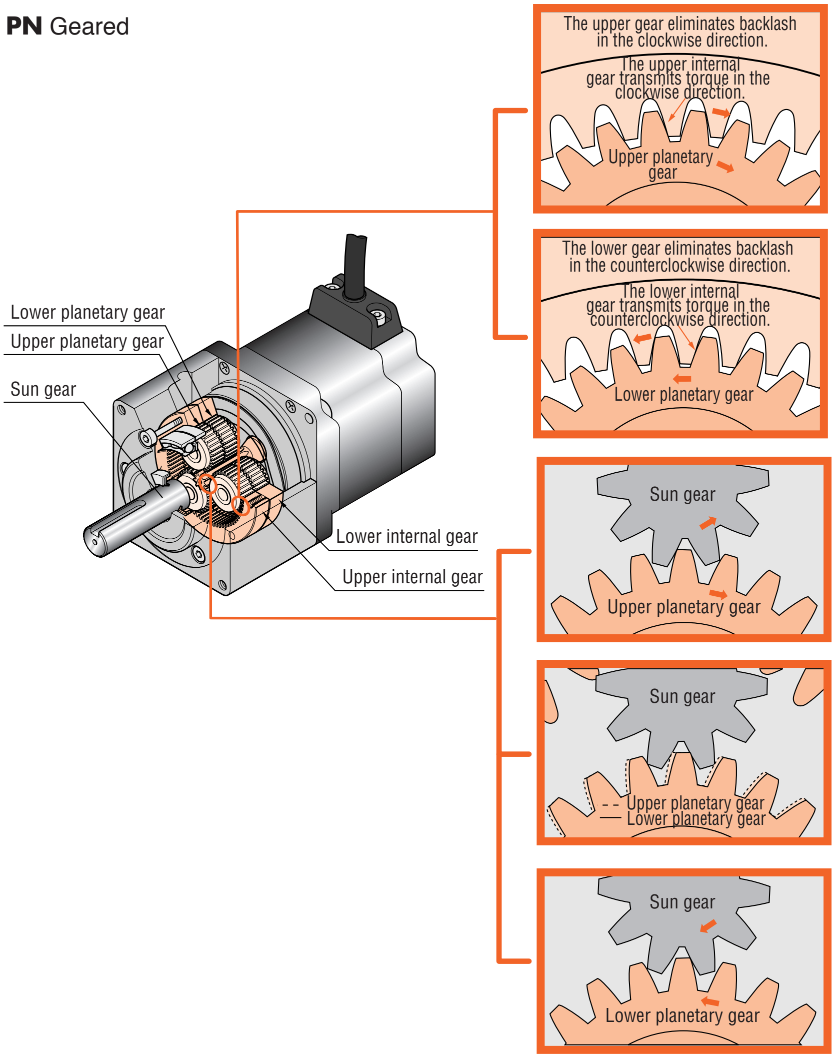
Type		Features	Series
Standard Type		The standard type combines the base αSTEP motor (round-shaft type) and a driver. The compact, high-response, tuning-free motor is easy to handle and offers excellent performance. The standard type comes in frame sizes from 1.10 inch sq. (28 mm sq.) to 3.35 inch sq. (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 αSTEP motors. These models incorporate a highly accurate, non-backlash gear or low-backlash gear. The geared type comes in frame sizes from 1.10 inch sq. (28 mm sq.) to 3.54 inch sq. (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 Standard **P** Type (High Torque) 	The standard type combines the base motor (round-shaft type) and a driver. Designed to reduce heat generation and power consumption in the motor and driver, these models are easy to use yet provide the required performance. The standard type comes in frame sizes from 0.79 inch sq. (20 mm sq.) to 3.35 inch sq. (85 mm sq.).	5-Phase **RK** Series 2-Phase **UMK** Series 5-Phase **CSK** Series 5-Phase **CFKⅡ** Series 5-Phase **PMC** Series 2-Phase **CSK** Series 2-Phase **PK** Series
High-Speed Type 	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 **CFKⅡ** Series
High-Resolution Type 	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. ✻ All of the high-resolution models currently available use 2-phase motors.	2-Phase **CSK** Series 2-Phase **PK** Series
PV Series (High-Inertia Capability) 	Having a larger rotor inertia than the standard motors, the high-torque motors are designed to drive large inertial loads with outstanding efficiency. These motors also generate higher torque.	2-Phase **PV** Series
Geared Type 	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 5-Phase **CSK** Series 5-Phase **PMC** Series 2-Phase **CSK** Series 2-Phase **PK** Series

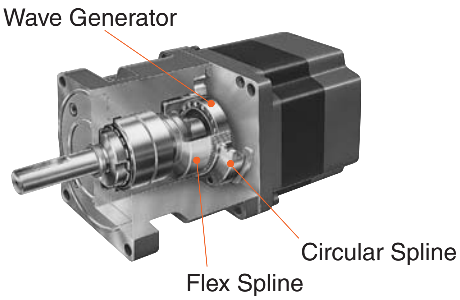
Introduction of Geared Type

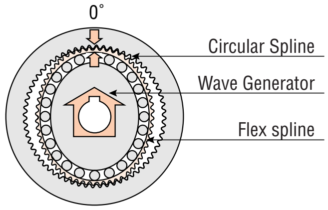
Geared Motors using dedicated gears for control motors.

Type	Principle and Structure	Series
TH Geared   Structure of **TH** gear's final stage	In **TH**-type gears, 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 5-Phase **CSK** Series
PN Geared 	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

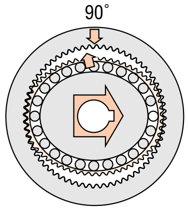
<table>
<tr><th>Type</th><th>Principle and Structure</th><th>Series</th></tr>
<tr><td>

HG (Harmonic) Geared

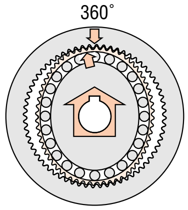




Combines three basic parts. The flex spline is bent into an oval shape by the wave generator. The teeth at the long axis of the oval mesh with the circular spline, while the teeth at the short axis of the oval are completely separate from it.



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.

</td><td>

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.

</td><td>

AS Series
ASC Series
5-Phase **RK** Series
5-Phase **PMC** Series

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<tr><td>

MG Geared
SH Geared

MG Geared

SH Geared

</td><td>

MG geared · **SH** geared type are for stepping motors with spur gear's speed reduction mechanism. Backlash value is 1° to 2°.

</td><td>

5-Phase **PMC** Series
2-Phase **CSK** Series
2-Phase **PK** Series

</td></tr>
</table>

Characteristics Comparison for Geared Motors

Notes:

- Note that the values shown below must be used as reference. These values vary depending on the series, frame size and gear ratio.
- Maximum holding torque, maximum backlash, minimum resolution and maximum output shaft speed listed here are representative values of the following series:
  TH Geared Type, **PN** Geared Type, **HG** Geared Type: *αSTEP* **AS** Series
  MG Geared Type: **PMC** Series
  SH Geared Type: 2-Phase **CSK** Series

Geared Type		Features	Maximum Holding Torque lb-in (N·m)	Maximum Backlash [Arc min] (Reference Value)	Minimum Resolution [°/step]	Maximum Output Shaft Speed [r/min]
Low backlash	 **TH** Geared (Parallel Shaft)	• A wide variety of low gear ratio, high-speed operation • Gear ratio : 3.6:1, 7.2:1, 10:1, 20:1, 30:1	106 (12)	45	0.012	500
Non-backlash	 **PN** Geared (Planetary)	• High speed (low gear ratio), high positioning precision • High permissible/maximum torque • Wide variety of gear ratios for selecting the desired step angle. (resolution) • Centered output shaft • Gear ratio : 5:1, 7.2:1, 10:1, 25:1, 36:1, 50:1	Maximum □ Torque□ 530 (60) Permissible □ Torque□ 320 (37)	3	0.0072	600
	 Harmonic Geared (Harmonic Drive)	• High positioning precision • High permissible/maximum torque • High gear ratio, high resolution • Centered output shaft • Gear ratio : 50:1, 100:1	Maximum □ Torque□ 480 (55) Permissible □ Torque□ 320 (37)	0	0.0036	70
For compact motors	 **MG** Geared (Parallel Shaft)	• A wide variety of low gear ratio, high-speed operation • Gear ratio : 3.6:1, 7.2:1, 10:1, 20:1, 30:1	4.5 (0.51)	Approx. 1~2°□	0.024	833
	 **SH** Geared (Parallel Shaft)	• A wide variety of low gear ratio, high-speed operation • Gear ratio : 3.6:1, 7.2:1, 9:1, 10:1, 18:1, 36:1	35 (4)	Approx. 1~2°□	0.05	500

How to Read Specifications Table

Model	Single-Phase	Single Shaft	**RK544AA-N5**	**RK544AA-N7.2**	**RK544AA-N10**
	100-115 VAC	Double Shaft	**RK544BA-N5**	**RK544BA-N7.2**	**RK544BA-N10**
① Maximum Holding Torque		lb-in (N·m)	7 (0.8)	10.6 (1.2)	13.2 (1.5)
② Rotor Inertia J		oz-in^2 (kg·m^2)	$0.30\ (54\times10^{-7})$		
③ Rated Current		A/Phase	0.75		
④ Basic Step Angle			0.144°	0.1°	0.072°
⑤ Gear Ratio			5 : 1	7.2 : 1	10 : 1
⑥ Permissible Torque		lb-in. (N·m)	7 (0.8)	10.6 (1.2)	13.2 (1.5)
⑦ Maximum Torque		lb-in. (N·m)	13.2 (1.5)	17.7 (2)	17.7 (2)
⑧ Backlash		arc minute (degrees)	2 (0.034°)		
Angle Error		arc minute (degrees)	6 (0.1°)		
⑨ Permissible Speed Range		r/min	0∼600	0∼416	0∼300
⑩ Power Source Input			Single-Phase 100-115 VAC ±15% 50/60 Hz 1 A		
⑪ Excitation Mode			Microstep: Basic Angle/n * (/Step)		
Weight	Motor	lb. (kg)	1.2 (0.56)		
	Driver	lb. (kg)	0.88 (0.4)		
Dimension No.	Motor		7		
	Driver		13		

① Maximum Holding Torque

The holding torque (5-Phase : 5-Phase Excitation, 2-Phase: 2-Phase Excitation) is the maximum holding power (torque) the stepping motor has when power (rated current) is being supplied but the motor is not rotating (with consideration given to the permissible strength of the gear when applicable). At motor standstill, the driver's "Automatic Current Cutback" function reduces the maximum holding torque by approximately 50% (approximately 40% for **UMK** and 2-phase **CSK** series).

② Rotor Inertia

This refers to the inertia of rotor inside the motor. This is necessary when the required torque (acceleration torque) for the motor needs is calculated.

③ Rated Current

The rated current is determined by motor temperature rise. It is the current value that can flow to the motor coils continuously at motor standstill. As a general rule, the current must be set to the rated current.

④ Basic Step Angle

The step angle is the angular distance (in degrees) that the motor moves at the input of one pulse from the driver. It differs depending on the motor structure and excitation system.

⑤ Gear Ratio

This is the ratio in rotation speed between the input speed from the motor and the speed of the gear output shaft. For example, the gear ratio 10:1 is that when the input speed from the motor is 10 r/min, the gear output shaft is 1 r/min.

⑥ Permissible Torque

The permissible torque represents the torque value limited by the mechanical strength of the gear. For **TH** geared type, the total torque including acceleration/deceleration torque should not exceed this value. For the **PN** & **HG** geared types, the torque not including the acceleration/deceleration torque should not exceed this value.

⑦ Maximum Torque (PN Geared, Harmonic Geared Type only)

This is the maximum torque that can be used instantaneously (for a short time). During acceleration/deceleration, the motor can be operated up to this value.

⑧ Backlash

The play of gear output shaft when the motor shaft is fixed. When positioning in bi-direction, the positioning accuracy is affected.

⑨ Permissible Speed Range

This is the rotation speed that the motor can be operated at with the gear output shaft.

⑩ Power Source

The current value of the power input is the maximum input current value. (The input current varies according to the rotation speed.)

⑪ Excitation Mode

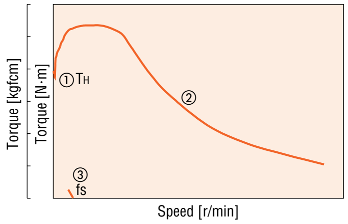
The driver has a function that can change the motor's step angle. Shown in the table is the step angle value at which the motor can be operated.

Static Friction Torque (*α*STEP, AS Series, ASC Series Only)

The electromagnetic brake specifications. This is the maximum holding torque at which the electromagnetic brake can hold the position.

How to Read Speed—Torque Characteristics

The graph below is the characteristics that indicate the relationship between the speed and torque when a stepping motor is driven. The required speed and torque is always used when selecting a stepping motor. On the graph, the horizontal axis expresses the speed at motor output shaft while the vertical axis expresses the torque.



The speed-torque characteristics are determined by the motor and driver, so they vary greatly based upon the type of the driver used.

① Maximum Holding Torque

The holding torque (5-Phase : 5-Phase Excitation, 2-Phase : 2-Phase Excitation) is the maximum holding power (torque) the stepping motor has when power is being supplied but the motor shaft is not rotating (rated current). At motor standstill, the driver's "Automatic Current Cutback" function reduces the maximum holding torque by approximately 50% (approximately 40% for **UMK** and 2-phase **CSK** series).

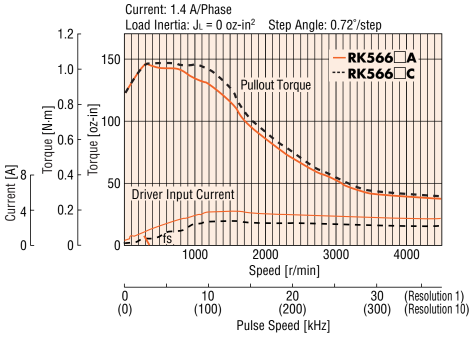
② Pullout Torque

Pullout torque is the maximum torque that can be output at a given speed. When selecting a motor, be sure the required torque falls within this curve.

③ Maximum Starting Frequency (fs)

This is the maximum pulse speed at which the motor can start or stop instantly (without an acceleration or deceleration period) when the frictional load and inertial load of the stepping motor are 0. Driving the motor at greater than this pulse speed requires gradual acceleration or deceleration. This frequency drops when there is a load inertia on the motor. (Refer to Load Inertia-Maximum Starting Frequency Characteristics in Technical Reference → Page F-32)

The following figure shows the speed-torque characteristics of the 5-phase stepping motor/driver package **RK566BA**.



- ● Pay attention to heat dissipation from the motor and driver. The motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212°F (100°C). (Under 167°F (75°C) is required to comply with UL or CSA standards.)
- ● In order to prevent fatigue of the gear grease in the harmonic gear, keep the temperature of the gear case under 158°F (70°C).

Notes on characteristics diagrams:
• The actual characteristics will vary depending on the driver used. Please use these diagrams only for reference purposes when selecting a motor.
You must also conduct a thorough evaluation with the actual driver to be used.

αSTEP®
AS Series

Additional Information

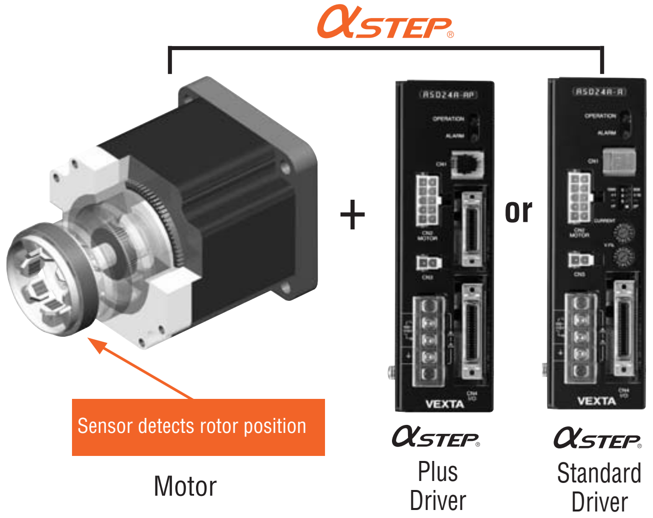
Closed Loop Stepping Motor and Driver Package
αSTEP® AS Series

The αSTEP is a revolutionary hybrid stepping motor and driver package which eliminates missed steps; a common problem with stepping motors. The αSTEP uses a built-in feedback device that constantly monitors the motor shaft position to detect and correct for loss of synchronism. Geared models are also available.

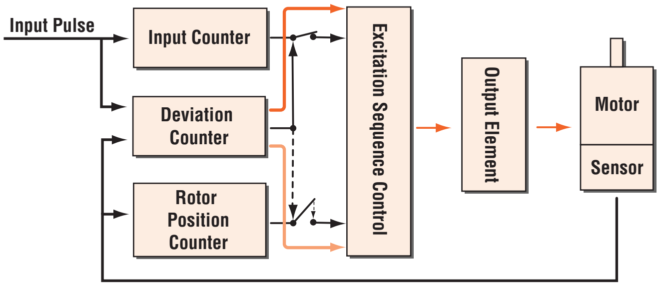
Features

● Thanks to closed loop control, there is no loss of synchronism.

αSTEP does not lose synchronism even when subjected to abrupt load fluctuation or acceleration. A newly developed rotor position detection sensor constantly monitors the motor movement. If synchronism is about to be lost, closed loop control is used, so there is no need to worry about loss of steps.



◆ αSTEP Control Diagram



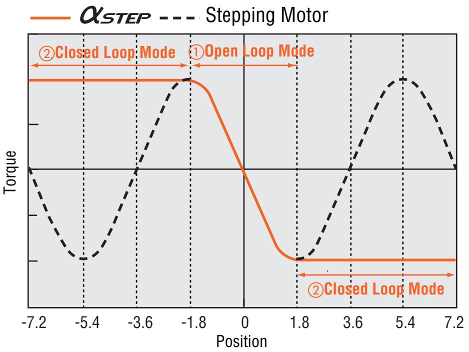
Normal (Positioning Deviation is less than ±1.8°)

Mortor runs in open loop mode like a stepping motor.

If Motor Missteps (Positioning Deviation is greater than ±1.8°)

Control switches to closed loop mode to prevent loss of synchronism.

◆ αSTEP Angle-Torque Characteristics



① If the positioning deviation is ±1.8° or smaller, the motor runs in open loop mode like a stepping motor.

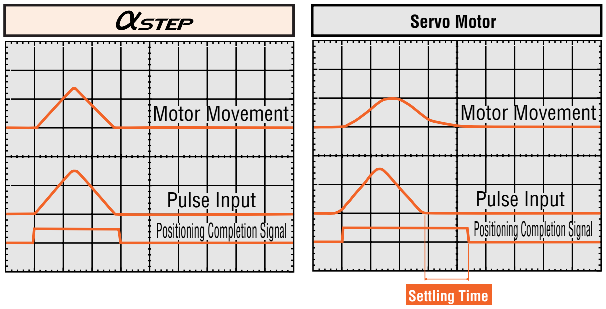
② If the positioning deviation is ±1.8° or greater, the motor runs in closed loop mode and the position is corrected by exciting the motor windings to generate maximum torque based on the rotor position.

Features C-12 System Configuration C-17 Specifications/Characteristics C-21

● High Response

Like conventional stepping motors, αSTEP operates in synchronism with command pulses. This makes possible short stroke positioning in a short time.

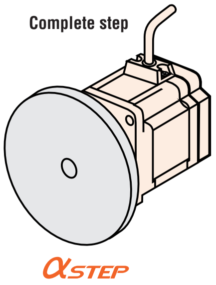
Measurement condition : Feed 1/5 rotation
Load inertia 1.365 oz-in^2 (250×10^{-7} kg·m^2)

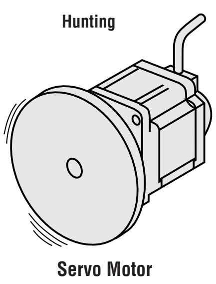


- In traditional servo motors, there is a delay between the input pulse signals and the motor movement due to the way positioning is continuously monitored. Therefore, a servo motor needs time to settle to a stop after input signals stop. This is called settling time.

● No Hunting

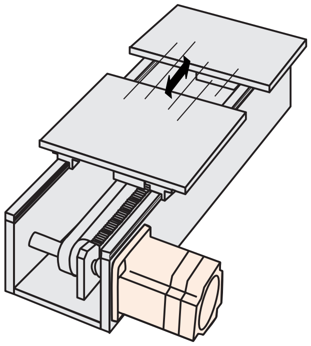
Since αSTEP is a stepping motor, it has no hunting problem such as might be found in a traditional servo motor. Therefore, when it stops, its position is completely stable and does not fluctuate. αSTEP is ideal for applications in which vibration would be a problem.





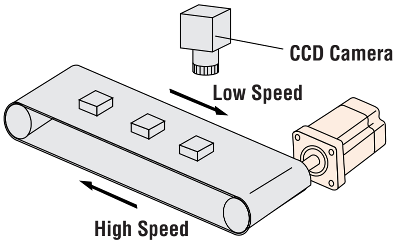
● No Gain Tuning

Gain tuning for a servo motor is critical, troublesome and time-consuming. Since the αSTEP operates like a stepping motor, there are no gain tuning requirements. Low rigidity applications, such as a belt and pulley system, are ideal for αSTEP.



● Low Vibration at Low Speed

The driver employs advanced technology that produces smoothness comparable to a microstepping driver.
Its vibration level is incredibly low, even when operating in the low speed range. When frequent changes from low (high) to high (low) speed operation are required, the use of the Resolution Select Function solves the problem.
αSTEP provides resolution as low as 0.036°per step without any damping mechanism or other mechanical device. Even smoother operation is possible with geared models.



αSTEP is well suited to applications where smooth movement or stability is required, such as where a camera is used to monitor the quality of a product.

Common Specifications C-29 | Dimensions C-32 | Connection and Operation C-39 | Motor and Driver Combinations C-53

AS Series Line-Up

αSTEP

AS Series
(AC Power Input)

- αSTEP — Can be controlled from your own pulse generator
- αSTEP PLUS — **Plus Integrated Controller and Driver** — No separate pulse generator required

ASC Series →See Page C-55
(DC Power Input)

Standard

- Basic Model of αSTEP Motor and Driver System

Tapered Hob (TH) Geared

- A wide variety of low gear ratios for high-speed operation

Gear Ratios 3.6:1, 7.2:1, 10:1, 20:1, 30:1

Planetary (PN) Geared

- High speed (low gear ratios), High positioning precision
- High permissible torque
- Centered output shaft

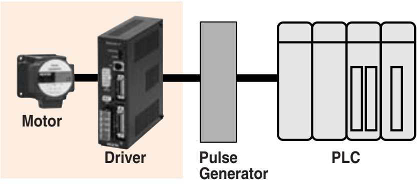
Gear Ratios 5:1, 7.2:1, 10:1, 25:1, 36:1, 50:1

Harmonic (HG) Geared

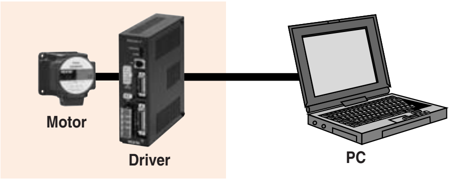
- High positioning precision
- High permissible/maximum torque
- Zero backlash
- High gear ratio, High resolution
- Centered output shaft

Gear Ratios 50:1, 100:1

Step & Direction Input Type or **Integrated Controller & Driver**



Motor and driver are controlled with an external pulse generator.



No external pulse generator required.

Product Line

Type	Power Supply Voltage	Maximum Holding Torque		
		□1.65 in. (□42 mm)	□2.36 in. (□60 mm)	□3.35 in. (□85 mm) [Geared: □3.54 in. (□90 mm)]
Standard Type	Single-Phase 100-115 VAC	●	●	●
	Single-Phase 200-230 VAC	—	●	●
	Three-Phase 200-230 VAC	—	●	●
		42 oz-in (0.3 N·m)	170~280 oz-in (1.2~2.0 N·m)	280~560 oz-in (2.0~4.0 N·m)
TH Geared Type	Single-Phase 100-115 VAC	●	●	●
	Single-Phase 200-230 VAC	—	●	●
	Three-Phase 200-230 VAC	—	●	●
		3.0~13.2 lb-in (0.35~1.5 N·m)	11.0~35 lb-in (1.25~4 N·m)	39~106 lb-in (4.5~12 N·m)
PN Geared Type	Single-Phase 100-115 VAC	●	●	●
	Single-Phase 200-230 VAC	—	●	●
	Three-Phase 200-230 VAC	—	●	●
		13.2 lb-in (1.5 N·m)	30~70 lb-in (3.5~8 N·m)	88~320 lb-in (10~37 N·m)
HG Geared Type	Single-Phase 100-115 VAC	●	●	●
	Single-Phase 200-230 VAC	—	●	●
	Three-Phase 200-230 VAC	—	●	●
		30~44 lb-in (3.5~5.0 N·m)	48~70 lb-in (5.5~8.0 N·m)	220~320 lb-in (25~37 N·m)

● Electromagnetic brake models are also available.

Features C-12 System Configuration C-17 Specifications/Characteristics C-21

αSTEP PLUS

Position Control

- Incremental mode (relative distance specification)/Absolute mode (absolute position specification)
- Linked operation (a maximum of four motion profiles may be linked)
- Data range (in pulses): −8,388,608 to +8,388,607
- Operating speed: 10 Hz to 500 kHz (set in 1Hz increments)

Four Operation Modes

1. Positioning
2. Mechanical home seeking (+LS, −LS, HOMELS)
3. Continuous
4. Electrical home seeking

General Inputs/Outputs

- 8 Programmable Inputs
- 8 Programmable Outputs

Daisy Chain Capability

- Up to 36 units can be daisy chained with unique device ID's

Communication

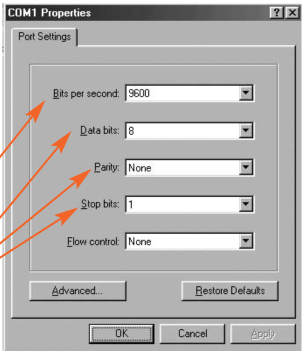
- ASCII based commands
- Conforms to RS-232C communication specifications
- Start-stop asynchronous transmission method
- Transmission speed: 9,600 bps
- Data length: 8 bits, 1 stop bit, no parity
  Protocol: TTY (CR+LF)
- Modular 4-pin connector

Program Memory

- Maximum number of programs: 14 (including STARTUP)
- Maximum lines per program: 64
- Commands per line: 1
- Program variables: 26 (A to Z)

Built-in Functions

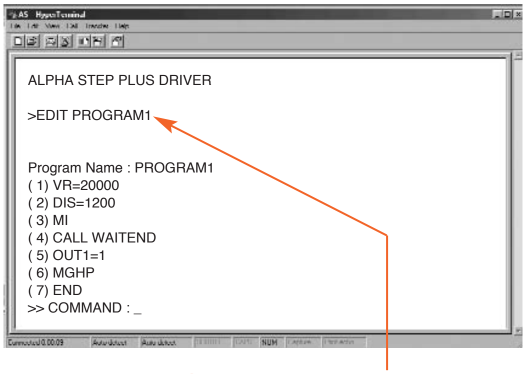
- Selectable motor-resolution
- Run and stop current values
- Speed-filter set value
- Motor rotation direction
- Emergency stop
- Sensor logic
- Over-travel limits
- Software over-travel
- Alarm history
- Syntax checking
- Display values
- Incremental moves
- I/O status



Bits per second: 9600
Data bits: 8
Parity: None
Stop bits: 1
Flow control: None

Using Windows HyperTerminal®, programming the αSTEP **Plus** driver is a simple task.

Example: "PROGRAM1"



```
ALPHA STEP PLUS DRIVER

>EDIT PROGRAM1


Program Name : PROGRAM1
( 1) VR=20000
( 2) DIS=1200
( 3) MI
( 4) CALL WAITEND
( 5) OUT1=1
( 6) MGHP
( 7) END
>> COMMAND : _
```

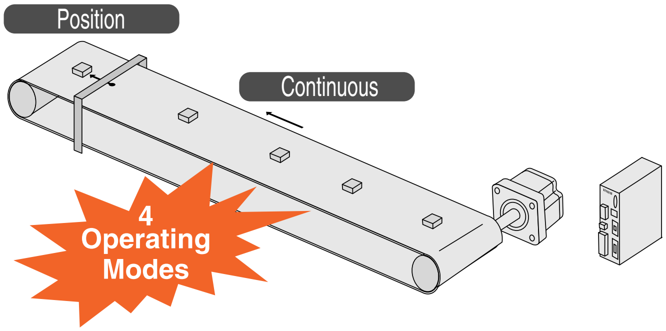
PROGRAM1 Definition

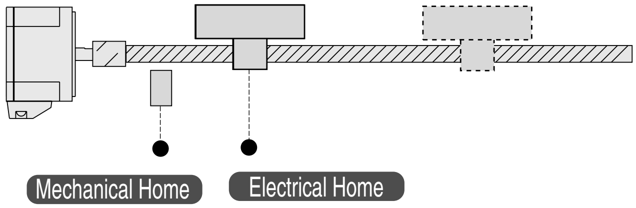
- Operating Speed: 20,000 Hz
- Move Distance: 1,200 pulses
- Call a subroutine that waits for the motor to stop before moving on to the next command
- Turn On Output #1
- Seek the Mechanical Home Position in the Positive Direction
- End of Program

Common Specifications C-29 | Dimensions C-32 | Connection and Operation C-39 | Motor and Driver Combinations C-53

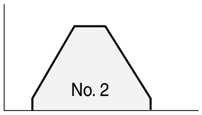
αSTEP Plus Features

Operating Modes

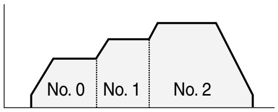




Linked Motion Capability



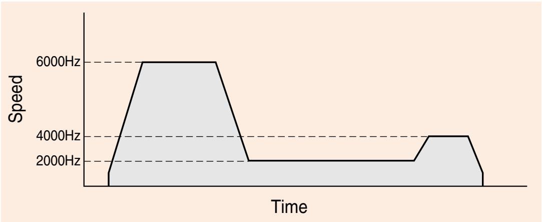
Single Motion



Linked Motion

When a START signal is received motions 0, 1 and 2 are executed without stopping between each one.

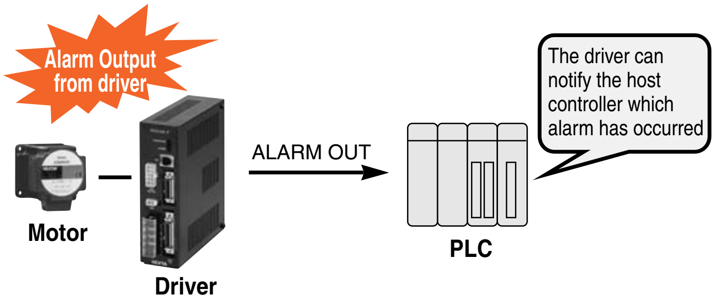
Speed Change On The Fly



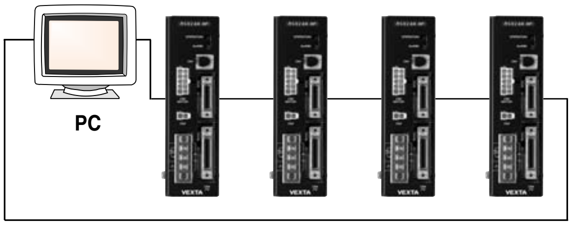
The running speed of the motor can be changed while the motor is in motion.

Alarm Functions

The driver can flash LEDs to indicate which alarm has occurred.



Daisy Chain



Up to 36 units can be daisy chained via customer supplied cable.

Safety Standards and CE Marking (Except for **AS46** type)

Model	Standards	Certification Body	File No.	CE Marking
Motor	UL1004 UL2111 CSA C22.2 No.100 CSA C22.2 No.77	UL	E64199	Low Voltage Directives EMC Directives
	EN60950 EN60034-1 EN60034-5	Conform to EN Standards		
Driver	UL508C ✻1 CSA C22.2 No.14	UL	E171462	
	EN60950 ✻2 EN50178	Conform to EN Standards		

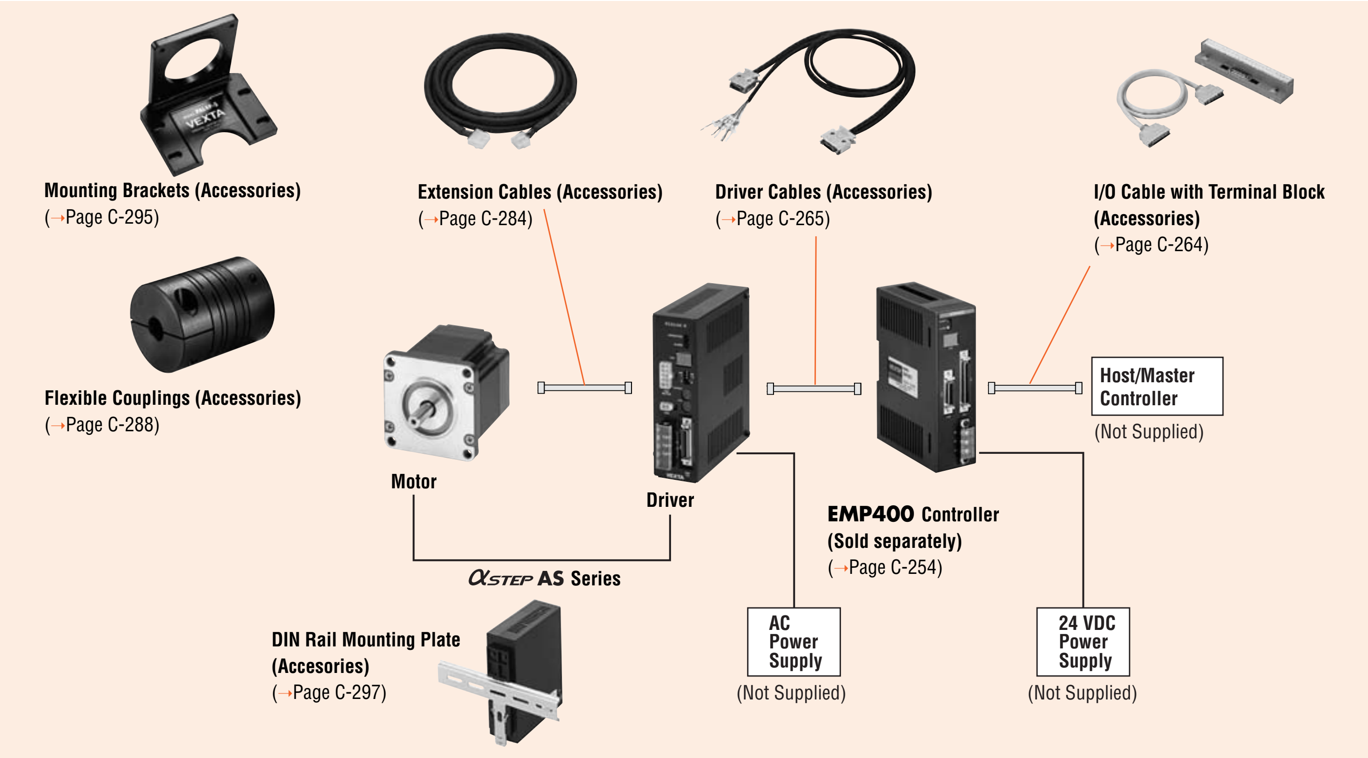
- When the system is approved under various safety standards, the model names in the motor and driver nameplates are the approved model names.
  List of Motor and Driver Combinations → Page C-53
- **Details of Safety Standards** → Page G-2
- The EMC value changes according to the wiring and layout. Therefore, the final EMC level must be checked with the motor/driver incorporated in the user's equipment.

✻1 Maximum Ambient Temperature for UL
AS: 122°F (+50°C), **AS PLUS**: 104°F (+40°C)

✻2 EN60950 (Certified **AS** only)

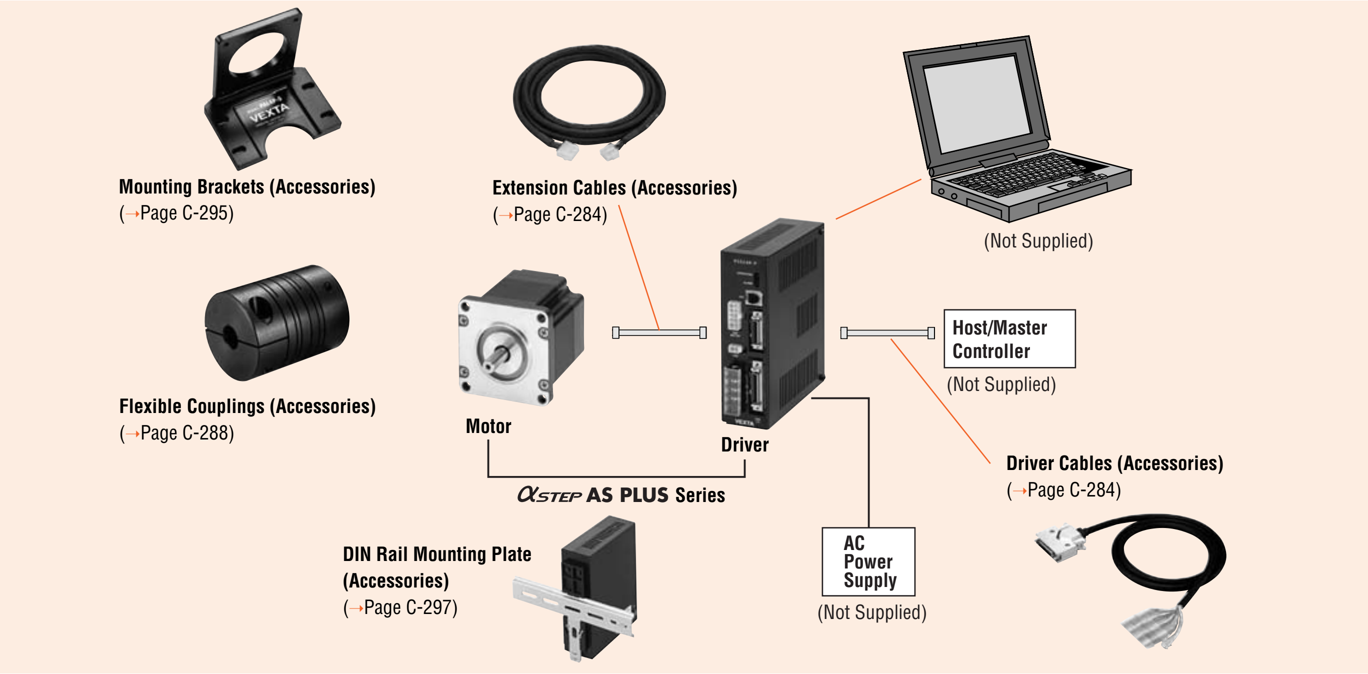
System Configuration

AS Series



An example of a single-axis system configuration with the **EMP400** Series controller.

AS PLUS



The system configuration shown is an example. Other combinations are available.

Extension Cables (For AS Series and AS PLUS Series)

Extension cables are not included with αSTEP products. When using the αSTEP stepping motor and driver more than 1.31 feet (0.4 m) apart from each other, use an optional extension cable (sold separately).

Note:
- Electromagnetic brake motor models [except motor frame size □1.65 in. (□42 mm)] must use an optional electromagnetic brake extension cable. The frame size □1.65 in. (□42 mm) models can use a standard extension cable even for electromagnetic brake motor models.

Product Number Code

AS 6 6 A A P-T 3.6

Gear Ratio

Blank: Standard Type
T: **TH** Geared Type
N: **PN** Geared Type
H: **HG** Geared Type

P: **AlphaStep Plus**
Blank: **AlphaStep** Standard

Power Input **A**: Single-Phase 100-115 VAC
C: Single-Phase 200-230 VAC
S: Three-Phase 200-230 VAC

A: Without Electromagnetic Brake (Single Shaft)
M: Electromagnetic Brake

Motor Case Length

Motor Frame Size **4**: 1.65 in. sq. (42 mm sq.)
6: 2.36 in. sq. (60 mm sq.)
9: 3.35 in. sq. (85 mm sq.) [3.54 in. sq. (90 mm sq.) for geared type]

AS: **AS** series

AS Product Lines

● AS Series

◆ Standard Type

Power Source	Without Electromagnetic Brake			Electromagnetic Brake		
	Motor Frame Size: □1.65 in. (□42 mm) Model	Motor Frame Size: □2.36 in. (□60 mm) Model	Motor Frame Size: □3.35 in. (□85 mm) Model	Motor Frame Size: □1.65 in. (□42 mm) Model	Motor Frame Size: □2.36 in. (□60 mm) Model	Motor Frame Size: □3.35 in. (□85 mm) Model
Single-Phase 100-115 VAC	**AS46AA**	**AS66AA**	**AS98AA**	**AS46MA**	**AS66MA**	**AS98MA**
	—	**AS69AA**	**AS911AA**	—	**AS69MA**	—
Single-Phase 200-230 VAC	—	**AS66AC**	**AS98AC**	—	**AS66MC**	**AS98MC**
	—	**AS69AC**	**AS911AC**	—	**AS69MC**	—
Three-Phase 200-230 VAC	—	**AS66AS**	**AS98AS**	—	**AS66MS**	**AS98MS**
	—	**AS69AS**	**AS911AS**	—	**AS69MS**	—

◆ TH Geared Type

Power Source	Without Electromagnetic Brake			Electromagnetic Brake		
	Motor Frame Size: □1.65 in. (□42 mm) Model	Motor Frame Size: □2.36 in. (□60 mm) Model	Motor Frame Size: □3.54 in. (□90 mm) Model	Motor Frame Size: □1.65 in. (□42 mm) Model	Motor Frame Size: □2.36 in. (□60 mm) Model	Motor Frame Size: □3.54 in. (□90 mm) Model
Single-Phase 100-115 VAC	**AS46AA-T3.6**	**AS66AA-T3.6**	**AS98AA-T3.6**	**AS46MA-T3.6**	**AS66MA-T3.6**	**AS98MA-T3.6**
	AS46AA-T7.2	**AS66AA-T7.2**	**AS98AA-T7.2**	**AS46MA-T7.2**	**AS66MA-T7.2**	**AS98MA-T7.2**
	AS46AA-T10	**AS66AA-T10**	**AS98AA-T10**	**AS46MA-T10**	**AS66MA-T10**	**AS98MA-T10**
	AS46AA-T20	**AS66AA-T20**	**AS98AA-T20**	**AS46MA-T20**	**AS66MA-T20**	**AS98MA-T20**
	AS46AA-T30	**AS66AA-T30**	**AS98AA-T30**	**AS46MA-T30**	**AS66MA-T30**	**AS98MA-T30**
Single-Phase 200-230 VAC	—	**AS66AC-T3.6**	**AS98AC-T3.6**	—	**AS66MC-T3.6**	**AS98MC-T3.6**
	—	**AS66AC-T7.2**	**AS98AC-T7.2**	—	**AS66MC-T7.2**	**AS98MC-T7.2**
	—	**AS66AC-T10**	**AS98AC-T10**	—	**AS66MC-T10**	**AS98MC-T10**
	—	**AS66AC-T20**	**AS98AC-T20**	—	**AS66MC-T20**	**AS98MC-T20**
	—	**AS66AC-T30**	**AS98AC-T30**	—	**AS66MC-T30**	**AS98MC-T30**
Three-Phase 200-230 VAC	—	**AS66AS-T3.6**	**AS98AS-T3.6**	—	**AS66MS-T3.6**	**AS98MS-T3.6**
	—	**AS66AS-T7.2**	**AS98AS-T7.2**	—	**AS66MS-T7.2**	**AS98MS-T7.2**
	—	**AS66AS-T10**	**AS98AS-T10**	—	**AS66MS-T10**	**AS98MS-T10**
	—	**AS66AS-T20**	**AS98AS-T20**	—	**AS66MS-T20**	**AS98MS-T20**
	—	**AS66AS-T30**	**AS98AS-T30**	—	**AS66MS-T30**	**AS98MS-T30**

Features C-12 | System Configuration C-17 | Specifications/Characteristics C-21

◆ PN Geared Type

Power Source	Without Electromagnetic Brake			Electromagnetic Brake		
	Motor Frame Size: ☐1.65 in. (☐42 mm) Model	Motor Frame Size: ☐2.36 in. (☐60 mm) Model	Motor Frame Size: ☐3.54 in. (☐90 mm) Model	Motor Frame Size: ☐1.65 in. (☐42 mm) Model	Motor Frame Size: ☐2.36 in. (☐60 mm) Model	Motor Frame Size: ☐3.54 in. (☐90 mm) Model
Single-Phase 100-115 VAC	—	**AS66AA-N5**	**AS98AA-N5**	—	**AS66MA-N5**	**AS98MA-N5**
	AS46AA-N7.2	**AS66AA-N7.2**	**AS98AA-N7.2**	**AS46MA-N7.2**	**AS66MA-N7.2**	**AS98MA-N7.2**
	AS46AA-N10	**AS66AA-N10**	**AS98AA-N10**	**AS46MA-N10**	**AS66MA-N10**	**AS98MA-N10**
	—	**AS66AA-N25**	**AS98AA-N25**	—	**AS66MA-N25**	**AS98MA-N25**
	—	**AS66AA-N36**	**AS98AA-N36**	—	**AS66MA-N36**	**AS98MA-N36**
	—	**AS66AA-N50**	**AS98AA-N50**	—	**AS66MA-N50**	**AS98MA-N50**
Single-Phase 200-230 VAC	—	**AS66AC-N5**	**AS98AC-N5**	—	**AS66MC-N5**	**AS98MC-N5**
	—	**AS66AC-N7.2**	**AS98AC-N7.2**	—	**AS66MC-N7.2**	**AS98MC-N7.2**
	—	**AS66AC-N10**	**AS98AC-N10**	—	**AS66MC-N10**	**AS98MC-N10**
	—	**AS66AC-N25**	**AS98AC-N25**	—	**AS66MC-N25**	**AS98MC-N25**
	—	**AS66AC-N36**	**AS98AC-N36**	—	**AS66MC-N36**	**AS98MC-N36**
	—	**AS66AC-N50**	**AS98AC-N50**	—	**AS66MC-N50**	**AS98MC-N50**
Three-Phase 200-230 VAC	—	**AS66AS-N5**	**AS98AS-N5**	—	**AS66MS-N5**	**AS98MS-N5**
	—	**AS66AS-N7.2**	**AS98AS-N7.2**	—	**AS66MS-N7.2**	**AS98MS-N7.2**
	—	**AS66AS-N10**	**AS98AS-N10**	—	**AS66MS-N10**	**AS98MS-N10**
	—	**AS66AS-N25**	**AS98AS-N25**	—	**AS66MS-N25**	**AS98MS-N25**
	—	**AS66AS-N36**	**AS98AS-N36**	—	**AS66MS-N36**	**AS98MS-N36**
	—	**AS66AS-N50**	**AS98AS-N50**	—	**AS66MS-N50**	**AS98MS-N50**

◆ HG Geared Type

Power Source	Without Electromagnetic Brake			Electromagnetic Brake		
	Motor Frame Size: ☐1.65 in. (☐42 mm) Model	Motor Frame Size: ☐2.36 in. (☐60 mm) Model	Motor Frame Size: ☐3.54 in. (☐90 mm) Model	Motor Frame Size: ☐1.65 in. (☐42 mm) Model	Motor Frame Size: ☐2.36 in. (☐60 mm) Model	Motor Frame Size: ☐3.54 in. (☐90 mm) Model
Single-Phase 100-115 VAC	**AS46AA2-H50**	**AS66AA2-H50**	**AS98AA-H50**	**AS46MA2-H50**	**AS66MA2-H50**	**AS98MA-H50**
	AS46AA2-H100	**AS66AA2-H100**	**AS98AA-H100**	**AS46MA2-H100**	**AS66MA2-H100**	**AS98MA-H100**
Single-Phase 200-230 VAC	—	**AS66AC2-H50**	**AS98AC-H50**	—	**AS66MC2-H50**	**AS98MC-H50**
	—	**AS66AC2-H100**	**AS98AC-H100**	—	**AS66MC2-H100**	**AS98MC-H100**
Three-Phase 200-230 VAC	—	**AS66AS2-H50**	**AS98AS-H50**	—	**AS66MS2-H50**	**AS98MS-H50**
	—	**AS66AS2-H100**	**AS98AS-H100**	—	**AS66MS2-H100**	**AS98MS-H100**

● AS Series αSTEP PLUS

◆ Standard Type

Power Source	Without Electromagnetic Brake			Electromagnetic Brake		
	Motor Frame Size: ☐1.65 in. (☐42 mm) Model	Motor Frame Size: ☐2.36 in. (☐60 mm) Model	Motor Frame Size: ☐3.35 in. (☐85 mm) Model	Motor Frame Size: ☐1.65 in. (☐42 mm) Model	Motor Frame Size: ☐2.36 in. (☐60 mm) Model	Motor Frame Size: ☐3.35 in. (☐85 mm) Model
Single-Phase 100-115 VAC	**AS46AAP**	**AS66AAP**	**AS98AAP**	**AS46MAP**	**AS66MAP**	**AS98MAP**
	—	**AS69AAP**	**AS911AAP**	—	**AS69MAP**	—
Single-Phase 200-230 VAC	—	**AS66ACP**	**AS98ACP**	—	**AS66MCP**	**AS98MCP**
	—	**AS69ACP**	**AS911ACP**	—	**AS69MCP**	—
Three-Phase 200-230 VAC	—	**AS66ASP**	**AS98ASP**	—	**AS66MSP**	**AS98MSP**
	—	**AS69ASP**	**AS911ASP**	—	**AS69MSP**	—

Common Specifications C-29 | Dimensions C-32 | Connection and Operation C-39 | Motor and Driver Combinations C-53

◆ TH Geared Type

Power Source	Without Electromagnetic Brake			Electromagnetic Brake		
	Motor Frame Size: □1.65 in. (□42 mm) Model	Motor Frame Size: □2.36 in. (□60 mm) Model	Motor Frame Size: □3.54 in. (□90 mm) Model	Motor Frame Size: □1.65 in. (□42 mm) Model	Motor Frame Size: □2.36 in. (□60 mm) Model	Motor Frame Size: □3.54 in. (□90 mm) Model
Single-Phase 100-115 VAC	**AS46AAP-T3.6**	**AS66AAP-T3.6**	**AS98AAP-T3.6**	**AS46MAP-T3.6**	**AS66MAP-T3.6**	**AS98MAP-T3.6**
	AS46AAP-T7.2	**AS66AAP-T7.2**	**AS98AAP-T7.2**	**AS46MAP-T7.2**	**AS66MAP-T7.2**	**AS98MAP-T7.2**
	AS46AAP-T10	**AS66AAP-T10**	**AS98AAP-T10**	**AS46MAP-T10**	**AS66MAP-T10**	**AS98MAP-T10**
	AS46AAP-T20	**AS66AAP-T20**	**AS98AAP-T20**	**AS46MAP-T20**	**AS66MAP-T20**	**AS98MAP-T20**
	AS46AAP-T30	**AS66AAP-T30**	**AS98AAP-T30**	**AS46MAP-T30**	**AS66MAP-T30**	**AS98MAP-T30**
Single-Phase 200-230 VAC	—	**AS66ACP-T3.6**	**AS98ACP-T3.6**	—	**AS66MCP-T3.6**	**AS98MCP-T3.6**
	—	**AS66ACP-T7.2**	**AS98ACP-T7.2**	—	**AS66MCP-T7.2**	**AS98MCP-T7.2**
	—	**AS66ACP-T10**	**AS98ACP-T10**	—	**AS66MCP-T10**	**AS98MCP-T10**
	—	**AS66ACP-T20**	**AS98ACP-T20**	—	**AS66MCP-T20**	**AS98MCP-T20**
	—	**AS66ACP-T30**	**AS98ACP-T30**	—	**AS66MCP-T30**	**AS98MCP-T30**
Three-Phase 200-230 VAC	—	**AS66ASP-T3.6**	**AS98ASP-T3.6**	—	**AS66MSP-T3.6**	**AS98MSP-T3.6**
	—	**AS66ASP-T7.2**	**AS98ASP-T7.2**	—	**AS66MSP-T7.2**	**AS98MSP-T7.2**
	—	**AS66ASP-T10**	**AS98ASP-T10**	—	**AS66MSP-T10**	**AS98MSP-T10**
	—	**AS66ASP-T20**	**AS98ASP-T20**	—	**AS66MSP-T20**	**AS98MSP-T20**
	—	**AS66ASP-T30**	**AS98ASP-T30**	—	**AS66MSP-T30**	**AS98MSP-T30**

◆ PN Geared Type

Power Source	Without Electromagnetic Brake			Electromagnetic Brake		
	Motor Frame Size: □1.65 in. (□42 mm) Model	Motor Frame Size: □2.36 in. (□60 mm) Model	Motor Frame Size: □3.54 in. (□90 mm) Model	Motor Frame Size: □1.65 in. (□42 mm) Model	Motor Frame Size: □2.36 in. (□60 mm) Model	Motor Frame Size: □3.54 in. (□90 mm) Model
Single-Phase 100-115 VAC	—	**AS66AAP-N5**	**AS98AAP-N5**	—	**AS66MAP-N5**	**AS98MAP-N5**
	AS46AAP-N7.2	**AS66AAP-N7.2**	**AS98AAP-N7.2**	**AS46MAP-N7.2**	**AS66MAP-N7.2**	**AS98MAP-N7.2**
	AS46AAP-N10	**AS66AAP-N10**	**AS98AAP-N10**	**AS46MAP-N10**	**AS66MAP-N10**	**AS98MAP-N10**
	—	**AS66AAP-N25**	**AS98AAP-N25**	—	**AS66MAP-N25**	**AS98MAP-N25**
	—	**AS66AAP-N36**	**AS98AAP-N36**	—	**AS66MAP-N36**	**AS98MAP-N36**
	—	**AS66AAP-N50**	**AS98AAP-N50**	—	**AS66MAP-N50**	**AS98MAP-N50**
Single-Phase 200-230 VAC	—	**AS66ACP-N5**	**AS98ACP-N5**	—	**AS66MCP-N5**	**AS98MCP-N5**
	—	**AS66ACP-N7.2**	**AS98ACP-N7.2**	—	**AS66MCP-N7.2**	**AS98MCP-N7.2**
	—	**AS66ACP-N10**	**AS98ACP-N10**	—	**AS66MCP-N10**	**AS98MCP-N10**
	—	**AS66ACP-N25**	**AS98ACP-N25**	—	**AS66MCP-N25**	**AS98MCP-N25**
	—	**AS66ACP-N36**	**AS98ACP-N36**	—	**AS66MCP-N36**	**AS98MCP-N36**
	—	**AS66ACP-N50**	**AS98ACP-N50**	—	**AS66MCP-N50**	**AS98MCP-N50**
Three-Phase 200-230 VAC	—	**AS66ASP-N5**	**AS98ASP-N5**	—	**AS66MSP-N5**	**AS98MSP-N5**
	—	**AS66ASP-N7.2**	**AS98ASP-N7.2**	—	**AS66MSP-N7.2**	**AS98MSP-N7.2**
	—	**AS66ASP-N10**	**AS98ASP-N10**	—	**AS66MSP-N10**	**AS98MSP-N10**
	—	**AS66ASP-N25**	**AS98ASP-N25**	—	**AS66MSP-N25**	**AS98MSP-N25**
	—	**AS66ASP-N36**	**AS98ASP-N36**	—	**AS66MSP-N36**	**AS98MSP-N36**
	—	**AS66ASP-N50**	**AS98ASP-N50**	—	**AS66MSP-N50**	**AS98MSP-N50**

◆ HG Geared Type

Power Source	Without Electromagnetic Brake			Electromagnetic Brake		
	Motor Frame Size: □1.65 in. (□42 mm) Model	Motor Frame Size: □2.36 in. (□60 mm) Model	Motor Frame Size: □3.54 in. (□90 mm) Model	Motor Frame Size: □1.65 in. (□42 mm) Model	Motor Frame Size: □2.36 in. (□60 mm) Model	Motor Frame Size: □3.54 in. (□90 mm) Model
Single-Phase 100-115 VAC	**AS46AAP2-H50**	**AS66AAP2-H50**	**AS98AAP-H50**	**AS46MAP2-H50**	**AS66MAP2-H50**	**AS98MAP-H50**
	AS46AAP2-H100	**AS66AAP2-H100**	**AS98AAP-H100**	**AS46MAP2-H100**	**AS66MAP2-H100**	**AS98MAP-H100**
Single-Phase 200-230 VAC	—	**AS66ACP2-H50**	**AS98ACP-H50**	—	**AS66MCP2-H50**	**AS98MCP-H50**
	—	**AS66ACP2-H100**	**AS98ACP-H100**	—	**AS66MCP2-H100**	**AS98MCP-H100**
Three-Phase 200-230 VAC	—	**AS66ASP2-H50**	**AS98ASP-H50**	—	**AS66MSP2-H50**	**AS98MSP-H50**
	—	**AS66ASP2-H100**	**AS98ASP-H100**	—	**AS66MSP2-H100**	**AS98MSP-H100**

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Standard Type Motor Frame Size: □1.65 in. (□42 mm), □2.36 in. (□60 mm), □3.35 in. (□85 mm)

Specifications

c UL us CE (Except for **AS46** type)

Model✻1	**AS**	W/O Electromagnetic Brake	**AS46AA**	**AS66A□**	**AS69A□**	**AS98A□**	**AS911A□**
		Electromagnetic Brake	**AS46MA**	**AS66M□**	**AS69M□**	**AS98M□**	—
	AS PLUS	W/O Electromagnetic Brake	**AS46AAP**	**AS66A□P**	**AS69A□P**	**AS98A□P**	**AS911A□P**
		Electromagnetic Brake	**AS46MAP**	**AS66M□P**	**AS69M□P**	**AS98M□P**	—
Maximum Holding Torque		oz-in (N·m)	42 (0.3)	170 (1.2)	280 (2.0)	280 (2.0)	560 (4.0)
Rotor Inertia✻2 J		oz-in^2 (kg·m^2)	0.37 (68×10^{-7}) [0.45 (83×10^{-7})]	2.2 (405×10^{-7}) [3.1 (564×10^{-7})]	4.4 (802×10^{-7}) [5.3 (961×10^{-7})]	7.7 (1400×10^{-7}) [8.5 (1560×10^{-7})]	14.8 (2710×10^{-7})
Resolution✻4			0.36°/Pulse (Resolution Setting: 1000 P/R)				
Power Source		Voltage·Frequency	□=**A** for Single-Phase 100-115 VAC −15%~+10% · 50/60 Hz □=**C** for Single-Phase 200-230 VAC −15%~+10% · 50/60 Hz □=**S** for Three-Phase 200-230 VAC −15%~+10% · 50/60 Hz				
Maximum Input Current		Single-Phase 100-115 VAC	3.3 A	5.0 A	6.4 A	6.0 A	6.5 A
		Single-Phase 200-230 VAC	—	3.0 A	3.9 A	3.5 A	4.5 A
		Three-Phase 200-230 VAC	—	1.5 A	2.2 A	1.9 A	2.4 A
Electromagnetic Brake✻3	Type		Active when power is off				—
	Power Supply Input		24 VDC±5%				—
	Power Consumption		2 W	6 W			—
	Excitation Current		0.08 A	0.25 A			—
	Static Friction Torque	oz-in (N·m)	21 (0.15)	85 (0.6)	142 (1.0)	142 (1.0)	—
Weight✻2	Motor	lb. (kg)	1.1 (0.5) [1.3 (0.6)]	1.9 (0.85) [2.4 (1.1)]	3.1 (1.4) [3.6 (1.65)]	4.0 (1.8) [4.8 (2.2)]	6.6 (3.0)
	Driver	lb. (kg)	1.8 (0.8)				
Dimension No.	Motor		$\boxed{1}$	$\boxed{2}$		$\boxed{3}$	
	Driver		**AS**=$\boxed{13}$ **AS PLUS**=$\boxed{14}$				

✻1 The square box in the model number will contain one of the following letters to indicate the power supply voltage: **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC).

✻2 The values inside the brackets [ ] represents the specification for electromagnetic brake type.

✻3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable.

✻4 **AS** series: The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, 10000 P/R with the resolution select switch or resolution select switching signals. See page C-39 for details.
AS PLUS: The resolution can be set from 500 P/R to 10000 P/R by setting parameters.

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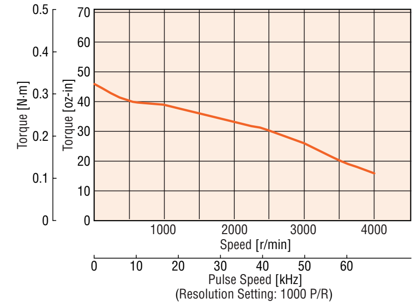
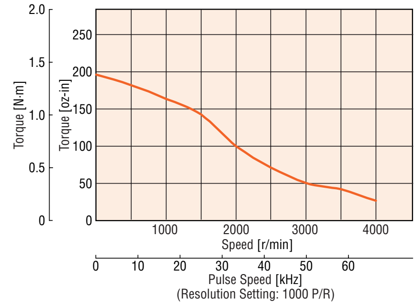
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

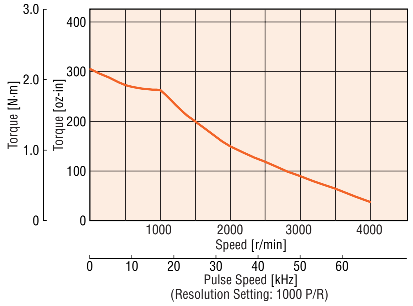
AS46□A, AS46□AP



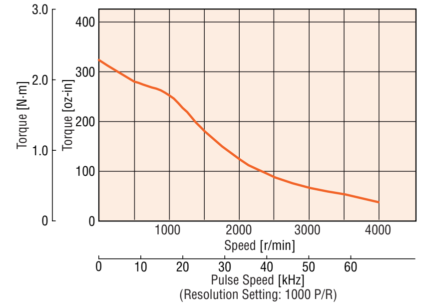
AS66□□, AS66□□P



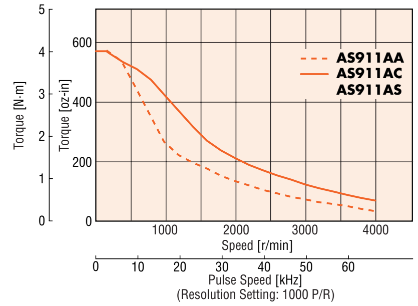
AS69□□, AS69□□P



AS98□□, AS98□□P



AS911A□, AS911A□P



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212˚F (100˚C). [Under 176˚F (75˚C) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

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TH Geared Type

Motor Frame Size: □ 1.65 in. (□ 42 mm)

Specifications

Model							
Model	**AS**	W/O Electromagnetic Brake	**AS46AA-T3.6**	**AS46AA-T7.2**	**AS46AA-T10**	**AS46AA-T20**	**AS46AA-T30**
		Electromagnetic Brake	**AS46MA-T3.6**	**AS46MA-T7.2**	**AS46MA-T10**	**AS46MA-T20**	**AS46MA-T30**
	AS PLUS	W/O Electromagnetic Brake	**AS46AAP-T3.6**	**AS46AAP-T7.2**	**AS46AAP-T10**	**AS46AAP-T20**	**AS46AAP-T30**
		Electromagnetic Brake	**AS46MAP-T3.6**	**AS46MAP-T7.2**	**AS46MAP-T10**	**AS46MAP-T20**	**AS46MAP-T30**
Maximum Holding Torque		lb-in (N·m)	3 (0.35)	6.1 (0.7)	8.8 (1)	13.2 (1.5)	13.2 (1.5)
Rotor Inertia✻2 J		oz-in^2 (kg·m^2)	0.37 (68×10^{-7}) [0.45 (83×10^{-7})]				
Backlash		arc min (degrees)	45 (0.75°)	25 (0.417°)	25 (0.417°)	15 (0.25°)	15 (0.25°)
Permissible Speed Range		r/min	0~500	0~250	0~180	0~90	0~60
Gear Ratio			3.6 : 1	7.2 : 1	10 : 1	20 : 1	30 : 1
Resolution✻4		1000 P/R	0.1°/pulse	0.05°/pulse	0.036°/pulse	0.018°/pulse	0.012°/pulse
Permissible Torque		lb-in (N·m)	3 (0.35)	6.1 (0.7)	8.8 (1)	13.2 (1.5)	13.2 (1.5)
Power Source		Voltage·Frequency·Maximum Input Current	Single-Phase 100-115 VAC −15%~+10% · 50/60 Hz·3.3 A				
Electromagnetic Brake✻3	Type		Active when power is off				
	Power Supply Input		24 VDC±5%				
	Power Consumption		2 W				
	Excitation Current		0.08 A				
	Static Friction Torque	lb-in (N·m)	1.5 (0.17)	3 (0.35)	4.4 (0.5)	6.6 (0.75)	6.6 (0.75)
Weight✻2	Motor	lb. (kg)	1.4 (0.65) [1.7 (0.75)]				
	Driver	lb. (kg)	1.8 (0.8)				
Dimension No.	Motor		4				
	Driver		**AS**=13 **AS PLUS**=14				

✻2 The values inside the brackets [ ] represents the specification for electromagnetic brake type.
✻3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking.
Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable.
✻4 **AS** series: The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, 10000 P/R with the resolution select switch or resolution select switching signals. See page C-39 for details.
AS PLUS: The resolution can be set from 500 P/R to 10000 P/R by setting parameters.

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Note:

- Direction of rotation of the motor and that of the gear output shaft are the same for unit type with reduction ratio 3.6:1, 7.2:1 and 10:1.
It is opposite for 20:1 and 30:1 ratio type.

Speed — Torque Characteristics

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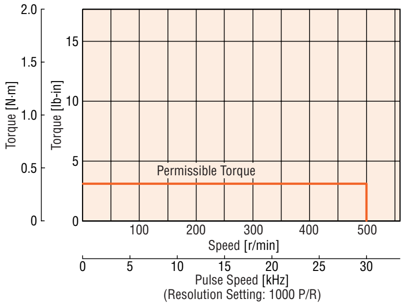
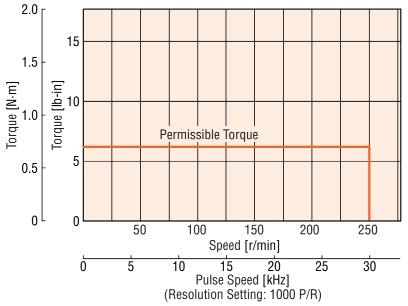
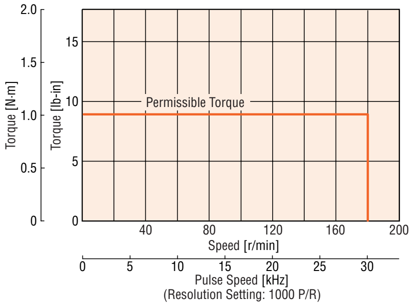
AS46□A-T3.6, AS46□AP-T3.6



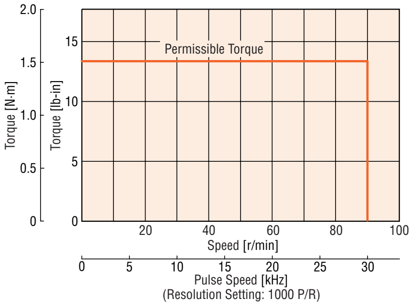
AS46□A-T7.2, AS46□AP-T7.2



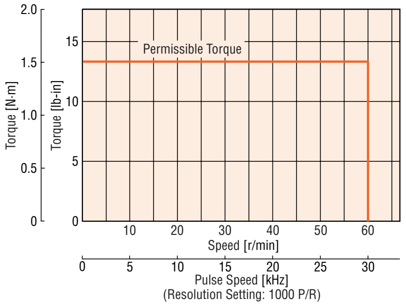
AS46□A-T10, AS46□AP-T10



AS46□A-T20, AS46□AP-T20



AS46□A-T30, AS46□AP-T30



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212˚F (100˚C).
- When using the motor with the dedicated driver, the driver's automatic current cutbuck at motor standstill function reduces maximum holding torque by approximately 50%.

TH Geared Type

Motor Frame Size: □ 2.36 in. (□ 60 mm)

Specifications

c UL us CE

Model[1]	**AS**	W/O Electromagnetic Brake	**AS66A□-T3.6**	**AS66A□-T7.2**	**AS66A□-T10**	**AS66A□-T20**	**AS66A□-T30**
		Electromagnetic Brake	**AS66M□-T3.6**	**AS66M□-T7.2**	**AS66M□-T10**	**AS66M□-T20**	**AS66M□-T30**
	AS PLUS	W/O Electromagnetic Brake	**AS66A□P-T3.6**	**AS66A□P-T7.2**	**AS66A□P-T10**	**AS66A□P-T20**	**AS66A□P-T30**
		Electromagnetic Brake	**AS66M□P-T3.6**	**AS66M□P-T7.2**	**AS66M□P-T10**	**AS66M□P-T20**	**AS66M□P-T30**
Maximum Holding Torque		lb-in (N·m)	11 (1.25)	22 (2.5)	26 (3)	30 (3.5)	35 (4)
Rotor Inertia[2] J		oz-in^2 (kg·m^2)	2.2 (405×10^{-7}) [3.1 (564×10^{-7})]				
Backlash		arc min (degrees)	35 (0.584°)	15 (0.25°)	15 (0.25°)	10 (0.167°)	10 (0.167°)
Permissible Speed Range		r/min	0~500	0~250	0~180	0~90	0~60
Gear Ratio			3.6 : 1	7.2 : 1	10 : 1	20 : 1	30 : 1
Resolution[4]		1000 P/R	0.1°/pulse	0.05°/pulse	0.036°/pulse	0.018°/pulse	0.012°/pulse
Permissible Torque		lb-in (N·m)	11 (1.25)	22 (2.5)	26 (3)	30 (3.5)	35 (4)
Power Source		Voltage·Frequency·Maximum Input Current	□=**A** For Single-Phase 100-115 VAC −15%~+10% · 50/60 Hz·5.0 A □=**C** For Single-Phase 200-230 VAC −15%~+10% · 50/60 Hz·3.0 A □=**S** For Three-Phase 200-230 VAC −15%~+10% · 50/60 Hz·1.5 A				
Electromagnetic Brake[3]	Type		Active when power is off				
	Power Supply Input		24 VDC±5%				
	Power Consumption		6 W				
	Excitation Current		0.25 A				
	Static Friction Torque	lb-in (N·m)	5.4 (0.62)	11 (1.25)	13.2 (1.5)	15.4 (1.75)	17.7 (2.0)
Weight[2]	Motor	lb. (kg)	2.8 (1.25) [3.3 (1.5)]				
	Driver	lb. (kg)	1.8 (0.8)				
Dimension No.	Motor		5				
	Driver		**AS**=13 **AS PLUS**=14				

[1] The square box in the model number will contain one of the following letters to indicate the power supply voltage: **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC).

[2] The values inside the brackets [ ] represents the specification for electromagnetic brake type.

[3] The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking.
Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable.

[4] **AS** series: The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, 10000 P/R with the resolution select switch or resolution select switching signals. See page C-39 for details.
AS PLUS: The resolution can be set from 500 P/R to 10000 P/R by setting parameters.

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Note:

- Direction of rotation of the motor and that of the gear output shaft are the same for unit type with reduction ratio 3.6:1, 7.2:1 and 10:1. It is opposite for 20:1 and 30:1 ratio type.

Speed — Torque Characteristics

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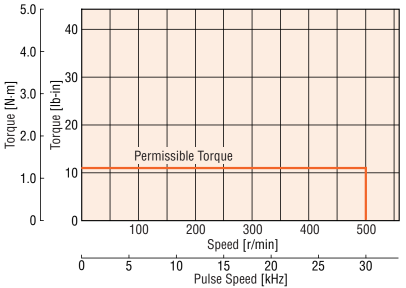
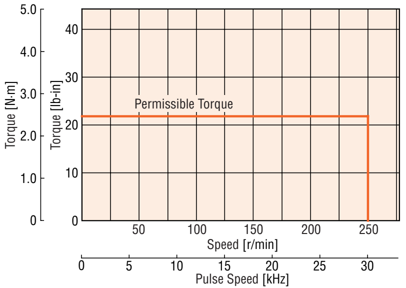
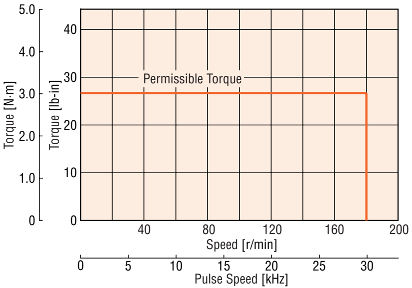
AS66□□-T3.6, AS66□□P-T3.6



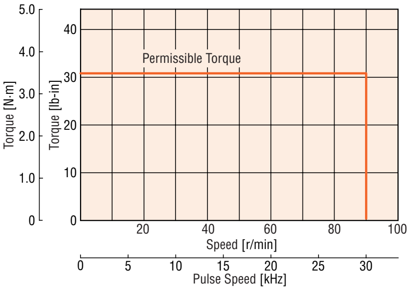
AS66□□-T7.2, AS66□□P-T7.2



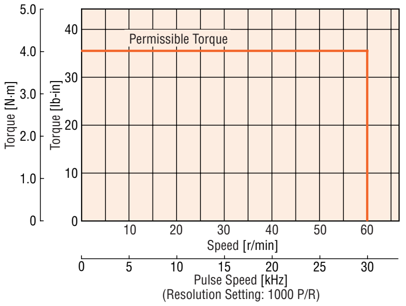
AS66□□-T10, AS66□□P-T10



AS66□□-T20, AS66□□P-T20



AS66□□-T30, AS66□□P-T30



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212˚F (100˚C). [Under 176˚F (75˚C) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

TH Geared Type Motor Frame Size: ☐ 3.54 in. (☐ 90 mm)

Specifications

Model[*1]							
Model[*1]	**AS**	W/O Electromagnetic Brake	**AS98A☐-T3.6**	**AS98A☐-T7.2**	**AS98A☐-T10**	**AS98A☐-T20**	**AS98A☐-T30**
		Electromagnetic Brake	**AS98M☐-T3.6**	**AS98M☐-T7.2**	**AS98M☐-T10**	**AS98M☐-T20**	**AS98M☐-T30**
	AS PLUS	W/O Electromagnetic Brake	**AS98A☐P-T3.6**	**AS98A☐P-T7.2**	**AS98A☐P-T10**	**AS98A☐P-T20**	**AS98A☐P-T30**
		Electromagnetic Brake	**AS98M☐P-T3.6**	**AS98M☐P-T7.2**	**AS98M☐P-T10**	**AS98M☐P-T20**	**AS98M☐P-T30**
Maximum Holding Torque		lb-in (N·m)	39 (4.5)	79 (9)	79 (9)	106 (12)	106 (12)
Rotor Inertia[*2] J		oz-in^2 (kg·m^2)	7.7 (1400×10^{-7}) [8.5 (1560×10^{-7})]				
Backlash		arc min (degrees)	25 (0.417°)	15 (0.25°)	15 (0.25°)	10 (0.167°)	10 (0.167°)
Permissible Speed Range		r/min	0~500	0~250	0~180	0~90	0~60
Gear Ratio			3.6 : 1	7.2 : 1	10 : 1	20 : 1	30 : 1
Resolution[*4]		1000 P/R	0.1°/pulse	0.05°/pulse	0.036°/pulse	0.018°/pulse	0.012°/pulse
Permissible Torque		lb-in (N·m)	39 (4.5)	79 (9)	79 (9)	106 (12)	106 (12)
Power Source	Voltage·Frequency·Maximum Input Current		☐=**A** for Single-Phase 100-115 VAC −15%~+10% · 50/60 Hz·6.0 A ☐=**C** for Single-Phase 200-230 VAC −15%~+10% · 50/60 Hz·3.5 A ☐=**S** for Three-Phase 200-230 VAC −15%~+10% · 50/60 Hz·1.9 A				
Electromagnetic Brake[*3]	Type		Active when power is off				
	Power Supply Input		24 VDC±5%				
	Power Consumption		6 W				
	Excitation Current		0.25 A				
	Static Friction Torque	lb-in (N·m)	19.9 (2.25)	39 (4.5)	39 (4.5)	53 (6)	53 (6)
Weight[*2]	Motor	lb. (kg)	6.6 (3.0) [7.5 (3.4)]				
	Driver	lb. (kg)	1.8 (0.8)				
Dimension No.	Motor		6				
	Driver		**AS**=13 **AS PLUS**=14				

[*1] The square box in the model number will contain one of the following letters to indicate the power supply voltage: **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC).

[*2] The values inside the brackets [ ] represents the specification for electromagnetic brake type.

[*3] The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable.

[*4] **AS** series: The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, 10000 P/R with the resolution select switch or resolution select switching signals. See page C-39 for details.

AS PLUS: The resolution can be set from 500 P/R to 10000 P/R by setting parameters.

How to Read Specifications Table→Page C-9

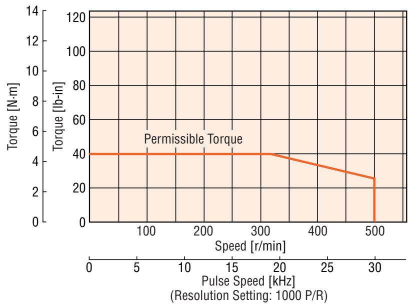
Note:

- Direction of rotation of the motor and that of the gear output shaft are the same for unit type with reduction ratio 3.6:1, 7.2:1 and 10:1. It is opposite for 20:1 and 30:1 ratio type.

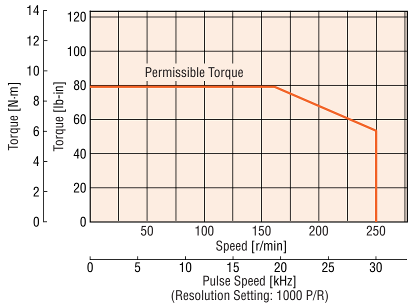
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

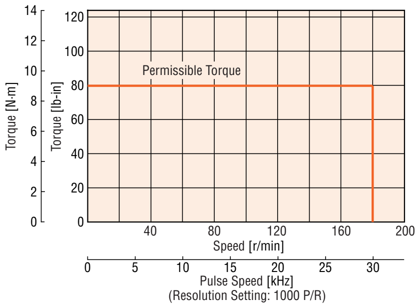
AS98☐☐-T3.6, AS98☐☐P-T3.6



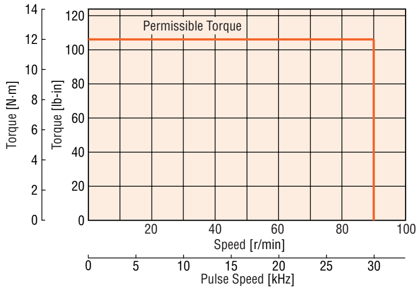
AS98☐☐-T7.2, AS98☐☐P-T7.2



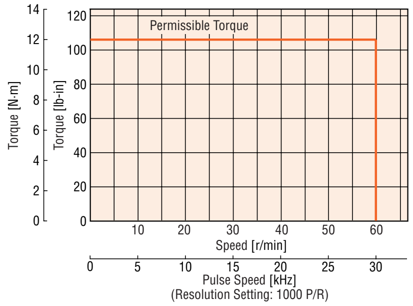
AS98☐☐-T10, AS98☐☐P-T10



AS98☐☐-T20, AS98☐☐P-T20



AS98☐☐-T30, AS98☐☐P-T30



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212˚F (100˚C). [Under 176˚F (75˚C) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutbuck at motor standstill function reduces maximum holding torque by approximately 50%.

PN Geared Type

Motor Frame Size: □ 1.65 in. (□ 42 mm)

Specifications

Model	**AS**	W/O Electromagnetic Brake	**AS46AA-N7.2**	**AS46AA-N10**
		Electromagnetic Brake	**AS46MA-N7.2**	**AS46MA-N10**
	AS PLUS	W/O Electromagnetic Brake	**AS46AAP-N7.2**	**AS46AAP-N10**
		Electromagnetic Brake	**AS46MAP-N7.2**	**AS46MAP-N10**
Maximum Holding Torque		lb-in (N·m)	13.2 (1.5)	
Rotor Inertia[✻2] J		oz-in^2 (kg·m^2)	0.37 (68×10^{-7}) [0.45 (83×10^{-7})]	
Backlash		arc min (degrees)	2 (0.034°)	
Angle Error		arc min (degrees)	6 (0.1°)	
Permissible Speed Range		r/min	0～416	0～300
Gear Ratio			7.2 : 1	10 : 1
Resolution[✻4]		1000 P/R	0.05°/pulse	0.036°/pulse
Permissible Torque		lb-in (N·m)	13.2 (1.5)	
Maximum Torque[✻5]		lb-in (N·m)	17.7 (2)	
Power Source		Voltage·Frequency·Maximum Input Current	Single-Phase 100-115 VAC −15%～+10% · 50/60 Hz·3.3 A	
Electromagnetic Brake[✻3]	Type		Active when power is off	
	Power Supply Input		24 VDC±5%	
	Power Consumption		2 W	
	Excitation Current		0.08 A	
	Static Friction Torque	lb-in (N·m)	6.6 (0.75)	
Weight[✻2]	Motor	lb. (kg)	1.6 (0.71) [1.8 (0.81)]	
	Driver	lb. (kg)	1.8 (0.8)	
Dimension No.	Motor		7	
	Driver		**AS**=13 **AS PLUS**=14	

✻2 The values inside the brackets [ ] represents the specification for electromagnetic brake type.

✻3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable.

✻4 **AS** series: The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, 10000 P/R with the resolution select switch or resolution select switching signals. See page C-39 for details.
AS PLUS: The resolution can be set from 500 P/R to 10000 P/R by setting parameters.

✻5 The value of Maximum Torque is for gear. For output torque for geared motor, refer to the Speed - Torque characteristics.

How to Read Specifications Table→Page C-9

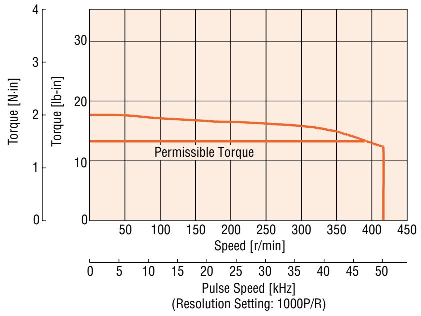
Note:

- Direction of rotation of the motor and that of the gear output shaft are the same.

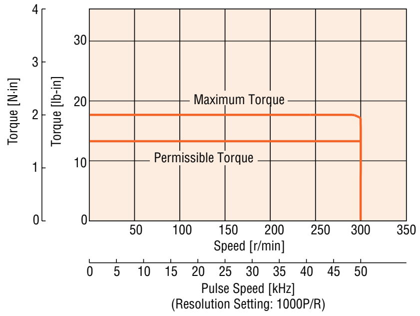
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

AS46□A-N7.2, AS46□AP-N7.2



AS46□A-N10, AS46□AP-N10



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212˚F (100˚C).
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

PN Geared Type

Motor Frame Size: □ 2.36 in. (□ 60 mm)

Specifications

Model*1	**AS**	W/O Electromagnetic Brake	**AS66A□-N5**	**AS66A□-N7.2**	**AS66A□-N10**	**AS66A□-N25**	**AS66A□-N36**	**AS66A□-N50**
		Electromagnetic Brake	**AS66M□-N5**	**AS66M□-N7.2**	**AS66M□-N10**	**AS66M□-N25**	**AS66M□-N36**	**AS66M□-N50**
	AS PLUS	W/O Electromagnetic Brake	**AS66A□P-N5**	**AS66A□P-N7.2**	**AS66A□P-N10**	**AS66A□P-N25**	**AS66A□P-N36**	**AS66A□P-N50**
		Electromagnetic Brake	**AS66M□P-N5**	**AS66M□P-N7.2**	**AS66M□P-N10**	**AS66M□P-N25**	**AS66M□P-N36**	**AS66M□P-N50**
Maximum Holding Torque		lb-in (N·m)	30 (3.5)	35 (4.0)	44 (5.0)	70 (8.0)		
Rotor Inertia*2 J		oz-in^2 (kg·m^2)	2.2 (405×10^{-7}) [3.1 (564×10^{-7})]					
Backlash		arc min (degrees)	2 (0.034°)			3 (0.05°)		
Angle Error		arc min (degrees)	5 (0.084°)					
Permissible Speed Range		r/min	0~600	0~416	0~300	0~120	0~83	0~60
Gear Ratio			5 : 1	7.2 : 1	10 : 1	25 : 1	36 : 1	50 : 1
Resolution*4		1000 P/R	0.072°/pulse	0.05°/pulse	0.036°/pulse	0.0144°/pulse	0.01°/pulse	0.0072°/pulse
Permissible Torque		lb-in (N·m)	30 (3.5)	35 (4.0)	44 (5.0)	70 (8.0)		
Maximum Torque*5		lb-in (N·m)	61 (7)	79 (9)	97 (11)	141 (16)	177 (20)	177 (20)
Power Source	Voltage·Frequency·Maximum Input Current		□=**A** for Single-Phase 100-115 VAC −15%~+10% · 50/60 Hz·5.0 A □=**C** for Single-Phase 200-230 VAC −15%~+10% · 50/60 Hz·3.0 A □=**S** for Three-Phase 200-230 VAC −15%~+10% · 50/60 Hz·1.5 A					
Electromagnetic Brake*3	Type		Active when power is off					
	Power Supply Input		24 VDC±5%					
	Power Consumption		6 W					
	Excitation Current		0.25 A					
	Static Friction Torque	lb-in (N·m)	15.4 (1.75)	17.7 (2.0)	22 (2.5)	35 (4.0)		
Weight*2	Motor	lb. (kg)	3.3 (1.5) [3.9 (1.75)]			3.7 (1.7) [4.3 (1.95)]		
	Driver	lb. (kg)	1.8 (0.8)					
Dimension No.	Motor		8					
	Driver		**AS**=13 **AS PLUS**=14					

*1 The square box in the model number will contain one of the following letters to indicate the power supply voltage: **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC).

*2 The values inside the brackets [ ] represents the specification for electromagnetic brake type.

*3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable.

*4 **AS** series: The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, 10000 P/R with the resolution select switch or resolution select switching signals. See page C-39 for details.

AS PLUS: The resolution can be set from 500 P/R to 10000 P/R by setting parameters.

*5 The value of Maximum Torque is for gear. For output torque for geared motor, refer to the Speed - Torque characteristics.

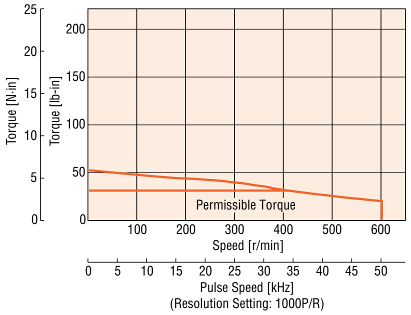
How to Read Specifications Table→Page C-9

Note: Direction of rotation of the motor and that of the gear output shaft are the same.

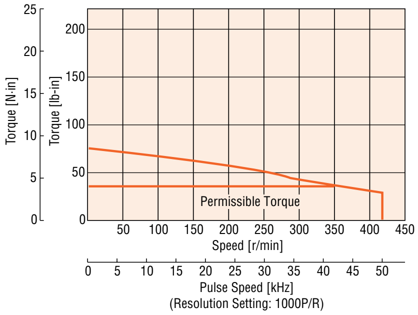
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

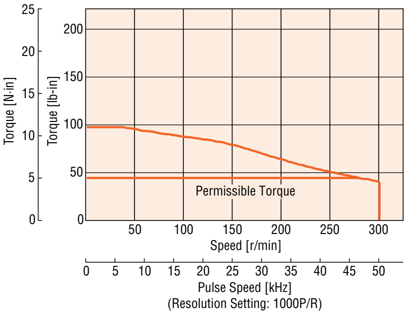
AS66□□-N5, AS66□□P-N5



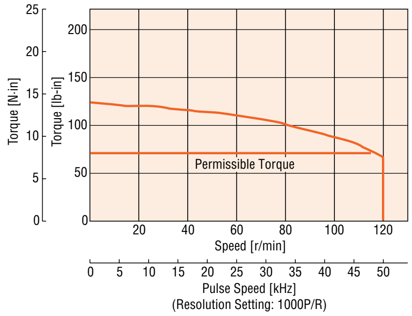
AS66□□-N7.2, AS66□□P-N7.2



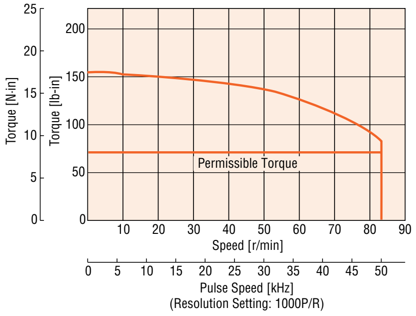
AS66□□-N10, AS66□□P-N10



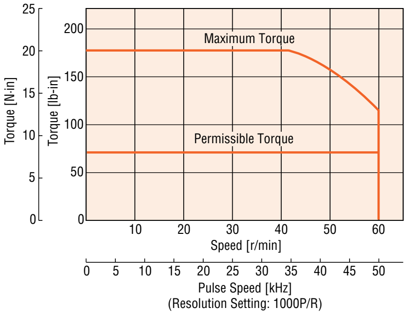
AS66□□-N25, AS66□□P-N25



AS66□□-N36, AS66□□P-N36



AS66□□-N50, AS66□□P-N50



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212˚F (100˚C). [Under 176˚F (75˚C) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutbuck at motor standstill function reduces maximum holding torque by approximately 50%.

Features C-12 System Configuration C-17 Specifications/Characteristics C-21

PN Geared Type

Motor Frame Size: □ 3.54 in. (□ 90 mm)

Specifications

c UL us CE

Model[✻1]	AS	W/O Electromagnetic Brake	**AS98A□-N5**	**AS98A□-N7.2**	**AS98A□-N10**	**AS98A□-N25**	**AS98A□-N36**	**AS98A□-N50**
		Electromagnetic Brake	**AS98M□-N5**	**AS98M□-N7.2**	**AS98M□-N10**	**AS98M□-N25**	**AS98M□-N36**	**AS98M□-N50**
	AS PLUS	W/O Electromagnetic Brake	**AS98A□P-N5**	**AS98A□P-N7.2**	**AS98A□P-N10**	**AS98A□P-N25**	**AS98A□P-N36**	**AS98A□P-N50**
		Electromagnetic Brake	**AS98M□P-N5**	**AS98M□P-N7.2**	**AS98M□P-N10**	**AS98M□P-N25**	**AS98M□P-N36**	**AS98M□P-N50**
Maximum Holding Torque		lb-in (N·m)	88 (10)	123 (14)	177 (20)	320 (37)		
Rotor Inertia[✻2] J		oz-in^2 (kg·m^2)	7.7 (1400×10^{-7}) [8.5 (1560×10^{-7})]					
Backlash		arc min (degrees)	2 (0.034°)			3 (0.05°)		
Angle Error		arc min (degrees)	4 (0.067°)					
Permissible Speed Range		r/min	0~600	0~416	0~300	0~120	0~83	0~60
Gear Ratio			5 : 1	7.2 : 1	10 : 1	25 : 1	36 : 1	50 : 1
Resolution[✻4]		1000 P/R	0.072°/pulse	0.05°/pulse	0.036°/pulse	0.0144°/pulse	0.01°/pulse	0.0072°/pulse
Permissible Torque		lb-in (N·m)	88 (10)	123 (14)	177 (20)	320 (37)		
Maximum Torque[✻5]		lb-in (N·m)	240 (28)	300 (35)	300 (35)	490 (56)	530 (60)	530 (60)
Power Source	Voltage·Frequency·Maximum Input Current		□=**A** for Single-Phase 100-115 VAC −15%~+10% · 50/60 Hz·6.0 A □=**C** for Single-Phase 200-230 VAC −15%~+10% · 50/60 Hz·3.5 A □=**S** for Three-Phase 200-230 VAC −15%~+10% · 50/60 Hz·1.9 A					
Electromagnetic Brake[✻3]	Type		Active when power is off					
	Power Supply Input		24 VDC±5%					
	Power Consumption		6 W					
	Excitation Current		0.25 A					
	Static Friction Torque	lb-in (N·m)	39 (4.5)	57 (6.45)	79 (9)	163 (18.5)		
Weight[✻2]	Motor	lb. (kg)	8.8 (4.0) [9.7 (4.4)]			10 (4.7) [11 (5.1)]		
	Driver	lb. (kg)	1.8 (0.8)					
Dimension No.	Motor		9					
	Driver		**AS**=13 **AS PLUS**=14					

✻1 The square box in the model number will contain one of the following letters to indicate the power supply voltage: **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC).

✻2 The values inside the brackets [ ] represents the specification for electromagnetic brake type.

✻3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable.

✻4 **AS** series: The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, 10000 P/R with the resolution select switch or resolution select switching signals. See page C-39 for details.
AS PLUS: The resolution can be set from 500 P/R to 10000 P/R by setting parameters.

✻5 The value of Maximum Torque is for gear. For output torque for geared motor, refer to the Speed - Torque characteristics.

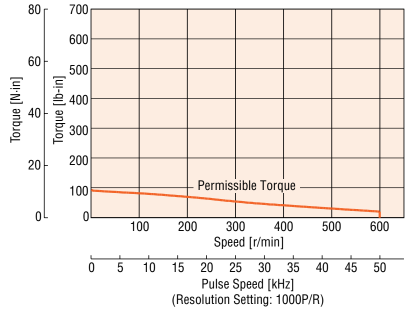
How to Read Specifications Table→Page C-9

Note: Direction of rotation of the motor and that of the gear output shaft are the same.

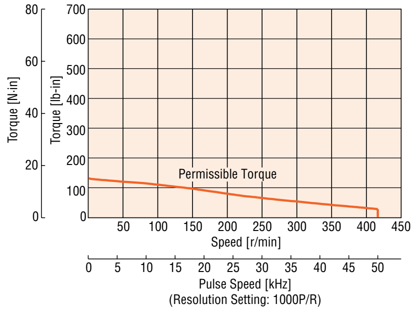
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

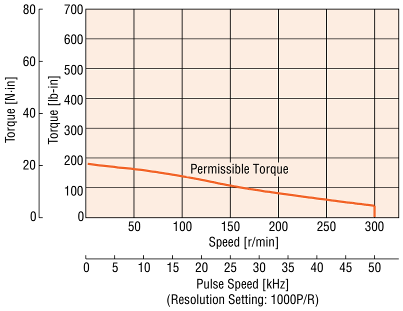
AS98□□-N5, AS98□□P-N5



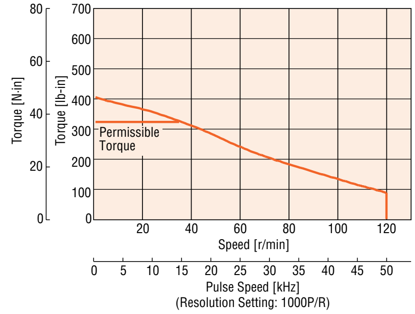
AS98□□-N7.2, AS98□□P-N7.2



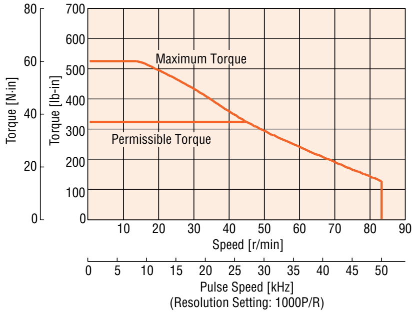
AS98□□-N10, AS98□□P-N10



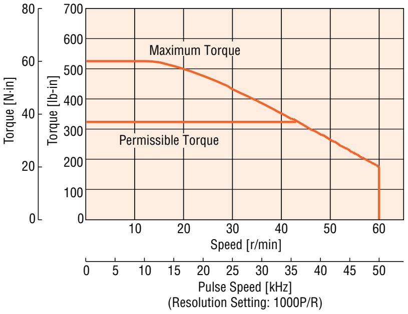
AS98□□-N25, AS98□□P-N25



AS98□□-N36, AS98□□P-N36



AS98□□-N50, AS98□□P-N50



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212˚F (100˚C). [Under 176˚F (75˚C) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

HG Geared Type Motor Frame Size: □ 1.65 in. (□ 42 mm), □ 2.36 in. (□ 60 mm), □ 3.54 in. (□ 90 mm)

Specifications

c UL us C E (Except for **AS46** type)

Model*1	AS	W/O Electromagnetic Brake	**AS46AA2-H50**	**AS46AA2-H100**	**AS66A□2-H50**	**AS66A□2-H100**	**AS98A□-H50**	**AS98A□-H100**
		Electromagnetic Brake	**AS46MA2-H50**	**AS46MA2-H100**	**AS66M□2-H50**	**AS66M□2-H100**	**AS98M□-H50**	**AS98M□-H100**
	AS PLUS	W/O Electromagnetic Brake	**AS46AAP2-H50**	**AS46AAP2-H100**	**AS66A□P2-H50**	**AS66A□P2-H100**	**AS98A□P-H50**	**AS98A□P-H100**
		Electromagnetic Brake	**AS46MAP2-H50**	**AS46MAP2-H100**	**AS66M□P2-H50**	**AS66M□P2-H100**	**AS98M□P-H50**	**AS98M□P-H100**
Maximum Holding Torque		lb-in (N·m)	30 (3.5)	44 (5.0)	48 (5.5)	70 (8.0)	220 (25)	320 (37)
Rotor Inertia*2 J		oz-in^2 (kg·m^2)	0.46 (85×10^{-7}) [0.55 (100×10^{-7})]		2.3 (422×10^{-7}) [3.18 (581×10^{-7})]		7.8 (1417×10^{-7}) [8.6 (1577×10^{-7})]	
Permissible Speed Range		r/min	0~70	0~35	0~70	0~35	0~70	0~35
Gear Ratio			50 : 1	100 : 1	50 : 1	100 : 1	50 : 1	100 : 1
Resolution*4		1000 P/R	0.0072°/pulse	0.0036°/pulse	0.0072°/pulse	0.0036°/pulse	0.0072°/pulse	0.0036°/pulse
Permissible Torque		lb-in (N·m)	30 (3.5)	44 (5.0)	48 (5.5)	70 (8.0)	220 (25)	320 (37)
Maximum Torque		lb-in (N·m)	73 (8.3)	97 (11)	159 (18)	240 (28)	300 (35)	480 (55)
Lost Motion (Load Torque)		arc min	Max. 1.5 (±0.16 N·m)	Max. 1.5 (±0.2 N·m)	Max. 0.7 (±0.28 N·m)	Max. 0.7 (±0.39 N·m)	Max. 1.5 (±1.2 N·m)	Max. 1.5 (±1.2 N·m)
Power Source		Voltage·Frequency·Maximum Input Current	Single-Phase 100-115 VAC −15%~+10%·50/60 Hz 3.3 A		Single-Phase 100-115 VAC −15%~+10%·50/60 Hz 5 A Single-Phase 200-230 VAC −15%~+10%·50/60 Hz 3 A Three-Phase 200-230 VAC −15%~+10%·50/60 Hz 1.5 A		Single-Phase 100-115 VAC −15%~+10%·50/60 Hz 6 A Single-Phase 200-230 VAC −15%~+10%·50/60 Hz 3.5 A Three-Phase 200-230 VAC −15%~+10%·50/60 Hz 1.9 A	
Electromagnetic Brake*3	Type		Active when power is off					
	Power Supply Input		24 VDC±5%					
	Power Consumption		2 W		6 W		6 W	
	Excitation Current		0.08 A		0.25 A		0.25 A	
	Static Friction Torque	lb-in (N·m)	15.4 (1.75)	22 (2.5)	24 (2.75)	35 (4)	110 (12.5)	163 (18.5)
Weight*2	Motor	lb. (kg)	1.5 (0.7) [1.8 (0.8)]		3.1 (1.4) [3.6 (1.65)]		8.6 (3.9) [9.5 (4.3)]	
	Driver	lb. (kg)	1.8 (0.8)					
Dimension No.	Motor		10		11		12	
	Driver		**AS**=13 **AS PLUS**=14					

*1 The square box in the model number will contain one of the following letters to indicate the power supply voltage: **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC).

*2 The values inside the brackets [ ] represents the specification for electromagnetic brake type.

*3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable.

*4 **AS** series: The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, 10000 P/R with the resolution select switch or resolution select switching signals. See page C-39 for details.

AS PLUS: The resolution can be set from 500 P/R to 10000 P/R by setting parameters.

How to Read Specifications Table→Page C-9

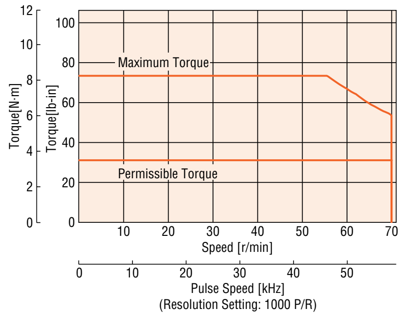
Note:

- The inertia represents a sum of the inertia at the harmonic gear converted to a motor shaft value, and the rotor inertia. Direction of rotation of the motor and that of the gear output shaft are the opposite.

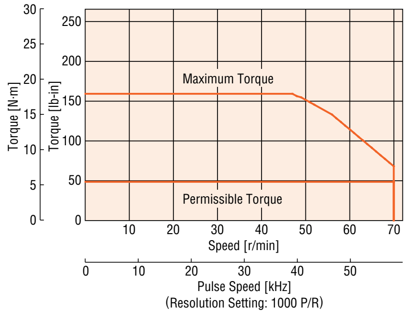
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

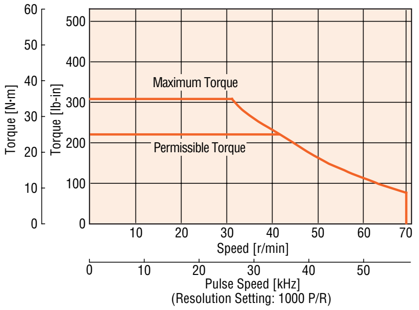
AS46□A2-H50, AS46□AP2-H50



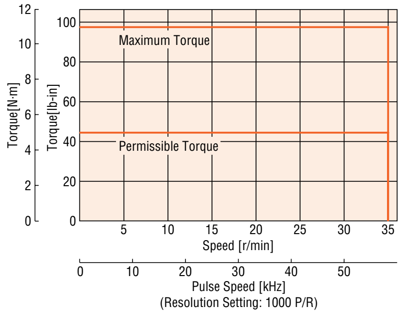
AS66□□2-H50, AS66□□P2-H50



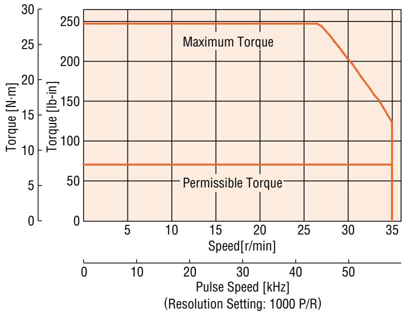
AS98□□-H50, AS98□□P-H50



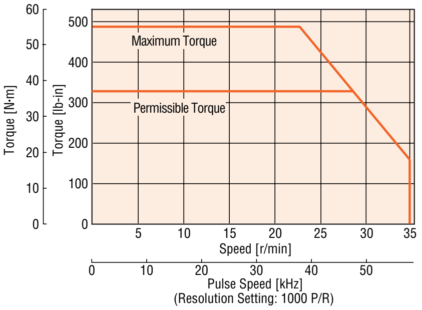
AS46□A2-H100, AS46□AP2-H100



AS66□□2-H100, AS66□□P2-H100



AS98□□-H100, AS98□□P-H100



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. In order to prevent fatigue of the gear grease in the harmonic gear, keep the temperature of the gear case under 158˚F (70˚C).
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

Features C-12 System Configuration C-17 Specifications/Characteristics C-21

Common Specifications

AS Series

Speed and Position Control Command	Pulse Train Input
Maximum Input Pulse Frequency	250 kHz
Protective Functions	Overheat, Overload, Overvoltage, Speed Error, Overcurrent, OverSpeed, EEPROM Data Error, Sensor Error, System Error
Input Signals	Photocoupler Input (optically isolated), Equivalent Input Impedance : 220 Ω, Input Current 7~20 mA (Pulse Signal, Rotation Direction Signal, All Windings Off Signal, Alarm Clear Signal, Resolution Select Signal)
Output Signals	Photocoupler, Open-Collector Output, External use condition: 30 VDC maximum, 15 mA Maximum (Positioning Completion Signal, Alarm Signal, Excitation Timing Signal, ASG•BSG Signal) Line Driver Output: Equivalent of 26C31 (Timing Signal, ASG•BSG Signal)

AS PLUS

Positioning Control	Incremental (relative distance) mode/Absolute (absolute positioning) mode. One-shot operation/Linked operation (A maximum of 4 profiles can be linked) Maximum Operating Ranges • Steps: −8388608~8388607 (1 each) • Operating speed: 10 Hz~500,000 Hz (500 kHz) • Acceleration/deceleration rate*: 10~50,000 msec
Operating Modes	• Indexing (Positioning operation) • Scan (Continuous operation) • Linked Profile • Return (Return to electrical home position) • Home Operation (Return to mechanical home position)
Mechanical Home Hunting Function	Home hunting operation is performed from the entire range using mechanical position detection signals (+LS, −LS, HOMELS).
Other Functions	• Setting function for speed-filter value • Current setting function • Electronic gear function • Setting function for direction of motor rotation • Emergency stop function • Over-travel function • Software over-travel function • Alarm trace-back function • Daisy-chain connections
Input Signals	AC Photocoupler input Control inputs: 24 VDC, input resistance 4.7 kΩ (X0~X7, START, E-STOP, HOMELS, +LS, −LS, SENSOR)
Output Signals	Photocoupler/Open Collector Output External operating conditions; 30 VDC or below, 4~8 mA (Y0~Y7, ALM)
Terminal Emulation	Communication Standard: RS-232C conformity Transmit system: Asynchronous communication, NRZ (Non Return to Zero), Full duplex Data length: 8 bits, 1 stop bit, No parity Transmit speed: 9600 bps Connector specification: Modular (4 wires, 4 pins) Pin arrangement: RS232 Compatible Protocol: TTY (CR+LF)
User Program	Maximum number of programs: 14 programs (including STARTUP program) Maximum lines per program: 64 lines Maximum commands per 1 line: 1 command (Single state) Maximum program variables: 26 variables (A~Z)

* The rates of acceleration and deceleration can be set separately.

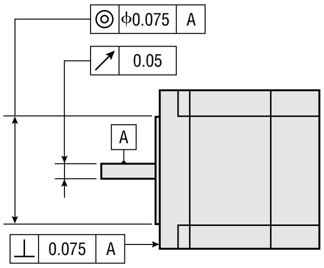
General Specifications

This is the value after rated operation at normal temperature and normal humidity.

		Motor	Driver
Insulation Class		Class B [266°F (130°C)]	—
Insulation Resistance		100 MΩ minimum when measured by a 500 VDC megger between the following places: • Frame-Windings • Frame-Electromagnetic brake windings	100 MΩ minimum when measured by a 500 VDC megger between the following places: • Frame-Power supply input terminal • I/O-Power supply input terminal
Dielectric Strength		Sufficient to withstand the following for one minute: • Frame-Windings 1.5 kV (1.0 kV for **AS46**) 50 Hz • Frame-Electromagnetic brake windings 1.0 kV 50 Hz	Sufficient to withstand the following for one minute: • Frame-Power supply input terminal 1.5 kV 50 Hz • I/O-Power supply input terminal 2.3 kV (3.0 kV for 200-230 VAC) 50 Hz: **AS** 1.8 kV 50 Hz: **AS PLUS**
Operating Environment (In Operation)	Ambient Temperature	0°C~+50°C (32°F~122°F), nonfreezing	**AS PLUS**: 0°C~+40°C (32°F~104°F) **AS**: 0°C~+50°C (32°F~122°F), nonfreezing
	Ambient Humidity	85% or less (noncondensing)	
	Atmosphere	No corrosive gases, dust, water or oil.	
Static Angle Error		±5 minutes	—
Shaft Runout		0.002 inch (0.05 mm) T.I.R.*	—
Concentricity		0.003 inch (0.075 mm) T.I.R.*	—
Perpendicularity		0.003 inch (0.075 mm) T.I.R.*	—

* T.I.R.(Total Indicator Reading) : Refers to the total dial gauge reading when the measurement section is rotated 1 revolution centered on the reference axis center.

Note:
- Do not measure insulation resistance or perform the dielectric strength test while the motor and driver are connected.



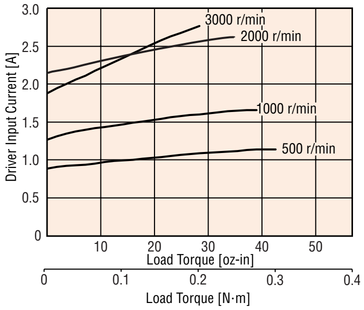
Load Torque — Driver Input Current Characteristics

This is the relationship between the load torque and driver input current at each speed when the motor is operated. From these characteristics, the current capacity required when used for multiple axes can be estimated. For the Geared Type, calculate the power capacity in terms of the speed and the torque at the motor shaft.

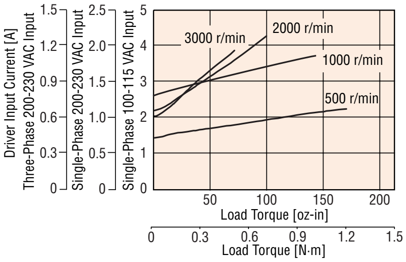
$$\text{Motor shaft speed} = \text{Gear output shaft speed} \times \text{Gear ratio [r/min]}$$

$$\text{Motor shaft torque} = \frac{\text{Gear output shaft torque}}{\text{Gear ratio}} \text{ [oz-in (N·m)]}$$

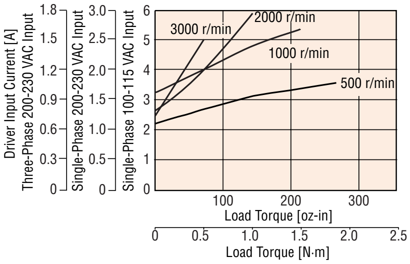
AS46□A, AS46□AP



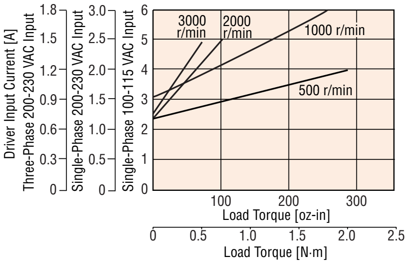
AS66□□, AS66□□P



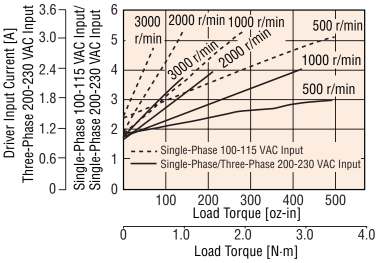
AS69□□, AS69□□P



AS98□□, AS98□□P



AS911A□, AS911A□P



Permissible Overhung Load and Permissible Thrust Load

Unit = Upper values: lb./Lower values: N

Model	Overhung Load Distance from Shaft End [inch (mm)]					Thrust Load
	0	0.2 (5)	0.39 (10)	0.59 (15)	0.79 (20)	
AS46□	4.5 20	5.6 25	7.6 34	11.7 52	—	Keep thrust loads below the weight of the motor used.
AS66□ **AS69□**	14.1 63	16.8 75	21 95	29 130	42 190	
AS98□ **AS911A□**	58 260	65 290	76 340	87 390	108 480	
AS46□-T3.6 **AS46□-T7.2** **AS46□-T10** **AS46□-T20** **AS46□-T30**	2.2 10	3.1 14	4.5 20	6.7 30	—	3.3 15
AS66□-T3.6 **AS66□-T7.2** **AS66□-T10** **AS66□-T20** **AS66□-T30**	15.7 70	18 80	22 100	27 120	33 150	9 40
AS98□-T3.6 **AS98□-T7.2** **AS98□-T10** **AS98□-T20** **AS98□-T30**	49 220	56 250	67 300	78 350	90 400	22 100
AS46□-N7.2 **AS46□-N10**	22 100	27 120	33 150	42 190	—	
AS66□-N5	45 200	49 220	56 250	63 280	72 320	
AS66□-N7.2 **AS66□-N10**	56 250	60 270	67 300	76 340	87 390	
AS66□-N25 **AS66□-N36** **AS66□-N50**	74 330	81 360	90 400	101 450	117 520	
AS98□-N5	108 480	117 520	123 550	130 580	139 620	67 300
AS98□-N7.2 **AS98□-N10**	108 480	121 540	135 600	153 680	177 790	
AS98□-N25	191 850	210 940	230 1050	240 1110	260 1190	
AS98□-N36	200 930	230 1030	250 1150	270 1220	290 1300	
AS98□-N50	230 1050	260 1160	290 1300	310 1380	330 1490	
AS46□2-H50 **AS46□2-H100**	40 180	49 220	60 270	81 360	114 510	54 240
AS66□2-H50 **AS66□2-H100**	72 320	83 370	99 440	123 550	162 720	105 470
AS98□-H50 **AS98□-H100**	240 1090	250 1150	270 1230	290 1310	310 1410	290 1300

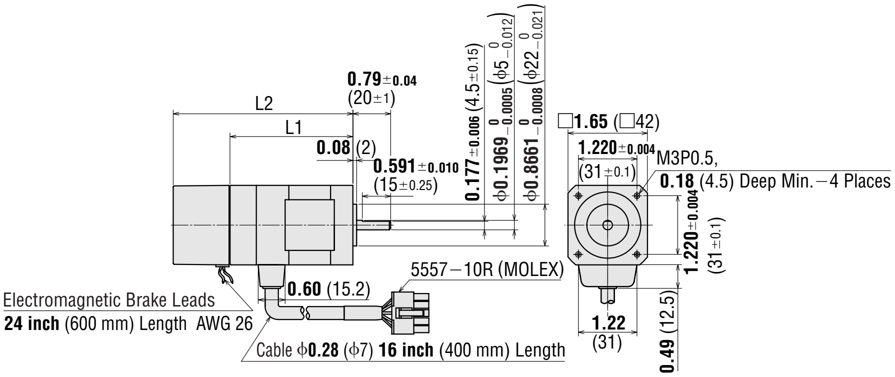
✻ These values are common to the **AS** Series, the **AS PLUS** Series and all electromagnetic brake models.

Dimensions Scale 1/4, Unit = **inch** (mm)

● Motor

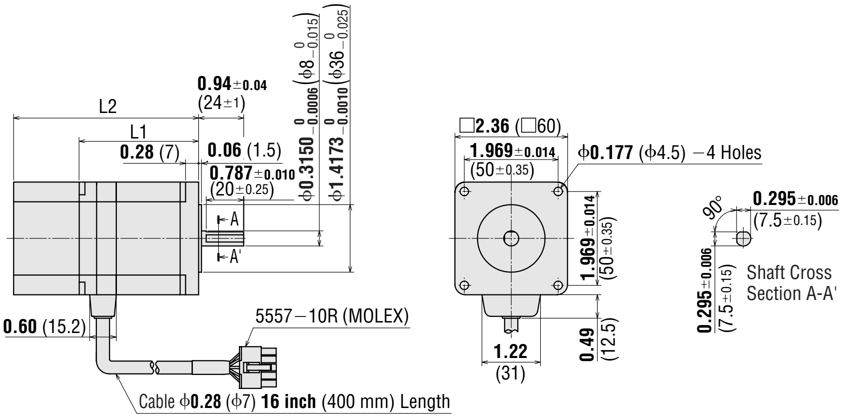
◆ Standard Type

1 Motor Frame Size: □1.65 in. (□42 mm)



Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS46AA	ASM46AA	2.56 (64.9)	—	1.1 (0.5)	B192
AS46AAP					
AS46MA	ASM46MA	—	3.74 (94.9)	1.3 (0.6)	B193
AS46MAP					

2 Motor Frame Size: □2.36 in. (□60 mm)

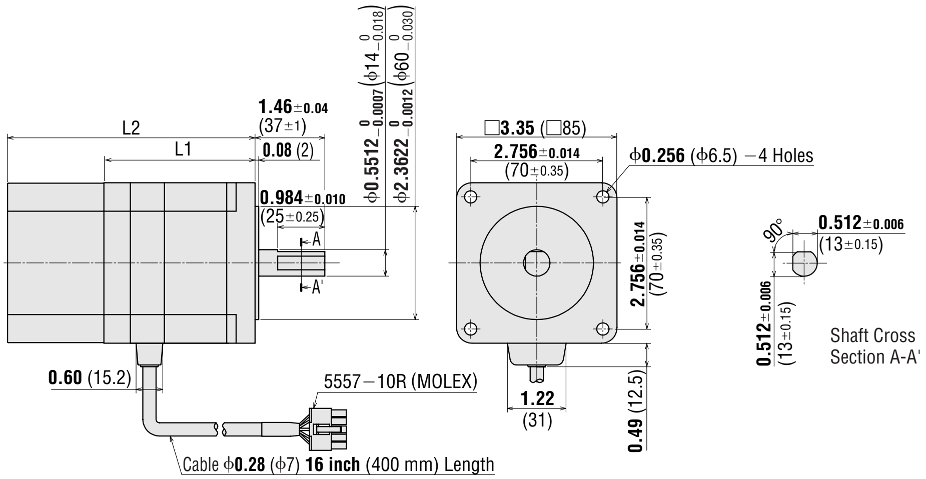


Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS66A□	ASM66A□	2.50 (63.6)	—	1.9 (0.85)	B194
AS66A□P					
AS66M□	ASM66M□	—	3.88 (98.6)	2.4 (1.1)	B195
AS66M□P					
AS69A□	ASM69A□	3.72 (94.6)	—	3.1 (1.4)	B272
AS69A□P					
AS69M□	ASM69M□	—	5.1 (129.6)	3.6 (1.65)	B273
AS69M□P					

- Enter the power supply voltage **A**, **C** or **S** in the box (□) within the model number.

Features C-12 System Configuration C-17 Specifications/Characteristics C-21

3 Motor Frame Size: □3.35 in. (□85 mm)

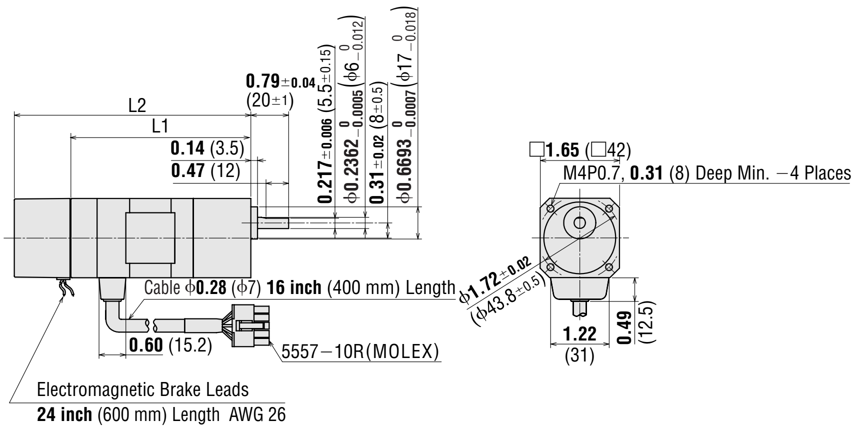


Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS98A□	ASM98A□	3.15 (80)	—	4.0 (1.8)	B196
AS98A□P					
AS98M□	ASM98M□	—	5.16 (131)	4.8 (2.2)	B235
AS98M□P					
AS911A□	ASM911A□	4.33 (110)	—	6.6 (3.0)	B264
AS911A□P					

- Enter the power supply voltage **A**, **C**, or **S** in the box (□) within the model number.

◆ TH Geared Type

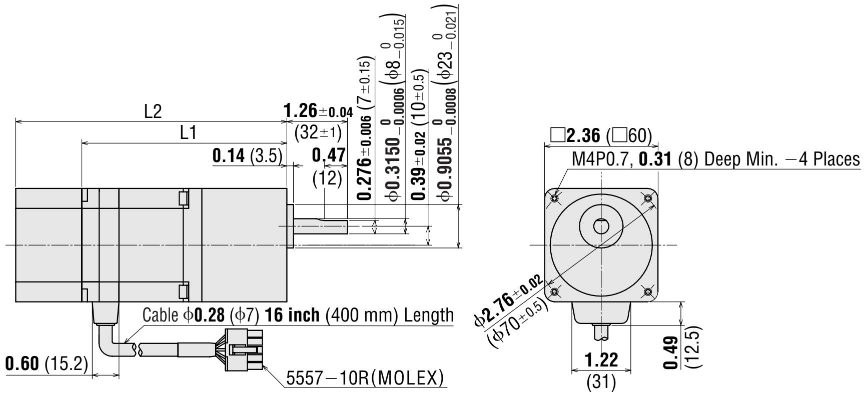
4 Motor Frame Size: □1.65 in. (□42 mm)



Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS46AA-T□	ASM46AA-T□	**3.6**, **7.2**, **10**, **20**, **30**	3.76 (95.4)	—	1.4 (0.65)	B199
AS46AAP-T□						
AS46MA-T□	ASM46MA-T□		—	4.94 (125.4)	1.7 (0.75)	B200
AS46MAP-T□						

- Enter the gear ratio in the box (□) within the model number.

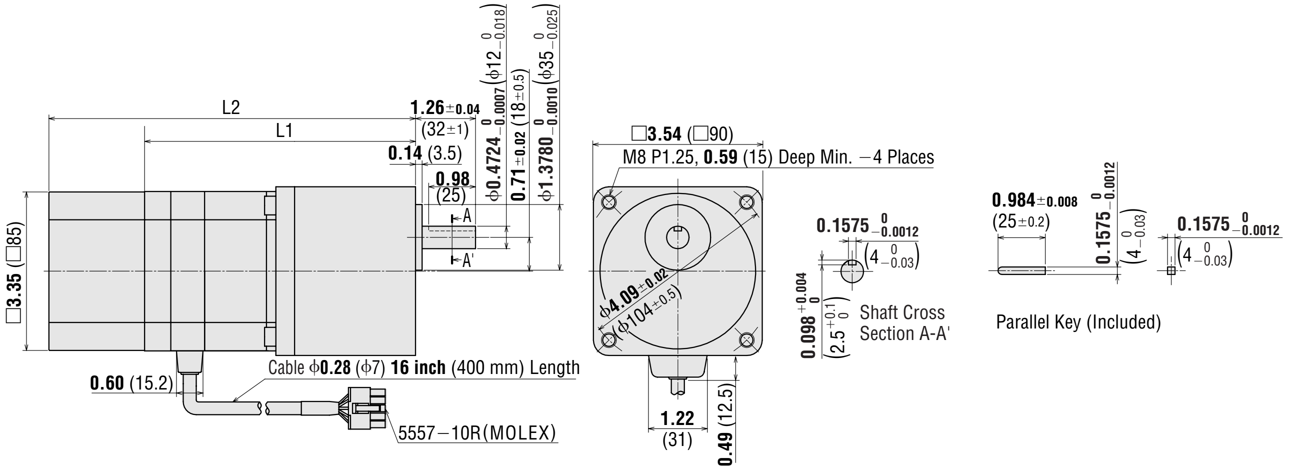
5 Motor Frame Size: □2.36 in. (□60 mm)



Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS66A▨-T□	ASM66A▨-T□	**3.6, 7.2, 10, 20, 30**	4.28 (108.6)	—	2.8 (1.25)	B201
AS66A▨P-T□						
AS66M▨-T□	ASM66M▨-T□		—	5.65 (143.6)	3.3 (1.5)	B202
AS66M▨P-T□						

- Enter the gear ratio in the box (□) within the model number.
- Enter the power supply voltage **A**, **C** or **S** in the box (▨) within the model number.

6 Motor Frame Size: □3.54 in. (□90 mm)



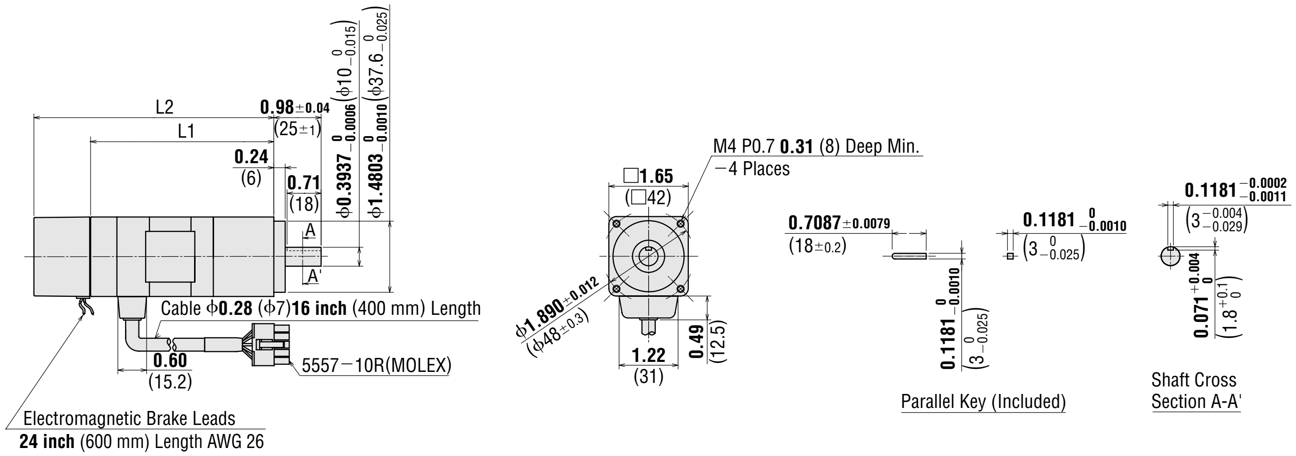
Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS98A▨-T□	ASM98A▨-T□	**3.6, 7.2, 10, 20, 30**	5.69 (144.5)	—	6.6 (3.0)	B203
AS98A▨P-T□						
AS98M▨-T□	ASM98M▨-T□		—	7.70 (195.5)	7.5 (3.4)	B236
AS98M▨P-T□						

- Enter the gear ratio in the box (□) within the model number.
- Enter the power supply voltage **A**, **C** or **S** in the box (▨) within the model number.

Features C-12 System Configuration C-17 Specifications/Characteristics C-21

◆ PN Geared Type

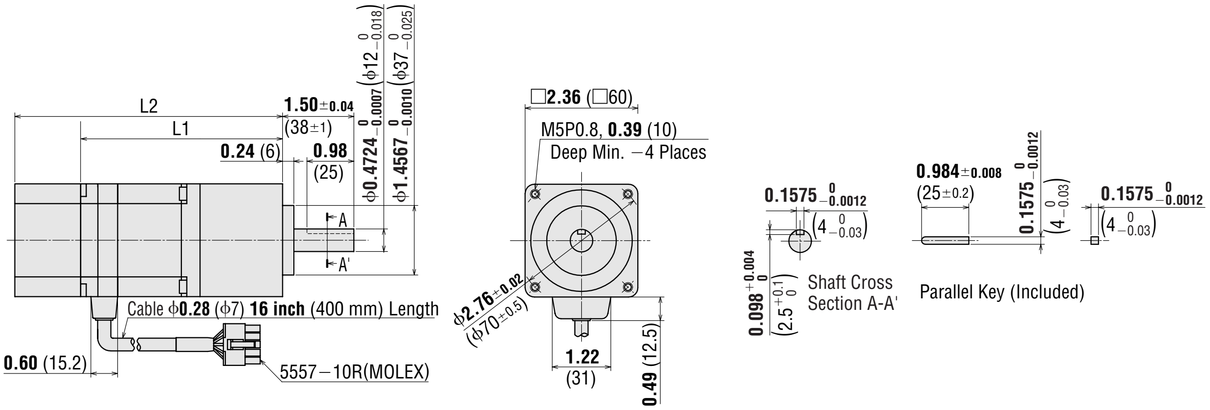
7 Motor Frame Size: □1.65 in. (□42 mm)



Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS46AA-N□	ASM46AA-N□	**7.2**, **10**	3.81 (96.9)	—	1.6 (0.71)	B306
AS46AAP-N□						
AS46MA-N□	ASM46MA-N□		—	5.0 (126.9)	1.8 (0.81)	B307
AS46MAP-N□						

- Enter the gear ratio in the box (□) within the model number.

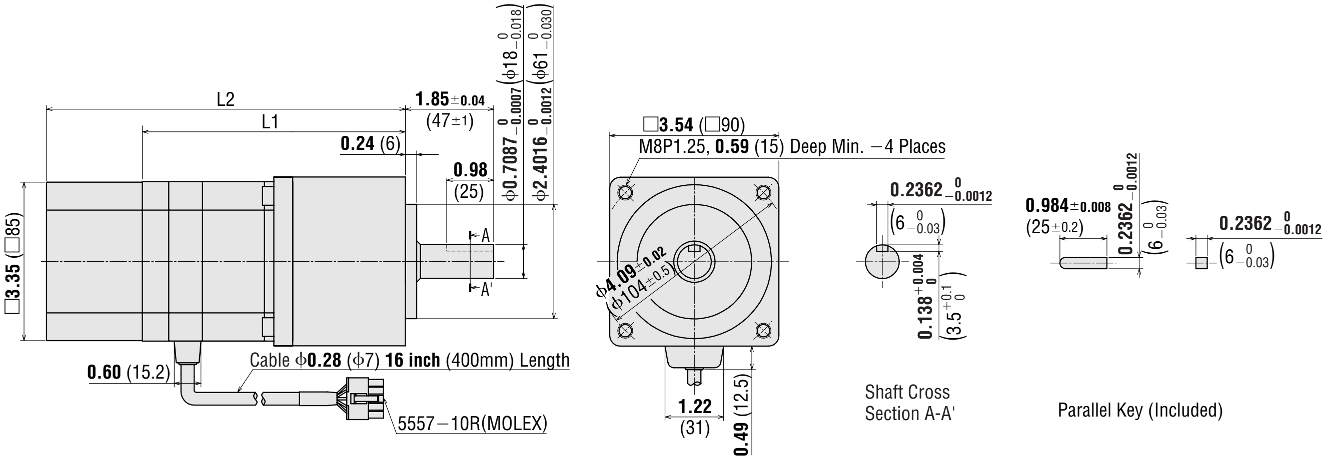
8 Motor Frame Size: □2.36 in. (□60 mm)



Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS66A□-N□	ASM66A□-N□	**5**, **7.2**, **10**	4.24 (107.6)	—	3.3 (1.5)	B226
AS66A□P-N□						
AS66A□-N□	ASM66A□-N□	**25**, **36**, **50**	4.87 (123.6)		3.7 (1.7)	B228
AS66A□P-N□						
AS66M□-N□	ASM66M□-N□	**5**, **7.2**, **10**	—	5.61 (142.6)	3.9 (1.75)	B227
AS66M□P-N□						
AS66M□-N□	ASM66M□-N□	**25**, **36**, **50**		6.24 (158.6)	4.3 (1.95)	B229
AS66M□P-N□						

- Enter the gear ratio in the box (□) within the model number.
- Enter the power supply voltage **A**, **C** or **S** in the box (□) within the model number.

9 Motor Frame Size: □3.54 in. (□90 mm)

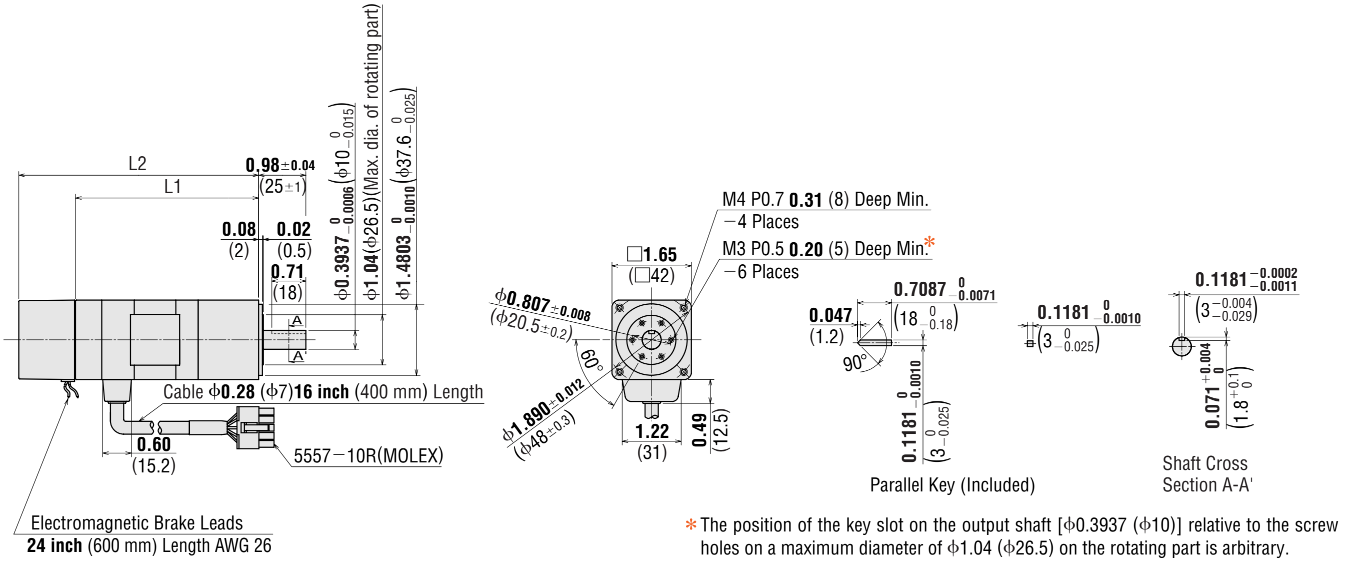


Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS98A🟧-N□	ASM98A🟧-N□	**5**, **7.2**, **10**	5.51 (140)	—	8.8 (4.0)	B230
AS98A🟧P-N□						
AS98A🟧-N□	ASM98A🟧-N□	**25**, **36**, **50**	6.42 (163)		10 (4.7)	B231
AS98A🟧P-N□						
AS98M🟧-N□	ASM98M🟧-N□	**5**, **7.2**, **10**	—	7.52 (191)	9.7 (4.4)	B239
AS98M🟧P-N□						
AS98M🟧-N□	ASM98M🟧-N□	**25**, **36**, **50**		8.43 (214)	11 (5.1)	B240
AS98M🟧P-N□						

- Enter the gear ratio in the box (□) within the model number.
- Enter the power supply voltage **A**, **C** or **S** in the box (🟧) within the model number.

◆ HG Geared Type

10 Motor Frame Size: □1.65 in. (□42 mm)

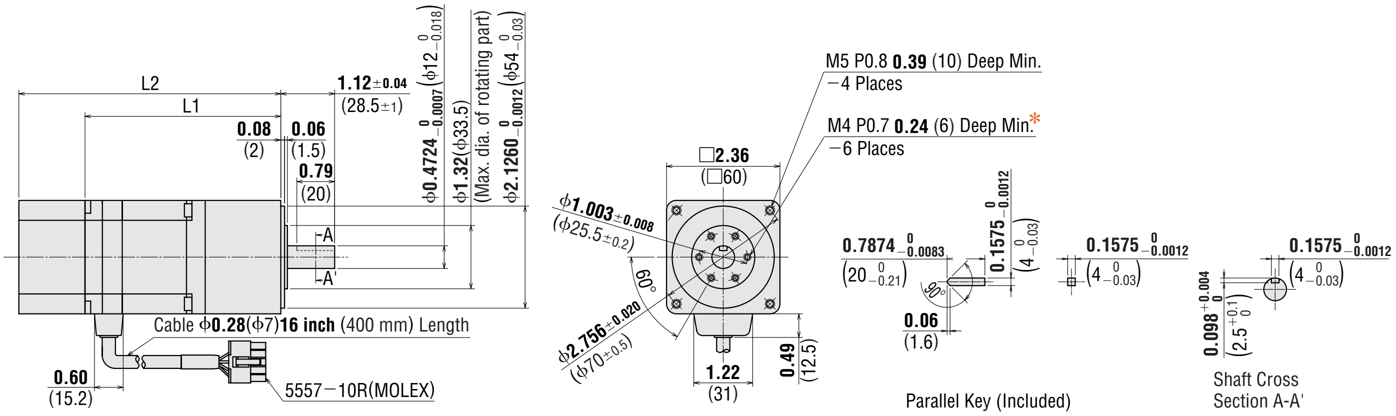


*The position of the key slot on the output shaft [ϕ0.3937 (ϕ10)] relative to the screw holes on a maximum diameter of ϕ1.04 (ϕ26.5) on the rotating part is arbitrary.

Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS46AA2-H□	ASM46AA2-H□	**50**, **100**	3.81 (96.9)	—	1.5 (0.7)	B308
AS46AAP2-H□						
AS46MA2-H□	ASM46MA2-H□		—	5.0 (126.9)	1.8 (0.8)	B309
AS46MAP2-H□						

- Enter the gear ratio in the box (□) within the model number.

11 Motor Frame Size: □2.36 in. (□60 mm)

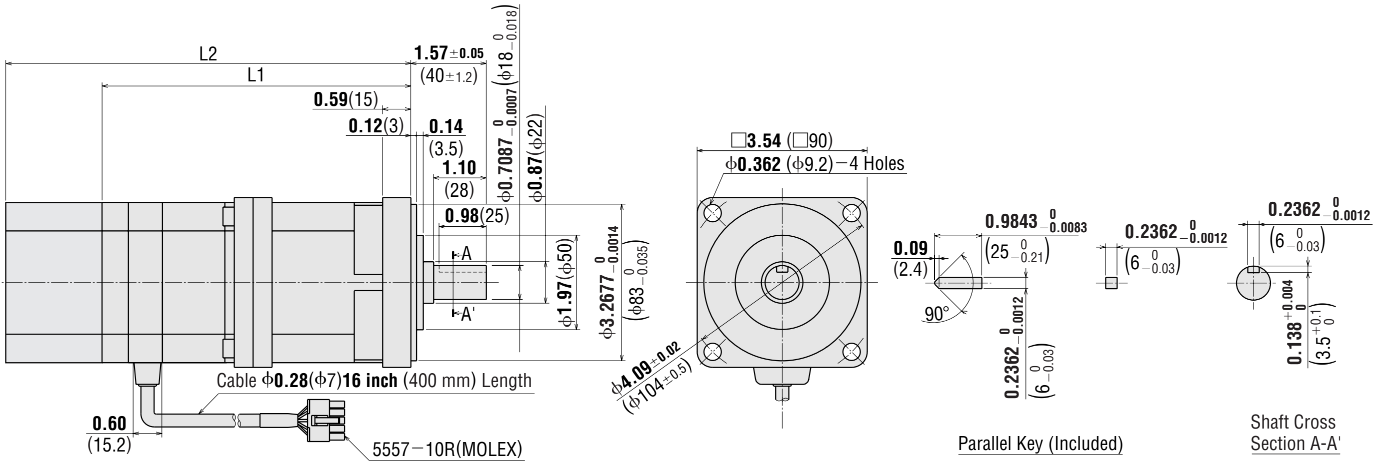


* The position of the key slot on the output shaft [ϕ0.4724 (ϕ12)] relative to the screw holes on a maximum diameter of ϕ1.32 (ϕ33.5) on the rotating part is arbitrary.

Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS66A🟧2-H□	ASM66A🟧2-H□	**50**, **100**	4.08 (103.6)	—	3.1 (1.4)	B310
AS66A🟧P2-H□						
AS66M🟧2-H□	ASM66M🟧2-H□		—	5.46 (138.6)	3.6 (1.65)	B311
AS66M🟧P2-H□						

- Enter the gear ratio in the box(□)within the model number.
- Enter the power supply voltage **A**, **C** or **S** in the box (🟧) within the model number.

12 Motor Frame Size: □3.54 in. (□90 mm)



Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS98A🟧-H□	ASM98A🟧-H□	**50**, **100**	6.44 (163.5)	—	8.6 (3.9)	B218
AS98A🟧P-H□						
AS98M🟧-H□	ASM98M🟧-H□		—	8.44 (214.5)	9.5 (4.3)	B241
AS98M🟧P-H□						

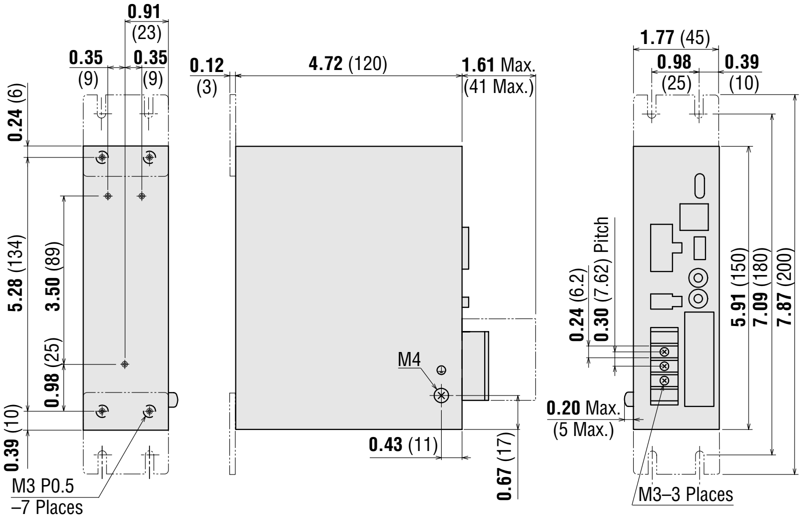
- Enter the gear ratio in the box(□)within the model number.
- Enter the power supply voltage **A**, **C** or **S** in the box (🟧) within the model number.

● Driver

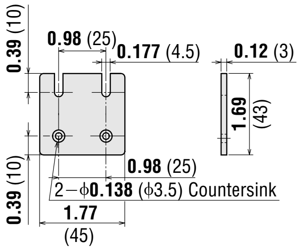
13 AS Series

Weight: 1.8 lb. (0.8 kg)

DXF B197



●Mounting Bracket (2 pieces, included)



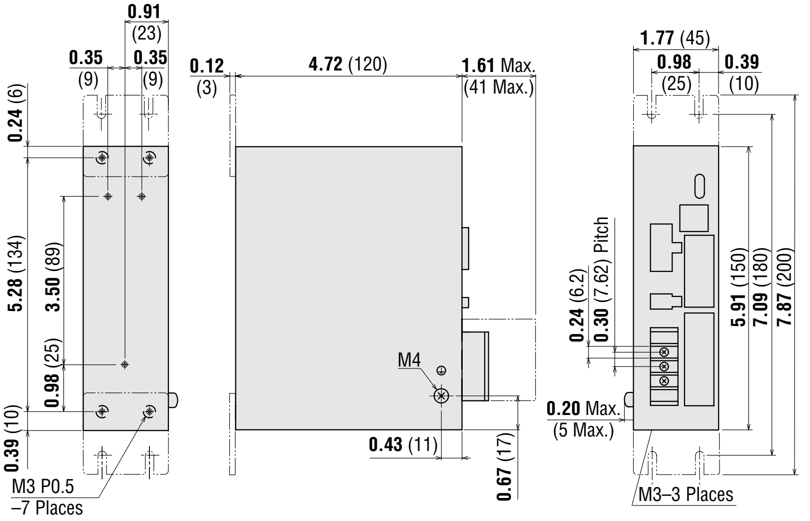
●I/O Connector (included)

Connector: 54306-3611 (MOLEX)
Cover Assembly: 54331-1361 (MOLEX)

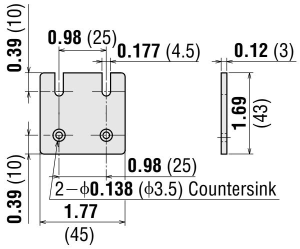
14 AS PLUS

Weight: 1.8 lb. (0.8 kg)

DXF B298



●Mounting Bracket (2 pieces, included)

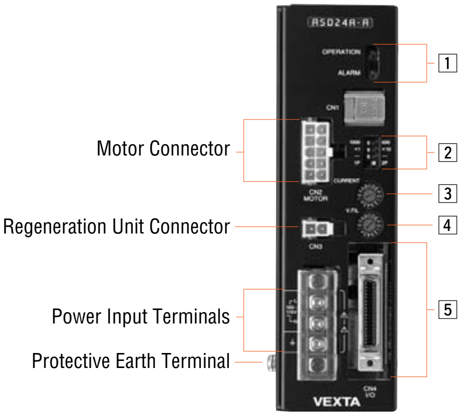


●I/O Connector (included)

Connector (36 pin): 54306-3611 (MOLEX) for CN4
Cover Assembly (36 pin): 54331-1361 (MOLEX) for CN4
Connector (24 pin): 54306-2011 (MOLEX) for CN5
Cover Assembly (24 pin): 54331-1201 (MOLEX) for CN5

Features C-12 System Configuration C-17 Specifications/Characteristics C-21

Connection and Operation
AS Series



1 Signal Monitor Display

• LED Indicators

Indication	Color	Function	When Activated
OPERATION	Green	Power Supply Indication	Lights when AC power is on.
ALARM	Red	Alarm Indication	Blinks when protection functions are activated.

• Alarm

Blink Count	Protection Function	When Activated
1	Overheat	The temperature of the driver's internal heat sink rises to approximately 185°F (85°C).
2	Overload	The motor is operated continuously over 5 seconds under a load exceeding the maximum torque.
3	Overvoltage	The primary voltage of the driver's inverter exceeds the permissible value.
4	Speed error	The motor cannot accurately follow at the indicated pulse velocity.
5	Overcurrent	An excessive current has flowed to the driver's inverter.
6	Overspeed	The motor shaft velocity exceeds 5000 r/min. (Except for Gear Type)
7	EEPROM Data Error	The EEPROM has a fault.
8	Sensor Error	The power source turns it on when the motor cable is not connected to the driver.
No Blink	System Error	The driver has a fatal error.

2 Function Switches

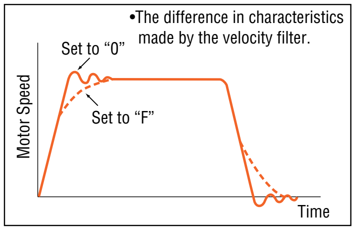
Indication	Switch Name	Function
1000/500 X1/ X10	Resolution Select Switch	This function is for selecting the motor resolution. For each geared type, the resolution of the gears output shaft is 1/gear ratio. "1000" "×1" →1000 pulses (0.36°/step) "1000" "×10" →10000 pulses (0.036°/step) "500" "×1" →500 pulses (0.72°/step) "500" "×10" →5000 pulses (0.072°/step)
1P/2P	Pulse Input Mode Switch	The settings of this switch are compatible with the following two pulse input modes: "1P" for the 1-pulse input mode (step and direction), "2P" for the 2-pulse input mode (CW, CCW).

Note:
- Always turn the power off before switching resolution or pulse input, and turn it ON again after you have made the change.
  If the "Resolution Select" switch is set to "×10", it cannot control the resolution select by input terminal. It is always "×10".

3 Current Adjustment Switch

Indication	Switch Name	Function
CURRENT	Current Adjustment Switch	The motor running current can be lowered to suppress temperature rise in the motor and driver, or lower operating current in order to allow a margin for motor torque.

4 Velocity Filter Adjustment Switch

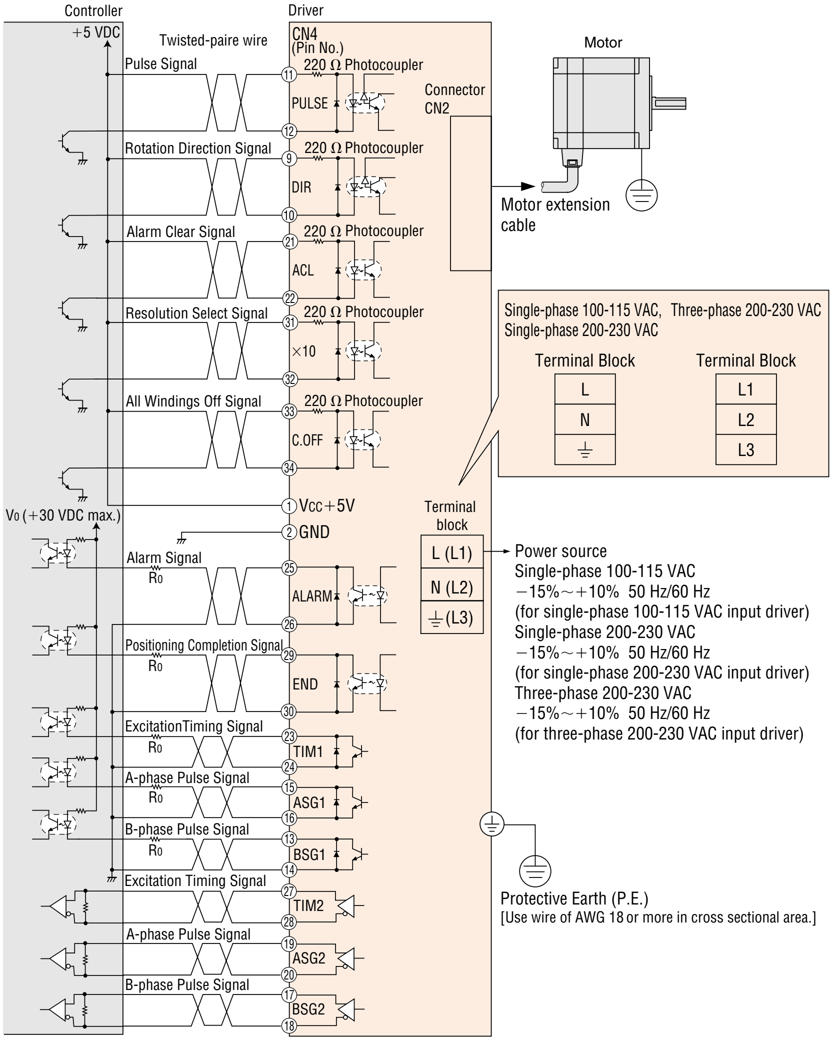
Indication	Switch Name	Function	
V.FIL	Velocity Filter Adjustment Switch	This switch is used to make adjustments when a smooth start-stop or smooth motion at low speed is required.	

5 Input/Output Signals

Connector	Pin Number	Input/Output	Signal	Name of Signal
CN4	1	External Power Input	Vcc+5V✻1	Power supply for control signal
	2		GND	
	3		Vcc+24V✻1	
	9	Input Signal	CCW (DRE)	CCW Pulse(Rotation Direction)✻2
	10		$\overline{\text{CCW}}$ $\overline{\text{(DRE)}}$	
	11		CW (PLS)	CW Pulse(Pulse)✻2
	12		$\overline{\text{CW}}$ $\overline{\text{(PLS)}}$	
	13	Output Signal	BSG1	B-Phase Pulse Output (Open Collector)
	14		GND	
	15		ASG1	A-Phase Pulse Output (Open Collector)
	16		GND	
	17		BSG2	B-Phase Pulse Output (Line Driver)
	18		$\overline{\text{BSG2}}$	
	19		ASG2	A-Phase Pulse Output (Line Driver)
	20		$\overline{\text{ASG2}}$	
	21	Input Signal	ACL	Alarm Clear
	22		$\overline{\text{ACL}}$	
	23	Output Signal	TIM1	Timing (Open Collector)
	24		GND	
	25		ALARM	Alarm
	26		$\overline{\text{ALARM}}$	
	27		TIM2	Timing (Line Driver)
	28		$\overline{\text{TIM2}}$	
	29		END	Positioning Completion
	30		$\overline{\text{END}}$	
	31	Input Signal	×10	Resolution Select
	32		$\overline{\times 10}$	
	33		C.OFF	All Windings Off
	34		$\overline{\text{C.OFF}}$	

✻1 Do not input 5 VDC and 24 VDC at the same time.
✻2 Value in parentheses represents the setting 1-pulse input mode. The setting at shipment is the 2-pulse input mode.

Connection Diagrams



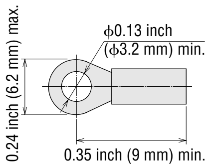
Notes:

- Vo and the current must be 30 VDC, 15 mA or less respectively. If the current exceeds 15 mA, connect external resistance Ro.
- Use a multi-core, twisted-pair shielded wire AWG 28 for the control input/output signal line (CN4), and keep wiring as short as possible [within 6.6 feet (2 m)].
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.
- For the wiring between the motor and driver, use the extension cable or movable cable.
- Use a three-core cable for the power supply line with a conductor cross-sectional area of at least AWG 18. (single-phase 100-115 VAC, single-phase 200-230 VAC)
- Use a four-core cable for the power supply line with a conductor cross-sectional area of at least AWG 18. (three-phase 200-230 VAC)
- Keep the control input/output signal line at least 1 foot (300 mm) away from power lines (e.g. lines carrying large current, such as AC lines and motor lines). Also, do not run these lines through the same ducts or pipes as power lines.
- The customer must furnish the cables for power supply lines and control input/output signal lines.
- The driver must be properly grounded. The driver's Protective Earth terminal should be grounded to a common ground point, using a cable of AWG 18.
- When the "Timing Signal" or "Pulse Signal" is used, 5 VDC or 24 VDC power supply is necessary. Use either a 5 VDC or a 24 VDC power supply. Do not connect power to pins ① and ③ at the same time. See 5 Input/Output table on page C-39.

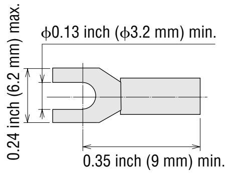
Features C-12 System Configuration C-17 Specifications/Characteristics C-21

◆Recommended Crimp Terminals

- Round shape terminals with insulator



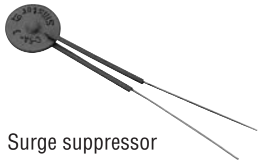
- U shape terminals with insulator



✻ Crimp terminals are not provided with the package. They must be furnished separately.

◆Connecting the Electromagnetic Brake to Power Supply

Connect the electromagnetic brake to the power supply using a cable with a conductor cross-sectional area of at least AWG 24. The power supply input to the electromagnetic brake is 24 VDC ±5% 0.3 A min. (**AS46**: 0.1 A min.) and therefore must be independent of the driver's power supply.



Surge suppressor

Notes:

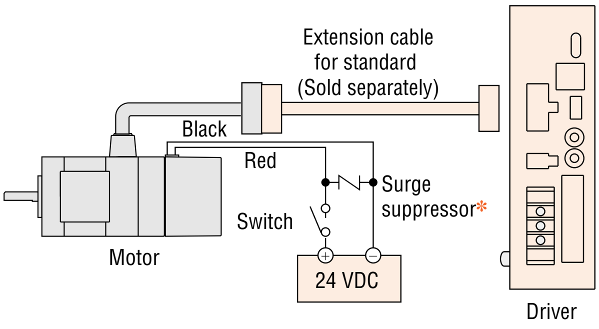
- Applying a voltage that exceeds the specifications will cause the electromagnetic brake to generate a great deal of heat, resulting in motor temperature rises and possible damage to the motor. Conversely, if voltage is too low, the electromagnetic brake may not release.
- To protect the switch contacts and prevent noise, always connect the accessory surge suppressor.
- Correct polarity (+ and −) must be ensured when connecting the electromagnetic brake lead wire of **AS** series to the DC power supply. If polarity is incorrect, the electromagnetic brake will not operate properly.
- When using as a CE certified part, use a DC power supply with reinforced insulation for the primary side as the power supply for the electromagnetic brake.

(✻ The surge suppressor is included with electromagnetic brake motors.)

Connection Method

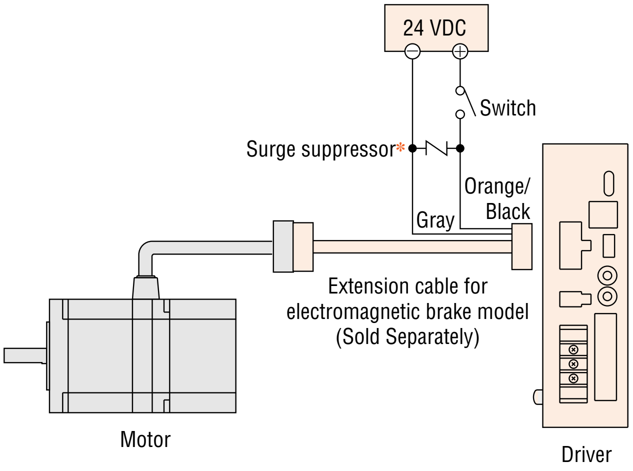
AS46

The electromagnetic brake wire is linked to the connector on the motor [23.6 inch (600 mm)]. When connecting with the DC power supply, connect the red spiral lead wire to +24 V, and the black lead wire to the ground (GND). Use the extension cable or the movable cable (both sold separately) for standard.



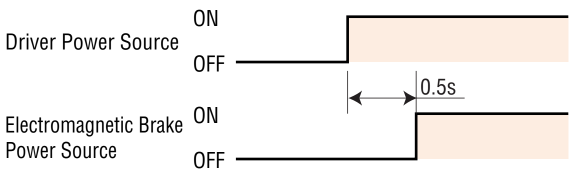
AS66, AS69, AS98

The electromagnetic brake wire is linked to the connector on the driver connection side of extension cable for electromagnetic brake models (sold separately). Be sure to use the accessory (sold separately) extension cable or movable cable. Connect the orange/black spiral lead wire [2.36 inch (60 mm)] to +24 V, and the gray lead wire [2.36 inch (60 mm)] to the ground (GND).



Timing Chart for Electromagnetic Brake Operation

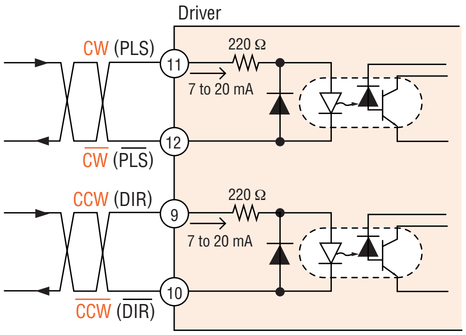
To release the electromagnetic brake, wait at least 0.5 seconds after turning on the driver power source.
The load may fall down due to a loss of holding torque.



●Description of Input/Output Signals

Pulse Input (CW) and Rotation Direction (CCW) Input Signal

◆Input Circuit and Sample Connection



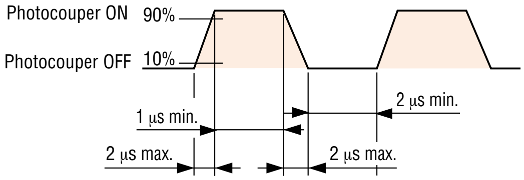
The letters indicate signals under the 2-pulse input mode, while the letters in parentheses indicate signals under the 1-pulse input mode.
The factory setting is 2-pulse input mode.

Note:

- When Vo is equal to 5 VDC, external resistance is not necessary. When Vo is above 5 VDC, connect external resistance to keep the input current between 7 mA and 20 mA.

◆Pulse Waveform Characteristics

(Photocoupler state corresponding to the input pulse)



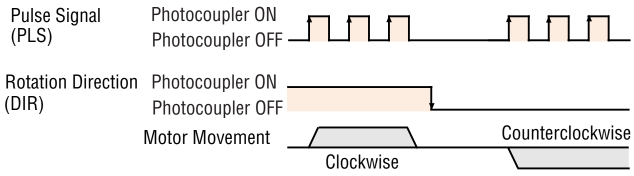
For pulse signals, use input pulse waveforms like those shown in the figure above.

◆Pulse Input Mode

1-Pulse Input Mode

The 1-pulse input mode uses "Pulse" (PLS) and "Rotation Direction" (DIR) signals. CW is selected by inputting DIR signals at low level (with the input photocoupler on), CCW by inputting at high level (with input photocoupler off).
"Rotation Direction" signals
Photocoupler "ON": Clockwise,
Photocoupler "OFF": Counterclockwise

1 Pulse Input Mode



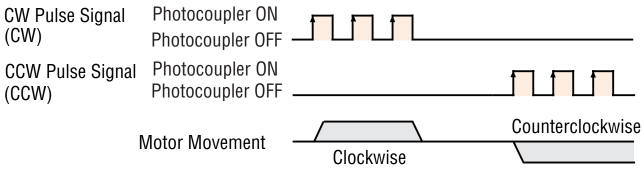
2-pulse input mode

The 2-pulse input mode is used for "CW" and "CCW" pulses. When "CW" pulses are input, the motor's output shaft rotates clockwise when the motor is viewed facing the shaft; when "CCW" pulses are input, the shaft rotates counterclockwise.

Note:

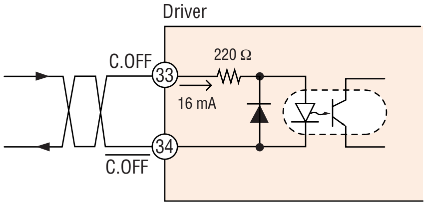
- The factory setting is 2-pulse input.

2 Pulse Input Mode

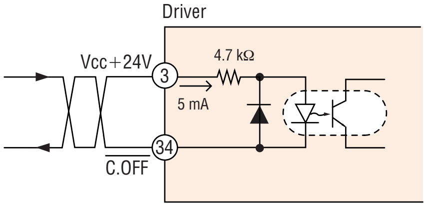


All Windings Off (C.OFF) Input Signal

◆Input Circuit and Sample Connection



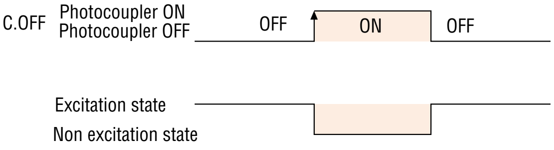
When using 5 VDC



When using 24 VDC

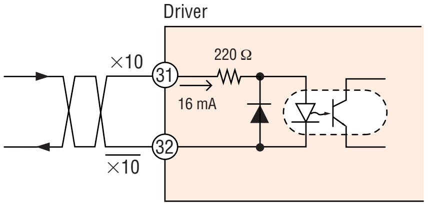
This controller power source offers a choice of either 5 VDC or 24 VDC.

Inputting the "All Windings Off" (C.OFF) signal puts the motor in a non-excitation (free) state. It is functioning when the photocoupler is ON. It is used when turning the motor shaft externally or when positioning manually. This signal clears the deviation counter.

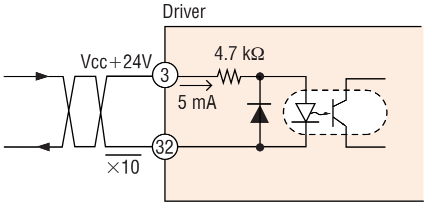


Resolution Select (×10) Input Signal

◆Input Circuit and Sample Connection



When using 5 VDC



When using 24 VDC

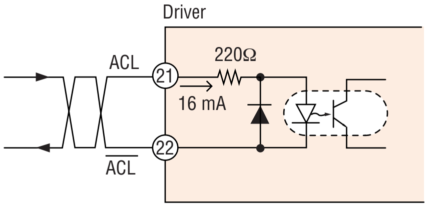
This controller power source offers a choice of either 5 VDC or 24 VDC. During input of this signal, the magnification of the resolution is ×10. It is only valid when the resolution select switch is set to ×1.

Note:

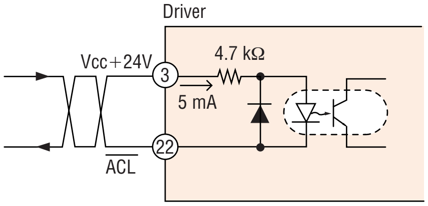
- When the resolution select switch is set to ×10, the "Resolution Select" Input is ignored. In this case, the "Resolution Select" Input is always equal to ON.

Alarm Clear (ACL) Input Signal

◆Input Circuit and Sample Connection



When using 5 VDC



When using 24 VDC

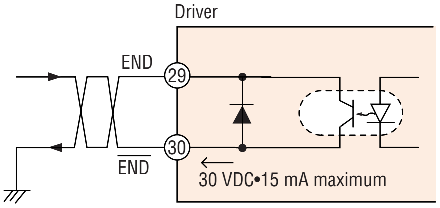
This controller power source offers a choice of either 5 VDC or 24 VDC. This signal is used when a protection circuit has been activated, for canceling the alarm without turning off power to the driver.

Note:

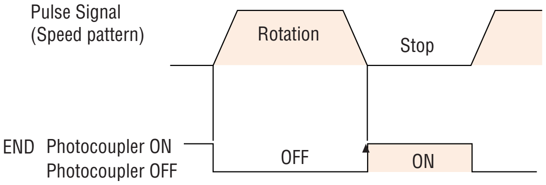
- The following alarm cannot be released. To cancel the alarm, first resolve the cause and check for safety, and then turn power on again.
  ●Over Current ●EEPROM Data Error ●System Error

Position Completion (END) Output Signal

◆Output Circuit and Sample Connection



Circuits for use with 30 VDC, 15 mA maximum.
This signal is output at the photocoupler ON state when positioning is completed. This signal is output when the rotor position is less than ±1.8˚ from the command position, approximately 2 ms after the pulse input stops.

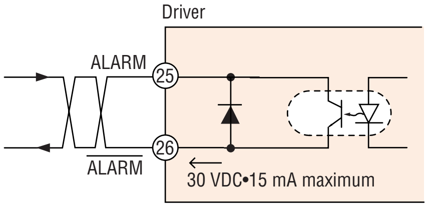


Note:

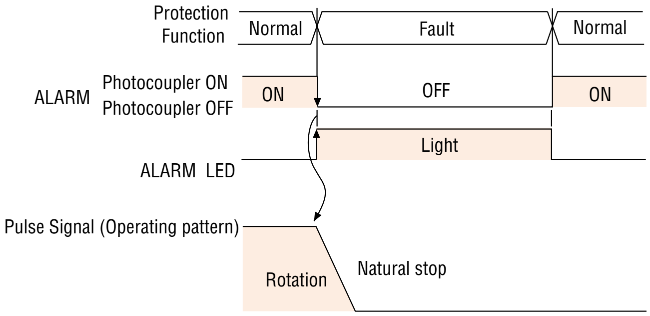
- The END signal flashes during operation with a pulse input frequency of 500 Hz or less.

Alarm (ALARM) Output Signal

◆Output Circuit and Sample Connection



Circuits for use with 30 VDC, 15 mA maximum.
This signal indicates that one of the driver's protection circuits has been activated. When an abnormality such as an overload or over current is detected, the alarm signal is output, the ALARM indicator lights, and the motor stops (non-excitation state). To cancel the alarm, first resolve the cause and check for safety, and then input an Alarm-clear (ACL) signal or cycle power. Once power has been turned off, wait at least 3 seconds before turning it on again.



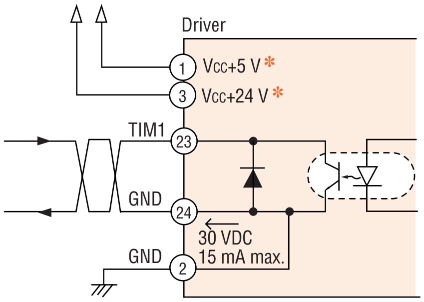
Note:
The alarm output uses positive logic (Normally Closed), all other outputs use negative logic (Normally Open).

Excitation Timing (TIM.) Output Signal

◆Output Circuit and Sample Connection

Open Collector Output (Current Source Type)

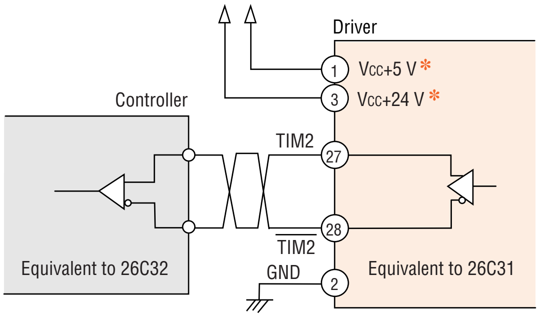
✻Power supply for timing output should be connected to either 5 VDC or 24 VDC.
Do not input 5 VDC and 24 VDC at the same time.



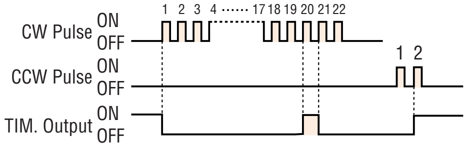
Circuits for use with 30 V, 15 mA maximum.

Line Driver Output

✻Power supply for timing output should be connected to either 5 VDC or 24 VDC.
Do not input 5 VDC and 24 VDC at the same time.



When the "Excitation Timing" signal is output, the photocoupler turns ON (For the line driver output which is TIM2, the output signal is High). This signal can be used to detect the home position with greater precision.
This signal is output 50 times per motor shaft revolution.



Resolution: 1000 pulses

Notes:

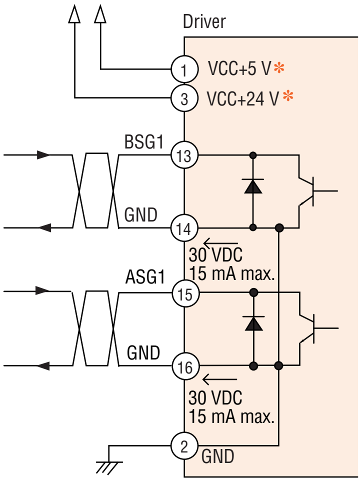
- ●A precise timing signal cannot be obtained when the speed of the pulse input frequency is over 500 Hz.
- ●When the Timing Signal Output is used, 5 VDC or 24 VDC power supply is necessary.

Quadrature (ASG1/BSG1, ASG2/BSG2) Output Signal

◆Output Circuit and Sample Connection

Open Collector Output (Current Source Type)

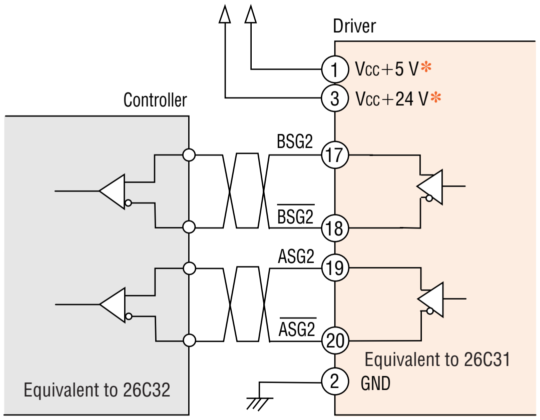
✻Power supply for quadrature output should be connected to either 5 VDC or 24 VDC.
Do not input 5 VDC and 24 VDC at the same time.



Circuits for use with 30 V, 15 mA maximum.

Line Driver Output

✻Power supply for quadrature output should be connected to either 5 VDC or 24 VDC.
Do not input 5 VDC and 24 VDC at the same time.

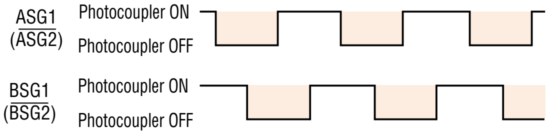


These signals are used when monitoring the motor position. The pulse resolution is the same as the motor resolution at the time of power-on.
[Example: Resolution select switch (1000 P/R)→Output pulse number for each motor revolution (1000).] The phase difference between A and B is 90˚ electrical.

Notes:

- ● The pulse output accuracy is, regardless of resolution, within ±0.36˚ (repetition accuracy: within 0.09˚)
- ● When the "quadrature" signal output is used, 5 VDC or 24 VDC power supply is necessary.These signals are only for position verification when the motor is stopped. There is a 1 ms (max.) time lag between real rotor motion and the output signals.

◆Pulse Waveform Characteristics



(Clockwise rotation of motor)

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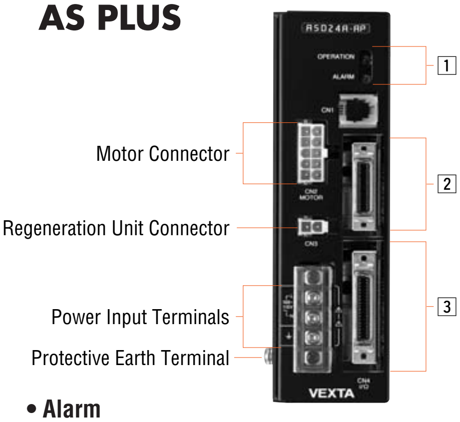
Connection and Operation

AS PLUS



1 Signal Monitor Display

- **LED Indications**

Indication	Color	Function	When Activated
OPERATION	Green	Power supply indication	Lights when AC power is on
ALARM	Red	Alarm indication	Blinks when protective functions are activated

- **Alarm**

Blink Count	Protective Function	When Activated	Alarm Code Output	Operation	Reset
1	Stack overflow	Too many nested LOOP, ENDL, CALL, etc.	90h (Decimal: 144)	The program stops. The motor performs stop operation set by MSTOPACT.	✻ Possible
	Memory read error	The data stored in the memory is damaged.	91h (Decimal: 145)		
	Program reference error	The called program does not exist.	94h (Decimal: 148)		
	Compilation error	The executed program is not executable.	95h (Decimal: 149)		
	Operation result overflow	The operation result exceeds the range of -8,388,608 to +8,388,607.	98h (Decimal: 152)		
	Parameter out-of-range error	The parameter exceeds its setting range.	99h (Decimal: 153)		
	Divide by zero	Divide by zero was executed.	9Ah (Decimal: 154)		
	General I/O definition error	The signal assignment method for general I/O ports was not correct.	9Ch (Decimal: 156)		
	PC command execution error	A PC command was executed while the motor was operating or not energized.	9Dh (Decimal: 157)		
2	Overheat protection	The temperature of the heat sink in the driver has reached approx. 185°F (85°C).	21h (Decimal: 33)	The motor loses it's holding torque.	✻ Possible
	Overload protection	A load exceeding the maximum torque was applied to the motor for the duration set by the OLTIME command.	30h (Decimal: 48)		
	Overspeed error	The speed of the motor's output shaft has exceeded 5,000 r/min.	31h (Decimal: 49)		
3	Overvoltage protection	The driver's primary inverter voltage has exceeded the limit of tolerance.	22h (Decimal: 34)	The motor loses it's holding torque.	✻ Possible
4	Excessive position deviation	The position of the motor's output shaft has deviated from the position specified by the operation command, by at least the number of revolutions set by the OVERFLOW command.	10h (Decimal: 16)	The motor loses it's holding torque.	✻ Possible
5	Overcurrent protection	An excessive current has flowed into the power element of the driver's inverter section.	20h (Decimal: 32)	The motor loses it's holding torque.	✻ Impossible
6	Emergency stop	An E-STOP signal has been input.	68h (Decimal: 104)	The program stops. The motor loses it's holding torque (ESTOPACT = 0).	✻ Possible
7	Incorrect limit-sensor logic	Both the +LS and -LS are ON simultaneously.	60h (Decimal: 96)	The motor stops immediately.	✻ Possible
	Reverse limit-sensor connection	The +LS and -LS are connected in reverse.	61h (Decimal: 97)		
	Mechanical home seeking error	Mechanical home seeking could not be executed correctly.	62h (Decimal: 98)		
	Overtravel	The motor has exceeded its hardware limit.	66h (Decimal: 102)	The program stops. The motor stops immediately (ESTOPACT= 1).	
	Software overtravel	The motor has exceeded its software limit.	67h (Decimal: 103)	Decelerates to a stop.	
	Emergency stop	An E-STOP signal has been input.	68h (Decimal: 104)	The motor stops immediately.	
	Invalid operation data	An inoperable operation pattern has been started.	70h (Decimal: 112)	Motion is stopped.	
8	Resolver sensor error	The motor cable has not been connected or a motor's error has occurred in a sensor.	42h (Decimal: 66)	The motor loses it's holding torque.	✻ Impossible
	Initial rotor revolution error	The driver's power was turned on while the motor's output shaft was turning by external force.	43h (Decimal: 67)		
9	NVRAM error	Motor control parameters has been damaged.	41h (Decimal: 65)	The motor loses it's holding torque.	✻ Impossible
Stays ON.	System error	Driver failure has occurred.	F0h (Decimal: 240)	The motor loses it's holding torque.	✻ Impossible

✻Possible – The Alarm can be cleared with the ALMCLR command or an ACL input.
Impossible – The AC power must be cycled to clear these alarms.

2 Limit Sensor Input Communication Signals (CN5)

Connector	Pin No.	Input/Output	Signal	Signal Name
CN5	1	Input	COM1	Power source for input signals
	2		COM2	Power source for input signals
	3	-	-	No Connection
	4	-	-	No Connection
	5	Output	TX	RS-232C Transmit
	6	-	-	No Connection
	7	Input	RX	RS-232C Receive
	8	-	-	No Connection
	9	-	-	No Connection
	10	Input	N24	External power supply terminal (GND)
	11	Input	COM1	Power source for input signals
	12		COM2	Power source for input signals
	13		+LS	+LS limit sensor
	14		-LS	-LS limit sensor
	15		HOMELS	HOME sensor
	16		SENSOR	Sensor
	17		-	No connection
	18		-	No connection
	19		COM1	Power source for input signals
	20		COM2	Power source for input signals

3 I/O Signals (CN4)

Connector	Pin No.	Input/Output	Signal	Signal Name
CN4	1	Input	P24	Power source for RS-232C, ASG and BSG (24 VDC)
	2		N24	Power source for RS-232C, ASG and BSG (GND)
	3	Output	Y0	General output[*1] (Y0 to Y3)
	4		$\overline{Y0}$	
	5		Y1	
	6		$\overline{Y1}$	
	7		Y2	
	8		$\overline{Y2}$	
	9		Y3	
	10		$\overline{Y3}$	
	11		ASG	Phase A pulse output□ (Line-driver output)
	12		$\overline{ASG}$	
	13		BSG	Phase B pulse output□ (Line-driver output)
	14		$\overline{BSG}$	
	15	Input	START	START
	16		E-STOP	Emergency stop
	17		COM1	Power source for input signal
	18			
	19	Output	Y4	General output[*1] (Y4 to Y7)
	20		$\overline{Y4}$	
	21		Y5	
	22		$\overline{Y5}$	
	23		Y6	
	24		$\overline{Y6}$	
	25		Y7	
	26		$\overline{Y7}$	
	27		ALM	Alarm
	28		ALM	
	29	Input	X0	General input[*2] (X0 to X7)
	30		X1	
	31		X2	
	32		X3	
	33		X4	
	34		X5	
	35		X6	
	36		X7	

[*1]: The following signals can be assigned arbitrarily via program settings. Additionally, the output logic of each signal can be switched.□END output, RUN output, MOVE output, HOME-P output, TIM output, MBC output□□

[*2]: The following signals can be assigned arbitrarily via program settings. Additionally, the input logic of each signal can be switched.□ACL input, PAUSE input, MSTOP input, RESTART input

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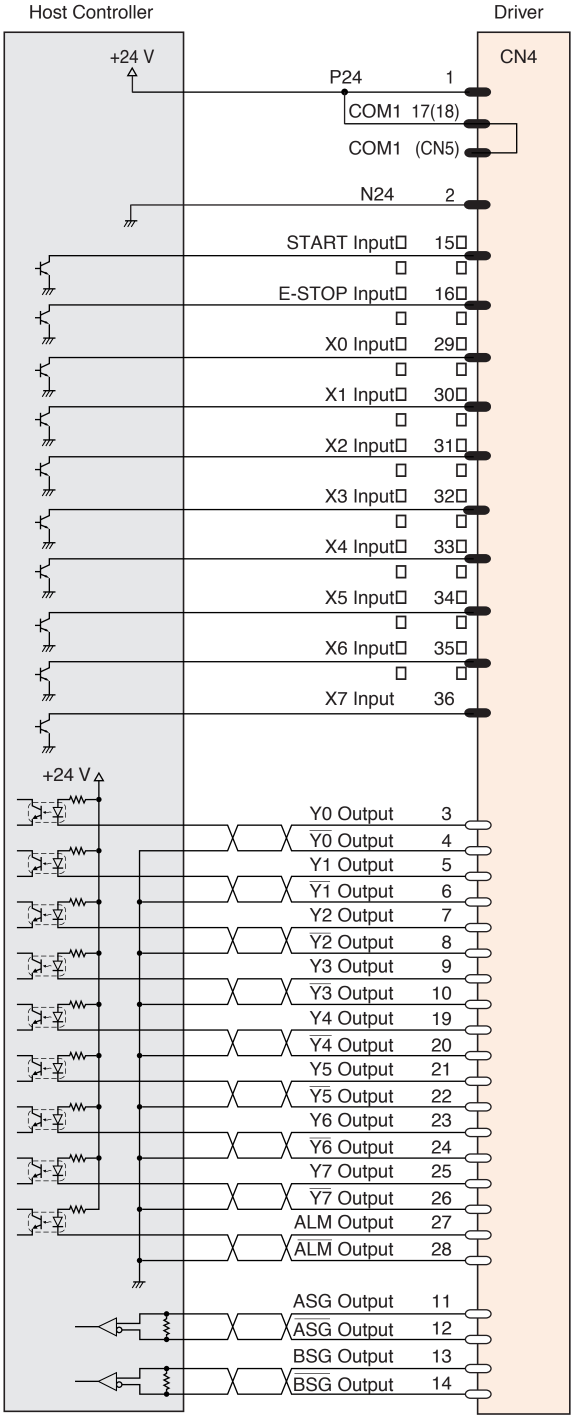
Connection Diagrams

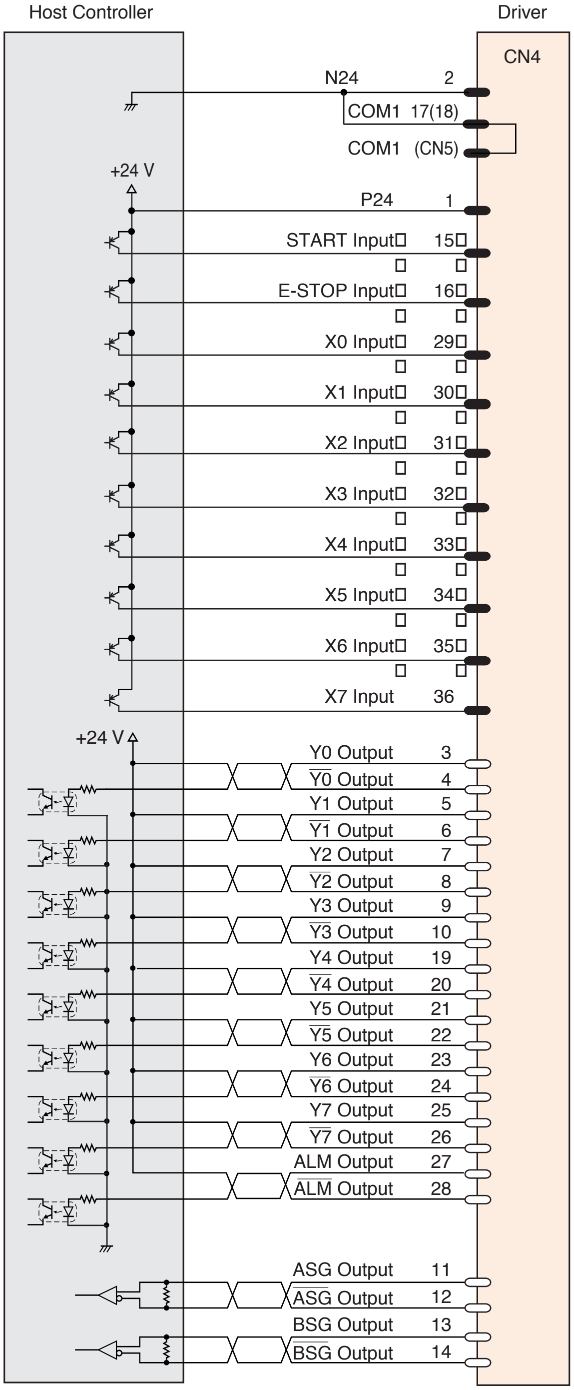
AS PLUS

◆Power Lines and I/O Signals (CN4)

- Current source input and current sink output

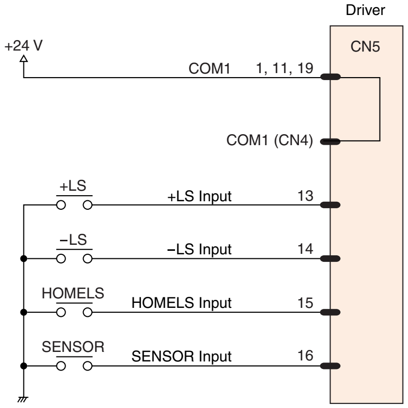


- Current sink input current source output

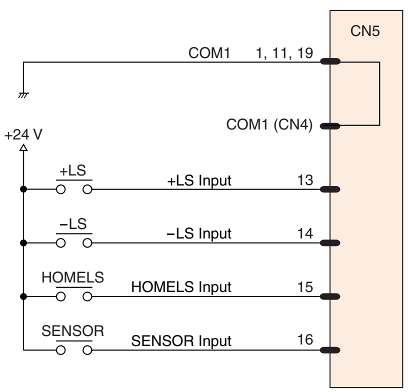


◆ Power Lines and Limit Sensors (CN5)

- Current Source Input



- Current Sink Input



◆ Wiring the signal cable

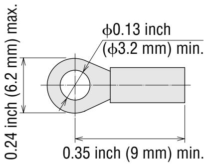
- Use input signals at 24 VDC±10%.
- Use output signals at 30 VDC or below and at 4 to 8 mA.
- Use a shielded cable with a wire of a size ranging between AWG 24 and AWG 22 for the driver signal cable (I/O signals, limit sensors signals), and keep it as short as possible.
- Keep the control input/output signal line at least 1 foot (300 mm) away from power lines (e.g. lines carrying large current, such as AC lines and motor lines). Also, do not run these lines through the same ducts or pipes as power lines.

◆ Other wiring

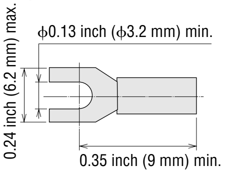
- For the wiring between the motor and driver, use the extension cable or movable extension cable.
- Use a three-core cable for the power supply line with a conductor cross-sectional area of at least AWG 18.
- The customer must furnish the cables for power supply lines and control input/output signal lines.
- The driver must be properly grounded. The driver's Protective Earth terminal should be grounded to a common ground point, using a cable of AWG 18.

◆ Recommended Crimp Terminals

Round shape terminals with insulator



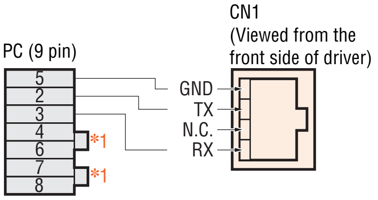
U shape terminals with insulator



✻ Crimp terminals are not provided with the package. They must be furnished separately.

◆ Connecting the Driver with a Personal Computer (CN1)

- **Pin Assignments and Connecting**



✻1 Short pins 4 and 6 together, as well as pins 7 and 8 together.

- **Communication Specifications**

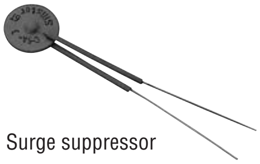
Item	Description
Electrical characteristics	In conformance with RS-232C.
Transmission method	Start-stop asynchronous method, NRZ □ (non-return to Zero), full-duplex
Data length	8 bits, 1 stop bit, no parity
Transmission speed	9,600 bps
Protocol	TTY (CR+LF)
Connector specification	Modular (4 lines, 4 pins)

Notes:

- Confirm that 24 VDC is supplied to the driver's external power supply input terminals (P24 and N24).
- Use the RS-232C signal lines over the shortest possible distance. It is recommended that the signal lines be shielded to protect them from noise interference.
- The maximum distance between drivers when using a daisy chain connection should be 49.2 feet (15 m).

◆Connecting the Electromagnetic Brake to Power Supply

Connect the electromagnetic brake to the power supply using a cable with a conductor cross-sectional area of at least AWG 24. The power supply input to the electromagnetic brake is 24 VDC ±5% 0.3 A min. (**AS46**: 0.1 A min.) and therefore must be independent of the driver's power supply.



Surge suppressor

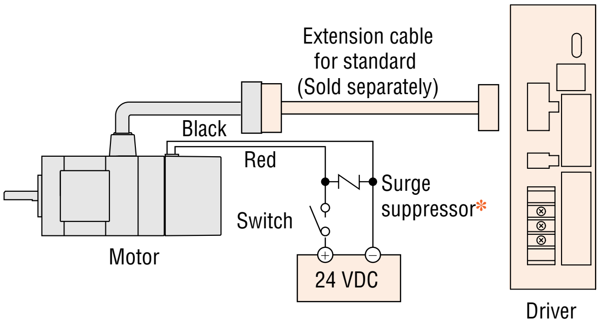
Notes:

- Applying a voltage that exceeds the specifications will cause the electromagnetic brake to generate a great deal of heat, resulting in motor temperature rises and possible damage to the motor. Conversely, if voltage is too low, the electromagnetic brake may not release.
- To protect the switch contacts and prevent noise, always connect the accessory surge suppressor.
- Correct polarity (+ and −) must be ensured when connecting the electromagnetic brake lead wire of **AS** series to the DC power supply. If polarity is incorrect, the electromagnetic brake will not operate properly.
- When using as a CE certified part, use a DC power supply with reinforced insulation for the primary side as the power supply for the electromagnetic brake.
  (* The surge suppressor is included with electromagnetic brake motors.)

Connection Method

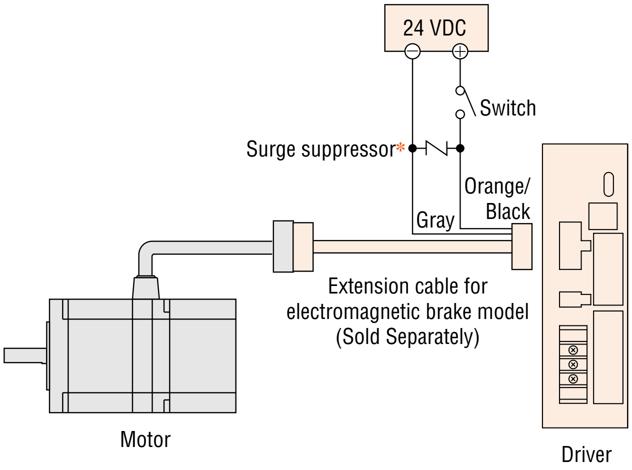
AS46

The electromagnetic brake wire is linked to the connector on the motor [23.6 inch (600 mm)]. When connecting with DC power supply, connect the red spiral lead wire to +24 V, and the black lead wire to the ground (GND). Use the extension cable or the movable cable (both sold separately) for standard type.



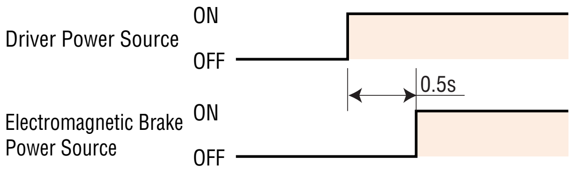
AS66, AS69, AS98

The electromagnetic brake wire is linked to the connector on the driver connection side of extension cable for electromagnetic brake model (sold separately). Be sure to use the accessory (sold separately) extension cable or movable cable. Connect the orange/black spiral lead wire [2.36 inch (60 mm)] to +24 V, and the gray lead wire [2.36 inch (60 mm)] to the ground (GND).



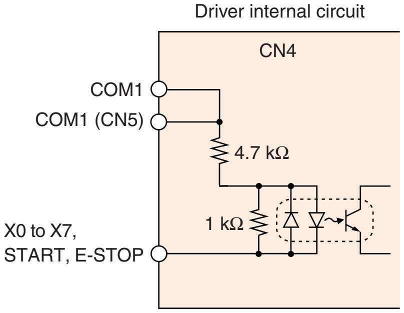
Timing Chart for Electromagnetic Brake Operation

To release the electromagnetic brake, wait at least 0.5 seconds after turning on the driver power source.
The load may fall down due to a loss of holding torque.



●Description of Input Signals (CN4)

◆Input Circuit and Sample Connection



Note:
- Use input signals at 24 VDC±10%.

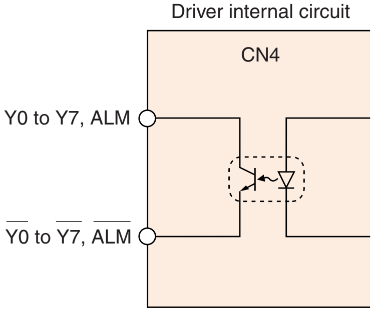
- **P24 input, N24 input**
  These inputs are for the external power supply required for the RS-232C communication, ASG and BSG outputs. Make sure to use a power supply of at least 24 VDC±10%, 0.05A.
  If the same power supply is going to be used for the RS-232C, ASG, BSG and other external I/O, make sure to use a power supply of at least 24 VDC±10%, 0.2A.
- **START input**
  This signal starts the program named "STARTUP".
  OFF→ON edge to start "STARTUP" program.
- **E-STOP input**
  This signal is used to forcibly stop the operation.
  Set the stopping method using the ESTOPACT command.
  Additionally, the input logic can be changed using the ESTOPLV command. (The factory setting of this command is normally open.)
  OFF→ON edge to stop operation
- **COM1 input**
  This is an external power-source terminal for input signals.
  This signal is internally connected to terminals COM1 of CN5.
- **X0 to X7 inputs**
  The X0 thorough X7 inputs can be used as input ports for general signals. The status of each port can be read using an IN command or INx command.
  The general signals assignable to the X0 through X7 inputs are listed below. Use a corresponding command to assign signal.

ACL input	INACL command
PAUSE input	INPAUSE command
MSTOP input	INMSTOP command
RESTART input	INRESTART command

- **ACL input**
  This signal is used to reset the alarm that has been generated by the driver's protective function.
  Input an ACL signal once after removing the cause that has triggered the protective function.

●Description of Output Signals (CN4)

◆Output Circuit and Sample Connection



Note:
- Use output signals at 30 VDC or below and at 4 to 8 mA.

- **Y0 to Y7 output**
  The Y0 through Y7 outputs can be used as output ports for general signals. The status of each port can be read using an OUT command or OUTx command.
  The general signals assignable to the Y0 through Y7 outputs are listed below. Use the corresponding command to assign each signal.

END output	OUTEND command
RUN output	OUTRUN command
MOVE output	OUTMOVE command
HOME-P output	OUTHOMEP command
TIM output	OUTTIM command
MBC output	OUTMBC command

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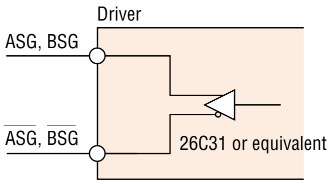
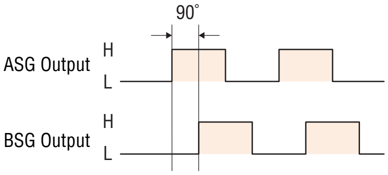
ASG, BSG Output

- Line driver output (26C31 or equivalent)





- **ASG Output, BSG Output**

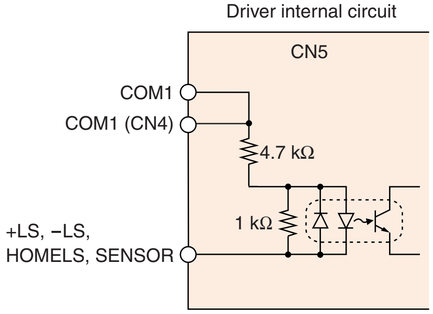
  To monitor the motor position, connect these signals to a counter, etc.
  The pulse resolution is the same as the motor resolution at the time of power-on.
  The ASG output and BSG output have a phase difference of 90 degrees electrical.
  Pulse output is subject to a maximum delay of 1 ms relative to the motor's motion. Use the ASG output and BSG output to check the stopping position.

- **ALM Output**

  This signal is output when an alarm is generated by the driver's protective function.
  The reason for triggering of the protective function can be identified through the blink count of the alarm LED, or ALM command.
  To reset the ALM output, remove the cause of the alarm and then perform one of the following procedures after ensuring safety:
  - Assign INACL then turn the ACL input to ON.
  - Enter an ALMCLR command.
  - Turn off the AC power, wait at least 10 seconds, then turn it back on.

●Description of Limit Sensors (CN5)

◆Input Circuit and Sample Connection



Note:
- Use input signals at 24 VDC±10%.

- **COM1 input**

  This is a power-source input terminal for limit-sensor signals. The power-source voltage must be 24 VDC±10%.
  This signal is internally connected to terminals COM1 of CN4.

- **COM2 input**

  This is a power-source input terminal for limit-sensor signals.
  Use it when sharing the input signal power source among two or more drivers.

- **+LS input, -LS input**

  These signals are input from +LS and -LS.
  The input logic can be changed using the OTLV command. (The factory setting of this command is normally open.) Input logic for the +LS input and -LS input cannot be set separately.

  Continuous Operation and Positioning Operation

  When a +LS or -LS is detected, the driver's protective function (over travel) is activated. As a result, the ALM output is turned OFF and the motor stops.
  Set the stopping method using the OTACT command.
  To pull out of +LS or -LS, cancel the protective function by inputting an ACL signal once or by using the ALMCLR command. Then perform mechanical home seeking routine or operate the motor in the direction opposite that of the limit sensor during continuous operation.

  Mechanical Home Seeking Routine

  When a +LS or -LS is detected, the motor operates in the direction opposite that of the detected limit.

- **HOMELS input**

  This signal is input from HOMELS.

  Connect the HOMELS when mechanical home seeking is performed in 3-sensor mode.

  When mechanical home seeking is performed in 3-sensor mode, the HOMELS becomes the mechanical home. The input logic can be changed using the HOMELV command. (The factory setting of this command is normally open.)

- **SENSOR input**

  This signal is input from SENSOR.

  The input logic can be changed using the SENSORLV command. (The factory setting of this command is normally open.)

  Mechanical Home Seeking Routine

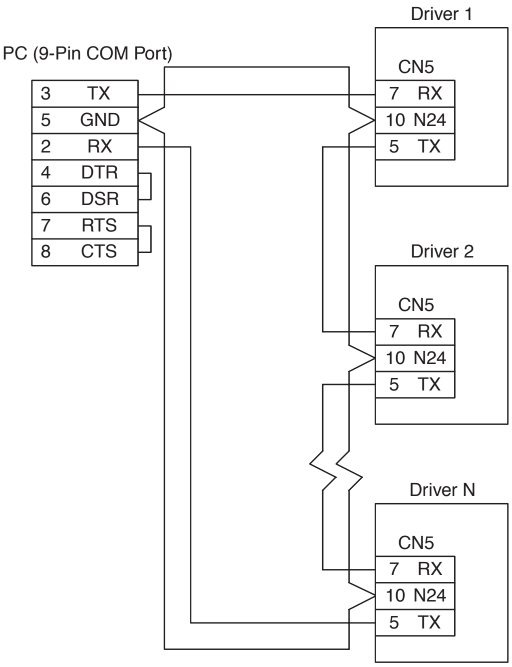
  This input is used when detecting the mechanical home at a specific point on the motor's output shaft or load shaft using a slotted disc, etc. The accuracy of mechanical home hunting increases if this input is used in conjunction with the TIM signal.

  Continuous Operation

  The motor can be stopped forcibly upon the detection of SENSOR.

  Set the stopping method using the SENSORACT command.

  Note:
  - If the SENSOR input is used in mechanical home hunting, it cannot be used during continuous operation.



●Description of Daisy-chain Connections

Use the RS-232C communication pins (TX, RX and N24) of the sensor connector (CN5) when connecting two or more drivers via a daisy chain (up to 36 drivers).

- **TX, RX**

  These communication terminals are used when implementing daisy-chain connections.

Notes:
- Confirm that each driver is supplied 24 VDC±10% (P24 and N24) of CN4 from outside for communication.
- Wire the RS-232C signal lines over the shortest possible distance. It is recommended that the signal lines be shielded to protect them from noise interference.
- The maximum distance between drivers when using a daisy chain connection should be 49.2 feet (15 m).
- Do not use the RS-232C communication port (CN1).

List of Motor and Driver Combinations

Single-Phase 100-115 VAC

Type	AS			AS PLUS		
	Package Model	Motor Model	Driver Model	Package Model	Motor Model	Driver Model
Standard	**AS46□A**	ASM46□A	ASD13A-A	**AS46□AP**	ASM46□A	ASD13A-AP
	AS66□A	ASM66□A	ASD24A-A	**AS66□AP**	ASM66□A	ASD24A-AP
	AS69□A	ASM69□A	ASD30D-A	**AS69□AP**	ASM69□A	ASD30D-AP
	AS98□A	ASM98□A	ASD30A-A	**AS98□AP**	ASM98□A	ASD30A-AP
	AS911AA	ASM911AA	ASD30E-A	**AS911AAP**	ASM911AA	ASD30E-AP
TH Geared	**AS46□A-T3.6**	ASM46□A-T3.6	ASD13B-A	**AS46□AP-T3.6**	ASM46□A-T3.6	ASD13B-AP
	AS46□A-T7.2	ASM46□A-T7.2		**AS46□AP-T7.2**	ASM46□A-T7.2	
	AS46□A-T10	ASM46□A-T10		**AS46□AP-T10**	ASM46□A-T10	
	AS46□A-T20	ASM46□A-T20	ASD13C-A	**AS46□AP-T20**	ASM46□A-T20	ASD13C-AP
	AS46□A-T30	ASM46□A-T30		**AS46□AP-T30**	ASM46□A-T30	
	AS66□A-T3.6	ASM66□A-T3.6	ASD24B-A	**AS66□AP-T3.6**	ASM66□A-T3.6	ASD24B-AP
	AS66□A-T7.2	ASM66□A-T7.2		**AS66□AP-T7.2**	ASM66□A-T7.2	
	AS66□A-T10	ASM66□A-T10		**AS66□AP-T10**	ASM66□A-T10	
	AS66□A-T20	ASM66□A-T20	ASD24C-A	**AS66□AP-T20**	ASM66□A-T20	ASD24C-AP
	AS66□A-T30	ASM66□A-T30		**AS66□AP-T30**	ASM66□A-T30	
	AS98□A-T3.6	ASM98□A-T3.6	ASD30A-A	**AS98□AP-T3.6**	ASM98□A-T3.6	ASD30A-AP
	AS98□A-T7.2	ASM98□A-T7.2		**AS98□AP-T7.2**	ASM98□A-T7.2	
	AS98□A-T10	ASM98□A-T10		**AS98□AP-T10**	ASM98□A-T10	
	AS98□A-T20	ASM98□A-T20	ASD30C-A	**AS98□AP-T20**	ASM98□A-T20	ASD30C-AP
	AS98□A-T30	ASM98□A-T30		**AS98□AP-T30**	ASM98□A-T30	
PN Geared	**AS46□A-N7.2**	ASM46□A-N7.2	ASD13A-A	**AS46□AP-N7.2**	ASM46□A-N7.2	ASD13A-AP
	AS46□A-N10	ASM46□A-N10		**AS46□AP-N10**	ASM46□A-N10	
	AS66□A-N5	ASM66□A-N5	ASD24A-A	**AS66□AP-N5**	ASM66□A-N5	ASD24A-AP
	AS66□A-N7.2	ASM66□A-N7.2		**AS66□AP-N7.2**	ASM66□A-N7.2	
	AS66□A-N10	ASM66□A-N10		**AS66□AP-N10**	ASM66□A-N10	
	AS66□A-N25	ASM66□A-N25	ASD24B-A	**AS66□AP-N25**	ASM66□A-N25	ASD24B-AP
	AS66□A-N36	ASM66□A-N36	ASD24C-A	**AS66□AP-N36**	ASM66□A-N36	ASD24C-AP
	AS66□A-N50	ASM66□A-N50		**AS66□AP-N50**	ASM66□A-N50	
	AS98□A-N5	ASM98□A-N5	ASD30A-A	**AS98□AP-N5**	ASM98□A-N5	ASD30A-AP
	AS98□A-N7.2	ASM98□A-N7.2		**AS98□AP-N7.2**	ASM98□A-N7.2	
	AS98□A-N10	ASM98□A-N10		**AS98□AP-N10**	ASM98□A-N10	
	AS98□A-N25	ASM98□A-N25		**AS98□AP-N25**	ASM98□A-N25	
	AS98□A-N36	ASM98□A-N36		**AS98□AP-N36**	ASM98□A-N36	
	AS98□A-N50	ASM98□A-N50	ASD30B-A	**AS98□AP-N50**	ASM98□A-N50	ASD30B-AP
HG Geared	**AS46□A2-H50**	ASM46□A2-H50	ASD13A-A	**AS46□AP2-H50**	ASM46□A2-H50	ASD13A-AP
	AS46□A2-H100	ASM46□A2-H100		**AS46□AP2-H100**	ASM46□A2-H100	
	AS66□A2-H50	ASM66□A2-H50	ASD24B-A	**AS66□AP2-H50**	ASM66□A2-H50	ASD24B-AP
	AS66□A2-H100	ASM66□A2-H100	ASD24C-A	**AS66□AP2-H100**	ASM66□A2-H100	ASD24C-AP
	AS98□A-H50	ASM98□A-H50	ASD30B-A	**AS98□AP-H50**	ASM98□A-H50	ASD30B-AP
	AS98□A-H100	ASM98□A-H100		**AS98□AP-H100**	ASM98□A-H100	

- Enter **A** (Standard) or **M** (electromagnetic brake) in the box (□) within the model numbers.

Single-Phase 200-230 VAC

Type	AS			AS PLUS		
	Package Model	Motor Model	Driver Model	Package Model	Motor Model	Driver Model
Standard	**AS66□C**	ASM66□C	ASD12A-C	**AS66□CP**	ASM66□C	ASD12A-CP
	AS69□C	ASM69□C	ASD16D-C	**AS69□CP**	ASM69□C	ASD16D-CP
	AS98□C	ASM98□C	ASD16A-C	**AS98□CP**	ASM98□C	ASD16A-CP
	AS911AC	ASM911AC	ASD20A-C	**AS911ACP**	ASM911AC	ASD20A-CP

- Enter **A** (Standard) or **M** (electromagnetic brake) in the box (□) within the model numbers.

Single-Phase 200-230 VAC

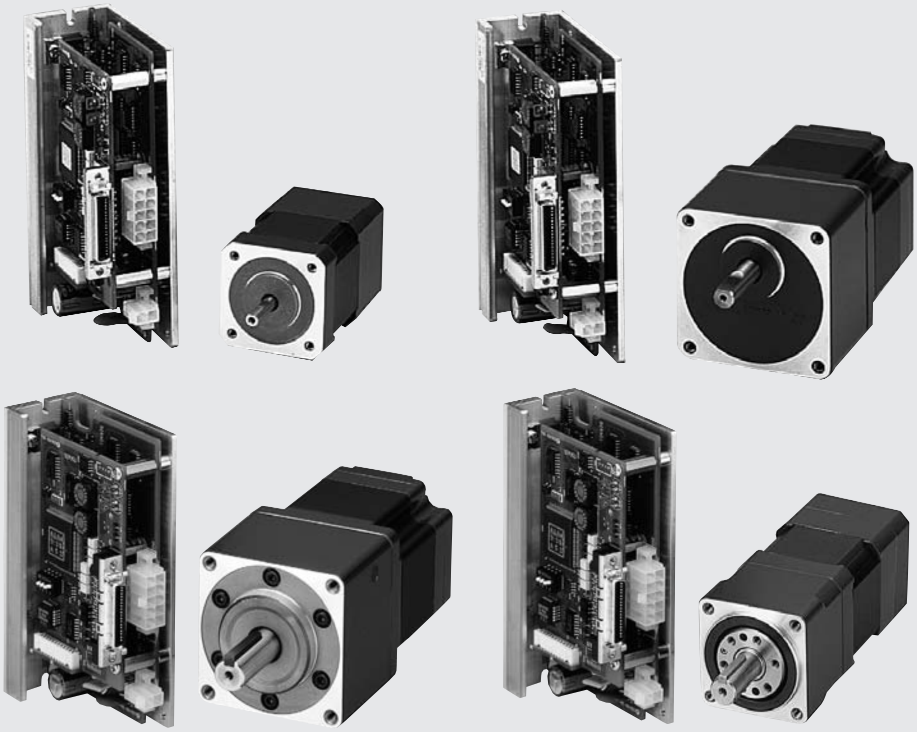
Type	AS			AS PLUS		
	Package Model	Motor Model	Driver Model	Package Model	Motor Model	Driver Model
TH Geared	**AS66□C-T3.6**	ASM66□C-T3.6	ASD12B-C	**AS66□CP-T3.6**	ASM66□C-T3.6	ASD12B-CP
	AS66□C-T7.2	ASM66□C-T7.2		**AS66□CP-T7.2**	ASM66□C-T7.2	
	AS66□C-T10	ASM66□C-T10		**AS66□CP-T10**	ASM66□C-T10	
	AS66□C-T20	ASM66□C-T20	ASD12C-C	**AS66□CP-T20**	ASM66□C-T20	ASD12C-CP
	AS66□C-T30	ASM66□C-T30		**AS66□CP-T30**	ASM66□C-T30	
	AS98□C-T3.6	ASM98□C-T3.6	ASD16A-C	**AS98□CP-T3.6**	ASM98□C-T3.6	ASD16A-CP
	AS98□C-T7.2	ASM98□C-T7.2		**AS98□CP-T7.2**	ASM98□C-T7.2	
	AS98□C-T10	ASM98□C-T10		**AS98□CP-T10**	ASM98□C-T10	
	AS98□C-T20	ASM98□C-T20	ASD16C-C	**AS98□CP-T20**	ASM98□C-T20	ASD16C-CP
	AS98□C-T30	ASM98□C-T30		**AS98□CP-T30**	ASM98□C-T30	
PN Geared	**AS66□C-N5**	ASM66□C-N5	ASD12A-C	**AS66□CP-N5**	ASM66□C-N5	ASD12A-CP
	AS66□C-N7.2	ASM66□C-N7.2		**AS66□CP-N7.2**	ASM66□C-N7.2	
	AS66□C-N10	ASM66□C-N10		**AS66□CP-N10**	ASM66□C-N10	
	AS66□C-N25	ASM66□C-N25	ASD12B-C	**AS66□CP-N25**	ASM66□C-N25	ASD12B-CP
	AS66□C-N36	ASM66□C-N36	ASD12C-C	**AS66□CP-N36**	ASM66□C-N36	ASD12C-CP
	AS66□C-N50	ASM66□C-N50		**AS66□CP-N50**	ASM66□C-N50	
	AS98□C-N5	ASM98□C-N5	ASD16A-C	**AS98□CP-N5**	ASM98□C-N5	ASD16A-CP
	AS98□C-N7.2	ASM98□C-N7.2		**AS98□CP-N7.2**	ASM98□C-N7.2	
	AS98□C-N10	ASM98□C-N10		**AS98□CP-N10**	ASM98□C-N10	
	AS98□C-N25	ASM98□C-N25		**AS98□CP-N25**	ASM98□C-N25	
	AS98□C-N36	ASM98□C-N36		**AS98□CP-N36**	ASM98□C-N36	
	AS98□C-N50	ASM98□C-N50	ASD16B-C	**AS98□CP-N50**	ASM98□C-N50	ASD16B-CP
HG Geared	**AS66□C2-H50**	ASM66□C2-H50	ASD12B-C	**AS66□CP2-H50**	ASM66□C2-H50	ASD12B-CP
	AS66□C2-H100	ASM66□C2-H100	ASD12C-C	**AS66□CP2-H100**	ASM66□C2-H100	ASD12C-CP
	AS98□C-H50	ASM98□C-H50	ASD16B-C	**AS98□CP-H50**	ASM98□C-H50	ASD16B-CP
	AS98□C-H100	ASM98□C-H100		**AS98□CP-H100**	ASM98□C-H100	

- Enter **A** (Standard) or **M** (electromagnetic brake) in the box (□) within the model numbers.

Three-Phase 200-230 VAC

Type	AS			AS PLUS		
	Package Model	Motor Model	Driver Model	Package Model	Motor Model	Driver Model
Standard	**AS66□S**	ASM66□C	ASD12A-S	**AS66□SP**	ASM66□C	ASD12A-SP
	AS69□S	ASM69□C	ASD16D-S	**AS69□SP**	ASM69□C	ASD16D-SP
	AS98□S	ASM98□C	ASD16A-S	**AS98□SP**	ASM98□C	ASD16A-SP
	AS911AS	ASM911AC	ASD20A-S	**AS911ASP**	ASM911AC	ASD20A-SP
TH Geared	**AS66□S-T3.6**	ASM66□C-T3.6	ASD12B-S	**AS66□SP-T3.6**	ASM66□C-T3.6	ASD12B-SP
	AS66□S-T7.2	ASM66□C-T7.2		**AS66□SP-T7.2**	ASM66□C-T7.2	
	AS66□S-T10	ASM66□C-T10		**AS66□SP-T10**	ASM66□C-T10	
	AS66□S-T20	ASM66□C-T20	ASD12C-S	**AS66□SP-T20**	ASM66□C-T20	ASD12C-SP
	AS66□S-T30	ASM66□C-T30		**AS66□SP-T30**	ASM66□C-T30	
	AS98□S-T3.6	ASM98□C-T3.6	ASD16A-S	**AS98□SP-T3.6**	ASM98□C-T3.6	ASD16A-SP
	AS98□S-T7.2	ASM98□C-T7.2		**AS98□SP-T7.2**	ASM98□C-T7.2	
	AS98□S-T10	ASM98□C-T10		**AS98□SP-T10**	ASM98□C-T10	
	AS98□S-T20	ASM98□C-T20	ASD16C-S	**AS98□SP-T20**	ASM98□C-T20	ASD16C-SP
	AS98□S-T30	ASM98□C-T30		**AS98□SP-T30**	ASM98□C-T30	
PN Geared	**AS66□S-N5**	ASM66□C-N5	ASD12A-S	**AS66□SP-N5**	ASM66□C-N5	ASD12A-SP
	AS66□S-N7.2	ASM66□C-N7.2		**AS66□SP-N7.2**	ASM66□C-N7.2	
	AS66□S-N10	ASM66□C-N10		**AS66□SP-N10**	ASM66□C-N10	
	AS66□S-N25	ASM66□C-N25	ASD12B-S	**AS66□SP-N25**	ASM66□C-N25	ASD12B-SP
	AS66□S-N36	ASM66□C-N36	ASD12C-S	**AS66□SP-N36**	ASM66□C-N36	ASD12C-SP
	AS66□S-N50	ASM66□C-N50		**AS66□SP-N50**	ASM66□C-N50	
	AS98□S-N5	ASM98□C-N5	ASD16A-S	**AS98□SP-N5**	ASM98□C-N5	ASD16A-SP
	AS98□S-N7.2	ASM98□C-N7.2		**AS98□SP-N7.2**	ASM98□C-N7.2	
	AS98□S-N10	ASM98□C-N10		**AS98□SP-N10**	ASM98□C-N10	
	AS98□S-N25	ASM98□C-N25		**AS98□SP-N25**	ASM98□C-N25	
	AS98□S-N36	ASM98□C-N36		**AS98□SP-N36**	ASM98□C-N36	
	AS98□S-N50	ASM98□C-N50	ASD16B-S	**AS98□SP-N50**	ASM98□C-N50	ASD16B-SP
HG Geared	**AS66□S2-H50**	ASM66□C2-H50	ASD12B-S	**AS66□SP2-H50**	ASM66□C2-H50	ASD12B-SP
	AS66□S2-H100	ASM66□C2-H100	ASD12C-S	**AS66□SP2-H100**	ASM66□C2-H100	ASD12C-SP
	AS98□S-H50	ASM98□C-H50	ASD16B-S	**AS98□SP-H50**	ASM98□C-H50	ASD16B-SP
	AS98□S-H100	ASM98□C-H100		**AS98□SP-H100**	ASM98□C-H100	

- Enter **A** (Standard) or **M** (electromagnetic brake) in the box (□) within the model numbers.



αSTEP®

ASC Series

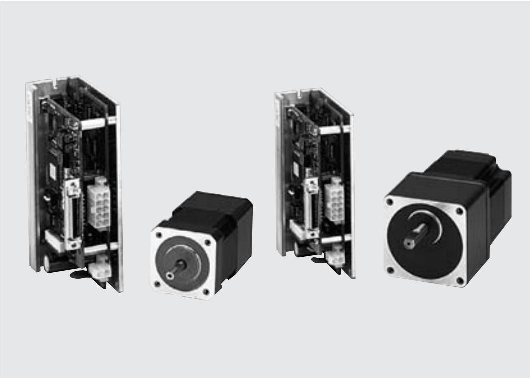
Additional Information

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

Closed Loop Stepping Motor and Driver Package

αSTEP® ASC Series

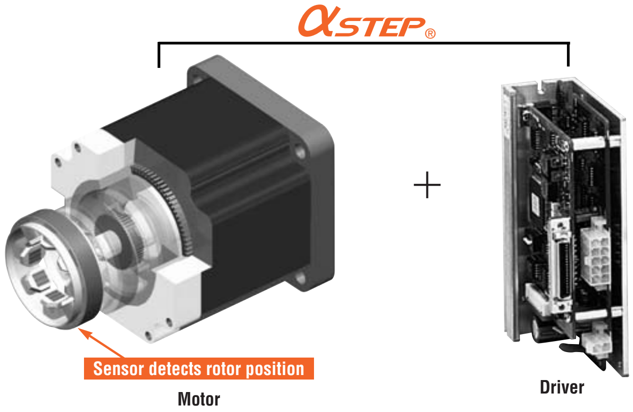
The αSTEP is a revolutionary hybrid stepping motor and driver package which eliminates missed steps, a common probrem with stepping motors. The αSTEP uses a built-in feedback device that constantly monitors the motor shaft position to detect and correct for loss of synchronism. Geared models are available.



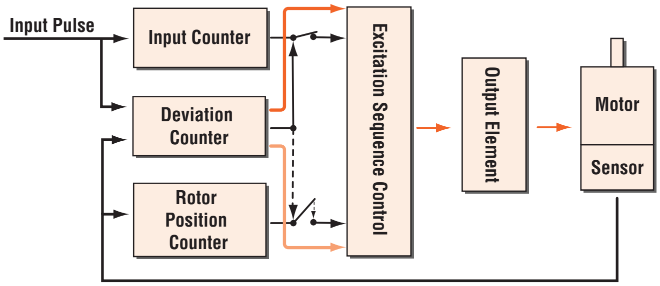
Features

● Closed loop control prevents loss of synchronism.

αSTEP does not lose synchronism even when subjected to abrupt load fluctuation or acceleration.
A newly developed rotor position detection sensor constantly monitors the motor movement. If synchronism is about to be lost, closed loop control is used, so there is no need to worry about loss of steps.



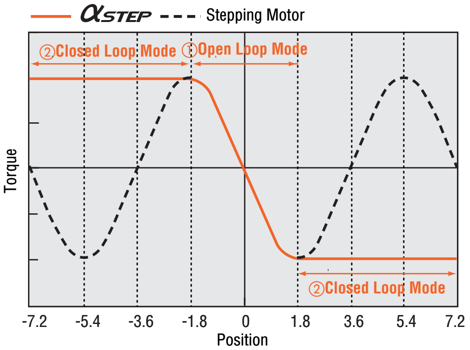
◆ αSTEP Control Diagram



Normal (Positioning Deviation is less than ±1.8°)
Motor runs in open loop mode like a stepping motor.

If Motor Missteps (Positioning Deviation is greater than ±1.8°)
Control switches to closed loop mode to prevent loss of synchronism.

◆ αSTEP Angle-Torque Characteristics



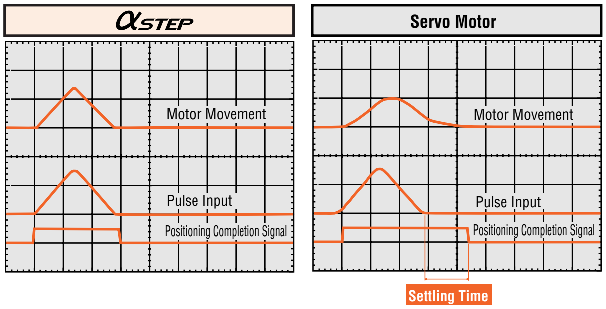
① If the positioning deviation is ±1.8° or smaller, the motor runs in open loop mode like a stepping motor.
② If the positioning deviation is ±1.8° or greater, the motor runs in closed loop mode and the position is corrected by exciting the motor windings to generate maximum torque based on the rotor position.

Features C-56 System Configuration C-58 Specifications/Characteristics C-59

● High Response

Like conventional stepping motors, αSTEP operates in synchronism with command pulses. This makes possible short stroke positioning in a short time.

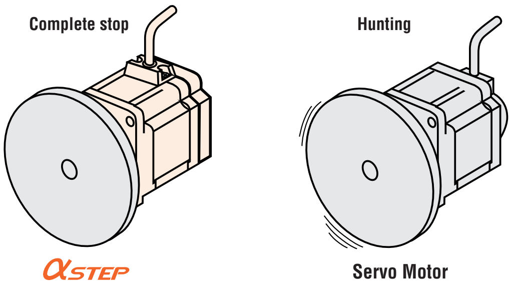
Measurement condition : Feed 1/5 rotation
Load Inertia (J) $= 1.37$ oz-in^2(250×10^{-7} kg·m^2)



- In traditional servo motors, there is a delay between the input pulse signals and the motor movement due to the way positioning is continuously monitored. Therefore, a servo motor needs time to settle to a stop after input signals stop. This is called settling time.

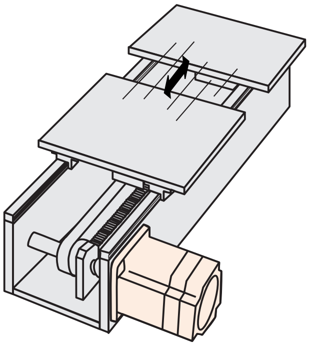
● No Hunting

Since αSTEP is a stepping motor, it has no hunting problem such as might be found in a traditional servo motor. Therefore, when it stops, its position is completely stable and does not fluctuate. αSTEP is ideal for applications in which vibration would be a problem.



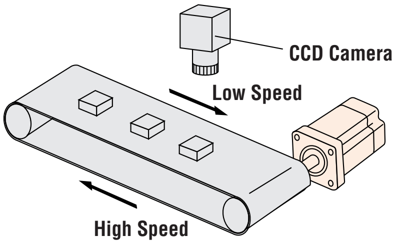
● No Gain Tuning

Gain tuning for servo motors is critical, troublesome and time-consuming. Since the αSTEP operates like a stepping motor, there are no gain tuning requirements. Low rigidity applications, such as belt and pulley, are ideal for αSTEP.



● Low Vibration at Low Speed

The driver employs advanced technology that produces smoothness comparable to a microstepping driver.
Its vibration level is incredibly low, even when operating in the low speed range. When frequent changes from low (high) to high (low) speed operation are required, the use of the Resolution Select Function solves the problem.
αSTEP provides resolution as low as 0.036°per step without any damping mechanism or other mechanical device. Even smoother operation is possible with geared models.



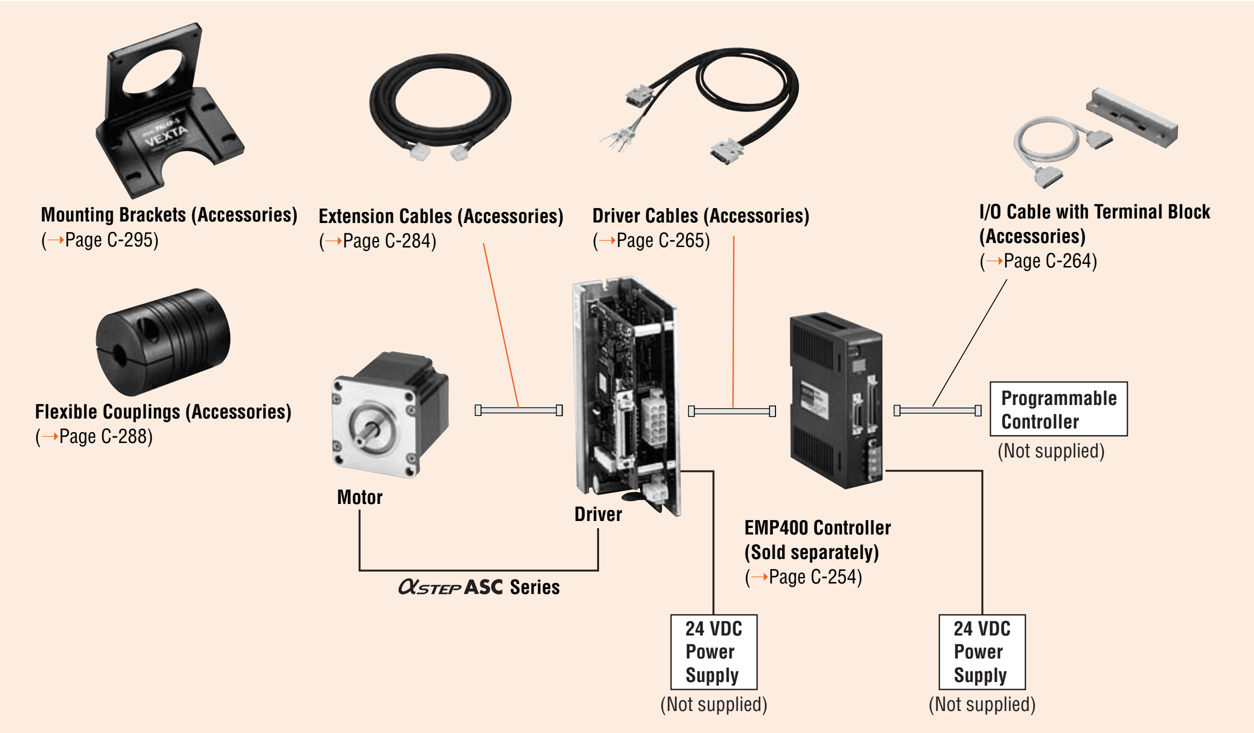
αSTEP is well-suited to applications where smooth movement or stability is required, such as where a camera is used to monitor the quality of a product.

Safety Standards and CE Marking

Model	Standards	Certification Body	Standards File No.	CE Marking
Motor	UL60950 CSA C22.2 No.60950	UL	E208200	EMC Directives
Driver	UL508C CSA C22.2 No.14		E171462	
	UL60950 CSA C22.2 No.60950		E208200	

- When the system is approved under various safety standards, the model names in the motor and driver nameplates are the approved model names.
  List of Motor and Driver Combinations→Page C-76
- **Details of Safety Standards**→Page G-2
- The EMC value changes according to the wiring and layout. Therefore, the final EMC level must be checked with the motor/driver incorporated in the user's equipment.

System Configuration



✻An example of a single-axis system configuration with the **EMP400** Series contoller.

Extension Cables (For **ASC** Series)

Extension cables are not included with *αSTEP* products. When using the *αSTEP* stepping motor and driver more than 1.31 feet (0.4 m) apart from each other, use an optional extension cable (sold separately).

Note:

- Electromagnetic brake motor models [except motor frame size □1.65 in. (□42 mm)] must use an optional electromagnetic brake extension cable. The frame size □1.65 in. (□42 mm) models can use a standard extension cable even for electromagnetic brake motor models.

Product Line

Type	Power Supply Voltage	Maximum Holding Torque		
		□1.10 in. (□28 mm)	□1.65 in. (□42 mm)	□2.36 in. (□60 mm)
Round Shaft Type	24 VDC	7.8~17 oz-in✻ (0.055~0.12 N·m)	42 oz-in (0.3 N·m)	142 oz-in (1 N·m)
TH Geared Type		—	3~13.2 lb-in (0.35~1.5 N·m)	11~35 lb-in (1.25~4 N·m)
PN Geared Type		—	13.2 lb-in (1.5 N·m)	30~70 lb-in (3.5~8.0 N·m)
HG Geared Type		13.2~17.7 lb-in✻ (1.5~2 N·m)	30~44 lb-in (3.5~5.0 N·m)	48~70 lb-in (5.5~8.0 N·m)

✻ : Electromagnetic brake models not available.

Product Number Code

ASC 6 6 A K-T 3.6

Gear Ratio

Blank: Standard Type
T : **TH** Geared Type
N: **PN** Geared Type
H: **HG** Geared Type

Power Supply Voltage
K: 24 VDC

A : Standard (Single Shaft)
M: Electromagnetic Brake

Motor Case Length

Motor Frame Size
3: 1.10 in. (28 mm) sq.
4: 1.65 in. (42 mm) sq.
6: 2.36 in. (60 mm) sq.

ASC Series

Features C-56 System Configuration C-58 Specifications/Characteristics C-59

Standard Type Motor Frame Size: □ 1.10 in. (□ 28 mm), □ 1.65 in. (□ 42 mm), □ 2.36 in. (□ 60 mm)

Specifications

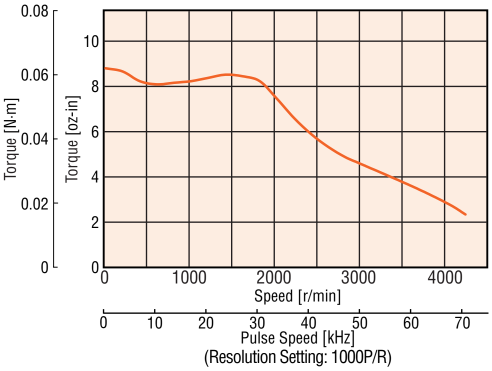
Model	w/o Electromagnetic Brake	**ASC34AK**	**ASC36AK**	**ASC46AK**	**ASC66AK**
	Electromagnetic Brake	—	—	**ASC46MK**	**ASC66MK**
Maximum Holding Torque	oz-in (N·m)	7.8 (0.055)	17 (0.12)	42 (0.3)	142 (1)
Rotor Inertia[✻1] J	oz-in^2 (kg·m^2)	0.06 (11×10^{-7})	0.148 (27×10^{-7})	0.37 (68×10^{-7}) [0.45 (83×10^{-7})]	2.2 (405×10^{-7}) [3.1 (564×10^{-7})]
Resolution[✻2] (Setting by Resolution Switch and Resolution Select Switch)		0.36°/Pulse (1000 P/R) 0.036°/Pulse (10000 P/R) 0.72°/Pulse (500 P/R) 0.072°/Pulse (5000 P/R)			
Power Source	Voltage	24 VDC±10%			
	Maximum Input Current	1.0 A	1.1 A	1.7 A	3.7 A
Electromagnetic Brake[✻3]	Type	—		Active when power is off	
	Power Supply Input	—		24 VDC±5%	
	Power Consumption	—		2 W	6 W
	Excitation Current	—		0.08 A	0.25 A
	Static Friction Torque oz-in (N·m)	—		21 (0.15)	85 (0.6)
Weight[✻1]	Motor lb. (kg)	0.33 (0.15)	0.48 (0.22)	1.1 (0.5) [1.3 (0.6)]	1.9 (0.85) [2.4 (1.1)]
	Driver lb. (kg)	0.55 (0.25)			
Dimension No.	Motor	1		2	3
	Driver	11			

✻1 The values inside the brackets [ ] represent the specification for the electromagnetic brake type.
✻2 The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals.
"**Resolution Select**" **switch** →Page C-72
✻3 The electromagnetic brakes are for holding the position when the power is off. They cannot be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brakes.

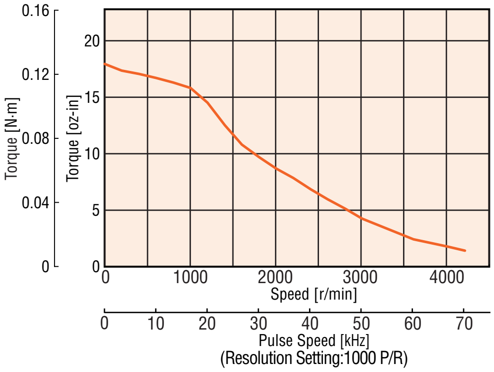
How to Read Specifications Table→Page C-9

Speed — Torque Characteristics **How to Read Speed-Torque Characteristics**→Page C-10

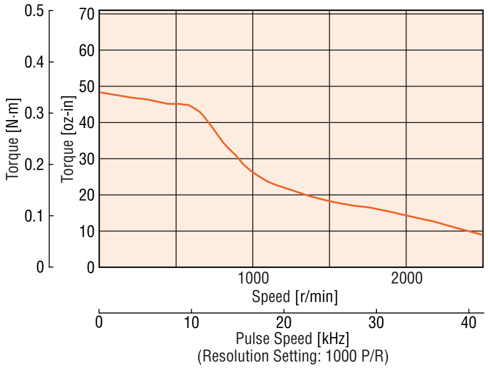
ASC34AK



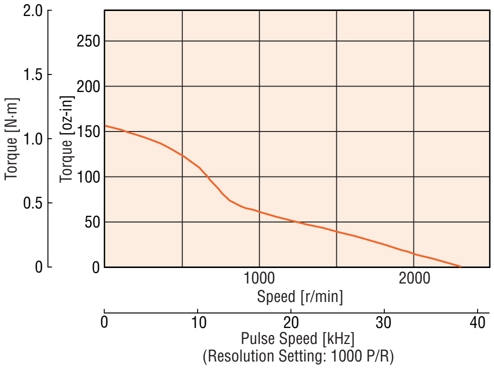
ASC36AK



ASC46□K



ASC66□K



Notes:
- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212 °F (100 °C). [Under 176 °F (75 °C) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

TH Geared Type

Motor Frame Size: □ 1.65 in. (□ 42 mm)

Specifications

Model			ASC46AK-T3.6	ASC46AK-T7.2	ASC46AK-T10	ASC46AK-T20	ASC46AK-T30
Model	Electromagnetic Brake		ASC46MK-T3.6	ASC46MK-T7.2	ASC46MK-T10	ASC46MK-T20	ASC46MK-T30
Maximum Holding Torque		lb-in (N·m)	3 (0.35)	6.1 (0.7)	8.8 (1)	13.2 (1.5)	13.2 (1.5)
Rotor Inertia*1 J		oz-in² (kg·m²)	0.37 (68×10⁻⁷) [0.45 (83×10⁻⁷)]				
Backlash		arc min (degrees)	45 (0.75°)	25 (0.417°)	25 (0.417°)	15 (0.25°)	15 (0.25°)
Permissible Speed Range		r/min	0~500	0~250	0~180	0~90	0~60
Gear Ratio			3.6:1	7.2:1	10:1	20:1	30:1
Resolution*2		1000 P/R	0.1°/pulse	0.05°/pulse	0.036°/pulse	0.018°/pulse	0.012°/pulse
Permissible Torque		lb-in (N·m)	3 (0.35)	6.1 (0.7)	8.8 (1)	13.2 (1.5)	13.2 (1.5)
Power Source		Voltage·Maximum Input Current	24 VDC±10% 1.7 A				
Electromagnetic Brake*3	Type		Active when power is off				
	Power Supply Input		24 VDC±5%				
	Power Consumption		2 W				
	Excitation Current		0.08 A				
	Static Friction Torque	lb-in (N·m)	1.5 (0.17)	3 (0.35)	4.4 (0.5)	6.6 (0.75)	6.6 (0.75)
Weight*1	Motor	lb. (kg)	1.4 (0.65) [1.7 (0.75)]				
	Driver	lb. (kg)	0.55 (0.25)				
Dimension No.	Motor		4				
	Driver		11				

*1 The values inside the brackets [ ] represent the specification for the electromagnetic brake type.

*2 The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals.
"**Resolution Select**" **switch** →Page C-72

*3 The electromagnetic brakes are for holding the position when the power is off. They cannot be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brakes.

How to Read Specifications Table→Page C-9

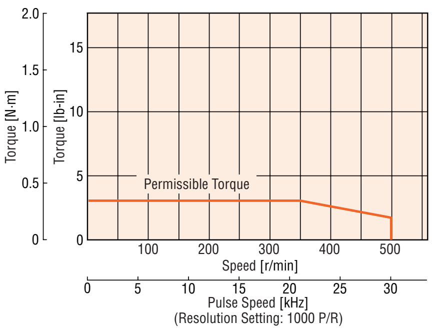
Note:

- Direction of rotation of the motor shaft and that of the gear output shaft are the same for models with gear ratios of 3.6:1, 7.2:1 and 10:1.
  The direction of rotation is opposite for models with gear ratios of 20:1 and 30:1.

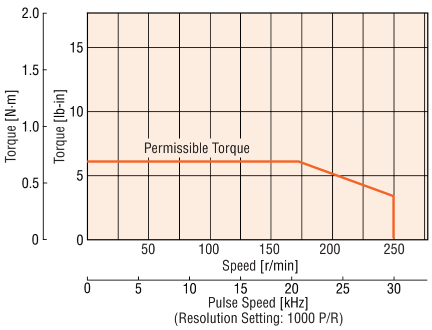
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

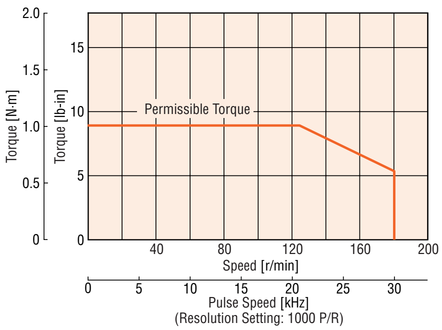
ASC46□K-T3.6



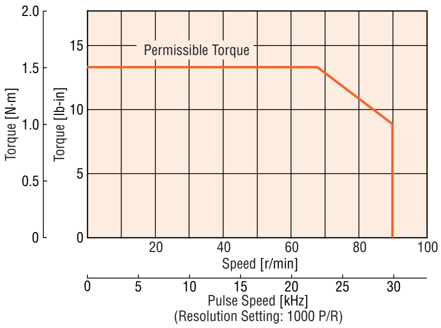
ASC46□K-T7.2



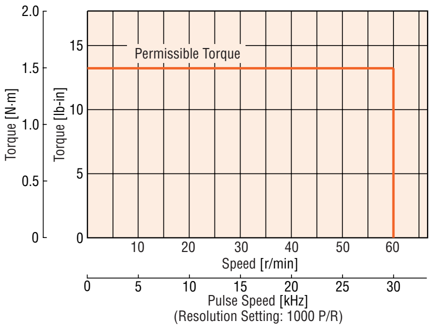
ASC46□K-T10



ASC46□K-T20



ASC46□K-T30



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212 °F (100 °C). [Under 176 °F (75 °C) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

Features C-56 System Configuration C-58 Specifications/Characteristics C-59

TH Geared Type

Motor Frame Size: □ 2.36 in. (□ 60 mm)

Specifications

c UL us CE

Model						
Model	w/o Electromagnetic Brake	ASC66AK-T3.6	ASC66AK-T7.2	ASC66AK-T10	ASC66AK-T20	ASC66AK-T30
	Electromagnetic Brake	ASC66MK-T3.6	ASC66MK-T7.2	ASC66MK-T10	ASC66MK-T20	ASC66MK-T30
Maximum Holding Torque	lb-in (N·m)	11 (1.25)	22 (2.5)	26 (3)	30 (3.5)	35 (4)
Rotor Inertia[✻1] J	oz-in^2 (kg·m^2)	2.2 (405×10^{-7}) [3.1 (564×10^{-7})]				
Backlash	arc min (degrees)	35 (0.584°)	15 (0.25°)	15 (0.25°)	10 (0.167°)	10 (0.167°)
Permissible Speed Range	r/min	0~500	0~250	0~180	0~90	0~60
Gear Ratio		3.6:1	7.2:1	10:1	20:1	30:1
Resolution[✻2]	1000 P/R	0.1°/pulse	0.05°/pulse	0.036°/pulse	0.018°/pulse	0.012°/pulse
Permissible Torque	lb-in (N·m)	11 (1.25)	22 (2.5)	26 (3)	30 (3.5)	35 (4)
Power Source	Voltage·Maximum Input Current	24 VDC±10% 3.7 A				
Electromagnetic Brake[✻3]	Type	Active when power is off				
	Power Supply Input	24 VDC±5%				
	Power Consumption	6 W				
	Excitation Current	0.25 A				
	Static Friction Torque lb-in (N·m)	5.4 (0.62)	11 (1.25)	13.2 (1.5)	15.4 (1.75)	17.7 (2.0)
Weight[✻1]	Motor lb. (kg)	2.8 (1.25) [3.3 (1.5)]				
	Driver lb. (kg)	0.55 (0.25)				
Dimension No.	Motor	$\boxed{5}$				
	Driver	$\boxed{11}$				

[✻1] The values inside the brackets [ ] represent the specification for the electromagnetic brake type.

[✻2] The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals.
"**Resolution Select**" **switch** →Page C-72

[✻3] The electromagnetic brakes are for holding the position when the power is off. They cannot be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brakes.

How to Read Specifications Table→Page C-9

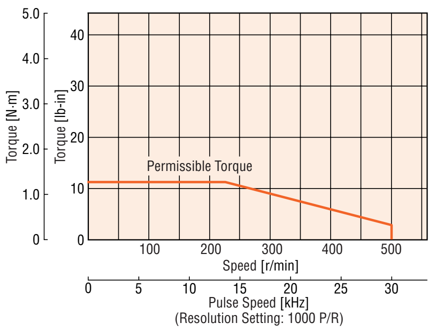
Note:

- Direction of rotation of the motor shaft and that of the gear output shaft are the same for models with gear ratio of 3.6:1, 7.2:1 and 10:1.
The direction of rotation is opposite for models with gear ratios of 20:1 and 30:1.

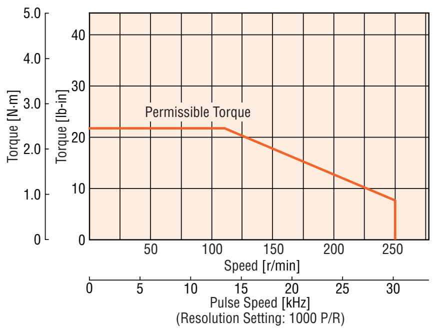
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

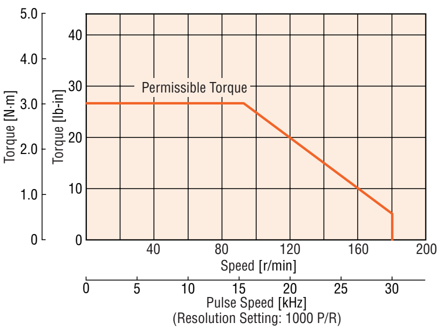
ASC66□K-T3.6



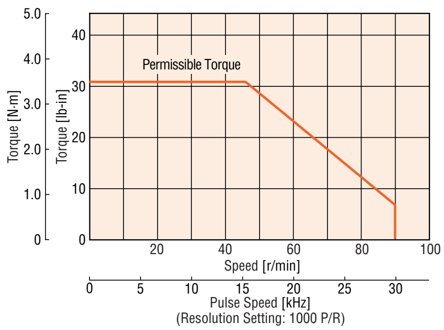
ASC66□K-T7.2



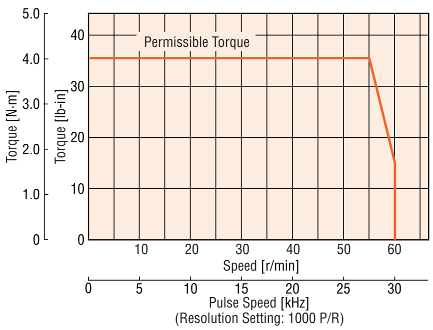
ASC66□K-T10



ASC66□K-T20



ASC66□K-T30



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212 °F (100 °C). [Under 176 °F (75 °C) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

PN Geared Type

Motor Frame Size: □ 1.65 in. (□ 42 mm)

Specifications

How to Read Specifications Table→Page C-9

Model	w/o Electromagnetic Bracke	**ASC46AK-N7.2**	**ASC46AK-N10**
	Electromagnetic Brake	**ASC46MK-N7.2**	**ASC46MK-N10**
Maximum Holding Torque	lb-in (N·m)	13.2 (1.5)	
Rotor Inertia✻1 J	oz-in² (kg·m²)	0.37 (68×10^{-7}) [0.454 (83×10^{-7})]	
Backlash	arc min (degrees)	2 (0.034°)	
Angle Error	arc min (degrees)	6 (0.1°)	
Permissible Speed Range	r/min	0~333	0~240
Gear Ratio		7.2:1	10:1
Resolution✻2	1000 P/R	0.5°/pulse	0.036°/pulse
Permissible Torque	lb-in (N·m)	13.2 (1.5)	
Maximum Torque✻4	lb-in (N·m)	17.7 (2)	
Power Source	Voltage·Maximum Input Current	24 VDC±10% 1.7 A	
Electromagnetic Brake✻3	Type	Active when power is off	
	Power Supply Input	24 VDC±5%	
	Power Consumption	2 W	
	Excitation Current	0.08 A	
	Static Friction Torque lb-in (N·m)	6.6 (0.75)	
Weight✻1	Motor lb. (kg)	1.6 (0.71) [1.8 (0.81)]	
	Driver lb. (kg)	0.55 (0.25)	
Dimension No.	Motor	$\boxed{6}$	
	Driver	$\boxed{11}$	

✻1 The values inside the brackets [ ] represent the specification for the electromagnetic brake type.

✻2 The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals. "**Resolution Select**" **switch** →Page C-72

✻3 The electromagnetic brakes are for holding the position when the power is off. They cannot be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brakes.

✻4 The value of Maximum Torque is for gear. For output torque for geared motor, refer to the Speed - Torque characteristics.

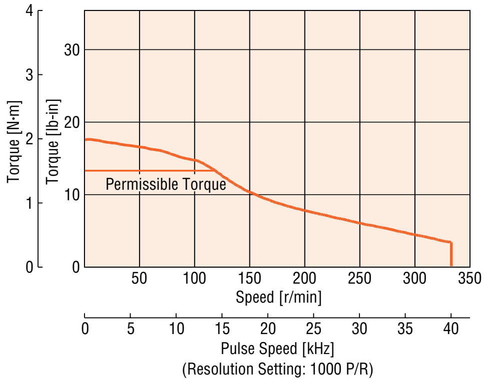
Note:

- Direction of rotation of the motor shaft and that of the gear output shaft is the same.

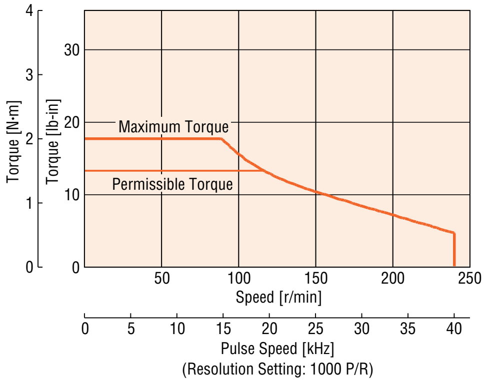
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

ASC46□K-N7.2



ASC46□K-N10



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212 °F (100 °C). [Under 176 °F (75 °C) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

PN Geared Type

Motor Frame Size: □ 2.36 in. (□ 60 mm)

Specifications

How to Read Specifications Table→Page C-9

Model	w/o Electromagnetic Brake	ASC66AK-N5	ASC66AK-N7.2	ASC66AK-N10	ASC66AK-N25	ASC66AK-N36	ASC66AK-N50
	Electromagnetic Brake	ASC66MK-N5	ASC66MK-N7.2	ASC66MK-N10	ASC66MK-N25	ASC66MK-N36	ASC66MK-N50
Maximum Holding Torque	lb-in (N·m)	30 (3.5)	35 (4.0)	44 (5.0)	70 (8.0)		
Rotor Inertia[*1] J	oz-in² (kg·m²)	2.2 (405×10⁻⁷) [3.1 (564×10⁻⁷)]					
Backlash	arc min (degrees)	2 (0.034°)			3 (0.05°)		
Angle Error	arc min (degrees)	5 (0.084°)					
Permissible Speed Range	r/min	0~360	0~250	0~180	0~72	0~50	0~36
Gear Ratio		5:1	7.2:1	10:1	25:1	36:1	50:1
Resolution[*2]	1000 P/R	0.072°/pulse	0.05°/pulse	0.036°/pulse	0.0144°/pulse	0.01°/pulse	0.0072°/pulse
Permissible Torque	lb-in (N·m)	30 (3.5)	35 (4.0)	44 (5.0)	70 (8.0)		
Maximum Torque[*4]	lb-in (N·m)	61 (7)	79 (9)	97 (11)	140 (16)	170 (20)	170 (20)
Power Source	Voltage·Maximum Input Current	24 VDC±10% 3.7 A					
Electromagnetic Brake[*3]	Type	Active when power is off					
	Power Supply Input	24 VDC±5%					
	Power Consumption	6 W					
	Excitation Current	0.25 A					
	Static Friction Torque lb-in (N·m)	15.4 (1.75)	17.7 (2.0)	22 (2.5)	35 (4.0)		
Weight[*1]	Motor lb. (kg)	3.3 (1.5) [3.9 (1.75)]			3.7 (1.7) [4.3 (1.95)]		
	Driver lb. (kg)	0.55 (0.25)					
Dimension No.	Motor	$\boxed{7}$					
	Driver	$\boxed{11}$					

[*1] The values inside the brackets [ ] represent the specification for the electromagnetic brake type.

[*2] The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals. "**Resolution Select**" **switch** →Page C-72

[*3] The electromagnetic brakes are for holding the position when the power is off. They cannot be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brakes.

[*4] The value of Maximum Torque is for gear. For output torque for geared motor, refer to the Speed - Torque characteristics.

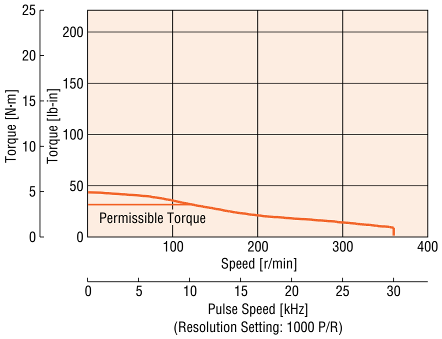
Note:

- Direction of rotation of the motor shaft and that of the gear output shaft is the same.

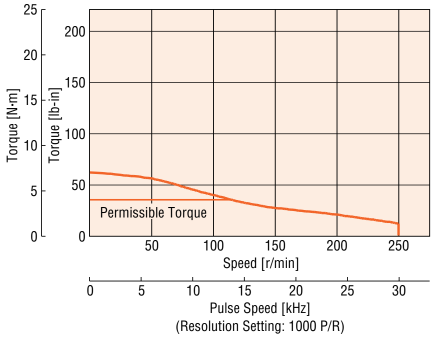
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

ASC66□K-N5



ASC66□K-N7.2



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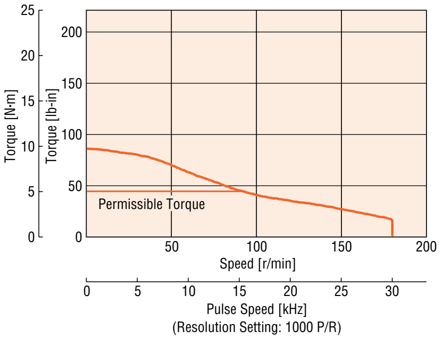
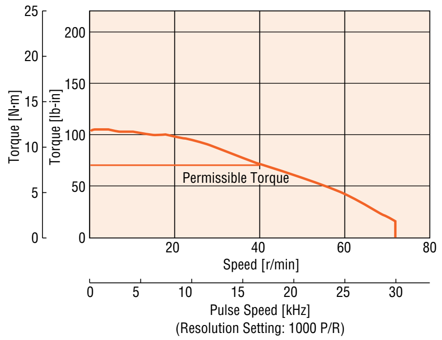
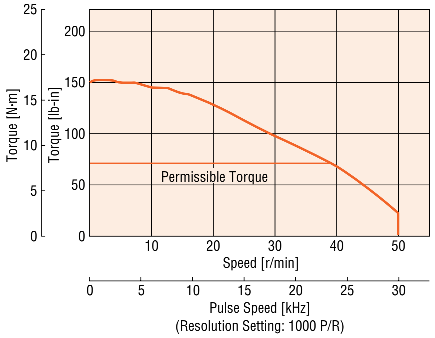


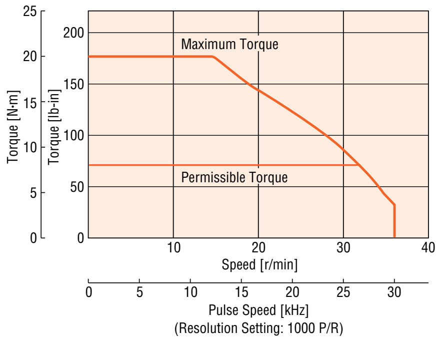
ASC66□K-N25



ASC66□K-N36



ASC66□K-N50



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212 °F (100 °C). [Under 176 °F (75 °C) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

HG Geared Type Motor Frame Size: □ 1.10 in. (□ 28 mm), □ 1.65 in. (□ 42 mm)

Specifications

Model	w/o Electromagnetic Brake	ASC34AK-H50	ASC34AK-H100	ASC46AK-H50	ASC46AK-H100
	Electromagnetic Brake	—	—	ASC46MK-H50	ASC46MK-H100
Maximum Holding Torque	lb-in (N·m)	13.2 (1.5)	17.7 (2)	30 (3.5)	44 (5.0)
Rotor Inertia[✻1]J	oz-in^2 (kg·m^2)	0.153 (28×10^{-7})		0.46 (85×10^{-7}) [0.55 (100×10^{-7})]	
Permissible Speed Range	r/min	0~70	0~35	0~48	0~24
Gear Ratio		50:1	100:1	50:1	100:1
Resolution[✻2]	1000 P/R	0.0072°	0.0036°	0.0072°	0.0036°
Permissible Torque	lb-in (N·m)	13.2 (1.5)	17.7 (2)	30 (3.5)	44 (5.0)
Maximum Torque	lb-in (N·m)	17.7 (2)	24 (2.8)	73 (8.3)	97 (11)
Lost Motion (Load Torque)	arc min	Max. 3 (±0.06 N·m)	Max. 3 (±0.08 N·m)	Max. 1.5 (±0.16 N·m)	Max. 1.5 (±0.2 N·m)
Power Source	Voltage·Maximum Input Current	24 VDC±10% 1.0 A		24 VDC±10% 1.7 A	
Electromagnetic Brake[✻3]	Type	—		Active when power is off	
	Power Supply Input	—		24 VDC±5%	
	Power Consumption	—		2 W	
	Excitation Current	—		0.08 A	
	Static Friction Torque lb-in (N·m)	—		15.4 (1.75)	22 (2.5)
Weight[✻1]	Motor lb. (kg)	0.55 (0.25)		1.5 (0.7) [1.8 (0.8)]	
	Driver lb. (kg)	0.55 (0.25)			
Dimension No.	Motor	8		9	
	Driver	11			

✻1 The values inside the brackets [ ] represent the specification for the electromagnetic brake type.

✻2 The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals.
"**Resolution Select**" **switch** →Page C-72

✻3 The electromagnetic brakes are for holding the position when the power is off. They cannot be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brakes.

How to Read Specifications Table→Page C-9

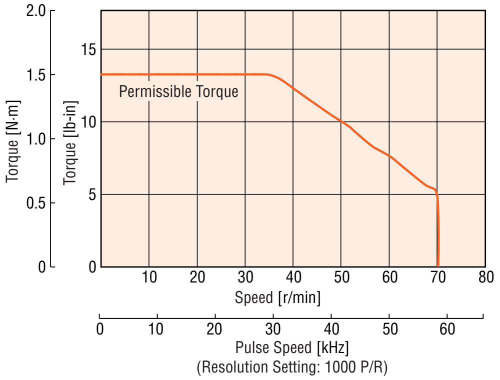
Note:

- The inertia represents a sum of the inertia of the harmonic gear converted to a motor shaft value, and the rotor inertia. Direction of rotation of the motor shaft and that of the gear output shaft is opposite.

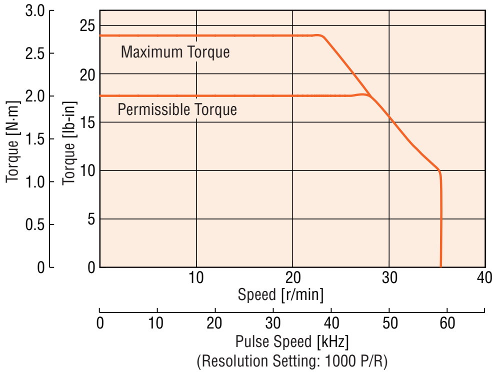
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

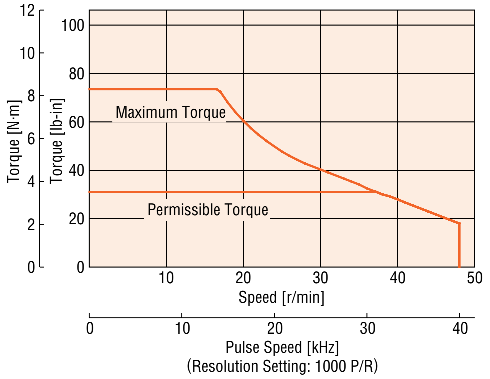
ASC34AK-H50



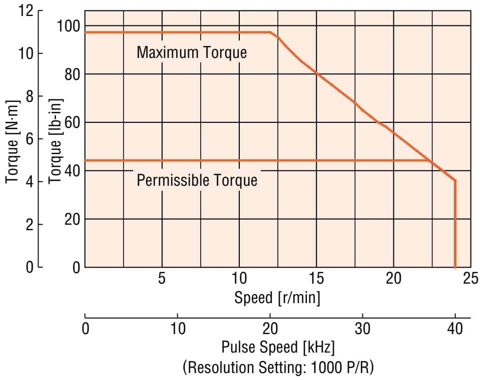
ASC34AK-H100



ASC46□K-H50



ASC46□K-H100



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. In order to prevent fatigue of the gear grease in the harmonic gear, keep the temperature of the gear case under 158 °F (70 °C).
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

HG Geared Type

Motor Frame Size: □ 2.36 in. (□ 60 mm)

Specifications

Model	w/o Electromagnetic Brake	ASC66AK-H50	ASC66AK-H100
	Electromagnetic Brake	ASC66MK-H50	ASC66MK-H100
Maximum Holding Torque	lb-in (N·m)	48 (5.5)	70 (8.0)
Rotor Inertia[*1] J	oz-in^2 (kg·m^2)	$2.3\ (422\times10^{-7})\ [3.2\ (581\times10^{-7})]$	
Permissible Speed Range	r/min	0~36	0~18
Gear Ratio		50:1	100:1
Resolution[*2]	1000P/R	0.0072°/pulse	0.0036°/pulse
Permissible Torque	lb-in (N·m)	48 (5.5)	70 (8.0)
Maximum Torque	lb-in (N·m)	159 (18)	240 (28)
Lost Motion (Load Torque)	arc min	Max. 0.7 (±0.28 N·m)	Max. 0.7 (±0.39 N·m)
Power Source	Voltage·Maximum Input Current	24 VDC±10% 3.7 A	
Electromagnetic Brake[*3]	Type	Active when power is off	
	Power Supply Input	24 VDC±5%	
	Power Consumption	6 W	
	Excitation Current	0.25 A	
	Static Friction Torque lb-in (N·m)	24 (2.75)	35 (4)
Weight[*1]	Motor lb. (kg)	3.1 (1.4) [3.6 (1.65)]	
	Driver lb. (kg)	0.55 (0.25)	
Dimension No.	Motor	10	
	Driver	11	

[*1] The values inside the brackets [ ] represent the specification for the electromagnetic brake type.

[*2] The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals.
"**Resolution Select**" **switch** →Page C-72

[*3] The electromagnetic brakes are for holding the position when the power is off. They cannot be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brakes.

How to Read Specifications Table→Page C-9

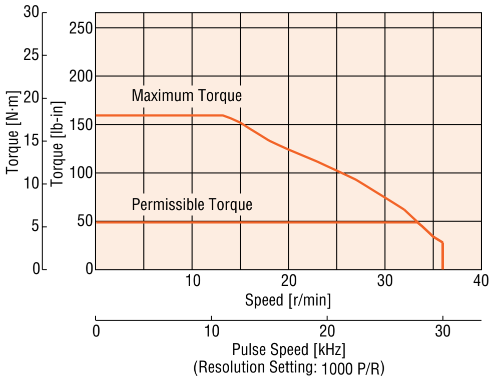
Note:

- The inertia represents a sum of the inertia of the harmonic gear converted to a motor shaft value, and the rotor inertia. Direction of rotation of the motor shaft and that of the gear output shaft is opposite.

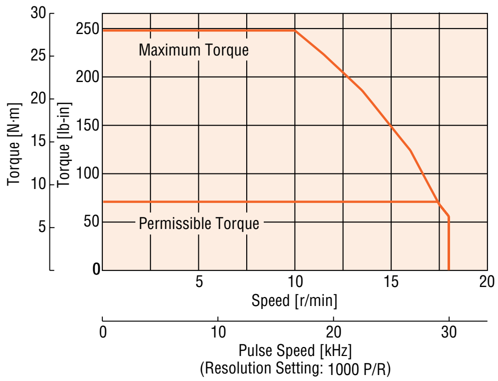
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

ASC66□K-H50



ASC66□K-H100



Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. In order to prevent fatigue of the gear grease in the harmonic gear, keep the temperature of the gear case under 158 °F (70 °C).
- When using the motor with the dedicated driver, the driver's automatic current cutbuck at motor standstill function reduces maximum holding torque by approximately 50%.

Common Specifications

Maximum Input Pulse Frequency	250 kHz
Speed • Positioning Control Command	Pulse Train Input
Protection Functions	When the protection functions are activated, an alarm signal is output and the motor stops automatically. Overload Protection, Overvoltage Protection, Speed Error Protection, Overspeed protection, EEPROM Data Error, Sensor Error, System Error
Input Signals	Photocoupler Input Input Resistance: 220 Ω Input Current 7~20 mA (Forward Pulse, Reverse Pulse, Current Off, Alarm Clear, Resolution Setting)
Output Signals	Photocoupler • Open Collector Output External equipment requirement Less than 30 VDC, 15 mA (Positioning Completion, Alarm, Timing) Transistor • Open Collector Output External equipment requirement Less than 30 VDC, 15 mA (Feedback Pulse A • B phase)

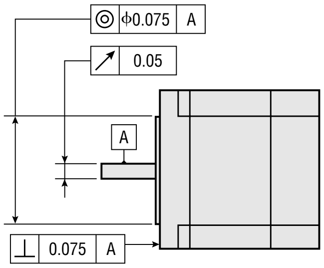
General Specifications

		Motor	Driver
Insulation Class		Class B [266°F (130˚C)]	—
Insulation Resistance		100 MΩ minimum when measured by a 500 VDC megger between the following places · Frame-Motor and Sensor Windings	100 MΩ minimum when measured by a 500 VDC megger between the following places · Heat Sink-Power Supply Terminal
Dielectric Strength		Sufficient to withstand the following for one minute · Frame-Motor and Sensor Windings 0.5 kV 60 Hz	Sufficient to withstand the following for one minute · Heat Sink-Power Supply Terminal 0.5 kV 60 Hz
Operating Environment	Ambient Temperature	32°F~122˚F (0°C~+50˚C) (nonfreezing): Standard·**TH·PN** Geared Type 32°F~104˚F (0°C~+40˚C) (nonfreezing): **HG** Geared Type	+32°F~+104˚F (0°C~+40˚C) (nonfreezing)
	Ambient Humidity	85% or less (noncondensing)	
	Atmosphere	No corrosive gases, dust, water or oil.	
Static Angle Error		±5 minutes	—
Shaft Runout		0.002 inch (0.05 mm) T.I.R.✻	—
Concentricity		0.003 inch (0.075 mm) T.I.R.✻	—
Perpendicularity		0.003 inch (0.075 mm) T.I.R.✻	—

✻ T.I.R.(Total Indicator Reading): The total dial gauge reading when the measurement section is rotated one revolution centered on the reference axis center.

Note:

- Do not measure insulation resistance or perform the dielectric strength test while the motor and driver are connected.



Features C-56 System Configuration C-58 Specifications/Characteristics C-59

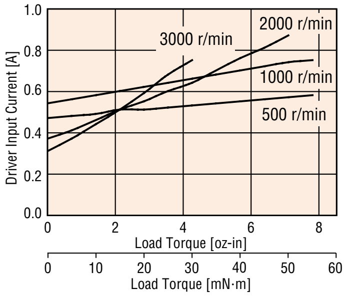
Load Torque-Driver Input Current Characteristics

This is the relationship between the load torque and driver input current at each speed when the motor is operated. From these characteristics, the current capacity required when used for multiple axes can be estimated. For geared motors convert to torque and speed at the motor axis.

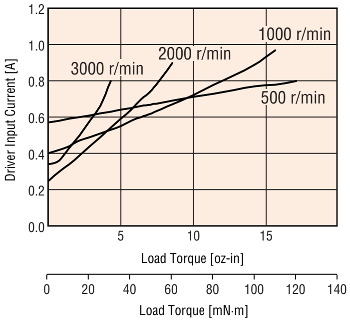
$$\text{Motor shaft speed [r/min]} = \text{Gear output shaft speed} \times \text{Gear ratio}$$

$$\text{Motor shaft torque [oz-in]} = \frac{\text{Gear output shaft torque}}{\text{Gear ratio}}$$

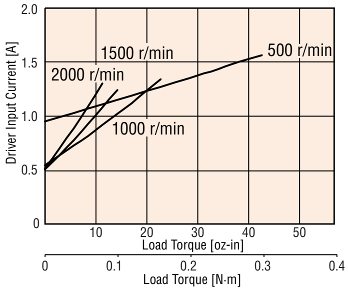
ASC34AK



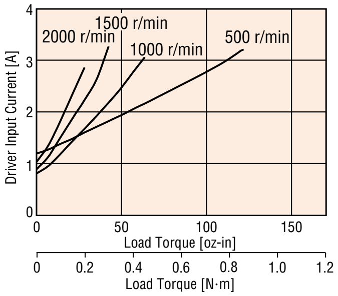
ASC36AK



ASC46□K



ASC66□K



Permissible Overhung Load and Permissible Thrust Load

Unit = Upper values: lb./Lower values: N

Model	Overhung Load Distance from Shaft End [inch (mm)]					Thrust Load
	0	0.2 (5)	0.39 (10)	0.59 (15)	0.79 (20)	
ASC34AK **ASC36AK**	5.6 25	7.6 34	11.7 52	—	—	Keep thrust loads below the weight of the motor used.
ASC46□K	4.5 20	5.6 25	7.6 34	11.7 52	—	
ASC66□K	14.1 63	16.8 75	21 95	29 130	42 190	
ASC46□K-T3.6 **ASC46□K-T7.2** **ASC46□K-T10** **ASC46□K-T20** **ASC46□K-T30**	22 100	3.1 14	4.5 20	6.7 30	—	3.3 15
ASC66□K-T3.6 **ASC66□K-T7.2** **ASC66□K-T10** **ASC66□K-T20** **ASC66□K-T30**	15 70	18 80	22 100	27 120	33 150	9 40
ASC46□K-N7.2 **ASC46□K-N10**	22 100	27 120	33 150	42 190	—	22 100
ASC66□K-N5	45 200	49 220	56 250	63 280	72 320	22 100
ASC66□K-N7.2 **ASC66□K-N10**	56 250	60 270	67 300	76 340	87 390	
ASC66□K-N25 **ASC66□K-N36** **ASC66□K-N50**	74 330	81 360	90 400	101 450	117 520	
ASC34AK-H50 **ASC34AK-H100**	31 140	36 160	45 200	54 240	—	
ASC46□K-H50 **ASC46□K-H100**	40 180	49 220	60 270	81 360	114 510	54 240
ASC66□K-H50 **ASC66□K-H100**	72 320	83 370	99 440	123 550	162 720	105 470

Dimensions Scale 1/4, Unit = **inch** (mm)

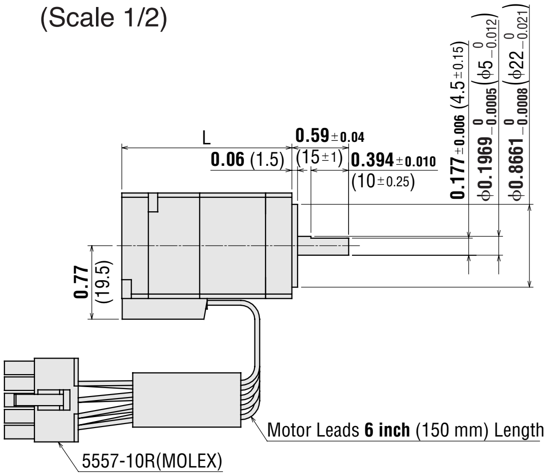
● Motor

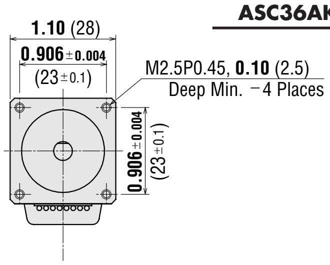
◆ Standard Type

1 Motor Frame Size □1.10 in. (□28 mm)

(Scale 1/2)

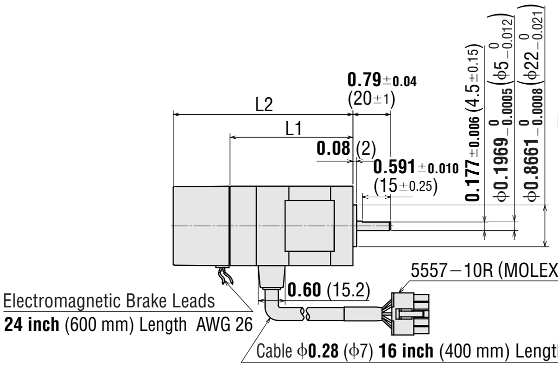
Model	Motor Model	L inch (mm)	Weight lb. (kg)	DXF
ASC34AK	ASM34AK	1.77 (45)	0.33 (0.15)	B274
ASC36AK	ASM36AK	2.56 (65)	0.48 (0.22)	B275

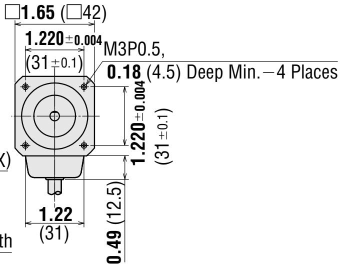




2 Motor Frame Size □1.65 in. (□42 mm)

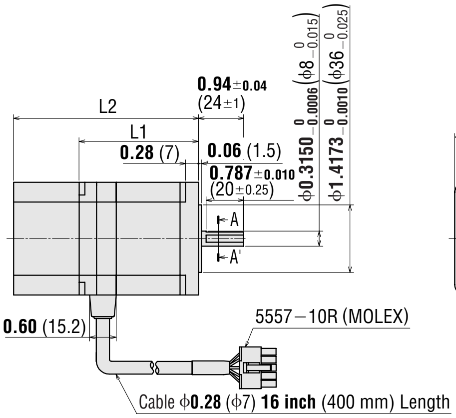
Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
ASC46AK	ASM46AK	2.56 (64.9)	—	1.1 (0.5)	B192
ASC46MK	ASM46MK	—	3.74 (94.9)	1.3 (0.6)	B193

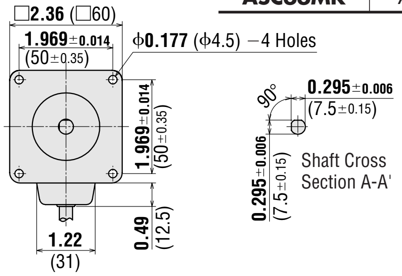




3 Motor Frame Size □2.36 in. (□60 mm)

Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
ASC66AK	ASM66AK	2.50 (63.6)	—	1.9 (0.85)	B194
ASC66MK	ASM66MK	—	3.88 (98.6)	2.4 (1.1)	B195



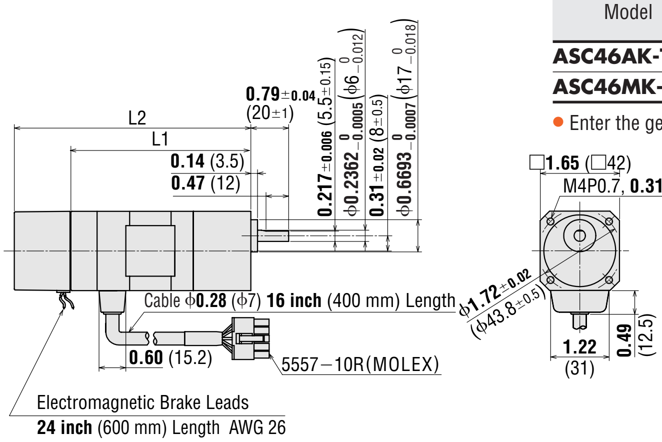


◆ TH Geared Type

4 Motor Frame Size □1.65 in. (□42 mm)

Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
ASC46AK-T□	ASM46AK-T□	**3.6**, **7.2**, **10**, **20**, **30**	3.76 (95.4)	—	1.4 (0.65)	B199
ASC46MK-T□	ASM46MK-T□		—	4.94 (125.4)	1.7 (0.75)	B200

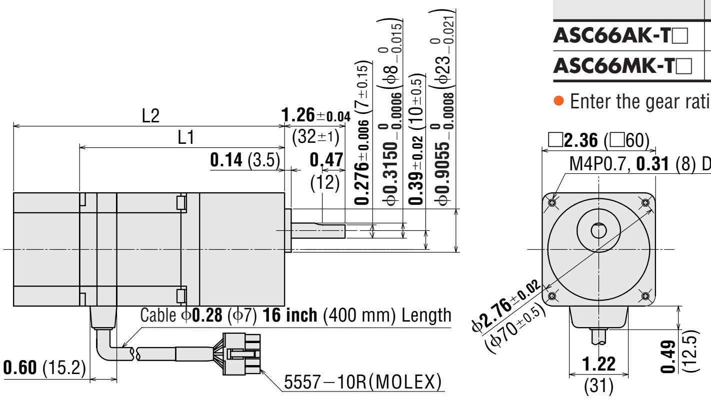
- Enter the gear ratio in the box (□) within the model number.



5 Motor Frame Size □2.36 in. (□60 mm)

Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
ASC66AK-T□	ASM66AK-T□	**3.6**, **7.2**, **10**, **20**, **30**	4.28 (108.6)	—	2.8 (1.25)	B201
ASC66MK-T□	ASM66MK-T□		—	5.65 (143.6)	3.3 (1.5)	B202

- Enter the gear ratio in the box (□) within the model number.

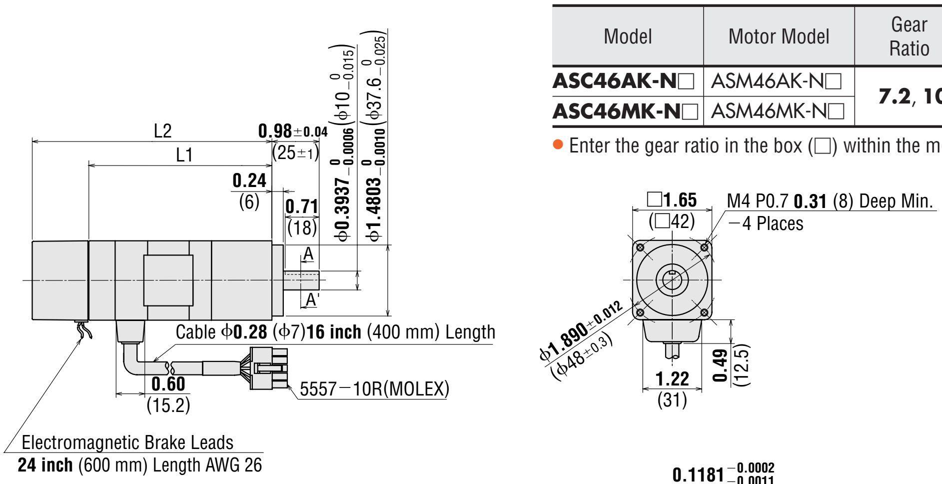


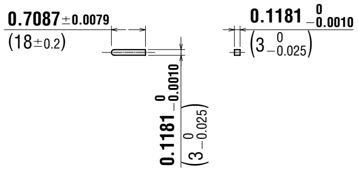
◆ PN Geared Type

6 Motor Frame Size □1.65 in. (□42 mm)

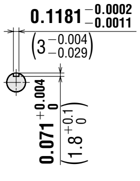
Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
ASC46AK-N□	ASM46AK-N□	**7.2**, **10**	3.81 (96.9)	—	1.6 (0.71)	B306
ASC46MK-N□	ASM46MK-N□		—	5.00 (126.9)	1.8 (0.81)	B307

- Enter the gear ratio in the box (□) within the model number.





Parallel Key (Included)

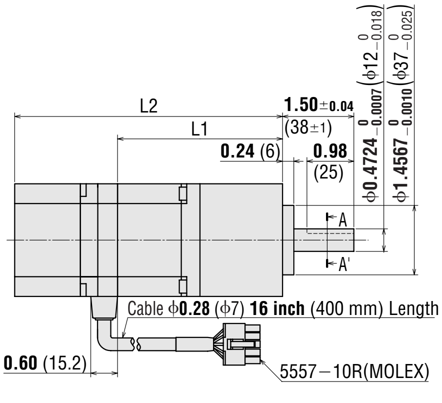


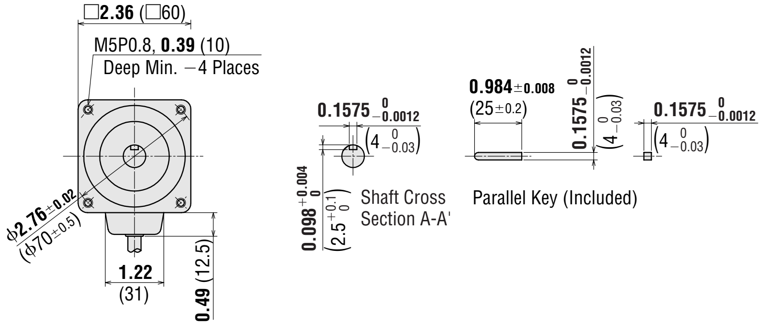
Shaft Cross Section A-A'

7 Motor Frame Size □2.36 in. (□60 mm)

Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
ASC66AK-N□	ASM66AK-N□	**5, 7.2, 10**	4.24 (107.6)	—	3.3 (1.5)	B226
ASC66AK-N□	ASM66AK-N□	**25, 36, 50**	4.87 (123.6)	—	3.7 (1.7)	B228
ASC66MK-N□	ASM66MK-N□	**5, 7.2, 10**	—	5.61 (142.6)	3.9 (1.75)	B227
ASC66MK-N□	ASM66MK-N□	**25, 36, 50**	—	6.24 (158.6)	4.3 (1.95)	B229

- Enter the gear ratio in the box (□) within the model number.



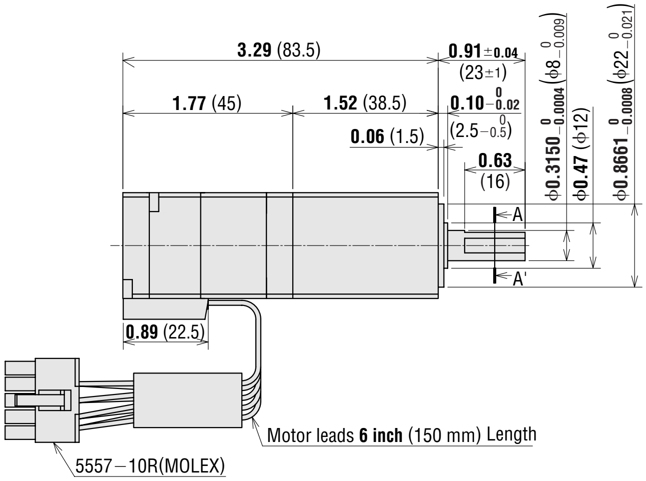


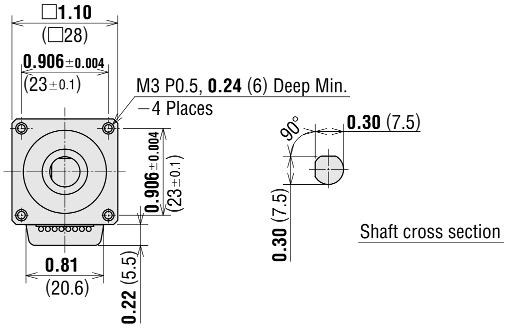
◆ HG Geared Type

8 Motor Frame Size □1.10 in. (□28 mm)
(Scale 1/2)

Model	Motor Model	Gear Ratio	Weight lb. (kg)	DXF
ASC34AK-H□	ASM34AK-H□	**50, 100**	0.55 (0.25)	B289

- Enter the gear ratio in the box (□) within the model number.

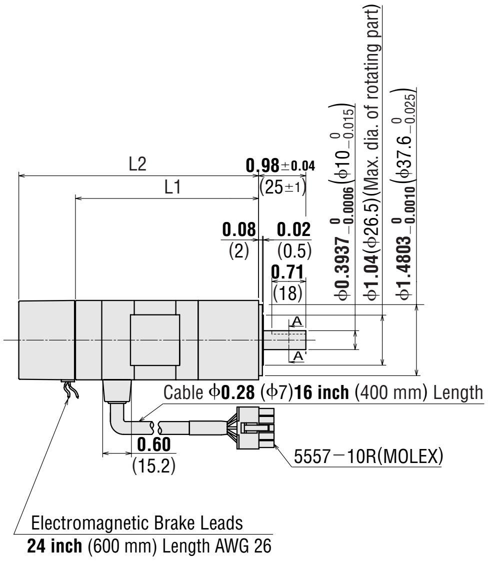


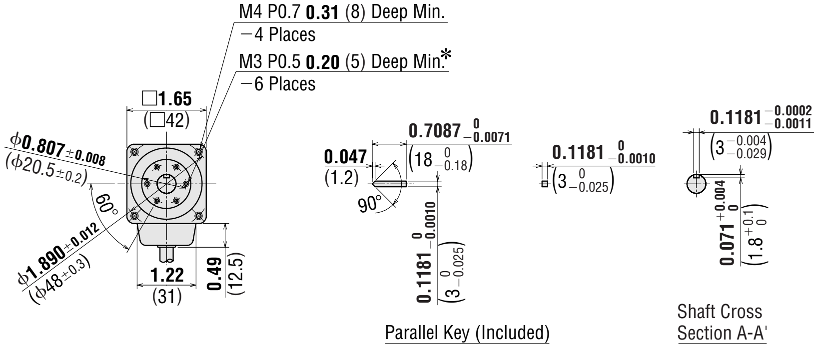


9 Motor Frame Size □1.65 in. (□42 mm)

Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
ASC46AK-H□	ASM46AK-H□	**50, 100**	3.81 (96.9)	—	1.5 (0.7)	B308
ASC46MK-H□	ASM46MK-H□		—	5.00 (126.9)	1.8 (0.8)	B309

- Enter the gear ratio in the box (□) within the model number.





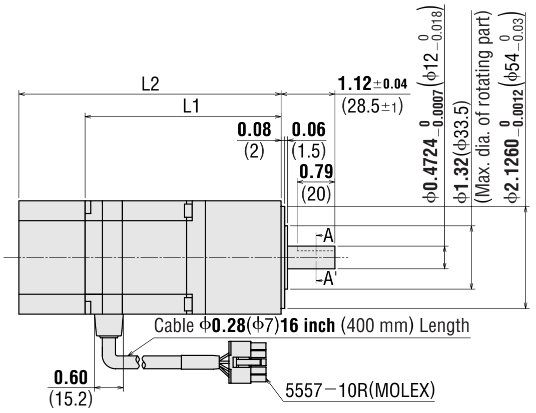
*The position of the key slot on the output shaft [ϕ0.3937 (ϕ10)] relative to the screw holes on a maximum diameter of ϕ1.04 (ϕ26.5) on the rotating part is arbitrary.

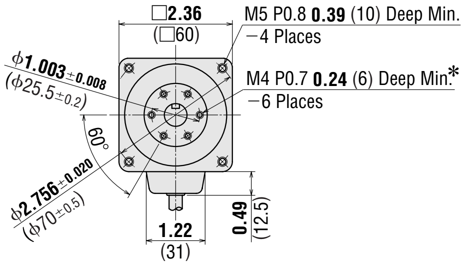
Features C-56 | System Configuration C-58 | Specifications/Characteristics C-59

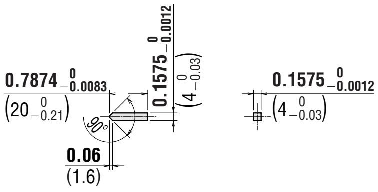
10 Motor Frame Size □2.36 in. (□60 mm)

Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
ASC66AK-H□	ASM66AK-H□	**50, 100**	4.08 (103.6)	—	3.1 (1.4)	B310
ASC66MK-H□	ASM66MK-H□		—	5.46 (138.6)	3.6 (1.65)	B311

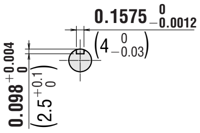
- Enter the gear ratio in the box (□) within the model number.







Parallel Key (Included)



Shaft Cross Section A-A'

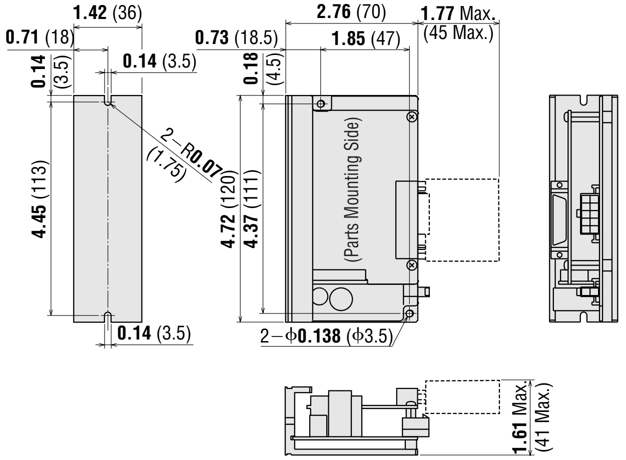
*The position of the key slot on the output shaft [φ0.4724 (φ12)] relative to the screw holes on a maximum diameter of φ1.32 (φ33.5) on the rotating part is arbitrary.

● Driver

11 ASD10A-K, ASD10B-K, ASD10C-K, ASD18A-K, ASD18B-K, ASD36A-K, ASD36B-K

Weight: 0.55 lb. (0.25 kg)

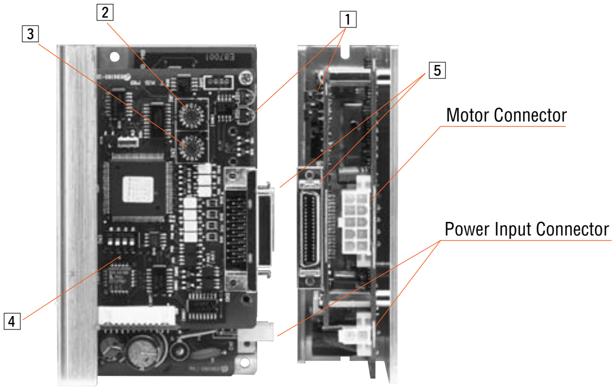
DXF B198



● I/O Connector (included)

Connector: 54306-3611 (MOLEX)
Cover Assembly: 54331-1361 (MOLEX)

Connection and Operation



1 Signal Monitor Display

• LED Indicators

Indication	Color	Function	When Activated
LED1	Green	Power supply indication	Lights when power is on.
LED2	Red	Alarm indication	Blinks when protection functions are activated.

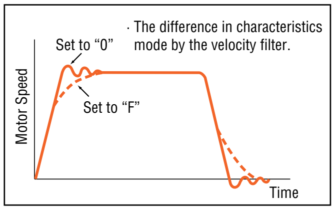
· Alarm

Blink Count	Protection Function	When Activated
2	Overload	The motor is operated continuously over 5 seconds under a load exceeding the maximum torque.
3	Overvoltage	The primary voltage of the driver's inverter exceeds the permissible value.
4	Speed error	The motor cannot accurately follow at the indicated pulse velocity.
6	Overspeed	The motor shaft velocity exceeds 5000 r/min. (Except geared type)
7	EEPROM data error	The EEPROM has a fault.
8	Sensor error	The power source turns it on when the motor cable is not connected to the driver.
No Blink	System error	The driver has fatal error.

2 Current Adjustment Switch

Indication	Switch Name	Function
CURRENT	Current adjustment switch	The motor running current can be lowered to suppress temperature rise in the motor and driver, or lower operating current in order to allow a margin for motor torque.

3 Velocity Filter Adjustment Switch

Indication	Switch Name	Function
V.FIL	Velocity filter adjustment switch	This switch is used to make adjustments when a smooth start-stop or smooth motion at low speed is required. 

4 Function Switches

Indication	Switch Name	Function
1000/500 X1/ X10	Resolution select switch	This function is for selecting the motor resolution. For each geared type, the resolution of gear output shaft is 1/gear ratio. "1000" "×1" →1000 Pulses (0.36°/step) "1000" "×10" →10000 Pulses (0.036°/step) "500" "×1" →500 Pulses (0.72°/step) "500" "×10" →5000 Pulses (0.072°/step)
1P/2P	Pulse input mode switch	The settings of this switch are compatible with the following two pulse input modes: "1P" for the 1-pulse input mode, "2P" for the 2-pulse input mode.

Note:

- Always turn the power off before switching resolution or pulse input, and turn it ON again after you have made the change.
  If the “Resolution Select” switch is set to “×10”, it cannot control the resolution selected by the input terminals. It will always be “×10”.

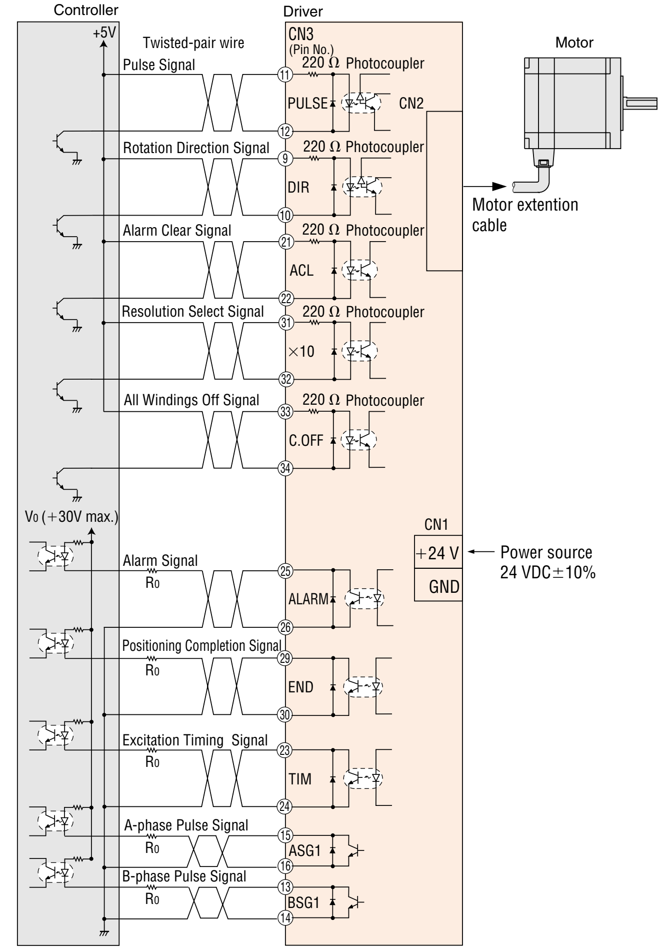
5 Input/Output Signals

Connector	Pin Number	Input/Output	Signal	Name of Signal
CN3	2	External power input	GND	Power Supply for signal control
	3		Vcc+24V	
	9	Input signal	CCW (DRE)	CCW Pulse (Rotation Direction)*
	10		$\overline{\text{CCW}}$ $\overline{\text{(DRE)}}$	
	11		CW (PLS)	CW Pulse (Pulse)*
	12		$\overline{\text{CW}}$ $\overline{\text{(PLS)}}$	
	13	Output signal	BSG1	B-Phase Pulse Output (Open Collector)
	14		GND	
	15		ASG1	A-Phase Pulse Output (Open Collector)
	16		GND	
	21	Input signal	ACL	Alarm Clear
	22		$\overline{\text{ACL}}$	
	23	Output signal	TIM1	Timing (Open Collector)
	24		$\overline{\text{TIM1}}$	
	25		ALARM	Alarm
	26		$\overline{\text{ALARM}}$	
	29		END	Positioning Completion
	30		$\overline{\text{END}}$	
	31	Input signal	×10	Resolution Select
	32		$\overline{\times 10}$	
	33		C.OFF	All Windings Off
	34		$\overline{\text{C.OFF}}$	

* Value in parentheses represents the setting in 1-pulse input mode. The setting at shipment is the 2-pulse input mode.

Features C-56 System Configuration C-58 Specifications/Characteristics C-59

Connection Diagrams

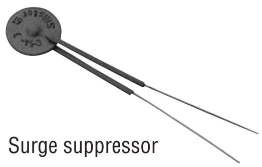


Notes:
- Vo and the current must be 30 VDC, 15 mA or less respectively. If the current exceeds 15 mA, connect an external resistance Ro.
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.
- Use a multi-core, twisted-pair shielded wire AWG 28 for the control input/output signal line (CN3), and keep wiring as short as possible [within 6.6 feet (2 m)].
- For the wiring between the motor and driver, use an extension cable or flexible cable (sold separately).
- The range of wire for the power connector (CN1) is AWG 18~24. Use wire AWG 20 or thicker for the power line.
- Keep the control input/output signal line at least 1 foot (300 mm) away from power lines (e.g. lines carrying large current , such as AC lines and motor lines). Also, do not run these lines through the same ducts or pipes as power lines.
- Cables for power supply lines and control input/output signal lines are not supplied.
- Always use the accessory connector to connect the power connector.
- To install the pins, be sure to use the specified crimping tool made by Molex 57026-5000 (for UL1007) or 57027-5000 (for UL1015).

◆Connecting the Electromagnetic Brake to Power Supply

Connect the electromagnetic brake to the power supply using a cable with a conductor cross-sectional area of at least AWG 24. The power supply input to the electromagnetic brake is 24 VDC ±5% 0.3 A min. (**ASC46**: 0.1 A min.) and therefore must be independent of the driver's power supply.

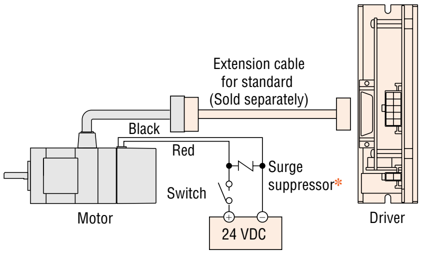
Notes:
- Applying a voltage that exceeds the specifications will cause the electromagnetic brake to generate a great deal of heat, resulting in motor temperature rises and possible damage to the motor. Conversely, if voltage is too low, the electromagnetic brake may not release.
- To protect the switch contacts and prevent noise, always connect the accessory surge suppressor.
- Correct polarity (+ and −) must be ensured when connecting the electromagnetic brake lead wire of **ASC** series to the DC power supply. If polarity is incorrect, the electromagnetic brake will not operate properly.
- When using as a CE certified part, use a DC power supply with reinforced insulation for the primary side as the power supply for the electromagnetic brake.
(✻ The surge suppressor is included with electromagnetic brake motors.)


Surge suppressor

Connection Method

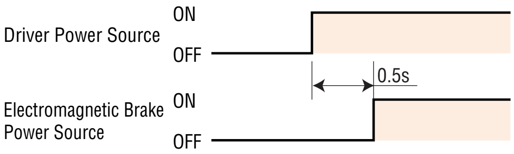
ASC46

The electromagnetic brake wire is linked to the connector on the motor [23.6 inch (600 mm)]. When connecting with the DC power supply, connect the red spiral lead wire to +24 V, and the black lead wire to the ground (GND). Use the extension cable or the movable cable (both sold separately) for standard.



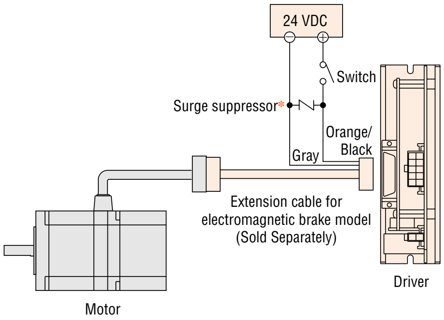
Timing Chart for Electromagnetic Brake Operation

To release the electromagnetic brake, wait at least 0.5 seconds after turning on the driver power source.
The load may fall down due to a loss of holding torque.



ASC66

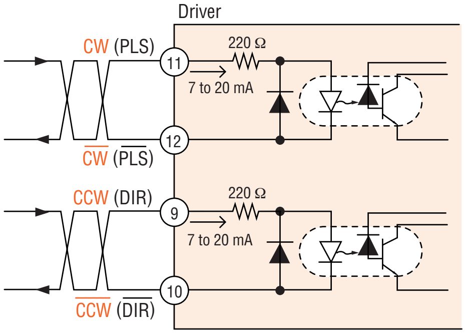
The electromagnetic brake wire is linked to the connector on the driver connection side of extension cable for electromagnetic brake models (sold separately). Be sure to use the accessory (sold separately) extension cable or movable cable. Connect the orange/black spiral lead wire [2.36 inch (60 mm)] to +24 V, and the gray lead wire [2.36 inch (60 mm)] to the ground (GND).



●Description of Input/Output Signals

Pulse Input (CW) and Rotation Direction (CCW) Input Signal

◆Input Circuit and Sample Connection



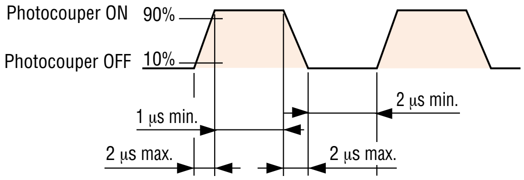
The letters indicate signals under the 2-pulse input mode, while the letters in parentheses indicate signals under the 1-pulse input mode.

Note:

- When Vo is equal to 5 VDC, the external resistance is not necessary. When Vo is above 5 VDC, connect the external resistance and keep the input current between 7 mA and 20 mA.

◆Pulse Waveform Characteristics

(Photocoupler state corresponding to the input pulse)



For pulse signals, use input pulse waveforms like those shown the figure above.

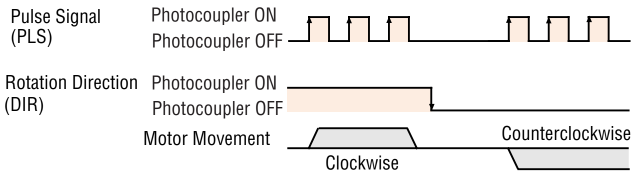
◆Pulse Input Mode

1-Pulse Input Mode

The 1-pulse input mode uses Pulse (PLS) and Rotation Direction (DIR) signals. CW is selected by inputting DIR signal at a low level (with the input photocoupler ON), CCW by inputting at high level (with input photocoupler OFF).

Rotation Direction signals
Photocoupler "ON": Clockwise,
Photocoupler "OFF": Counterclockwise

1 Pulse Input Mode



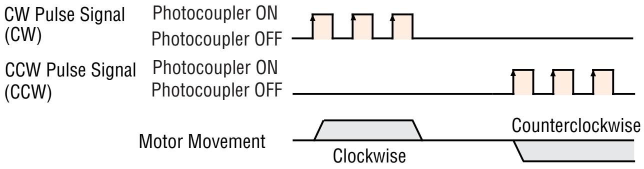
2-pulse input mode

The 2-pulse input mode is used for "CW" and "CCW" pulses. When "CW" pulses are input, the motor's output shaft rotates clockwise when the motor is viewed facing the shaft; when "CCW" pulses are input, the shaft rotates counterclockwise.

Note:

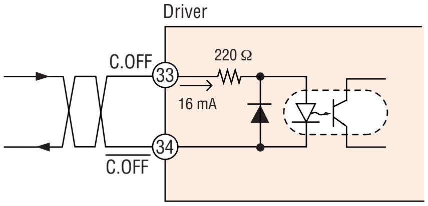
- The factory setting is 2-pulse input.

2 Pulse Input Mode

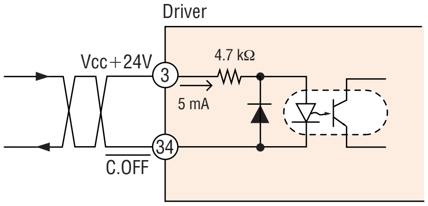


All Windings OFF (C.OFF) Input Signal

◆Input Circuit and Sample Connection



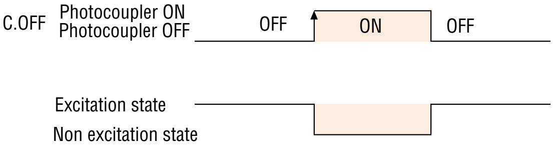
When using 5 VDC



When using 24 VDC

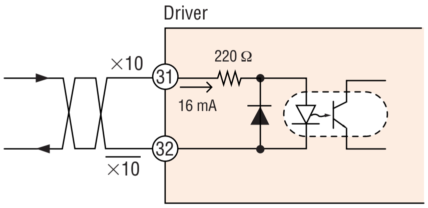
This controller power source offers a choice of either 5 VDC or 24 VDC.

Inputting the All Windings Off (C.OFF) signal puts the motor in a non-excitation (free) state. It is functioning when the photocoupler is ON. It is used when turning the motor shaft externally or when positioning manually. This signal clears the deviation counter.

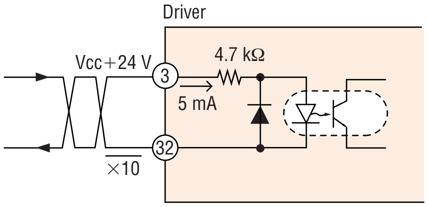


Resolution Select (×10) Input Signal

◆Input Circuit and Sample Connection



When using 5 VDC



When using 24 VDC

This controller power source offers a choice of either 5 VDC or 24 VDC.
During input of this signal, the magnification of the resolution is ×10. It is only valid when the resolution select switch is set to ×1.

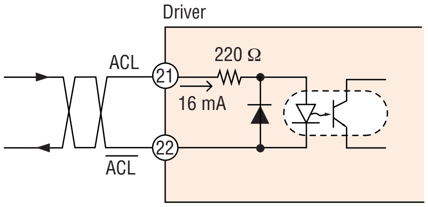
Note:

- When the resolution select switch is set to ×10, the Resolution Select Input is ignored. In this case, the Resolution Select Input is always equal to ON.

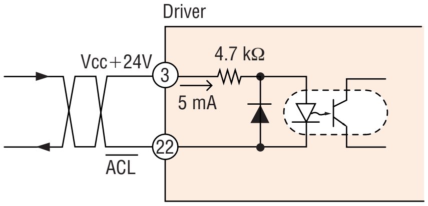
Features C-56 System Configuration C-58 Specifications/Characteristics C-59

Alarm Clear (ACL) Input Signal

◆Input Circuit and Sample Connection



When using 5 VDC



When using 24 VDC

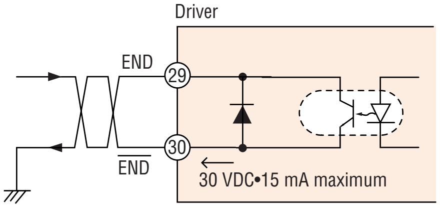
This controller power source offers a choice of either 5 VDC or 24 VDC. This signal is used for canceling the alarm without turning off power to the driver when a protection circuit has been activated.

Note:

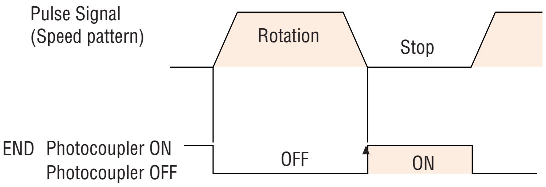
- The following alarm cannot be cleared. To cancel the alarm, first resolve the cause and check for safety, and then turn power on again.
  ●Over Current ●EEPROM Data Error ●System Error

Position Completion (END) Output Signal

◆Output Circuit and Sample Connection



Circuits for use with 30 VDC, 15 mA maximum.
This signal is output at the photocoupler ON state when positioning is completed. This signal is output when the rotor position is less than ±1.8° from the command position, approximately 2 ms after the pulse input stops.

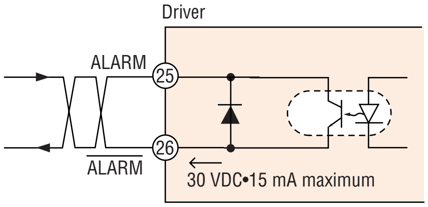


Note:

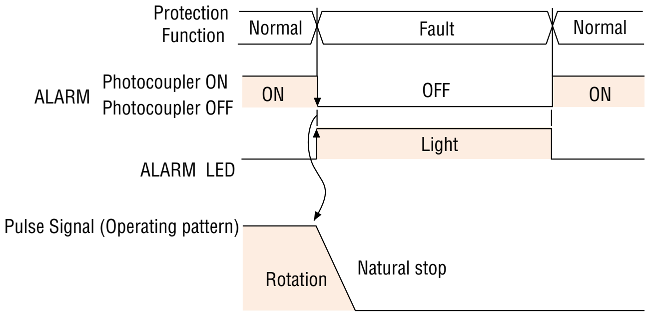
- The END signal flashes during operation with a pulse input frequency of 500 Hz or less.

Alarm (ALARM) Output Signal

◆Output Circuit and Sample Connection



Circuits for use with 30 VDC, 15 mA maximum.
This signal indicates that one of the driver's protection circuits has been activated. When an abnormality such as an overload or over current is detected, the alarm signal is output, the ALARM indicator lights, and the motor stops (non-excitation state). To cancel the alarm, first resolve the cause and check for safety, and then input an Alarm Clear (ACL) signal or cycle power on. Once power has been turned off, wait at least 3 seconds before turning it on again.

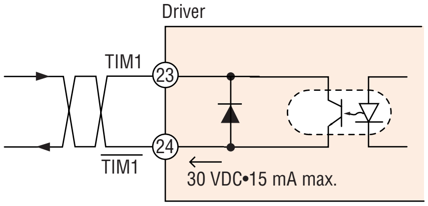


Note:

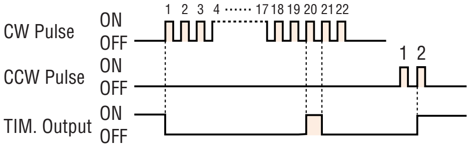
- The alarm output uses positive logic (Normally Closed), all other outputs use negative logic (Normally Open).

Excitation Timing Signal (TIM.) Output Signal

◆Output Circuit and Sample Connection



Circuits for use with 30 VDC, 15 mA maximum.
When the Excitation Timing signal is output, the photocoupler turns ON. This signal can be used to detect the home position with greater precision. This signal is output 50 times per motor shaft revolution.



Resolution: 1000 pulses

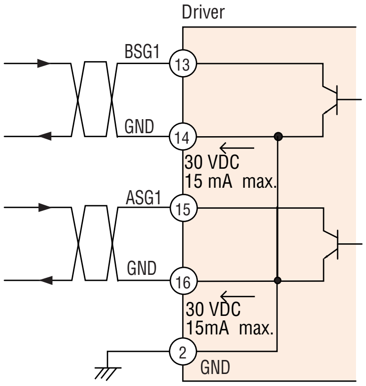
Note:

- A precise timing signal cannot be obtained when the speed of the pulse input frequency is over 500 Hz.

Stepping Motors
Introduction
Motor & Driver Packages
Closed Loop αSTEP AC Input AS AS PLUS DC Input ASC
5-Phase Microstep AC Input RK DC Input CFK II
5-Phase Full/Half DC Input CSK PMC
2-Phase Full/Half AC Input UMK DC Input CSK
2-Phase Stepping Motors without Encoder PK/PV with Encoder PK
Driver with Indexer UI2120G
Controllers EMP401 EMP402 SC8800 SC8800E SG8030J
Low-Speed Synchronous Motors SMK
Accessories
Before Using a Stepping Motor

Quadrature (ASG1/BSG1) Output Signal

◆Output Circuit and Sample Connection

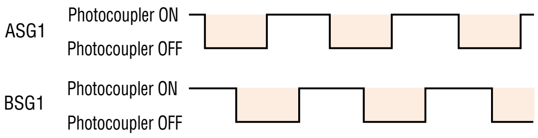


Circuits for use with 30 VDC, 15 mA maximum.
These signals are used when monitoring the motor position.
The pulse resolution is the same as the motor resolution at the time of power-on.
[Example: Resolution select switch (1000 P/R)→Output pulse number for each motor revolution (1000).] The phase difference between A and B is 90˚ electrical.

Notes:

- The pulse output accuracy is, regardless of resolution, within ±0.36˚ (repetition accuracy: within 0.09˚)
- These signals are only for position verification when the motor has stopped. There is a 1 ms (max.) time lag between real rotor motion and the output signals.

◆Pulse Waveform Characteristics



(Clockwise rotation of motor)

List of Motor and Driver Combinations

Type	Package Model	Motor Model	Driver Model
Standard	**ASC34AK**	ASM34AK	ASD10A-K
	ASC36AK	ASM36AK	ASD10B-K
	ASC46□K	ASM46□K	ASD18A-K
	ASC66□K	ASM66□K	ASD36A-K
TH Geared	**ASC46□K-T3.6**	ASM46□K-T3.6	ASD18B-K
	ASC46□K-T7.2	ASM46□K-T7.2	
	ASC46□K-T10	ASM46□K-T10	
	ASC46□K-T20	ASM46□K-T20	
	ASC46□K-T30	ASM46□K-T30	
	ASC66□K-T3.6	ASM66□K-T3.6	ASD36B-K
	ASC66□K-T7.2	ASM66□K-T7.2	
	ASC66□K-T10	ASM66□K-T10	
	ASC66□K-T20	ASM66□K-T20	
	ASC66□K-T30	ASM66□K-T30	
PN Geared	**ASC46□K-N7.2**	ASM46□K-N7.2	ASD18A-K
	ASC46□K-N10	ASM46□K-N10	
	ASC66□K-N5	ASM66□K-N5	ASD36A-K
	ASC66□K-N7.2	ASM66□K-N7.2	
	ASC66□K-N10	ASM66□K-N10	
	ASC66□K-N25	ASM66□K-N25	ASD36B-K
	ASC66□K-N36	ASM66□K-N36	
	ASC66□K-N50	ASM66□K-N50	
HG Geared	**ASC34AK-H50**	ASM34AK-H50	ASD10C-K
	ASC34AK-H100	ASM34AK-H100	
	ASC46□K-H50	ASM46□K-H50	ASD18A-K
	ASC46□K-H100	ASM46□K-H100	
	ASC66□K-H50	ASM66□K-H50	ASD36B-K
	ASC66□K-H100	ASM66□K-H100	

- Enter **A** (standard) or **M** (electromagnetic) in the box (□) within the model numbers.

5-Phase Stepping Motor and Driver Package

NanoStep® RK Series

Additional Information

5-Phase Stepping Motor and Driver Package

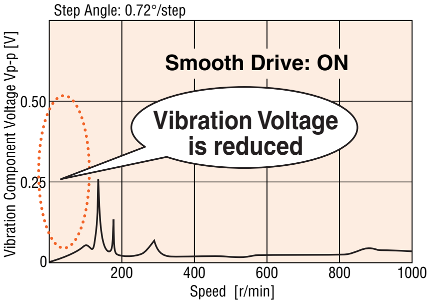
RK Series

The **RK** series offers both the high resolution and smooth motion of a 5-phase microstepping system with the simplicity of a full step system. The **RK** Series “Smooth Drive” function achieves low vibration without the need for a higher cost pulse generator usually required for microstepping systems.

Features

1 Smooth Drive Function

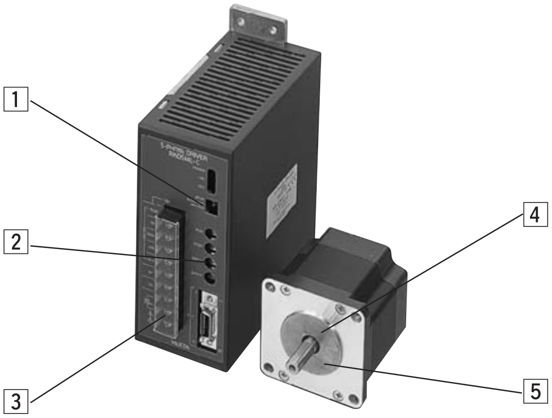
Want to reduce vibration and noise during low-speed operation in microstepping mode without changing the full-step resolution? Or, are you looking for ways to use microstepping while keeping the pulse frequency low to accommodate the oscillator requirement? If so, the **RK** Series is the answer to your needs. The new and innovative Smooth Drive function ensures low-vibration and low-noise operation at low speeds by internally executing microstepping within the driver, working independently of the input pulse frequency of your controller.



2 Lower Vibration

● Microstepping System

The motor's basic step angle is divided by a maximum of 1/250 without the use of a reduction mechanism or other mechanical elements. This enables fine positioning and the further reduction of vibration and noise. A motion sequence of “low-speed transfer → high-speed return” can easily be performed without the need for changing from a microstep pulse frequency to a full step pulse frequency. The **RK** Series can also be used in full-step operation.

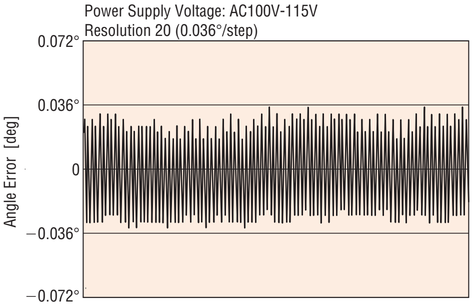


3 100-115 V, 200-230 V Power Source Variation

The **RK** Series can be used with most common power supplies available around the world.

4 Improved Angle Accuracy

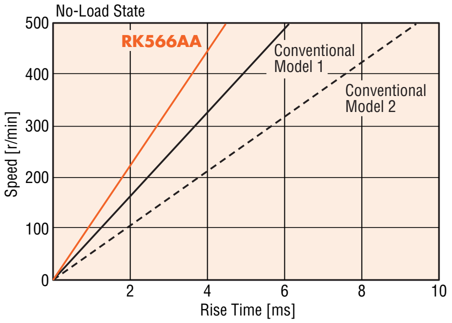
Angle accuracy may decrease during use of microstep drivers, due to the effect of current control. However, the drivers used in the **RK** Series are designed to ensure that the motor operates at maximum accuracy.



Features C-78 | System Configuration C-80 | Specifications/Characteristics C-81

5 Improved Response

The **RK** Series, with its high starting frequency, shortens the machine cycle without affecting acceleration/deceleration rates. This produces a significant savings in time for an operation in which the same cycle is repeated thousands of times each day.



● Wide Variations

The **RK** Series is comprised of motors in various sizes and with varying functions, such as high-accuracy, and non-backlash geared types.

Safe Operation in Major Countries around the World

● Compliance with Safety Standards

The **RK** Series complies with the UL/CSA and EN standards. The CE marking certifies compliance with the EMC Directive and Low-Voltage Directive. Additionally, the **RK** Series conforms to the EMC Directive only through its use of surge protector. The **RK** Series doesn't require an external ferrite core or filter in the motor line or power line.

✻ Except for **RK54☐** [Motor frame size 1.65 inch (42 mm)]

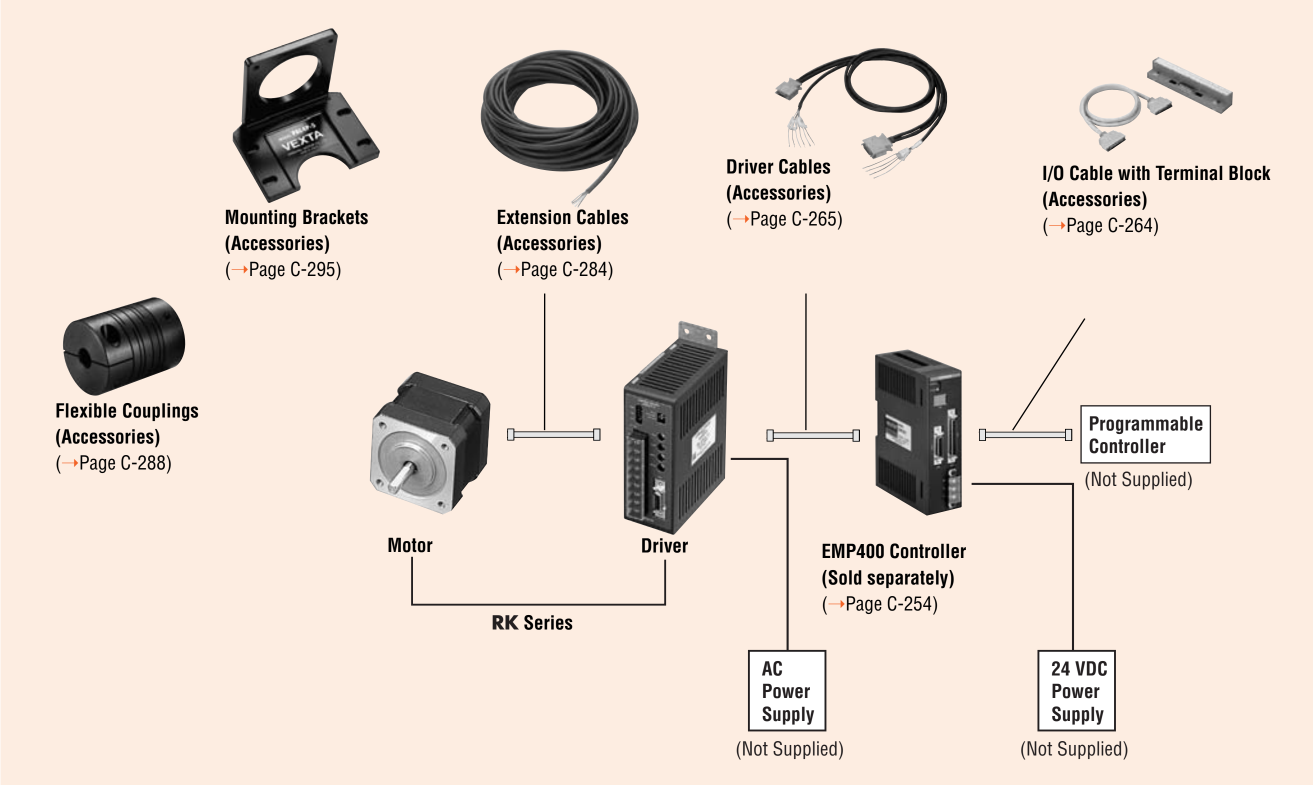
Standards/CE Marking

Products	Standards	Certification Body	File No.	CE Marking
Stepping Motor	UL1004, UL519 CSA C22.2 No.100[✻3] CSA C22.2 No.77[✻3]	UL	E64199	Low Voltage Directives EMC Directives
	EN60950 EN60034-1 EN60034-5	VDE [✻2]	114293ÜG	
Driver	UL508C [✻1] CSA C22.2 No.14	UL [✻3]	E171462	
	EN50178	—	—	

✻1 Test Condition is Maximum Ambient Temperature 122°F (50°C) according to UL Standards. (UL508C)
✻2 Except for harmonic geared type **RK543-H☐**, **RK564-H☐**, and **PN** geared type **RK544-N☐**.
✻3 Except for **RK54☐** type.

- When the system is approved under various safety standards, the model names in the motor and driver nameplates are the approved model names.
  List of Motor and Driver Combinations → Page C-104
- **Details of Safety Standards** → Page G-2
- The EMC value changes according to the wiring and layout. Therefore, the final EMC level must be checked with the motor/driver incorporated in the user's equipment.

System Configuration



An example of a single-axis system configuration with the **EMP400** Series controller.

Product Number Code

RK 5 6 6 B A - N 5

Gear Ratio

Blank: Standard Type **N**: **PN** Geared Type
T: **TH** Geared Type **H**: **HG** Geared Type

Power Input **A**: Single-Phase 100~115 VAC Input
B: Single-Phase 200~230 VAC Input

Motor Shaft Type
A: Single Shaft **B**: Double Shaft

Motor Case Length

Motor Frame Size **4**: 1.65 in.sq. (42 mm sq.)
6: 2.36 in.sq. (60 mm sq.)
9: 3.35 in.sq. (85 mm sq.) [3.54 in. sq. (90 mm sq.) for Geared Type]

5-Phase

RK Series

Product Line

Type	Power Supply Voltage	Maximum Holding Torque		
		□1.65 in. (□42 mm)	□2.36 in. (□60 mm)	□3.35 in. (□85 mm) □3.54 in. (□90 mm) for geared type
Standard	Single-Phase 100-115 VAC	18.4~34 oz-in (0.13~0.24 N·m)	59~230 oz-in (0.42~1.66 N·m)	290~890 oz-in (2.1~6.3 N·m)
	Single-Phase 200-230 VAC	—	59~230 oz-in (0.42~1.66 N·m)	290~890 oz-in (2.1~6.3 N·m)
TH Geared	Single-Phase 100-115 VAC	3~13.2 lb-in (0.35~1.5 N·m)	11~35 lb-in (1.25~4 N·m)	39~106 lb-in (4.5~12 N·m)
	Single-Phase 200-230 VAC	—	11~35 lb-in (1.25~4 N·m)	39~106 lb-in (4.5~12 N·m)
PN Geared	Single-Phase 100-115 VAC	7~13.2 lb-in (0.8~1.5 N·m)	30~70 lb-in (3.5~8 N·m)	123~320 lb-in (14~37 N·m)
	Single-Phase 200-230 VAC	—	30~70 lb-in (3.5~8 N·m)	123~320 lb-in (14~37 N·m)
HG Geared	Single-Phase 100-115 VAC	30~44 lb-in (3.5~5 N·m)	48~70 lb-in (5.5~8 N·m)	220~320 lb-in (25~37 N·m)
	Single-Phase 200-230 VAC	—	48~70 lb-in (5.5~8 N·m)	220~320 lb-in (25~37 N·m)

Features C-78 System Configuration C-80 Specifications/Characteristics C-81

Standard Type Motor Frame Size: □ 1.65 in. (□ 42 mm)

Specifications How to Read Specifications Table→Page C-9

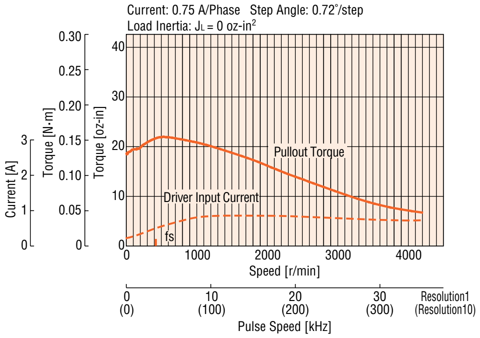
CE

Model	Single-Phase 100-115 VAC	Single Shaft	RK543AA	RK544AA	RK545AA
		Double Shaft	RK543BA	RK544BA	RK545BA
Maximum Holding Torque		oz-in (N·m)	18.4 (0.13)	25 (0.18)	34 (0.24)
Rotor Inertia J		oz-in^2 (kg·m^2)	0.191 (35×10^{-7})	0.3 (54×10^{-7})	0.37 (68×10^{-7})
Rated Current		A/Phase	0.75		
Basic Step Angle			0.72°		
Power Source Input			Single-Phase 100-115 VAC ±15% 50/60 Hz 1 A		
Excitation Mode			Microstep: Basic Angle/n * (/Step)		
Weight	Motor	lb. (kg)	0.55 (0.25)	0.66 (0.3)	0.88 (0.4)
	Driver	lb. (kg)	0.88 (0.4)		
Dimension No.	Motor		$\boxed{1}$		
	Driver		$\boxed{13}$		

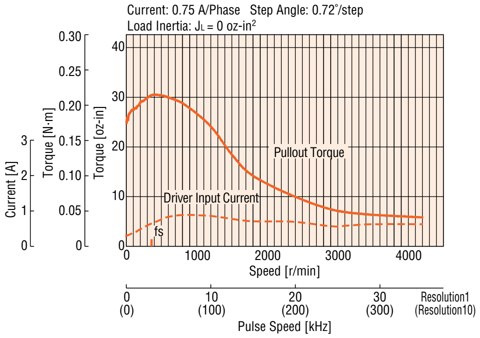
* Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Speed — Torque Characteristics How to Read Speed-Torque Characteristics→Page C-10

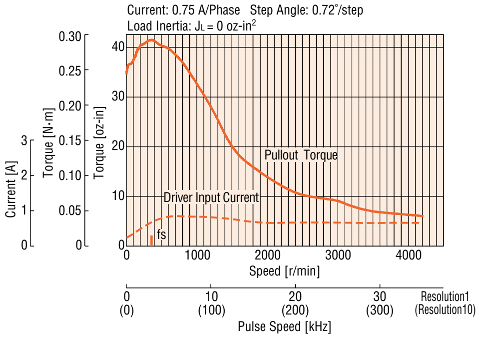
RK543□A



RK544□A



RK545□A



Note: The pulse input circuit responds to approximately 200 kHz with a pulse duty of 50%.

Standard Type Motor Frame Size: □ 2.36 in. (□ 60 mm), □ 3.35 in. (□ 85 mm)

Specifications How to Read Specifications Table→Page C-9

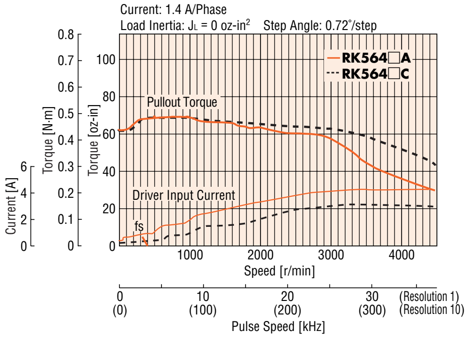
c**RU**us CE

				RK564AA	RK566AA	RK569AA	RK596AA	RK599AA	RK5913AA
Model	Single-Phase 100-115 VAC	Single Shaft		RK564AA	RK566AA	RK569AA	RK596AA	RK599AA	RK5913AA
		Double Shaft		RK564BA	RK566BA	RK569BA	RK596BA	RK599BA	RK5913BA
	Single-Phase 200-230 VAC	Single Shaft		RK564AC	RK566AC	RK569AC	RK596AC	RK599AC	RK5913AC
		Double Shaft		RK564BC	RK566BC	RK569BC	RK596BC	RK599BC	RK5913BC
Maximum Holding Torque			oz-in (N·m)	59 (0.42)	117 (0.83)	230 (1.66)	290 (2.1)	580 (4.1)	890 (6.3)
Rotor Inertia J			oz-in^2 (kg·m^2)	$0.96\ (175\times10^{-7})$	$1.53\ (280\times10^{-7})$	$3.1\ (560\times10^{-7})$	$7.7\ (1400\times10^{-7})$	$14.8\ (2700\times10^{-7})$	$22\ (4000\times10^{-7})$
Rated Current			A/Phase	1.4					
Basic Step Angle				0.72°					
Power Source Input				Single-Phase 100-115 VAC ±15% 50/60 Hz 4.5 A Single-Phase 200-230 VAC $^{+10\%}_{-15\%}$ 50/60 Hz 3.5 A					
Excitation Mode				Microstep: Basic Angle/n * (/Step)					
Weight	Motor		lb. (kg)	1.3 (0.6)	1.8 (0.8)	2.9 (1.3)	3.7 (1.7)	6.2 (2.8)	8.4 (3.8)
	Driver		lb. (kg)	1.9 (0.85)					
Dimension No.	Motor			$\boxed{2}$			$\boxed{3}$		
	Driver			$\boxed{14}$					

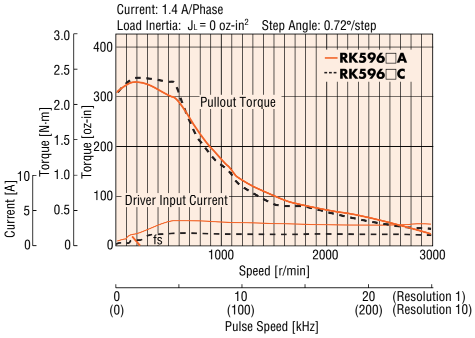
* Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Speed — Torque Characteristics How to Read Speed-Torque Characteristics→Page C-10

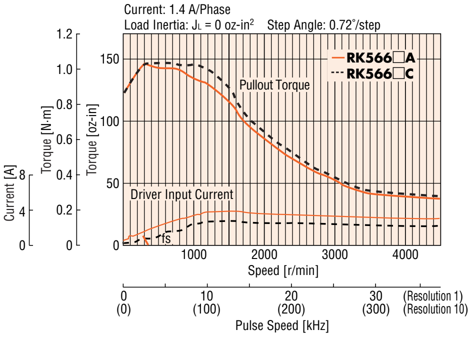
RK564□A RK564□C



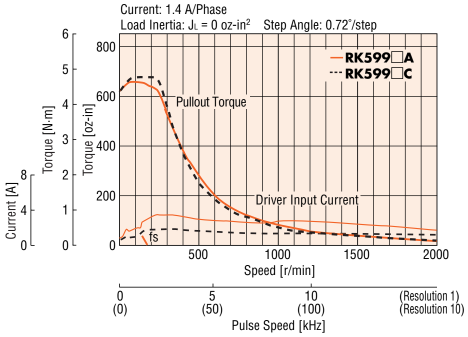
RK596□A RK596□C



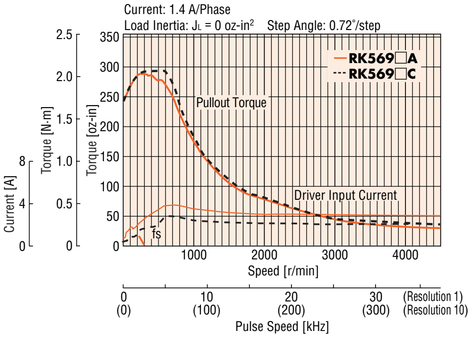
RK566□A RK566□C



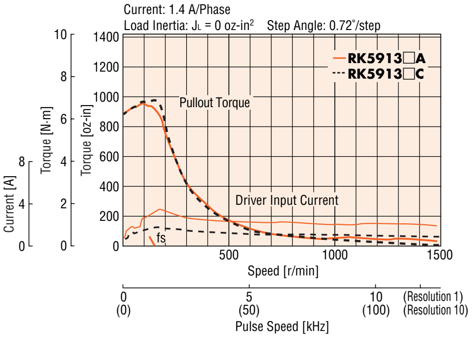
RK599□A RK599□C



RK569□A RK569□C



RK5913□A RK5913□C



Note: The pulse input circuit responds to approximately 200 kHz with a pulse duty of 50%.

TH Geared Type Motor Frame Size: □ 1.65 in. (□ 42 mm)

Specifications How to Read Specifications Table→Page C-9

CE

Model	Single-Phase 100-115 VAC	Single Shaft	RK543AA-T3.6	RK543AA-T7.2	RK543AA-T10	RK543AA-T20	RK543AA-T30
		Double Shaft	RK543BA-T3.6	RK543BA-T7.2	RK543BA-T10	RK543BA-T20	RK543BA-T30
Maximum Holding Torque		lb-in (N·m)	3 (0.35)	6.1 (0.7)	8.8 (1.0)	13.2 (1.5)	
Rotor Inertia J		oz-in^2 (kg·m^2)	0.191 (35×10^{-7})				
Rated Current		A/Phase	0.75				
Basic Step Angle			0.2°	0.1°	0.072°	0.036°	0.024°
Gear Ratio			3.6:1	7.2:1	10:1	20:1	30:1
Permissible Torque		lb-in. (N·m)	3 (0.35)	6.1 (0.7)	8.8 (1.0)	13.2 (1.5)	
Backlash		arc minute (degrees)	45 (0.75°)	25 (0.417°)		15 (0.25°)	
Permissible Speed Range		r/min	0~500	0~250	0~180	0~90	0~60
Power Source Input			Single-Phase 100-115 VAC ±15% 50/60 Hz 1 A				
Excitation Mode			Microstep: Basic Angle/n * (/Step)				
Weight	Motor	lb. (kg)	0.77 (0.35)				
	Driver	lb. (kg)	0.88 (0.4)				
Dimension No.	Motor		4				
	Driver		13				

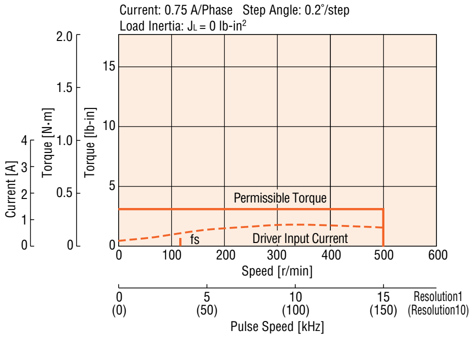
* Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Note:

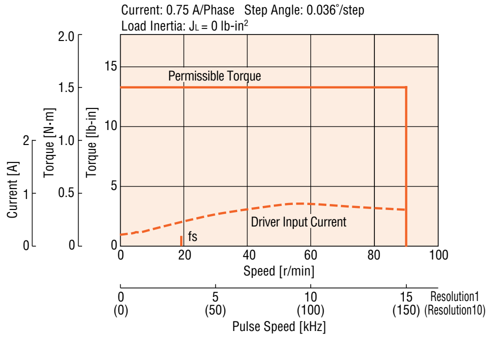
- Direction of rotation of the motor and that of the gear output shaft are the same for models with gear ratios of 3.6:1, 7.2:1 and 10:1.
  It is opposite for 20:1 and 30:1 gear ratio models.

Speed — Torque Characteristics How to Read Speed-Torque Characteristics→Page C-10

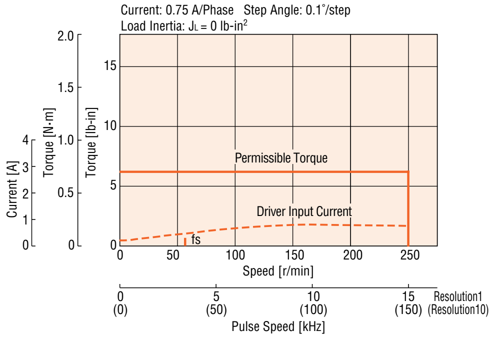
RK543□A-T3.6



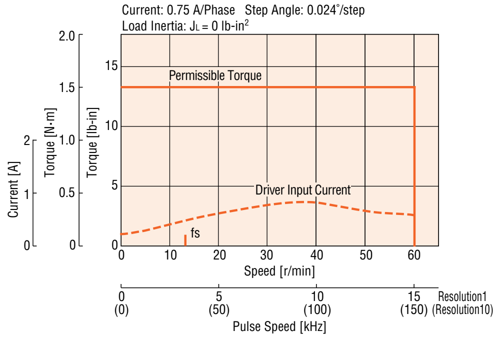
RK543□A-T20



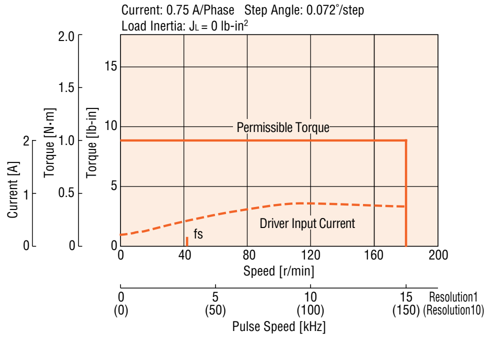
RK543□A-T7.2



RK543□A-T30



RK543□A-T10



Note: The pulse input circuit responds to approximately 200 kHz with a pulse duty of 50%.

Common Specifications C-90 | Dimensions C-92 | Connection and Operation C-98 | Motor and Driver Combinations C-104

TH Geared Type Motor Frame Size: ☐ 2.36 in. (☐ 60 mm)

Specifications How to Read Specifications Table→Page C-9

Model	Single-Phase 100-115 VAC	Single Shaft	RK564AA-T3.6	RK564AA-T7.2	RK564AA-T10	RK564AA-T20	RK564AA-T30
		Double Shaft	RK564BA-T3.6	RK564BA-T7.2	RK564BA-T10	RK564BA-T20	RK564BA-T30
	Single-Phase 200-230 VAC	Single Shaft	RK564AC-T3.6	RK564AC-T7.2	RK564AC-T10	RK564AC-T20	RK564AC-T30
		Double Shaft	RK564BC-T3.6	RK564BC-T7.2	RK564BC-T10	RK564BC-T20	RK564BC-T30
Maximum Holding Torque		lb-in (N·m)	11 (1.25)	22 (2.5)	26 (3)	30 (3.5)	35 (4)
Rotor Inertia J		oz-in^2 (kg·m^2)	0.96 (175×10^{-7})				
Rated Current		A/Phase	1.4				
Basic Step Angle			0.2°	0.1°	0.072°	0.036°	0.024°
Gear Ratio			3.6:1	7.2:1	10:1	20:1	30:1
Permissible Torque		lb-in. (N·m)	11 (1.25)	22 (2.5)	26 (3)	30 (3.5)	35 (4)
Backlash		arc minute (degrees)	35 (0.584°)	15 (0.25°)		10 (0.167°)	
Permissible Speed Range		r/min	0~500	0~250	0~180	0~90	0~60
Power Source Input			Single-Phase 100-115 VAC ±15% 50/60 Hz 4.5 A Single-Phase 200-230 VAC $^{+10\%}_{-15\%}$ 50/60 Hz 3.5 A				
Excitation Mode			Microstep: Basic Angle/n * (/Step)				
Weight	Motor	lb. (kg)	2.1 (0.95)				
	Driver	lb. (kg)	1.9 (0.85)				
Dimension No.	Motor		$\boxed{5}$				
	Driver		$\boxed{14}$				

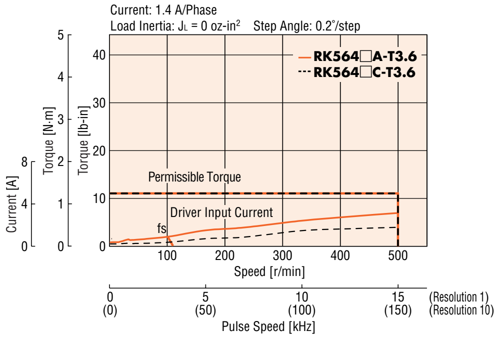
* Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Note:

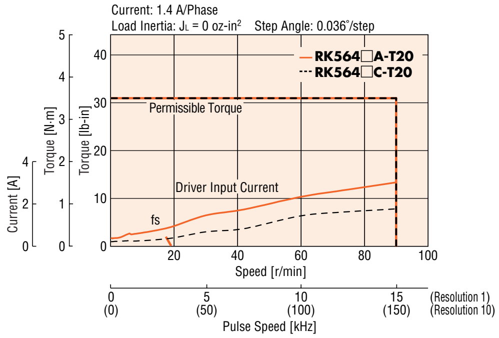
- Direction of rotation of the motor and that of the gear output shaft are the same for models with gear ratios of 3.6:1, 7.2:1 and 10:1. It is opposite for 20:1 and 30:1 gear ratio models.

Speed — Torque Characteristics How to Read Speed-Torque Characteristics→Page C-10

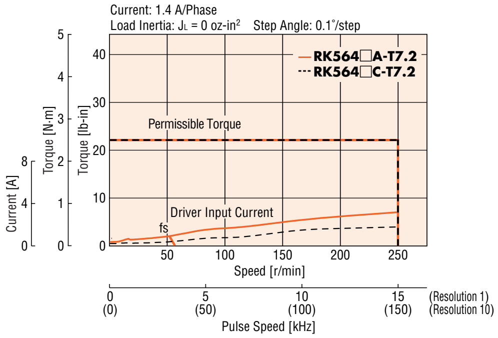
RK564☐A-T3.6 RK564☐C-T3.6



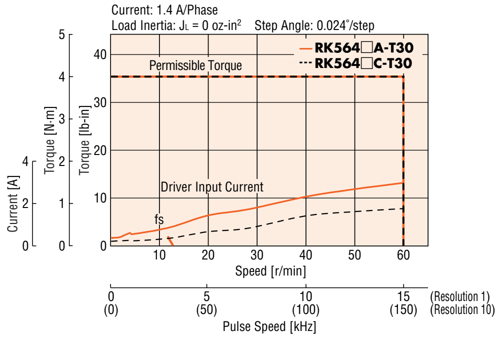
RK564☐A-T20 RK564☐C-T20



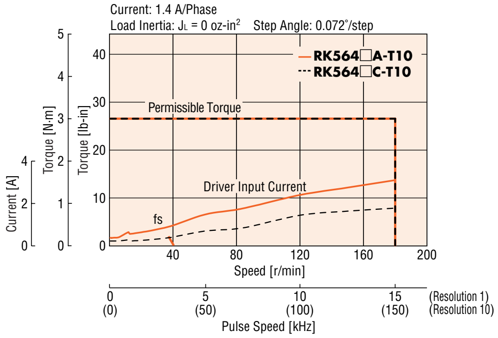
RK564☐A-T7.2 RK564☐C-T7.2



RK564☐A-T30 RK564☐C-T30



RK564☐A-T10 RK564☐C-T10



Note: The pulse input circuit responds to approximately 200 kHz with a pulse duty of 50%.

TH Geared Type Motor Frame Size: □ 3.54 in. (□ 90 mm)

Specifications How to Read Specifications Table→Page C-9

Model							
Model	Single-Phase 100-115 VAC	Single Shaft	**RK596AA-T3.6**	**RK596AA-T7.2**	**RK596AA-T10**	**RK596AA-T20**	**RK596AA-T30**
		Double Shaft	**RK596BA-T3.6**	**RK596BA-T7.2**	**RK596BA-T10**	**RK596BA-T20**	**RK596BA-T30**
	Single-Phase 200-230 VAC	Single Shaft	**RK596AC-T3.6**	**RK596AC-T7.2**	**RK596AC-T10**	**RK596AC-T20**	**RK596AC-T30**
		Double Shaft	**RK596BC-T3.6**	**RK596BC-T7.2**	**RK596BC-T10**	**RK596BC-T20**	**RK596BC-T30**
Maximum Holding Torque		lb-in (N·m)	39 (4.5)	79 (9)		106 (12)	
Rotor Inertia J		oz-in^2 (kg·m^2)	7.7 (1400×10^{-7})				
Rated Current		A/Phase	1.4				
Basic Step Angle			0.2°	0.1°	0.072°	0.036°	0.024°
Gear Ratio			3.6:1	7.2:1	10:1	20:1	30:1
Permissible Torque		lb-in. (N·m)	39 (4.5)	79 (9)		106 (12)	
Backlash		arc minute (degrees)	25 (0.417°)	15 (0.25°)		10 (0.167°)	
Permissible Speed Range		r/min	0∼500	0∼250	0∼180	0∼90	0∼60
Power Source Input			Single-Phase 100-115 VAC ±15% 50/60 Hz 4.5 A Single-Phase 200-230 VAC $^{+10\%}_{-15\%}$ 50/60 Hz 3.5 A				
Excitation Mode			Microstep: Basic Angle/n * (/Step)				
Weight	Motor	lb. (kg)	6.3 (2.85)				
	Driver	lb. (kg)	1.9 (0.85)				
Dimension No.	Motor		6				
	Driver		14				

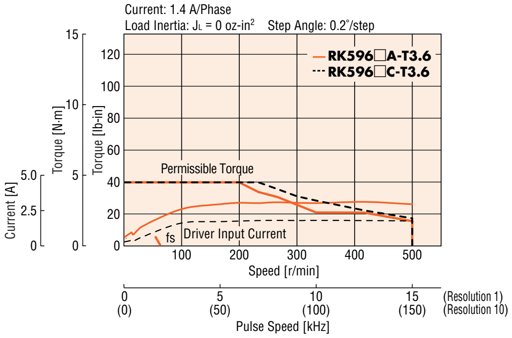
* Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Note:

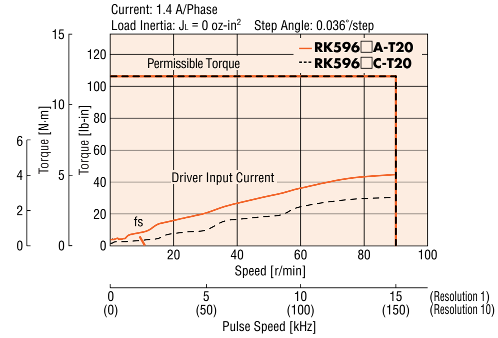
- Direction of rotation of the motor and that of the gear output shaft are the same for models with gear ratios of 3.6:1, 7.2:1 and 10:1. It is opposite for 20:1 and 30:1 gear ratio models.

Speed — Torque Characteristics How to Read Speed-Torque Characteristics→Page C-10

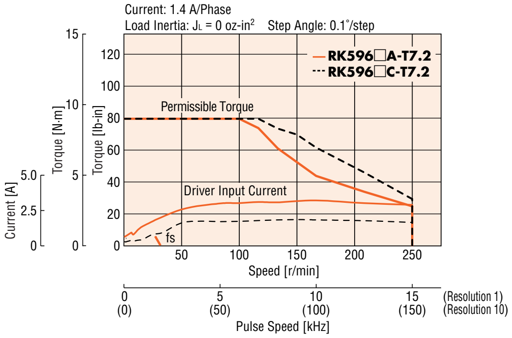
RK596□A-T3.6 RK596□C-T3.6



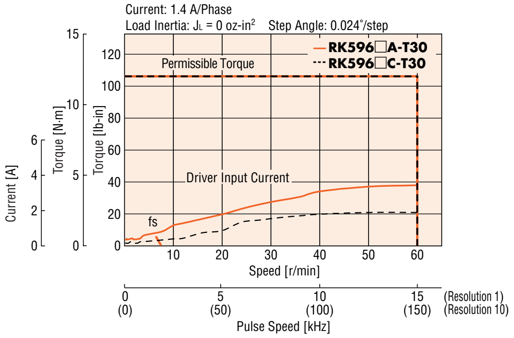
RK596□A-T20 RK596□C-T20



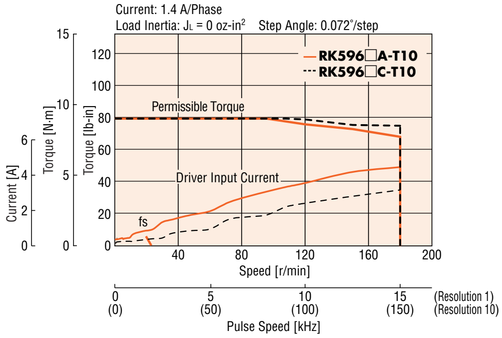
RK596□A-T7.2 RK596□C-T7.2



RK596□A-T30 RK596□C-T30



RK596□A-T10 RK596□C-T10



Note: The pulse input circuit responds to approximately 200 kHz with a pulse duty of 50%.

PN Geared Type Motor Frame Size: □ 1.65 in. (□ 42 mm)

Specifications How to Read Specifications Table→Page C-9

CE

Model	Single-Phase 100-115 VAC	Single Shaft	RK544AA-N5	RK544AA-N7.2	RK544AA-N10
		Double Shaft	RK544BA-N5	RK544BA-N7.2	RK544BA-N10
Maximum Holding Torque		lb-in (N·m)	7 (0.8)	10.6 (1.2)	13.2 (1.5)
Rotor Inertia J		oz-in^2 (kg·m^2)	0.30 (54×10^{-7})		
Rated Current		A/Phase	0.75		
Basic Step Angle			0.144°	0.1°	0.072°
Gear Ratio			5:1	7.2:1	10:1
Permissible Torque		lb-in. (N·m)	7 (0.8)	10.6 (1.2)	13.2 (1.5)
Maximum Torque		lb-in. (N·m)	13.2 (1.5)	17.7 (2)	17.7 (2)
Backlash		arc minute (degrees)	2 (0.034°)		
Angle Error		arc minute (degrees)	6 (0.1°)		
Permissible Speed Range		r/min	0~600	0~416	0~300
Power Source Input			Single-Phase 100-115 VAC ±15% 50/60 Hz 1 A		
Excitation Mode			Microstep: Basic Angle/n ✻ (/Step)		
Weight	Motor	lb. (kg)	1.2 (0.56)		
	Driver	lb. (kg)	0.88 (0.4)		
Dimension No.	Motor		$\boxed{7}$		
	Driver		$\boxed{13}$		

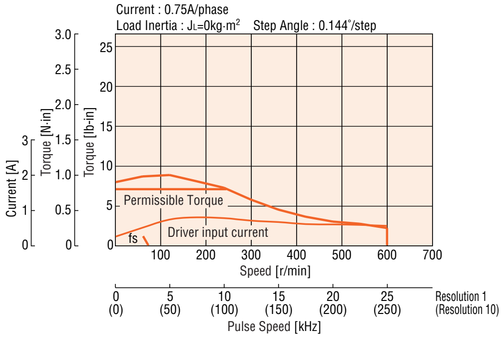
✻ Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Notes:

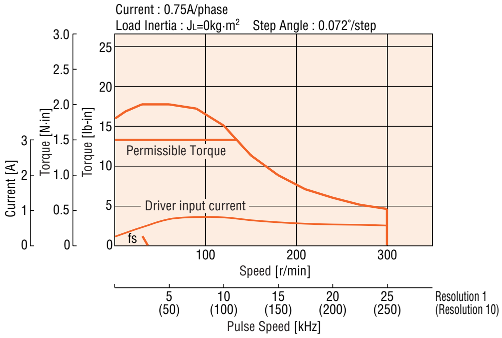
- Direction of rotation of the motor and that of the gear output shaft are the same.
- The value of Maximum Torque is for the gear. Refer to the Speed-Torque Characteristics for the output torque of the geared motors.

Speed — Torque Characteristics How to Read Speed-Torque Characteristics→Page C-10

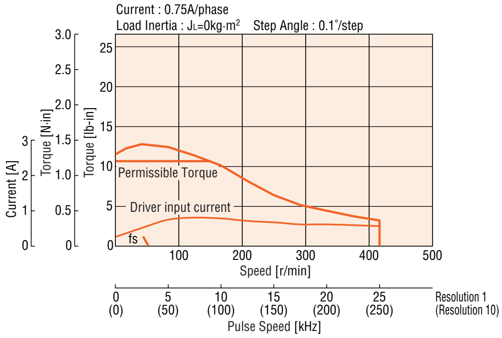
RK544□A-N5



RK544□A-N10



RK544□A-N7.2



Note: The pulse input circuit responds to approximately 200 kHz with a pulse duty of 50%.

PN Geared Type Motor Frame Size: □ 2.36 in. (□ 60 mm)

Specifications How to Read Specifications Table→Page C-9

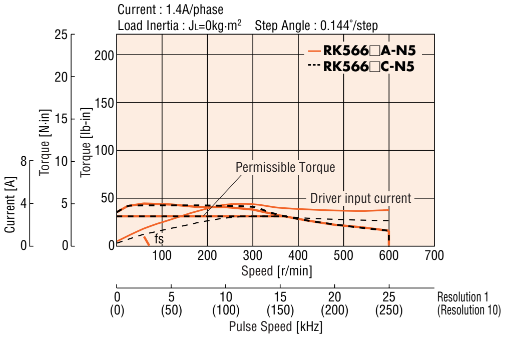
Model	Single-Phase 100-115 VAC	Single Shaft	**RK566AA-N5**	**RK566AA-N7.2**	**RK566AA-N10**	**RK564AA-N25**	**RK564AA-N36**	**RK564AA-N50**
		Double Shaft	**RK566BA-N5**	**RK566BA-N7.2**	**RK566BA-N10**	**RK564BA-N25**	**RK564BA-N36**	**RK564BA-N50**
	Single-Phase 200-230 VAC	Single Shaft	**RK566AC-N5**	**RK566AC-N7.2**	**RK566AC-N10**	**RK564AC-N25**	**RK564AC-N36**	**RK564AC-N50**
		Double Shaft	**RK566BC-N5**	**RK566BC-N7.2**	**RK566BC-N10**	**RK564BC-N25**	**RK564BC-N36**	**RK564BC-N50**
Maximum Holding Torque		lb-in (N·m)	30 (3.5)	35 (4)	44 (5)	70 (8)		
Rotor Inertia J		oz-in^2 (kg·m^2)	1.53 (280×10^{-7})			0.96 (175×10^{-7})		
Rated Current		A/Phase	1.4					
Basic Step Angle			0.144°	0.1°	0.072°	0.0288°	0.02°	0.0144°
Gear Ratio			5:1	7.2:1	10:1	25:1	36:1	50:1
Permissible Torque		lb-in. (N·m)	30 (3.5)	35 (4)	44 (5)	70 (8)		
Maximum Torque		lb-in. (N·m)	61 (7)	79 (9)	97 (11)	141 (16)	177 (20)	177 (20)
Backlash		arc minute (degrees)	2 (0.034°)			3 (0.05°)		
Angle Error		arc minute (degrees)	5 (0.084°)					
Permissible Speed Range		r/min	0~600	0~416	0~300	0~120	0~83	0~60
Power Source Input			Single-Phase 100-115 VAC ±15% 50/60 Hz 4.5 A			Single-Phase 200-230 VAC $^{+10\%}_{-15\%}$ 50/60 Hz 3.5 A		
Excitation Mode			Microstep: Basic Angle/n * (/Step)					
Weight	Motor	lb. (kg)	3.3 (1.5)					
	Driver	lb. (kg)	1.9 (0.85)					
Dimension No.	Motor		8					
	Driver		14					

* Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

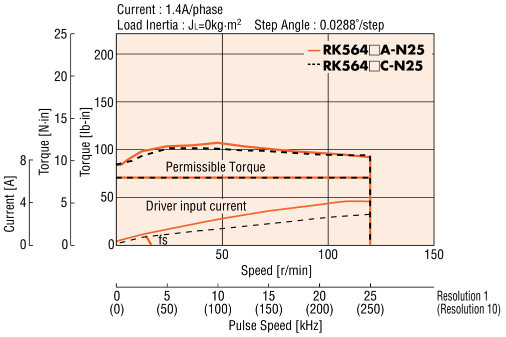
Notes: • Direction of rotation of the motor and that of the gear output shaft are the same.
• The value of Maximum Torque is for the gear. Refer to the Speed-Torque Characteristics for the output torque of the geared motors.

Speed — Torque Characteristics How to Read Speed-Torque Characteristics→Page C-10

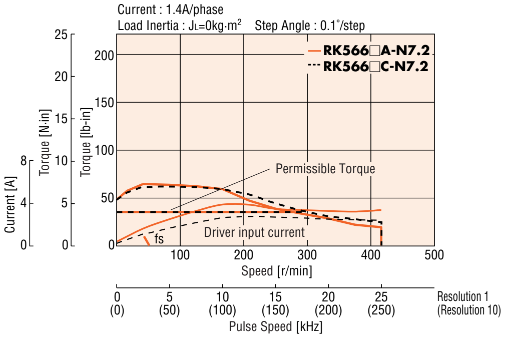
RK566□A-N5 RK566□C-N5



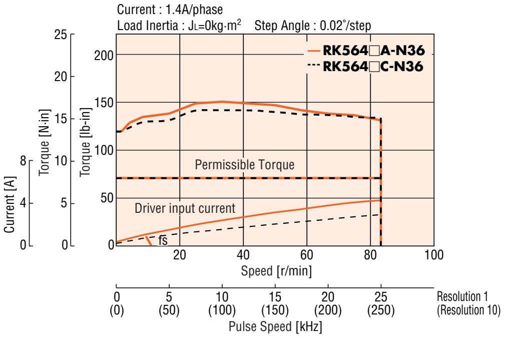
RK564□A-N25 RK564□C-N25



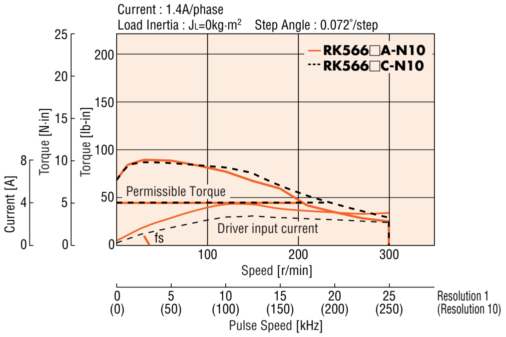
RK566□A-N7.2 RK566□C-N7.2



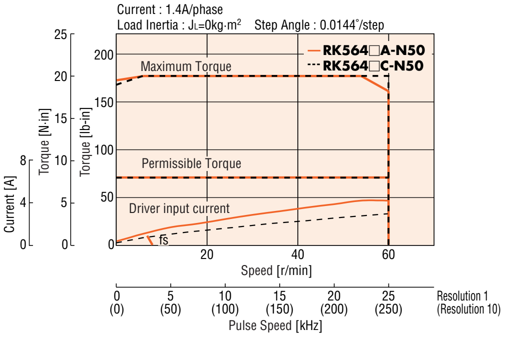
RK564□A-N36 RK564□C-N36



RK566□A-N10 RK566□C-N10



RK564□A-N50 RK564□C-N50



Note: The pulse input circuit responds to approximately 200 kHz with a pulse duty of 50%.

Common Specifications C-90 | Dimensions C-92 | Connection and Operation C-98 | Motor and Driver Combinations C-104

PN Geared Type

Motor Frame Size: □ 3.54 in. (□ 90 mm)

Specifications

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c UL us CE

Model	Single-Phase 100-115 VAC	Single Shaft	RK599AA-N5	RK599AA-N7.2	RK599AA-N10	RK596AA-N25	RK596AA-N36	RK596AA-N50
		Double Shaft	RK599BA-N5	RK599BA-N7.2	RK599BA-N10	RK596BA-N25	RK596BA-N36	RK596BA-N50
	Single-Phase 200-230 VAC	Single Shaft	RK599AC-N5	RK599AC-N7.2	RK599AC-N10	RK596AC-N25	RK596AC-N36	RK596AC-N50
		Double Shaft	RK599BC-N5	RK599BC-N7.2	RK599BC-N10	RK596BC-N25	RK596BC-N36	RK596BC-N50
Maximum Holding Torque		lb-in (N·m)	123 (14)	177 (20)		320 (37)		
Rotor Inertia J		oz-in^2 (kg·m^2)	14.8 (2700×10^{-7})			7.7 (1400×10^{-7})		
Rated Current		A/Phase	1.4					
Basic Step Angle			0.144°	0.1°	0.072°	0.0288°	0.02°	0.0144°
Gear Ratio			5:1	7.2:1	10:1	25:1	36:1	50:1
Permissible Torque		lb-in. (N·m)	123 (14)	177 (20)		320 (37)		
Maximum Torque		lb-in. (N·m)	240 (28)	300 (35)	300 (35)	490 (56)	530 (60)	530 (60)
Backlash		arc minute (degrees)	2 (0.034°)			3 (0.05°)		
Angle Error		arc minute (degrees)	4 (0.067°)					
Permissible Speed Range		r/min	0~600	0~416	0~300	0~120	0~83	0~60
Power Source Input			Single-Phase 100-115 VAC ±15% 50/60 Hz 4.5 A			Single-Phase 200-230 VAC $^{+10\%}_{-15\%}$ 50/60 Hz 3.5 A		
Excitation Mode			Microstep: Basic Angle/n * (/Step)					
Weight	Motor	lb. (kg)	11 (5)			10 (4.7)		
	Driver	lb. (kg)	1.9 (0.85)					
Dimension No.	Motor		9					
	Driver		14					

* Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

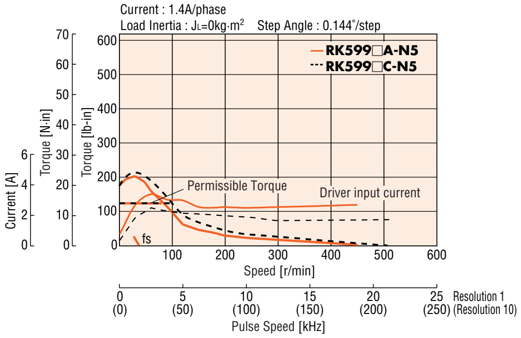
Notes: • Direction of rotation of the motor and that of the gear output shaft are the same.

• The value of Maximum Torque is for the gear. Refer to the Speed-Torque Characteristics for the output torque of the geared motors.

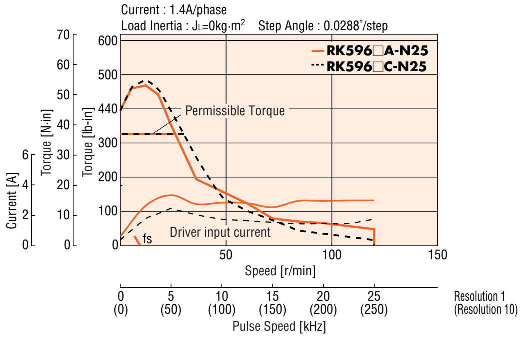
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

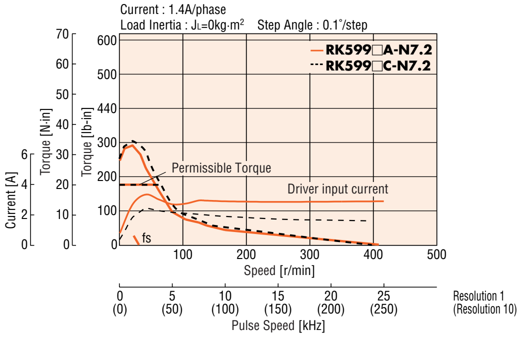
RK599□A-N5 RK599□C-N5



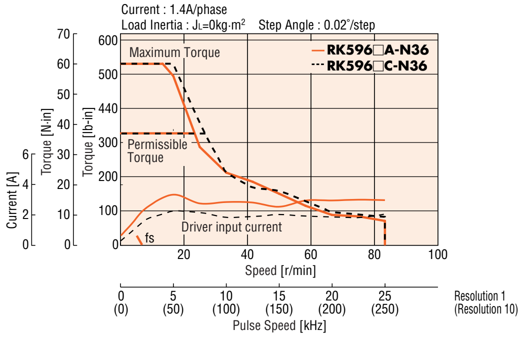
RK596□A-N25 RK596□C-N25



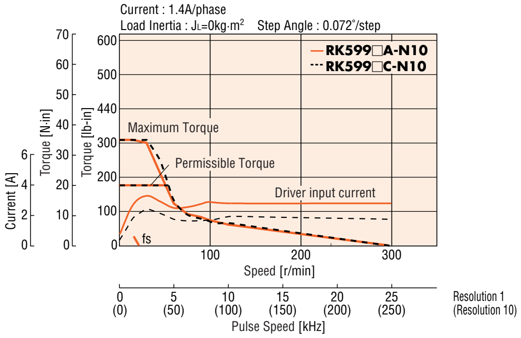
RK599□A-N7.2 RK599□C-N7.2



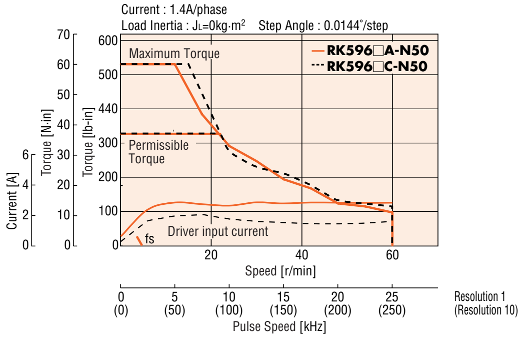
RK596□A-N36 RK596□C-N36



RK599□A-N10 RK599□C-N10



RK596□A-N50 RK596□C-N50



Note: The pulse input circuit responds to approximately 200 kHz with a pulse duty of 50%.

Features C-78 System Configuration C-80 Specifications/Characteristics C-81

HG Geared Type Motor Frame Size: □ 1.65 in. (□ 42 mm), □ 2.36 in. (□ 60 mm), □ 3.54 in. (□ 90 mm)

Specifications How to Read Specifications Table→Page C-9

c UL us (only for **RK564□** and **RK596□**) CE

Model	Single-Phase 100-115 VAC	Single Shaft	**RK543AA-H50**	**RK543AA-H100**	**RK564AA-H50**	**RK564AA-H100**	**RK596AA-H50**	**RK596AA-H100**
		Double Shaft	**RK543BA-H50**	**RK543BA-H100**	**RK564BA-H50**	**RK564BA-H100**	**RK596BA-H50**	**RK596BA-H100**
	Single-Phase 200-230 VAC	Single Shaft	—	—	**RK564AC-H50**	**RK564AC-H100**	**RK596AC-H50**	**RK596AC-H100**
		Double Shaft	—	—	**RK564BC-H50**	**RK564BC-H100**	**RK596BC-H50**	**RK596BC-H100**
Maximum Holding Torque		lb-in (N·m)	30 (3.5)	44 (5.0)	48 (5.5)	70 (8)	220 (25)	320 (37)
Rotor Inertia J		oz-in^2 (kg·m^2)	0.28 (52×10^{-7})		1.15 (210×10^{-7})		8.8 (1600×10^{-7})	
Rated Current		A/Phase	0.75		1.4			
Basic Step Angle			0.0144°	0.0072°	0.0144°	0.0072°	0.0144°	0.0072°
Gear Ratio			50:1	100:1	50:1	100:1	50:1	100:1
Permissible Torque		lb-in. (N·m)	30 (3.5)	44 (5.0)	48 (5.5)	70 (8)	220 (25)	320 (37)
Maximum Torque		lb-in. (N·m)	73 (8.3)	97 (11)	159 (18)	240 (28)	300 (35)	480 (55)
Lost Motion (Load Torque)		arc minute (degrees)	Maximum 1.5 (±0.16 N·m)	Maximum 1.5 (±0.2 N·m)	Maximum 0.7 (±0.28 N·m)	Maximum 0.7 (±0.39 N·m)	Maximum 1.5 (±1.2 N·m)	Maximum 1.5 (±1.2 N·m)
Permissible Speed Range			0~70	0~35	0~70	0~35	0~70	0~35
Power Source Input			Single-Phase 100-115 VAC ±15% 50/60 Hz 1 A		Single-Phase 100-115 VAC ±15% 50/60 Hz 4.5 A		Single-Phase 200-230 VAC $^{+10\%}_{-15\%}$ 50/60 Hz 3.5 A	
Excitation Mode			Microstep: Basic Angle/n * (/Step)					
Weight	Motor	lb. (kg)	1 (0.46)		2.4 (1.08)		8.1 (3.7)	
	Driver	lb. (kg)	0.88 (0.4)		1.9. (0.85)			
Dimension No.	Motor/Driver		10/13		11/14		12/14	

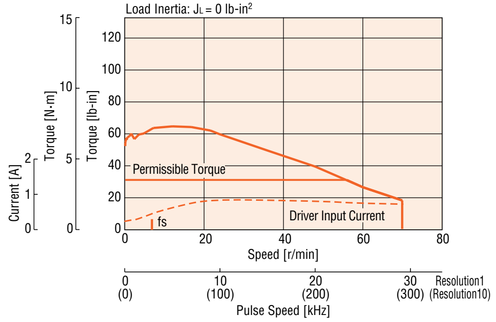
* Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Notes:
- The inertia represents a sum of the inertia at the harmonic gear converted to a motor shaft value, and the rotor inertia.
- Direction of rotation of the motor and that of the gear output shaft are the opposite.
- The value of Maximum Torque is for the gear. Refer to the Speed-Torque Characteristics for the output torque of the geared motors.

Speed — Torque Characteristics How to Read Speed-Torque Characteristics→Page C-10

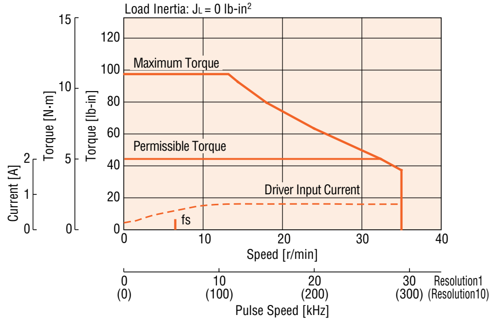
RK543□A-H50

Current: 0.75 A/Phase Step Angle: 0.0144°/step
Load Inertia: J_L = 0 lb-in^2



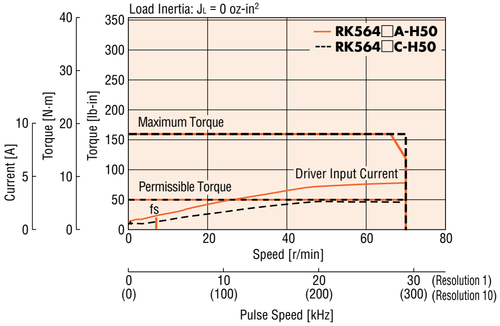
RK543□A-N100

Current: 0.75 A/Phase Step Angle: 0.0072°/step
Load Inertia: J_L = 0 lb-in^2



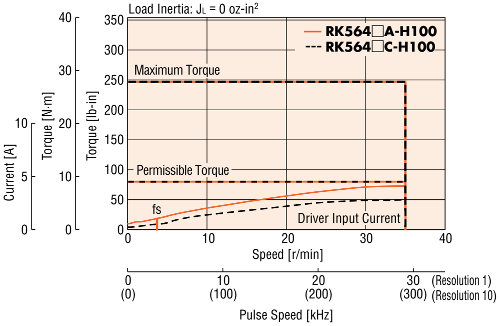
RK564□A-H50 RK564□C-H50

Current: 1.4 A/Phase Step Angle: 0.0144°/step
Load Inertia: J_L = 0 oz-in^2



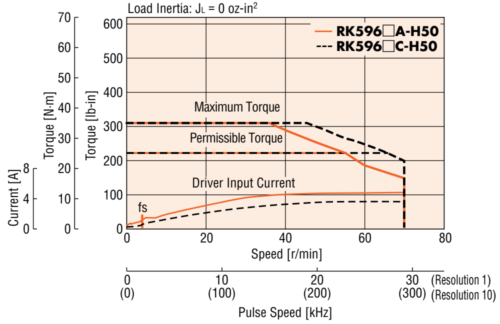
RK564□A-H100 RK564□C-H100

Current: 1.4 A/Phase Step Angle: 0.0072/step
Load Inertia: J_L = 0 oz-in^2



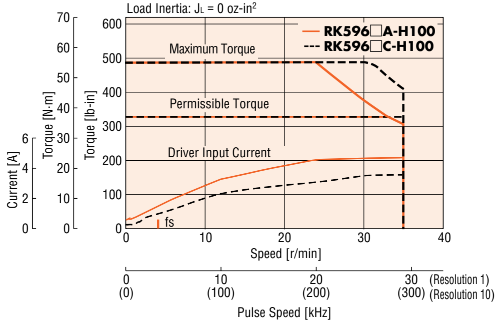
RK596□A-H50 RK596□C-H50

Current: 1.4 A/Phase Step Angle: 0.0144°/step
Load Inertia: J_L = 0 oz-in^2



RK596□A-H100 RK596□C-H100

Current: 1.4 A/Phase Step Angle: 0.0072/step
Load Inertia: J_L = 0 oz-in^2



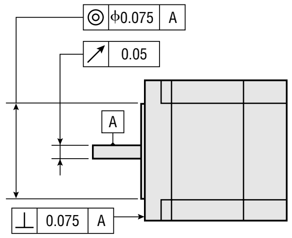
Note: The pulse input circuit responds to approximately 200 kHz with a pulse duty of 50%.

Common Specifications

Input Signal	Input Mode	Photocoupler input, Input impedance: 220 Ω; Input current: 10 to 20 mA ON: +4.5 V~5 V, OFF: 0~+1 V (Voltage between terminals)
	Pulse Signal (CW Pulse Signal)	Operation command pulse signal (CW direction operation command pulse signal when in 2-pulse input mode) Pulse width: 2.5 μs minimum; Pulse rise/fall: 2 μs maximum Pulse duty: 50% and below The motor moves one step when the pulse input is switched from photocoupler On to Off. Maximum input frequency: 200 kHz (When the duty is 50%)
	Rotation Direction Signal (CCW Pulse Signal)	Rotation direction signal, Photocoupler OFF: CCW; Photocoupler ON: CW (CCW direction operation command pulse signal when in 2-pulse input mode Pulse width: 2.5 μs minimum; Pulse rise/fall: 2 μs maximum Pulse duty: 50% and below The motor moves one step when the pulse input is switched from photocoupler On to Off. Maximum input pulse frequency: 200 kHz (When the duty is 50%))
	All Windings Off Signal	When in the "photocoupler ON" state, the output current to the motor is cut off and the motor's shaft can be rotated manually. When in the "photocoupler OFF" state, the output current is supplied to the motor.
	Step Angle Select Signal	Step angle specified in DATA1 when photocoupler OFF Step angle specified in DATA2 when photocoupler ON
Output Signal	Output Mode	Photocoupler, Open Collector Output External usage conditions 24 VDC maximum, 10 mA maximum
	Excitation Timing Signal	The signal is output every time the excitation sequence returns to the initial stage "0." (Photocoupler: ON) 0.72°/step (1 resolution): Signal output every 10 pulses; 0.072°/step (10 resolutions): Signal output every 100 pulses
	Overheat Signal	Output is turned off when the driver's internal temperature rises to approximately 176°F (80°C) or above. (Photocoupler: ON)
Functions		Automatic Current Cutback, Automatic current off, Step Angle Switch, Pulse Input Mode Switch, Smooth Drive Function
Indicators (LED)		Power input, Excitation Timing signal output, Overheat signal output
Cooling Method		Natural Ventilation

General Specifications

Specifications		Motor	Driver
Insulation Class		Class B [266°F (130°C)] [Recognized as Class A 221°F (105°C) by UL/CSA standard]	—
Insulation Resistance		100 MΩ minimum under normal temperature and humidity, when measured by a 500 VDC megger between the windings and the motor casing.	100 MΩ minimum under normal temperature and humidity, when measured by a 500 VDC megger between the following places: • Power input terminal - Protective earth terminal • Motor output terminal - Protective earth terminal • Electromagnetic brake power output terminal* - Protective earth terminal • Signal input/output terminals - Power input terminal • Signal input/output terminals - Motor output terminal • Signal input/output terminals* - Electromagnetic brake power output terminal *Only for electromagnetic brake type
Dielectric Strength		Sufficient to withstand 1.5 kV (1.0 kV for **RK54□**), 60 Hz applied for one minute between the windings and casing under normal temperature and humidity.	Sufficient to withstand the following for one minute, under normal temperature and humidity. • Power input terminal - Protective earth terminal 1.1 k VAC 60 Hz • Motor output terminal - Protective earth terminal 1.1 k VAC 60 Hz • Electromagnetic brake power output terminal* - Protective earth terminal 1.1 k VAC 60 Hz • Signal input/output terminals - Power input terminal 1.8 k VAC 60 Hz • Signal input/output terminals - Motor output terminal 1.8 k VAC 60 Hz • Signal input/output terminals* - Electromagnetic brake power output terminal 1.8 k VAC 60 Hz *Only for electromagnetic brake type
Operating Environment	Ambient Temperature	14°F~122°F (−10°C~+50°C) (nonfreezing) [Harmonic geared type: 32°F~104°F (0°C~+40°C)]	32°F~122°F (0°C~+50°C) (nonfreezing)
	Humidity	85% or less, noncondensing	
	Atmosphere	No corrosive gases, dust, water or oil.	
Temperature Rise		Temperature rise of the coil measured by the Change Resistance Method is 144°F (80°C) or less. (at standstill, five phases energized)	—
Stop Position Accuracy [1]		±3 minutes (±0.05°)	—
Shaft Runout		0.002 inch (0.05 mm) T.I.R. at top of output shaft[4]	—
Radial Play [2]		0.001 inch (0.025 mm) max. of 1.12 lb. (5 N)	—
Axial Play [3]		0.003 inch (0.075 mm) max. of 2.2 lb. (10 N)	—
Concentricity		0.003 inch (0.075 mm) T.I.R.[4]	—
Perpendicularity		0.003 inch (0.075 mm) T.I.R.[4]	—



[1] This value is for full step under no load. (The value changes with the size of the load.)

[2] Radial Play: Displacement in shaft position in the radial direction, when a 1.12 lb. (5 N) load is applied in the vertical direction to the tip of the motor's shaft.

[3] Axial Play: Displacement in shaft position in the axial direction, when a 2.2 lb. (10 N) load is applied to the motor's shaft in the axial direction.

[4] T.I.R. (Total Indicator Reading): Total dial gauge reading when the measurement section is rotated one revolution centered on a reference axis.

Note:

- Do not measure insulation resistance or perform a dielectric strength test while the motor and driver are connected.

Features C-78 System Configuration C-80 Specifications/Characteristics C-81

Permissible Overhung Load and Permissible Thrust Load

Unit = Upper values: lb./Lower values: N

Model	Overhung Load Distance from the Output Shaft End [inch (mm)]					Thrust Load
	0 (0)	0.2 (5)	0.39 (10)	0.59 (15)	0.79 (20)	
RK543 **RK544** **RK545**	4.5 20	5.6 25	7.6 34	11.7 52	—	The permissible thrust load [lb. (N)] shall be no greater than the motor mass.
RK564 **RK566** **RK569**	14.1 63	16.8 75	21 95	29 130	42 190	
RK596 **RK599** **RK5913**	58 260	65 290	76 340	87 390	108 480	
RK543-T□	2.2 10	3.1 14	4.5 20	6.7 30	—	3.3 15
RK564-T□	15.7 70	18 80	22 100	27 120	33 150	9 40
RK596-T□	49 220	56 250	67 300	78 350	90 400	22 100
RK544-N□	22 100	27 120	33 150	42 190	—	22 100
RK566-N5	45 200	49 220	56 250	63 280	72 320	22 100
RK566-N7.2 **RK566-N10**	56 250	60 270	67 300	76 340	87 390	
RK564-N25 **RK564-N36** **RK564-N50**	74 330	81 360	90 400	101 450	117 520	
RK599-N5	108 480	117 520	123 550	130 580	139 620	67 300
RK599-N7.2 **RK599-N10**	108 480	121 540	135 600	153 680	177 790	
RK596-N25	191 850	210 940	230 1050	240 1110	260 1190	
RK596-N36	200 930	230 1030	250 1150	270 1220	290 1300	
RK596-N50	230 1050	260 1160	290 1300	310 1380	330 1490	
RK543-H□	40 180	49 220	60 270	81 360	114 510	49 220
RK564-H□	72 320	83 370	99 440	123 550	162 720	101 450
RK596-H□	240 1090	250 1150	270 1230	290 1310	310 1410	290 1300

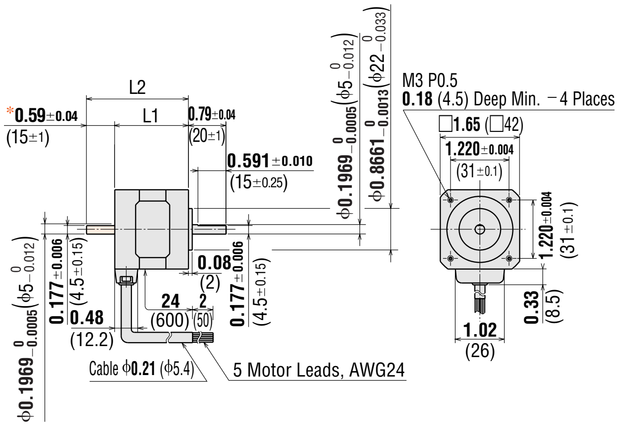
- Enter the gear ratio in the box (□) within the model numbers.

Dimensions Scale 1/4, Unit = inch (mm)

● Motor

◆ Standard Type

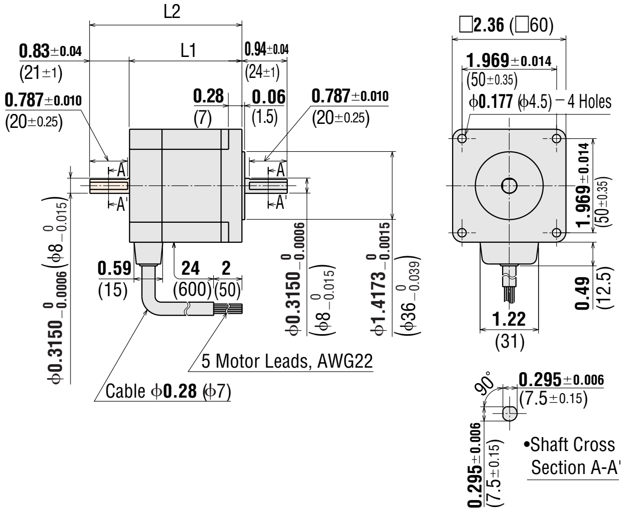
1 Motor Frame Size: □1.65 in. (□42 mm)



Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
RK543AA	PK543AW	1.3 (33)	—	0.55 (0.25)	B001
RK543BA	PK543BW		1.89 (48)		
RK544AA	PK544AW	1.54 (39)	—	0.66 (0.3)	B002
RK544BA	PK544BW		2.13 (54)		
RK545AA	PK545AW	1.85 (47)	—	0.88 (0.4)	B003
RK545BA	PK545BW		2.44 (62)		

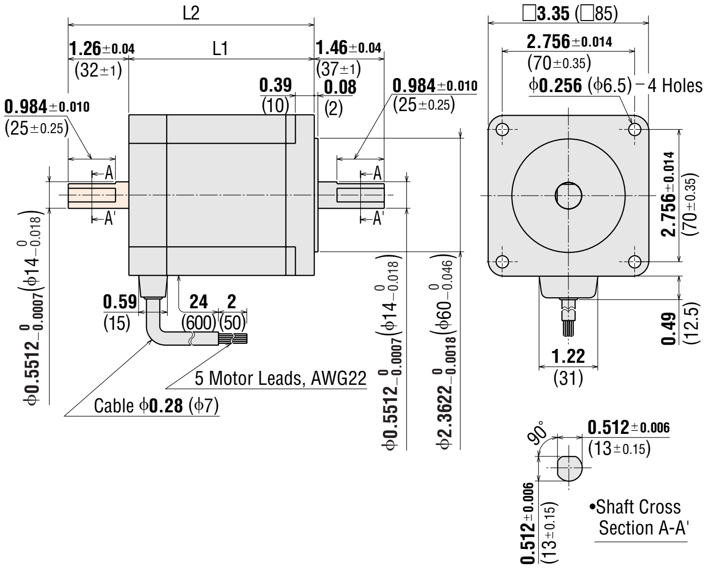
✻ The length of machining on double shaft model is **0.591**±**0.010** (15±0.25).

2 Motor Frame Size: □2.36 in. (□60 mm)



Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
RK564AA	PK564AW	1.91 (48.5)	—	1.3 (0.6)	B004
RK564AC					
RK564BA	PK564BW		2.74 (69.5)		
RK564BC					
RK566AA	PK566AW	2.34 (59.5)	—	1.8 (0.8)	B005
RK566AC					
RK566BA	PK566BW		3.17 (80.5)		
RK566BC					
RK569AA	PK569AW	3.50 (89)	—	2.9 (1.3)	B006
RK569AC					
RK569BA	PK569BW		4.33 (110)		
RK569BC					

3 Motor Frame Size: □3.35 in. (□85 mm)



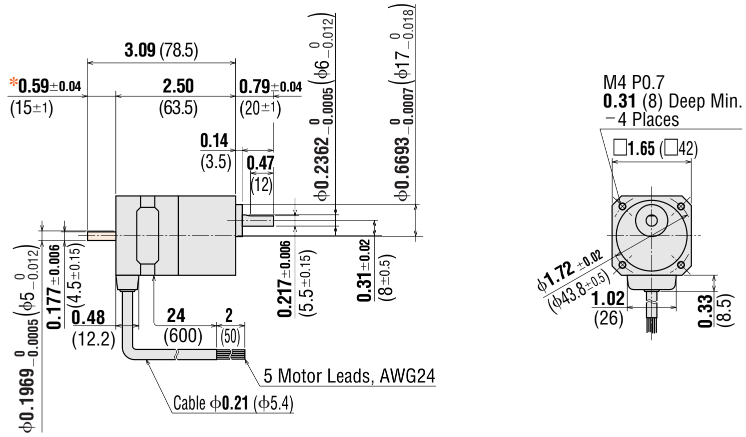
Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
RK596AA	PK596AW	2.68 (68)	—	3.7 (1.7)	B007
RK596AC					
RK596BA	PK596BW		3.94 (100)		
RK596BC					
RK599AA	PK599AW	3.86 (98)	—	6.2 (2.8)	B008
RK599AC					
RK599BA	PK599BW		5.12 (130)		
RK599BC					
RK5913AA	PK5913AW	5.04 (128)	—	8.4 (3.8)	B009
RK5913AC					
RK5913BA	PK5913BW		6.3 (160)		
RK5913BC					

✻ These dimensions are for double shaft models. For single shaft models, ignore the shaded areas.

Features C-78 System Configuration C-80 Specifications/Characteristics C-81

◆ TH Geared Type

4 Motor Frame Size: □1.65 in. (□42 mm)

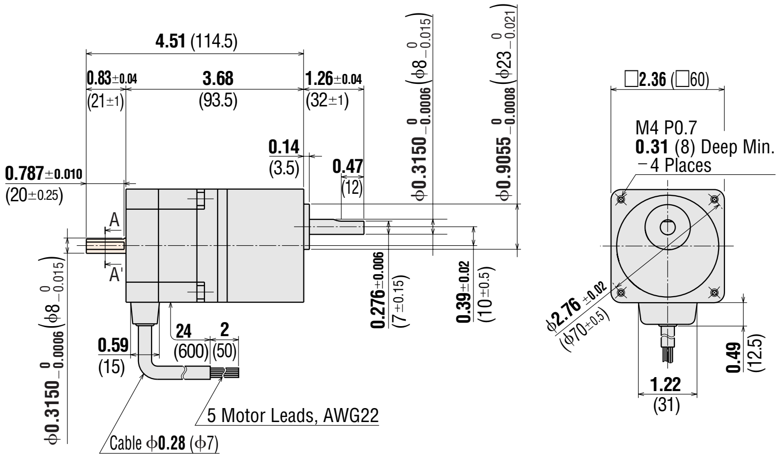


Model	Motor Model	Gear Ratio	Weight lb. (kg)	DXF
RK543AA-T□	PK543AW-T□	**3.6**, **7.2**, **10**, **20**, **30**	0.77 (0.35)	B183
RK543BA-T□	PK543BW-T□			

- Enter the gear ratio in the box (□) within the model number.

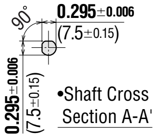
✻ The length of machining on double shaft model is **0.591**±**0.010** (15±0.25).

5 Motor Frame Size: □2.36 in. (□60 mm)



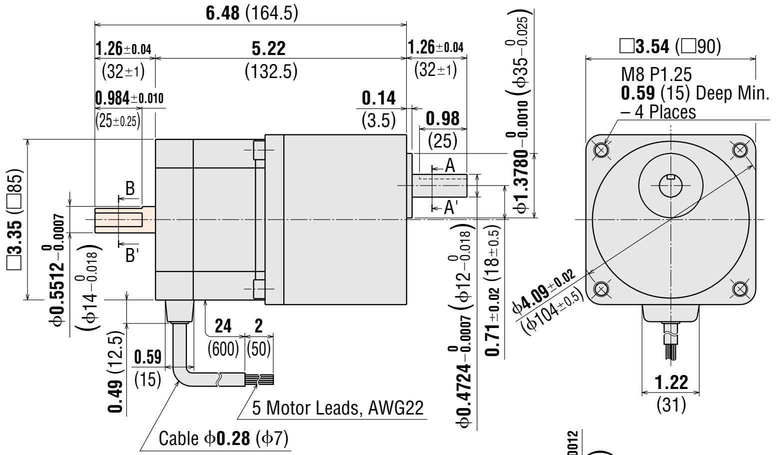
Model	Motor Model	Gear Ratio	Weight lb. (kg)	DXF
RK564AA-T□	PK564AW-T□	**3.6**, **7.2**, **10**, **20**, **30**	2.1 (0.95)	B187
RK564AC-T□				
RK564BA-T□	PK564BW-T□			
RK564BC-T□				

- Enter the gear ratio in the box (□) within the model number.



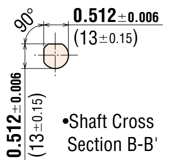
•Shaft Cross Section A-A'

6 Motor Frame Size: □3.54 in. (□90 mm)

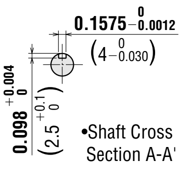


Model	Motor Model	Gear Ratio	Weight lb. (kg)	DXF
RK596AA-T□	PK596AW-T□	**3.6**, **7.2**	6.3 (2.85)	B188
RK596AC-T□				
RK596AA-T□	PK596AW1-T□	**10**, **20**, **30**		
RK596AC-T□				
RK596BA-T□	PK596BW-T□	**3.6**, **7.2**		
RK596BC-T□				
RK596BA-T□	PK596BW1-T□	**10**, **20**, **30**		
RK596BC-T□				

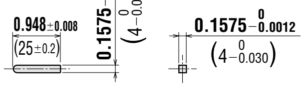
- Enter the gear ratio in the box (□) within the model number.



•Shaft Cross Section B-B'



•Shaft Cross Section A-A'

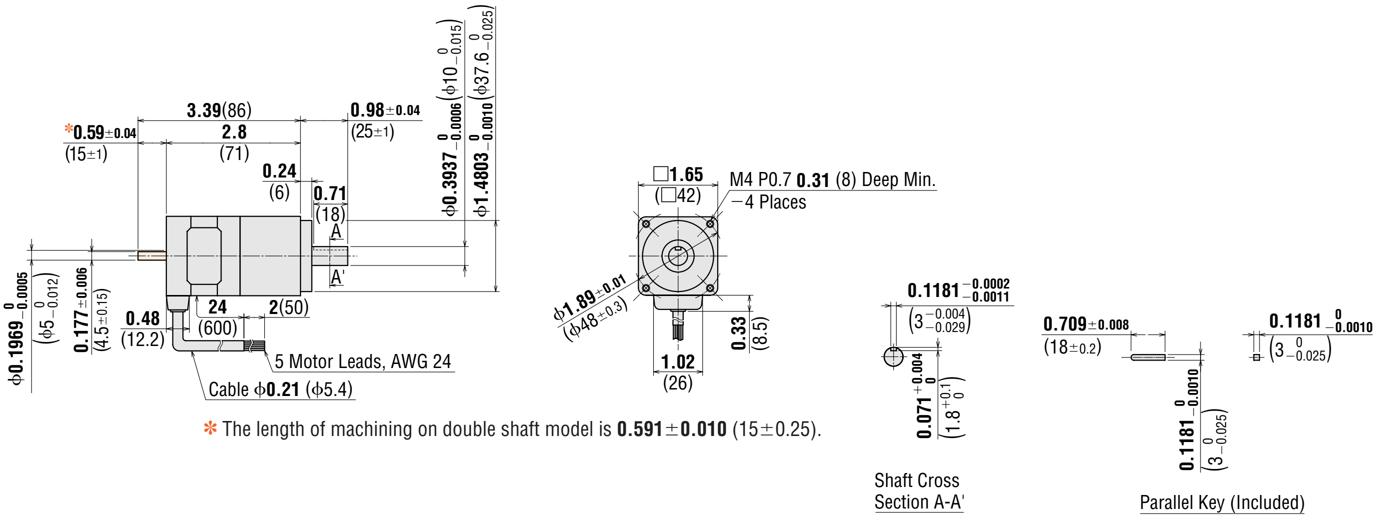


Parallel Key (included)

✻ These dimensions are for double shaft models. For single shaft models, ignore the shaded areas.

◆ PN Geared Type

7 Motor Frame Size: □1.65 in. (□42 mm)

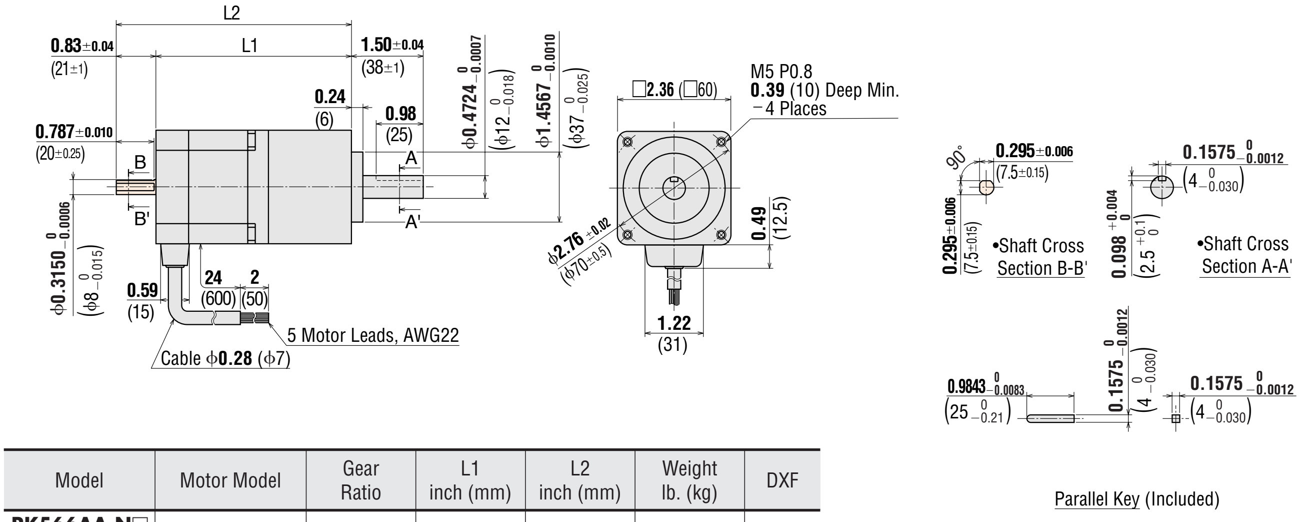


* The length of machining on double shaft model is **0.591**±**0.010** (15±0.25).

Model	Motor Model	Gear Ratio	Weight lb. (kg)	DXF
RK544AA-N□	PK544AW-N□	**5**, **7.2**, **10**	1.2 (0.56)	B312
RK544BA-N□	PK544BW-N□			

- Enter the gear ratio in the box (□) within the model number.

8 Motor Frame Size: □2.36 in. (□60 mm)

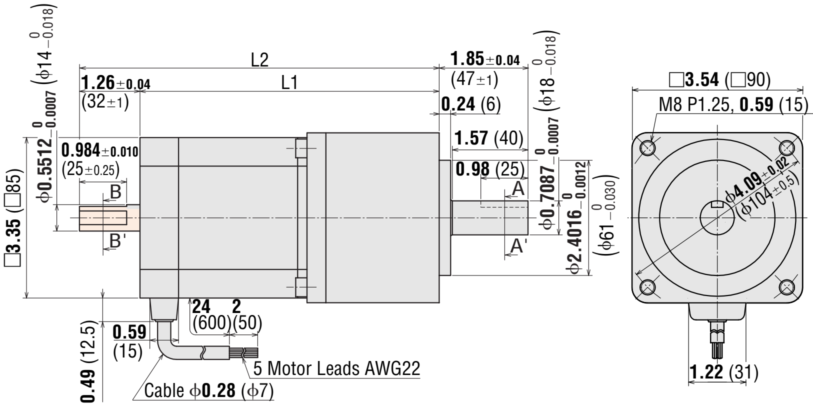


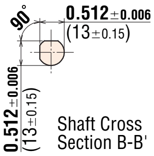
Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
RK566AA-N□	PK566AW-N□	**5**, **7.2**, **10**	4.07 (103.5)	—	3.3 (1.5)	B190
RK566AC-N□						
RK566BA-N□	PK566BW-N□			4.90 (124.5)		
RK566BC-N□						
RK564AA-N□	PK564AW-N□	**25**, **36**, **50**	4.27 (108.5)	—		B191
RK564AC-N□						
RK564BA-N□	PK564BW-N□			5.1 (129.5)		
RK564BC-N□						

- Enter the gear ratio in the box (□) within the model number.

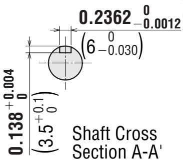
* These dimensions are for double shaft models. For single shaft models, ignore the shaded areas.

9 Motor Frame Size: □3.54 in. (□90 mm)

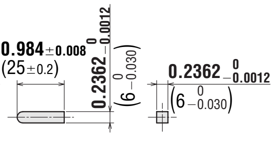




Shaft Cross Section B-B'



Shaft Cross Section A-A'



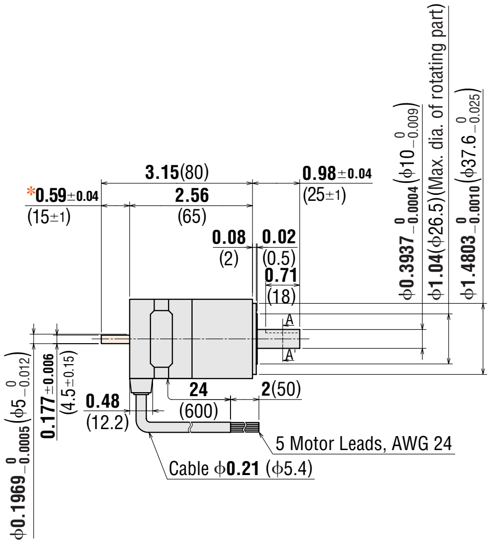
Parallel Key (included)

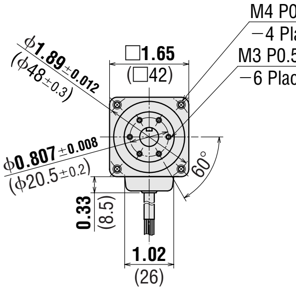
Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
RK599AA-N□	PK599AW-N□	**5**, **7.2**, **10**	6.22 (158)	—	11 (5.0)	B282
RK599AC-N□						
RK599BA-N□	PK599BW-N□			7.48 (190)		
RK599BC-N□						
RK596AA-N□	PK596AW-N□	**25**, **36**, **50**	5.94 (151)	—	10 (4.7)	B283
RK596AC-N□						
RK596BA-N□	PK596BW-N□			7.20 (183)		
RK596BC-N□						

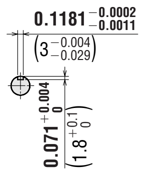
- Enter the gear ratio in the box (□) within the model number.

◆ HG Geared Type

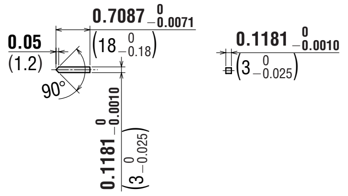
10 Motor Frame Size: □1.65 in. (□42 mm)







Shaft Cross Section A-A'



Parallel Key (Included)

* The length of machining on double shaft model is **0.591**±**0.010** (15±0.25).

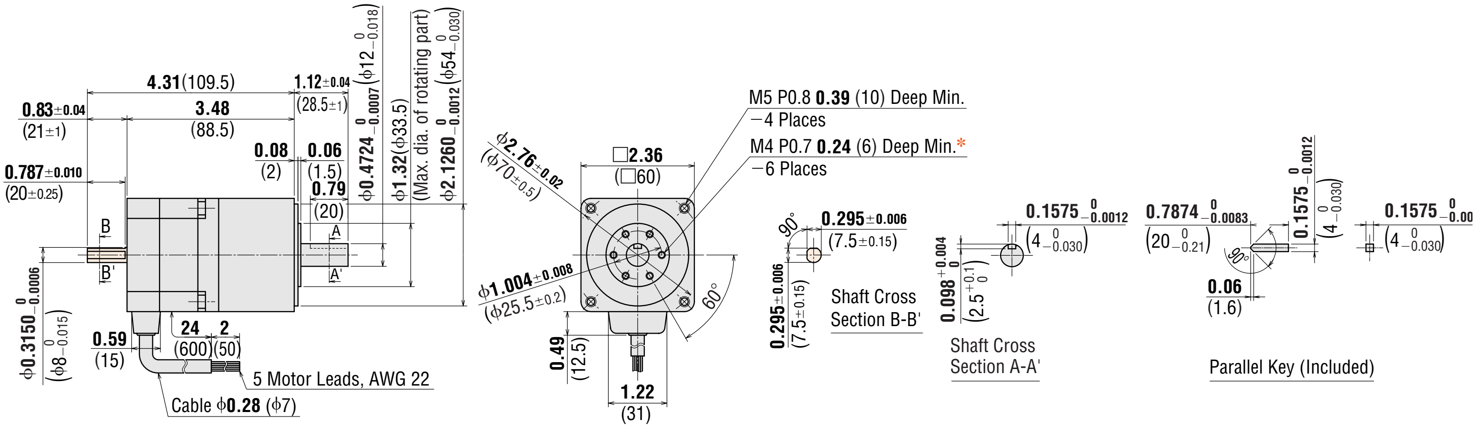
* The position of the key slot on the output shaft ϕ0.3937 (ϕ10) relative to the screw holes on a maximum diameter of ϕ1.04 (ϕ26.5) on the rotating part is arbitrary.

Model	Motor Model	Gear Ratio	Weight lb. (kg)	DXF
RK543AA-H□	PK543AW-H□S	**50**, **100**	1.0 (0.46)	B313
RK543BA-H□	PK543BW-H□S			

- Enter the gear ratio in the box (□) within the model number.

* These dimensions are for double shaft models. For single shaft models, ignore the shaded areas.

11 Motor Frame Size: □2.36 in. (□60 mm)

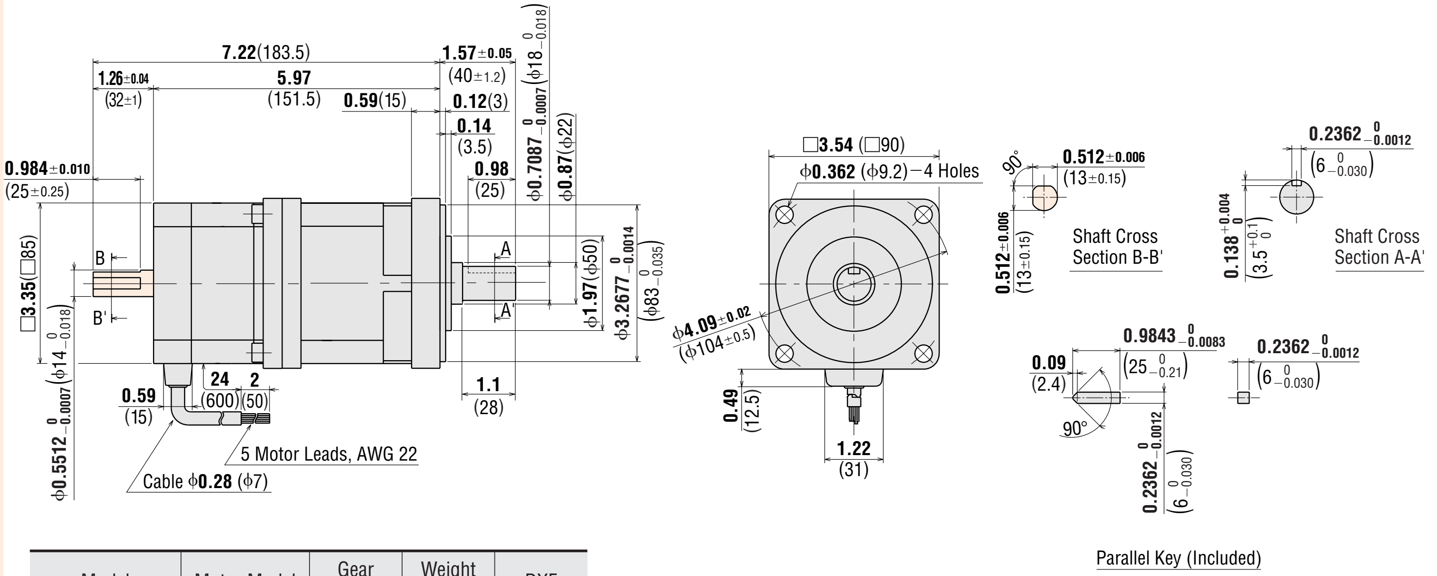


* The position of the key slot on the output shaft ϕ0.4724 (ϕ12) relative to the screw holes on a maximum diameter of ϕ1.32 (ϕ33.5) on the rotating part is arbitrary.

Model	Motor Model	Gear Ratio	Weight lb. (kg)	DXF
RK564AA-H□	PK564AW-H□S	**50**, **100**	2.4 (1.08)	B314
RK564AC-H□				
RK564BA-H□	PK564BW-H□S			
RK564BC-H□				

- Enter the gear ratio in the box (□) within the model number.

12 Motor Frame Size: □3.54 in. (□90 mm)



Model	Motor Model	Gear Ratio	Weight lb. (kg)	DXF
RK596AA-H□	PK596AW1-H□	**50**, **100**	8.1 (3.7)	B136
RK596AC-H□				
RK596BA-H□	PK596BW1-H□			
RK596BC-H□				

- Enter the gear ratio in the box (□) within the model number.

* These dimensions are for double shaft models. For single shaft models, ignore the shaded areas.

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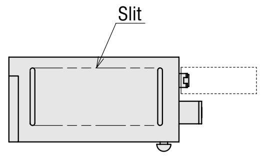
● Driver

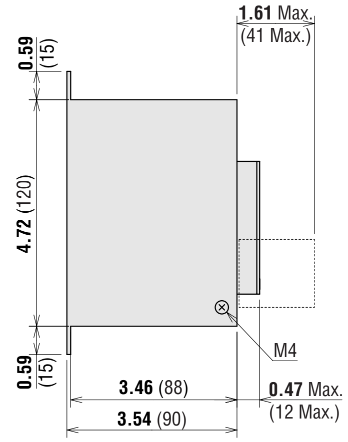
13 RKD507-A

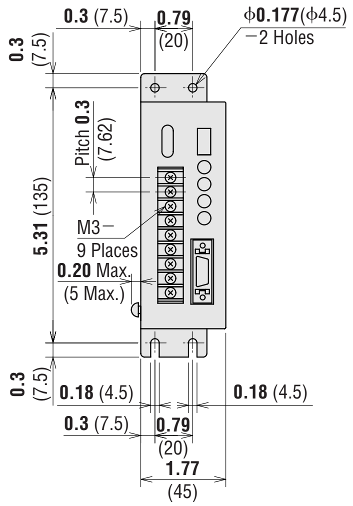
Weight: 0.88 lb. (0.4 kg)

DXF B315



●I/O Connector (included)
Connector: 54306-2011 (MOLEX)
Cover Assembly: 54331-1201 (MOLEX)

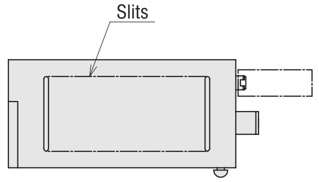




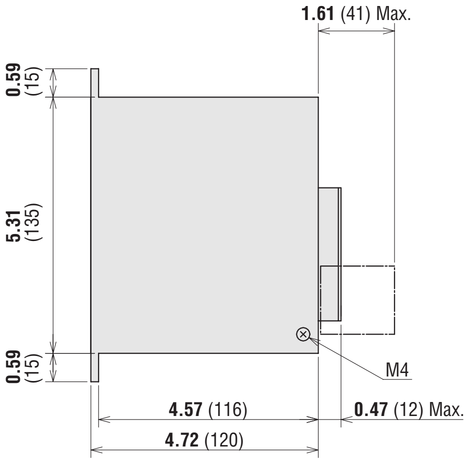
14 RKD514L-A, RKD514L-C, RKD514H-A, RKD514H-C

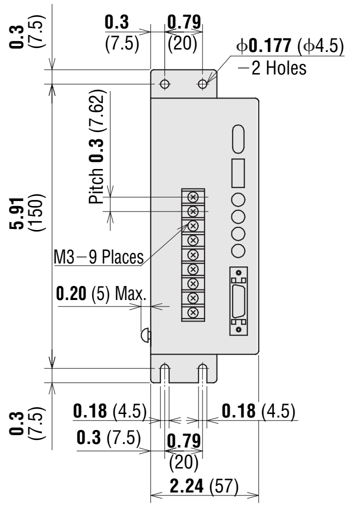
Weight: 1.9 lb. (0.85 kg)

DXF B284

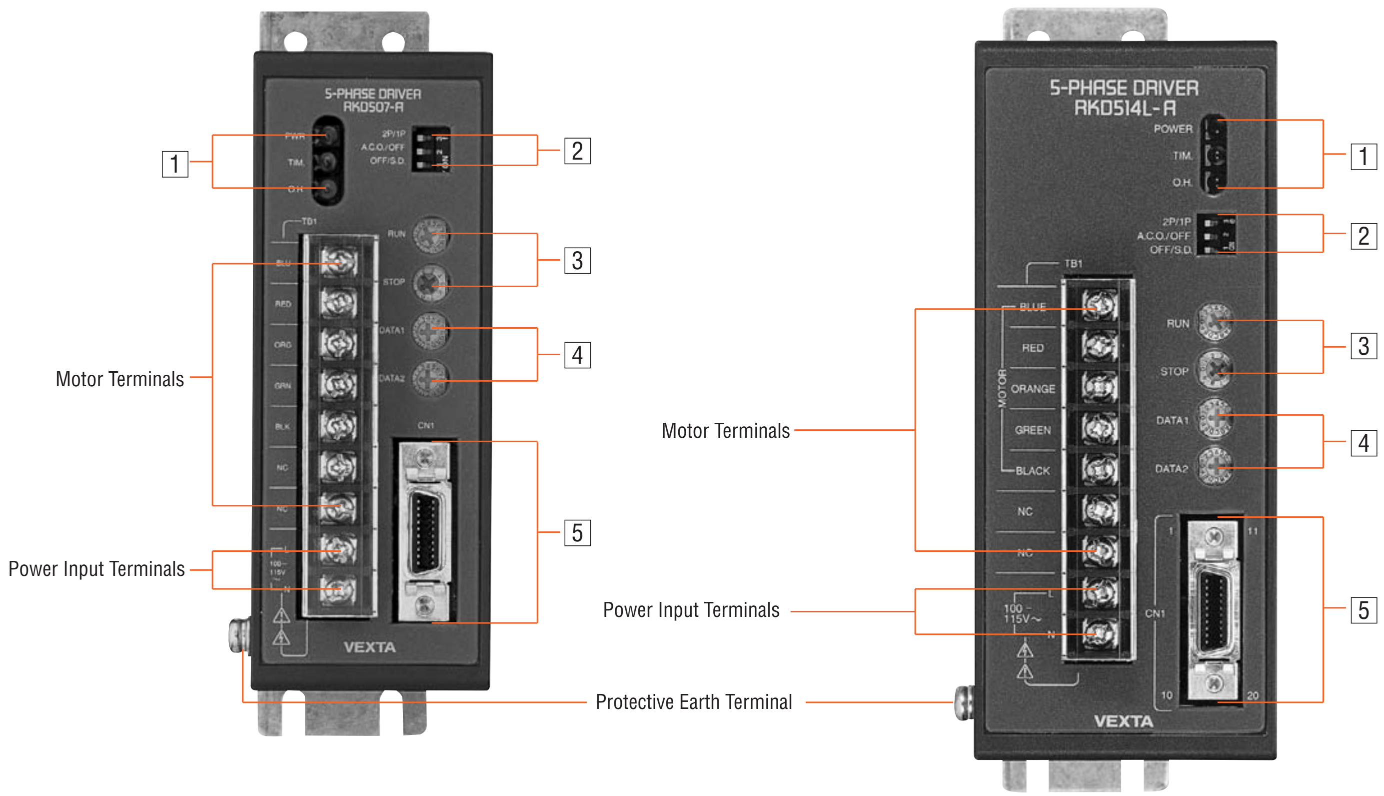


●I/O Connector (included)
Connector: 54306-2011 (MOLEX)
Cover Assembly: 54331-1201 (MOLEX)





Connection and Operation



RKD507-A RKD514L-A

1 LED Monitor Display

Indication	Color	Function
POWER	Green	Power Input Display
TIM.	Green	Excitation Timing Output Display
O.H.	Red	Overheat Output Display

2 Function Select Switches

Indication	Switch Name	Function
2P/1P	Pulse Input Mode Switch	Switches between 1-pulse input and 2-pulse input.
A.C.O./OFF	Automatic Current Off Function Switch	When the temperature inside the driver rises above 176˚F (80˚C), this function automatically switches the motor current off. The function can be set and defeated with this switch.
OFF/S.D.	Smooth Drive Function Switch	Low vibration and low noise operation are available even in the low speed range without changing the step angle setting. The function can be set and defeated with this switch.

3 Current Adjustment Switches

Indication	Switch Name	Function
RUN	Motor Run Current Switch	For adjusting the motor running current.
STOP	Motor Stop Current Switch	For adjusting the current at motor standstill.

4 Resolution Select Switches

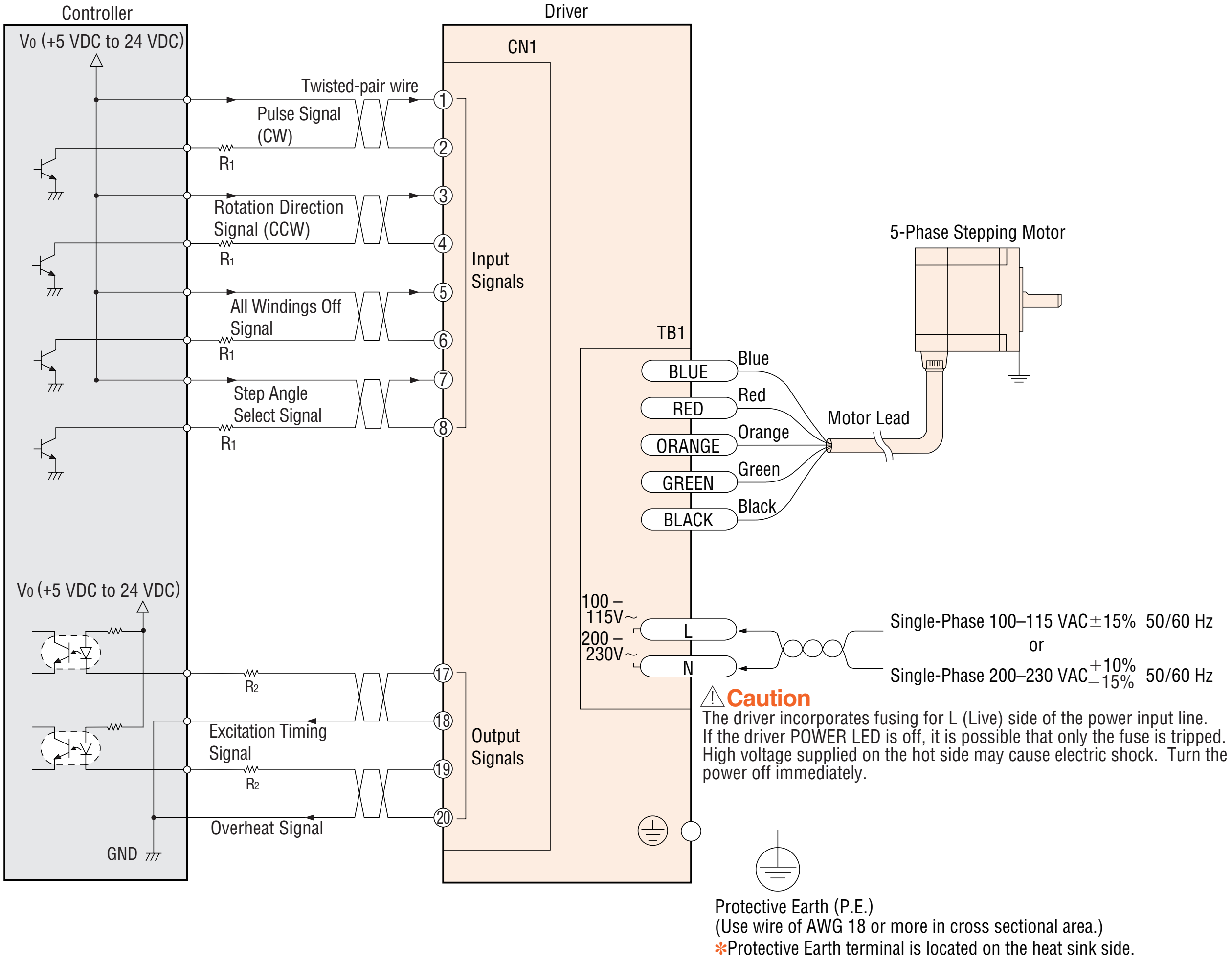
Indication	Switch Name	Function
DATA1	Step Angle Select Switch	Each switch can be set to the desired resolution from the 16 resolution levels.
DATA2		

5 Input/Output Signals

Indication	Terminal No.	Input/Output	Terminal Name
CN1	1	Input Signals	Pulse Signal (CW Pulse Signal)
	2		
	3		Rotation Direction Signal (CCW Pulse Signal)
	4		
	5		All Windings Off Signal
	6		
	7		Step Angle Select Signal
	8		
	17	Output Signals	Excitation Timing Signal
	18		
	19		Overheat Signal
	20		

Features C-78 System Configuration C-80 Specifications/Characteristics C-81

Connection Diagrams



⚠Caution
The driver incorporates fusing for L (Live) side of the power input line.
If the driver POWER LED is off, it is possible that only the fuse is tripped.
High voltage supplied on the hot side may cause electric shock. Turn the power off immediately.

Protective Earth (P.E.)
(Use wire of AWG 18 or more in cross sectional area.)
✻Protective Earth terminal is located on the heat sink side.

◆Power Supply

Can be used with single-phase 100-115 VAC or single-phase 200-230 VAC 50/60 Hz power supply. Use a power supply that can supply sufficient input current. When power supply capacity is insufficient, a decrease in motor output can cause the following malfunctions:

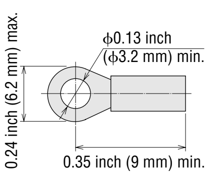
- Motor does not rotate properly at high-speed (insufficient torque).
- Slow motor startup and stopping.

Notes:

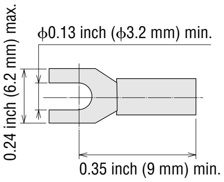
- Keep the voltage Vo between 5 VDC and 24 VDC. When they are equal to 5 VDC, the external resistance R_1 is not necessary. When they are above 5 VDC, connect R_1 to keep the current between 10 mA and 20 mA, and connect R_2 to keep the current below 10 mA.
- Use twisted-pair wire of AWG 24 or thicker and 6.6 feet (2 m) or less in length for the signal line.
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases. (→ Technical Reference F-36)
- Use AWG 22 or thicker for motor lines (when extended) and power supply lines, and use AWG 18 or thicker for the wire for the protective earthing line.
- Use spot grounding for the grounding of the driver and external controller.
- Signal lines should be kept at least 3.9 inch (10 cm) away from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.

◆Recommended Crimp Terminals

- Round shape terminal with insulator



- U shape terminal with insulator



✻ Crimp terminals are not provided with the package. They must be furnished separately.

●Setting the Step Angles (Resolution)

The driver can be preset to two different step angles (resolutions) using the step angle select switches DATA1 and DATA2.
Use these switches to set the desired resolution from the 16 resolution levels available. (Refer to the table below.)
After setting the two step angles (resolutions), use the step angle select signal to change the step angle.
Photocoupler OFF: Step angle (resolution) set by DATA1 is selected
Photocoupler ON: Step angle (resolution) set by DATA2 is selected

◆Standard Type

Step Angle Select Switch (Common to DATA1 and DATA2)	Resolution	Step Angle
0	1	0.72°
1	2	0.36°
2	2.5	0.288°
3	4	0.18°
4	5	0.144°
5	8	0.09°
6	10	0.072°
7	20	0.036°
8	25	0.0288°
9	40	0.018°
A	50	0.0144°
B	80	0.009°
C	100	0.0072°
D	125	0.00576°
E	200	0.0036°
F	250	0.00288°

◆TH Geared Type

Step Angle Select Switch (Common to DATA1 and DATA2)	Resolution	Step Angle at Output Shaft				
		Gear Ratio 3.6:1	Gear Ratio 7.2:1	Gear Ratio 10:1	Gear Ratio 20:1	Gear Ratio 30:1
0	1	0.2°	0.1°	0.072°	0.036°	0.024°
1	2	0.1°	0.05°	0.036°	0.018°	0.012°
2	2.5	0.08°	0.04°	0.0288°	0.0144°	0.0096°
3	4	0.05°	0.025°	0.018°	0.009°	0.006°
4	5	0.04°	0.02°	0.0144°	0.0072°	0.0048°
5	8	0.025°	0.0125°	0.009°	0.0045°	0.003°
6	10	0.02°	0.01°	0.0072°	0.0036°	0.0024°
7	20	0.01°	0.005°	0.0036°	0.0018°	0.0012°
8	25	0.008°	0.004°	0.00288°	0.00144°	0.00096°
9	40	0.005°	0.0025°	0.00188°	0.0009°	0.0006°
A	50	0.004°	0.002°	0.00144°	0.00072°	0.00048°
B	80	0.0025°	0.00125°	0.0009°	0.00045°	0.0003°
C	100	0.002°	0.001°	0.00072°	0.00036°	0.00024°
D	125	0.0016°	0.0008°	0.000576°	0.000288°	0.000192°
E	200	0.001°	0.0005°	0.00036°	0.00018°	0.00012°
F	250	0.0008°	0.0004°	0.000288°	0.000144°	0.000096°

◆ PN Geared Type

Step Angle Select Switch (Common to DATA1 and DATA2)	Resolution	Step Angle at Output Shaft					
		Gear Ratio 5:1	Gear Ratio 7.2:1	Gear Ratio 10:1	Gear Ratio 25:1	Gear Ratio 36:1	Gear Ratio 50:1
0	1	0.144°	0.1°	0.072°	0.0288°	0.02°	0.0144°
1	2	0.072°	0.05°	0.036°	0.0144°	0.01°	0.0072°
2	2.5	0.0576°	0.04°	0.0288°	0.01152°	0.008°	0.00576°
3	4	0.036°	0.025°	0.018°	0.0072°	0.005°	0.0036°
4	5	0.0288°	0.02°	0.0144°	0.00576°	0.004°	0.00288°
5	8	0.018°	0.0125°	0.009°	0.0036°	0.0025°	0.0018°
6	10	0.0144°	0.01°	0.0072°	0.00288°	0.002°	0.00144°
7	20	0.0072°	0.005°	0.0036°	0.00144°	0.001°	0.00072°
8	25	0.00576°	0.004°	0.00288°	0.001152°	0.0008°	0.000576°
9	40	0.0036°	0.0025°	0.0018°	0.00072°	0.0005°	0.00036°
A	50	0.00288°	0.002°	0.00144°	0.000576°	0.0004°	0.000288°
B	80	0.0018°	0.00125°	0.0009°	0.00036°	0.00025°	0.00018°
C	100	0.00144°	0.001°	0.00072°	0.000288°	0.0002°	0.000144°
D	125	0.001152°	0.0008°	0.000576°	0.0002304°	0.00016°	0.0001152°
E	200	0.00072°	0.0005°	0.00036°	0.000144°	0.0001°	0.000072°
F	250	0.000576°	0.0004°	0.000288°	0.0001152°	0.00008°	0.0000576°

◆ HG Geared Type

Step Angle Select Switch (Common to DATA1 and DATA2)	Resolution	Step Angle at Output Shaft	
		Gear Ratio 50:1	Gear Ratio 100:1
0	1	0.0144°	0.0072°
1	2	0.0072°	0.0036°
2	2.5	0.00576°	0.00288°
3	4	0.0036°	0.0018°
4	5	0.00288°	0.00144°
5	8	0.0018°	0.0009°
6	10	0.00144°	0.00072°
7	20	0.00072°	0.00036°
8	25	0.000576°	0.000288°
9	40	0.00036°	0.00018°
A	50	0.000288°	0.000144°
B	80	0.00018°	0.00009°
C	100	0.000144°	0.000072°
D	125	0.0001152°	0.0000576°
E	200	0.000072°	0.000036°
F	250	0.0000576°	0.0000288°

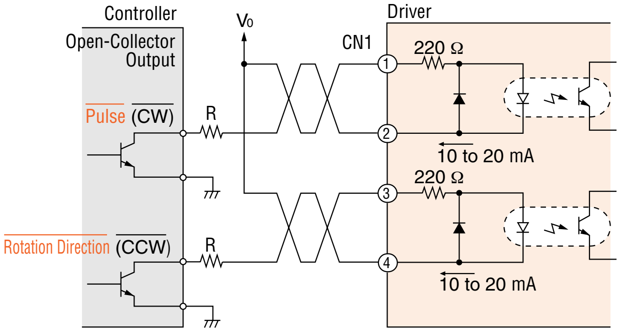
Notes:

- Do not change the step angle input setting unless the pulse signal is at rest.
  If the setting is changed while pulses are being input, a motor positional error may result.
- There is no positional error when changing the step angle with the motor is at rest.
- Step angle does not affect torque based on the shaft speed of the motor.

Features C-78 System Configuration C-80 Specifications/Characteristics C-81

Pulse (CW) and Rotation Direction (CCW) Input Signal

◆Input Circuit and Sample Connection



The letters indicate signals under the 1-pulse input mode, while the letters in parentheses indicate signals under the 2-pulse input mode.

Note:

- When Vo is equal to 5 VDC, the external resistance (R) is not necessary. When Vo is above 5 VDC, connect the external resistance (R) and keep the input current between 10 mA and 20 mA.

1-Pulse Input Mode

Pulse Signal

The "Pulse" signal is input to the pulse signal terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step. The direction of rotation is determined by the rotation direction signal.

Rotation Direction Signal

The "Rotation Direction" signal is input to the rotation direction signal input terminal. A "photocoupler ON" signal input commands a clockwise direction rotation.
A "photocoupler OFF" signal input commands a counterclockwise direction rotation.

2-Pulse Input Mode

CW Pulse Signal

When the photocoupler state changes from "ON" to "OFF", the motor rotates one step in the clockwise direction.

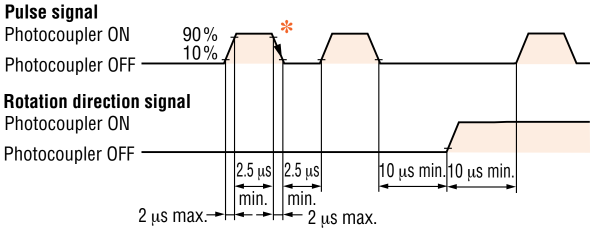
CCW Pulse Signal

When the photocoupler state changes from "ON" to "OFF", the motor rotates one step in the counterclockwise direction.

CW and CCW refer to clockwise and counterclockwise direction respectively, from a reference point of facing the motor output shaft.

◆Pulse Waveform Characteristics

(Photocoupler state corresponding to the input pulse)



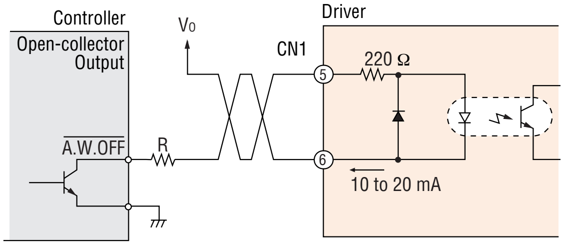
*The shaded area indicates when the photocoupler diode is ON. The motor moves when the photocoupler state changes from ON to OFF as indicated by the arrow.

◆Pulse Signal Characteristics

- The pulse voltage is 4.5 to 5 V in the "photocoupler ON" state, and 0 to 1 V in the "photocoupler OFF" state.
- Input pulse signals should have a pulse width over 2.5 μs, pulse rise/fall below 2 μs, and a pulse duty below 50%.
- Keep the pulse signal at the "photocoupler OFF" state when no pulses are being input.
- The minimum interval time when changing rotation direction is 10 μs. This value varies greatly depending on the motor type, pulse frequency and load inertia. It may be necessary to increase this time interval.
- In 1-pulse input mode, leave the pulse signal at rest ("photocoupler OFF") when changing rotation directions.

All Windings Off (A.W.OFF) Input Signal

◆Input Circuit and Sample Connection



Note:

- When Vo is equal to 5 VDC, the external resistance (R) is not necessary. When Vo is above 5 VDC, connect the external resistance (R) and keep the input current between 10 mA and 20 mA.

When the "All Windings Off" signal is in the "photocoupler ON" state, the current to the motor is cut off and motor torque is reduced to zero. The motor output shaft can then be rotated freely by hand.

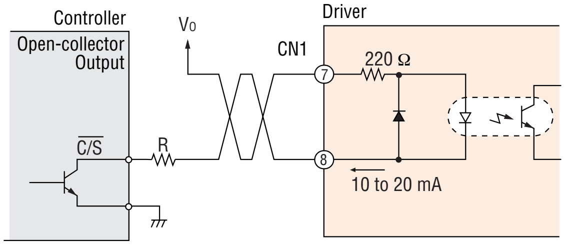
When the "All Windings Off" signal is in the "photocoupler OFF" state, the motor holding torque is proportional to the current set by the current adjustment rotary switches. During motor operation, be sure to keep the signal in the "photocoupler OFF" state.

This signal is used when moving the motor by external force or manual home position is desired. If this function is not needed, it is not necessary to connect this terminal.

Switching the "All Windings Off" signal from "photocoupler ON" to "photocoupler OFF" does not alter the excitation sequence. When the motor shaft is manually adjusted with the "All Windings Off" signal input, the shaft will shift up to ±3.6° from the position set after the "All Windings Off" signal is released.

Step Angle Select (C/S) Input Signal

◆Input Circuit and Sample Connection

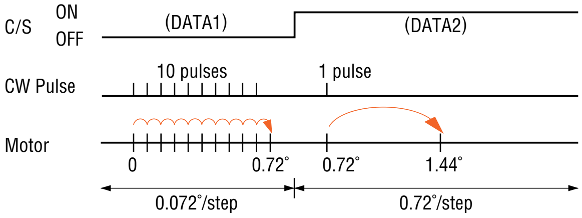


Note:

- When Vo is equal to 5 VDC, the external resistance (R) is not necessary. When Vo is above 5 VDC, connect the external resistance (R) and keep the input current between 10 mA and 20 mA.

You may select two step angles (resolutions) from 16 available step angles (resolutions) with the step angle select switches DATA1 and DATA2. When the signal is at “photocoupler OFF”, a step angle set by DATA1 is selected; at “photocoupler ON”, DATA2 is selected.

Example: Changing the step angle from 0.072° to 0.72°.

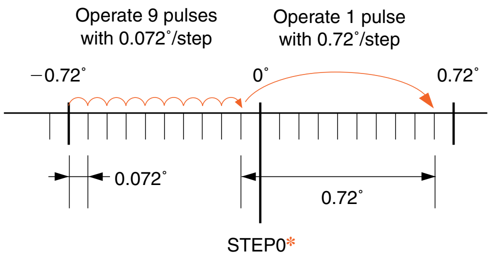


Notes:

- Be sure to change step angle setting inputs only when the pulse signals are at rest. Switching while moving may cause a positional error of the motor.
- There is no positional error if the step angle setting is changed with the motor at rest.
- When the step angle is changed by the “C/S” signal, the “TIMING” signal output shown below may become impossible for some combinations of step angles.When the “TIMING” signal is used, adjust the number of pulses so that the motor can operate with angles that are multiples of 7.2°.

Example:

After operate 9 pulses with 0.072°/step setting, change the step angle 0.72°/step and operate with 1 pulse. In this case, “Excitation Timing” signal will not be output because step 0 position is skipped.

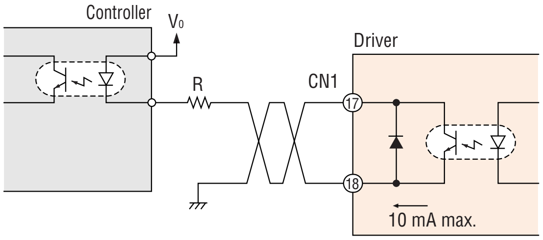


✻ “Excitation Timing” signal only output at step 0 sequence.

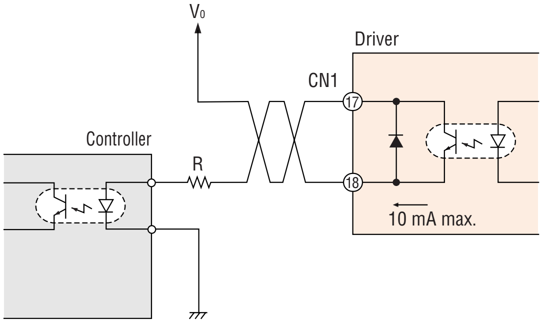
Excitation Timing (TIM.) Output Signal

◆Output Circuit and Sample Connection

Current Sink Output



Current Source Output



Note:

- Keep the voltage between 5 VDC and 24 VDC. Keep the current below 10 mA. If the current exceeds 10 mA, connect external resistance (R).

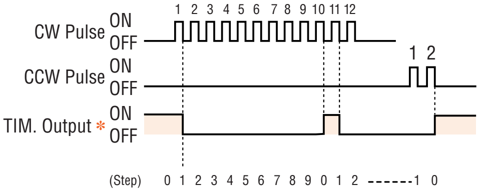
The "Excitation Timing" signal is output to indicate when the motor excitation (current flowing through the winding) is in the initial stage (step "0" at power up).
The "Excitation Timing" signal can be used to increase the accuracy of home position detection by setting the mechanical home position of your equipment (for example, a photo-sensor) to coincide with the excitation sequence initial stage (step "0").

The motor excitation stage changes simultaneously with pulse input, and returns to the initial stage for each 7.2° rotation of the motor output shaft.
When power is turned ON, the excitation sequence is reset to step "0".

The TIM. LED lights when the "Excitation Timing" signal is output. While the motor is rotating, the LED will turn ON and OFF at a high speed and will appear to be continuously lit.

The "Excitation Timing" signal is output simultaneously with a pulse input each time the excitation sequence returns to step "0".
The excitation sequence will complete one cycle for every 7.2° rotation of the motor output shaft.
Resolution 1: Signal is output once every 10 pulses.
Resolution 10: Signal is output once every 100 pulses.

Timing chart at 0.72°/step (Resolution 1)

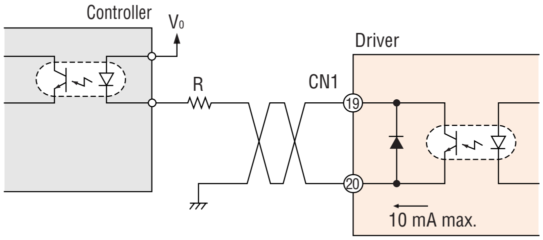


✻When connected as shown in the example connection, the signal will be "photocoupler ON" at step "0".

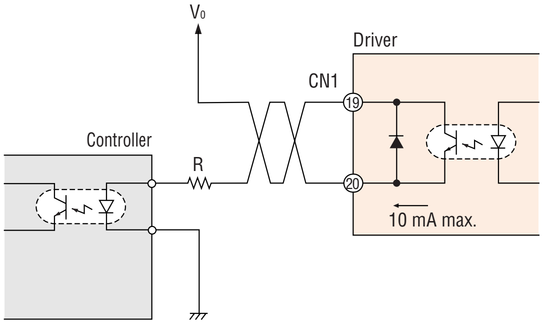
Overheat (O.HEAT) Output Signal

◆Output Circuit and Sample Connection

Current Sink Output



Current Source Output



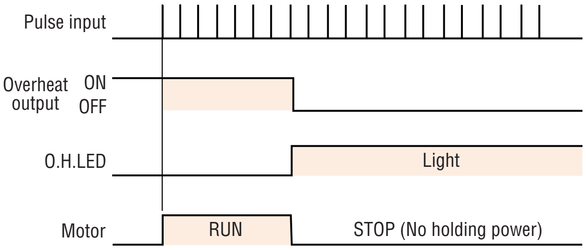
Note:

- Keep the voltage between 5 VDC and 24 VDC.
  Keep the current below 10 mA. If the current exceeds 10 mA, connect external resistance (R).

The "Overheat" signal is output to protect the driver from heat damage if the internal temperature of the driver rises above 176˚F (80˚C).

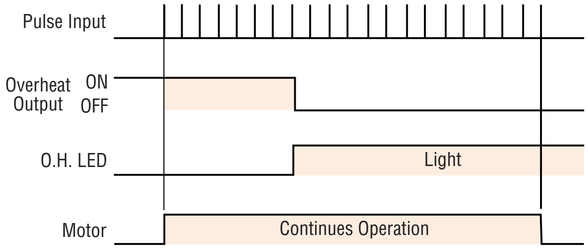
When connected as shown in the example connection, the signal will be "photocoupler OFF" during normal conditions, and "photocoupler ON" when the temperature exceeds 176˚F (80˚C).

When the "Overheat" signal is output, turn the driver power OFF, then adjust the operating conditions (ambient temperature, driver/controller settings), or use a fan to cool the driver. After taking appropriate measures, turn the power ON. Turning the power ON will reset the "Overheat" signal and release the "Automatic Current Off" condition.

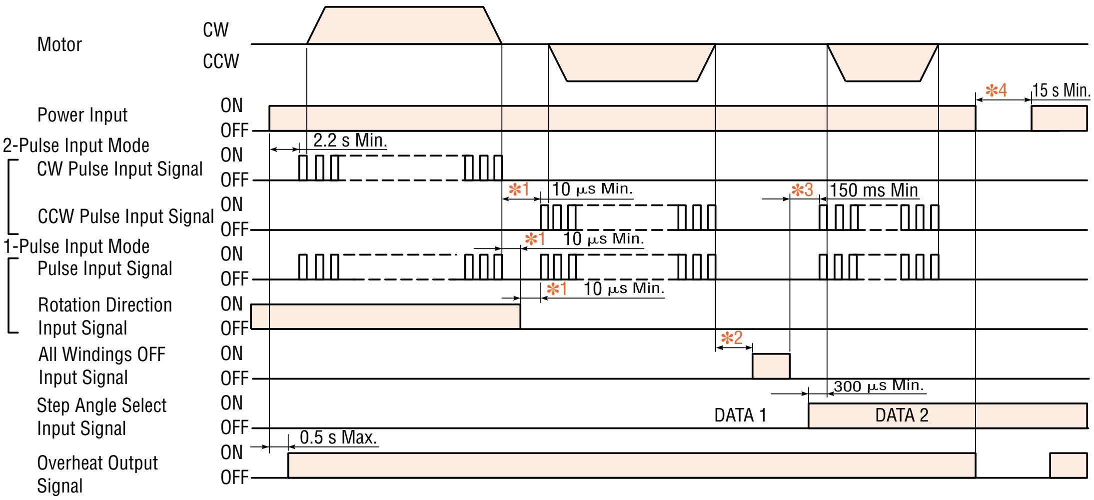


If the “Automatic Current Off” function switch is set to “OFF” position, the motor continues operation even when the “Overheat” signal is output. The output current does not cut off at this time.

When the “Overheat” signal is output, turn the driver power OFF, then adjust the operating conditions (ambient temperature, driver/controller settings), or use a fan to cool the driver. After taking appropriate measures, turn the power ON. Once the power has been turned OFF, wait at least 5 seconds before turning it ON again. After driver's temperature falls to 176˚F (80˚C) or less, turning the power ON will release the “Automatic Current Off” condition.



●Timing Chart



✻1 Switching time to change CW, CCW pulse (2-pulse input mode), and switching time to change direction (1-pulse input mode) 10 μ sec is shown as a response time of circuit. The motor may need more time.

✻2 Depends on load Inertia, load torque, and starting frequency.

✻3 Never input a step pulse signal immediately after switching the "All Winding Off" signal to the photocoupler off state. The motor may not start.

✻4 Wait at least 15 seconds before turning on the power.

List of Motor and Driver Combinations

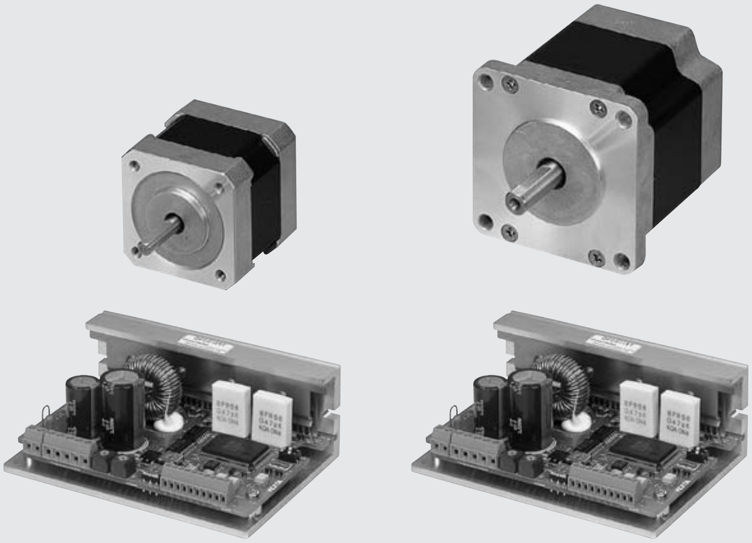
Model numbers for motor driver combinations are shown below.

Type	Model	Motor Model	Driver Model
Standard	**RK543□A**	PK543□W	RKD507-A
	RK544□A	PK544□W	
	RK545□A	PK545□W	
	RK564□A	PK564□W	RKD514L-A
	RK566□A	PK566□W	
	RK569□A	PK569□W	
	RK596□A	PK596□W	RKD514H-A
	RK599□A	PK599□W	
	RK5913□A	PK5913□W	
	RK564□C	PK564□W	RKD514L-C
	RK566□C	PK566□W	
	RK569□C	PK569□W	
	RK596□C	PK596□W	RKD514H-C
	RK599□C	PK599□W	
	RK5913□C	PK5913□W	
TH Geared	**RK543□A-T3.6**	PK543□W-T3.6	RKD507-A
	RK543□A-T7.2	PK543□W-T7.2	
	RK543□A-T10	PK543□W-T10	
	RK543□A-T20	PK543□W-T20	
	RK543□A-T30	PK543□W-T30	
	RK564□A-T3.6	PK564□W-T3.6	RKD514L-A
	RK564□A-T7.2	PK564□W-T7.2	
	RK564□A-T10	PK564□W-T10	
	RK564□A-T20	PK564□W-T20	
	RK564□A-T30	PK564□W-T30	
	RK596□A-T3.6	PK596□W-T3.6	RKD514H-A
	RK596□A-T7.2	PK596□W-T7.2	
	RK596□A-T10	PK596□W1-T10	
	RK596□A-T20	PK596□W1-T20	
	RK596□A-T30	PK596□W1-T30	
	RK564□C-T3.6	PK564□W-T3.6	RKD514L-C
	RK564□C-T7.2	PK564□W-T7.2	
	RK564□C-T10	PK564□W-T10	
	RK564□C-T20	PK564□W-T20	
	RK564□C-T30	PK564□W-T30	
	RK596□C-T3.6	PK596□W-T3.6	RKD514H-C
	RK596□C-T7.2	PK596□W-T7.2	
	RK596□C-T10	PK596□W1-T10	
	RK596□C-T20	PK596□W1-T20	
	RK596□C-T30	PK596□W1-T30	

✻ Enter **A** (Single shaft) or **B** (double shaft) in the box (□) within the model numbers.

Type	Model	Motor Model	Driver Model
PN Geared	**RK544□A-N5**	PK544□W-N5	RKD507-A
	RK544□A-N7.2	PK544□W-N7.2	
	RK544□A-N10	PK544□W-N10	
	RK566□A-N5	PK566□W-N5	RKD514L-A
	RK566□A-N7.2	PK566□W-N7.2	
	RK566□A-N10	PK566□W-N10	
	RK564□A-N25	PK564□W-N25	
	RK564□A-N36	PK564□W-N36	
	RK564□A-N50	PK564□W-N50	
	RK599□A-N5	PK599□W-N5	RKD514H-A
	RK599□A-N7.2	PK599□W-N7.2	
	RK599□A-N10	PK599□W-N10	
	RK596□A-N25	PK596□W-N25	
	RK596□A-N36	PK596□W-N36	
	RK596□A-N50	PK596□W-N50	
	RK566□C-N5	PK566□W-N5	RKD514L-C
	RK566□C-N7.2	PK566□W-N7.2	
	RK566□C-N10	PK566□W-N10	
	RK564□C-N25	PK564□W-N25	
	RK564□C-N36	PK564□W-N36	
	RK564□C-N50	PK564□W-N50	
	RK599□C-N5	PK599□W-N5	RKD514H-C
	RK599□C-N7.2	PK599□W-N7.2	
	RK599□C-N10	PK599□W-N10	
	RK596□C-N25	PK596□W-N25	
	RK596□C-N36	PK596□W-N36	
	RK596□C-N50	PK596□W-N50	
HG Geared	**RK543□A-H50**	PK543□W-H50S	RKD507-A
	RK543□A-H100	PK543□W-H100S	
	RK564□A-H50	PK564□W-H50S	RKD514L-A
	RK564□A-H100	PK564□W-H100S	
	RK564□C-H50	PK564□W-H50S	RKD514L-C
	RK564□C-H100	PK564□W-H100S	
	RK596□A-H50	PK596□W1-H50	RKD514H-A
	RK596□A-H100	PK596□W1-H100	
	RK596□C-H50	PK596□W1-H50	RKD514H-C
	RK596□C-H100	PK596□W1-H100	

✻ Enter **A** (Single shaft) or **B** (double shaft) in the box (□) within the model numbers.



5-Phase Stepping Motor and Driver Package

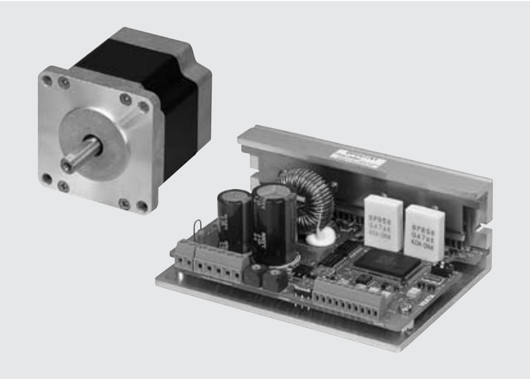
NanoStep® CFK II Series

Additional Information

5-Phase Stepping Motor and Driver Package

NanoStep® CFKⅡ Series

Offering high performance and simple operation in a compact size, the 5-phase **CFKⅡ** Series microstepping driver and motor package is available in both standard and high speed versions. The **CFKⅡ** Series provides unparalleled resolution and low vibration in an open loop system, as well as high torque in the high speed range.



Features

● Extensive Motor Selection

Oriental Motor has expanded the selection of its motors, which are now available in five frame sizes from □0.79 in. (20 mm) to □3.35 in. (85 mm) with torque ranging from 3.2 oz-in (0.0231 N·m) to 890 oz-in (6.3 N·m). The high-torque P-type, 0.79 in. (20 mm) square frame motor features our latest advances in technology providing high torque in a miniature motor, allowing for quick, easy connection.

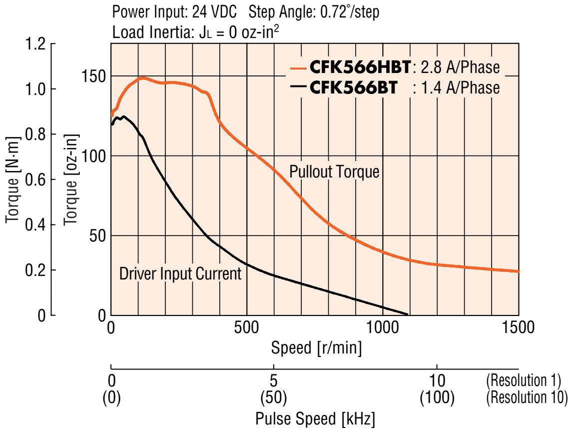
● Compact, Highly Functional Board-Level Driver

The microstepping driver electronically divides the basic step angle of the motor by up to 250 (0.00288°) without the use of a reduction mechanism or other mechanical element. A total of 16 different step angles can easily be selected with a digital switch on the driver. The 24 VDC input driver has an automatic current cutback function and is capable of switching between two different step angles using a signal input. The excitation-timing signal output is convenient for detecting the mechanical home position. The size of this compact yet highly functional driver is 2.76 in. (70 mm) [W] × 3.94 in. (100 mm) [D] × 1.42 in. (36 mm) [H].

● High-Speed Versions Available

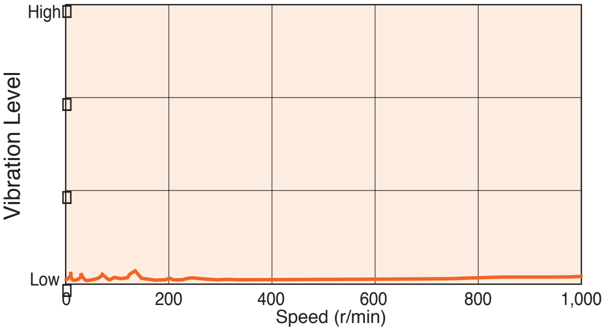
The high-speed versions provide more accurate positioning in the high-speed range, thereby reducing acceleration time.

◆ Comparisons of Speed-Torque Characteristics

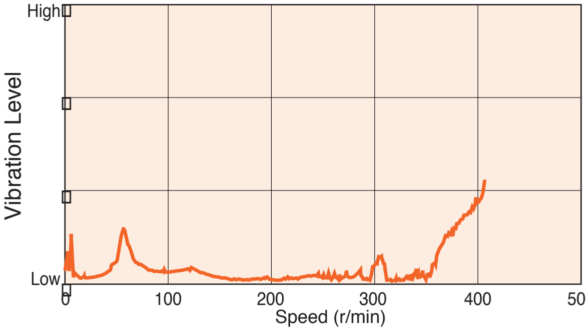


● Enables Low-Vibration Operation in the Low-Speed Range

A typical 2-phase motor vibrates so much at 400 r/min, that it will start to lose synchronization (misstep). However, a typical 5-phase motor can go up to 1000 r/min without any significant increase in vibration.



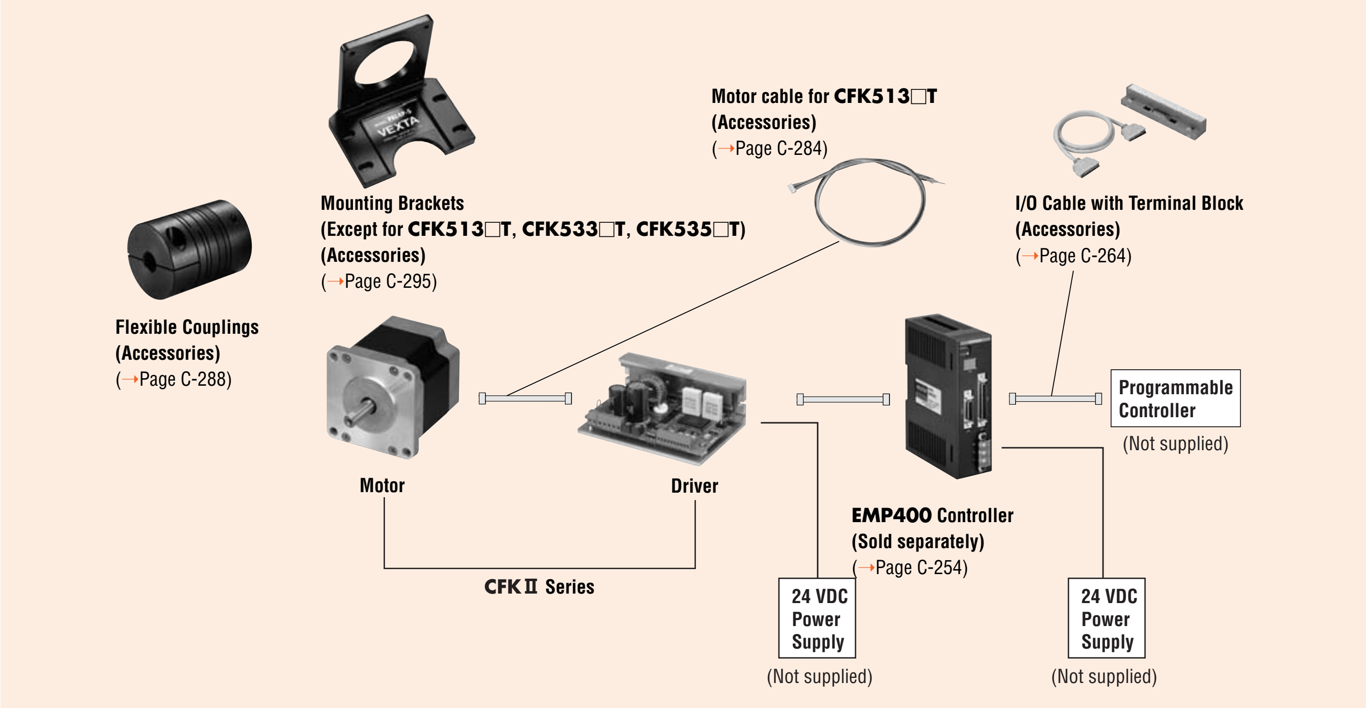
CFKⅡ Series 5-Phase Microstepping Driver and Motor



Comparable 2-Phase Microstepping Driver and Motor

Features C-106 System Configuration C-107 Specifications/Characteristics C-108

System Configuration



An example of a single-axis system configuration with the **EMP400** Series controller.

Product Number Code

CFK 5 6 6 H A T

CFK: **NanoStep** **CFK II** Series

5: 5-Phase

6: Motor Frame Size
1: 0.79 in. sq. (20 mm sq.)
3: 1.10 in. sq. (28 mm sq.)
4: 1.65 in. sq. (42 mm sq.)
6: 2.36 in. sq. (60 mm sq.)
9: 3.35 in. sq. (85 mm sq.)

6: Motor Case Length

H: High Speed Type
P: Standard **P** Type
Blank: Standard Type

Shaft Type **A**: Single Shaft
B: Double Shaft

T: Terminal Connection Type

Product Line

Type	Power Supply Voltage	Maximum Holding Torque				
		☐0.79 in. (☐20 mm)	☐1.10 in. (☐28 mm)	☐1.65 in. (☐42 mm)	☐2.36 in. (☐60 mm)	☐3.35 in. (☐85 mm)
Standard **P** Type (High Torque)	24 VDC	3.2 oz-in (0.0231 N·m)	—	—	—	—
Standard Type		—	4.6~8.5 oz-in (0.033~0.06 N·m)	18.4~34 oz-in (0.13~0.24 N·m)	59~230 oz-in (0.42~1.66 N·m)	—
High-Speed Type		—	—	—	117~230 oz-in (0.83~1.66 N·m)	290~890 oz-in (2.1~6.3 N·m)

Standard P Type (High Torque) Motor Frame Size: □ 0.79 in. (□ 20 mm)
Standard Type Motor Frame Size: □ 1.10 in. (□ 28 mm)

Specifications

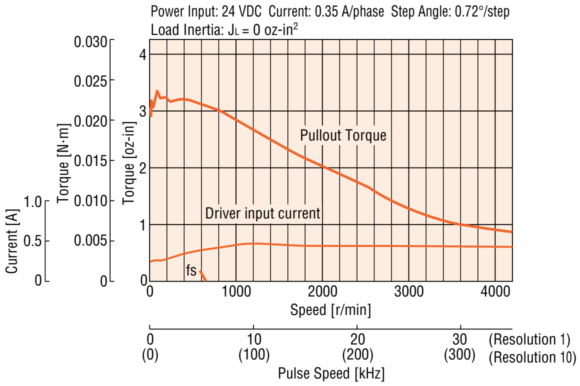
Model	Single Shaft	CFK513PAT	CFK533AT	CFK535AT
	Double Shaft	CFK513PBT	CFK533BT	CFK535BT
Maximum Holding Torque	oz-in (N·m)	3.2 (0.0231)	4.6 (0.033)	8.5 (0.06)
Rotor Inertia J	oz-in^2 (kg·m^2)	0.0142 (2.6×10^{-7})	0.049 (9×10^{-7})	0.098 (18×10^{-7})
Rated Current	A/phase	0.35	0.75	
Basic Step Angle		0.72°		
Power Source Input		24 VDC±10% 0.6 A	24 VDC±10% 1 A	
Excitation Mode		Microstep: Basic Step Angle/n* (/step)		
Weight	Motor lb. (kg)	0.11 (0.05)	0.22 (0.1)	0.37 (0.17)
	Driver lb. (kg)	0.44 (0.2)		
Dimension No.	Motor	$\boxed{1}$	$\boxed{2}$	
	Driver	$\boxed{6}$		

How to Read Specifications Table→Page C-9

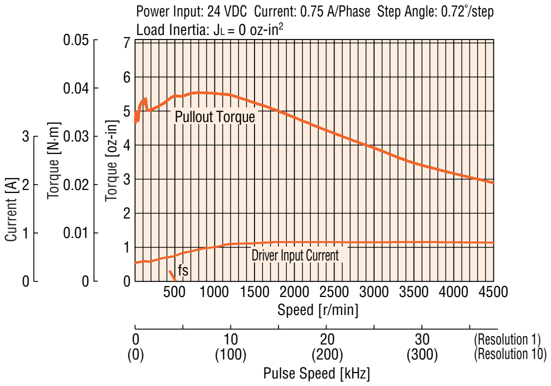
* Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Speed — Torque Characteristics **How to Read Speed-Torque Characteristics**→Page C-10

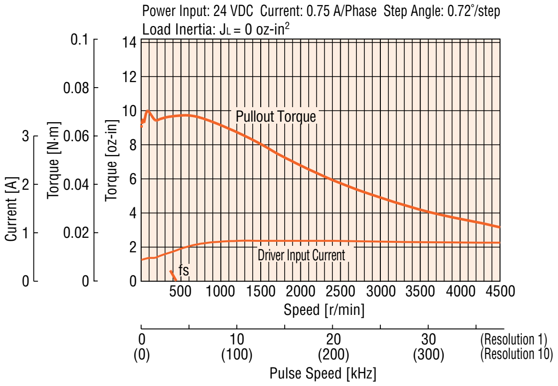
CFK513P□T



CFK533□T



CFK535□T



Note:
The pulse input circuit responds up to approximately 500 kHz with a pulse duty of 50 %.

Standard Type Motor Frame Size: ☐ 1.65 in. (☐ 42 mm), ☐ 2.36 in. (☐ 60 mm)

Specifications

Model	Single Shaft		CFK543AT	CFK544AT	CFK545AT	CFK564AT	CFK566AT	CFK569AT
	Double Shaft		CFK543BT	CFK544BT	CFK545BT	CFK564BT	CFK566BT	CFK569BT
Maximum Holding Torque		oz-in (N·m)	18.4 (0.13)	25 (0.18)	34 (0.24)	59 (0.42)	117 (0.83)	230 (1.66)
Rotor Inertia J		oz-in^2 (kg·m^2)	$0.191\ (35\times10^{-7})$	$0.3\ (54\times10^{-7})$	$0.37\ (68\times10^{-7})$	$0.96\ (175\times10^{-7})$	$1.53\ (280\times10^{-7})$	$3.1\ (560\times10^{-7})$
Rated Current		A/phase	0.75			1.4		
Basic Step Angle			0.72°					
Power Source Input			24 VDC±10% 1 A			24 VDC±10% 2 A		
Excitation Mode			Microstep: Basic Step Angle/n✻ (/step)					
Weight	Motor	lb. (kg)	0.46 (0.21)	0.59 (0.27)	0.77 (0.35)	1.3 (0.6)	1.8 (0.8)	2.9 (1.3)
	Driver	lb. (kg)	0.44 (0.2)					
Dimension No.	Motor		3			4		
	Driver		6					

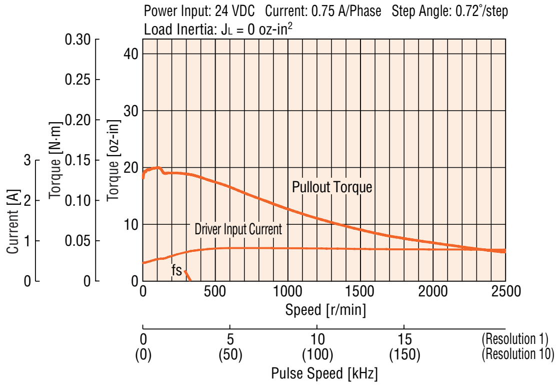
How to Read Specifications Table→Page C-9

✻ Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

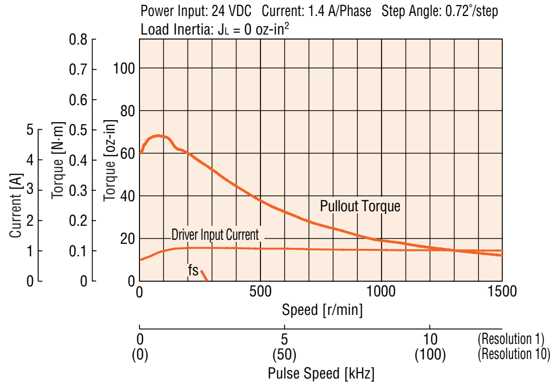
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

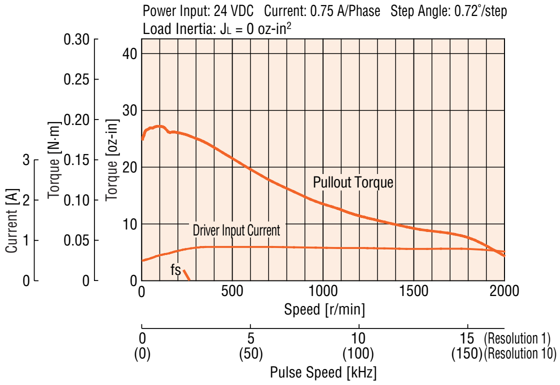
CFK543□T



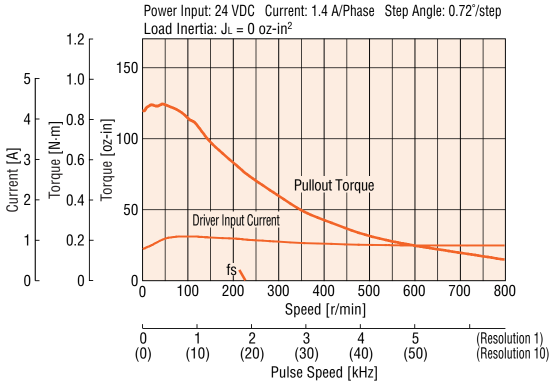
CFK564□T



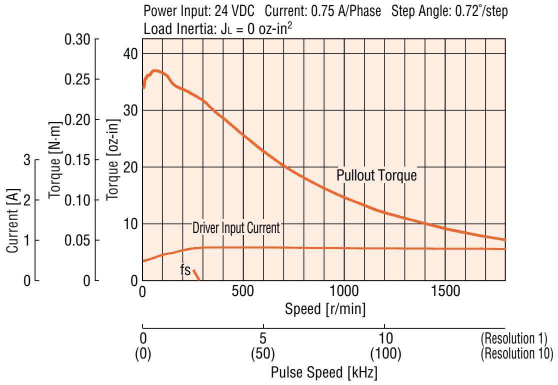
CFK544□T



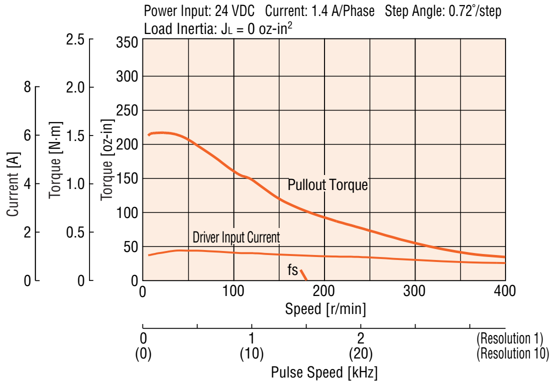
CFK566□T



CFK545□T



CFK569□T



Note:
The pulse input circuit responds up to approximately 500 kHz with a pulse duty of 50 %.

High-Speed Type Motor Frame Size: □ 2.36 in. (□ 60 mm), □ 3.35 in. (□ 85 mm)

Specifications

Model	Single Shaft	CFK566HAT	CFK569HAT	CFK596HAT	CFK599HAT	CFK5913HAT
	Double Shaft	CFK566HBT	CFK569HBT	CFK596HBT	CFK599HBT	CFK5913HBT
Maximum Holding Torque	oz-in (N·m)	117 (0.83)	230 (1.66)	290 (2.1)	580 (4.1)	890 (6.3)
Rotor Inertia J	oz-in^2 (kg·m^2)	1.53 (280×10^{-7})	3.1 (560×10^{-7})	7.7 (1400×10^{-7})	14.8 (2700×10^{-7})	22 (4000×10^{-7})
Rated Current	A/phase	2.8				
Basic Step Angle		0.72°				
Power Source Input		24 VDC±10% 4 A				
Excitation Mode		Microstep: Basic Step Angle/n* (/step)				
Weight	Motor lb. (kg)	1.8 (0.8)	2.9 (1.3)	3.7 (1.7)	6.2 (2.8)	8.4 (3.8)
	Driver lb. (kg)	0.48 (0.22)				
Dimension No.	Motor	4		5		
	Driver	6				

How to Read Specifications Table→Page C-9

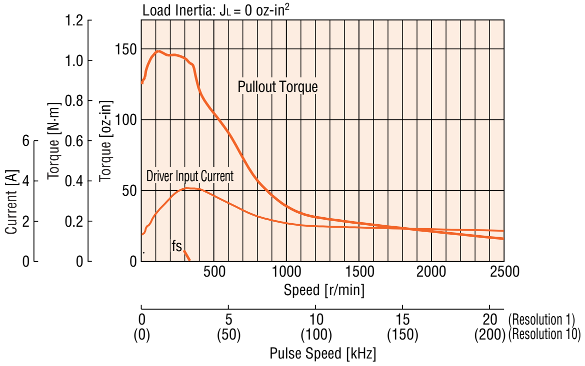
* Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

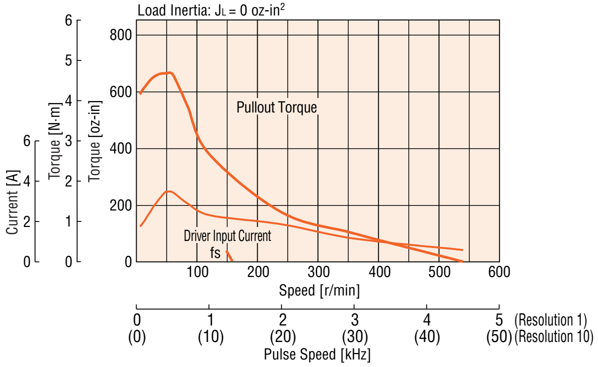
CFK566H□T

Power Input: 24 VDC Current: 2.8 A/Phase Step Angle: 0.72°/step
Load Inertia: JL = 0 oz-in^2



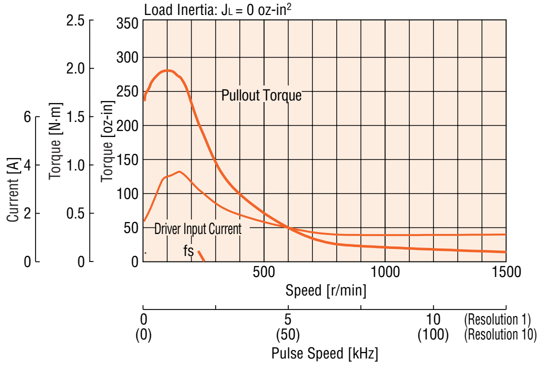
CFK599H□T

Power Input: 24 VDC Current: 2.8 A/Phase Step Angle: 0.72°/step
Load Inertia: JL = 0 oz-in^2



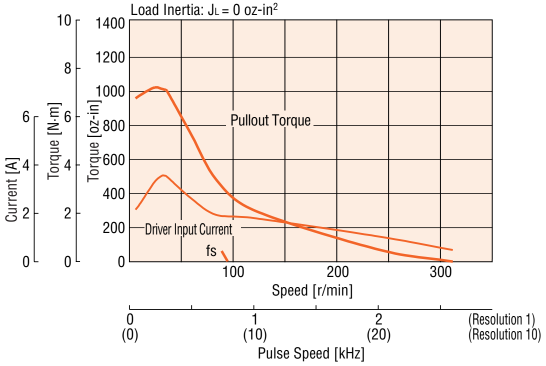
CFK569H□T

Power Input: 24 VDC Current: 2.8 A/Phase Step Angle: 0.72°/step
Load Inertia: JL = 0 oz-in^2



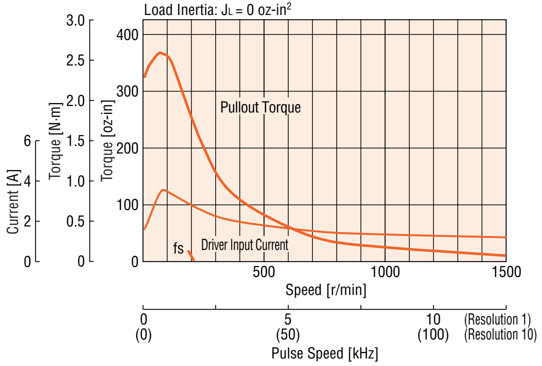
CFK5913H□T

Power Input: 24 VDC Current: 2.8 A/Phase Step Angle: 0.72°/step
Load Inertia: JL = 0 oz-in^2



CFK596H□T

Power Input: 24 VDC Current: 2.8 A/Phase Step Angle: 0.72°/step
Load Inertia: JL = 0 oz-in^2



Note:
The pulse input circuit responds up to approximately 500 kHz with a pulse duty of 50 %.

Features C-106 System Configuration C-107 Specifications/Characteristics C-108

Common Specifications

Input Signal	Input Mode	Photocoupler input Signal Voltage Photocoupler "ON": +4.5~+5V Photocoupler "OFF": 0~+1 V (Voltage between terminals) Pulse, Direction Rotation Input: 20 mA maximum, input resistance 220 Ω All Windings OFF, Step Angle Select Input: 15 mA maximum, input resistance 470Ω
	Pulse Signal	Step command pulse signal (CW direction operation command signal in 2-pulse input mode) Pulse width: 1 μs minimum, pulse rise/fall: 2 μs maximum, Pulse duty : Max. 50 % The motor moves one step when the pulse input is switched from photocoupler On to Off. Maximum Input Pulse Frequency 500 kHz (When the pulse duty is 50 %)
	Rotation Direction Signal	Rotation direction command signal, Photocoupler "ON": CW; Photocoupler "OFF": CCW (CCW direction operation command signal in 2-pulse input mode Pulse width: 1 μs minimum, pulse rise/fall: 2 μs maximum, Pulse duty : Max. 50 % The motor moves one step when the pulse input is switched from photocoupler On to Off. Maximum Input Pulse Frequency 500 kHz (When the pulse duty is 50 %))
	Step Angle Select Signal	Step angle specified by DATA1 when photocoupler is OFF. Step angle specified by DATA2 when photocoupler is ON.
	All Windings Off Signal	When in the "photocoupler ON" state, the output current to the motor is cut off and the motor's shaft can be rotated manually. When in the "photocoupler OFF" state, the operating current is supplied to the motor.
Output Signal	Output Mode	Photocoupler, Open collector output, External usage conditions: 24 VDC maximum, 10 mA maximum.
	Excitation Timing Signal	The signal is output each time the excitation sequence returns to the initial stage "0". (Photocoupler: ON) e.g. 0.72°/step (resolution 1): Signal output every 10 pulses; or 0.072°/step (resolution 10); Signal output every 100 pulses
Functions		Step angle switch, Pulse input mode switch, Current check switch, Automatic current cutback
Cooling Method		Natural ventilation

- The input power current supplied to the driver represents the maximum input value (which varies with pulse speed).

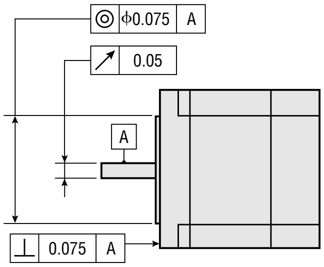
General Specifications

		Motor	Driver
Insulation Resistance		100 MΩ minimum under normal temperature and humidity, when measured by a 500 VDC megger between the windings and case.	—
Dielectric Strength		Sufficient to withstand 1.5 kV (**CFK513□T**, **CFK53□T**: 0.5 kV, **CFK54□T**: 1.0 kV), 50 Hz power applied between the windings and casing for one minute under normal temperature and humidity.	—
Insulation Class		Class B [266°F (130°C)] Recognized as Class A [221°F (105°C)] by UL and CSA standards.	—
Operating Environment	Ambient Temperature	14°F~122°F (−10°C~+50°C) (nonfreezing)	32°F~104°F (0°C~+40°C) (nonfreezing)
	Ambient Humidity	85% or less (noncondensing)	
	Atmosphere	No corrosive gases, dust, water or oil.	
Temperature Rise		Temperature rise of the coil measured by the Change Resistance Method is 144°F (80°C) or less. (at standstill, five phases energized)	—
Static Angle Error[✻1]		±3 arc minutes (±0.05°) [**CFK513**: ±10 arc minutes (±0.17°), **CFK53□**: ±5 arc minutes (±0.084°)]	—
Shaft Runout		0.002 inch (0.05 mm) T.I.R.[✻4]	—
Radial Play[✻2]		0.001 inch (0.025 mm) max. [Load torque: 1.12 lb. (5 N)]	—
Axial Play[✻3]		0.003 inch (0.075 mm) max. [Load torque: 2.2 lb. (10 N)]	—
Concentricity		0.003 inch (0.075 mm) T.I.R.[✻4]	—
Perpendicularity		0.003 inch (0.075 mm) T.I.R.[✻4]	—

✻1 This value is for full step with no load (value changes with size of load).
✻2 Radial Play: Displacement in shaft position in the radial direction, when a 1.12 lb. (5 N) load is applied in the vertical direction to the tip of the motor's shaft.
✻3 Axial Play: Displacement in shaft position in the axial direction, when a 2.2 lb. (10 N) load is applied to the motor's shaft in the axial direction.
✻4 T.I.R. (Total Indicator Reading): Total dial gauge reading when the measured section is rotated one revolution centered on a reference axis.

Note:

- Do not measure insulation resistance or perform the dielectric strength test while the motor and driver are connected.



Permissible Overhung Load and Permissible Thrust Load

Unit = Upper values: lb./Lower values: N

Model	Overhung Load Distance from Shaft End [in. (mm)]					Thrust Load
	0 (0)	0.2 (5)	0.39 (10)	0.59 (15)	0.79 (20)	
CFK513P□T	2.7 12	3.3 15	—	—	—	The permissible thrust load [lb.(N)] shall be no greater than the motor mass.
CFK533□T **CFK535□T**	5.6 25	7.6 34	11.7 52	—	—	
CFK543□T **CFK544□T** **CFK545□T**	4.5 20	5.6 25	7.6 34	11.7 52	—	
CFK564□T **CFK566□T, CFK566H□T** **CFK569□T, CFK569H□T**	14.1 63	16.8 75	21 95	29 130	42 190	
CFK596H□T **CFK599H□T** **CFK5913H□T**	58 260	65 290	76 340	87 390	108 480	

- Enter the shaft type **A** or **B** in the box (□) within the model number.

Dimensions

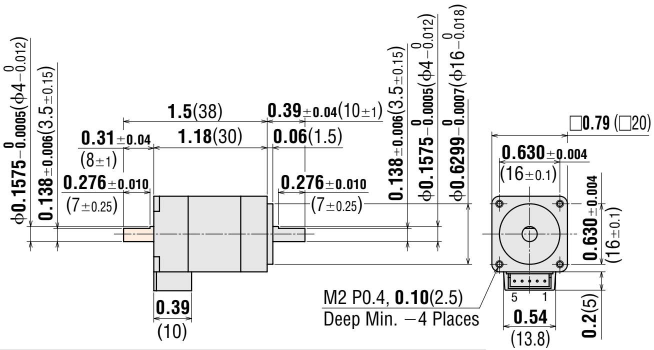
Scale 1/4, Unit = **inch** (mm)

● Motor

◆ Standard P Type (High Torque)

1 Motor Frame Size: □ 0.79 in. (□ 20 mm)

(Scale 1/2)



Model	Motor Model	Weight lb. (kg)	DXF
CFK513P□T	PK513P□	0.11 (0.05)	B316

- Enter the shaft type **A** or **B** in the box (□) within the model number.

Applicable Connector

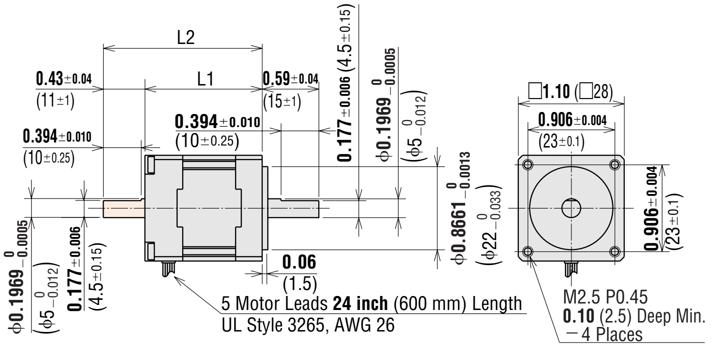
Contact Housing	51065-0500 (MOLEX)
Contact	50212-8100 (MOLEX)
Crimp tool	57176-5000 (MOLEX)

Note:
Connectors are not included.
Use the motor cables with connector (not included).

◆ Standard Type

2 Motor Frame Size: □ 1.10 in. (□ 28 mm)

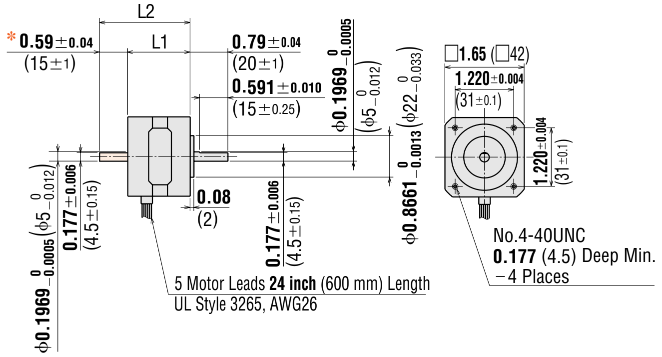
(Scale 1/2)



Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
CFK533□T	PMM33□H2	1.22 (31)	1.65 (42)	0.22 (0.1)	B036
CFK535□T	PMM35□H2	1.99 (50.5)	2.42 (61.5)	0.37 (0.17)	B037

- Enter the shaft type **A** or **B** in the box (□) within the model number.

3 Motor Frame Size: □ 1.65 in. (□ 42 mm)



✻ The length of machining on double shaft model is **0.591**±**0.010** (15±25).

Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
CFK543□T	PK543N□WA	1.3 (33)	1.89 (48)	0.46 (0.21)	B068U
CFK544□T	PK544N□WA	1.54 (39)	2.13 (54)	0.59 (0.27)	B069U
CFK545□T	PK545N□WA	1.85 (47)	2.44 (62)	0.77 (0.35)	B070U

- Enter the shaft type **A** or **B** in the box (□) within the model number.

- These dimensions are for double shaft models. For single shaft models, ignore the shaded areas.

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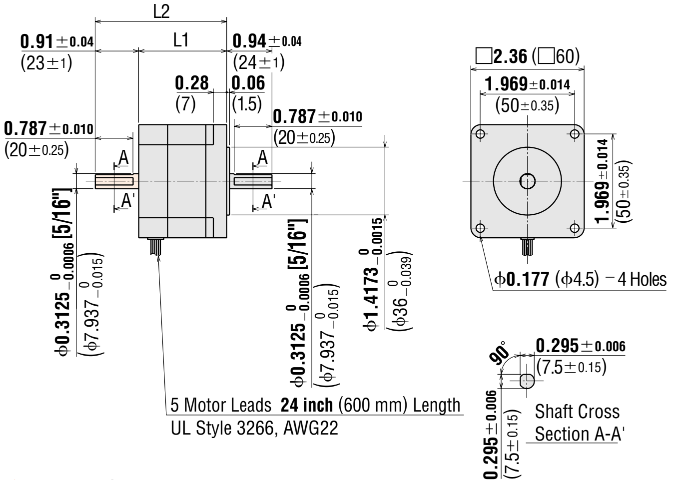
◆ Standard Type, High-Speed Type

4 Motor Frame Size: ☐ 2.36 in. (☐ 60 mm)

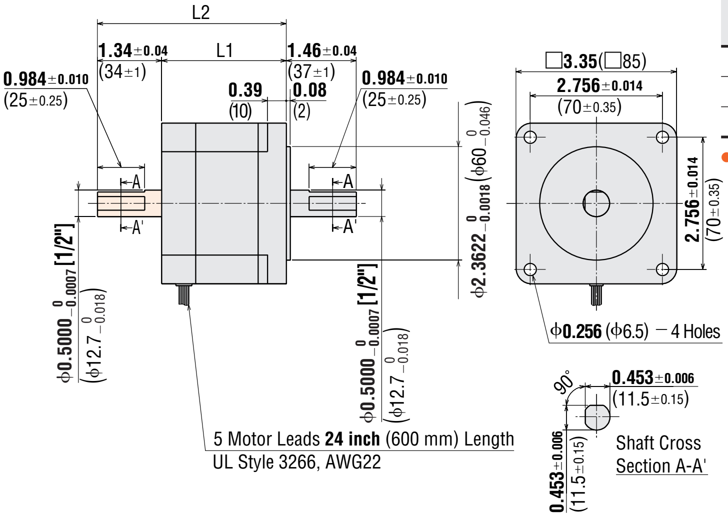


Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
CFK564☐T	PK564N☐WA	1.83 (46.5)	2.74 (69.5)	1.3 (0.6)	B071U
CFK566☐T	PK566N☐WA	2.26 (57.5)	3.17 (80.5)	1.8 (0.8)	B072U
CFK566H☐T	PK566H-N☐A				
CFK569☐T	PK569N☐WA	3.43 (87)	4.33 (110)	2.9 (1.3)	B073U
CFK569H☐T	PK569H-N☐A				

- Enter the shaft type **A** or **B** in the box (☐) within the model number.

◆ High-Speed Type

5 Motor Frame Size: ☐ 3.35 in. (☐ 85 mm)



Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
CFK596H☐T	PK596-N☐A	2.6 (66)	3.94 (100)	3.7 (1.7)	B155U
CFK599H☐T	PK599-N☐A	3.78 (96)	5.12 (130)	6.2 (2.8)	B156U
CFK5913H☐T	PK5913-N☐A	4.96 (126)	6.3 (160)	8.4 (3.8)	B157U

- Enter the shaft type **A** or **B** in the box (☐) within the model number.

- These dimensions are for double shaft models.
For single shaft models, ignore the shaded areas.

● Driver

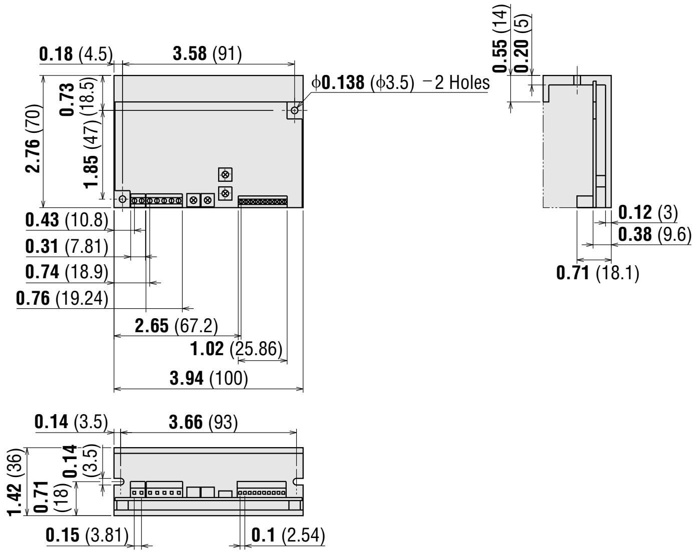
6 Model: DFC5103T, DFC5107T, DFC5114T

Weight: 0.44 lb. (0.2 kg)

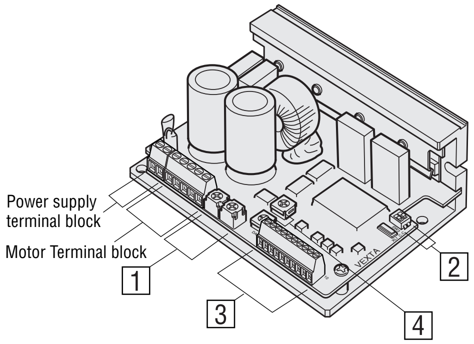
Model: DFC5128T

Weight: 0.48 lb. (0.22 kg)

DXF B285U



Connection and Operation



1 Current Adjustment Potentiometer

Indicator	Switch Name	Function
RUN	Motor run current potentiometer	For adjusting the motor running current
STOP	Motor stop current potentiometer	For adjusting the current at the motor standstill

2 Function Select Switches

Indicator	Switch Name	Function
2P/1P	Pulse input mode switch	Switch between 1-pulse input mode and 2-pulse input mode.
C.C./OFF	DC check switch	Adjusts the motor's running current. When running current the motor, always have this switch set to OFF. The factory setting is OFF

3 Input/Output Signal

Indicator	Input/Output	Terminal No.	Signal Name
TB3	Input signal	1	Pulse Signal (CW Pulse Signal)
		2	
		3	Rotation Direction Signal (CCW Pulse Signal)
		4	
		5	All Windings Off Signal
		6	
	Output signal	7	Excitation Timing Signal
		8	
	Input signal	9	Step Angle Select Signal
		10	

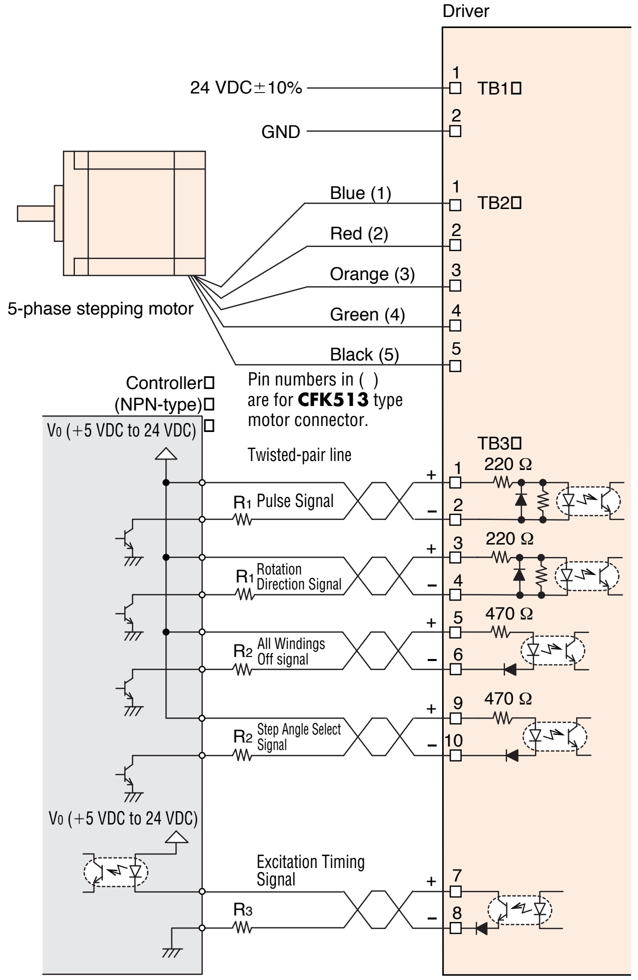
4 Resolution Select Switches

Indicator	Switch Name	Function
DATA1	Step Angle Select Switch	Each switch can be set to the desired resolution from the 16 resolution levels.
DATA2		

Step Angle	Resolution	Step Angle Select Switch (Common to DATA 1 and DATA 2)
0.72°	1	0
0.36°	2	1
0.288°	2.5	2
0.18°	4	3
0.144°	5	4
0.09°	8	5
0.072°	10	6
0.036°	20	7
0.0288°	25	8
0.018°	40	9
0.0144°	50	A
0.009°	80	B
0.0072°	100	C
0.00576°	125	D
0.0036°	200	E
0.00288°	250	F

Features C-106 System Configuration C-107 Specifications/Characteristics C-108

Connection Diagrams



Notes:

- Keep the input single voltage Vo between 5 VDC and 24 VDC.
  When Vo is equal to 5 VDC, the external resistances R1 and R2 are not necessary. When Vo is above 5 VDC, connect R1 and R2 to keep the current as follows:
  Pulse, Rotation Direction: 10 mA to 20 mA max.
  All Windings Off, Step Angle Select: 10 mA to 15 mA max.
- Keep the output signal voltage Vo between 5 VDC and 24 VDC.
  When Vo is equal to 5 VDC, the external resistance R3 is not necessary. When it is above 5 VDC, connect R3 to keep the current below 10 mA max.
- Use twisted-pair wire of AWG 24 to AWG 22 and 6.6 feet (2 m) or less in length for the signal line.
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.(→Technical Reference Page F-36)
- Suitable wire size for the TB1, TB2 and TB3 terminal block is between AWG20 and AWG26. Use AWG 20 for standard type (DFC5103T, DFC5107T, DFC5114T) and AWG 20 to AWG 18 for high-speed type (DFC5128T) for power supply lines.
- Use spot grounding to ground the driver and external controller.
- Signal lines should be kept at least 3.9 inches (10 cm) away from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.
- If noise generated by the motor lead wire causes a problem, try shielding the motor lead wires with conductive tape or wire mesh.
- Incorrect connection of DC power input will lead to driver damage. Make sure that the polarity is correct before turning the power on.

◆ Description of Input/Output Signals

Pulse Input and Rotation Direction Input

1-Pulse Input Mode

Pulse Signal

"Pulse" signal is input to the Pulse – terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step. The direction of rotation is determined by the rotation direction signal.

Rotation Direction Input

The "Rotation Direction" signal is input to D./CCW – terminal. A "photocoupler ON" signal input commands a clockwise direction rotation. A "photocoupler OFF" signal input commands a counter-clockwise direction rotation.

2-Pulse Input Mode

CW Pulse Signal

"Pulse" signal is input to the P./CW – terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step in the clockwise direction.

CCW Pulse Signal

"Pulse" signal is input to the D./CCW – terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step in the counterclockwise direction.

All Windings Off (A.W. OFF) Input

When the "All Windings Off" (A.W. OFF) signal is in the "photocoupler ON" state, the current to the motor is cut off and motor torque is reduced to zero. The motor output shaft can then be rotated freely by hand. This signal is used when moving the motor by external force or the manual home position.

Step Angle Select (C/S) Input

When the "Step Angle Select" signal is in the "photocoupler OFF" state, the step angle set by step resolution select switch DATA1 is selected, and when the "Step Angle Select" signal is in the "photocoupler ON" state, the step angle set by step resolution select switch DATA2 is selected. This signal can be used to change the motor speed or amount of rotation without altering the input pulses.

Excitation Timing (TIMING) Output

The Excitation Timing signal is output once each time the excitation sequence returns to step "0" in synchronization with input pulse. The excitation sequence is designed to complete one cycle as the motor shaft rotates 7.2˚.

0.72˚/step (resolution 1): Signal is output once every 10 pulses.

0.072˚/step (resolution 10): Signal is output once every 100 pulses.

Step Angle Selection

With the **CFKⅡ** Series, the motor speed and step distance can be changed without changing the input pulse frequency by switching the step angle switch. The step angle is set with step angle setting switches DATA1 and DATA2. DATA1 and DATA2 each have 16 settings from which one step angle each can be selected. The step angles that can be set are shown in the table below.

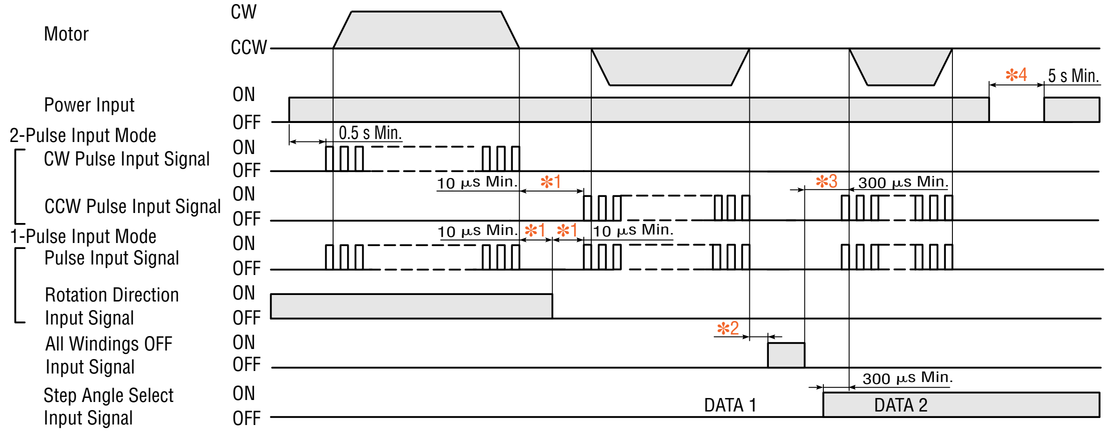
DATA1 and DATA2 are set to the scale corresponding to the step angle selected for each. The step angle is changed with the step angle select signals.

Photocoupler "OFF": The step angle set with DATA1 is selected.

Photocoupler "ON": The step angle set with DATA2 is selected.

Step Angle	Resolution	Step Angle Select Switch (Common to DATA 1 and DATA 2)
0.72°	1	0
0.36°	2	1
0.288°	2.5	2
0.18°	4	3
0.144°	5	4
0.09°	8	5
0.072°	10	6
0.036°	20	7
0.0288°	25	8
0.018°	40	9
0.0144°	50	A
0.009°	80	B
0.0072°	100	C
0.00576°	125	D
0.0036°	200	E
0.00288°	250	F

Timing Chart



The shaded section indicates that the photocoupler is on.

✻1 Switching time to change CW, CCW pulse (2-pulse input mode), and switching time to change direction (1-pulse input mode) 10 μ sec is shown as a response time of circuit. The motor may need more time.

✻2 Depends on load inertia, load torque, and starting frequency.

✻3 Never input a step pulse signal immediately after switching the "All Winding Off" signal to the photocoupler off state. The motor may not start.

✻4 Wait at least 5 seconds before turning on the power.

Features C-106 System Configuration C-107 Specifications/Characteristics C-108

Adjusting the Current

Adjusting the Motor Current

Use the "RUN" potentiometer to decrease the current and suppress the temperature rise in the motor/driver, or when there is sufficient motor torque and you want to suppress vibration by lowering the current.

Use the "STOP" potentiometer to readjust the current at motor standstill in relation to the holding-brake force of the motor.

Factory settings

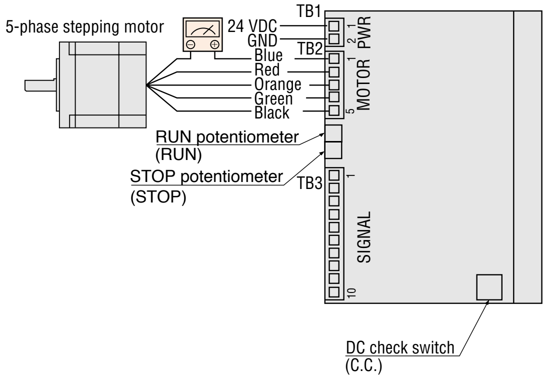
Running current:	Rated current
Current at motor standstill:	Approx. 50% of rated current

Follow the procedure below to adjust the motor current.

1 Connecting an Ammeter

Connect a DC ammeter as illustrated below.

Connect an ammeter between pin ① of TB2 connector and the motor. Set all driver input signals to the "photocoupler OFF" state.



Note:

- Do not input pulse signals.

2 Adjusting the Motor Running Current

To adjust the motor running current, follow the procedure below:

1. Set the current-checking switch to the "photocoupler ON" state. Keep other signals in the "photocoupler OFF" state.
2. Turn on the power to the driver.
3. Use the "RUN" potentiometer to adjust the motor's running current.
4. When the power is turned on, the value measured by the ammeter represents the total current in two phases through the blue motor lead wire. The current for one phase is equivalent to one-half the ammeter value. (Example: To set the current to 1.0 A/phase, adjust the current level until the ammeter reads 2.0 A.)
5. When the running current has been adjusted, set the current-checking switch back to the "photocoupler OFF" state.

Notes:

- Be sure to use the motor at the rated current or below.
- Adjusting the running current will also change the current at standstill.

3 Adjusting the Current at Motor Standstill

To adjust the current at motor standstill, follow the procedure below:

1. Set the current-checking switch to the "photocoupler OFF" state. Keep other signals in the "photocoupler OFF" state.
2. Turn on the power to the driver.
3. Use the "STOP" potentiometer to adjust the motor's running current.
4. When the power is turned on, the value measured by the ammeter represents the total current in two phases through the blue motor lead wire. The current for one phase is equivalent to one-half the ammeter value. (Example: To set the current to 1.0 A/phase, adjust the current level until the ammeter reads 2.0 A.)

$$\text{Holding Torque [oz-in (N·m)]} = \frac{\text{Maximum Holding Torque [oz-in (N·m)]} \times \text{Current at Standstill [A]}}{\text{Motor rated current [A]}}$$

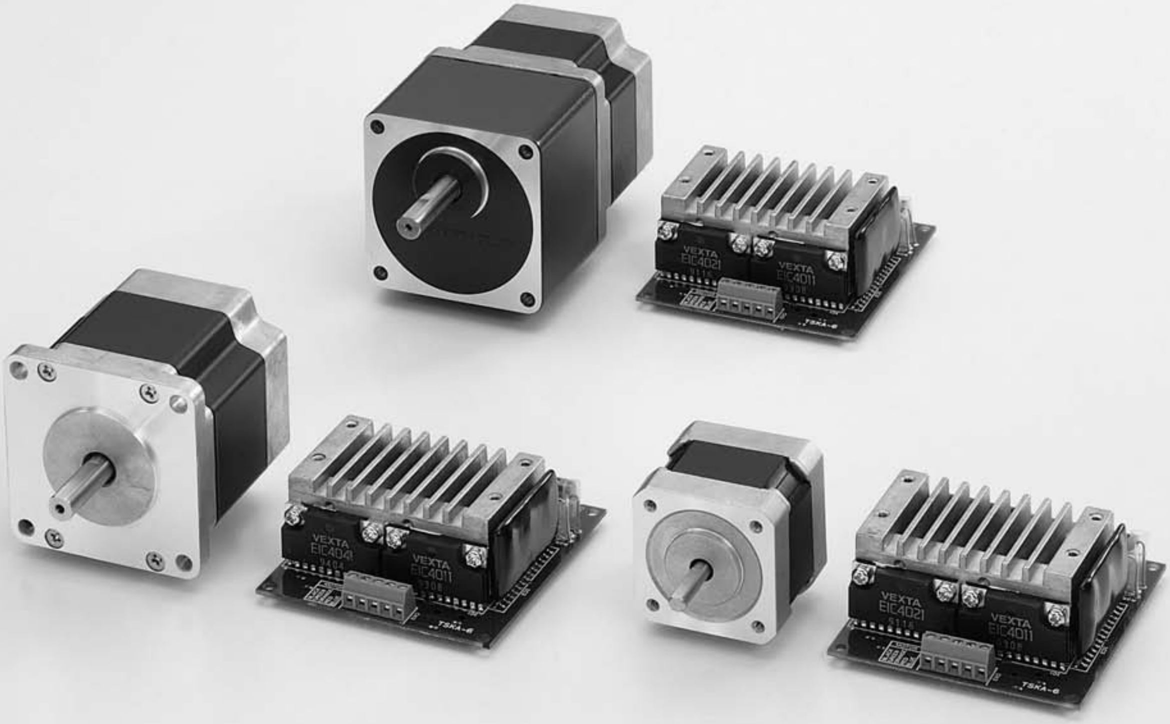
Notes:

- Always set the running current first, turn off the driver power and turn it back on, and then set the current at standstill. Setting the running current after current at standstill may change the current setting at standstill.
- Setting the current at motor standstill too low may affect the starting of the motor or the position-holding action.

List of Motor and Driver Combinations

Type	Model	Motor Model	Driver Model
Standard **P** Type	**CFK513P□T**	PK513P□	DFC5103T
Standard	**CFK533□T**	PMM33□H2	DFC5107T
	CFK535□T	PMM35□H2	
	CFK543□T	PK543N□WA	
	CFK544□T	PK544N□WA	
	CFK545□T	PK545N□WA	
	CFK564□T	PK564N□WA	DFC5114T
	CFK566□T	PK566N□WA	
	CFK569□T	PK569N□WA	
High Speed	**CFK566H□T**	PK566H-N□A	DFC5128T
	CFK569H□T	PK569H-N□A	
	CFK596H□T	PK596-N□A	
	CFK599H□T	PK599-N□A	
	CFK5913H□T	PK5913-N□A	

- Enter the shaft type **A** or **B** in the box (□) within the model number.



5-Phase Stepping Motor and Driver Package

CSK Series

Additional Information

5-Phase Stepping Motor and Driver Package

CSK Series

The **CSK** Series combines a 5-phase stepping motor and a 24 VDC input board-level driver to provide high torque, high resolution and low vibration in a compact package.

Features

● High torque

The **CSK** Series features **PK** motors, designed to produce high torque in a compact frame size.

● Low Vibration

Smooth rotation is achieved with no noticeable resonance, allowing for low vibration and low noise.

● Compact Package

Both the motor and driver are compact in design, making them perfect for reducing the size and weight of any system.

● High Resolution

5-phase stepping motors move 0.72° per step in full-step mode and 0.36° per step in half-step mode −2.5 times the resolution of a 2-phase stepping motor. This mechanically reduced step angle makes for extremely accurate positioning.

● Tapered Hobbed (TH) Geared Type

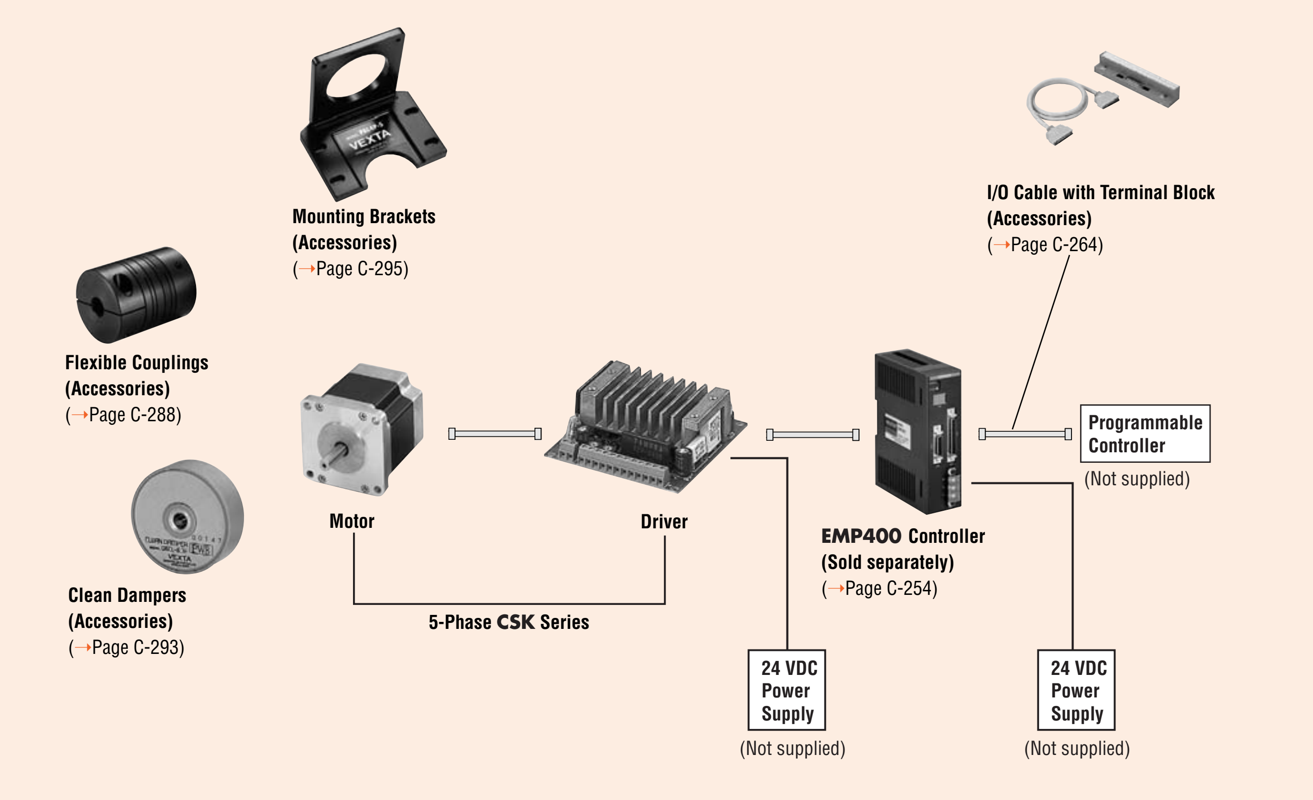
These low backlash geared stepping motors provide high permissible torque in a compact size. They are optimal for applications in which high torque is required in tight spaces.

Safety Standards and CE Marking

Product	Standards	Certification Body	File No.	CE Marking
Stepping Motor	UL1004, UL519 CSA C22.2 No.77 CSA C22.2 No.100	UL	E64199	EMC Directives
Driver	UL508C CSA C22.2 No.14	UL	E171462	
	UL1950 CSA C22.2 No.950	UL	E208200	

- Approval conditions for UL1950: Class Ⅲ equipment, SELV circuit, Pollution degree 2
- **CSK54**□ [Motor frame size: 1.65 in. sq (42 mm sq.)] types do not comply with CSA standards.
- **CSK59**□ [Motor frame size: 3.35 in. sq (85 mm sq.)] type is not recognized by UL and CSA.
- When the system is approved under various safety standards, the model names on the motor and driver nameplates are the approved model names.
  List of Motor and Driver Combinations→Page C-134
- **Details of Safety Standards**→Page G-2
- The EMC value changes according to the wiring and layout. Therefore, the final EMC level must be checked with the motor/driver incorporated in the user's equipment.

System Configuration



An example of a single-axis system configuration with the **EMP400** Series controller.

Product Number Code

Standard Type

CSK 5 6 6 - N □ T A

- **CSK** Series
- 5-Phase
- Motor Frame Size **4**: 1.65 in. sq. (42 mm sq.) **6**: 2.36 in. sq. (60 mm sq.) **9**: 3.35 in. sq. (85 mm sq.)
- Motor Case Length
- New Pentagon Drive
- Shaft Type **A**: Single Shaft
  B: Double Shaft
- Terminal Block Type
- USA Version

TH Geared Type

CSK 5 6 4 A A - TG 7.2

- **CSK** Series
- 5-Phase
- Motor Frame Size **4**: 1.65 in. sq. (42 mm sq.) **6**: 2.36 in. sq. (60 mm sq.)
- Motor Case Length
- Shaft Type **A**: Single Shaft
  B: Double Shaft
- USA Version
- **TH** Geared Type
- Gear Ratio

Product Line

Type	Power Supply Voltage	Maximum Holding Torque		
		□1.65 in. (42 mm)	□2.36 in. (60 mm)	□3.35 in. (85 mm)
Standard Type	24 VDC	18.4~34 oz-in (0.13~0.24 N·m)	59~230 oz-in (0.42~1.66 N·m)	290~890 oz-in (2.1~6.3 N·m)
TH Geared Type		3~13.2 lb-in (0.35~1.5 N·m)	11~35 lb-in (1.25~4 N·m)	—

Standard Type

Motor Frame Size: ☐ 1.65 in. (☐ 42 mm), ☐ 2.36 in. (☐ 60 mm)

Specifications

Model	Single Shaft	**CSK543-NATA**	**CSK544-NATA**	**CSK545-NATA**	**CSK564-NATA**	**CSK566-NATA**	**CSK569-NATA**
	Double Shaft	**CSK543-NBTA**	**CSK544-NBTA**	**CSK545-NBTA**	**CSK564-NBTA**	**CSK566-NBTA**	**CSK569-NBTA**
Maximum Holding Torque	oz-in (N·m)	18.4 (0.13)	25 (0.18)	34 (0.24)	59 (0.42)	117 (0.83)	230 (1.66)
Rotor Inertia J	oz-in^2 (kg·m^2)	0.191 (35×10^{-7})	0.3 (54×10^{-7})	0.37 (68×10^{-7})	0.96 (175×10^{-7})	1.53 (280×10^{-7})	3.1 (560×10^{-7})
Rated Current	A/phase	0.75			1.4		
Basic Step Angle		0.72˚					
Power Source		24 VDC±10% 1.3 A			24 VDC±10% 2.1 A		
Excitation Mode		● Full Step (4 phase excitation): 0.72°/step ● Half Step (4-5 phase excitation): 0.36°/step					
Weight	Motor lb. (kg)	0.46 (0.21)	0.59 (0.27)	0.77 (0.35)	1.3 (0.6)	1.8 (0.8)	2.9 (1.3)
	Driver lb. (kg)	0.31 (0.14)					
Dimension No.	Motor	1			2		
	Driver	6					

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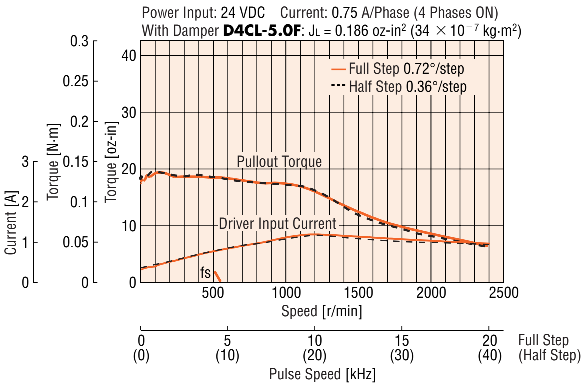
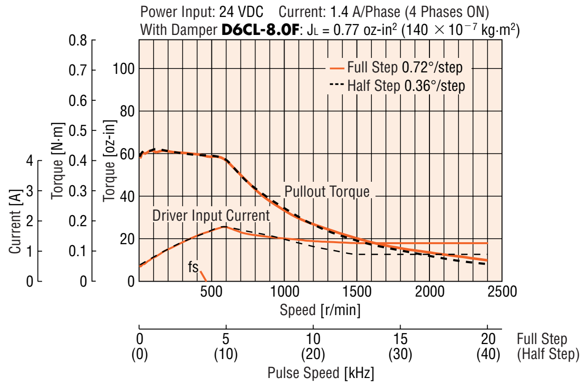
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics➝Page C-10

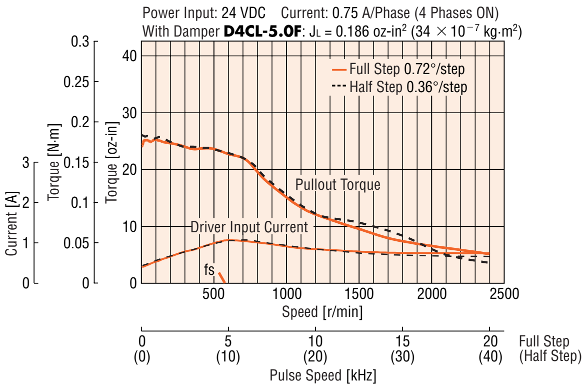
CSK543-NBTA



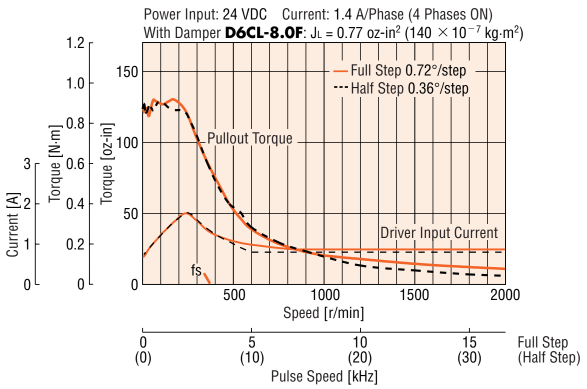
CSK564-NBTA



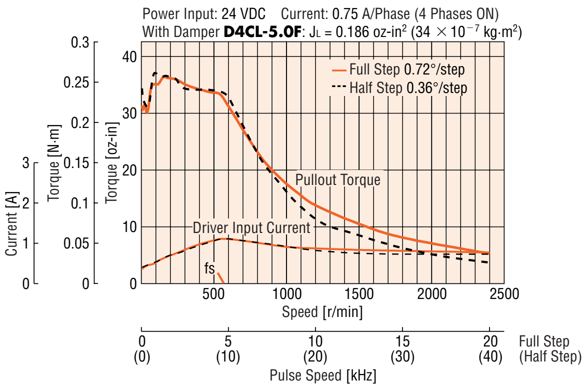
CSK544-NBTA



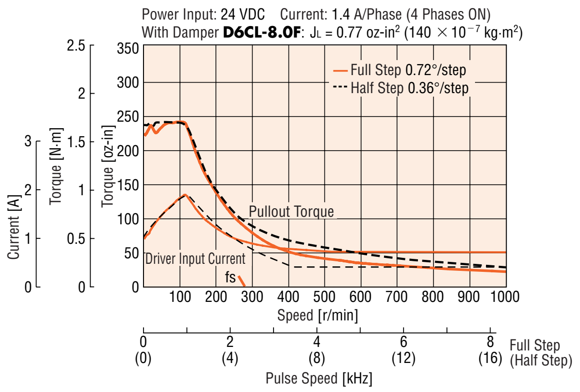
CSK566-NBTA



CSK545-NBTA



CSK569-NBTA



Note:
The pulse input circuit responds up to approximately 100 kHz with a pulse duty of 50%.

Standard Type

Motor Frame Size: □ 3.35 in. (□ 85 mm)

Specifications

Model	Single Shaft	CSK596-NATA	CSK599-NATA	CSK5913-NATA
	Double Shaft	CSK596-NBTA	CSK599-NBTA	CSK5913-NBTA
Maximum Holding Torque	oz-in (N·m)	290 (2.1)	580 (4.1)	890 (6.3)
Rotor Inertia J	oz-in^2 (kg·m^2)	7.7 (1400×10^{-7})	14.8 (2700×10^{-7})	22 (4000×10^{-7})
Rated Current	A/phase	2.8		
Basic Step Angle		0.72°		
Power Source		24 VDC±10% 4 A		
Excitation Mode		● Full Step (4 phase excitation): 0.72°/step ● Half Step (4-5 phase excitation): 0.36°/step		
Weight	Motor lb. (kg)	3.7 (1.7)	6.2 (2.8)	8.4 (3.8)
	Driver lb. (kg)	0.55 (0.25)		
Dimension No.	Motor	$\boxed{3}$		
	Driver	$\boxed{7}$		

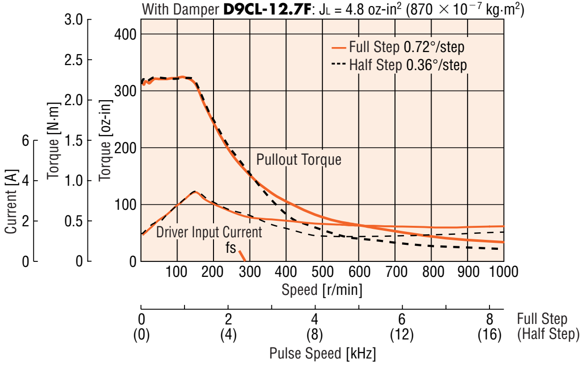
How to read specifications table→Page C-9

Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

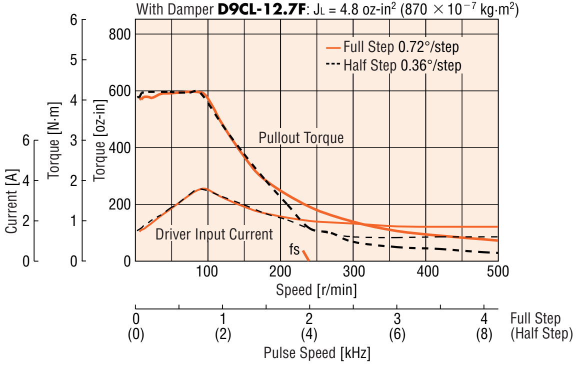
CSK596-NBTA

Power Input: 24 VDC Current: 2.8 A/Phase (4 Phases ON)
With Damper **D9CL-12.7F**: JL = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)



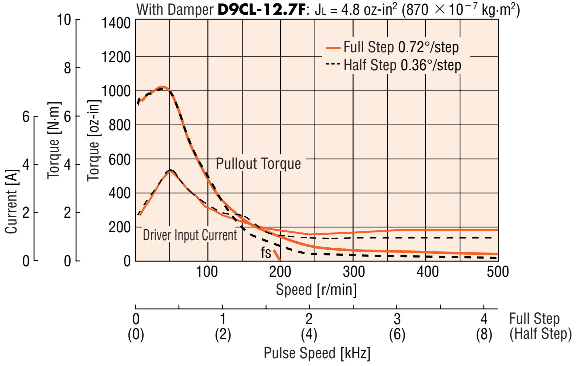
CSK599-NBTA

Power Input: 24 VDC Current: 2.8 A/Phase (4 Phases ON)
With Damper **D9CL-12.7F**: JL = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)



CSK5913-NBTA

Power Input: 24 VDC Current: 2.8 A/Phase (4 Phases ON)
With Damper **D9CL-12.7F**: JL = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)



Note:
The pulse input circuit responds up to approximately 100 kHz with a pulse duty of 50%.

TH Geared Type

Motor Frame Size: □ 1.65 in. (□ 42 mm)

Specifications

Model	Single Shaft	CSK543AA-TG3.6	CSK543AA-TG7.2	CSK543AA-TG10	CSK543AA-TG20	CSK543AA-TG30
	Double Shaft	CSK543BA-TG3.6	CSK543BA-TG7.2	CSK543BA-TG10	CSK543BA-TG20	CSK543BA-TG30
Maximum Holding Torque	lb-in (N·m)	3 (0.35)	6.1 (0.7)	8.8 (1)	13.2 (1.5)	13.2 (1.5)
Rotor Inertia J	oz-in² (kg·m²)	0.191 (35×10⁻⁷)				
Rated Current	A/phase	0.75				
Basic Step Angle		0.2°	0.1°	0.072°	0.036°	0.024°
Gear Ratio		3.6:1	7.2:1	10:1	20:1	30:1
Permissible Torque	lb-in (N·m)	3 (0.35)	6.1 (0.7)	8.8 (1)	13.2 (1.5)	13.2 (1.5)
Backlash	Arc minute (degrees)	45 (0.7°)	25 (0.417°)	25 (0.417°)	15 (0.25°)	15 (0.25°)
Permissible Speed Range (Gear Output Shaft Speed)	r/min	0~500	0~250	0~180	0~90	0~60
Power Source		24 VDC±10% 1.3 A				
Excitation Mode	Full Step	0.2°/step	0.1°/step	0.072°/step	0.036°/step	0.024°/step
	Half Step	0.1°/step	0.05°/step	0.036°/step	0.018°/step	0.012°/step
Weight	Motor lb. (kg)	0.73 (0.33)				
	Driver lb. (kg)	0.31 (0.14)				
Dimension No.	Motor	$\boxed{4}$				
	Driver	$\boxed{6}$				

How to read specifications table→Page C-9

Note:

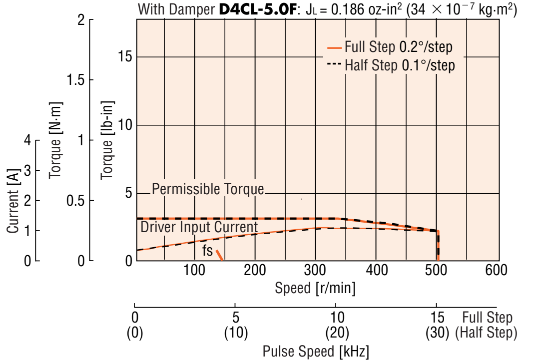
- Direction of rotation of the motor and that of the gear output shaft are the same for models with gear ratios of 3.6:1, 7.2:1 and 10:1. It is opposite for 20:1 and 30:1 gear ratios.

Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

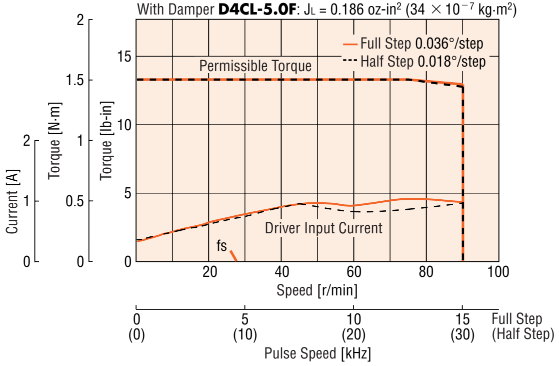
CSK543BA-TG3.6

Power Input: 24 VDC Current: 0.75 A/Phase (4 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in² (34 × 10⁻⁷ kg·m²)



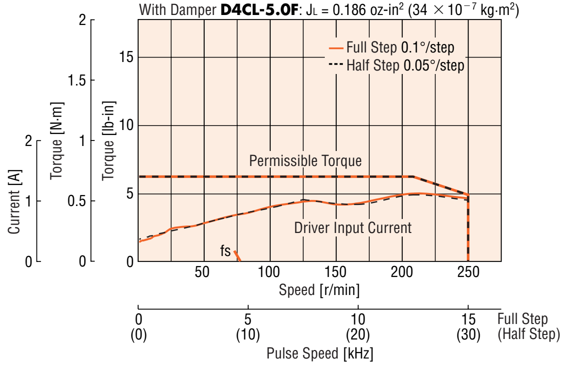
CSK543BA-TG20

Power Input: 24 VDC Current: 0.75 A/Phase (4 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in² (34 × 10⁻⁷ kg·m²)



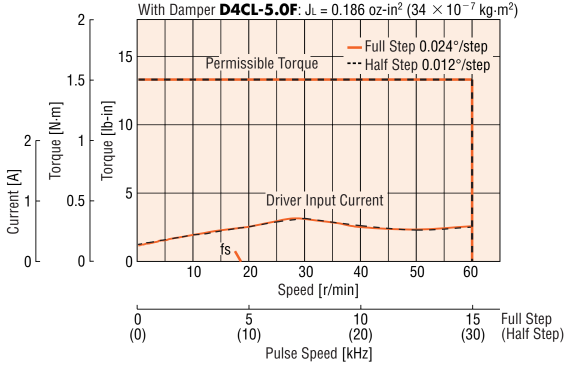
CSK543BA-TG7.2

Power Input: 24 VDC Current: 0.75 A/Phase (4 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in² (34 × 10⁻⁷ kg·m²)



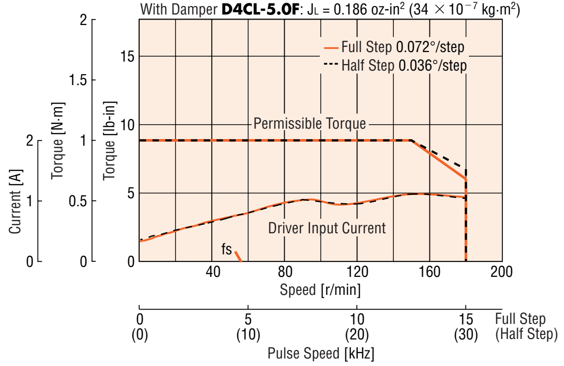
CSK543BA-TG30

Power Input: 24 VDC Current: 0.75 A/Phase (4 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in² (34 × 10⁻⁷ kg·m²)



CSK543BA-TG10

Power Input: 24 VDC Current: 0.75 A/Phase (4 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in² (34 × 10⁻⁷ kg·m²)



Note:
The pulse input circuit responds up to approximately 100 kHz with a pulse duty of 50%.

TH Geared Type

Motor Frame Size: □ 2.36 in. (□ 60 mm)

Specifications

Model	Single Shaft	CSK564AA-TG3.6	CSK564AA-TG7.2	CSK564AA-TG10	CSK564AA-TG20	CSK564AA-TG30
	Double Shaft	CSK564BA-TG3.6	CSK564BA-TG7.2	CSK564BA-TG10	CSK564BA-TG20	CSK564BA-TG30
Maximum Holding Torque	lb-in (N·m)	11 (1.25)	22 (2.5)	26 (3)	30 (3.5)	35 (4)
Rotor Inertia J	oz-in² (kg·m²)	0.96 (175×10^{-7})				
Rated Current	A/phase	1.4				
Basic Step Angle		0.2°	0.1°	0.072°	0.036°	0.024°
Gear Ratio		3.6:1	7.2:1	10:1	20:1	30:1
Permissible Torque	lb-in (N·m)	11 (1.25)	22 (2.5)	26 (3)	30 (3.5)	35 (4)
Backlash	Arc minute (degrees)	35 (0.584°)	15 (0.25°)	15 (0.25°)	10 (0.167°)	10 (0.167°)
Permissible Speed Range (Gear Output Shaft Speed)	r/min	0～500	0～250	0～180	0～90	0～60
Power Source		24 VDC±10% 2.1 A				
Excitation Mode	Full Step	0.2°/step	0.1°/step	0.072°/step	0.036°/step	0.024°/step
	Half Step	0.1°/step	0.05°/step	0.036°/step	0.018°/step	0.012°/step
Weight	Motor lb. (kg)	2.1 (0.95)				
	Driver lb. (kg)	0.31 (0.14)				
Dimension No.	Motor	5				
	Driver	6				

How to read specifications table→Page C-9

Note:

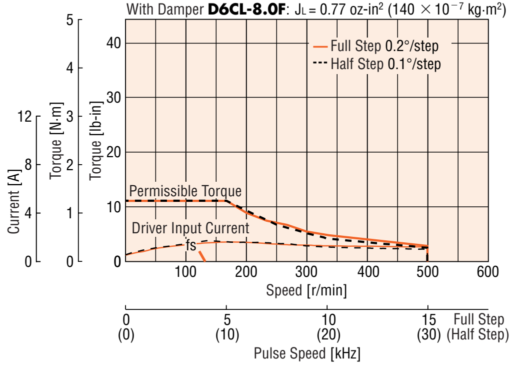
- Direction of rotation of the motor and that of the gear output shaft are the same for models with gear ratios of 3.6:1, 7.2:1 and 10:1. It is opposite for 20:1 and 30:1 gear ratios

Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

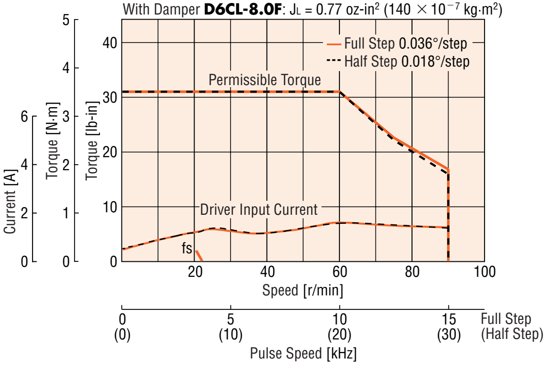
CSK564BA-TG3.6

Power Input: 24 VDC Current: 1.4 A/Phase (4 Phases ON)
With Damper **D6CL-8.0F**: J_L = 0.77 oz-in² (140 × 10^{-7} kg·m²)



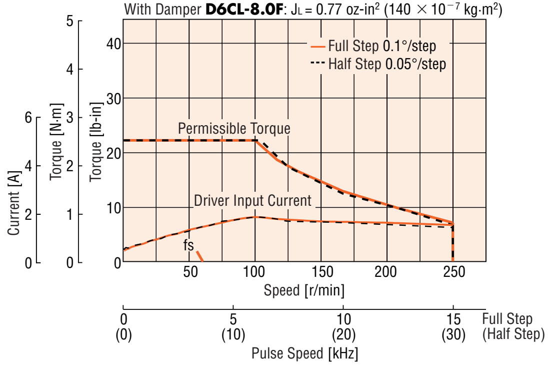
CSK564BA-TG20

Power Input: 24 VDC Current: 1.4 A/Phase (4 Phases ON)
With Damper **D6CL-8.0F**: J_L = 0.77 oz-in² (140 × 10^{-7} kg·m²)



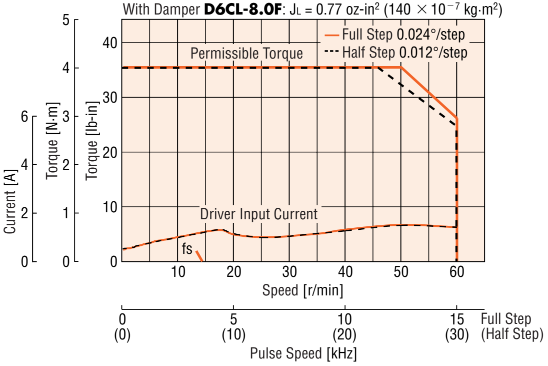
CSK564BA-TG7.2

Power Input: 24 VDC Current: 1.4 A/Phase (4 Phases ON)
With Damper **D6CL-8.0F**: J_L = 0.77 oz-in² (140 × 10^{-7} kg·m²)



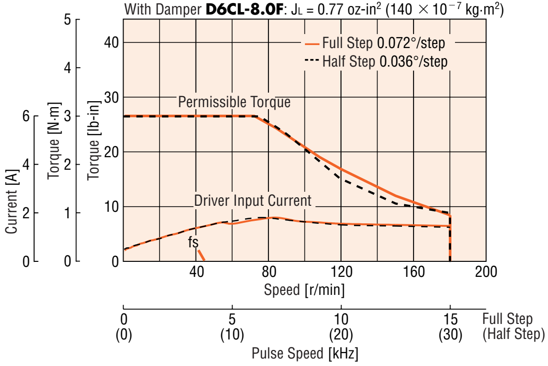
CSK564BA-TG30

Power Input: 24 VDC Current: 1.4 A/Phase (4 Phases ON)
With Damper **D6CL-8.0F**: J_L = 0.77 oz-in² (140 × 10^{-7} kg·m²)



CSK564BA-TG10

Power Input: 24 VDC Current: 1.4 A/Phase (4 Phases ON)
With Damper **D6CL-8.0F**: J_L = 0.77 oz-in² (140 × 10^{-7} kg·m²)



Note:
The pulse input circuit responds up to approximately 100 kHz with a pulse duty of 50%.

Common Specifications

Input Signals	Input Signal Circuit	Photocoupler input, Input resistance 220 Ω, Input current 10~20 mA maximum Signal voltage Photocoupler ON: +4.5~+5 V, Photocoupler OFF: 0~+1 V (voltage between terminals)
	● Pulse Signal (CW Pulse Signal)*	Step command pulse signal (CW step command pulse signal at 2-pulse input mode) Pulse width: 5 µs minimum, Pulse rise/fall: 2 µs maximum, pulse duty: Max. 50% Motor moves when the photocoupler state changes from ON to OFF. Maximum input frequency: 100 kHz (when a pulse duty is 50%)
	● Rotation Direction Signal (CCW Pulse Signal)*	Rotation direction signal Photocoupler ON: CW, Photocoupler OFF: CCW (CCW step command signal at 2-pulse input mode. Pulse width: 5 µs minimum, Pulse rise/fall: 2 µs maximum. pulse duty: Max. 50% Motor moves when the photocoupler state changes from ON to OFF. Maximum input frequency: 100 kHz (when a pulse duty is 50%))
	● Step Angle Signal	Full Step (0.72°) at "photocoupler OFF" Half Step (0.36°) at "photocoupler ON"
	● All Windings Off Signal	When in the "photocoupler ON" state, the current to the motor is cut off and the motor shaft can be rotated manually. When in the "photocoupler OFF" state, the current level set by the RUN switch is supplied to the motor.
	● Automatic Current Cutback Release Signal	When in the "photocoupler ON" state, the "Automatic Current Cutback" function at motor standstill is disabled. When in the "photocoupler OFF" state, the "Automatic Current Cutback" function at motor standstill is activated. (Approximately 100 ms after motor stops).
Output Signals	Output Signal Circuit	Photocoupler, Open-Collector Output External use condition: 24 VDC maximum, 10 mA maximum
	● Excitation Timing Signal	The signal is output every time the excitation sequence returns to the initial stage "0". (Photocoupler: ON) Full step: signal output every 10 pulses, Half step: signal output every 20 pulses
	● Overheat Signal *	The signal is output when the internal temperature of the driver rises above approximately 194°F (90°C). (Photocoupler: ON, Automatic return) The motor current is shut off automatically if the automatic current off function is ON.
Functions		Automatic current cutback, Automatic current off,* Pulse input mode switch.*
Driver Cooling Method		Natural ventilation

* Only for CSD5828N-T (**CSK59**□ Package)

General Specifications

Specifications		Motor	Driver
Insulation Class		Class B [266˚F (130˚C)] [Recognized as Class A [221°F (105°C)] by UL and CSA standards.]	—
Insulation Resistance		100 MΩ minimum under normal temperature and humidity, when measured by a 500 VDC megger between the motor coils and the motor casing.	—
Dielectric Strength		Sufficient to withstand 1.5 kV (1 kV for **CSK54** □type), 60 Hz applied between the motor coils and casing for one minute, under normal temperature and humidity.	—
Operating Environment	Ambient Temperature	14˚F~122˚F (−10˚C~+50˚C) (nonfreezing)	32˚F~104˚F (0˚C~+40˚C) (nonfreezing)
	Ambient Humidity	85% or less (non-condensing)	
	Atmosphere	No corrosive gases, dust, water or oil.	
Temperature Rise		Temperature rise of the coil measured by the Change Resistance Method is 144˚F (80˚C) or less. (at standstill, five phases energized)	—
Static Angle Error [1]		±3 arc minute (±0.05˚)	—
Shaft Runout		0.002 inch (0.05 mm) T.I.R at top of output shaft [4]	—
Radial Play [2]		0.001 inch (0.025 mm) max. of 1.12 lb. (5 N)	—
Axial Play [3]		0.003 inch (0.075 mm) max. of 2.2 lb. (10 N)	—
Concentricity		0.003 inch (0.075 mm) T.I.R [4]	—
Perpendicularity		0.003 inch (0.075 mm) T.I.R [4]	—

[1] This value is for full step under no load. (The value changes with size of the load.)

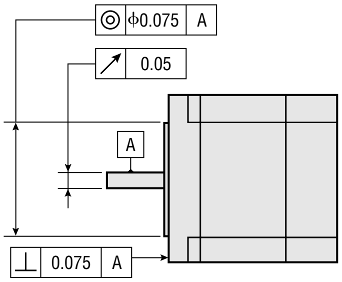
[2] Radial Play: Refers to the displacement in shaft position in the radial direction, when a 1.12 lb. (5 N) load is applied in the vertical direction to the tip of the motor's shaft.

[3] Axial Play: Refers to the displacement in shaft position in the axial direction, when a 2.2 lb. (10 N) load is applied to the motor's shaft in the axial direction.

[4] T.I.R. (Total Indicator Reading): Refers to the total dial gauge reading when the measured section is rotated one revolution centered on a reference axis.

Note:

- Do not measure insulation resistance or perform the dielectric strength test while the motor and driver are connected.



Permissible Overhung Load and Permissible Thrust Load

Unit = Upper values: lb./Lower values: N

Model	Overhung Load Distance from Shaft End [inch (mm)]					Thrust Load
	0 (0)	0.2 (5)	0.39 (10)	0.59 (15)	0.79 (20)	
CSK54□	4.5	5.6	7.6	11.7	—	The permissible thrust load [lb. (N)] shall be no greater than the motor mass.
	20	25	34	52		
CSK56□	14.1	16.8	21	29	42	
	63	75	95	130	190	
CSK59□	58	65	76	87	108	
	260	290	340	390	480	
CSK543-TG	2.2	3.1	4.5	6.7	—	3.3
	10	14	20	30		15
CSK564-TG	15.7	18	22	27	33	9
	70	80	100	120	150	40

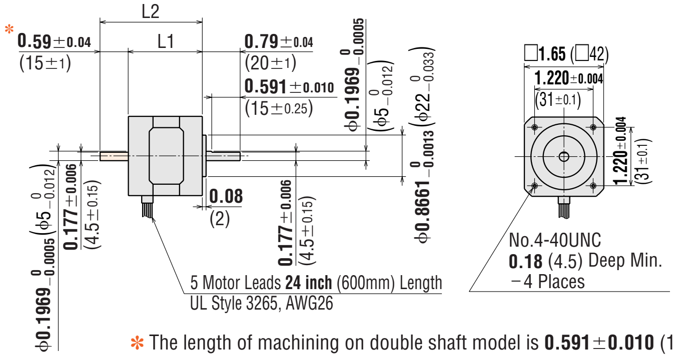
Dimensions

Scale 1/4, Unit = **inch** (mm)

● Motor

◆ Standard Type

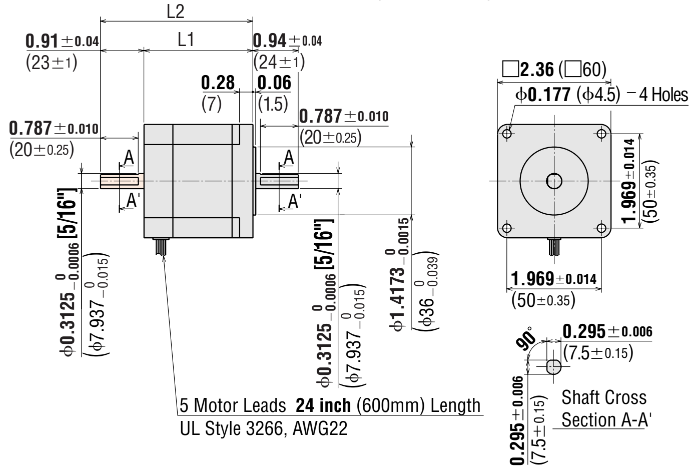
1 Motor Frame Size: □1.65 in. (□42 mm)



* The length of machining on double shaft model is **0.591**±**0.010** (15±0.25).

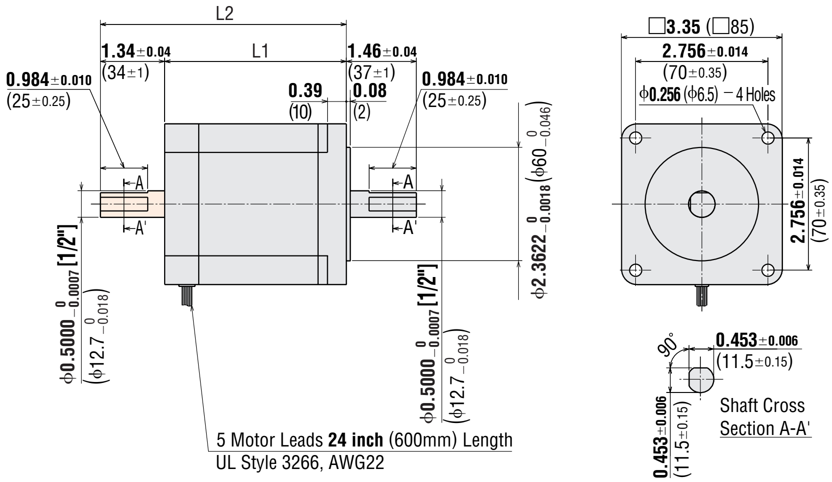
Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
CSK543-NATA	PK543NAWA	1.3 (33)	—	0.46 (0.21)	B068U
CSK543-NBTA	PK543NBWA		1.89 (48)		
CSK544-NATA	PK544NAWA	1.54 (39)	—	0.59 (0.27)	B069U
CSK544-NBTA	PK544NBWA		2.13 (54)		
CSK545-NATA	PK545NAWA	1.85 (47)	—	0.77 (0.35)	B070U
CSK545-NBTA	PK545NBWA		2.44 (62)		

2 Motor Frame Size: □2.36 in. (□60 mm)



Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
CSK564-NATA	PK564NAWA	1.83 (46.5)	—	1.3 (0.6)	B071U
CSK564-NBTA	PK564NBWA		2.74 (69.5)		
CSK566-NATA	PK566NAWA	2.26 (57.5)	—	1.8 (0.8)	B072U
CSK566-NBTA	PK566NBWA		3.17 (80.5)		
CSK569-NATA	PK569NAWA	3.43 (87)	—	2.9 (1.3)	B073U
CSK569-NBTA	PK569NBWA		4.33 (110)		

3 Motor Frame Size: □3.35 in. (□85 mm)

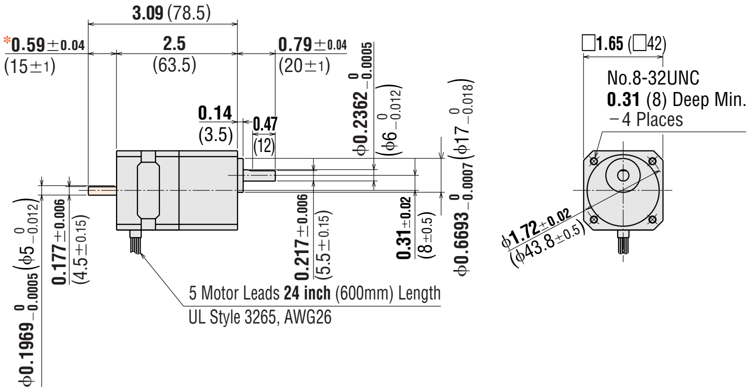


Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
CSK596-NATA	PK596-NAA	2.6 (66)	—	3.7 (1.7)	B155U
CSK596-NBTA	PK596-NBA		3.94 (100)		
CSK599-NATA	PK599-NAA	3.78 (96)	—	6.2 (2.8)	B156U
CSK599-NBTA	PK599-NBA		5.12 (130)		
CSK5913-NATA	PK5913-NAA	4.96 (126)	—	8.4 (3.8)	B157U
CSK5913-NBTA	PK5913-NBA		6.3 (160)		

- These dimensions are for double shaft models. For single shaft models, ignore the shaded areas.

◆ TH Geared Type

4 Motor Frame Size: □1.65 in. (□42 mm)

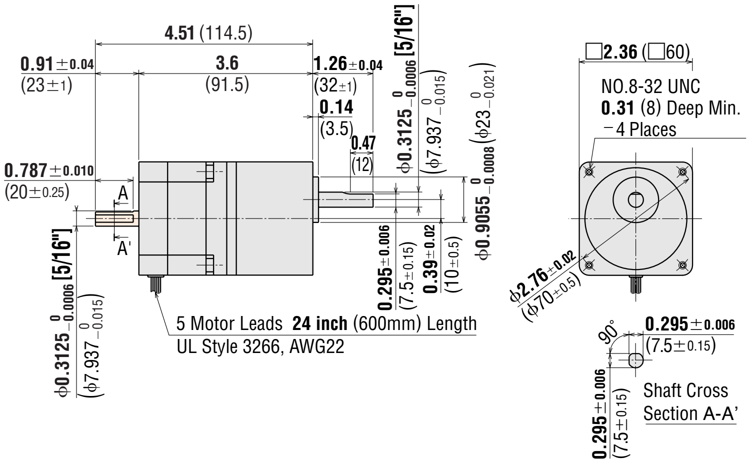


Model	Motor Model	Weight lb. (kg)	DXF
CSK543AA-TG□	PK543NAWA-T□	0.73 (0.33)	B074U
CSK543BA-TG□	PK543NBWA-T□		

- ● Enter the gear ratio in the box (□) within the model number.
- ● Screws (included)
  No.8-32 UNC, 0.375 inch (9.52 mm) length, 4 pieces

✻ The length of machining on double shaft model is **0.591**±**0.010** (15±0.25).

5 Motor Frame Size: □2.36 in. (□60 mm)



Model	Motor Model	Weight lb. (kg)	DXF
CSK564AA-TG□	PK564NAWA-T□	2.1 (0.95)	B075U
CSK564BA-TG□	PK564NBWA-T□		

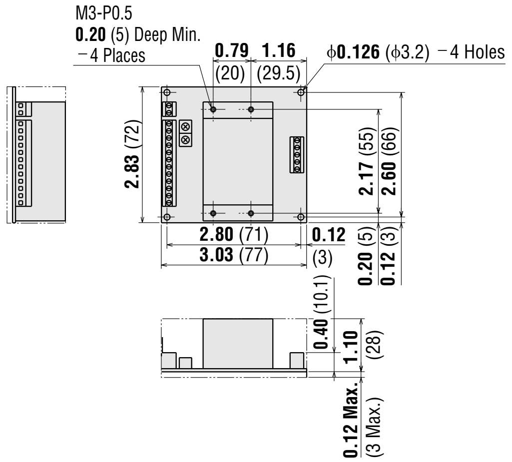
- ● Enter the gear ratio in the box (□) within the model number.
- ● Screws (included)
  No.8-32 UNC, 0.75 inch (19.05 mm) length, 4 pieces

- ● These dimensions are for double shaft models. For single shaft models, ignore the shaded areas.

● Driver

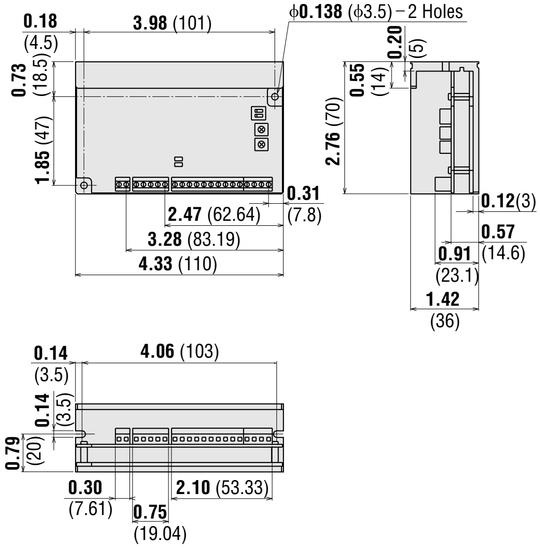
6 CSD5807N-T, CSD5814N-T

Weight: 0.31 lb. (0.14 kg) DXF B805U



7 CSD5828N-T

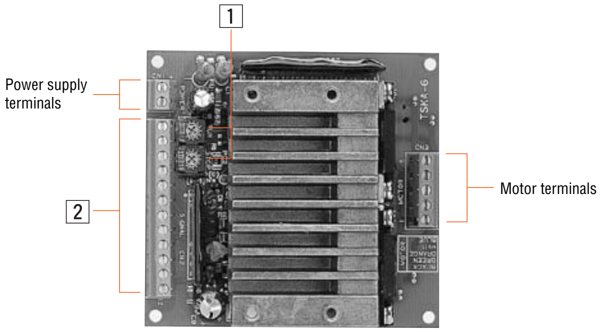
Weight: 0.55 lb. (0.25 kg) DXF B806U



Features C-120 | System Configuration C-121 | Specifications/Characteristics C-122

Connection and Operation

Standard Type: **CSK54□**, **CSK56□**
TH Geared Type: **CSK543□**, **CSK564□**



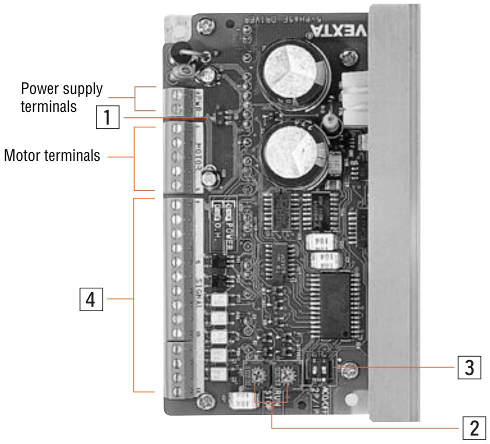
1 Current Adjustment Potentiometers

Indicator	Switch Name	Function
RUN	Motor run current potentiometer	Adjusts the motor running current
STOP	Motor stop current potentiometer	Adjusts the motor current at standstill

2 Input/Output Signal

Connector	Input/Output	Terminal No.	Signal Name
CN2	Input signals	1	Pulse Signal
		2	
		3	Rotation Direction Signal
		4	
		5	All Windings Off Signal
		6	
		7	Step Angle Select Signal
		8	
		9	Current Cutback Release Signal
		10	
	Output signals	11	Excitation Timing Signal
		12	

Standard Type: **CSK59□**



1 Signal Monitor Display

Indicator	Color	Function
POWER	Green	Power input display
O.H.	Red	Overheat output display

2 Current Adjustment Potentiometers

Indicator	Switch Name	Function
RUN	Motor run current potentiometer	Adjusts the motor running current
STOP	Motor stop current potentiometer	Adjusts the motor current at standstill

3 Function Select Switches

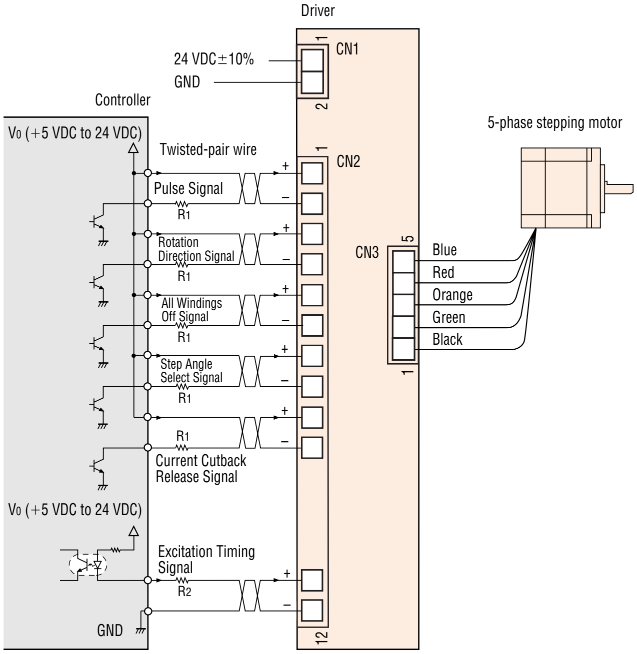
Indicator	Switch Name	Function
2P/1P	Pulse input mode switch	Switches between 1-pulse input and 2-pulse input
A.C.O/OFF	Automatic current off function switch	When the heat sink temperature of the driver rises above 194°F (90°C), this function automatically switches the motor current off. Function can be set and released with this switch.

4 Input/Output Signal

Connector	Input/Output	Terminal No.	Signal Name
SIGNAL	Input signals	1	Pulse Signal (CW Pulse Signal)
		2	
		3	Rotation Direction Signal (CCW Pulse Signal)
		4	
		5	All Windings Off Signal
		6	
		7	Step Angle Select Signal
		8	
		9	Current Cutback Release Signal
		10	
	Output signals	11	Excitation Timing Signal
		12	
		13	Overheat Signal
		14	

● Connection Diagrams

◆CSK54□, CSK56□
CSK543-TG, CSK564-TG



◆Power Supply

Use an input power voltage of 24 VDC±10%. Use a power supply that can supply sufficient input current.

Notes:

- Keep the voltage Vo between 5 VDC and 24 VDC. When Vo is equal to 5 VDC, the external resistance R_1 is not necessary. When Vo is above 5 VDC, connect R_1 to keep the current between 10 mA and 20 mA, and connect R_2 to keep the current below 10 mA.
- Use twisted-pair wire of AWG 24 or thicker and 6.6 feet (2 m) or less in length for the signal line.
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decrease. (→Technical Reference Page F-36)
- Suitable wire size for the CN1, CN2 and CN3 connector is between AWG 20 and AWG 26. Use AWG 20 or thicker for motor lines (when extended) and power supply line.
- Signal lines should be kept at least 3.9 inches (10 cm) away from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.
- Use spot grounding to ground the driver and external controller.
- If noise generated by the motor lead wire causes a problem, try shielding the motor lead wires with conductive tape or wire mesh.
- Incorrect connection of DC power input will lead to driver damage. Make sure that the polarity is correct before turning the power on.

◆Description of Input/Output Signals

Pulse Input Signal

"Pulse" signal is input to the PULSE−terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step. The direction of rotation is determined by the rotation direction signal.

Rotation Direction Input Signal

The "Rotation Direction" signal is input to the DIRECTION−terminal. A "photocoupler ON" signal input commands a clockwise direction rotation. A "photocoupler OFF" signal input commands a counterclockwise direction rotation.

All Windings Off Input Signal

When the "All Windings Off" (A.W. OFF) signal is in the "photocoupler ON" state, the current to the motor is cut off and motor torque is reduced to zero. The motor output shaft can then be rotated freely by hand.This signal is used when moving the motor by external force or to the manual home position.

Step Angle Select Input Signal

When the "Step Angle Select" (FULL/HALF) signal is in the "photocoupler ON" state, half step mode has been selected; when the FULL/HALF signal is in the "photocoupler OFF" state, full step mode has been selected.

Current Cutback Release Input Signal

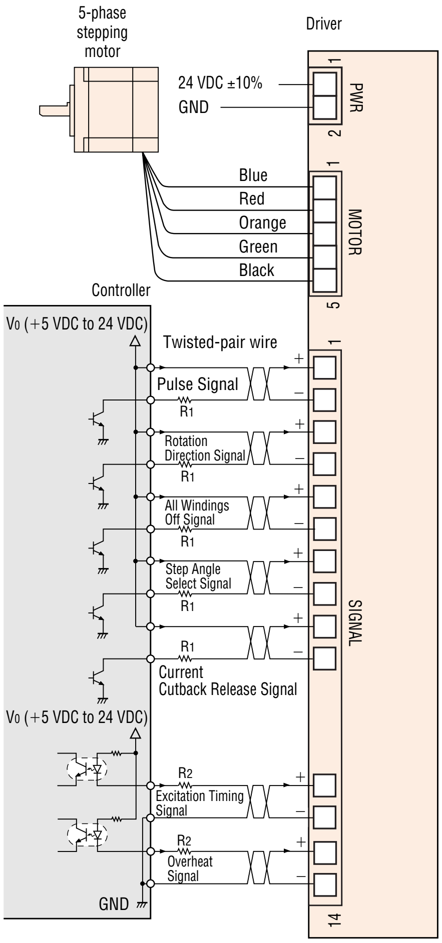
When the "Current Cutback Release" (C.D.INH) signal is in the "photocoupler ON" state, the "Automatic Current Cutback" function is not activated.

Excitation Timing Output Signal

The Excitation Timing signal is output once each time the excitation sequence returns to step “0” in synchronization with input pulses.

The excitation sequence is designed to complete one cycle as the motor shaft rotates 7.2˚. A signal is output every 10 pulses in full step mode and every 20 pulses in half step mode.(When the “Excitation Timing” signal is output, the transistor turns ON.)

◆ CSK59□



◆ Power Supply

Use an input power voltage of 24 VDC±10%. Use a power supply that can supply sufficient input current.

Notes:

- Keep the voltage Vo between 5 VDC and 24 VDC. When Vo is equal to 5 VDC, the external resistance R1 is not necessary. When Vo is above 5 VDC, connect R1 to keep the current between 10 mA and 20 mA, and connect R2 to keep the current below 10 mA.
- Use twisted-pair wire of AWG 24 or thicker and 6.6 feet (2 m) or less in length for the signal line.
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decrease. (→Technical Reference Page F-36)
- Suitable wire size for the "PWR", "MOTOR" and "SIGNAL" connector is between AWG 20 and AWG 26. Use AWG 20 or thicker for motor lines (when extended) and power supply line.
- Signal Lines should be kept at least 3.9 inches (10 cm) away from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.
- Use spot grounding to ground the driver and external controller.
- If noise generated by the motor lead wire causes a problem, try shielding the motor lead wires with conductive tape or wire mesh.
- Incorrect connection of DC power input will lead to driver damage. Make sure that the polarity is correct before turning the power on.

◆ Description of Input/Output Signals

Pulse (CW) and Rotation Direction (CCW) Input Signal

1-Pulse Input Mode

Pulse Signal

"Pulse" signal is input to the P./CW− terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step. The direction of rotation is determined by the rotation direction signal.

Rotation Direction Signal

The "Rotation Direction" signal is input to D./CCW− terminal. A "photocoupler ON" signal input commands a clockwise direction rotation. A "photocoupler OFF" signal input commands a counterclockwise direction rotation.

2-Pulse Input Mode

CW Pulse Signal

"Pulse" signal is input to the P./CW− terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step in the clockwise direction.

CCW Pulse Signal

"Pulse" signal is input to the D./CCW− terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step in the counterclockwise direction.

All Windings Off Input Signal

When the "All Windings Off" (A.W. OFF) signal is in the "photocoupler ON" state, the current to the motor is cut off and motor torque is reduced to zero. The motor output shaft can then be rotated freely by hand.This signal is used when moving the motor by external force or to the manual home position.

Step Angle Select Input Signal

When the "Step Angle Select" (FULL/HALF) signal is in the "photocoupler ON" state, half step mode has been selected; when the FULL/HALF signal is in the "photocoupler OFF" state, full step mode has been selected.

Current Cutback Release Input Signal

When the "Current Cutback Release" (C.D.INH) signal is in the "photocoupler ON" state, the "Automatic Current Cutback" function is not activated.

Excitation Timing Output Signal

The signal is output once each time the excitation sequence returns to step “0” in synchronization with input pulses.

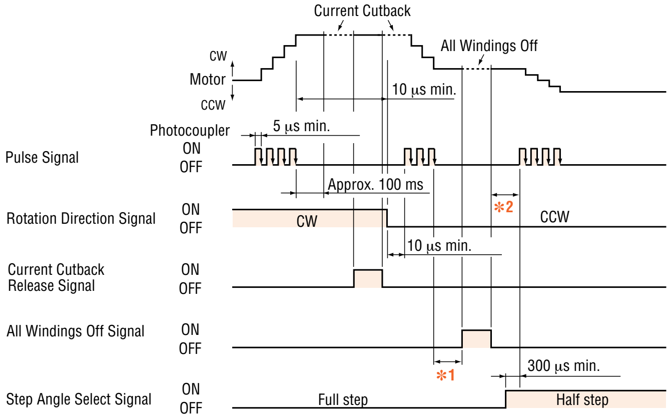
The excitation sequence is designed to complete one cycle as the motor shaft rotates 7.2˚. A signal is output every 10 pulses in full step mode and every 20 pulses in half step mode. (When the “Excitation Timing” signal is output, the transistor turns ON.)

Overheat Output Signal

The Overheat signal is output to protect the driver from heat damage if the internal temperature of the driver rises above 194˚F (90˚C). At the same time this signal is output, the O.H.LED on the circuit board is lit up. The O.HEAT signal is automatically turned off when the temperature of the driver heat sink falls to below 194˚F (90˚C). (The O.HEAT signal returns to the "photocoupler OFF" state, and O.H.LED turns off.)

Timing Chart

◆CSK54□, CSK56□
CSK543-TG, CSK564-TG



Note:
10 μs or more is the standard interval time for switching from CW to CCW. Note that the interval time varies greatly depending on the motor and load inertia.

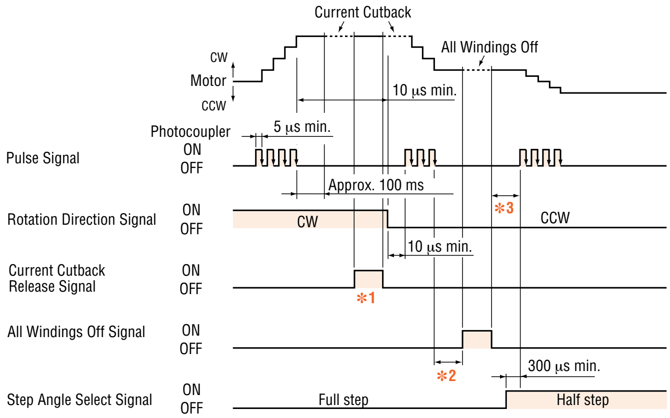
✻1 Wait a period of time to allow the motor oscillations to end before inputting the "All Windings Off" signal. This time varies with the load inertia, the load torque and the starting pulse rate. The signal input must be stopped before the motor stops.

✻2 Never input a step pulse signal immediately after switching the "All Windings Off" signal to “photocoupler OFF” state or the motor may lose synchronism. In general, a minimum interval of 300 μs is required.

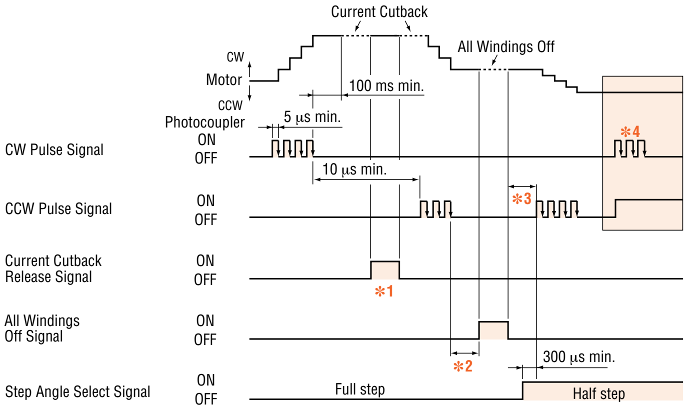
The shaded area indicates when the photocoupler is ON.

◆CSK59□

- 1-pulse input mode



- 2-pulse input mode



Note:
10 μs or more is the standard interval time for switching from CW to CCW. Note that the interval time varies greatly depending on the motor and load inertia.

✻1 When the signal is in the "photocoupler ON" state, the "Automatic Current Cutback" function is deactivated. Always set it in the "photocoupler OFF" state when the pulse signal is stopped.

✻2 Wait a period of time to allow the motor oscillations to end before inputting the "All Windings Off" signal. This time varies with the load inertia, the load torque and the starting pulse rate. The signal input must be stopped before the motor stops.

✻3 Never input a step pulse signal immediately after switching the "All Windings Off" signal to “photocoupler OFF” state or the motor may lose synchronism. In general, a minimum interval of 300 μs is required.

✻4 The motor will not operate properly if a pulse signal is input when either the CW or CCW input "photocoupler ON" state.

The shaded area indicates when the photocoupler is ON.

Features C-120 System Configuration C-121 Specifications/Characteristics C-122

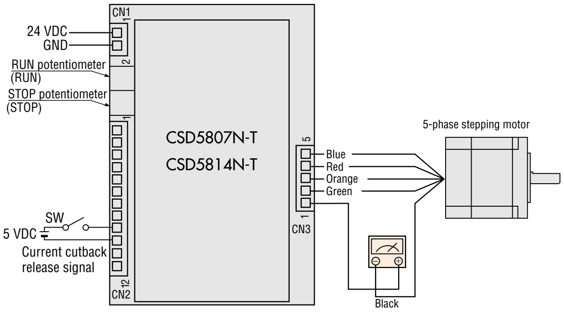
Adjusting the Output Current

The rated output current is set at the factory. When it is necessary to change the current setting, follow the procedures described below.

◆Connecting an Ammeter

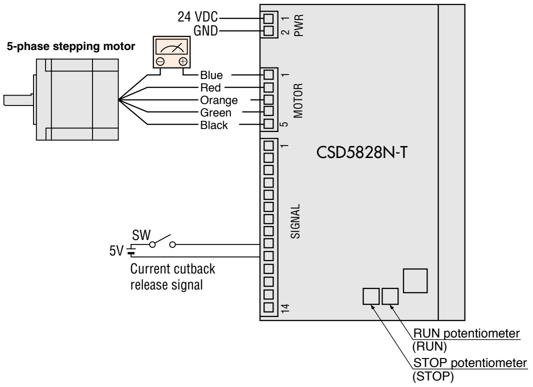
CSK54□, CSK56□
CSK543□A-TG, CSK564□A-TG□

Connect a DC ammeter between the motor and terminal ① of CN3 connector as shown below.



CSK59□

Connect a DC ammeter between the motor and terminal ① of the "MOTOR" connector as shown below.



- After connecting the DC ammeter to the motor, turn on the power. (The excitation status at this point is fixed.)
- When the power is turned on, the motor enters a 4 phase excitation state, and +directional positive current flows through the **CSK54□**, **CSK56□**-black, **CSK59□**-blue motor lead wire. (Even if 4-5 phase excitation has been selected, the motor enters a 4 phase excitation state when the power is turned on. Adjust the current in this state.)
- The value measured by the ammeter represents the total current in two phases. The current for one phase is equivalent to half of the ammeter value. (When setting the current to 1.0 A/phase, adjust the current level until the ammeter reads 2.0 A.)

Notes:

- Never input pulse signals.
- Select "photocoupler OFF" for "All Windings Off" signal. (Select "photocoupler OFF" when the switch is open.)
- When the RUN current is adjusted, the current at motor standstill also changes.

◆Adjusting the Motor Running Current

Set the "Current Cutback Release" signal to the "photocoupler ON" state (SW: ON) when adjusting the RUN current.

(1) Adjust the motor RUN current with the RUN potentiometer.
Adjusting range
CSD5807N-T: 0.1 A/phase to 0.75 A/phase
CSD5814N-T: 0.1 A/phase to 1.4 A/phase
CSD5828N-T: 1.0 A/phase to 2.8 A/phase

(2)The motor operating current is set for rated current (CSD5807N-T: 0.75 A/phase, CSD5814N-T: 1.4 A/phase, CSD5828N-T: 2.8 A/phase) at the time of shipping, but it can be readjusted using the RUN potentiometer. The operating current can be lowered to suppress temperature rise in the motor/driver, or lower running current in order to allow a margin for motor torque or to reduce vibration.

Note:

- The motor RUN current should be less than the motor rated current.

◆Adjusting the Current at Motor Standstill

Set the "Current Cutback Release" signal to the "photocoupler OFF" state (SW: OFF) when adjusting the current while the motor is stopped.

(1) Adjust the current at motor standstill with the STOP potentiometer.
Adjusting range
CSD5807N-T: 0.1 A/phase to 0.6 A/phase
CSD5814N-T: 0.1 A/phase to 1.05 A/phase
CSD5828N-T: 0.7 A/phase to 2.3 A/phase

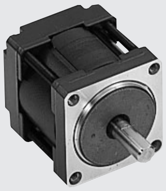
(2) At the time of shipping, the current at motor standstill is set for half the rated current. (CSD5807N-T: 0.375 A/phase, CSD5814N-T: 0.7 A/phase, CSD5828N-T: 1.4 A/phase). The STOP potentiometer can be used to readjust the current at motor standstill to the current value required to produce enough holding torque.

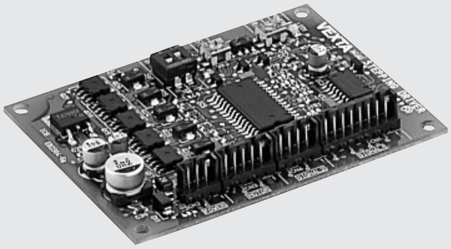
$$\text{Holding torque [oz-in (N·m)]} = \frac{\text{Maximum holding torque [oz-in (N·m)]} \times \text{Current at motor standstill [A]}}{\text{Motor rated current [A]}}$$

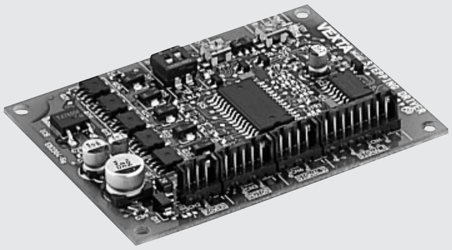
List of Motor and Driver Combinations

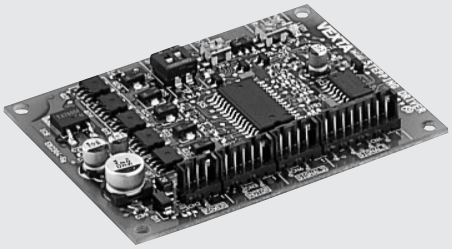
Type	Model	Motor Model	Driver Model
Standard	**CSK543-N□TA**	PK543N□WA	CSD5807N-T
	CSK544-N□TA	PK544N□WA	
	CSK545-N□TA	PK545N□WA	
	CSK564-N□TA	PK564N□WA	CSD5814N-T
	CSK566-N□TA	PK566N□WA	
	CSK569-N□TA	PK569N□WA	
	CSK596-N□TA	PK596-N□A	CSD5828N-T
	CSK599-N□TA	PK599-N□A	
	CSK5913-N□TA	PK5913-N□A	
TH Geared	**CSK543□A-TG3.6**	PK543N□WA-T3.6	CSD5807N-T
	CSK543□A-TG7.2	PK543N□WA-T7.2	
	CSK543□A-TG10	PK543N□WA-T10	
	CSK543□A-TG20	PK543N□WA-T20	
	CSK543□A-TG30	PK543N□WA-T30	
	CSK564□A-TG3.6	PK564N□WA-T3.6	CSD5814N-T
	CSK564□A-TG7.2	PK564N□WA-T7.2	
	CSK564□A-TG10	PK564N□WA-T10	
	CSK564□A-TG20	PK564N□WA-T20	
	CSK564□A-TG30	PK564N□WA-T30	

- Enter **A** (single shaft) or **B** (double shaft) in the box (□) within the model numbers.









5-Phase Stepping Motor and Driver Package

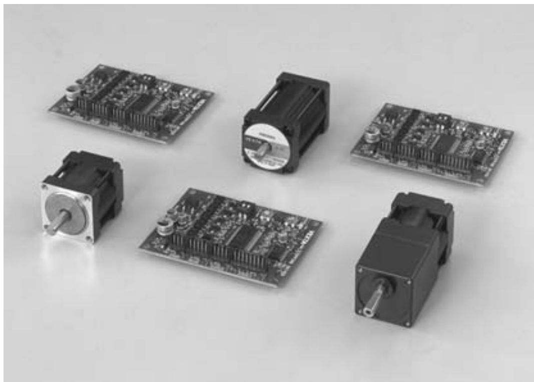
PMC Series

Additional Information

5-Phase Stepping Motor and Driver Package

PMC Series

The **PMC** Series combines a high torque miniature 5-phase stepping motor with a board-level, credit card sized driver. Zero or low backlash gearheads are available.



Features

● Miniature Motors & Gearmotors

Lightweight, compact motors are 1.10 in. sq. (28 mm sq.), and 0.22 lb. (0.1 kg: **PMC33□3**) or 0.38 lb. (0.17 kg: **PMC35□3**) in weight.
Gearmotors also feature a mounting frame of only 1.10 in. sq. (28 mm sq.) Zero backlash harmonic gearmotors (**HG**) are available in gear ratios of 50:1 and 100:1. The harmonic gearmotors provide high output torque and high resolution. Low backlash spur gearmotors (**MG**) are also available in gear ratios of 3.6:1, 7.2:1, 10:1, 20:1, and 30:1. The low gear ratios mean that speed can be reduced without slowing the motor too much, thus enabling more precise resolution and more smooth rotation at a low speed.

● High Output

Design advancements allow for high torque in a small package. In combination with the 0.35 A/phase output driver, the **PMC**'s high torque capability extends well into the high speed range.

● Superior Features

Features include enabling/disabling of the "Automatic Current Cutback" function via signal input and the "Excitation Timing" output, which is useful in setting the mechanical origin of your system.

● Connectors

Independent connectors are supplied for the driver input/output signals and the motor output line.

● Highly Reliable Photocoupler Input

Signal input/output sections use photocoupler inputs that provide protection from external noise. Requirement for a single 24 or 36 VDC power supply simplifies power supply design and reduces wiring work.

● Selectable: Full Step/Half Step

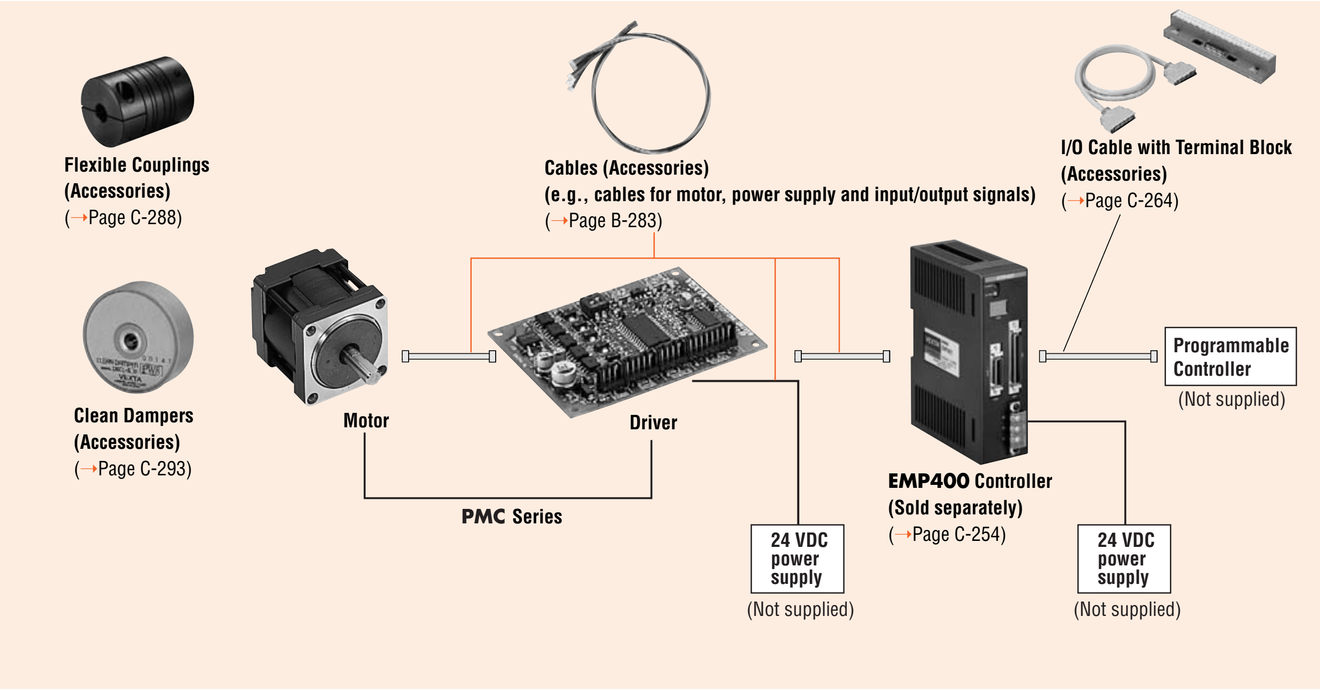
Half step drive is selectable through a signal for driving at higher resolution with lower vibration.

● 1-Pulse/2-Pulse Input Mode

A switch on the driver selects one-pulse or two-pulse input mode.

Features C-136 System Configuration C-137 Specifications/Characteristics C-138

System Configuration



An example of a single-axis system configuration with an **EPM400** series controller.

Product Number Code

PMC 3 3 A 1 - MG 3.6

PMC Series
Motor Frame Size 1.10 in. sq (28 mm sq.)
Motor Case Length
A: Single Shaft **B**: Double Shaft
Reference Number
Gear Type
None: Round Shaft
MG: **MG** Spur Gear
HG: **HG** Harmonic Gear
None: Round Shaft
Gear Ratio

Product Line

Type	Power Supply Voltage	Maximum Holding Torque
Standard Type	24/36 VDC	4.6~8.5 oz-in (0.033~0.06 N·m)
MG Geared Type		11.3~72 oz-in (0.08~0.51 N·m)
HG Geared Type		210~280 oz-in (1.5~2 N·m)

Standard Type Motor Frame Size: □ 1.10 in. (□ 28 mm)

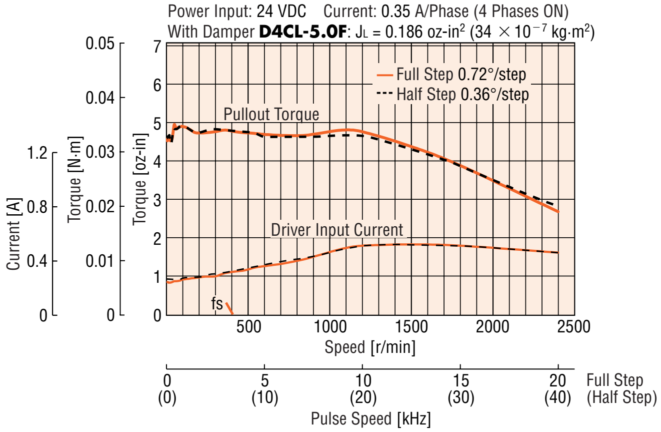
Specifications

Model	Single Shaft	PMC33A3	PMC35A3
	Double Shaft	PMC33B3	PMC35B3
Maximum Holding Torque	oz-in (N·m)	4.6 (0.033)	8.5 (0.06)
Rotor Inertia J	oz-in^2 (kg·m^2)	0.049 (9×10^{-7})	0.098 (18×10^{-7})
Rated Current	A/phase	0.35	
Basic Step Angle		0.72˚	
Power Source		24 VDC±10% 0.7 A or 36 VDC±10% 0.7 A	
Excitation Mode		● Full Step (4 phase excitation): 0.72°/step ● Half Step (4-5 phase excitation): 0.36°/step	
Weight	Motor lb. (kg)	0.22 (0.1)	0.37 (0.17)
	Driver lb. (kg)	0.055 (0.025)	
Dimension No.	Motor	$\boxed{1}$	
	Driver	$\boxed{4}$	

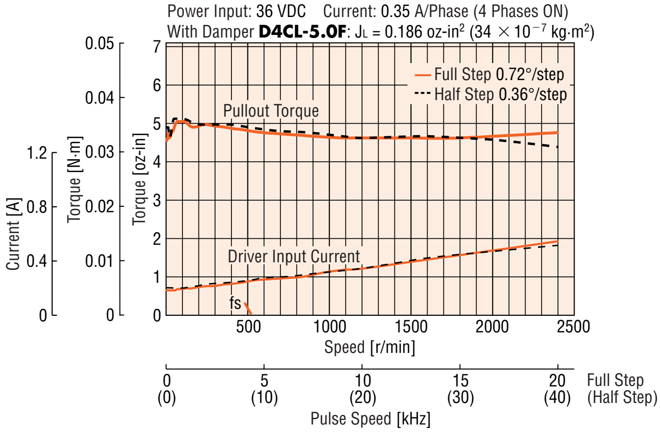
How to Read Specifications Table→Page C-9

Speed — Torque Characteristics **How to Read Speed-Torque Characteristics**→Page C-10

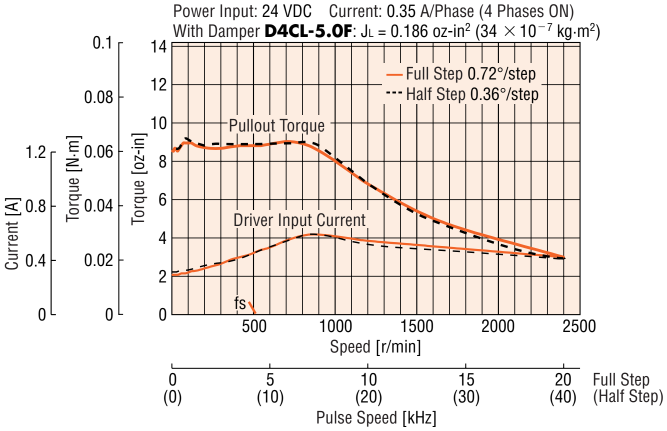
PMC33B3 24 VDC



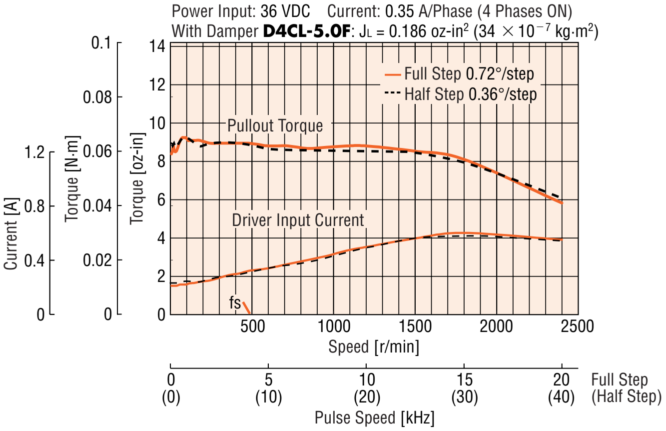
PMC33B3 36 VDC



PMC35B3 24 VDC



PMC35B3 36 VDC



Note:

The pulse input circuit responds up to approximately 100kHz with a pulse duty of 50%.

MG Geared Type   Motor Frame Size: □ 1.10 in. (□ 28 mm)

Specifications

Model	Single Shaft	PMC33A1-MG3.6	PMC33A1-MG7.2	PMC33A1-MG10	PMC33A1-MG20	PMC33A1-MG30
	Double Shaft	PMC33B1-MG3.6	PMC33B1-MG7.2	PMC33B1-MG10	PMC33B1-MG20	PMC33B1-MG30
Maximum Holding Torque	oz-in (N·m)	11.3 (0.08)	22 (0.16)	29 (0.21)	48 (0.34)	72 (0.51)
Rotor Inertia J	oz-in^2 (kg·m^2)	0.049 (9×10^{-7})				
Rated Current	A/phase	0.35				
Basic Step Angle		0.2°	0.1°	0.072°	0.036°	0.024°
Gear Ratio		3.6:1	7.2:1	10:1	20:1	30:1
Permissible Torque	oz-in (N·m)	11.3 (0.08)	22 (0.16)	29 (0.21)	48 (0.34)	72 (0.51)
Permissible Speed Range (Gear Output Shaft Speed)	r/min	0~833	0~416	0~300	0~150	0~100
Power Source		24 VDC±10% 0.7 A or 36 VDC±10% 0.7 A				
Excitation Mode	Full Step	0.2°/step	0.1°/step	0.072°/step	0.036°/step	0.024°/step
	Half Step	0.1°/step	0.05°/step	0.036°/step	0.018°/step	0.012°/step
Weight	Motor lb. (kg)	0.35 (0.16)				
	Driver lb. (kg)	0.055 (0.025)				
Dimension No.	Motor	2				
	Driver	4				

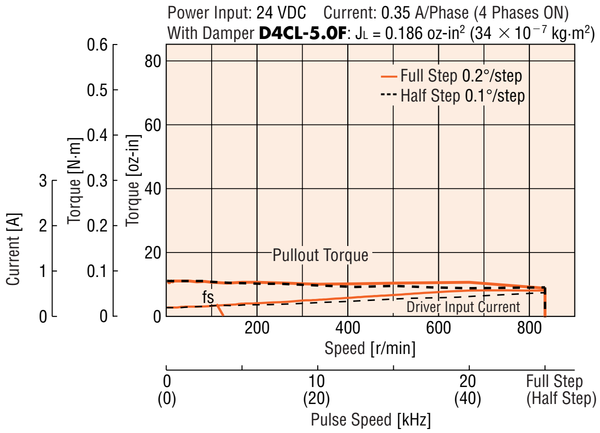
How to Read Specifications Table→Page C-9

Note:

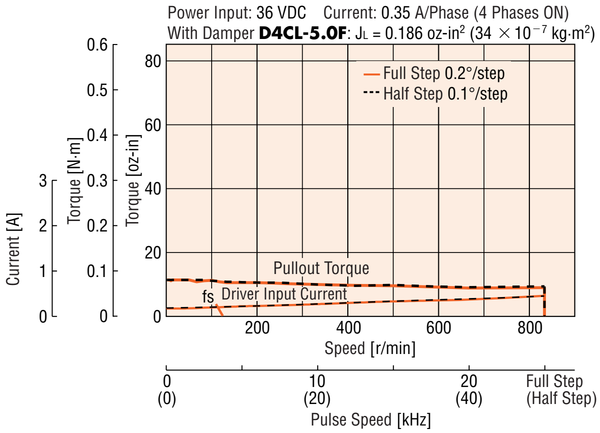
- Direction of rotation of the motor and that of the gear output shaft are the same for models with gear ratios of 3.6:1, 7.2:1, 20:1 and 30:1.
  It is opposite for 10:1 gear ratio.

Speed — Torque Characteristics **How to Read Speed-Torque Characteristics**→Page C-10

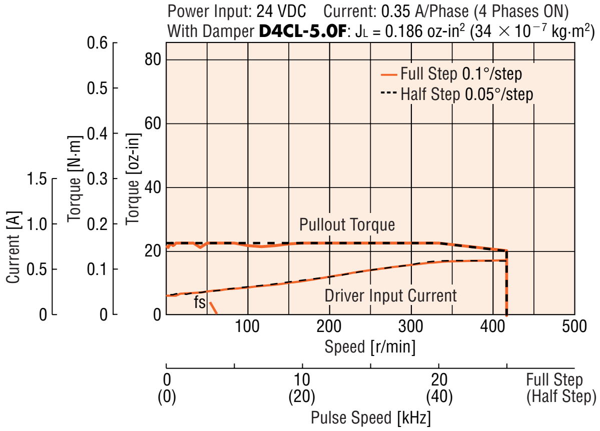
PMC33B1-MG3.6 24 VDC



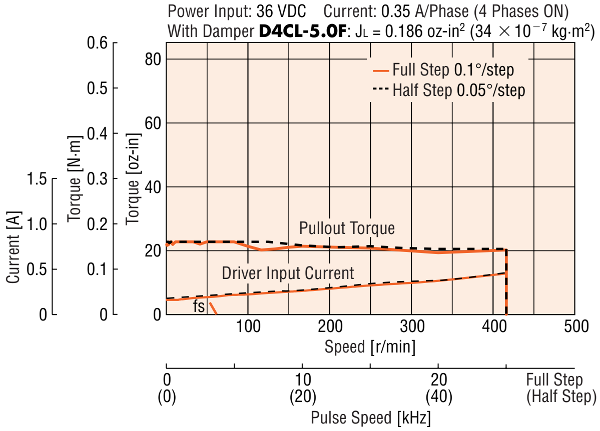
PMC33B1-MG3.6 36 VDC



PMC33B1-MG7.2 24 VDC



PMC33B1-MG7.2 36 VDC



Note:

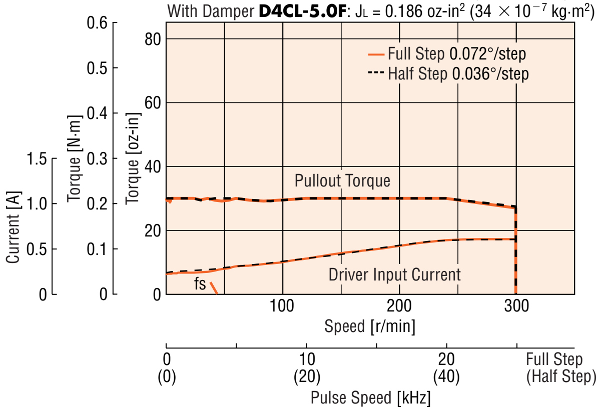
The pulse input circuit responds up to approximately 100kHz with a pulse duty of 50%.

Common Specifications C-142 | Dimensions C-143 | Connection and Operation C-145 | Motor and Driver Combinations C-148

Speed - Torque Characteristics **How to Read Speed Torque Characteristics**→Page C-10

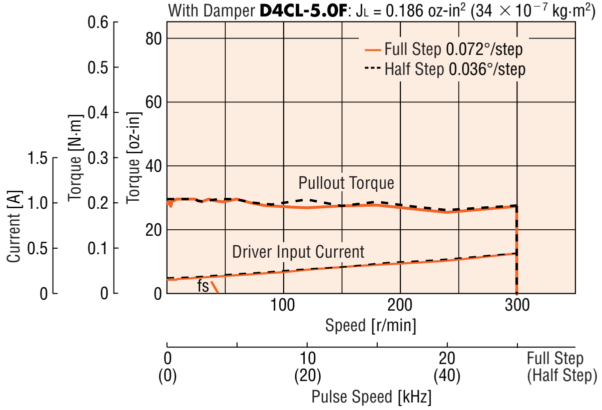
PMC33B1-MG10 24 VDC

Power Input: 24 VDC Current: 0.35 A/Phase (4 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)



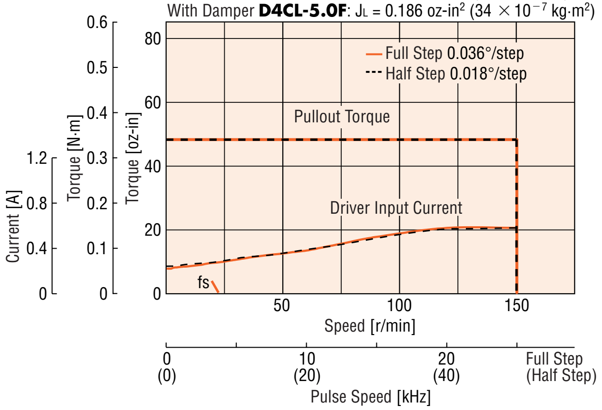
PMC33B1-MG10 36 VDC

Power Input: 36 VDC Current: 0.35 A/Phase (4 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)



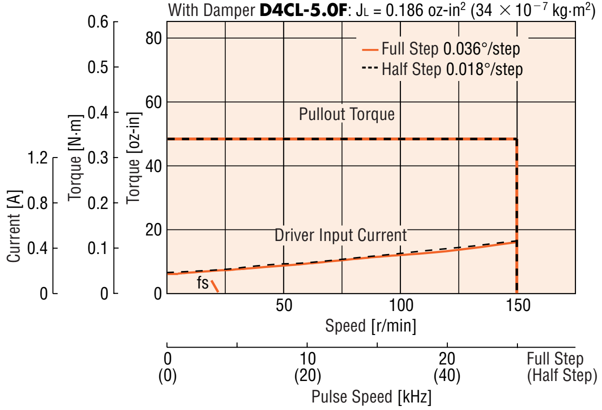
PMC33B1-MG20 24 VDC

Power Input: 24 VDC Current: 0.35 A/Phase (4 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)



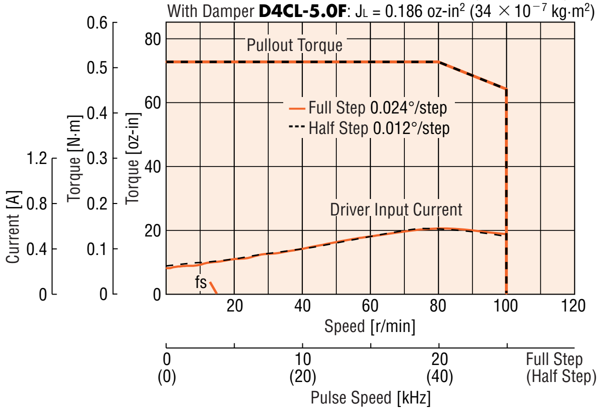
PMC33B1-MG20 36 VDC

Power Input: 36 VDC Current: 0.35 A/Phase (4 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)



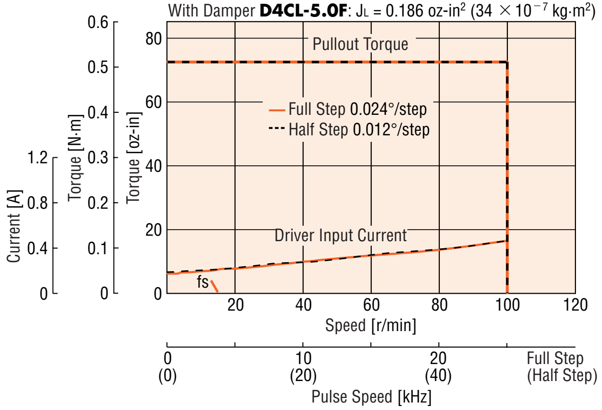
PMC33B1-MG30 24 VDC

Power Input: 24 VDC Current: 0.35 A/Phase (4 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)



PMC33B1-MG30 36 VDC

Power Input: 36 VDC Current: 0.35 A/Phase (4 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)



Note:

The pulse input circuit responds up to approximately 100kHz with a pulse duty of 50%.

HG Geared Type

Motor Frame Size: □ 1.10 in. (□ 28 mm)

Specifications

Model	Single Shaft	PMC33A1-HG50	PMC33A1-HG100
	Double Shaft	PMC33B1-HG50	PMC33B1-HG100
Maximum Holding Torque	oz-in (N·m)	210 (1.5)	280 (2)
Rotor Inertia J	oz-in^2 (kg·m^2)	0.066 (12×10^{-7})	
Rated Current	A/phase	0.35	
Basic Step Angle		0.0144˚	0.0072˚
Gear Ratio		50:1	100:1
Permissible Torque	oz-in (N·m)	210 (1.5)	280 (2)
Maximum Torque *	oz-in (N·m)	280 (2)	390 (2.8)
Lost Motion (at Load Torque)	Arc min	Max. 3.0 (±8.5 oz-in)	Max. 3.0 (±11.3 oz-in)
Permissible Speed Range (Gear Output Shaft Speed)	r/min	0∼70	0∼35
Power Source		24 VDC±10 % 0.7 A or 36 VDC±10 % 0.7 A	
Excitation Mode	Full Step	0.0144°step	0.0072°step
	Half Step	0.0072°step	0.0036°step
Weight	Motor lb. (kg)	0.46 (0.21)	
	Driver lb. (kg)	0.055 (0.025)	
Dimension No.	Motor	3	
	Driver	4	

How to Read Specifications Table→Page C-9

* The value of maximum torque is for the gear. Refer to the Speed-Torque Characteristics for the output torque of the geared motor.

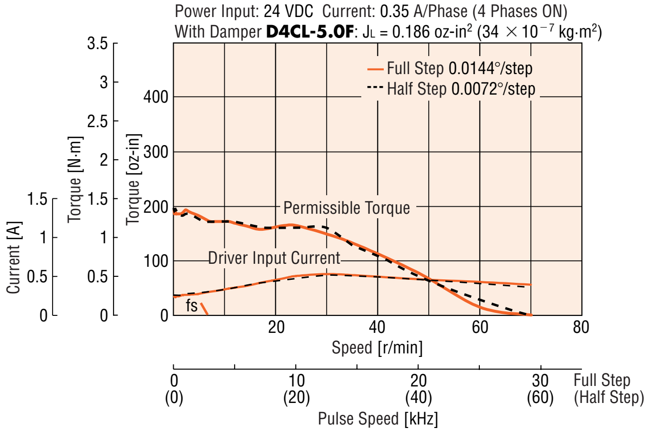
Note:

- The gear shaft rotates in the opposite direction from the motor shaft.

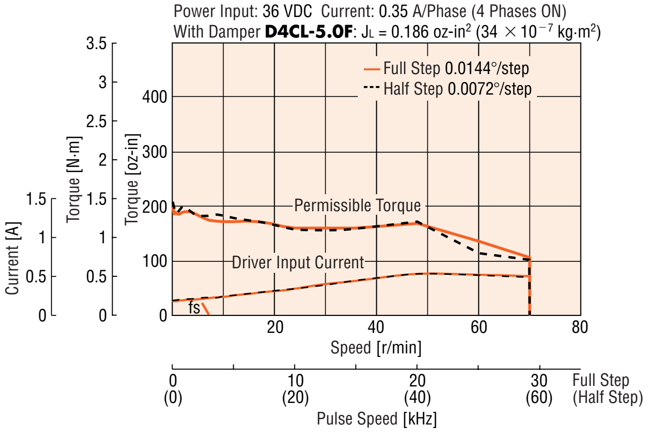
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

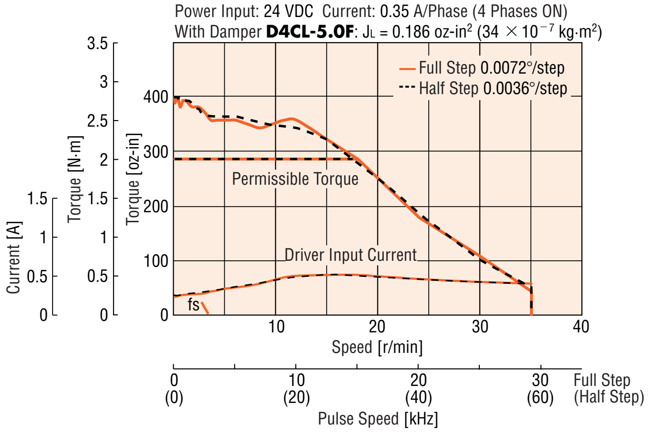
PMC33B1-HG50 24 VDC



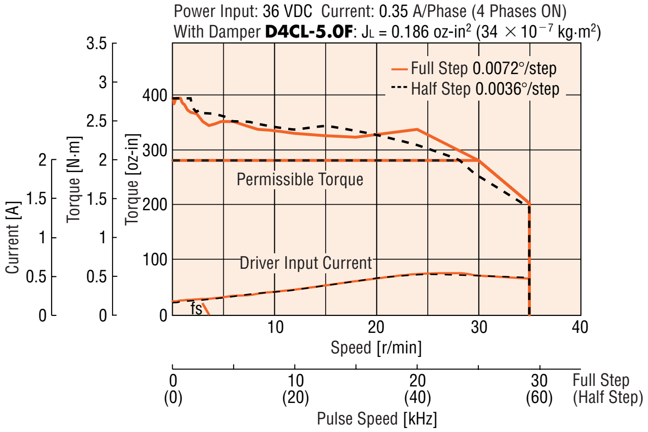
PMC33B1-HG50 36 VDC



PMC33B1-HG100 24 VDC



PMC33B1-HG100 36 VDC



Note:

The pulse input circuit responds up to approximately 100kHz with a pulse duty of 50%.

Common Specifications C-142 Dimensions C-143 Connection and Operation C-145 Motor and Driver Combinations C-148

Common Specifications

Input Signals	Input Signal Circuit	Photocoupler input, Input resistance 220 Ω, Input current 10~20 mA maximum Signal voltage Photocoupler ON: +4.5~+5 V, Photocoupler OFF: 0~+1 V (Voltage between terminals)
	● Pulse Signal (CW Pulse Signal)	Step command pulse signal (CW step command signal at 2-pulse input mode) Pulse width: 5 μs minimum, Pulse rise/fall: 2 μs maximum Pulse duty: Max. 50% Motor moves when the photocoupler state changes from ON to OFF. Maximum input frequency : 100 kHz (When the pulse duty is 50%)
	● Rotation Direction Signal (CCW Pulse Signal)	Rotation direction signal Photocoupler ON: CW, Photocoupler OFF: CCW (CCW step command signal at 2-pulse input mode. Pulse width: 5 μs minimum, Pulse rise/fall: 2 μs maximum. Pulse duty: Max. 50% Motor moves when the photocoupler state changes from ON to OFF. Maximum input frequency : 100 kHz (When the pulse duty is 50%))
	● Step Angle Signal	Full Step (0.72°) at "photocoupler OFF" Half Step (0.36°) at "photocoupler ON"
	● All Windings Off Signal	When in the "photocoupler ON" state, the current to the motor is cut off and the motor shaft can be rotated manually. When in the "photocoupler OFF" state, the current is supplied to the motor.
	● Automatic Current Cutback Release Signal	When in the "photocoupler ON" state, the "Automatic Current Cutback" function at motor standstill is disabled. When in the "photocoupler OFF" state, the "Automatic Current Cutback" function at motor standstill is activated. (approximately 100 ms after motor stops).
Output Signals	Output Signal Circuit	Photocoupler, Open-Collector Output External use condition: 24 VDC maximum, 10 mA maximum
	● Excitation Timing Signal	Signal is output every time the excitation sequence returns to the initial "0". (Photocoupler: ON) Full step: signal is output every 10 pulses, Half step: Signal is output every 20 pulses
Functions		Automatic current cutback, Pulse input mode switch, Step angle switch
Driver Cooling Method		Natural ventilation

General Specifications

Specifications		Motor	Driver
Insulation Class		Class B [266°F (130°C)]	—
Insulation Resistance		100 MΩ minimum under normal temperature and humidity, when measured by a 500 VDC megger between the motor coils and the motor casing.	—
Dielectric Strength		Sufficient to withstand 0.5 kV, 60 Hz applied between the motor coils and casing for one minute, under normal ambient temperature and humidity.	—
Operating Environment	Ambient Temperature	14°F ~ 122°F (−10°C ~ +50°C): Standard Type, **MG** Geared Type 32°F ~ 104°F (0°C ~ +40°C): **HG** Geared Type (nonfreezing)	32°F~ 104°F (0°C~40°C) (nonfreezing)
	Ambient Humidity	85% or less (noncondensing)	
	Atmosphere	No corrosive gases, dust, water or oil	
Temperature Rise		Temperature rise of the coil measured by the Change Resistance Method is 144°F (80°C) or less. (at standstill, five phases energized)	—
Static Angle Error [1]		±5 arc minutes (±0.084°)	—
Shaft Runout		0.002 inch (0.05 mm) T.I.R at top of output shaft [4]	—
Radial Play [2]		0.001 inch (0.025 mm) max. of 1.12 lb. (0.5 kg)	—
Axial Play [3]		0.003 inch (0.075 mm) max. of 2.2 lb. (1 kg)	—
Concentricity		0.003 inch (0.075 mm) T.I.R [4]	—
Perpendicularity		0.003 inch (0.075 mm) T.I.R [4]	—

[1] This value is for full step under no load. (The value changes with size of the load.)

[2] Radial Play: Refers to the displacement in shaft position in the radial direction, when a 1.12 lb. (5 N) load is applied in the vertical direction to the tip of the motor's shaft.

[3] Axial Play: Refers to the displacement in shaft position in the axial direction, when a 2.2 lb. (10 N) load is applied to the motor's shaft in the axial direction.

[4] T.I.R. (Total Indicator Reading): Refers to the total dial gauge reading when the measured section is rotated one revolution centered on a reference axis.

Note:

- Do not measure insulation resistance or perform the dielectric strength test while the motor and driver are connected.

Features C-136 System Configuration C-137 Specifications/Characteristics C-138

Permissible Overhung Load and Permissible Thrust Load

Unit = Upper values: lb./Lower values: N

Model	Overhung Load Distance from Shaft End [inch (mm)]					Thrust Load
	0	0.2 (5)	0.39 (10)	0.59 (15)	0.79 (20)	
PMC3□	5.6	7.6	11.7	—	—	The permissible thrust load [lb. (N)] shall be no greater than the motor mass.
	25	34	52			
PMC33-MG□	2	2.5	3.3	4.9	—	2.2
	9.2	11.4	15	21.9		10
PMC33-HG□	31	36	45	54	—	22
	140	160	200	240		100

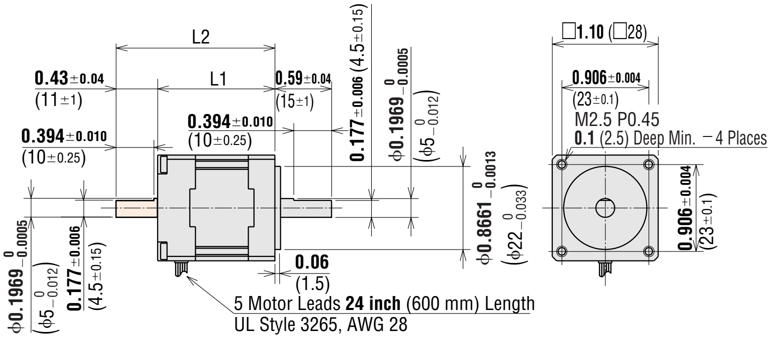
Dimensions

Scale 1/2, Unit = **inch** (mm)

Motor

Standard Type

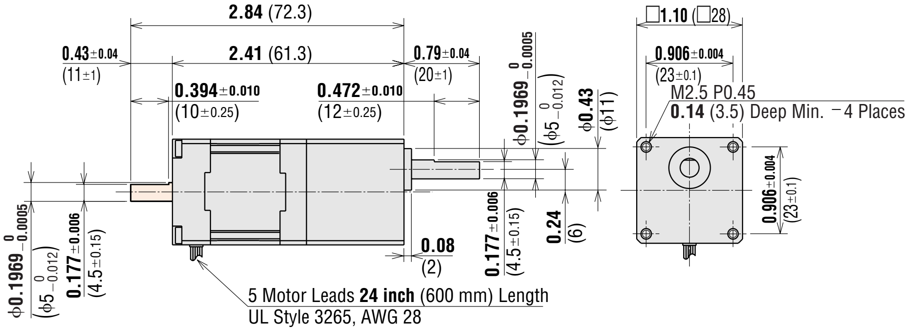
1 Motor Frame Size: □1.10 in. (□28 mm)



Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PMC33A3	PMM33A2	1.22 (31)	—	0.22 (0.1)	B077
PMC33B3	PMM33B2		1.65 (42)		
PMC35A3	PMM35A2	1.99 (50.5)	—	0.37 (0.17)	B078
PMC35B3	PMM35B2		2.42 (61.5)		

MG Geared Type

2 Motor Frame Size: □1.10 in. (□28 mm)



- Screws (included)
  M2.5 P0.45 length **0.39** (8) 4 pieces

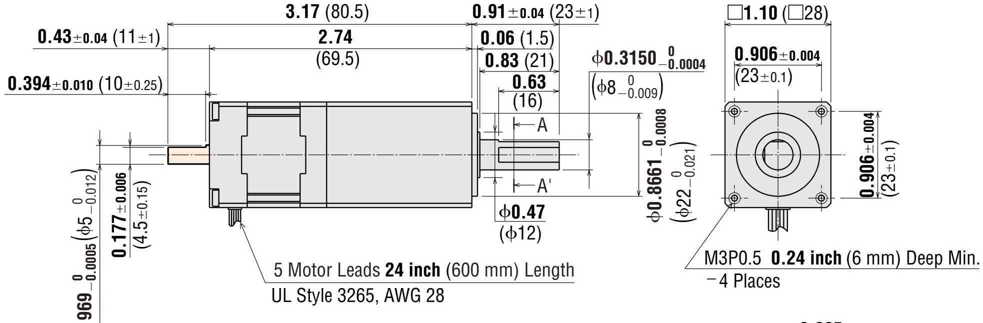
Model	Motor Model	Weight lb. (kg)	DXF
PMC33A1-MG□	PMM33A-MG□	0.35 (0.16)	B080
PMC33B1-MG□	PMM33B-MG□		

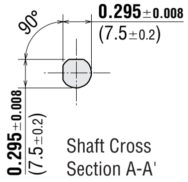
- Enter the gear ratio in the box (□) within the model number.

- These dimensions are for double shaft models. For single shaft models, ignore the shaded areas.

◆ HG Geared Type

3 Motor Frame Size: □1.10 in. (□28 mm)





- Screws (included)
  M2.5 P0.45 length 0.39 (8) 4 pieces

Model	Motor Model	Weight lb. (kg)	DXF
PMC33A1-HG□	PMM33A-HG□	0.46 (0.21)	B234
PMC33B1-HG□	PMM33B-HG□		

- Enter the gear ratio in the box (□) within the model number.

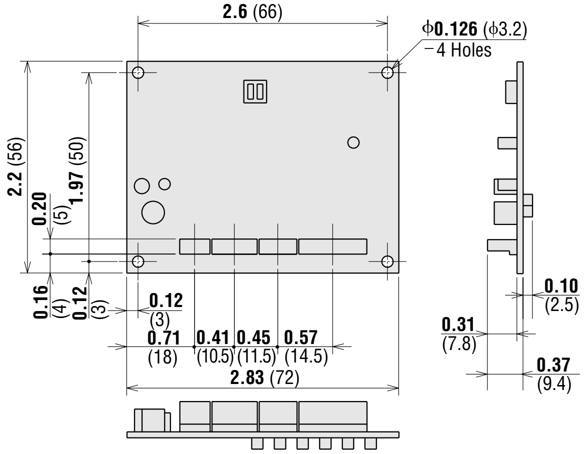
- This dimension is for double shaft model. For single shaft model, ignore the shaded area.

● Driver

4 PMD03CA

Weight: 0.055 lb. (0.025 kg)

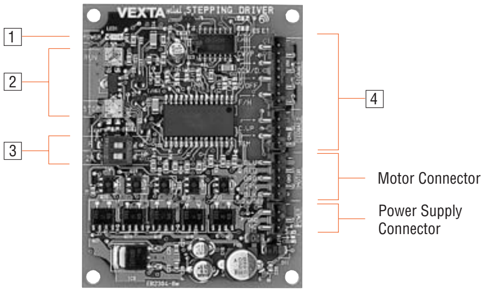
DXF B079



- Connector Housings (included)
  6-173977-3 (AMP): Power supply connector (CN2)
  6-173977-4 (AMP): I/O signal connector (CN4)
  6-173977-5 (AMP): Motor connector (CN3)
  6-173977-8 (AMP): I/O signal connector (CN1)

Note:
Use the connector assembly tool
(AMP 911790-1) when assembling the connectors.
The connector tool is not provided with the package.

Connection and Operation



1 Signal Monitor Display

Indicator	Color	Function
POWER	Green	Power input display

2 Current Adjustment Potentiometers

Indicator	Name	Functions
RUN	Motor run current potentiometer	For adjusting the motor running current
STOP	Motor stop current potentiometer	For adjusting the motor current at standstill

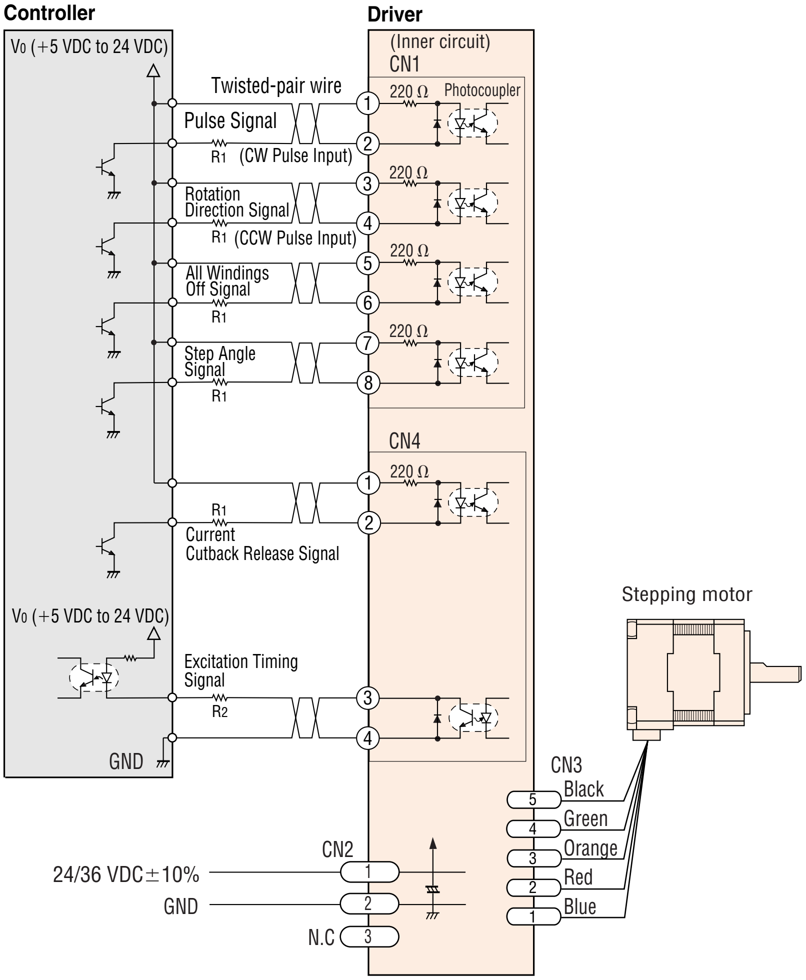
3 Function Select Switches

Indicator	Switch Name	Functions
F/H	Step angle select switch	Switches the motor's step angle. F: Full step, H: Half step
2P/1P	Pulse input mode switch	Switches between 1-pulse input mode and 2-pulse input mode

4 Input/Output Signals

Connector	Input/Output	Pin No.	Terminal Name
CN1	Input signal	1	Pulse Signal (CW Pulse Signal)
		2	
		3	Rotation Direction Signal (CCW Pulse Signal)
		4	
		5	All Windings Off Signal
		6	
		7	Step Angle Select Signal
		8	
CN4	Input signal	1	Current Cutback Release Signal
		2	
	Output signal	3	Excitation Timing Signal
		4	

Connection Diagrams



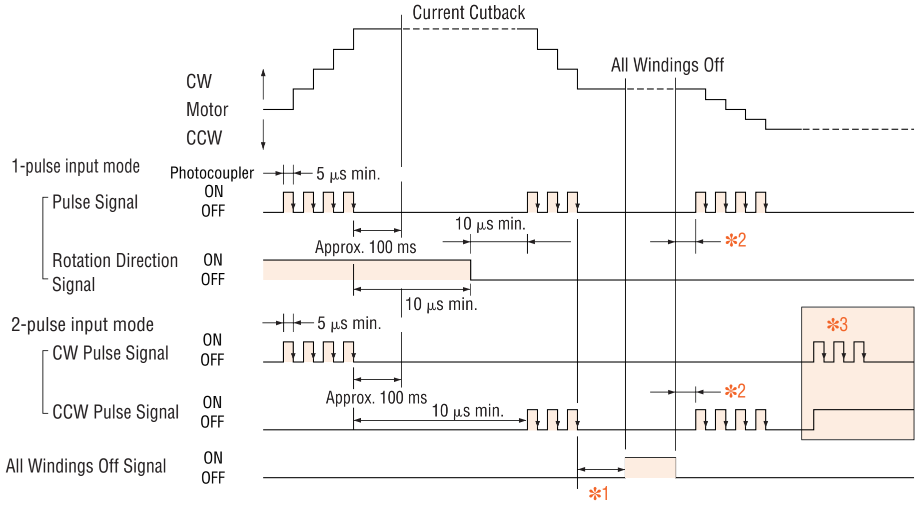
Notes:

- Keep the voltage V_o between 5 VDC and 24 VDC. When V_o is equal to 5 VDC, the external resistance R_1 is not necessary. When V_o is above 5 VDC, connect R_1 to keep the current between 10 mA and 20 mA, and connect R_2 to keep the current below 10 mA.
- Use twisted-pair wire of AWG 28 or thicker and 6.6 feet (2 m) or less in length for the signal line.
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreased. (→Technical Reference Page F-36)
- Suitable wire size for the CN1, CN2, CN3 and CN4 connector is between AWG 28 and AWG26. Use AWG 26 for the power line. When assembling the connectors, use the hand-operated crimp tool for contact 911790-1(AMP). The crimp tool is not provided with the package.
- Signal lines should be kept at least 3.9 inches (10 cm) away from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.
- If noise generated by the motor lead wire causes a problem, try shielding the motor lead wires with conductive tape or wire mesh.
- Incorrect connection of DC power input can lead to driver damage. Make sure that the polarity is correct before turning power on.

◆ Power Supply

Keep the input power voltage to either 24 VDC±10% or 36 VDC±10%. Use a power supply that can supply sufficient input current.

● Timing Chart



▭ Shaded area indicates the radiation of the photocoupler diode.

Note: 10 µs or more is the standard interval time for switching from CW to CCW. Note that the interval time varies greatly depending on the motor and load inertia.

✻1 Wait a period of time to allow the motor oscillations to end before inputting the "All Windings Off" signal. This time varies with the load inertia, the load torque and the starting pulse rate. The signal input must be stopped before the motor stops.

✻2 Never input step pulse signals immediately after switching the "All Windings Off" input signal to the "photocoupler OFF" state, or the motor may lose synchronism. In general, a minimum interval of 100 ms is required.

✻3 The motor will not operate properly when inputting a pulse signal while either the CW or CCW pulse is in the "photocoupler ON" state.

●Description of Input/Output Signals

Pulse Input and Rotation Direction Signals

1-Pulse Input Mode

Pulse Input Signal

"Pulse" signal is input to the PLS/CW −terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step. The direction of rotation is determined by the rotation direction signal.

Rotation Direction Input Signal

The "Rotation Direction" signal is input to the DIR/CCW −terminal.
A "photocoupler ON" signal input commands a clockwise direction rotation. A "photocoupler OFF" signal input commands a counterclockwise direction rotation.

2-Pulse Input Mode

CW Pulse Input Signal

"Pulse" signal is input to the CW/P − terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step in the clockwise direction.

CCW Pulse Input Signal

"Pulse" signal is input to the CCW/D − terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step in the counterclockwise direction.

All Windings Off Input Signal

When the "All Windings Off" (A.W.OFF) signal is in the "photocoupler ON" state, the current to the motor is cut off and motor torque is reduced to zero. The motor output shaft can then be rotated freely by hand. This signal is used when moving the motor by external force or to manual home position.

Step Angle Select Input Signal

When the "Step Angle Select" (F/H) signal is in the "photocoupler ON" state, half step mode has been selected; When the F/H signal is in the "photocoupler OFF" state, full step mode has been selected. (When using this input to select the step angle, the step angle switch should be set to "F" position).

Current Cutback Release Input Signal

When the "Current Cutback Release" (C UP) signal is in the "photocoupler ON" state, the "Automatic Current Cutback" function is not activated.

Excitation Timing Output Signal

The excitation timing signal is output once each time the excitation sequence returns to step "0" in synchronization with input pulse. The excitation sequence is designed to complete one cycle as the motor shaft rotates 7.2˚. A signal is output every 10 pulses in full step mode and every 20 pulses in half step mode. (When the "Excitation Timing" signal is output, the transistor turns ON.)

◆How to Use Function Select Switches

Step Angle Select

When the step angle select switch is set to "F" position, the setting is for full step. When set to "H" position, the setting is for half step.

Note:
The step angle can be set with not only the step angle select switch but the step angle select signal input. The unused step angle selection method should be set to FULL STEP. When either of them is set to HALF STEP, the setting is for half step.

Pulse Input Mode

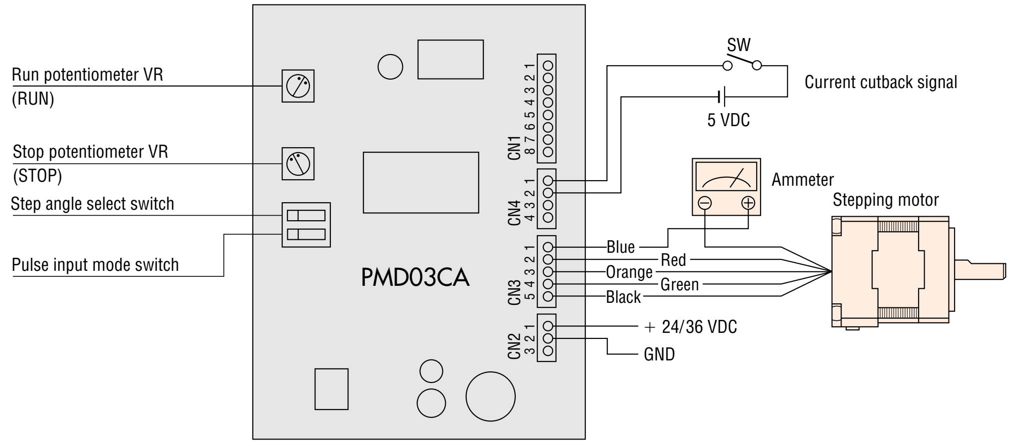
When the pulse input mode select switch is set to "2P" position, the 2-pulse input mode is set. When the pulse input mode select switch is set to "1P" position, the 1-pulse input mode is set.

● Adjusting the Driver Output Current

The rated output current is set at the factory. If it is necessary to change the current setting, follow the procedures described below.

◆ Connecting an Ammeter

①Connect a DC ammeter between the motor and pin ① of CN3 connector as shown below.



②After connecting the DC ammeter to the motor, turn on the power. (The excitation status at this point is fixed: power on reset.)

③When the power is turned on, the motor enters a 4 phase excitation state, and +directional current flows through the blue motor lead wire. (Even if 4-5 phase excitation has been selected, the motor enters a 4 phase excitation state when the power is turned on. Adjust the current in this state.)

④The value measured by the ammeter represents the total current in two phases. The current for one phase is equivalent to half of the ammeter value. (When setting the current to 0.3 A/phase, adjust the current level until the ammeter reads 0.6 A.)

Notes:
- Never input pulse signals.
- Select "photocoupler OFF" for "All Windings Off" signal. (Select "photocoupler OFF" when the switch is open.)
- When the RUN current is adjusted, the current at motor standstill also changes.

◆ Adjusting the Motor Running Current

Set "Current Cutback Release" signal to the "photocoupler ON" state when adjusting the RUN current.

(1)Adjust the motor RUN current with the RUN potentiometer.
Adjusting range
PMD03CA: 0.07 A/phase to 0.35 A/phase

(2)The motor running current is set for rated current at the time of shipping, but it can be readjusted using the RUN potentiometer. The running current can be lowered to suppress temperature rise in the motor/driver, or lower running current in order to allow a margin for motor torque or to reduce vibration.

Note:
- The motor RUN current should be less than the motor rated current.

◆ Adjusting the Current at Motor Standstill

Set "Current Cutback Release" signal to the "photocoupler OFF" state when adjusting the current while the motor is stopped.

(1)Adjust the current at motor standstill with the STOP potentiometer.
Adjusting range
PMD03CA: 0.07 A/phase to 0.28 A/phase

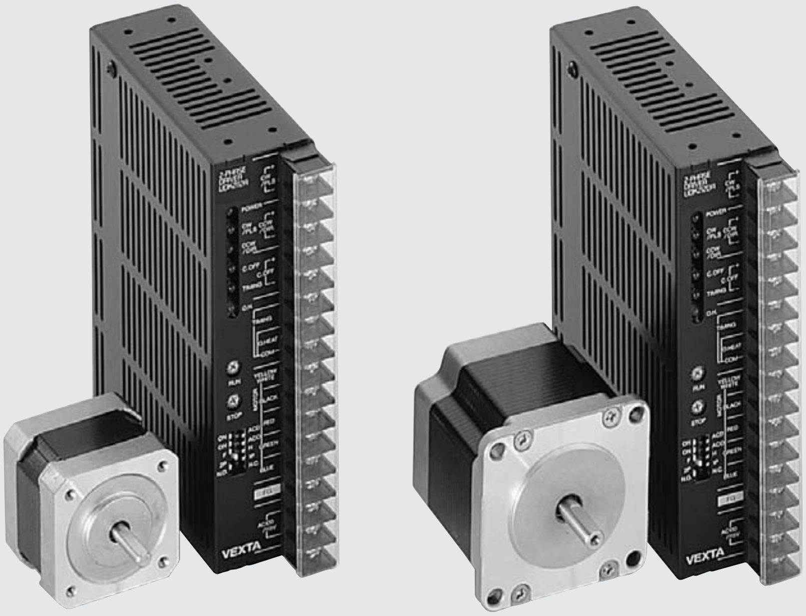
(2)At the time of shipping, the current at motor standstill is set for half of rated current. The STOP potentiometer can be used to readjust the current at motor standstill to the current value required to produce enough holding torque.

$$\begin{array}{c}\text{Holding torque}\\ \text{[oz-in (N·m)]}\end{array} = \frac{\begin{array}{c}\text{Maximum}\\ \text{holding torque}\\ \text{[oz-in (N·m)]}\end{array} \times \begin{array}{c}\text{Current at motor}\\ \text{standstill [A]}\end{array}}{\text{Motor rated current [A]}}$$

List of Motor and Driver Combinations

Type	Model	Motor Model	Driver Model
Standard	**PMC33□3** **PMC35□3**	PMM33□2 PMM35□2	PMD03CA
MG Geared	**PMC33□1-MG3.6** **PMC33□1-MG7.2** **PMC33□1-MG10** **PMC33□1-MG20** **PMC33□1-MG30**	PMM33□-MG3.6 PMM33□-MG7.2 PMM33□-MG10 PMM33□-MG20 PMM33□-MG30	
HG Geared	**PMC33□1-HG50** **PMC33□1-HG100**	PMM33□-HG50 PMM33□-HG100	

- Enter **A** (single shaft) or **B** (double shaft) in the box (□) within the model numbers



2-Phase Stepping Motor and Driver Package

UMK Series

Additional Infomation

2-Phase Stepping Motor and Driver Package

UMK Series

The **UMK** Series provides high torque and low vibration.

Features

● High Torque

Combines a high torque **PK** motor with a dedicated driver.
Maximum holding torque is as follows:

UMK24□:	22 oz-in (0.16 N·m)~45 oz-in (0.32 N·m)
UMK24□M:	22 oz-in (0.16 N·m)~45 oz-in (0.32 N·m)
UMK26□:	55 oz-in (0.39 N·m)~191 oz-in (1.35 N·m)
UMK26□M:	55 oz-in (0.39 N·m)~191 oz-in (1.35 N·m)

● Low Vibration and Low Noise

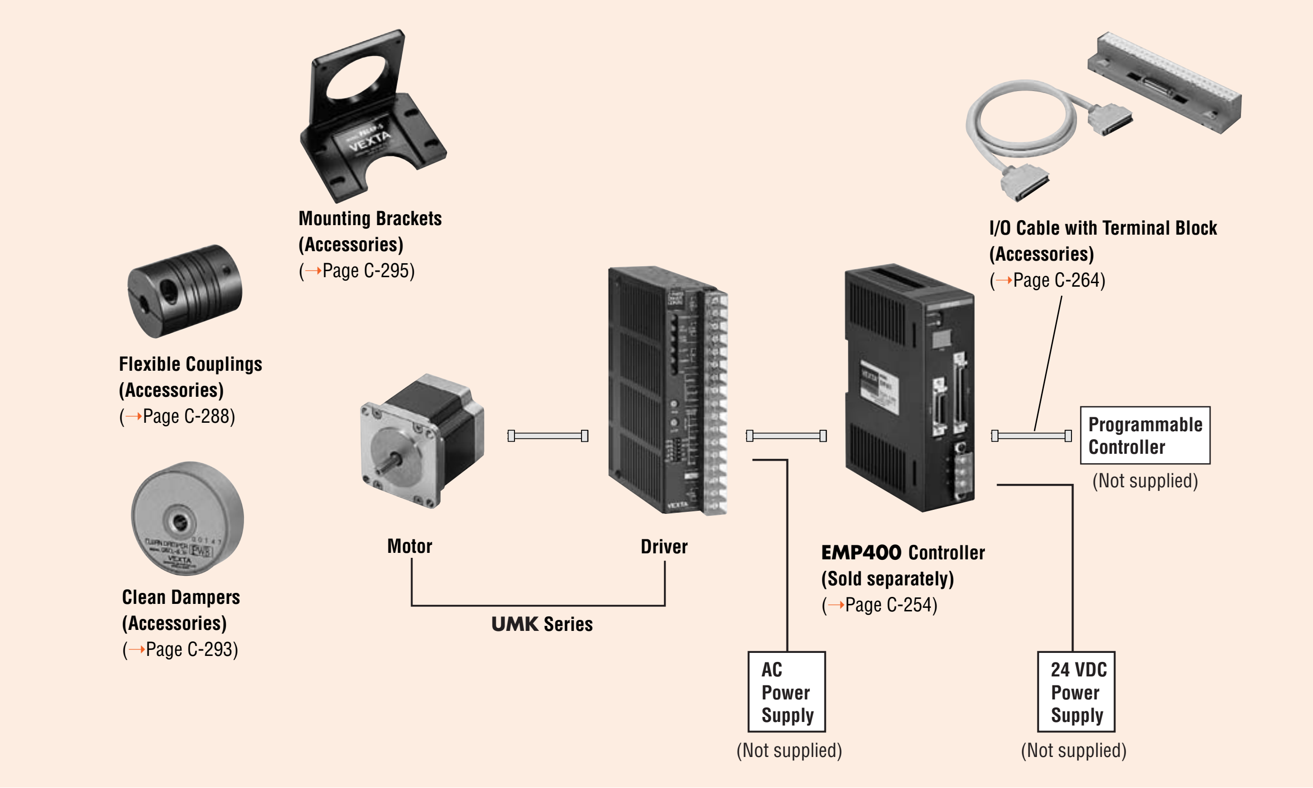
Raising the torque can increase vibration and audible noise. The **UMK** Series was designed to ensure low vibration and low noise. For a 2-phase stepping motor running at full step, rotation is achieved by continuous 1.8˚ steps. This is a type of motion that leads naturally to vibration. To lower vibration and noise, it is important to make rotation as smooth as possible.

● High-Resolution Type

The **UMK** Series also includes high resolution models for which the basic step angle (1.8˚/step) is cut in half to 0.9˚/step (for full steps).
The resolution is doubled from the 200 steps per rotation for the standard models to 400 steps per rotation. Consequently, the high-resolution model can be half-stepped to obtain 800 steps per rotation.

Features C-150 System Configuration C-151 Specifications/Characteristics C-152

System Configuration



An example of a single-axis system configuration with an **EMP400** series controller.

Product Number Code

UMK 2 6 6 M A A

- **UMK** Series
- **2**: 2-phase
- **6**: Motor Frame Size **4**: 1.65 in. sq. (42 mm sq.)
  6: 2.22 in. sq. (56.4 mm sq.)
- **6**: Motor Case Length
- **M**: Blank: Standard Type
  M:High-Resolution Type
- **A**: Shaft Type **A**: Single Shaft
  B: Double Shaft
- **A**: U.S.A. Version

Product Line

Type	Power Supply Voltage	Maximum Holding Torque	
		1.65 inch (42 mm)	2.22 inch (56.4 mm)
Standard Type	Single-Phase 100/115 VAC	22~45 oz-in (0.16~0.32 N·m)	55~191 oz-in (0.39~1.35 N·m)
High-Resolution Type	Single-Phase 100/115 VAC	22~45 oz-in (0.16~0.32 N·m)	55~191 oz-in (0.39~1.35 N·m)

Standard Type

Motor Frame Size: □ 1.65 in. (□ 42 mm), □ 2.22 in. (□ 56.4 mm)

Specifications

Model	Single Shaft	UMK243AA	UMK244AA	UMK245AA	UMK264AA	UMK266AA	UMK268AA
	Double Shaft	UMK243BA	UMK244BA	UMK245BA	UMK264BA	UMK266BA	UMK268BA
Maximum Holding Torque	oz-in (N·m)	22 (0.16)	36 (0.26)	45 (0.32)	55 (0.39)	127 (0.9)	191 (1.35)
Rotor Inertia J	oz-in^2(kg·m^2)	0.191 (35×10^{-7})	0.3 (54×10^{-7})	0.37 (68×10^{-7})	0.66 (120×10^{-7})	1.64 (300×10^{-7})	2.6 (480×10^{-7})
Rated Current	A/phase	0.95	1.2		2		
Basic Step Angle		1.8°					
Power Source		Single-Phase 115 VAC±15% 60 Hz or Single-Phase 100 VAC ±15% 50/60 Hz					
		1 A	1.4 A		2.2 A		
Excitation Mode		● Full Step (2 phase excitation): 1.8°/step ● Half Step (1-2 phase excitation): 0.9°/step					
Weight	Motor lb. (kg)	0.46 (0.21)	0.59 (0.27)	0.77 (0.35)	0.99 (0.45)	1.5 (0.7)	2.2 (1)
	Driver lb. (kg)	1 (0.47)					
Dimension No.	Motor	1			2		
	Driver	3					

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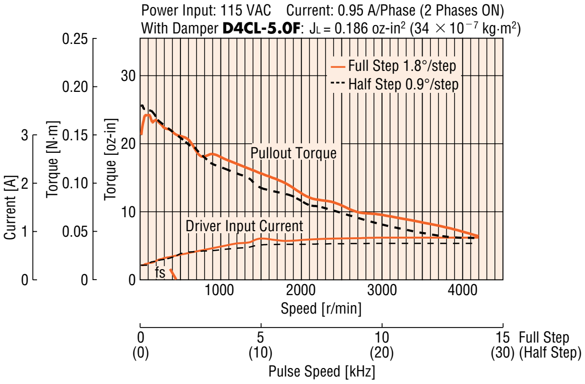
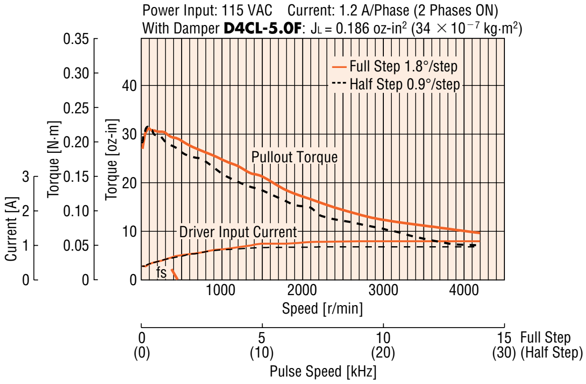
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

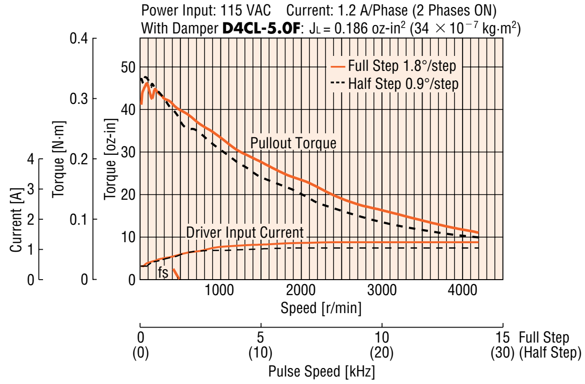
UMK243BA


Power Input: 115 VAC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)

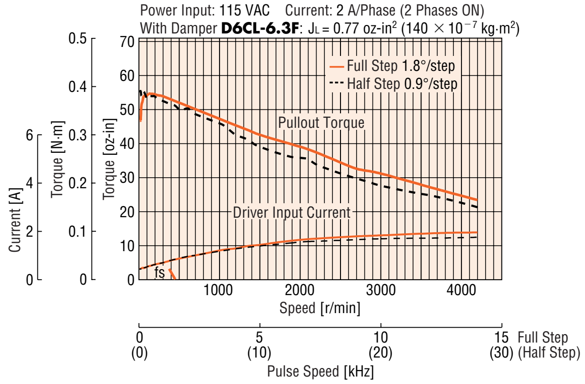
UMK244BA


Power Input: 115 VAC Current: 1.2 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)

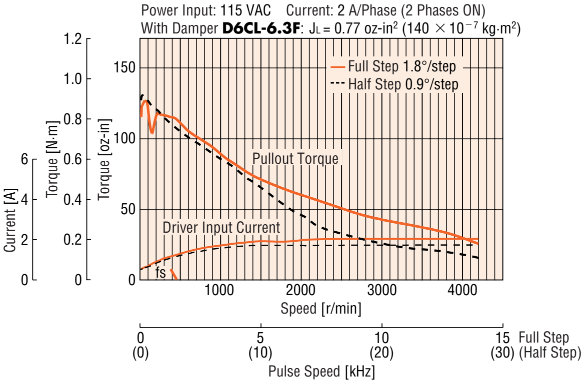
UMK245BA


Power Input: 115 VAC Current: 1.2 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)

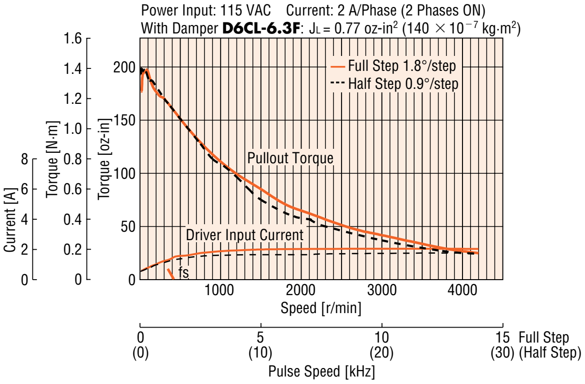
UMK264BA


Power Input: 115 VAC Current: 2 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)

UMK266BA


Power Input: 115 VAC Current: 2 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)

UMK268BA


Power Input: 115 VAC Current: 2 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)

Note:
The pulse input circuit responds up to approximately 20 kHz with a pluse duty of 50 %

High-Resolution Type Motor Frame Size: □ 1.65 in. (□ 42 mm), □ 2.22 in. (□ 56.4 mm)

Specifications

Model	Single Shaft	UMK243MAA	UMK244MAA	UMK245MAA	UMK264MAA	UMK266MAA	UMK268MAA
	Double Shaft	**UMK243MBA**	**UMK244MBA**	**UMK245MBA**	**UMK264MBA**	**UMK266MBA**	**UMK268MBA**
Maximum Holding Torque	oz-in (N·m)	22 (0.16)	36 (0.26)	45 (0.32)	55 (0.39)	127 (0.9)	191 (1.35)
Rotor Inertia J	oz-in^2 (kg·m^2)	0.191 (35×10^{-7})	0.3 (54×10^{-7})	0.37 (68×10^{-7})	0.66 (120×10^{-7})	1.64 (300×10^{-7})	2.6 (480×10^{-7})
Rated Current	A/phase	0.95	1.2		2		
Basic Step Angle		0.9°					
Power Source		Single-Phase 115 VAC±15% 60 Hz or Single-Phase 100 VAC ±15% 50/60 Hz					
		1 A	1.4 A		2.2 A		
Excitation Mode		● Full Step (2 phase excitation): 0.9°/step ● Half Step (1-2 phase excitation): 0.45°/step					
Weight	Motor lb. (kg)	0.53 (0.24)	0.66 (0.3)	0.81 (0.37)	0.99 (0.45)	1.5 (0.7)	2.2 (1)
	Driver lb. (kg)	1 (0.47)					
Dimension No.	Motor	1			2		
	Driver	3					

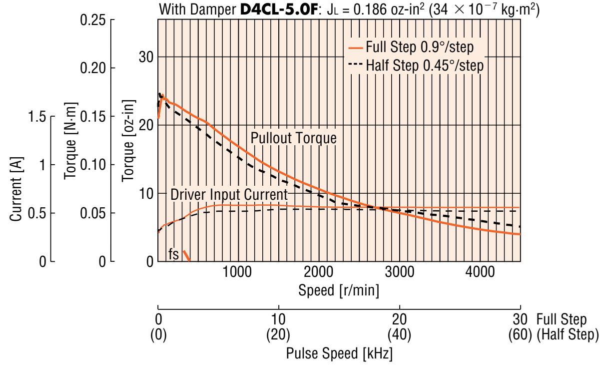
How to Read Specifications Table→Page C-9

Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

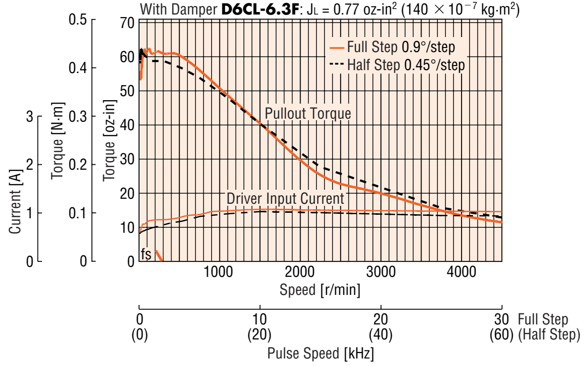
UMK243MBA

Power Input: 115 VAC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



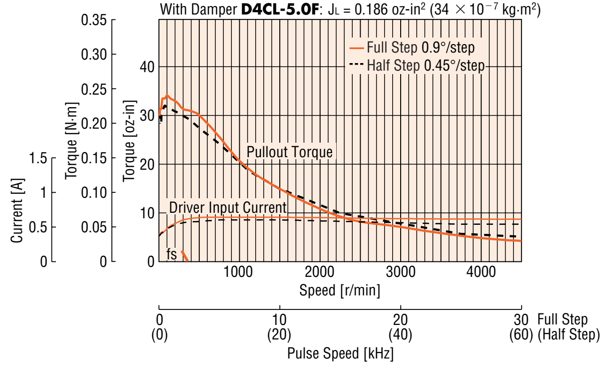
UMK264MBA

Power Input: 115 VAC Current: 2 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



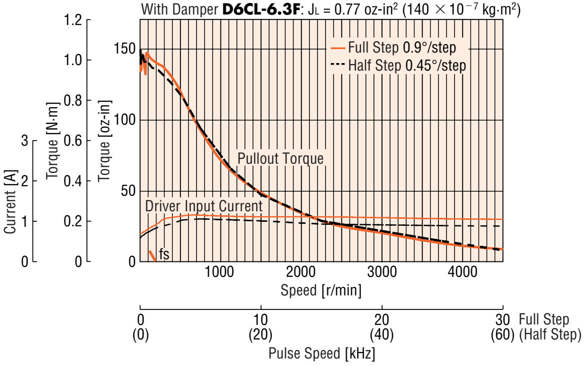
UMK244MBA

Power Input: 115 VAC Current: 1.2 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



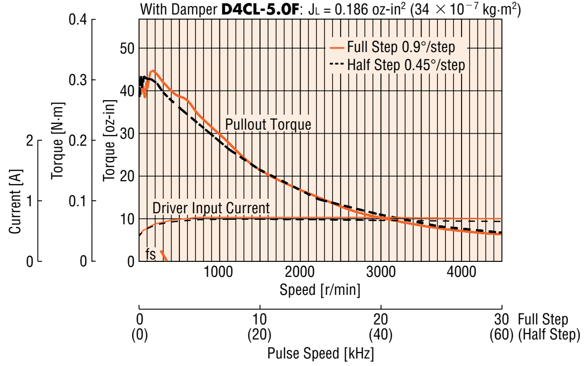
UMK266MBA

Power Input: 115 VAC Current: 2 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



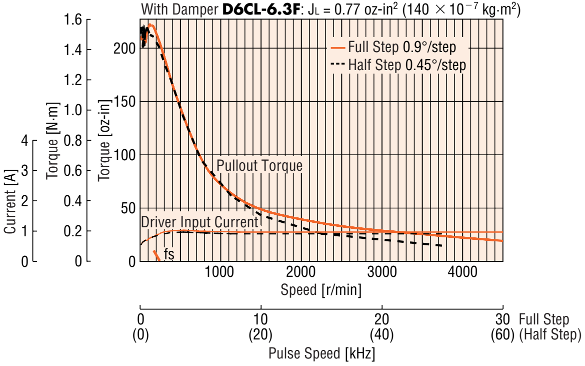
UMK245MBA

Power Input: 115 VAC Current: 1.2 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



UMK268MBA

Power Input: 115 VAC Current: 2 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



Note:
The pulse input circuit responds up to approximately 20 kHz with a pluse duty of 50 %

Common Specifications C-154 | Dimensions C-155 | Connection and Operation C-156 | Motor and Driver Combinations C-160

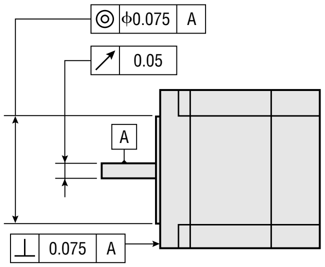
Common Specifications

Driver Specifications

Input Signals	Input Signal Circuit	Photocoupler input, Input resistance 220 Ω, Input current 10~20 mA maximum Signal voltage Photocoupler ON: +4.5~+5 V, Photocoupler OFF: 0~+1 V (voltate between terminals)
	● Pulse Signal (CW Pulse Signal)	Step command pulse signal (CW direction command pulse signal at 2-pulse input mode) Pulse width: 5 μs minimum, Pulse rise/fall: 2 μs maximum Pulse duty: Max 50% Motor moves when the photocoupler state changes from ON to OFF. Maximum input frequency: 20 kHz (when the pulse duty is 50 %)
	● Rotation Direction Signal (CCW Pulse Signal)	Rotation direction pulse signal, Photocoupler ON: CW, Photocoupler OFF: CCW (CCW direction command pulse signal at 2-pulse input mode. Pulse width: 5 μs minimum, Pulse rise/fall: 2 μs maximum, Pulse duty: Max. 50%. Motor moves when the photocoupler state changes from ON to OFF. Maximum input frequency: 20 kHz (when the pulse duty is 50 %))
	● All Windings Off Signal	When in the "photocoupler ON" state, the current to the motor is cut off and the motor shaft can be rotated manually. When in the "photocoupler OFF" state, the current is supplied to the motor.
Output Signals	Output Signal Circuit	Photocoupler, Open-Collector Output External use condition: 24 VDC maximum, 10 mA maximum
	● Excitation Timing Signal	The signal is output every time the excitation sequence returns to the initial stage "0". (Photocoupler: ON) Full step: signal output every 4 pulses, Half step: signal output every 8 pulses
	● Overheat Signal	The signal is output when the internal temperature of the driver rises above approximately 194°F (90°C). (Photocoupler: ON or OFF, automatic return available) The motor current is shut off automatically if the automatic current off function is ON. The output logic of the photocoupler is based on the setting of the overheat output logic switch
Functions		Automatic current cutback, All windings off, Pulse mode input switch, Step angle switch, Overheat output logic switch
Indicator (LED)		Power source input, CW/PLS input, CCW/DIR input, All windings off input, Excitation timing output, Overheat output
Driver Cooling Method		Natural ventilation

General Specifications

Specifications		Motor	Driver
Insulation Class		Class B [266˚F (130˚C)]	–
Insulation Resistance		100 MΩ minimum under normal temperature and humidity, when measured by a 500 VDC megger between the motor coils and the motor casing.	100 MΩ minimum under normal temperature and humidity, when measured by a 500 VDC ● Case – Power input terminal ● Case – Signal input/output terminal ● Power input terminal – Signal input/output terminal
Insulation Strength		Sufficient to withstand 1.0 kV (0.5 kV for **UMK24□** and **UMK24□M** type), 60 Hz applied between the motor coils and casing for one minute, under normal temperature and humidity.	Sufficient to withstand the following for one minute, under normal temperature and humidity ● Case - Power input terminal 1.0 k VAC 60 Hz ● Case - Signal input/output terminal 1.0 k VAC 60 Hz ● Power input terminal - Signal input/output terminal 1.0 k VAC 60 Hz
Operating Environment	Ambient Temperature	14°F~122°F (−10°C~+50°C) (nonfreezing)	32°F~104°F (0°C~+40°C) (nonfreezing)
	Ambient Humidity	85% or less (non-condensing)	
	Atmosphere	No corrosive gases, dust, water or oil.	
Temperature Rise		Temperature rise of the coil measured by the Change Resistance Method is 144°F (80°C) or less. (at standstill, two phases energized)	–
Static Angle Error [✻1]		±3 arc minutes (±0.05°)	–
Shaft Runout		0.002 inch (0.05 mm) T.I.R at top of output shaft [✻4]	–
Radial Play [✻2]		0.001 inch (0.025 mm) max. of 1.12 lb. (0.5 kg)	–
Axial Play [✻3]		0.003 inch (0.075 mm) max. of 2.2 lb. (1 kg)	–
Concentricity		0.003 inch (0.075 mm) T.I.R [✻4]	–
Perpendicularity		0.003 inch (0.075 mm) T.I.R [✻4]	–



✻1 This value is for full step under no load. (The value changes with size of the load.)

✻2 Radial Play: Displacement in shaft position in the radial direction, when a 1.12 lb. (5 N) load is applied in the vertical direction to the tip of the motor's shaft.

✻3 Axial Play: Displacement in shaft position in the axial direction, when a 2.2 lb. (10 N) load is applied to the motor's shaft in the axial direction.

✻4 T.I.R. (Total Indicator Reading): Total dial gauge reading when the measurement section is rotated one revolution centered on a reference axis.

Note:
- ● Do not measure insulation resistance or perform a dielectric strength test while the motor and driver are connected.

Features C-150 System Configuration C-151 Specifications/Characteristics C-152

Permissible Overhung Load and Permissible Thrust Load

Unit = Upper values: lb./Lower values: N

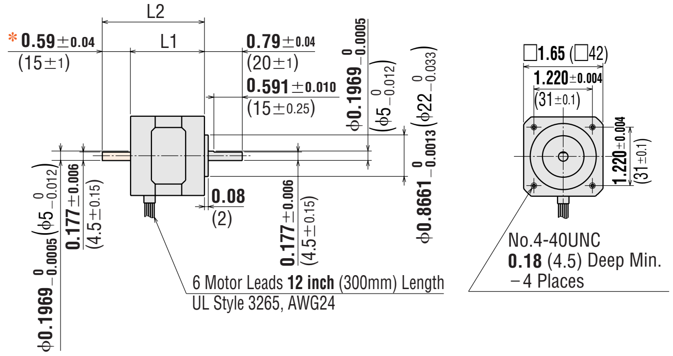
Model	Overhung Load Distance from Shaft End [inch (mm)]					Thrust Load
	0	0.2 (5)	0.39 (10)	0.59 (15)	0.79 (20)	
UMK24☐ **UMK24☐M**	4.5 20	5.6 25	7.6 34	11.7 52	–	The permissible thrust load [lb. (N)] shall be no greater than the motor mass.
UMK26☐ **UMK26☐M**	12.1 54	15 67	20 89	29 130	–	

Dimensions

Scale 1/4, Unit = **inch** (mm)

Standard and High-Resolution Type Motors

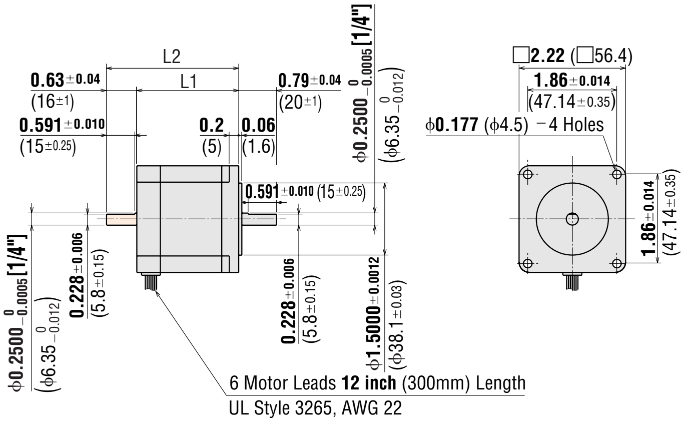
1 Motor Frame Size: ☐ 1.65 in. (☐ 42 mm)



✻ The length of machining on double shaft model is **0.591±0.010** (15±0.25).

Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
UMK243AA	PK243-01AA	1.3 (33)	–	0.46 (0.21)	B081U
UMK243MAA	PK243MAA			0.53 (0.24)	
UMK243BA	PK243-01BA		1.89 (48)	0.46 (0.21)	
UMK243MBA	PK243MBA			0.53 (0.24)	
UMK244AA	PK244-01AA	1.54 (39)	–	0.59 (0.27)	B082U
UMK244MAA	PK244MAA			0.66 (0.3)	
UMK244BA	PK244-01BA		2.13 (54)	0.59 (0.27)	
UMK244MBA	PK244MBA			0.66 (0.3)	
UMK245AA	PK245-01AA	1.85 (47)	–	0.77 (0.35)	B083U
UMK245MAA	PK245MAA			0.81 (0.37)	
UMK245BA	PK245-01BA		2.44 (62)	0.77 (0.35)	
UMK245MBA	PK245MBA			0.81 (0.37)	

2 Motor Frame Size: ☐ 2.22 in. (☐ 56.4 mm)



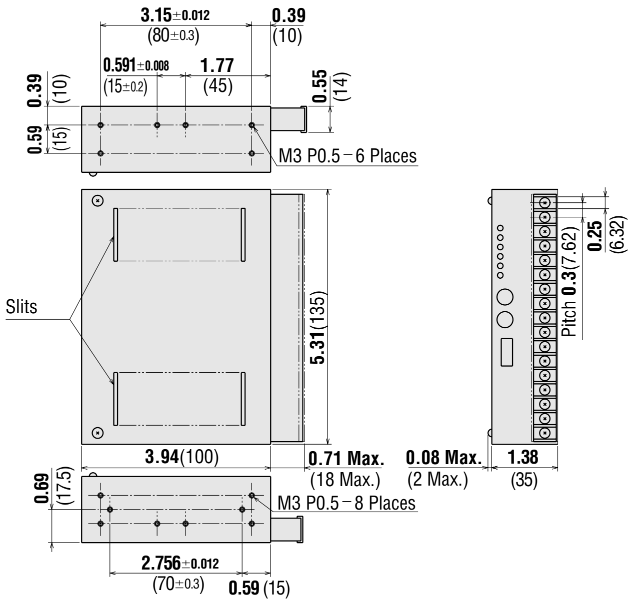
Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
UMK264AA	PK264-02A	1.54 (39)	–	0.99 (0.45)	B084
UMK264MAA	PK264MA				
UMK264BA	PK264-02B		2.17 (55)		
UMK264MBA	PK264MB				
UMK266AA	PK266-02A	2.13 (54)	–	1.5 (0.7)	B085
UMK266MAA	PK266MA				
UMK266BA	PK266-02B		2.76 (70)		
UMK266MBA	PK266MB				
UMK268AA	PK268-02A	2.99 (76)	–	2.2 (1)	B086
UMK268MAA	PK268MA				
UMK268BA	PK268-02B		3.62 (92)		
UMK268MBA	PK268MB				

- These dimensions are for double shaft models. For single shaft models, ignore the shaded areas.

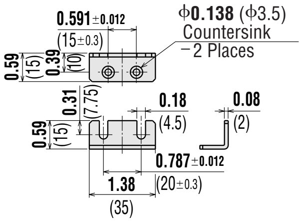
● Driver

3 UDK2109A, UDK2112A, UDK2120A

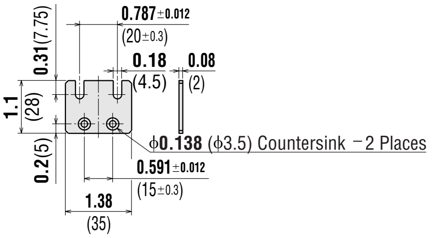
Weight: 1 lb. (0.47 kg) DXF B087



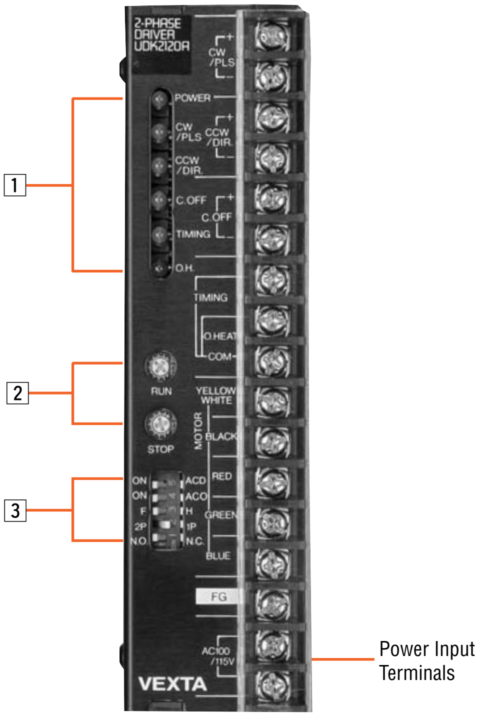
●Mounting Bracket A (2 pieces, included)



●Mounting Bracket B (2 pieces, included)



Connection and Operation



1 Signal Monitor Display

Indication	Color	Functions
POWER	Green	Power input display
CW/PLS	Green	Pulse/CW pulse input display
CCW/DIR.	Green	Rotation direction/CCW pulse input display
C.OFF	Green	All windings off input display
TIMING	Green	Excitation timing output display
O.H.	Red	Overheat output display

2 Current Adjustment Switches

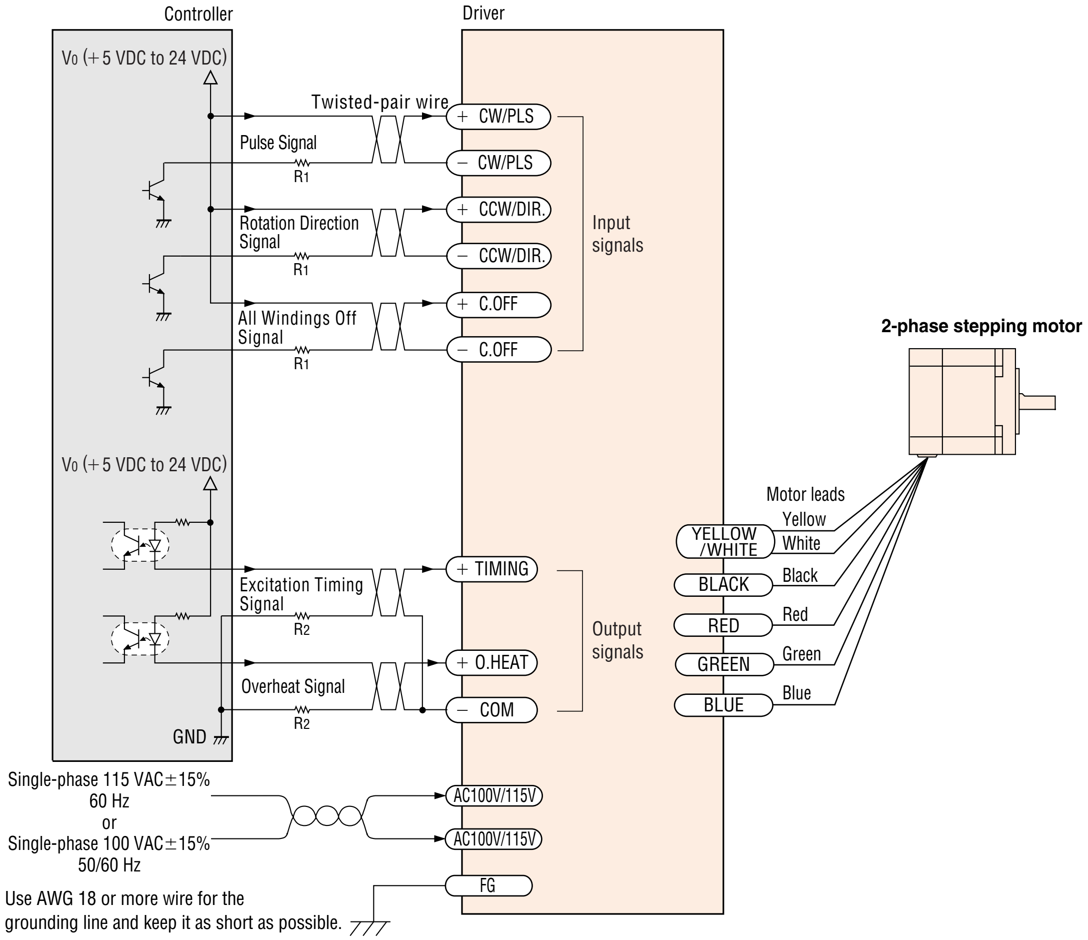
Indication	Name	Functions
RUN	Motor run current switch	Adjusts the motor running current
STOP	Motor stop current switch	Adjusts the motor current at standstill

3 Function Select Switches

Indication	Switch Name	Functions
A.C.D./OFF	Automatic current cutback function switch	Automatically decreases output current to motor at motor standstill.
A.C.O./OFF	Automatic current off function switch	When the temperature inside the driver rises above 194°F (90°C), this function automatically switches the motor current off. The function can be set and released with this switch.
F/H	Step angle switch	Switches the motor's step angle. Standard type F: 1.8°/step, H: 0.9°/step High-resolution type F: 0.9°/step, H: 0.45°/step
2P/1P	Pulse input mode switch	Switches between 1-pulse input and 2-pulse input
N.O./N.C.	Overheat output signal logic switch	Select overheat alarm logic. N.O.: Normal open N.C.: Normal close Use according to your equipment

Features C-150 System Configuration C-151 Specifications/Characteristics C-152

Connection Diagrams



◆Power Supply

Can be used with a single-phase 115 VAC, 60 Hz or 100 VAC, 50/60 Hz power supply. Use a power supply that can supply sufficient input current. If power supply capacity is insufficient, a decrease in motor output can cause the following malfunctions:

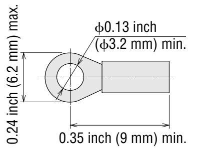
- Motor does not rotate properly at high-speed (insufficient torque).
- Slow motor startup and stopping.

Notes:

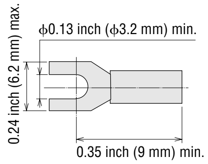
- Keep the voltage V_o between 5 VDC and 24 VDC. When it is equal to 5 VDC, the external resistance R_1 is not necessary. When it is above 5 VDC, connect R_1 to keep the current between 10 mA and 20 mA, and connect R_2 to keep the current below 10 mA.
- Use twisted-pair wire of AWG 24 or thicker and 6.6 feet (2 m) or less in length for the signal line.
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decrease. (→Technical Reference Page F-36)
- Use AWG 20 or thicker for motor lines (when extended) and power supply lines, and use AWG 18 or thicker for the wire for the grouding line.
- Use spot grounding for the grounding of the driver and external controller.
- Signal lines should be kept at least 3.9 inches (10 cm) away from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.
- Use open collector transistors (sink type) for the signal output sections of the controller.

◆Terminals

- Round terminals with insulator



- U terminals with insulator

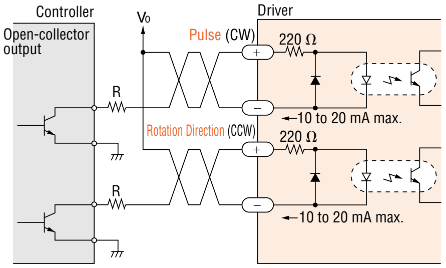


Crimp terminals are not provided with the package.

Description of Input/Output Signals

Pulse (CW) Input and Rotation Direction (CCW) Input Signal

◆Input Circuit and Sample Connection



The characters indicate signals under the 1-pulse input mode, while the characters in parentheses indicate signals under the 2-pulse input mode.

Note:

- When Vo is equal to 5 VDC, the external resistance (R) is not necessary. When Vo is above 5 VDC, connect the external resistance (R) and keep the input current between 10 mA and 20 mA.

1-Pulse Input Mode

Pulse Signal

"Pulse" signal is input to the pulse signal terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step. The direction of rotation is determined by the following rotation direction signal.

Rotation Direction Signal

The "Rotation Direction" signal is input to the rotation direction signal input terminal. A "photocoupler ON" signal input commands a clockwise direction rotation. A "photocoupler OFF" signal input commands a counterclockwise direction rotation.

2-Pulse Input Mode

CW and CCW refer to clockwise and counterclockwise direction respectively, from a reference point of facing the motor output shaft.

CW Pulse Signal

When the photocoupler state changes from "ON" to "OFF", the motor rotates one step in the clockwise direction.

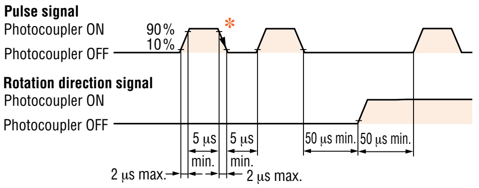
CCW Pulse Signal

When the photocoupler is state changes from "ON" to "OFF", the motor rotates one step in the counterclockwise direction.

◆Pulse Waveform Characteristics

(Photocoupler state corresponding to the input pulse)

* The shaded area indicates when the photocoupler is ON. The motor moves when the photocoupler state changes from ON to OFF as indicated by the arrow.

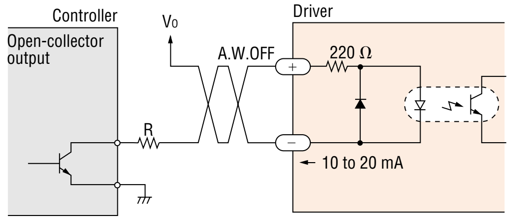


◆Pulse Signal Characteristics

- The pulse voltage is 4.5 to 5V in the "photocoupler ON" state, and 0 to 1V in the "photocoupler OFF" state.
- Input pulse signals should have a pulse width over 2μs, pulse rise/fall time below 1μs and a pulse duty below 50%.
- Keep the pulse signal at "photocoupler OFF" when no pulse is being input.
- The minimum interval time when changing rotation direction is 50 μs.
  This value varies greatly depending on the motor type, pulse frequency and load inertia. It may be necessary to increase this time interval.
- In 1-pulse input mode, leave the pulse signal at rest ("photocoupler OFF") when changing rotation directions.

All Windings Off (A.W.OFF) Input Signal

◆Input Circuit and Sample Connection



Note:

- When Vo is equal to 5 VDC, the external resistance (R) is not necessary. When Vo is above 5 VDC, connect the external resistance (R) and keep the input current between 10 mA and 20 mA.

When the "All Windings Off " signal is in the "photocoupler ON" state, the current to the motor is cut off and motor torque is reduced to zero. The motor output shaft can then be rotated freely by hand.

When the "All Windings Off " signal is in the "photocoupler OFF" state, the motor holding torque is proportional to the current set by the current adjustment rotary switches. During motor operation be sure to keep the signal in the "photocoupler OFF" state.

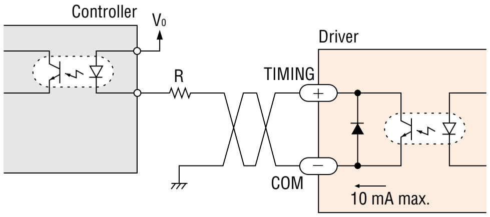
This signal is used when moving the motor by external force or manual home position is desired. If this function is not needed, it is not necessary to connect this terminal. Switching the "All Windings Off " signal from "photocoupler ON" to "photocoupler OFF" does not alter the excitation sequence.

When the motor shaft is manually adjusted with the "All Windings Off " signal input, the shaft will shift up to ±3.6° from the position set after the "All Windings Off " signal is released.

Features C-150 System Configuration C-151 Specifications/Characteristics C-152

Excitation Timing Signal (TIM.) Output Signal

◆Output Circuit and Sample Connection



Note:
- Keep the voltage between 5 VDC and 24 VDC.
  Keep the current below 10 mA.
  If the current exceeds 10 mA, connect external resistance (R).

The "Excitation Timing" signal is output to indicate when the motor excitation (current flowing through the winding) is in the initial stage (step "0" at power up).

The "Excitation Timing" signal can be used to increase the accuracy of home position detection by setting the mechanical home position of your equipment (for example, a photo-sensor) to coincide with the excitation sequence initial stage (step "0").

The motor excitation stage changes simultaneously with pulse input, and returns to the initial stage for each 7.2˚ rotation of the motor output shaft. When the power is turned ON, the excitation sequence is reset to step "0".

The TIM. LED lights when the "Excitation Timing" signal is output. While the motor is rotating, the LED will turn ON and OFF at a high speed and will appear to be continuously lit.

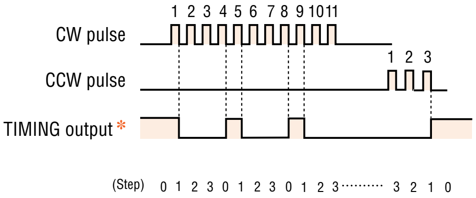
The "Excitation Timing" signal is output simultaneously with a pulse input each time the excitation sequence returns to step "0".

The excitation sequence will complete one cycle for every 7.2˚ rotation of the motor output shaft.

Full Step (the switch is set to F position): Signal is output once every 4 pulses.

Half Step (the switch is set to H position): Signal is output once every 8 pulses.

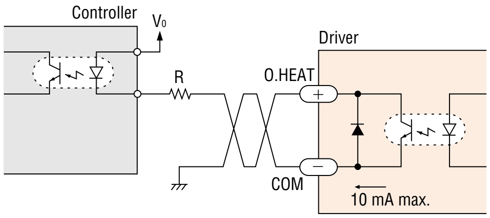
Timing chart at full step



Notes:
- ● When the power is turned ON, the excitation sequence is reset to STEP 0 and the LED lights up.
- ● The LED flashes quickly while the motor runs, appearing continuously lit.
- ✻ When connected as shown in the example connection, the signal will be "photocoupler ON" at step "0".

Overheat (O.HEAT) Output Signal

◆Output Signal and Sample Connection



Note:
- Keep the voltage between 5 VDC and 24 VDC.
  Keep the current below 10 mA.
  If the current exceeds 10 mA, connect external resistance (R).

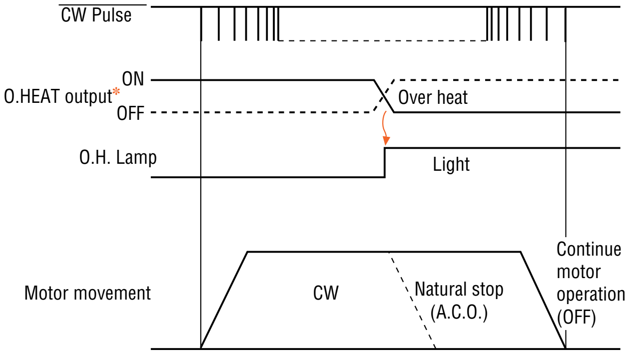
The "Overheat" signal is output to protect the driver against burnout when its internal temperature rises abnormally high due to high ambient temperature. The O.HEAT lamp on the front panel lights up when output.
When used as shown in the sample connection with the overheat output logic switch set to NO, the signal becomes "photocoupler ON". (Switch to NC to set to the "photocoupler OFF".)

If the A.C.O. (Automatic Current OFF) function is set, the output current to the motor drops to zero and the motor stops automatically.

When the "Overheat" signal is output, check the operating conditions (ambient temperature, driver settings) and cool the driver.

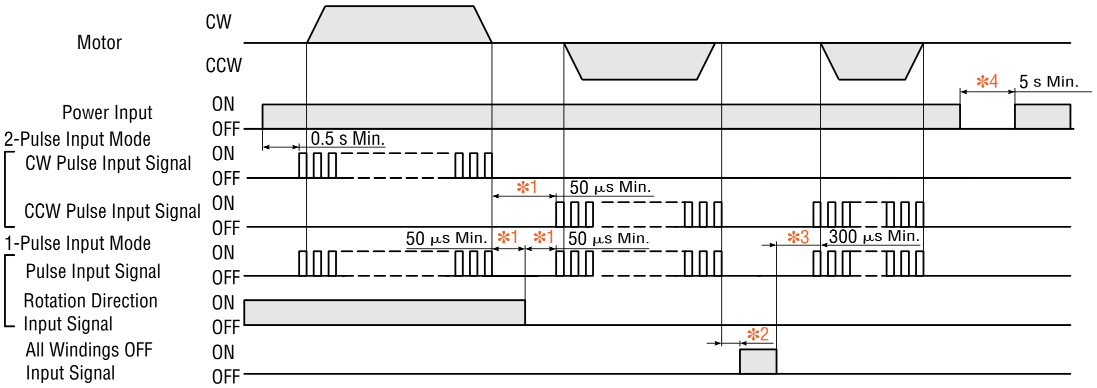
The "Overheat" signal automatically releases as the internal temperature of the driver drops. The overheat signal turns "photocoupler OFF" and the O.HEAT indicator turns off.

Please be aware that the above return/release cannot be controlled by external signals or by restarting the system.



✻ ——— Logic switch is set to NO
- - - - Logic switch is set to NC

Timing Chart

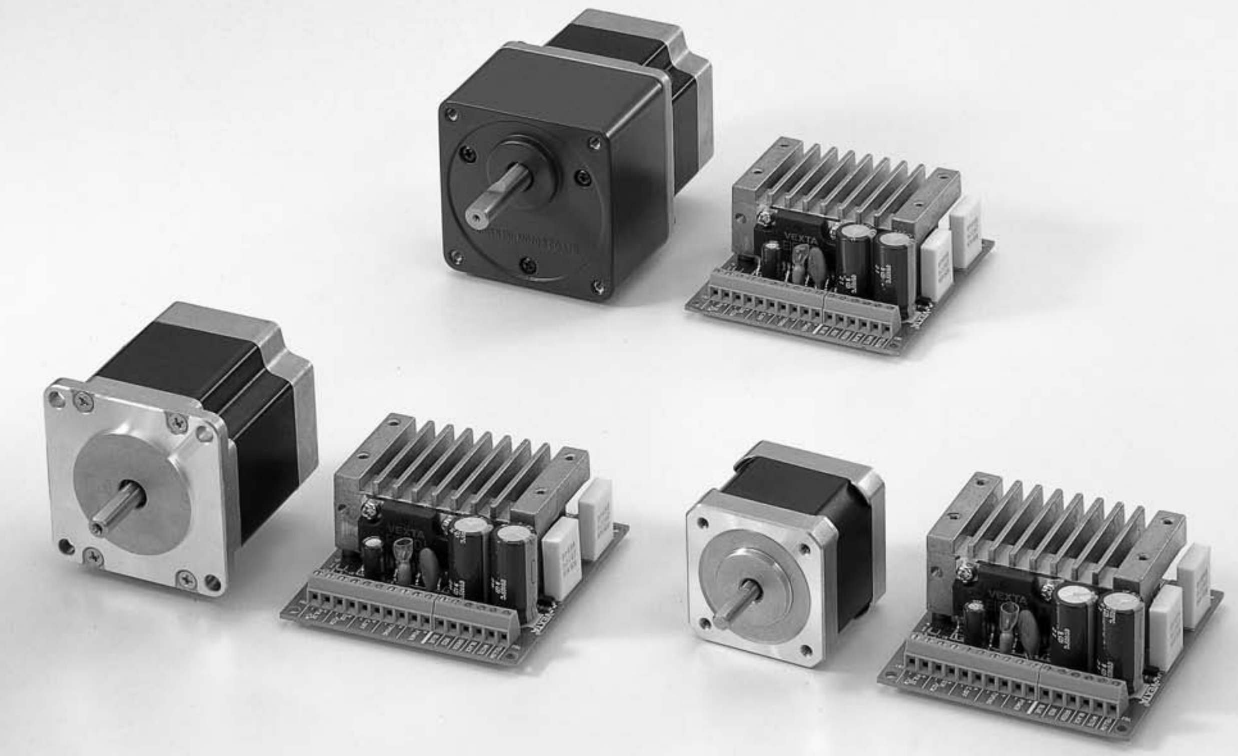


✻1 Switching time to change CW, CCW pulse (2-pulse input mode)
Switching time to change direction (1-pulse input mode) 50 µs is shown as a response time of circuit. Motor needs a time more than that.
✻2 Depends on load inertia, load torque, start frequency.
✻3 Never input a step pulse signal immediately after switching the "All Winding Off" signal to the photocoupler off state. The motor may not start.
✻4 Wait 5 seconds before cycling the power on.

List of Motor and Driver Combinations

Type	Model	Motor Model	Driver Model
Standard	**UMK243□A**	PK243-01□A	UDK2109A
	UMK244□A	PK244-01□A	UDK2112A
	UMK245□A	PK245-01□A	
	UMK264□A	PK264-02□	UDK2120A
	UMK266□A	PK266-02□	
	UMK268□A	PK268-02□	
High-Resolution	**UMK243M□A**	PK243M□A	UDK2109A
	UMK244M□A	PK244M□A	UDK2112A
	UMK245M□A	PK245M□A	
	UMK264M□A	PK264M□	UDK2120A
	UMK266M□A	PK266M□	
	UMK268M□A	PK268M□	

Enter **A** (single shaft) or **B** (double shaft) in the box (□) within the model numbers.



2-Phase Stepping Motor and Driver Package

CSK Series

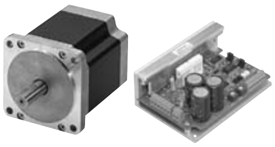
Additional Information

2-Phase Stepping Motor and Driver Package

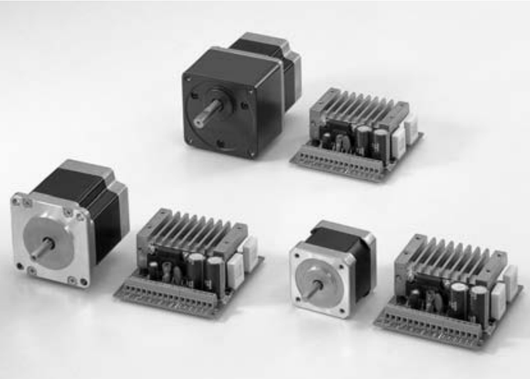
CSK Series

The CSK Series combines a 2-phase stepping motor with a 24 VDC or 36 VDC* input board level driver providing high torque, high resolution and low vibration in a compact package. High resolution and geared models are available.

* **CSK29**□ models are 24 VDC input only.



Motor Frame Size : □3.35 in. (□85 mm)



Features

High Torque

Maximum holding torque values are as follows:

CSK24□ : 22 oz-in (0.16 N·m) ~ 45 oz-in (0.32 N·m)
CSK26□ : 55 oz-in (0.39 N·m) ~ 191 oz-in (1.35 N·m)
CSK29□ : 310 oz-in (2.2 N·m) ~ 930 oz-in (6.6 N·m)

Powerful Gearheads

The spur (**SH**) geared models provide high torque. There are six gear ratios: 3.6:1, 7.2:1, 9:1, 10:1, 18:1, and 36:1.

High-Resolution Models

High-resolution models are available where the basic step angle (1.8°/step) for the two-phase stepping motors is cut in half to 0.9°/step (for full steps).The resolution is doubled from 200 steps per revolution for standard types to 400 steps per revolution. The high-resolution models can also be run in half-step mode to provide 800 steps per revolution. (Not available for **CSK29**□ models)

Compact Driver

The drivers produce a high output of 2A/phase at 24/36 VDC. They are compact in size W 3.03 in. (77 mm) × D 2.83 in. (72 mm) × H 1.22 in. (31 mm), due to a custom IC, surface mount technology and FET output stage.

Expanded Control Functions

These motors are equipped with an "Automatic Current Cutback" function and "Excitation Timing" output, which is handy for detecting the mechanical home position of the device. Internal switches can be used to set the step angle and pulse input type.

Highly Reliable Photocoupler Input

Photocouplers are used in the input/output signal section because they are not easily effected by external noise.

Product Line

Type	Power Supply Voltage	Maximum Holding Torque		
		□1.65 in. (□42 mm)	□2.22 in. (□56.4 mm) **SH** Geared: □2.36 in. (60 mm)	□3.35 in. (□85 mm)
Standard	24/36 VDC*	22~45 oz-in (0.16~0.32 N·m)	55~191 oz-in (0.39~1.35 N·m)	310~930 oz-in (2.2~6.6 N·m)
High-Resolution		22~45 oz-in (0.16~0.32 N·m)	55~191 oz-in (0.39~1.35 N·m)	—
SH Geared		1.77~7 lb-in (0.2~0.8 N·m)	8.8~35 lb-in (1~4 N·m)	—

* **CSK29**□ models are 24 VDC input only.

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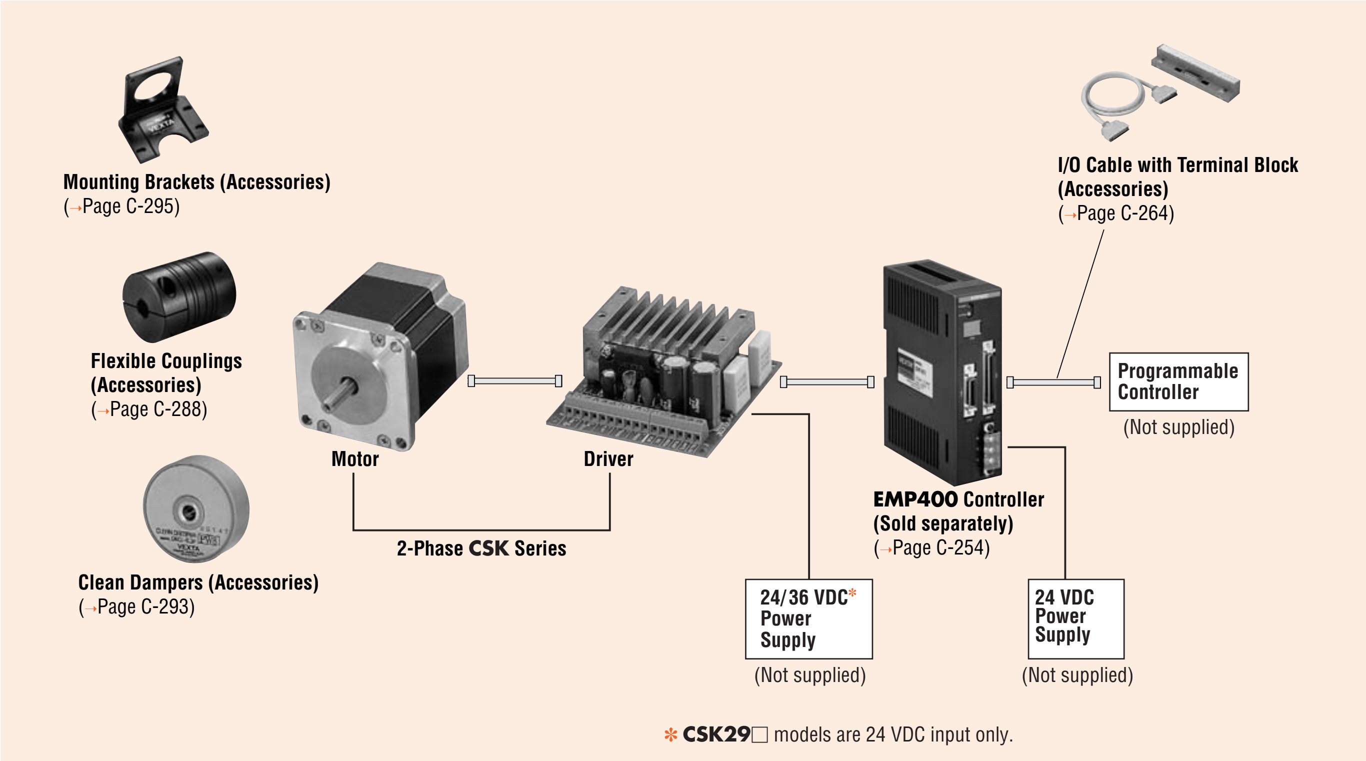
System Configuration



✻ **CSK29**☐ models are 24 VDC input only.

An example of a single-axis system configuration with the **EMP400** Series controller.

Product Number Code

Standard Type

CSK 2 4 5 - A T A

CSK Series
2-Phase
Motor Frame Size **4**: 1.65 in. sq. (42 mm) sq.
6: 2.22 in. sq. (56.4 mm) sq.
9: 3.35 in. sq. (85 mm) sq.
Motor Case Length
Shaft Type **A**: Single Shaft
B: Double Shaft
Terminal Block
USA Version

High-Resolution Type

CSK 2 4 5 M A T A

CSK Series
2-Phase
Motor Frame Size **4**: 1.65 in. sq. (42 mm) sq.
6: 2.22 in. sq. (56.4 mm) sq.
Motor Case Length
High-Resolution Type
Shaft Type **A**: Single Shaft
B: Double Shaft
Terminal Block
USA Version

SH Geared Type

CSK 2 6 4 A T A - SG 10

CSK Series
2-Phase
Motor Frame Size **4**: 1.65 in. sq. (42 mm) sq.
6: 2.22 in. sq. (56.4 mm) sq.
Motor Case Length
Shaft Type **A**: Single Shaft
B: Double Shaft
Terminal Block
USA Version
Gear Type
SG: **SH** Spur Gear
Gear Ratio

Standard Type Motor Frame Size: ☐ 1.65 in. (☐ 42 mm), ☐ 2.22 in. (☐ 56.4 mm)

Specifications

Model		Single Shaft	CSK243-ATA	CSK244-ATA	CSK245-ATA	CSK264-AT	CSK266-AT	CSK268-AT
		Double Shaft	CSK243-BTA	CSK244-BTA	CSK245-BTA	CSK264-BT	CSK266-BT	CSK268-BT
Maximum Holding Torque		oz-in (N·m)	22 (0.16)	36 (0.26)	45 (0.32)	55 (0.39)	127 (0.9)	191 (1.35)
Rotor Inertia J		oz-in^2 (kg·m^2)	0.191 (35×10^{-7})	0.3 (54×10^{-7})	0.37 (68×10^{-7})	0.66 (120×10^{-7})	1.64 (300×10^{-7})	2.6 (480×10^{-7})
Rated Current		A/phase	0.95	1.2		2		
Basic Step Angle			1.8°					
Power Source			24 VDC±10% 1.4 A 36 VDC ±10% 1.4 A	24 VDC±10% 1.6 A 36 VDC ±10% 1.6 A		24 VDC±10% 2.8 A 36 VDC ±10% 2.8 A		
Excitation Mode			● Full Step (2 phase excitation): 1.8°/step ● Half Step (1-2 phase excitation): 0.9°/step					
Weight	Motor	lb. (kg)	0.46 (0.21)	0.59 (0.27)	0.77 (0.35)	0.99 (0.45)	1.5 (0.7)	2.2 (1)
	Driver	lb. (kg)	0.29 (0.13)					
Dimension No.	Motor		$\boxed{1}$			$\boxed{2}$		
	Driver		$\boxed{6}$					

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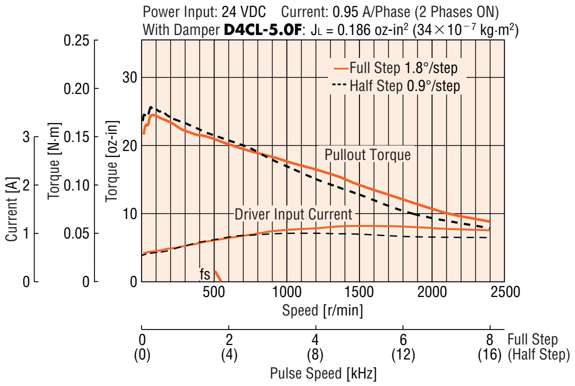
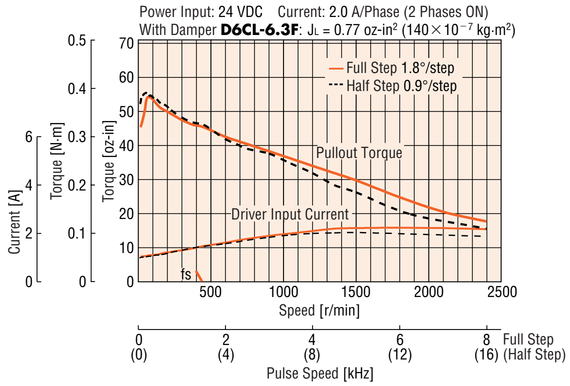
Speed — Torque Characteristics **How to Read Speed-Torque Characteristics**→Page C-10

● 24 VDC

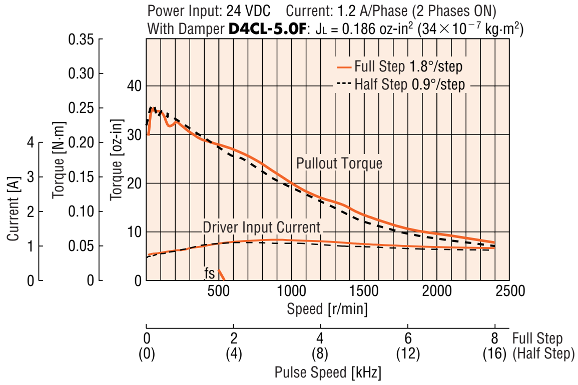
CSK243-BTA


Power Input: 24 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)

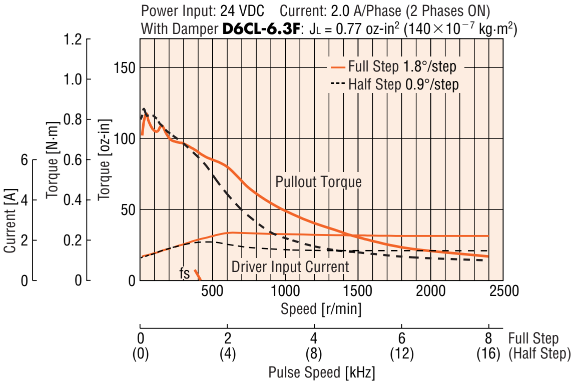
CSK264-BT


Power Input: 24 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)

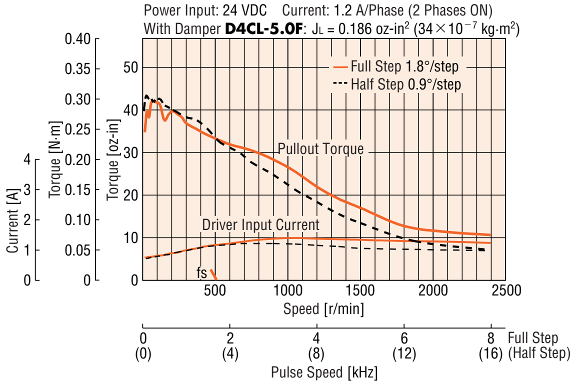
CSK244-BTA


Power Input: 24 VDC Current: 1.2 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)

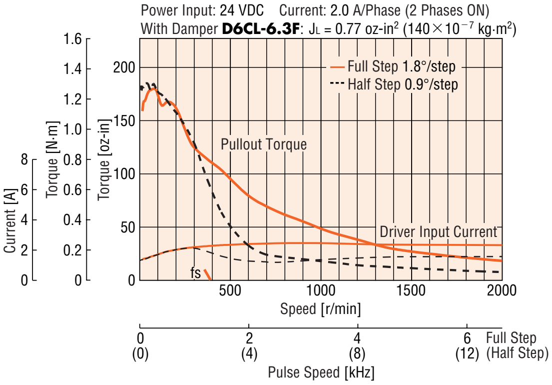
CSK266-BT


Power Input: 24 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)

CSK245-BTA


Power Input: 24 VDC Current: 1.2 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)

CSK268-BT

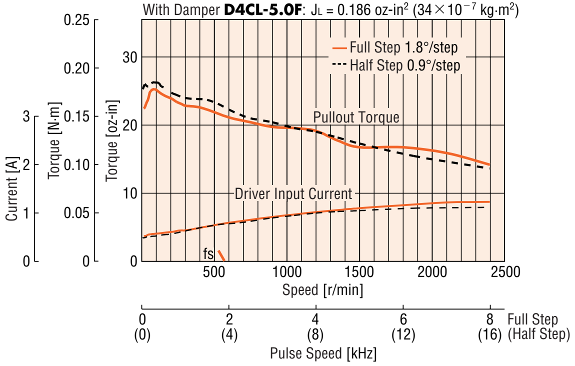

Power Input: 24 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)

Note: The pulse input circuit responds up to approximately 10 kHz with a pulse duty of 50%.

● 36 VDC

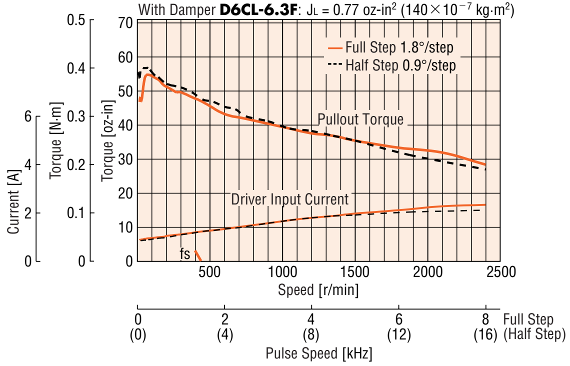
CSK243-BTA

Power Input: 36 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)



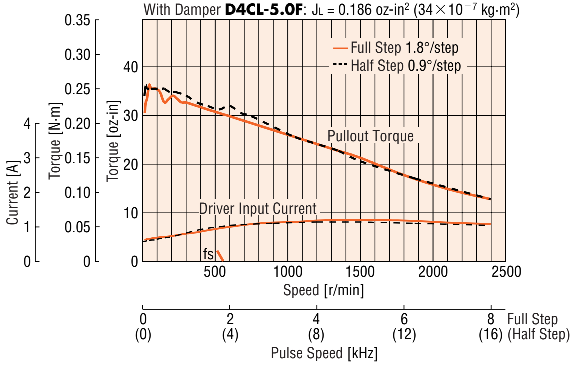
CSK264-BT

Power Input: 36 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)



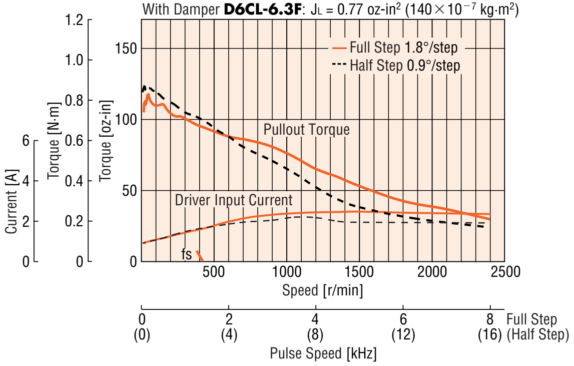
CSK244-BTA

Power Input: 36 VDC Current: 1.2 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)



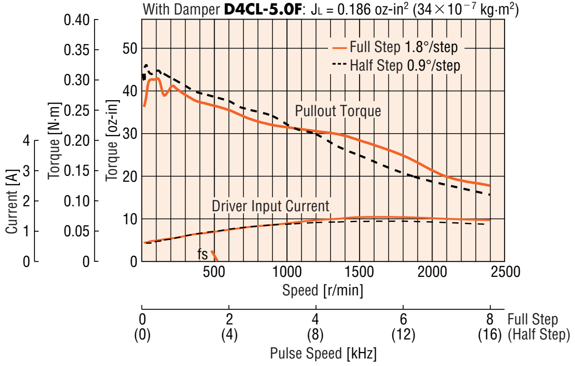
CSK266-BT

Power Input: 36 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)



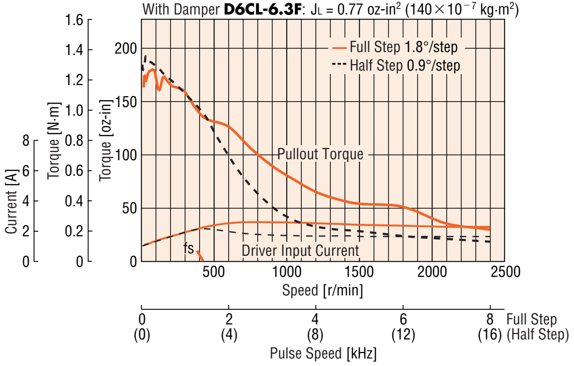
CSK245-BTA

Power Input: 36 VDC Current: 1.2 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)



CSK268-BT

Power Input: 36 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)



Note: The pulse input circuit responds up to approximately 10 kHz with a pulse duty of 50%.

Standard Type Motor Frame Size: □ 3.35 in. (□ 85 mm)

Specifications

Model	Single Shaft	CSK296-ATA	CSK299-ATA	CSK2913-ATA
	Double Shaft	**CSK296-BTA**	**CSK299-BTA**	**CSK2913-BTA**
Maximum Holding Torque	oz-in (N·m)	310 (2.2)	620 (4.4)	930 (6.6)
Rotor Inertia J	oz-in^2 (kg·m^2)	7.7 (1400×10^{-7})	14.8 (2700×10^{-7})	22 (4000×10^{-7})
Rated Current	A/phase	4.5		4
Basic Step Angle		1.8°		
Power Source		24 VDC±10% 5.5 A		24 VDC±10% 5 A
Excitation Mode		• Full Step (2 phase excitation): 1.8°/step • Half Step (1-2 phase excitation): 0.9°/step		
Weight	Motor lb. (kg)	3.7 (1.7)	6.2 (2.8)	8.4 (3.8)
	Driver lb. (kg)	0.44 (0.2)		
Dimension No.	Motor	$\boxed{3}$		
	Driver	$\boxed{7}$		

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Speed — Torque Characteristics

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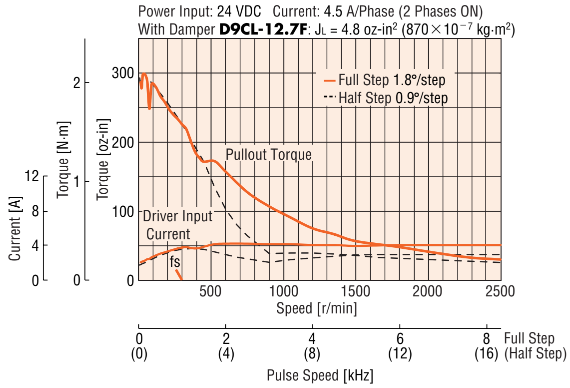
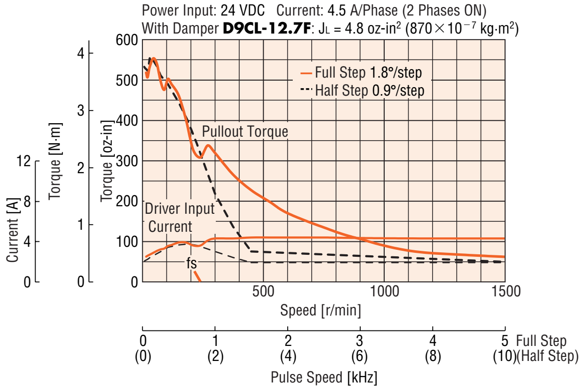
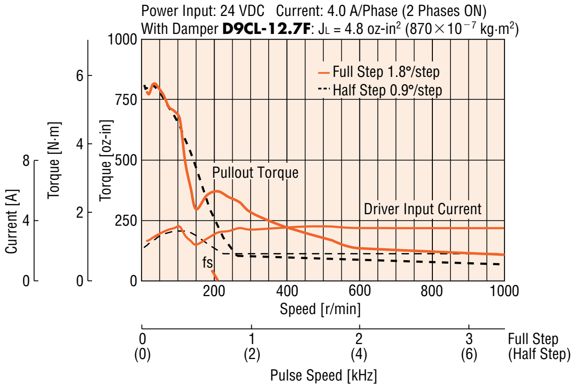
CSK296-BTA



CSK299-BTA



CSK2913-BTA



Note: The pulse input circuit responds up to approximately 10 kHz with a pulse duty of 50%.

Stepping Motors
Introduction
Closed Loop αSTEP: AS AC Input; AS PLUS; ASC DC Input
Motor & Driver Packages
5-Phase Microstep: RK AC Input; CFK II DC Input
5-Phase Full/Half: CSK DC Input; PMC
2-Phase Full/Half: UMK AC Input; CSK DC Input
2-Phase Stepping Motors: PK/PV without Encoder; PK with Encoder
Driver with Indexer: UI2120G
Controllers: EMP401 EMP402; SC8800 SC8800E; SG8030J
Low-Speed Synchronous Motors: SMK
Accessories
Before Using a Stepping Motor

High-Resolution Type Motor Frame Size: □ 1.65 in. (□ 42 mm), □ 2.22 in. (□ 56.4 mm)

Specifications

Model		CSK243MATA	CSK244MATA	CSK245MATA	CSK264MAT	CSK266MAT	CSK268MAT
	Double Shaft	CSK243MBTA	CSK244MBTA	CSK245MBTA	CSK264MBT	CSK266MBT	CSK268MBT
Maximum Holding Torque	oz-in (N·m)	22 (0.16)	36 (0.26)	45 (0.32)	55 (0.39)	127 (0.9)	191 (1.35)
Rotor Inertia J	oz-in^2 (kg·m^2)	0.191 (35×10^{-7})	0.3 (54×10^{-7})	0.37 (68×10^{-7})	0.66 (120×10^{-7})	1.64 (300×10^{-7})	2.6 (480×10^{-7})
Rated Current	A/phase	0.95	1.2		2		
Basic Step Angle		0.9°					
Power Source		24 VDC±10% 1.4 A 36 VDC ±10% 1.4 A	24 VDC±10% 1.6 A 36 VDC ±10% 1.6 A		24 VDC±10% 2.8 A 36 VDC ±10% 2.8 A		
Excitation Mode		• Full Step (2 phase excitation): 0.9°/step • Half Step (1-2 phase excitation): 0.45°/step					
Weight	Motor lb. (kg)	0.53 (0.24)	0.66 (0.3)	0.81 (0.37)	0.99 (0.45)	1.5 (0.7)	2.2 (1)
	Driver lb. (kg)	0.29 (0.13)					
Dimension No.	Motor	1			2		
	Driver	6					

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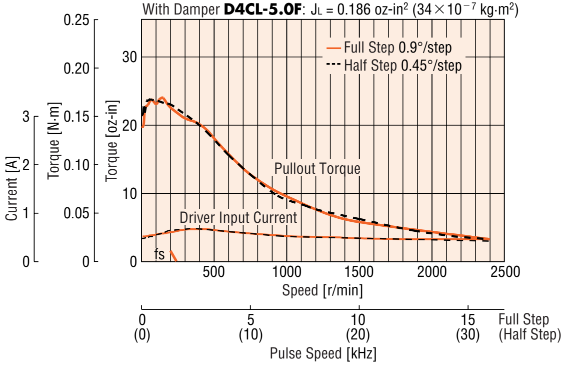
Speed — Torque Characteristics **How to Read Speed-Torque Characteristics**→Page C-10

● 24 VDC

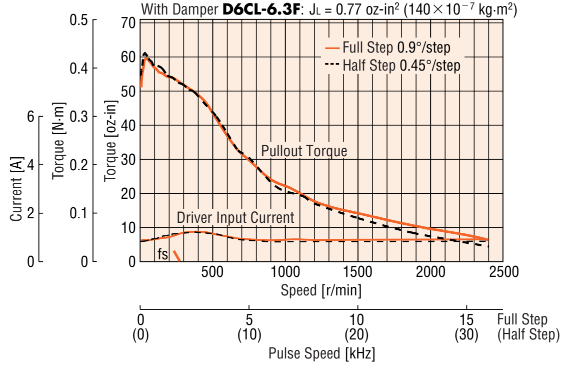
CSK243MBTA

Power Input: 24 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



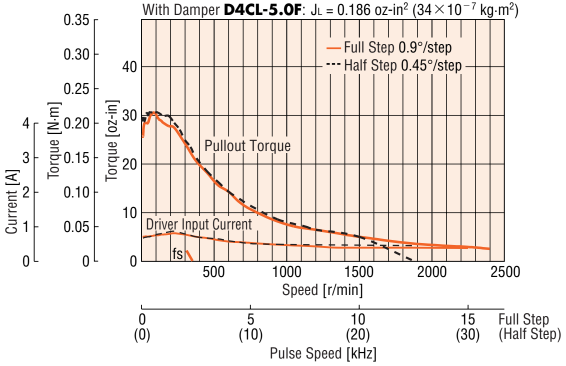
CSK264MBT

Power Input: 24 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



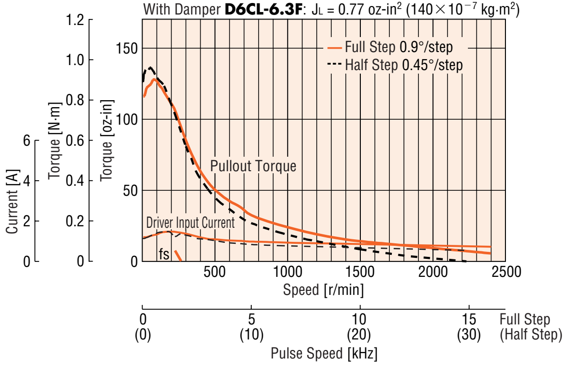
CSK244MBTA

Power Input: 24 VDC Current: 1.2 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



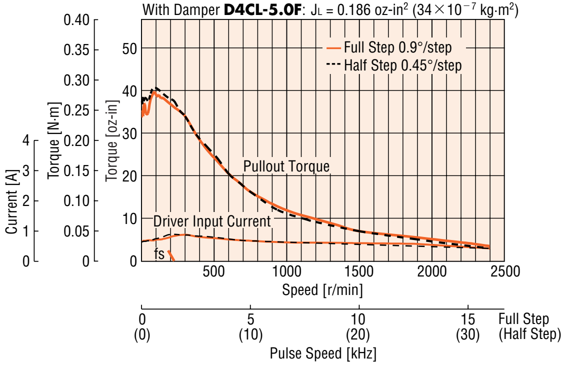
CSK266MBT

Power Input: 24 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



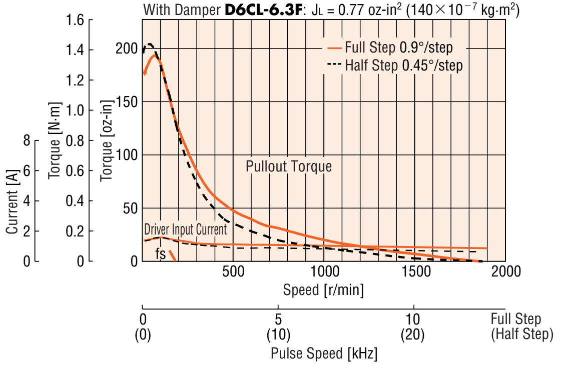
CSK245MBTA

Power Input: 24 VDC Current: 1.2 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



CSK268MBT

Power Input: 24 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)

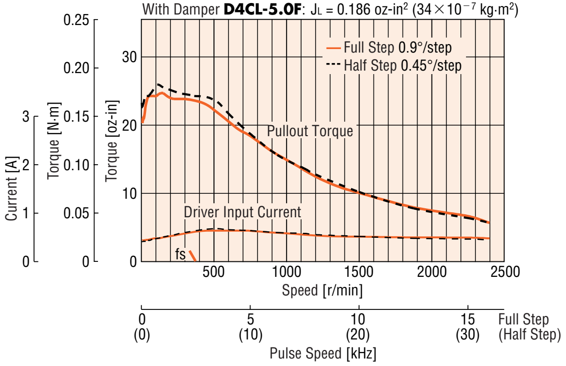


Note: The pulse input circuit responds up to approximately 10 kHz with a pulse duty of 50%.

● 36 VDC

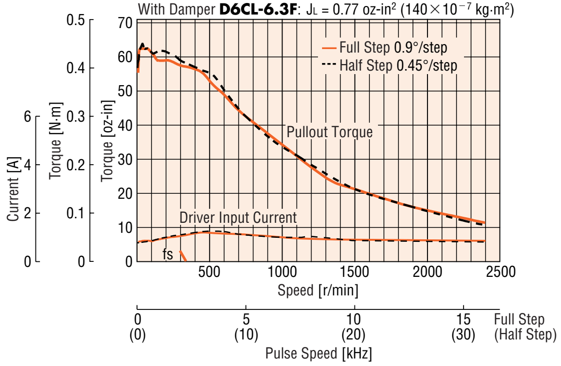
CSK243MBTA

Power Input: 36 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in² (34×10⁻⁷ kg·m²)



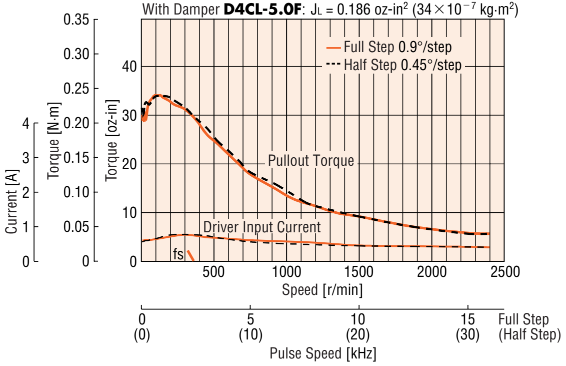
CSK264MBT

Power Input: 36 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)



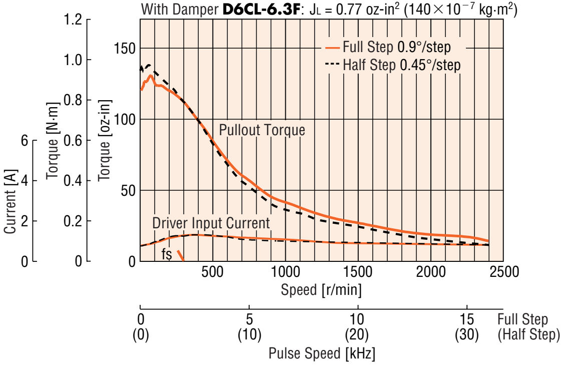
CSK244MBTA

Power Input: 36 VDC Current: 1.2 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in² (34×10⁻⁷ kg·m²)



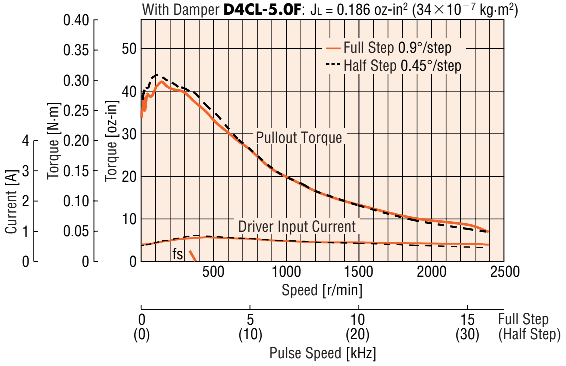
CSK266MBT

Power Input: 36 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)



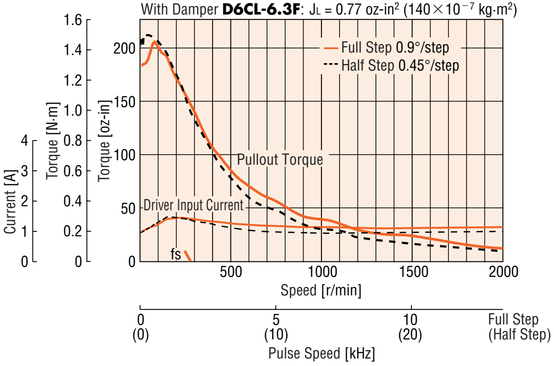
CSK245MBTA

Power Input: 36 VDC Current: 1.2 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in² (34×10⁻⁷ kg·m²)



CSK268MBT

Power Input: 36 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)



Note: The pulse input circuit responds up to approximately 10 kHz with a pulse duty of 50%.

SH Geared Type Motor Frame Size: □ 1.65 in. (□ 42 mm)

Specifications

Model		CSK243ATA-SG3.6	CSK243ATA-SG7.2	CSK243ATA-SG9	CSK243ATA-SG10	CSK243ATA-SG18	CSK243ATA-SG36
	Single Shaft	CSK243ATA-SG3.6	CSK243ATA-SG7.2	CSK243ATA-SG9	CSK243ATA-SG10	CSK243ATA-SG18	CSK243ATA-SG36
	Double Shaft	CSK243BTA-SG3.6	CSK243BTA-SG7.2	CSK243BTA-SG9	CSK243BTA-SG10	CSK243BTA-SG18	CSK243BTA-SG36
Maximum Holding Torque	lb-in (N·m)	1.77 (0.2)	3.5 (0.4)	4.4 (0.5)	4.9 (0.56)	7 (0.8)	7 (0.8)
Rotor Inertia J	oz-in^2 (kg·m^2)	0.191 (35×10^{-7})					
Rated Current	A/phase	0.95					
Basic Step Angle		0.5°	0.25°	0.2°	0.18°	0.1°	0.05°
Gear Ratio		3.6:1	7.2:1	9:1	10:1	18:1	36:1
Permissible Torque	lb-in (N·m)	1.77 (0.2)	3.5 (0.4)	4.4 (0.5)	4.9 (0.56)	7 (0.8)	7 (0.8)
Permissible Speed Range (Gear Output Shaft Speed)	r/min	0~500	0~250	0~200	0~180	0~100	0~50
Power Source		24 VDC±10% 1.4 A or 36 VDC ±10% 1.4 A					
Excitation Mode	Full Step	0.5°/step	0.25°/step	0.2°/step	0.18°/step	0.1°/step	0.05°/step
	Half Step	0.25°/step	0.125°/step	0.1°/step	0.09°/step	0.05°/step	0.025°/step
Weight	Motor lb. (kg)	0.77 (0.35)					
	Driver lb. (kg)	0.29 (0.13)					
Dimension No.	Motor	4					
	Driver	6					

How to Read Specifications Table→Page C-9

Note: Direction of rotation of the motor and that of the gear output shaft are the same for the gear ratios 3.6:1, 7.2:1, 9:1 and 10:1. It is opposite for 18:1 and 36:1 gear ratios.

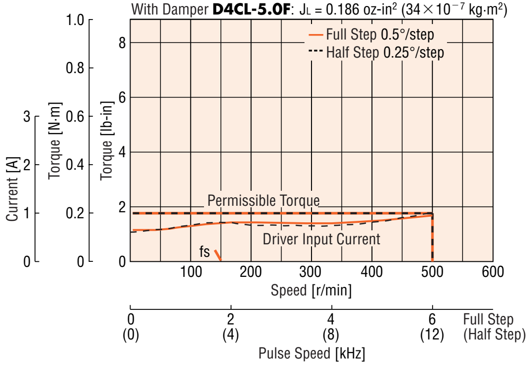
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

24 VDC

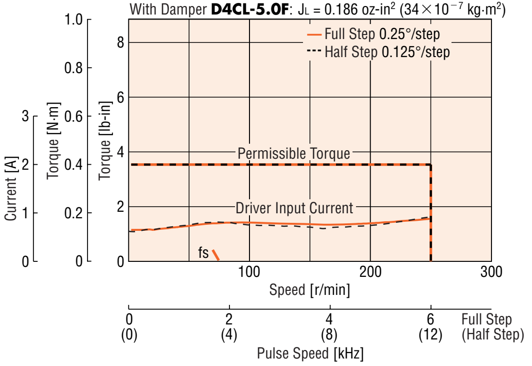
CSK243BTA-SG3.6

Power Input: 24 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



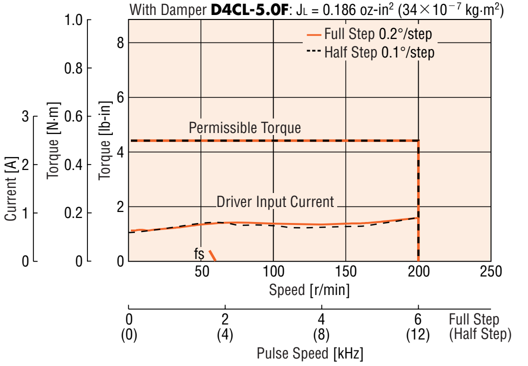
CSK243BTA-SG7.2

Power Input: 24 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



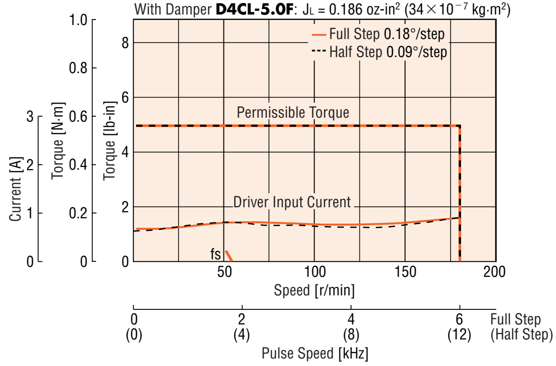
CSK243BTA-SG9

Power Input: 24 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



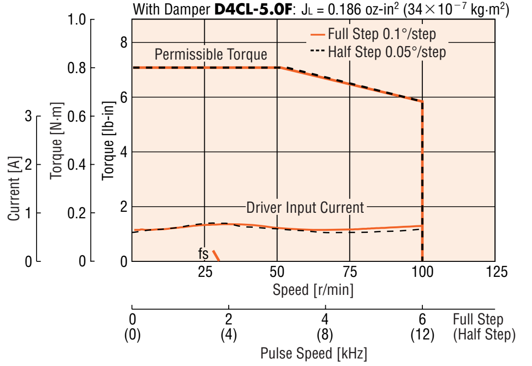
CSK243BTA-SG10

Power Input: 24 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



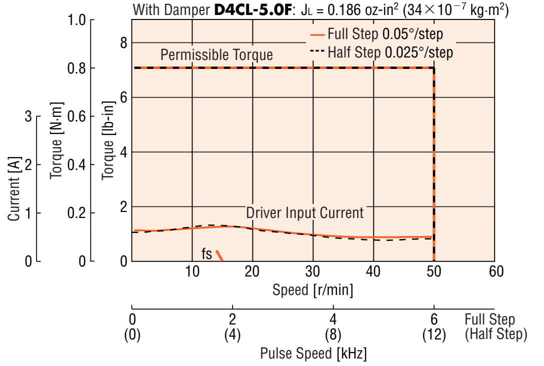
CSK243BTA-SG18

Power Input: 24 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



CSK243BTA-SG36

Power Input: 24 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



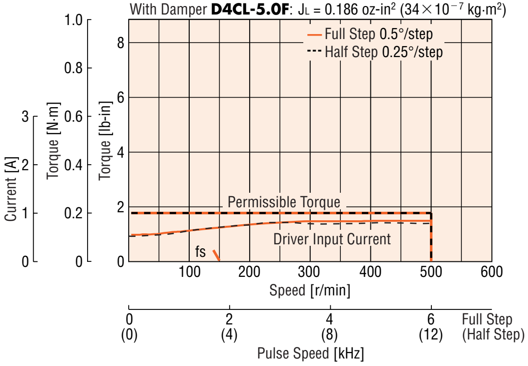
Note: The pulse input circuit responds up to approximately 10 kHz with a pulse duty of 50%.

Common Specifications C-172 Dimensions C-174 Connection and Operation C-176 Motor and Driver Combinations C-182

● 36 VDC

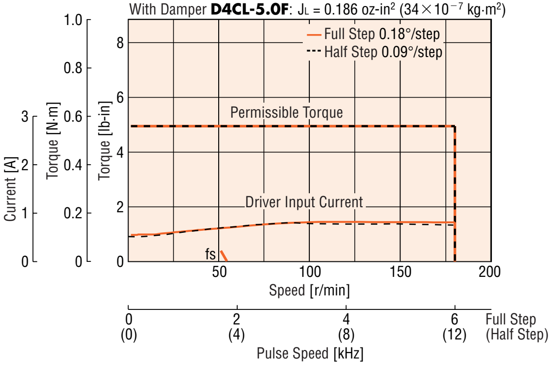
CSK243BTA-SG3.6

Power Input: 36 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



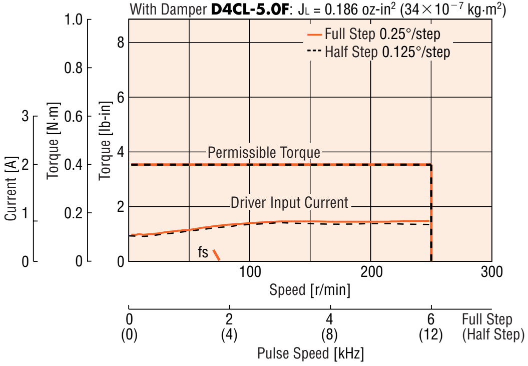
CSK243BTA-SG10

Power Input: 36 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



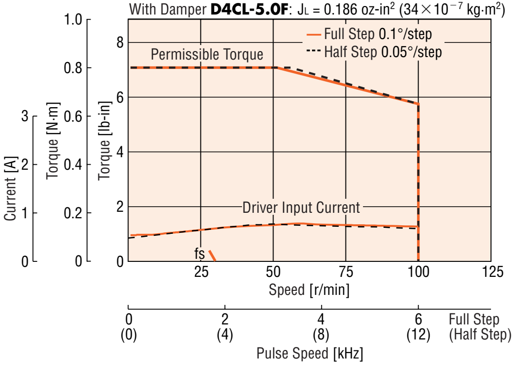
CSK243BTA-SG7.2

Power Input: 36 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



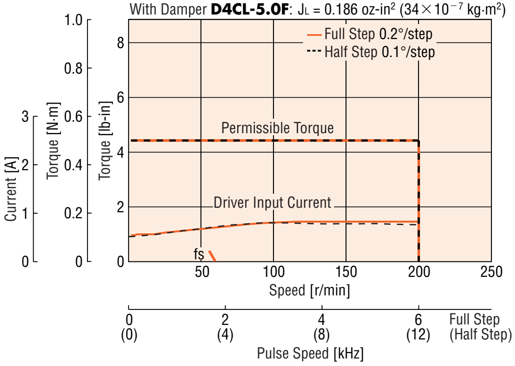
CSK243BTA-SG18

Power Input: 36 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



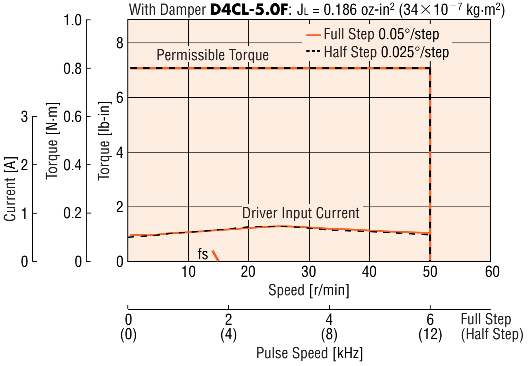
CSK243BTA-SG9

Power Input: 36 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



CSK243BTA-SG36

Power Input: 36 VDC Current: 0.95 A/Phase (2 Phases ON)
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



Note: The pulse input circuit responds up to approximately 10 kHz with a pulse duty of 50%.

SH Geared Type Motor Frame Size: □ 2.36 in. (□ 60 mm)

Specifications

Model	Single Shaft	**CSK264ATA-SG3.6**	**CSK264ATA-SG7.2**	**CSK264ATA-SG9**	**CSK264ATA-SG10**	**CSK264ATA-SG18**	**CSK264ATA-SG36**
	Double Shaft	**CSK264BTA-SG3.6**	**CSK264BTA-SG7.2**	**CSK264BTA-SG9**	**CSK264BTA-SG10**	**CSK264BTA-SG18**	**CSK264BTA-SG36**
Maximum Holding Torque	lb-in (N·m)	8.8 (1)	17.7 (2)	22 (2.5)	23 (2.7)	26 (3)	35 (4)
Rotor Inertia J	oz-in^2 (kg·m^2)	0.66 (120×10^{-7})					
Rated Current	A/phase	2.0					
Basic Step Angle		0.5°	0.25°	0.2°	0.18°	0.1°	0.05°
Gear Ratio		3.6:1	7.2:1	9:1	10:1	18:1	36:1
Permissible Torque	lb-in (N·m)	8.8 (1)	17.7 (2)	22 (2.5)	23 (2.7)	26 (3)	35 (4)
Permissible Speed Range (Gear Output Shaft Speed)	r/min	0~500	0~250	0~200	0~180	0~100	0~50
Power Source		24 VDC±10% 2.8 A or 36 VDC ±10% 2.8 A					
Excitation Mode	Full Step	0.5°/step	0.25°/step	0.2°/step	0.18°/step	0.1°/step	0.05°/step
	Half Step	0.25°/step	0.125°/step	0.1°/step	0.09°/step	0.05°/step	0.025°/step
Weight	Motor lb. (kg)	1.7 (0.75)					
	Driver lb. (kg)	0.29 (0.13)					
Dimension No.	Motor	5					
	Driver	6					

How to Read Specifications Table→Page C-9

Note: Direction of rotation of the motor and that of the gear output shaft are the same for the gear ratios 3.6:1, 7.2:1, 9:1 and 10:1. It is opposite for 18:1 and 36:1 gear ratios.

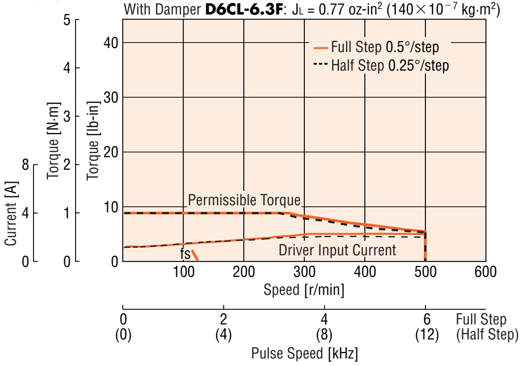
Speed — Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

24 VDC

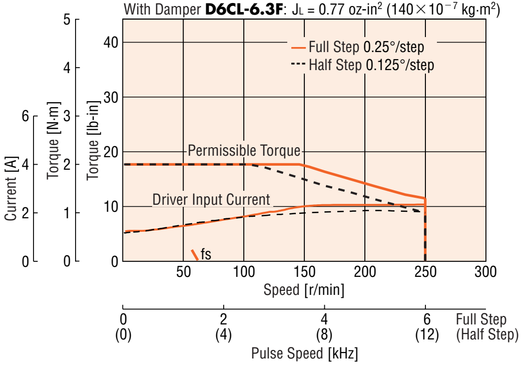
CSK264BTA-SG3.6

Power Input: 24 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



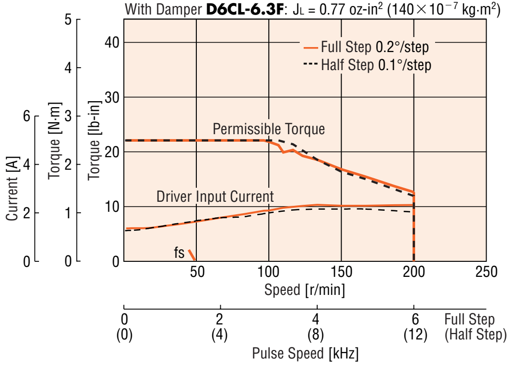
CSK264BTA-SG7.2

Power Input: 24 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



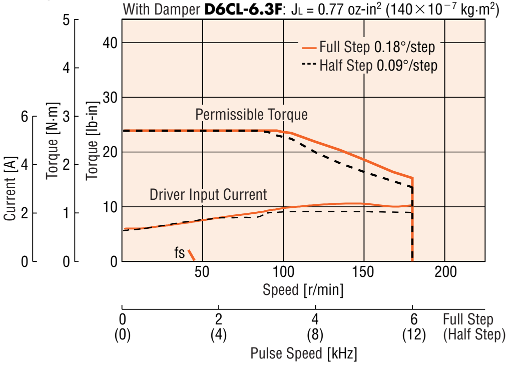
CSK264BTA-SG9

Power Input: 24 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



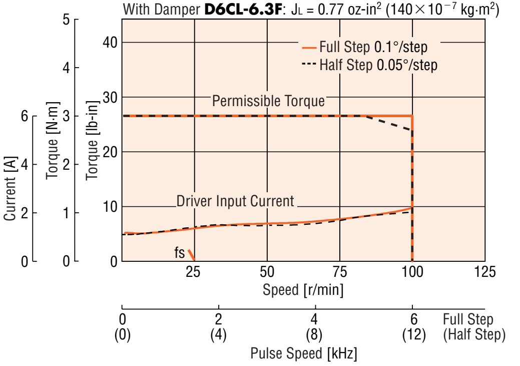
CSK264BTA-SG10

Power Input: 24 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



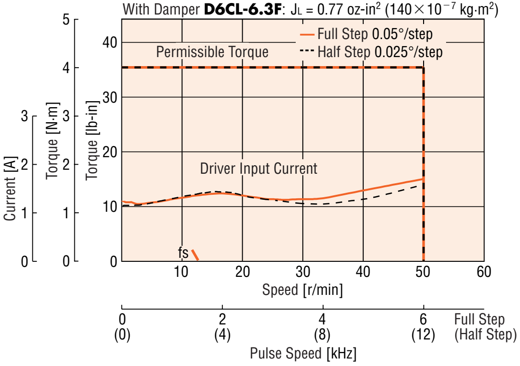
CSK264BTA-SG18

Power Input: 24 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



CSK264BTA-SG36

Power Input: 24 VDC Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



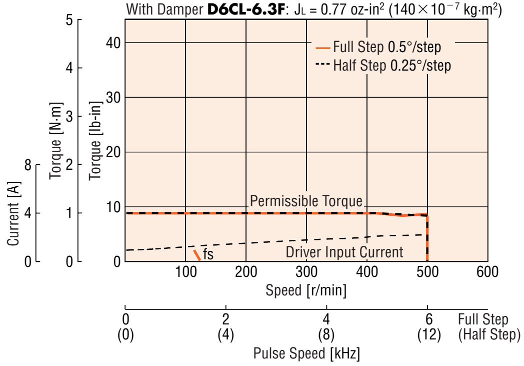
Note: The pulse input circuit responds up to approximately 10 kHz with a pulse duty of 50%.

Common Specifications C-172 Dimensions C-174 Connection and Operation C-176 Motor and Driver Combinations C-182

● 36 VDC

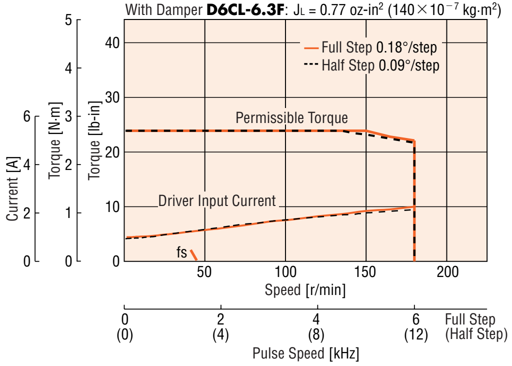
CSK264BTA-SG3.6

Power Input: 36 VDC　Current: 2.0 A/Phase (2Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)



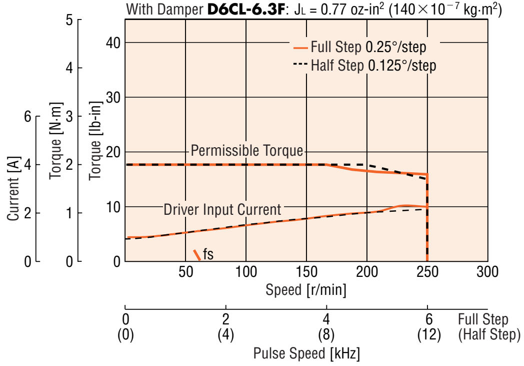
CSK264BTA-SG10

Power Input: 36 VDC　Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)



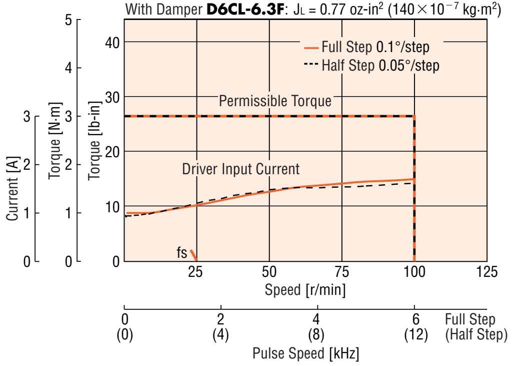
CSK264BTA-SG7.2

Power Input: 36 VDC　Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)



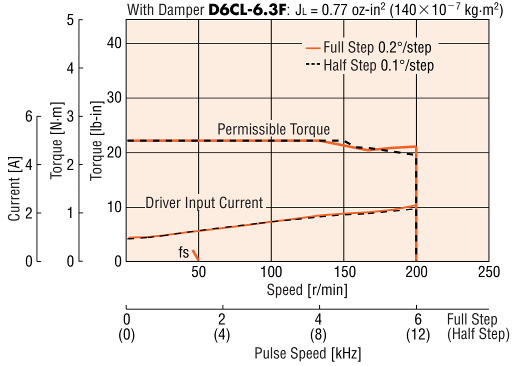
CSK264BTA-SG18

Power Input: 36 VDC　Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)



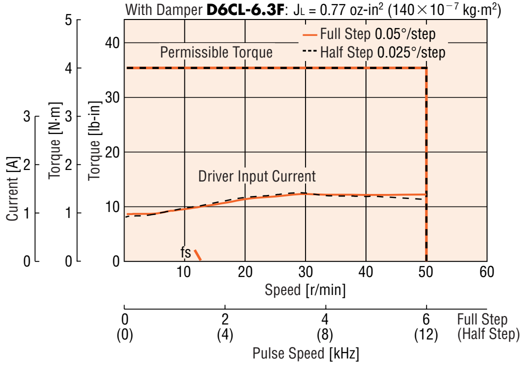
CSK264BTA-SG9

Power Input: 36 VDC　Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)



CSK264BTA-SG36

Power Input: 36 VDC　Current: 2.0 A/Phase (2 Phases ON)
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)



Note: The pulse input circuit responds up to approximately 10 kHz with a pulse duty of 50%.

■ Common Specifications

Input Signals	Input Signal Circuit	Photocoupler input, Input resistance 220 Ω, Input current 10~20 mA maximum Signal voltage　Photocoupler ON: +4.5~+5 V, Photocoupler OFF: 0~+1 V (Voltage between terminals)
	● Pulse Signal (CW Pulse Signal)*	Step command pulse signal (CW step command pulse signal in 2-pulse input mode*) Pulse width: 5 µs minimum, Pulse rise/fall: 2 µs maximum, Pulse duty : Max 50% Motor moves when the photocoupler state changes from ON to OFF. Maximum input frequency : 10 kHz (20 kHz for **CSK29□**) (when the pulse duty is 50 %)
	● Rotation Direction Signal (CCW Pulse Signal)*	Rotation direction signal　Photocoupler ON: CW, Photocoupler OFF: CCW (CCW step command signal in 2-pulse input mode*. Pulse width: 5 µs minimum, Pulse rise/fall: 2 µs maximum. Pulse duty : Max 50% Motor moves when the photocoupler state changes from ON to OFF. Maximum input frequency : 10 kHz (20 kHz for **CSK29□**) (when the pulse duty is 50 %))
	● All Windings Off Signal	When in the "photocoupler ON" state, the current to the motor is cut off and the motor shaft can be rotated manually. When in the "photocoupler OFF" state, the current level set by the RUN switch is supplied to the motor.
Output Signals	Output Signal Circuit	Photocoupler, Open-Collector Output External use condition: 24 VDC maximum, 10 mA maximum
	● Excitation Timing Signal	The signal is output every time the excitation sequence returns to the initial stage "0". (Photocoupler: ON) Full step: signal output every 4 pulses, Half step: signal output every 8 pulses
Functions		Automatic current cutback, Step angle switch, Pulse input mode switch, Power supply voltage switch
Driver Cooling Method		Natural ventilation

* **CSK29□** driver is 1-pulse input mode only.

General Specifications

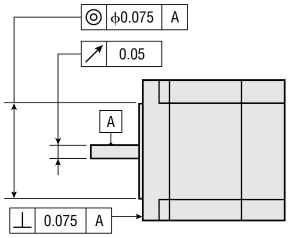
Specifications		Motor	Driver
Insulation Class		Class B [266˚F (130˚C)]	—
Insulation Resistance		100 MΩ minimum under normal temperature and humidity, when measured by a 500 VDC megger between the motor coils and the motor case.	—
Dielectric Strength		Sufficient to withstand 1.0 kV (0.5 kV for **CSK24□**, **CSK24□M**), 60 Hz applied between the motor coils and casing for one minute, under normal ambient temperature and humidity.	—
Operating Environment	Ambient Temperature	14˚F~122˚F (−10˚C~+50˚C) (nonfreezing)	32˚F~104˚F (0˚C~+40˚C)(nonfreezing)
	Ambient Humidity	85% or less (non-condensing)	
	Atmosphere	No corrosive gases, dust, water or oil.	
Temperature Rise		Temperature rise of the coil measured by the Change Resistance Method is 144˚F (80˚C) or less. (at standstill, two phases energized)	—
Static Angle Error ✻1		±3 arc minutes (±0.05˚)	—
Shaft Runout		0.002 inch (0.05 mm) T.I.R at top of output shaft ✻4	—
Radial Play ✻2		0.001 inch (0.025 mm) max. of 1.12 lb. (5 N)	—
Axial Play ✻3		0.003 inch (0.075 mm) max. of 2.2 lb. (10 N)	—
Concentricity		0.003 inch (0.075 mm) T.I.R ✻4	—
Perpendicularity		0.003 inch (0.075 mm) T.I.R ✻4	—

✻1 This value is for full step under no load. (The value changes with size of the load.)

✻2 Radial Play: Displacement in shaft position in the radial direction, when a 1.12 lb. (5 N) load is applied in the vertical direction to the tip of the motor's shaft.

✻3 Axial Play: Displacement in shaft position in the axial direction, when a 2.2 lb. (10 N) load is applied to the motor's shaft in the axial direction.

✻4 T.I.R. (Total Indicator Reading): Total dial gauge reading when the measured section is rotated one revolution centered on a reference axis.



Note:

- Do not measure insulation resistance or perform the dielectric strength test while the motor and driver are connected.

Permissible Overhung Load and Permissible Thrust Load

Unit = Upper values: lb./Lower values: N

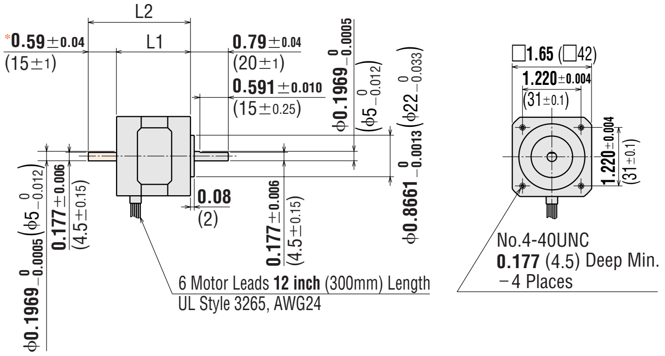
Model	Overhung Load Distance from Shaft End [inch (mm)]					Thrust Load
	0	0.2 (5)	0.39 (10)	0.59 (15)	0.79 (20)	
CSK24□, CSK24□M	4.5 20	5.6 25	7.6 34	11.7 52	—	The permissible thrust load [lb. (N)] shall be no greater than the motor mass.
CSK26□, CSK26□M	12.1 54	15 67	20 89	29 130	—	
CSK29□	58 260	65 290	76 340	87 390	108 480	
CSK243SG3.6~36	2.2 10	3.3 15	4.5 20	6.7 30	—	3.3 15
CSK264SG3.6~10	6.7 30	9 40	11.2 50	13.5 60	15.7 70	6.7 30
CSK264SG18, 36	18 80	22 100	27 120	31 140	36 160	

Dimensions Scale 1/4, Unit = **inch** (mm)

● Motor

◆ Standard Type, High-Resolution Type

1 Motor Frame Size □1.65 in. (□42 mm)



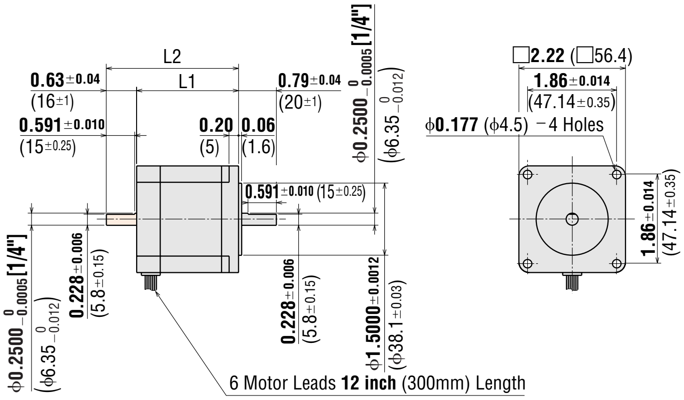
6 Motor Leads **12 inch** (300mm) Length
UL Style 3265, AWG24

No.4-40UNC
0.177 (4.5) Deep Min.
−4 Places

* The length of machining on double shaft model is **0.591**±0.010 (15±0.25).

Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
CSK243-ATA	PK243-01AA	1.3 (33)	—	0.46 (0.21)	B081U
CSK243MATA	PK243MAA			0.53 (0.24)	
CSK243-BTA	PK243-01BA		1.89 (48)	0.46 (0.21)	
CSK243MBTA	PK243MBA			0.53 (0.24)	
CSK244-ATA	PK244-01AA	1.54 (39)	—	0.59 (0.27)	B082U
CSK244MATA	PK244MAA			0.66 (0.3)	
CSK244-BTA	PK244-01BA		2.13 (54)	0.59 (0.27)	
CSK244MBTA	PK244MBA			0.66 (0.3)	
CSK245-ATA	PK245-01AA	1.85 (47)	—	0.77 (0.35)	B083U
CSK245MATA	PK245MAA			0.81 (0.37)	
CSK245-BTA	PK245-01BA		2.44 (62)	0.77 (0.35)	
CSK245MBTA	PK245MBA			0.81 (0.37)	

2 Motor Frame Size □2.22 in. (□56.4 mm)

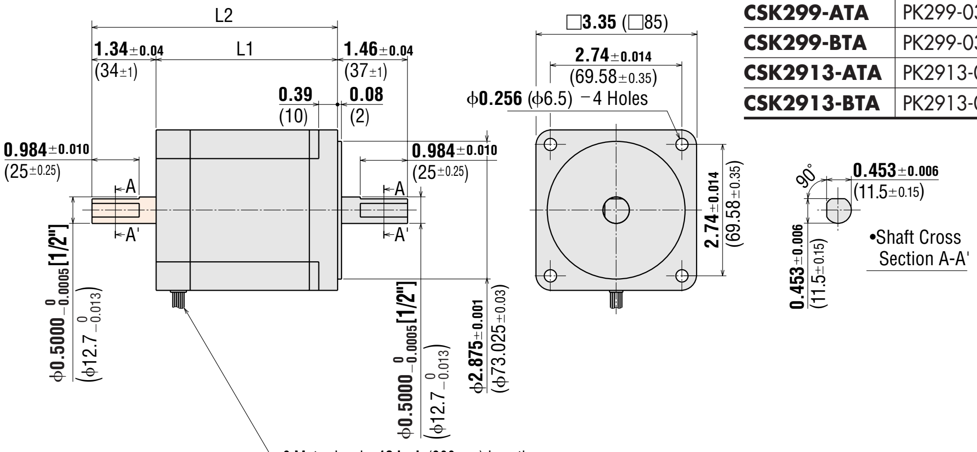


6 Motor Leads **12 inch** (300mm) Length
UL Style 3265, AWG 22

Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
CSK264-AT	PK264-02A	1.54 (39)	—	0.99 (0.45)	B084
CSK264MAT	PK264MA				
CSK264-BT	PK264-02B		2.17 (55)		
CSK264MBT	PK264MB				
CSK266-AT	PK266-02A	2.13 (54)	—	1.5 (0.7)	B085
CSK266MAT	PK266MA				
CSK266-BT	PK266-02B		2.76 (70)		
CSK266MBT	PK266MB				
CSK268-AT	PK268-02A	2.99 (76)	—	2.2 (1.0)	B086
CSK268MAT	PK268MA				
CSK268-BT	PK268-02B		3.62 (92)		
CSK268MBT	PK268MB				

3 Motor Frame Size □3.35 in. (□85 mm)

Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
CSK296-ATA	PK296-03AA	2.6 (66)	—	3.7 (1.7)	B122U
CSK296-BTA	PK296-03BA		3.94 (100)		
CSK299-ATA	PK299-03AA	3.78 (96)	—	6.2 (2.8)	B123U
CSK299-BTA	PK299-03BA		5.12 (130)		
CSK2913-ATA	PK2913-02AA	4.96 (126)	—	8.4 (3.8)	B124U
CSK2913-BTA	PK2913-02BA		6.3 (160)		



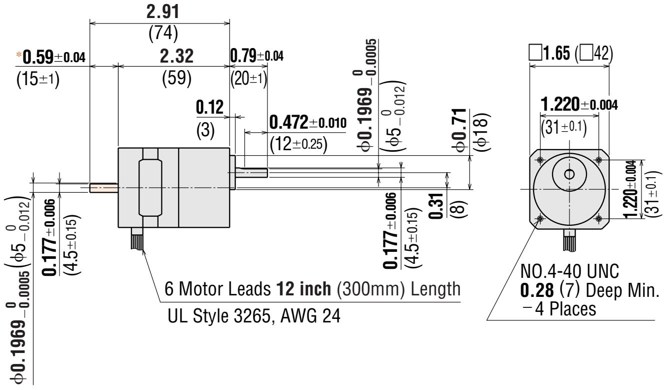
•Shaft Cross Section A-A'

6 Motor Leads, **12 inch** (300mm) Length,
UL Style 3265, AWG 20

● These dimensions are for double shaft models. For single shaft models, ignore the shaded areas.

◆ SH Geared Type

4 Motor Frame Size □1.65 in. (□42 mm)



* The length of machining on double shaft model is **0.591**±**0.010** (15±0.25).

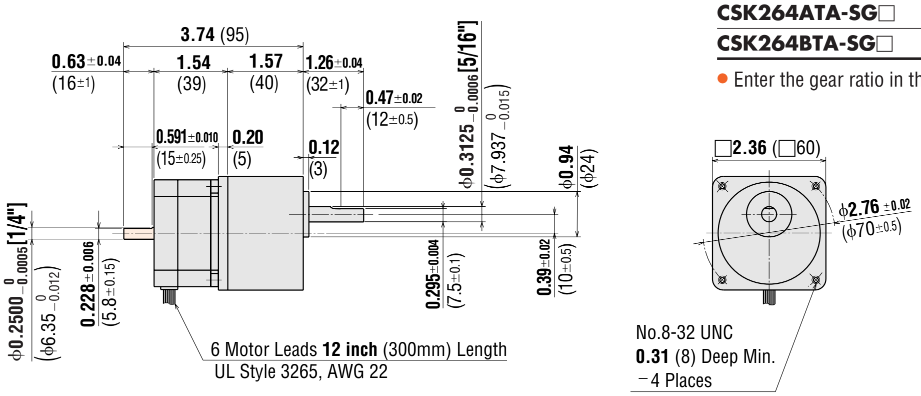
Model	Motor Model	Weight lb. (kg)	DXF
CSK243ATA-SG□	PK243A1A-SG□	0.77 (0.35)	B091U
CSK243BTA-SG□	PK243B1A-SG□		

- Enter the gear ratio in the box (□) within the model number.

5 Motor Frame Size □2.36 in. (□60 mm)

Model	Motor Model	Weight lb. (kg)	DXF
CSK264ATA-SG□	PK264A2A-SG□	1.7 (0.75)	B092U
CSK264BTA-SG□	PK264B2A-SG□		

- Enter the gear ratio in the box (□) within the model number.

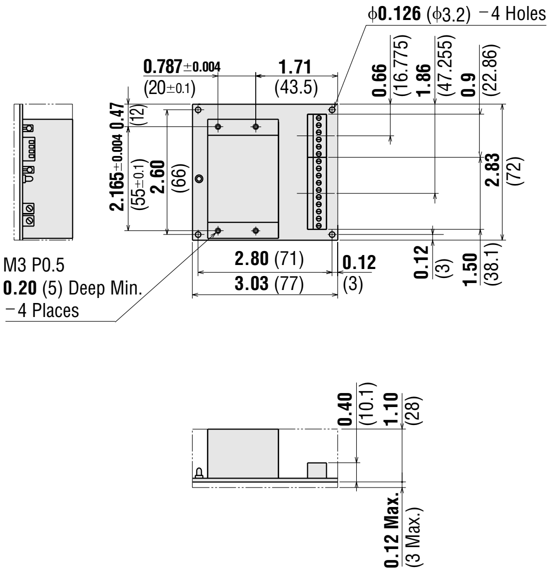


- These dimensions are for double shaft models. For single shaft models, ignore the shaded areas.

● Driver

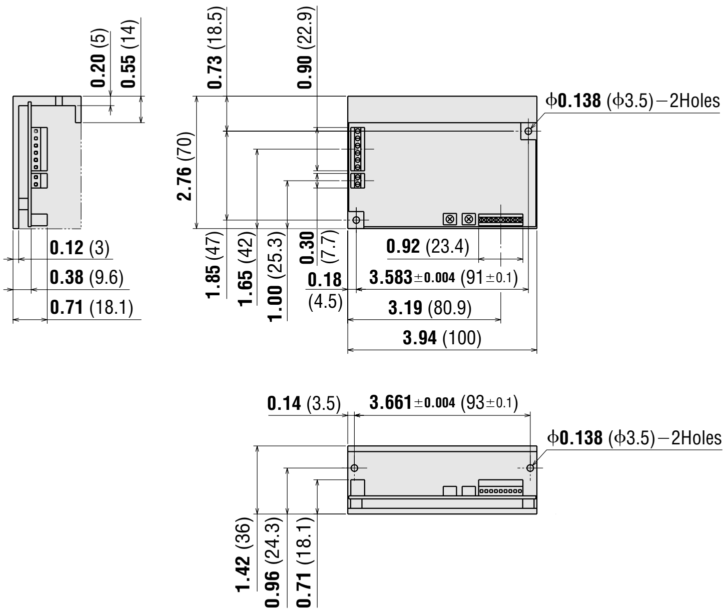
6 CSD2109-T, CSD2112-T, CSD2120-T

Weight: 0.29 lb. (0.13 kg) DXF B807U



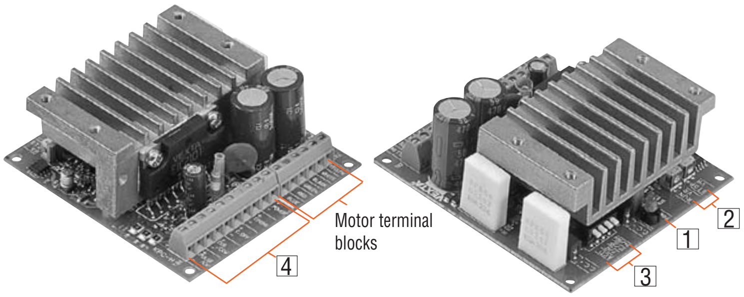
7 CSD2140T, CSD2145T

Weight: 0.44 lb. (0.2 kg) DXF B810U



Connection and Operation

CSK24□, CSK26□
CSK24□M, CSK26□M



1 Signal Monitor Display

Indicator	Color	Function
POWER	Green	Power input display

2 Current Adjustment Potentiometers

Indicator	Name of Potentiometer	Function
RUN VR	Motor run current potentiometer	For adjusting the motor running current.
STOP VR	Motor stop current potentiometer	For adjusting the motor current at standstill.

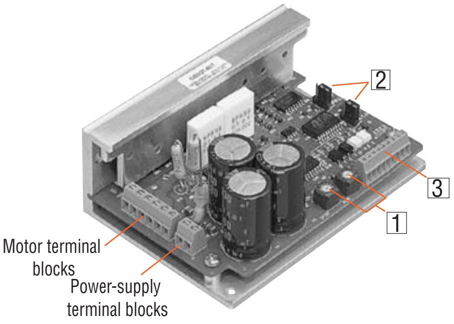
3 Function Select Switches

Indicator	Switch Name	Function
ACD	Automatic current cutback function select	Automatically decreases output current to motor at motor standstill.
F/H	Step angle select	Switches the motor's step angle. F (Full Step): 1.8˚/step, H (Half Step): 0.9˚/step (F: 0.9˚/step, H: 0.45˚/step for High-Resolution Type)
1P/2P	Pulse input mode	Switches between 1-pulse input mode and 2-pulse input mode.
24/36V	Power supply voltage select	Changes power supply voltage. For 24 VDC and 36 VDC

4 Input/Output Signals (TB1)

Indication	Input/Output	Signal Name
+POWER	Input	+24 VDC±10% or +36 VDC±10%
−POWER		GND
+TIMING	Output	Timing Signal
−TIMING		
+C.OFF	Input	All Windings OFF Signal
−C.OFF		
+DIR./CCW	Input	Rotation Direction Signal (CCW Pulse Signal)
−DIR./CCW		
+PLS/CW	Input	Pulse Signal (CW Pulse Signal)
−PLS/CW		

CSK29□



1 Current Adjustment Potentiometers

Indicator	Name of Potentiometer	Function
RUN VR	Motor run current potentiometer	For adjusting the motor running current.
STOP VR	Motor stop current potentiometer	For adjusting the motor current at standstill.

2 Function Select Switches

Indicator	Switch Name	Function
ACD	Automatic current cutback function select	Automatically decreases output current to motor at motor standstill.
F/H	Step angle select	Switches the motor's step angle. F (Full Step): 1.8°/step, H (Half Step): 0.9°/step

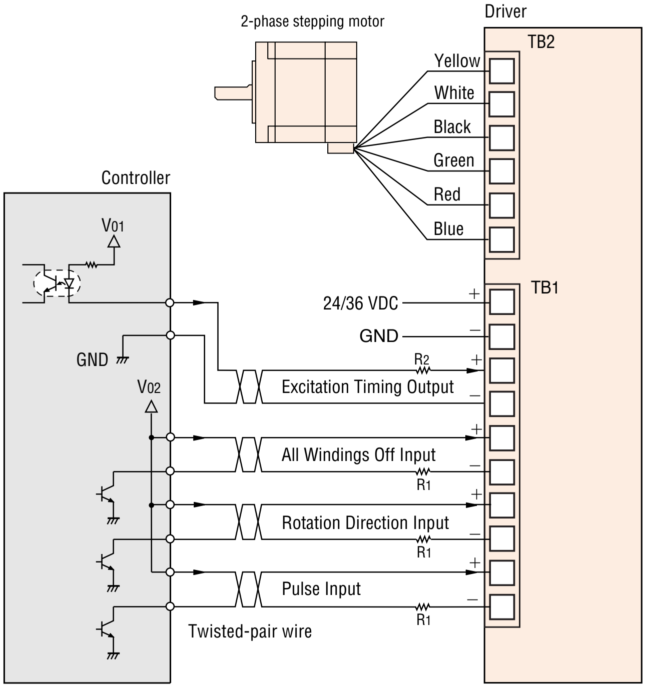
3 Input/Output Signals (TB3)

Terminal No.	Indication	Input/Output	Signal Name
1	+PLS	Input	Pulse Signal
2	−PLS		
3	+DIR.	Input	Rotation Direction Signal
4	−DIR.		
5	+C.OFF	Input	All Windings OFF Signal
6	−C.OFF		
7	+TIMING	Output	Timing Signal
8	−TIMING		
9	NC	−	−

Features C-162 System Configuration C-163 Specifications/Characteristics C-164

● Connection Diagrams

◆ CSK24□, CSK26□
CSK24□M, CSK26□M



◆ Power Supply

Keep the input power voltage to 24 VDC±10% or 36 VDC±10%. Use a power supply that provides sufficient input current.

Notes:

- Keep the voltage V_{01} and V_{02} between 5 VDC and 24 VDC. When they are equal to 5 VDC, the external resistance R_1 is not necessary. When they are above 5 VDC, connect R_1 to keep the current between 10 mA and 20 mA, and connect R_2 to keep the current below 10 mA.
- Use twisted-pair wire of AWG 24 or thicker and 6.6 feet (2 m) or less in length for the signal line.
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decrease.
(→ Technical Reference Page F-36)
- Suitable wire size for the TB1, TB2 and TB3 connector is between AWG 20 and 26. Use AWG 20 or thicker for motor lines (when extended) and power supply line.
- Signal lines should be kept at least 3.9 inches (10 cm) away from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.
- Use spot grounding to ground the driver and external controller.
- If noise generated by the motor lead wire causes a problem, try shielding the motor lead wires with conductive tape or wire mesh.
- Incorrect connection of DC power input will lead to driver damage. Make sure that the polarity is correct before turning power on.

● Description of Input/Output Signals

Pulse (CW) Input and Rotation Direction (CCW) Input Signal

1-Pulse Input Mode

Pulse Input Signal

"Pulse" signal is input to the PULSE/CW− terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step. The direction of rotation is determined by the rotation direction signal.

Rotation Direction Input Signal

The "Rotation Direction" signal is input to the DIR./CCW− terminal. A "photocoupler ON" signal input commands a clockwise direction rotation. A "photocoupler OFF" signal input commands a counterclockwise direction rotation.

2-Pulse Input Mode

CW Pulse Input Signal

"Pulse" signal is input to the PULSE/CW− terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step in a clockwise direction.

CCW Pulse Input Signal

"Pulse" signal is input to the DIR./CCW− terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step in a counterclockwise direction.

All Windings Off Input Signal

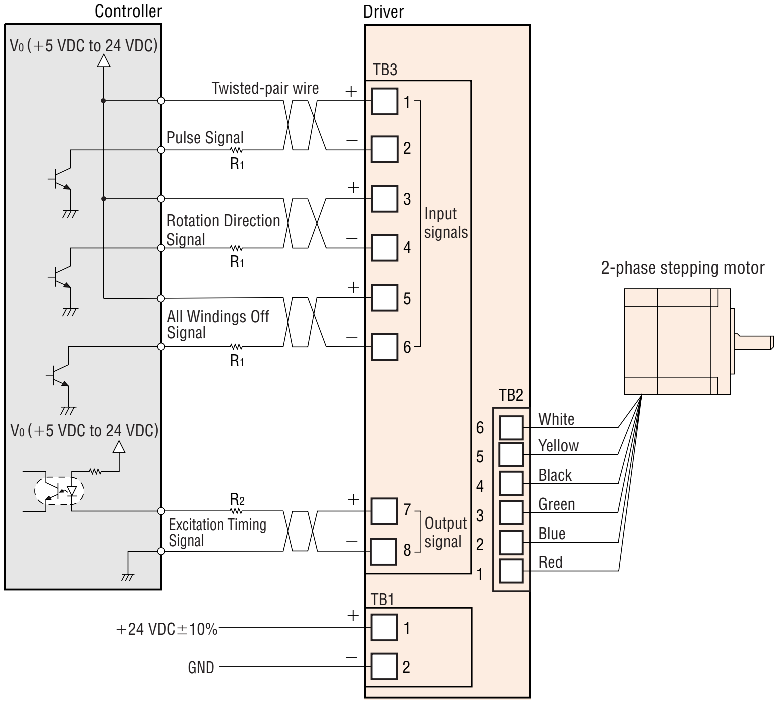
When the "All Windings Off" (A.W. OFF) signal is in the "photocoupler ON" state, the current to the motor is cut off and motor torque is reduced to zero. The motor output shaft can then be rotated freely by hand.This signal is used when moving the motor by external force or to the manual home position.

Excitation Timing Output Signal

The Excitation Timing signal is output once each time the excitation sequence returns to step “0” in synchronization with input pulse. The excitation sequence is designed to complete one cycle as the motor shaft rotates 7.2˚.
A signal is output every 4 pulses in full step mode and every 8 pulses in half step mode. (When the “excitation timing” signal is output, the transistor turns ON.)

Common Specifications C-172 Dimensions C-174 Connection and Operation C-176 Motor and Driver Combinations C-182

◆ CSK29□



◆ Power Supply

Keep the input power voltage at 24 VDC±10%. Use a power supply that provides sufficient input current.

Notes:

- Keep the voltage Vo between 5 VDC and 24 VDC. When Vo is equal to 5 VDC, the external resistance R1 is not necessary. When Vo is above 5 VDC, connect R1 to keep the current between 10 mA and 20 mA, and connect R2 to keep the current below 10 mA.
- Use twisted-pair wire of AWG 24 or thicker and 6.6 feet (2 m) or less in length for the signal line.
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decrease.
(→ Technical Reference Page F-36)
- Suitable wire size for the TB1, TB2 and TB3 connector is between AWG 20 and AWG 26. Use AWG 20 or thicker for motor lines (when extended) and power supply line.
- Signal lines should be kept at least 3.9 inches (10 cm) away from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.
- Use spot grounding to ground the driver and external controller.
- If noise generated by the motor lead wire causes a problem, try shielding the motor lead wires with conductive tape or wire mesh.
- Incorrect connection of DC power input will lead to driver damage. Make sure that the polarity is correct before turning power on.

●Description of Input/Output Signals

Pulse Input Signal

"Pulse" signal is input to the PULSE−terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step. The direction of rotation is determined by the rotation direction signal.

Rotation Direction Input Signal

The "Rotation Direction" signal is input to the DIR.−terminal. A "photocoupler ON" signal input commands a clockwise direction rotation. A "photocoupler OFF" signal input commands a counterclockwise direction rotation.

All Windings Off Input Signal

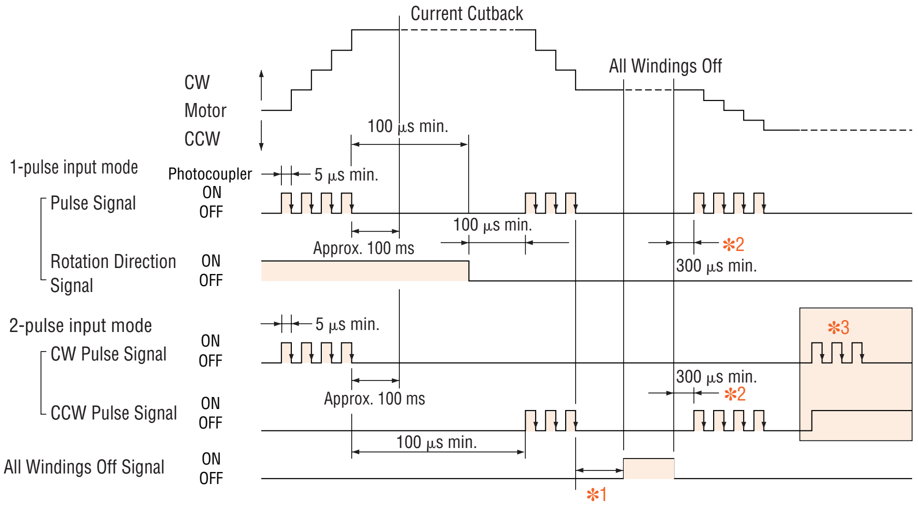
When the "All Windings Off" (A.W. OFF) signal is in the "photocoupler ON" state, the current to the motor is cut off and motor torque is reduced to zero. The motor output shaft can then be rotated freely by hand.This signal is used when moving the motor by external force or to the manual home position.

Excitation Timing Output Signal

The signal is output once each time the excitation sequence returns to step “0” in synchronization with input pulse.The excitation sequence is designed to complete one cycle as the motor shaft rotates 7.2˚. A signal is output every 4 pulses in full step mode and every 8 pulses in half step mode. (When the “excitation timing” signal is output, the transistor turns ON.)

● Timing Chart

◆ CSK24□, CSK26□
CSK24□M, CSK26□M



Note: 100 µs or more is the standard interval time for switching from CW to CCW. Note that the interval time varies greatly depending on the motor and load inertia.

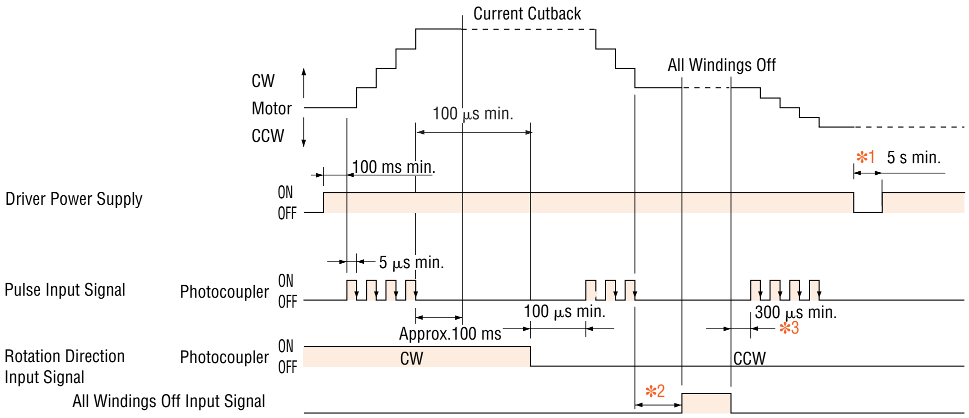
✻1 Wait a period of time to allow the motor oscillations to end before inputting the "All Windings Off" signal. This time varies with the load inertia, the load torque and the starting pulse rate. The signal input must be stopped before the motor stops.

✻2 Never input a step pulse signal immediately after switching the "All Windings Off" input signal to the "photocoupler OFF" state or the motor may lose synchronism. In general, a minimum interval of 300 ms is required.

✻3 The motor will not operate properly if a pulse signal is input when either the CW or CCW pulse is in the "photocoupler ON" state.

The shaded area indicates when the photocoupler is ON.

◆ CSK29□



Note: 100 µs or more is the standard interval time for switching from CW to CCW. Note that the interval time varies greatly depending on the motor and load inertia.

✻1 After turning off the power supply, wait at least 5 seconds before turning it on again.

✻2 Wait a period of time to allow the motor oscillations to end before inputting the "All Windings Off" signal. This time varies with the load inertia, the load torque and the starting pulse rate. The signal input must be stopped before the motor stops.

✻3 Never input a step pulse signal immediately after switching the "All Windings Off" signal to "photocoupler OFF" state, or the motor may lose synchronism. In general, a minimum interval of 300 ms is required.

The shaded area indicates when the photocoupler is ON.

● Adjusting the Output Current

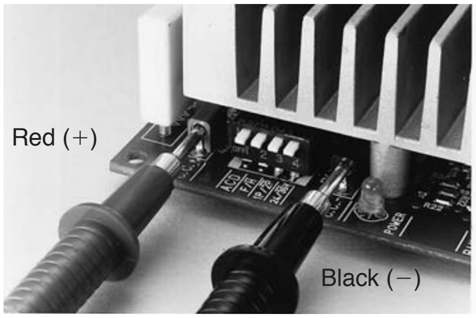
◆ CSK24□, CSK26□
CSK24□M, CSK26□M

◆ Adjustment Method

The rated output current is set at the factory. When it is necessary to change the current setting, follow the procedures described below.

Connecting Voltmeter

Insert the voltmeter test probes [approximately ϕ0.18 inch (ϕ2.1 mm)] as shown below.The current value for one phase is equivalent to the voltage shown by the voltmeter. (ex: voltmeter voltage 1 V = 1 A/Phase)

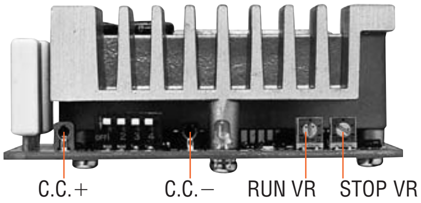


Adjusting the Motor Running Current

To set the "Automatic Current Cutback" function to inactive (SW1: OFF):

(1) Adjust the motor operating current with the RUN potentiometer. It can be adjusted from 0.3 A/phase to the rated value of the driver.

(2) The motor operating current is set for the rated current at the time of shipping. The RUN potentiometer can be used lower the operating current to reduce temperature rise in the motor/driver, adjust torque margin and reduce vibration.



Note:
- The motor RUN current should be less than the motor rated current.

Adjusting the Current at Motor Standstill

To set the "Automatic Current Cutback" function to active (SW1: ON):

(1) Adjust the current at motor standstill with the STOP potentiometer. It can be adjusted from 25% to 50% of the run operating current (0.3 A minimum).

(2) At the time of shipping, the current at motor standstill is set for 40%. The STOP potentiometer readjusts the current to the value required to produce enough holding torque.

$$\text{Holding torque [oz-in (N·m)]} = \frac{\text{Maximum holding torque [oz-in (N·m)]} \times \text{Current at motor standstill [A]}}{\text{Motor rated current [A]}}$$

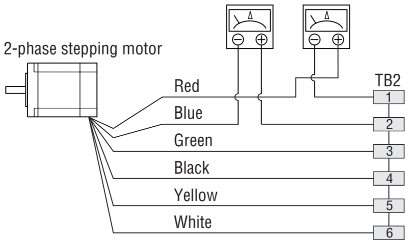
Features C-162 System Configuration C-163 Specifications/Characteristics C-164

◆ CSK29☐

♦ Adjusting Method

Connecting an Ammeter

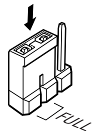
Connect the driver, motor and DC ammeter.



Motor Running Current

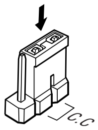
1. Set the step angle to full step.

Set the jumper socket for the step angle switch (FULL/HALF) to “ FULL”.



2. Disable the automatic current cutback function.

Set the jumper socket for automatic current cutback function (C.C/A.C.D) to “ C.C”.

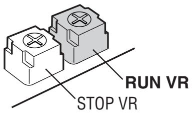


3. Turn on the power supply.

Wait until the motor reaches its operating current.

4. Manipulate the potentiometer for adjusting the motor operating current (RUN VR).

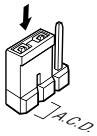
Adjust the potentiometer using an insulated screwdriver. The sum of the two DC ammeter readings indicates the current per motor phase. Be sure to adjust the current to the motor’s rated current or below.



Example: When the DC ammeter readings indicate 1.05 A and 0.95 A respectively, the output current per motor phase is 2.0 A.

5. Turn off the power supply.

6. Set the jumper socket for automatic current cutback function (C.C/A.C.D) to “A.C.D.” again.

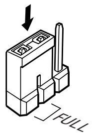


This completes the adjustment of the motor running current.

Motor Standstill Current

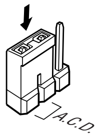
1. Set the step angle to full step.

Set the jumper socket for the step angle switch (FULL/HALF) to “ FULL”.



2. Enable the automatic current cutback function.

Set the jumper socket for automatic current cutback function (C.C/A.C.D.) to “A.C.D.”.

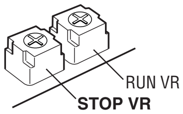


3. Turn on the power supply.

Wait until the motor reaches its standstill current.

4. Manipulate the potentiometer for adjusting the motor standstill current (STOP VR).

Adjust the potentiometer using an insulated screwdriver. The sum of the two DC ammeter readings indicates the current per motor phase. Be sure to adjust the current to 40 percent of the motor‘s rated current or below.



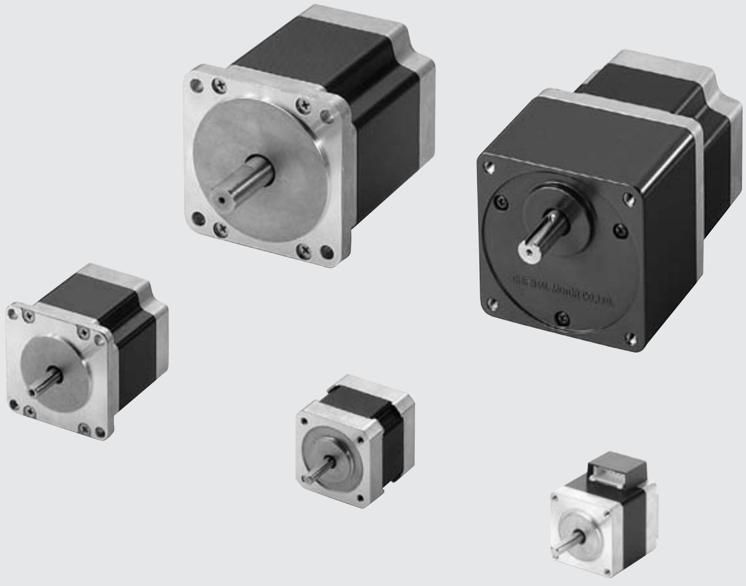
5. Turn off the power supply.

This completes the adjustment of the motor standstill current.

List of Motor and Driver Combinations

Type	Model	Motor Model	Driver Model
Standard	**CSK243-□TA**	PK243-01□A	CSD2109-T
	CSK244-□TA	PK244-01□A	CSD2112-T
	CSK245-□TA	PK245-01□A	
	CSK264-□T	PK264-02□	CSD2120-T
	CSK266-□T	PK266-02□	
	CSK268-□T	PK268-02□	
	CSK296-□TA	PK296-03□A	CSD2145T
	CSK299-□TA	PK299-03□A	
	CSK2913-□TA	PK2913-02□A	CSD2140T
High-Resolution	**CSK243M□TA**	PK243M□A	CSD2109-T
	CSK244M□TA	PK244M□A	CSD2112-T
	CSK245M□TA	PK245M□A	
	CSK264M□T	PK264M□	CSD2120-T
	CSK266M□T	PK266M□	
	CSK268M□T	PK268M□	
SH Geared	**CSK243□TA-SG3.6**	PK243□1A-SG3.6	CSD2109-T
	CSK243□TA-SG7.2	PK243□1A-SG7.2	
	CSK243□TA-SG9	PK243□1A-SG9	
	CSK243□TA-SG10	PK243□1A-SG10	
	CSK243□TA-SG18	PK243□1A-SG18	
	CSK243□TA-SG36	PK243□1A-SG36	
	CSK264□TA-SG3.6	PK264□2A-SG3.6	CSD2120-T
	CSK264□TA-SG7.2	PK264□2A-SG7.2	
	CSK264□TA-SG9	PK264□2A-SG9	
	CSK264□TA-SG10	PK264□2A-SG10	
	CSK264□TA-SG18	PK264□2A-SG18	
	CSK264□TA-SG36	PK264□2A-SG36	

- Enter **A** (single shaft) or **B** (double shaft) in the box (□) within the model number.

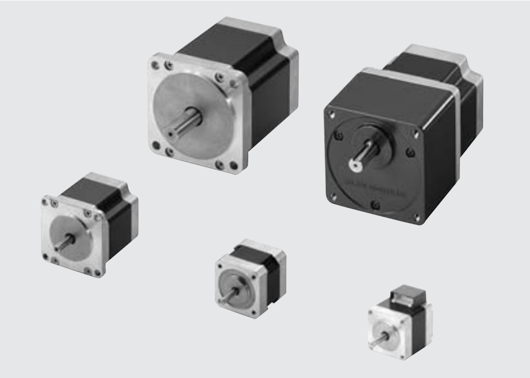


2-Phase Stepping Motors

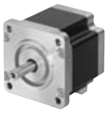
Additional Information

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) ✻1	□2.65 in. (□60 mm)	□3.35 in. (□85 mm) ✻2
PK Series	Standard Type	—	—	 Page C-202	with Encoder page→ C-233  Page C-214	—	 Page C-227
	Standard **P** Type (High Torque)	 Page C-196	 Page C-200	 Page C-204	—	—	—
	High Resolution Type	—	—	 Page C-208	with Encoder page→ C-239  Page C-218	—	—
	SH Geared Type	 Page C-198	—	 Page C-212	✻1  Page C-222	—	✻2  Page C-231
PV Series (High Inertia Capability)		—	—	—	—	 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-295

Mounting brackets cannot be used with **SH** geared types.

Clean Dampers
Page → C-293

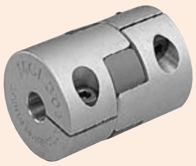
Effective at suppressing motor vibration and improving performance.

Flexible Couplings
Page → C-288

MC Motor Couplings

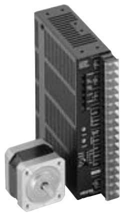
Flexible Couplings
Page → C-290

MCL Gearmotor Couplings

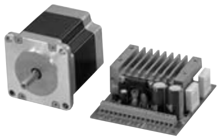


2-Phase Stepping Motor and Driver Packages

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



AC Input
UMK Series
→Page C-149



DC Input
CSK Series
→Page C-161

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

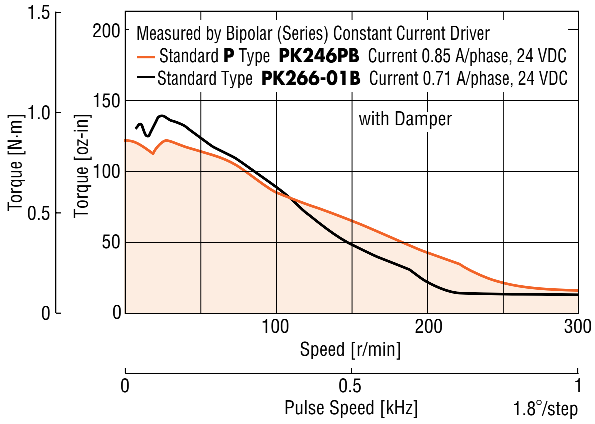
The **PK** Series 2-phase stepping motor with encoder offers high torque and precise feedback capability.

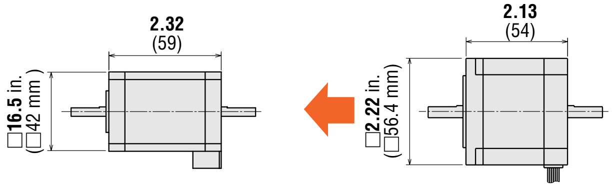
- Encoder Feedback Type: Incremental
- Two feedback resolutions: 200 and 400 pulses/rev.
- Provides closed loop system capability

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.

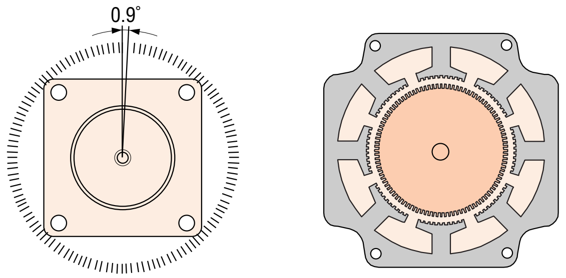


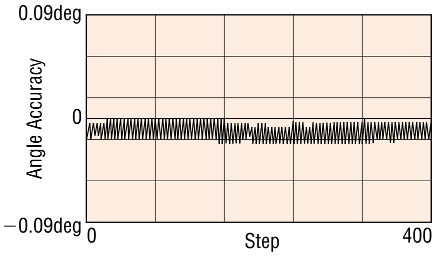


Standard **P** Type	**Type**	Standard Type
PK246PB	**Model**	**PK266-01B**
132 oz-in (0.93 N·m)	**Holding Torque**	166 oz-in (1.17 N·m)
0.77 oz-in^2 (114×10^{-7} kg·m^2)	**Rotor Inertia**	1.64 oz-in^2 (300×10^{-7} kg·m^2)

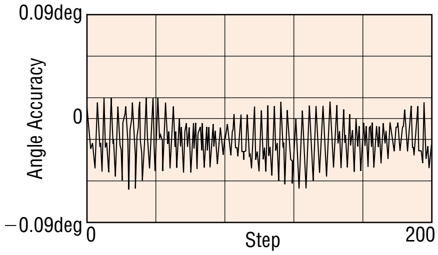
High Resolution Type

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.

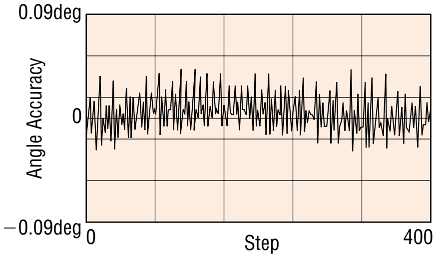




(1) High Resolution Type (0.9°/Step)



(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.

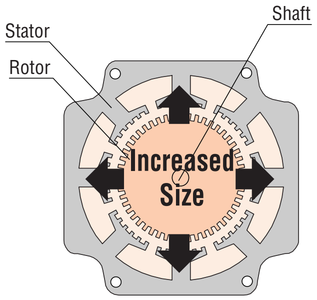
● Ideal for High Inertia Drive

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.

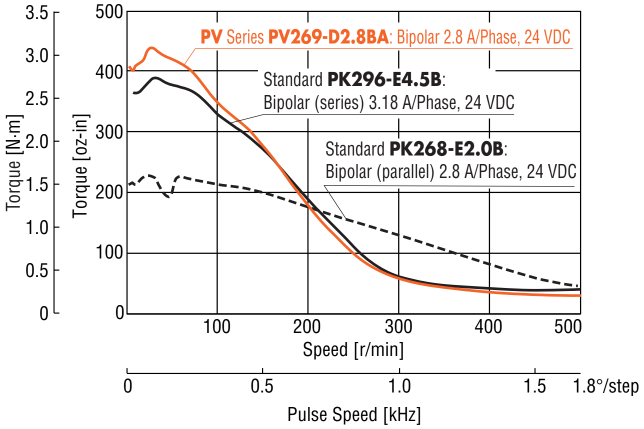
PV Series

High Inertia Capability

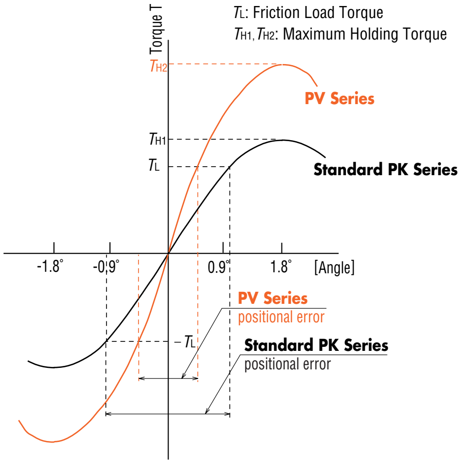
The **PV** Series provides, on average, 1.5 times higher torque than a standard stepping motor. By utilizing a larger rotor diameter, larger magnets can be used to significantly increase the output torque.



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.

Product Number Code

● PK Series

◆ Standard Type, High Resolution Type

PK243□-01BA

U.S.A. Version

Shaft Type
A: Single Shaft
B: Double Shaft

Winding Specification

0: Legacy Number
D: 4 Leads
E, F: 8 Leads

PK: **PK** Series

Step Angle
Blank: 1.8° (Standard)
M: 0.9° (High Resolution)

2-Phase

Motor Case Length

Motor Frame Size **4**: 1.65 in. sq. (42 mm sq.)
6: 2.22 in. sq. (56.4 mm sq.)
9: 3.35 in. sq. (85 mm sq.)

◆ Standard Type, High Resolution Type with Encoder

PK266□-01AR11

Encoder Resolution
R11: 200 P/R
R12: 400 P/R

Shaft Type
A: Single Shaft

Winding Specification

0: Legacy Number
E: 8 Leads

PK: **PK** Series

Step Angle
Blank: 1.8° (Standard)
M: 0.9° (High Resolution)

2-Phase

Motor Case Length

Motor Frame Size **6**: 1.65 in. sq. (42 mm sq.)

◆ Standard **P** Type (High Torque)

PK233PA

Shaft Type
A: Single Shaft
B: Double Shaft

Standard **P** Type

Motor Case Length

PK: **PK** Series

Motor Frame Size **2**: 1.10 in. sq. (28 mm sq.)
3: 1.38 in. sq. (35 mm sq.)
4: 1.65 in. sq. (42 mm sq.)

2-Phase

◆ SH Geared Type

PK223PA-SG10

Gear Ratio

SG: **SH** Gear Type

A: Single Shaft
B: Double Shaft

PK: **PK** Series

Motor Type

2-Phase

Motor Case Length

Motor Frame Size **2**: 1.10 in. sq. (28 mm sq.)

PK264A1A-SG10

Gear Ratio

SH Geared Type

U.S.A. Version

Winding Specification

PK: **PK** Series

Shaft Type
A: Single Shaft
B: Double Shaft

2-Phase

Motor Case Length

Motor Frame Size **4**: 1.65 in. sq. (42 mm sq.)
6: 2.36 in. sq. (60 mm sq.)
9: 3.54 in. sq. (90 mm sq.)

● PV Series (High Inertia Capability)

PV266-02BA

U.S.A. Version

A: Single Shaft
B: Double Shaft

Winding Specification

0: 6 Leads
D: 4 Leads

Motor Case Length

Motor Frame Size
2.36 in. sq. (60 mm sq.)

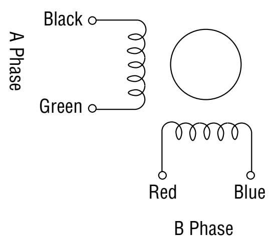
2-Phase

PV Series

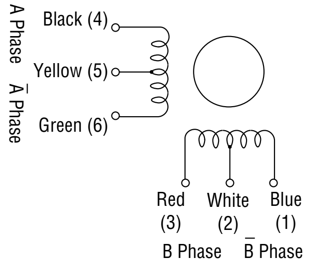
Connection Diagrams

Motor Wiring Diagrams

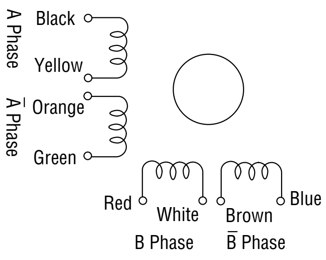
4 Lead Motor



6 Lead Motor

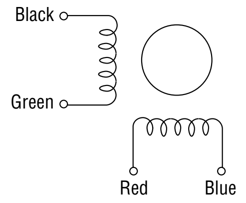


8 Lead Motor

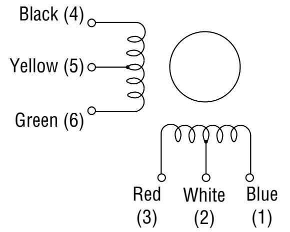


Wire Connection Diagrams

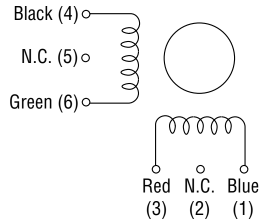
4 Lead Bipolar Connection



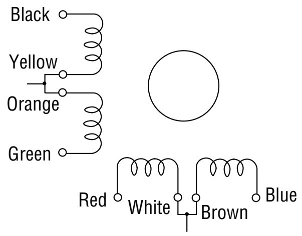
6 Lead Unipolar Connection



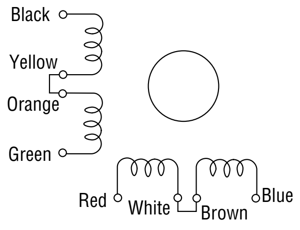
6 Lead Bipolar (Series) Connection



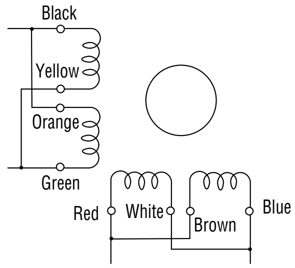
8 Lead Unipolar Connection



8 Lead Bipolar (Series) Connection



8 Lead Bipolar (Parallel) Connection



- 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.

Product Specifications

Motor Frame Size: □1.10 in. (□28 mm) PK22□

Type	Model Single Shaft Double Shaft	Basic Step Angle	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance	Inductance	Rotor Inertia		Page
				oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2	
Standard **P** Type (High Torque)	**PK223PA**	1.8°	Bipolar (Series)	9.2	0.065	0.67	3.8	5.6	4	0.049	9×10^{-7}	C-196
	PK223PB		Unipolar	7.1	0.05	0.95	2.66	2.8	1			
	PK224PA	1.8°	Bipolar (Series)	13.7	0.097	0.67	4.6	6.8	4.8	0.066	12×10^{-7}	
	PK224PB		Unipolar	10.6	0.075	0.95	3.2	3.4	1.2			
	PK225PA	1.8°	Bipolar (Series)	15.6	0.11	0.67	6.2	9.2	5.6	0.098	18×10^{-7}	
	PK225PB		Unipolar	12.7	0.09	0.95	4.4	4.6	1.4			
SH Geared Type	**PK223PA-SG7.2**	0.25°	Bipolar (Series)	42	0.3	0.67	3.8	5.6	4	0.049	9×10^{-7}	C-198
	PK223PB-SG7.2		Unipolar			0.95	2.66	2.8	1			
	PK223PA-SG9	0.2°	Bipolar (Series)	42	0.3	0.67	3.8	5.6	4			
	PK223PB-SG9		Unipolar			0.95	2.66	2.8	1			
	PK223PA-SG10	0.18°	Bipolar (Series)	42	0.3	0.67	3.8	5.6	4			
	PK223PB-SG10		Unipolar			0.95	2.66	2.8	1			
	PK223PA-SG18	0.1°	Bipolar (Series)	56	0.4	0.67	3.8	5.6	4			
	PK223PB-SG18		Unipolar			0.95	2.66	2.8	1			
	PK223PA-SG36	0.05°	Bipolar (Series)	56	0.4	0.67	3.8	5.6	4			
	PK223PB-SG36		Unipolar			0.95	2.66	2.8	1			

- The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Motor Frame Size: □1.38 in. (□35 mm) PK23□

Type	Model Single Shaft Double Shaft	Basic Step Angle	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance	Inductance	Rotor Inertia		Page
				oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2	
Standard **P** Type (High Torque)	**PK233PA**	1.8°	Bipolar (Series)	28	0.2	0.85	4.6	5.4	5.6	0.131	24×10^{-7}	C-200
	PK233PB		Unipolar	22	0.16	1.2	3.24	2.7	1.4			
	PK235PA	1.8°	Bipolar (Series)	52	0.37	0.85	5.8	6.8	8	0.27	50×10^{-7}	
	PK235PB		Unipolar	42	0.3	1.2	4.08	3.4	2			

- The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Motor Frame Size: □1.65 in. (□42 mm) PK24□

Type	Model Single Shaft Double Shaft	Basic Step Angle	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance	Inductance	Rotor Inertia		Page
				oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2	
Standard Type	**PK243-01AA**	1.8°	Bipolar (Series)	28	0.2	0.67	5.6	8.4	10	0.191	35×10^{-7}	C-204
	PK243-01BA		Unipolar	22	0.16	0.95	4	4.2	2.5			
	PK243-02AA		Bipolar (Series)	28	0.2	0.28	13	48	60			
	PK243-02BA		Unipolar	22	0.16	0.4	9.6	24	15			
	PK243-03AA		Bipolar (Series)	28	0.2	0.22	17	77	84			
	PK243-03BA		Unipolar	22	0.16	0.31	12	38.5	21			
	PK244-01AA		Bipolar (Series)	46	0.33	0.85	5.6	6.6	12.8	0.3	54×10^{-7}	
	PK244-01BA		Unipolar	36	0.26	1.2	4	3.3	3.2			
	PK244-02AA		Bipolar (Series)	46	0.33	0.57	8.6	15	26.8			
	PK244-02BA		Unipolar	36	0.26	0.8	6	7.5	6.7			
	PK244-03AA		Bipolar (Series)	46	0.33	0.28	17	60	120			
	PK244-03BA		Unipolar	36	0.26	0.4	12	30	30			
	PK244-04AA		Bipolar (Series)	46	0.33	0.14	34	240	428			
	PK244-04BA		Unipolar	36	0.26	0.2	24	120	107			
	PK245-01AA		Bipolar (Series)	61	0.43	0.85	5.6	6.6	11.2	0.37	68×10^{-7}	
	PK245-01BA		Unipolar	45	0.32	1.2	4	3.3	2.6			
	PK245-02AA		Bipolar (Series)	61	0.43	0.57	8.6	15	28.4			
	PK245-02BA		Unipolar	45	0.32	0.8	6	7.5	7.1			
	PK245-03AA		Bipolar (Series)	61	0.43	0.28	17	60	100			
	PK245-03BA		Unipolar	45	0.32	0.4	12	30	25			

- The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Motor Frame Size: □1.65 in. (□42 mm) PK24□

Type	Model Single Shaft Double Shaft	Basic Step Angle	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance	Inductance	Rotor Inertia		Page
				oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2	
Standard **P** Type (High Torque)	**PK244PA**	1.8°	Bipolar (Series)	68	0.48	0.85	6.8	8	15.6	0.31	57×10^{-7}	C-202
	PK244PB		Unipolar	55	0.39	1.2	4.8	4	3.9			
	PK246PA		Bipolar (Series)	132	0.93	0.85	10	12	26	0.62	114×10^{-7}	
	PK246PB		Unipolar	106	0.75	1.2	7.2	6	6.5			
High Resolution Type	**PK243M-01AA**	0.9°	Bipolar (Series)	28	0.2	0.67	5.6	8.4	15.2	0.191	35×10^{-7}	C-208
	PK243M-01BA		Unipolar	22	0.16	0.95	4	4.2	3.8			
	PK243M-02AA		Bipolar (Series)	28	0.2	0.42	8.4	20	38.8			
	PK243M-02BA		Unipolar	22	0.16	0.6	6	10	9.7			
	PK243M-03AA		Bipolar (Series)	28	0.2	0.22	17	77	136			
	PK243M-03BA		Unipolar	22	0.16	0.31	12	38.5	34			
	PK244M-01AA		Bipolar (Series)	44	0.31	0.85	5.6	6.6	17.2	0.3	54×10^{-7}	
	PK244M-01BA		Unipolar	36	0.26	1.2	4	3.3	4.3			
	PK244M-02AA		Bipolar (Series)	44	0.31	0.57	8.6	15	38.8			
	PK244M-02BA		Unipolar	36	0.26	0.8	6	7.5	9.7			
	PK244M-03AA		Bipolar (Series)	44	0.31	0.28	17	60	152			
	PK244M-03BA		Unipolar	36	0.26	0.4	12	30	38			
	PK245M-01AA		Bipolar (Series)	53	0.38	0.85	5.6	6.6	15.6	0.37	68×10^{-7}	
	PK245M-01BA		Unipolar	45	0.32	1.2	4	3.3	3.9			
	PK245M-02AA		Bipolar (Series)	53	0.38	0.57	8.6	15	39.6			
	PK245M-02BA		Unipolar	45	0.32	0.8	6	7.5	9.9			
	PK245M-03AA		Bipolar (Series)	53	0.38	0.28	17	60	128			
	PK245M-03BA		Unipolar	45	0.32	0.4	12	30	32			

- The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Motor Frame Size: □1.65 in. (□42 mm) PK243

Type	Model Single Shaft Double Shaft	Basic Step Angle	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance	Inductance	Rotor Inertia		Page
				lb-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2	
SH Geared Type	**PK243A1A-SG3.6**	0.5°	Bipolar (Series)	1.77	0.2	0.67	5.6	8.4	10	0.191	35×10^{-7}	C-212
	PK243B1A-SG3.6		Unipolar			0.95	4.0	4.2	2.5			
	PK243A1A-SG7.2	0.25°	Bipolar (Series)	3.5	0.4	0.67	5.6	8.4	10			
	PK243B1A-SG7.2		Unipolar			0.95	4.0	4.2	2.5			
	PK243A1A-SG9	0.2°	Bipolar (Series)	4.4	0.5	0.67	5.6	8.4	10			
	PK243B1A-SG9		Unipolar			0.95	4.0	4.2	2.5			
	PK243A1A-SG10	0.18°	Bipolar (Series)	4.9	0.56	0.67	5.6	8.4	10			
	PK243B1A-SG10		Unipolar			0.95	4.0	4.2	2.5			
	PK243A1A-SG18	0.1°	Bipolar (Series)	7.0	0.8	0.67	5.6	8.4	10			
	PK243B1A-SG18		Unipolar			0.95	4.0	4.2	2.5			
	PK243A1A-SG36	0.05°	Bipolar (Series)	7.0	0.8	0.67	5.6	8.4	10			
	PK243B1A-SG36		Unipolar			0.95	4.0	4.2	2.5			
	PK243A2A-SG3.6	0.5°	Bipolar (Series)	1.77	0.2	0.28	13	48	60	0.191	35×10^{-7}	
	PK243B2A-SG3.6		Unipolar			0.4	9.6	24	15			
	PK243A2A-SG7.2	0.25°	Bipolar (Series)	3.5	0.4	0.28	13	48	60			
	PK243B2A-SG7.2		Unipolar			0.4	9.6	24	15			
	PK243A2A-SG9	0.2°	Bipolar (Series)	4.4	0.5	0.28	13	48	60			
	PK243B2A-SG9		Unipolar			0.4	9.6	24	15			
	PK243A2A-SG10	0.18°	Bipolar (Series)	4.9	0.56	0.28	13	48	60			
	PK243B2A-SG10		Unipolar			0.4	9.6	24	15			
	PK243A2A-SG18	0.1°	Bipolar (Series)	7.0	0.8	0.28	13	48	60			
	PK243B2A-SG18		Unipolar			0.4	9.6	24	15			
	PK243A2A-SG36	0.05°	Bipolar (Series)	7.0	0.8	0.28	13	48	60			
	PK243B2A-SG36		Unipolar			0.4	9.6	24	15			

- The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Motor Frame Size: □2.22 in. (□56.4 mm) PK26□

Type	Model Single Shaft Double Shaft	Basic Step Angle	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance	Inductance	Rotor Inertia		Page
				oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2	
Standard Type	**PK264-01A**	1.8°	Bipolar (Series)	68	0.48	0.71	8.1	11.4	21.6	0.66	120×10^{-7}	C-214
	PK264-01B		Unipolar	55	0.39	1	5.7	5.7	5.4			
	PK264-02A		Bipolar (Series)	68	0.48	1.4	3.9	2.8	5.6			
	PK264-02B		Unipolar	55	0.39	2	2.8	1.4	1.4			
	PK264-03A		Bipolar (Series)	68	0.48	2.1	2.6	1.26	2.4			
	PK264-03B		Unipolar	55	0.39	3	1.9	0.63	0.6			
	PK264-E2.0A **PK264-E2.0B**		Bipolar (Parallel)	68	0.48	2.8	1.96	0.7	1.4			
			Bipolar (Series)	68	0.48	1.4	3.9	2.8	5.6			
			Unipolar	55	0.39	2	2.8	1.4	1.4			
	PK266-01A		Bipolar (Series)	166	1.17	0.71	11	14.8	40	1.64	300×10^{-7}	
	PK266-01B		Unipolar	127	0.9	1	7.4	7.4	10			
	PK266-02A		Bipolar (Series)	166	1.17	1.4	5	3.6	10			
	PK266-02B		Unipolar	127	0.9	2	3.6	1.8	2.5			
	PK266-03A		Bipolar (Series)	166	1.17	2.1	3.2	1.5	4.4			
	PK266-03B		Unipolar	127	0.9	3	2.3	0.75	1.1			
	PK266-E2.0A **PK266-E2.0B**		Bipolar (Parallel)	166	1.17	2.8	2.52	0.9	2.5			
			Bipolar (Series)	166	1.17	1.4	5	3.6	10			
			Unipolar	127	0.9	2	3.6	1.8	2.5			
	PK268-01A		Bipolar (Series)	248	1.75	0.71	12	17.2	56	2.6	480×10^{-7}	
	PK268-01B		Unipolar	191	1.35	1	8.6	8.6	14			
	PK268-02A		Bipolar (Series)	248	1.75	1.4	6.3	4.5	14.4			
	PK268-02B		Unipolar	191	1.35	2	4.5	2.25	3.6			
	PK268-03A		Bipolar (Series)	248	1.75	2.1	4.2	2	6.4			
	PK268-03B		Unipolar	191	1.35	3	3	1	1.6			
	PK268-E2.0A **PK268-E2.0B**		Bipolar (Parallel)	240	1.75	2.8	3.16	1.13	3.6			
			Bipolar (Series)	240	1.75	1.4	6.3	4.5	14.4			
			Unipolar	191	1.35	2	4.5	2.25	3.6			
Standard Type with Encoder	**PK264-01AR11**	1.8°	Bipolar (Series)	68	0.48	0.71	8.1	11.4	21.6	0.66	120×10^{-7}	C-233
	PK264-01AR12		Unipolar	55	0.39	1	5.7	5.7	5.4			
	PK264-02AR11		Bipolar (Series)	68	0.48	1.4	3.9	2.8	5.6			
	PK264-02AR12		Unipolar	55	0.39	2	2.8	1.4	1.4			
	PK264-03AR11		Bipolar (Series)	68	0.48	2.1	2.6	1.26	2.4			
	PK264-03AR12		Unipolar	55	0.39	3	1.9	0.63	0.6			
	PK264-E2.0AR11 **PK264-E2.0AR12**		Bipolar (Parallel)	68	0.48	2.8	1.96	0.7	1.4			
			Bipolar (Series)	68	0.48	1.4	3.9	2.8	5.6			
			Unipolar	55	0.39	2	2.8	1.4	1.4			
	PK266-01AR11		Bipolar (Series)	166	1.17	0.71	11	14.8	40	1.64	300×10^{-7}	
	PK266-01AR12		Unipolar	127	0.9	1	7.4	7.4	10			
	PK266-02AR11		Bipolar (Series)	166	1.17	1.4	5	3.6	10			
	PK266-02AR12		Unipolar	127	0.9	2	3.6	1.8	2.5			
	PK266-03AR11		Bipolar (Series)	166	1.17	2.1	3.2	1.5	4.4			
	PK266-03AR12		Unipolar	127	0.9	3	2.3	0.75	1.1			
	PK266-E2.0AR11 **PK266-E2.0AR12**		Bipolar (Parallel)	166	1.17	2.8	2.52	0.9	2.5			
			Bipolar (Series)	166	1.17	1.4	5	3.6	10			
			Unipolar	127	0.9	2	3.6	1.8	2.5			

- The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Motor Frame Size: □2.22 in. (□56.4 mm) PK26□

Type	Model Single Shaft Double Shaft	Basic Step Angle	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance	Inductance	Rotor Inertia		Page
				oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2	
High Resolution Type	**PK264M-01A**	0.9°	Bipolar (Series)	68	0.48	0.71	8.1	11.4	26	0.66	120×10^{-7}	C-218
	PK264M-01B		Unipolar	55	0.39	1	5.7	5.7	6.5			
	PK264M-02A		Bipolar (Series)	68	0.48	1.4	3.9	2.8	6.8			
	PK264M-02B		Unipolar	55	0.39	2	2.8	1.4	1.7			
	PK264M-03A		Bipolar (Series)	68	0.48	2.1	2.6	1.26	3			
	PK264M-03B		Unipolar	55	0.39	3	1.9	0.63	0.75			
	PK264M-E2.0A **PK264M-E2.0B**		Bipolar (Parallel)	68	0.48	2.8	1.96	0.7	1.7			
			Bipolar (Series)	68	0.48	1.4	3.9	2.8	6.8			
			Unipolar	55	0.39	2	2.8	1.4	1.7			
	PK266M-01A		Bipolar (Series)	166	1.17	0.71	11	14.8	50.8	1.64	300×10^{-7}	
	PK266M-01B		Unipolar	127	0.9	1	7.4	7.4	12.7			
	PK266M-02A		Bipolar (Series)	166	1.17	1.4	5	3.6	12.8			
	PK266M-02B		Unipolar	127	0.9	2	3.6	1.8	3.2			
	PK266M-03A		Bipolar (Series)	166	1.17	2.1	3.2	1.5	5.8			
	PK266M-03B		Unipolar	127	0.9	3	2.3	0.75	1.45			
	PK266M-E2.0A **PK266M-E2.0B**		Bipolar (Parallel)	166	1.17	2.8	2.52	0.9	3.2			
			Bipolar (Series)	166	1.17	1.4	5	3.6	12.8			
			Unipolar	127	0.9	2	3.6	1.8	3.2			
	PK268M-01A		Bipolar (Series)	248	1.75	0.71	12	17.2	77.6	2.6	480×10^{-7}	
	PK268M-01B		Unipolar	191	1.35	1	8.6	8.6	19.4			
	PK268M-02A		Bipolar (Series)	248	1.75	1.4	6.3	4.5	19.2			
	PK268M-02B		Unipolar	191	1.35	2	4.5	2.25	4.8			
	PK268M-03A		Bipolar (Series)	248	1.75	2.1	4.2	2	8.4			
	PK268M-03B		Unipolar	191	1.35	3	3	1	2.1			
	PK268M-E2.0A **PK268M-E2.0B**		Bipolar (Parallel)	240	1.75	2.8	3.16	1.13	4.8			
			Bipolar (Series)	240	1.75	1.4	6.3	4.5	19.2			
			Unipolar	191	1.35	2	4.5	2.25	4.8			
High Resolution Type with Encoder	**PK264M-01AR11**	0.9°	Bipolar (Series)	68	0.48	0.71	8.1	11.4	26	0.66	120×10^{-7}	C-236
	PK264M-01AR12		Unipolar	55	0.39	1	5.7	5.7	6.5			
	PK264M-02AR11		Bipolar (Series)	68	0.48	1.4	3.9	2.8	6.8			
	PK264M-02AR12		Unipolar	55	0.39	2	2.8	1.4	1.7			
	PK264M-03AR11		Bipolar (Series)	68	0.48	2.1	2.6	1.26	3			
	PK264M-03AR12		Unipolar	55	0.39	3	1.9	0.63	0.75			
	PK264M-E2.0AR11 **PK264M-E2.0AR12**		Bipolar (Parallel)	68	0.48	2.8	1.96	0.7	1.7			
			Bipolar (Series)	68	0.48	1.4	3.9	2.8	6.8			
			Unipolar	55	0.39	2	2.8	1.4	1.7			
	PK266M-01AR11		Bipolar (Series)	166	1.17	0.71	11	14.8	50.8	1.64	300×10^{-7}	
	PK266M-01AR12		Unipolar	127	0.9	1	7.4	7.4	12.7			
	PK266M-02AR11		Bipolar (Series)	166	1.17	1.4	5	3.6	12.8			
	PK266M-02AR12		Unipolar	127	0.9	2	3.6	1.8	3.2			
	PK266M-03AR11		Bipolar (Series)	166	1.17	2.1	3.2	1.5	5.8			
	PK266M-03AR12		Unipolar	127	0.9	3	2.3	0.75	1.45			
	PK266M-E2.0AR11 **PK266M-E2.0AR12**		Bipolar (Parallel)	166	1.17	2.8	2.52	0.9	3.2			
			Bipolar (Series)	166	1.17	1.4	5	3.6	12.8			
			Unipolar	127	0.9	2	3.6	1.8	3.2			

● The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Motor Frame Size: □2.22 in. (□56.4 mm) **PK264** Frame Size of **SH** Geared Type is □2.36 in. (□60 mm)

Type	Model Single Shaft Double Shaft	Basic Step Angle	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance	Inductance	Rotor Inertia		Page
				lb-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2	
SH Geared Type	**PK264A1A-SG3.6**	0.5°	Bipolar (Series)	8.8	1	0.71	8.1	11.4	21.6	0.66	120×10^{-7}	C-222
	PK264B1A-SG3.6		Unipolar			1	5.7	5.7	5.4			
	PK264A1A-SG7.2	0.25°	Bipolar (Series)	17.7	2	0.71	8.1	11.4	21.6			
	PK264B1A-SG7.2		Unipolar			1	5.7	5.7	5.4			
	PK264A1A-SG9	0.2°	Bipolar (Series)	22	2.5	0.71	8.1	11.4	21.6			
	PK264B1A-SG9		Unipolar			1	5.7	5.7	5.4			
	PK264A1A-SG10	0.18°	Bipolar (Series)	23	2.7	0.71	8.1	11.4	21.6			
	PK264B1A-SG10		Unipolar			1	5.7	5.7	5.4			
	PK264A1A-SG18	0.1°	Bipolar (Series)	26	3	0.71	8.1	11.4	21.6			
	PK264B1A-SG18		Unipolar			1	5.7	5.7	5.4			
	PK264A1A-SG36	0.05°	Bipolar (Series)	35	4	0.71	8.1	11.4	21.6			
	PK264B1A-SG36		Unipolar			1	5.7	5.7	5.4			
	PK264A2A-SG3.6	0.5°	Bipolar (Series)	8.8	1	1.4	3.9	2.8	5.6	0.66	120×10^{-7}	
	PK264B2A-SG3.6		Unipolar			2	2.8	1.4	1.4			
	PK264A2A-SG7.2	0.25°	Bipolar (Series)	17.7	2	1.4	3.9	2.8	5.6			
	PK264B2A-SG7.2		Unipolar			2	2.8	1.4	1.4			
	PK264A2A-SG9	0.2°	Bipolar (Series)	22	2.5	1.4	3.9	2.8	5.6			
	PK264B2A-SG9		Unipolar			2	2.8	1.4	1.4			
	PK264A2A-SG10	0.18°	Bipolar (Series)	23	2.7	1.4	3.9	2.8	5.6			
	PK264B2A-SG10		Unipolar			2	2.8	1.4	1.4			
	PK264A2A-SG18	0.1°	Bipolar (Series)	26	3	1.4	3.9	2.8	5.6			
	PK264B2A-SG18		Unipolar			2	2.8	1.4	1.4			
	PK264A2A-SG36	0.05°	Bipolar (Series)	35	4	1.4	3.9	2.8	5.6			
	PK264B2A-SG36		Unipolar			2	2.8	1.4	1.4			

- The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Motor Frame Size: □2.36 in. (□60 mm) **PV26□**

Type	Model Single Shaft Double Shaft	Basic Step Angle	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance	Inductance	Rotor Inertia		Page
				oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2	
PV Series (High Inertia Capability)	**PV264-02AA**	1.8°	Bipolar (Series)	150	1.06	1.4	4.1	2.92	7.2	1.53	280×10^{-7}	C-224
	PV264-02BA		Unipolar	106	0.75	2	2.9	1.46	1.8			
	PV264-D2.8AA		Bipolar	150	1.06	2.8	2.1	0.73	1.8			
	PV264-D2.8BA											
	PV266-02AA		Bipolar (Series)	240	1.75	1.4	5.6	4	12.2	2.5	450×10^{-7}	
	PV266-02BA		Unipolar	191	1.35	2	4	2	3.05			
	PV266-D2.8AA		Bipolar	240	1.75	2.8	2.8	1	3.05			
	PV266-D2.8BA											
	PV267-02AA		Bipolar (Series)	310	2.2	1.4	6.7	4.8	14.2	3.1	570×10^{-7}	
	PV267-02BA		Unipolar	240	1.7	2	4.8	2.4	3.54			
	PV267-D2.8AA		Bipolar	310	2.2	2.8	3.4	1.2	3.54			
	PV267-D2.8BA											
	PV269-02AA		Bipolar (Series)	440	3.1	1.4	8.3	5.96	22.8	4.9	900×10^{-7}	
	PV269-02BA		Unipolar	310	2.2	2	6	2.98	5.7			
	PV269-D2.8AA		Bipolar	440	3.1	2.8	4.2	1.49	5.7			
	PV269-D2.8BA											

- The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Motor Frame Size: □3.35 in. (□85 mm) PK29□

Type	Model Single Shaft Double Shaft	Basic Step Angle	Connection Type	Holding Torque oz-in	Holding Torque N·m	Current per Phase A/phase	Voltage VDC	Resistance Ω/phase	Inductance mH/phase	Rotor Inertia oz-in^2	Rotor Inertia kg·m^2	Page
Standard Type	**PK296-01AA**	1.8°	Bipolar (Series)	440	3.1	1.4	6.2	4.4	30.8	7.7	1400×10^{-7}	C-277
	PK296-01BA		Unipolar	310	2.2	2	4.4	2.2	7.7			
	PK296-02AA		Bipolar (Series)	440	3.1	2.1	4.2	2	14			
	PK296-02BA		Unipolar	310	2.2	3	3	1	3.5			
	PK296-03AA		Bipolar (Series)	440	3.1	3.18	2.8	0.96	6			
	PK296-03BA		Unipolar	310	2.2	4.5	2	0.48	1.5			
	PK296-F4.5A **PK296-F4.5B**		Bipolar (Parallel)	440	3.1	6.3	1.4	0.24	1.5			
			Bipolar (Series)	440	3.1	3.18	2.8	0.96	6			
			Unipolar	310	2.2	4.5	2	0.48	1.5			
	PK299-01AA		Bipolar (Series)	880	6.2	1.4	9	6.4	56	14.8	2700×10^{-7}	
	PK299-01BA		Unipolar	620	4.4	2	6.4	3.2	14			
	PK299-02AA		Bipolar (Series)	880	6.2	2.1	6	3	24			
	PK299-02BA		Unipolar	620	4.4	3	4.2	1.5	6			
	PK299-03AA		Bipolar (Series)	880	6.2	3.18	3.9	1.32	10			
	PK299-03BA		Unipolar	620	4.4	4.5	2.8	0.66	2.5			
	PK299-F4.5A **PK299-F4.5B**		Bipolar (Parallel)	880	6.2	6.3	1.9	0.33	2.5			
			Bipolar (Series)	880	6.2	3.18	3.9	1.32	10			
			Unipolar	620	4.4	4.5	2.8	0.66	2.5			
	PK2913-01AA		Bipolar (Series)	1320	9.3	1.4	10	7.6	76.8	22	4000×10^{-7}	
	PK2913-01BA		Unipolar	930	6.6	2	7.6	3.8	19.2			
	PK2913-02AA		Bipolar (Series)	1320	9.3	2.8	5.3	1.94	16.8			
	PK2913-02BA		Unipolar	930	6.6	4	3.8	0.97	4.2			
	PK2913-F4.0A **PK2913-F4.0B**		Bipolar (Parallel)	1320	9.3	5.6	2.6	0.49	4.2			
			Bipolar (Series)	1320	9.3	2.8	5.3	1.94	16.8			
			Unipolar	930	6.6	4	3.8	0.97	4.2			

- The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Motor Frame Size: □3.35 in. (□85 mm) PK296 Frame Size of **SH** Geared Type is □3.54 in. (□90 mm)

Type	Model Single Shaft Double Shaft	Basic Step Angle	Connection Type	Holding Torque lb-in	Holding Torque N·m	Current per Phase A/phase	Voltage VDC	Resistance Ω/phase	Inductance mH/phase	Rotor Inertia oz-in^2	Rotor Inertia kg·m^2	Page
SH Geared Type	**PK296A1A-SG3.6**	0.5°	Bipolar (Series)	22	2.5	1	4.4	4.4	30.8	7.7	1400×10^{-7}	C-231
	PK296B1A-SG3.6		Unipolar			1.5	3.3	2.2	7.7			
	PK296A1A-SG7.2	0.25°	Bipolar (Series)	44	5	1	4.4	4.4	30.8			
	PK296B1A-SG7.2		Unipolar			1.5	3.3	2.2	7.7			
	PK296A1A-SG9	0.2°	Bipolar (Series)	55	6.3	1	4.4	4.4	30.8			
	PK296B1A-SG9		Unipolar			1.5	3.3	2.2	7.7			
	PK296A1A-SG10	0.18°	Bipolar (Series)	61	7	1	4.4	4.4	30.8			
	PK296B1A-SG10		Unipolar			1.5	3.3	2.2	7.7			
	PK296A1A-SG18	0.1°	Bipolar (Series)	79	9	1	4.4	4.4	30.8			
	PK296B1A-SG18		Unipolar			1.5	3.3	2.2	7.7			
	PK296A1A-SG36	0.05°	Bipolar (Series)	106	12	1	4.4	4.4	30.8			
	PK296B1A-SG36		Unipolar			1.5	3.3	2.2	7.7			
	PK296A2A-SG3.6	0.5°	Bipolar (Series)	22	2.5	2.1	2	0.96	6	7.7	1400×10^{-7}	
	PK296B2A-SG3.6		Unipolar			3	1.4	0.48	1.5			
	PK296A2A-SG7.2	0.25°	Bipolar (Series)	44	5	2.1	2	0.96	6			
	PK296B2A-SG7.2		Unipolar			3	1.4	0.48	1.5			
	PK296A2A-SG9	0.2°	Bipolar (Series)	55	6.3	2.1	2	0.96	6			
	PK296B2A-SG9		Unipolar			3	1.4	0.48	1.5			
	PK296A2A-SG10	0.18°	Bipolar (Series)	61	7	2.1	2	0.96	6			
	PK296B2A-SG10		Unipolar			3	1.4	0.48	1.5			
	PK296A2A-SG18	0.1°	Bipolar (Series)	79	9	2.1	2	0.96	6			
	PK296B2A-SG18		Unipolar			3	1.4	0.48	1.5			
	PK296A2A-SG36	0.05°	Bipolar (Series)	106	12	2.1	2	0.96	6			
	PK296B2A-SG36		Unipolar			3	1.4	0.48	1.5			

- The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Stepping Motors
□1.10 in. (□28 mm)
□1.38 in. (□35 mm)
□1.65 in. (□42 mm)
□2.22 in. (□56.4 mm)
□2.36 in. (□60 mm)
□3.35 in. (□85 mm)
□3.54 in. (□90 mm)

□1.10 in. (□28 mm)

Step Angle 1.8°

PK Series Standard P Type (High Torque)

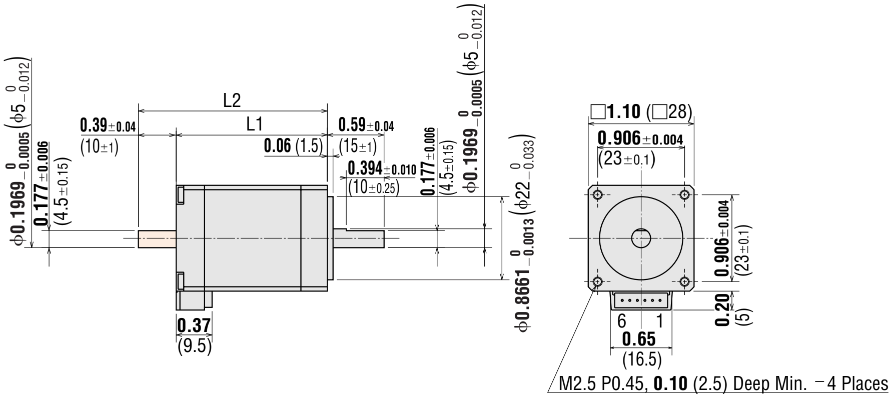
Specifications

Model Single Shaft Double Shaft	Connection Type	Holding Torque oz-in	Holding Torque N·m	Current per Phase A/phase	Voltage VDC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J oz-in²	Rotor Inertia J kg·m²	Lead Wires (Pins)
PK223PA	Bipolar (Series)	9.2	0.065	0.67	3.8	5.6	4	0.049	9×10^{-7}	6
PK223PB	Unipolar	7.1	0.05	0.95	2.66	2.8	1			
PK224PA	Bipolar (Series)	13.7	0.097	0.67	4.6	6.8	4.8	0.066	12×10^{-7}	6
PK224PB	Unipolar	10.6	0.075	0.95	3.2	3.4	1.2			
PK225PA	Bipolar (Series)	15.6	0.11	0.67	6.2	9.2	5.6	0.098	18×10^{-7}	6
PK225PB	Unipolar	12.7	0.09	0.95	4.4	4.6	1.4			

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189

Dimensions

Scale 1/2, Unit = **inch** (mm)



✻ The length of machining on double shaft model is 0.394±0.010 (10±0.25).

- These dimensions are for double shaft models. For single shaft models, ignore the shaded area.

Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PK223PA	1.26 (32)	—	0.24 (0.11)	B326
PK223PB		1.65 (42)		
PK224PA	1.57 (40)	—	0.31 (0.14)	B327
PK224PB		1.97 (50)		
PK225PA	2.03 (51.5)	—	0.44 (0.2)	B328
PK225PB		2.42 (61.5)		

Applicable Connector

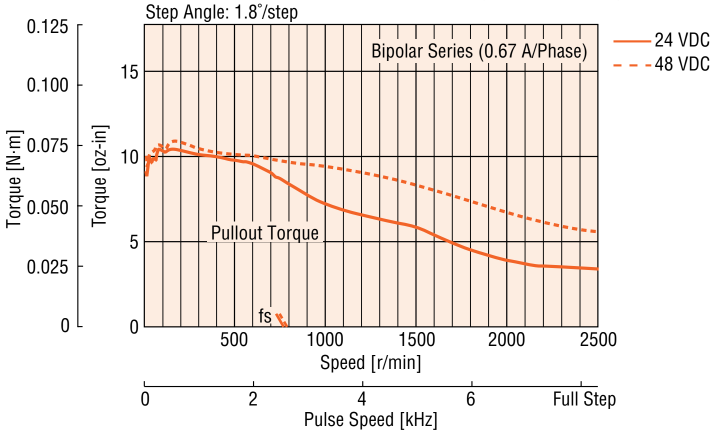
The following housing and contacts must be purchased separately.
Housing: 51065-0600 (MOLEX)
Contact: 50212-8100 (MOLEX)
Connector Assembly Tool: 57176-5000 (MOLEX)

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

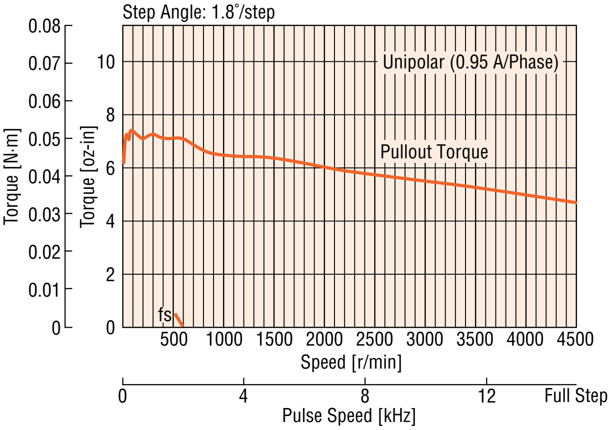
● **PK223PB** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



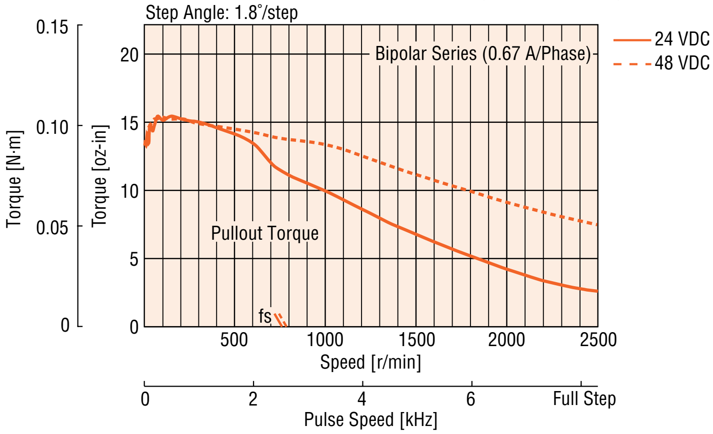
● **PK223PB** Unipolar

Power Input: 24 VDC   Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



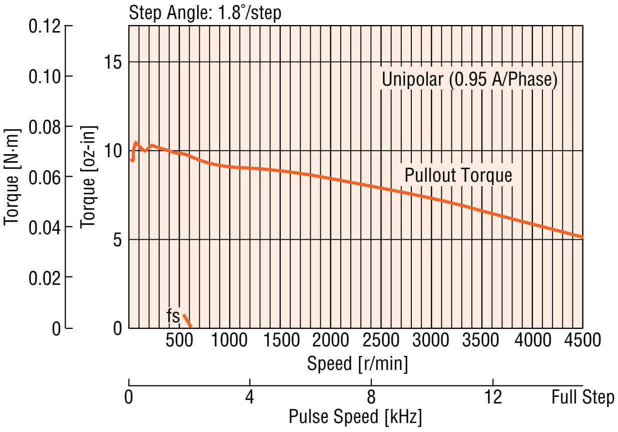
● **PK224PB** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



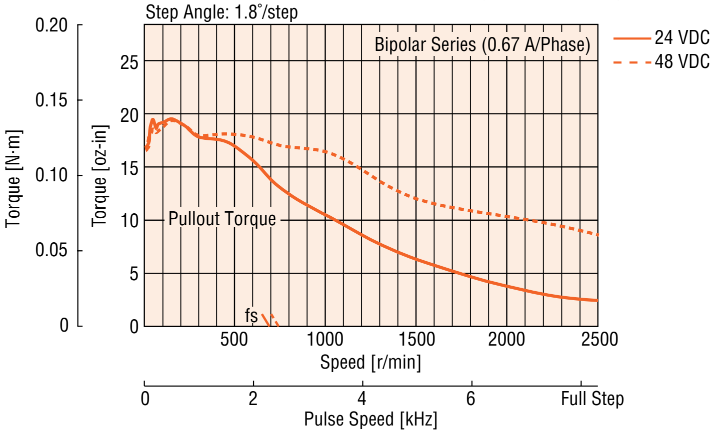
● **PK224PB** Unipolar

Power Input: 24 VDC   Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



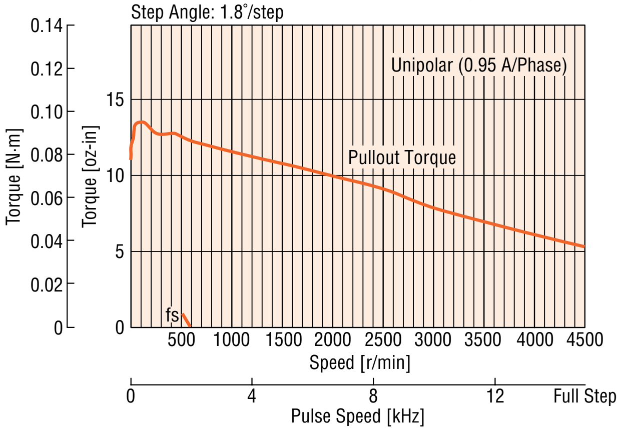
● **PK225PB** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



● **PK225PB** Unipolar

Power Input: 24 VDC   Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



Motor Cables (Sold separately)

These cables make it easy to connect the Standard **P** type motor. The crimped connectors eliminate the need for assembly. There are two cable lengths to choose from.

Model	Cable Length		Number of Leads	Lead Specifications	
	feet	(m)		UL Style No.	AWG No.
LC2U06A	2	(0.6)	6 Leads	3265	24
LC2U10A	3.3	(1)			

Connection Diagrams C-189 General Specifications C-240

□1.10 in. (□28 mm)

PK Series SH Geared Type

Specifications

Motor Specifications

Model Single Shaft Double Shaft	Connection Type	Current per Phase A/phase	Voltage VDC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J oz-in²	Rotor Inertia J kg·m²	Lead Wires (Pins)
PK223PA-SG□	Bipolar (Series)	0.67	3.8	5.6	4	0.049	9×10^{-7}	6
PK223PB-SG□	Unipolar	0.95	2.66	2.8	1			

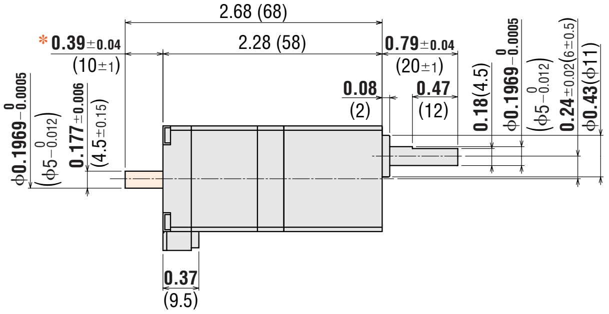
How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189
- Enter the gear ratio in the box (□) within the model number.

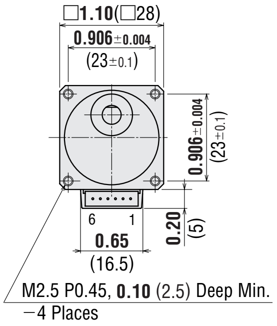
Gearmotor Specifications

Model Single Shaft Double Shaft	Gear Ratio	Holding Torque* oz-in	Holding Torque* N·m	Step Angle	Permissible Speed r/min
PK223PA-SG7.2 **PK223PB-SG7.2**	7.2:1	42	0.3	0.25°	250
PK223PA-SG9 **PK223PB-SG9**	9:1	42	0.3	0.2°	200
PK223PA-SG10 **PK223PB-SG10**	10:1	42	0.3	0.18°	180
PK223PA-SG18 **PK223PB-SG18**	18:1	56	0.4	0.1°	100
PK223PA-SG36 **PK223PB-SG36**	36:1	56	0.4	0.05°	50

* Holding torque is the same regardless of the connection type, due to the permissible torque limit of the gearhead.

Dimensions Scale 1/2, Unit = **inch** (mm)





* The length of machining on double shaft model is 0.394±0.010 (10±0.25).

Mounting Screws (included)
M2.5 P0.45 0.31 in. (8 mm) length: 4 pieces

- These dimensions are for double shaft models. For single shaft models, ignore the shaded area.

Applicable Connector
The following housing and contacts must be purchased separately.
Housing: 51065-0600 (MOLEX)
Contact: 50212-8100 (MOLEX)
Connector Assembly Tool: 57176-5000 (MOLEX)

Model	Weight lb. (kg)	DXF
PK223PA-SG□ **PK223PB-SG□**	0.35 (0.16)	B335

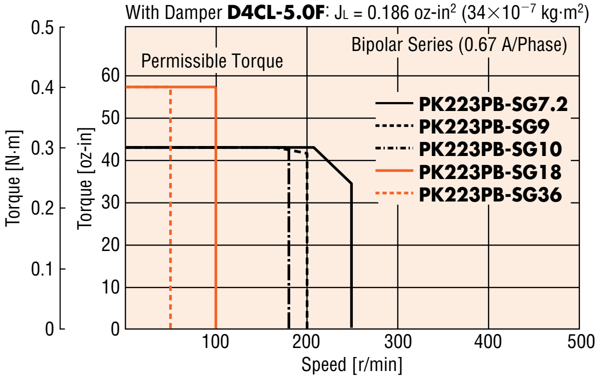
- Enter the gear ratio in the box (□) within the model number.

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

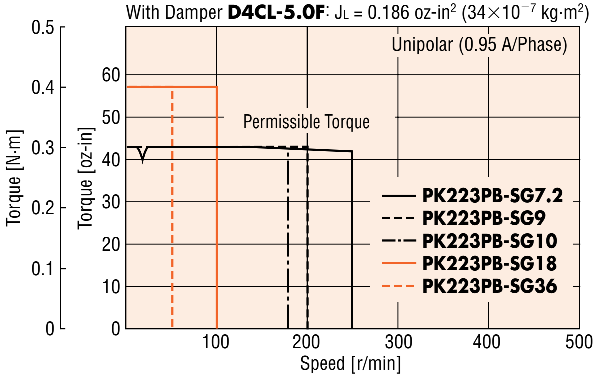
● PK223PB-SG□ Bipolar (Series) 24 VDC

Power Input: 24 VDC Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



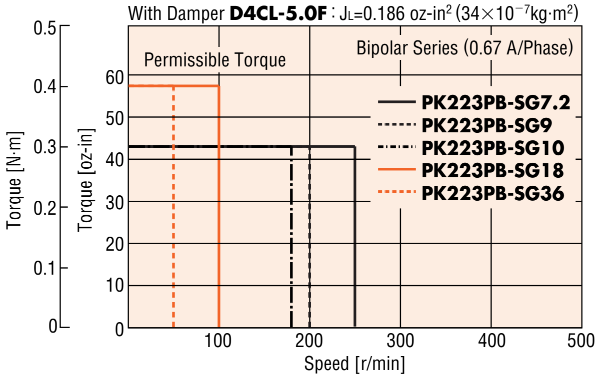
● PK223PB-SG□ Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)



● PK223PB-SG□ Bipolar (Series) 48 VDC

Power Input: 48 VDC Bipolar Constant Current Driver
With Damper **D4CL-5.0F** : J_L=0.186 oz-in^2 (34×10^{-7}kg·m^2)



Motor Cables (Sold separately)

These cables make it easy to connect the standard **P** type motor. The crimped connectors eliminate the need for assembly. There are two cable lengths to choose from.

Model	Cable Length feet (m)	Number of Leads	Lead Specifications	
			UL Style No.	AWG No.
LC2U06A	2 (0.6)	6 Leads	3265	24
LC2U10A	3.3 (1)			

Connection Diagrams C-189 General Specifications C-240

□1.38 in. (□35 mm)

Step Angle 1.8°

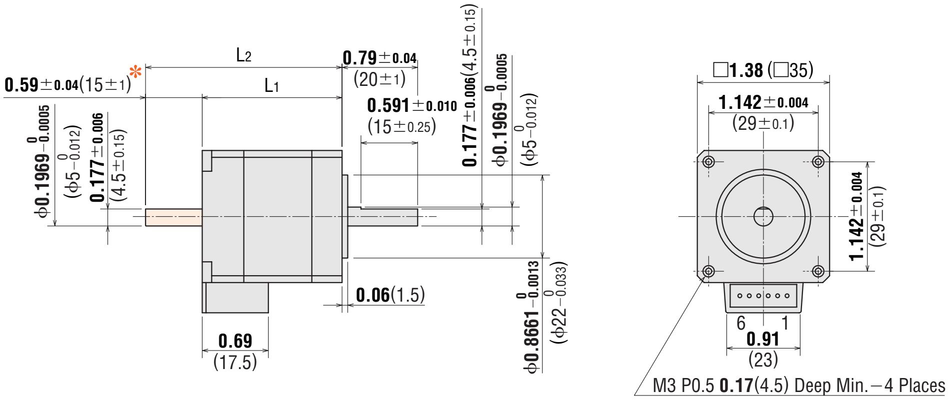
PK Series Standard P Type (High Torque)

Specifications

Model Single Shaft Double Shaft	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J		Lead Wires (Pins)
		oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2	
PK233PA	Bipolar (Series)	28	0.2	0.85	4.6	5.4	5.6	0.131	24×10^{-7}	6
PK233PB	Unipolar	22	0.16	1.2	3.24	2.7	1.4			
PK235PA	Bipolar (Series)	52	0.37	0.85	5.8	6.8	8	0.27	50×10^{-7}	6
PK235PB	Unipolar	42	0.3	1.2	4.08	3.4	2			

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189

Dimensions Scale 1/2, Unit = **inch** (mm)



* The length of machining on double shaft model is 0.591±0.010 (15±0.25).
- These dimensions are for double shaft models. For single shaft models, ignore the shaded area.

Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PK233PA	1.46 (37)	—	0.4 (0.18)	B329
PK233PB		2.05 (52)		
PK235PA	2.05 (52)	—	0.63 (0.285)	B330
PK235PB		2.64 (67)		

Applicable Connector

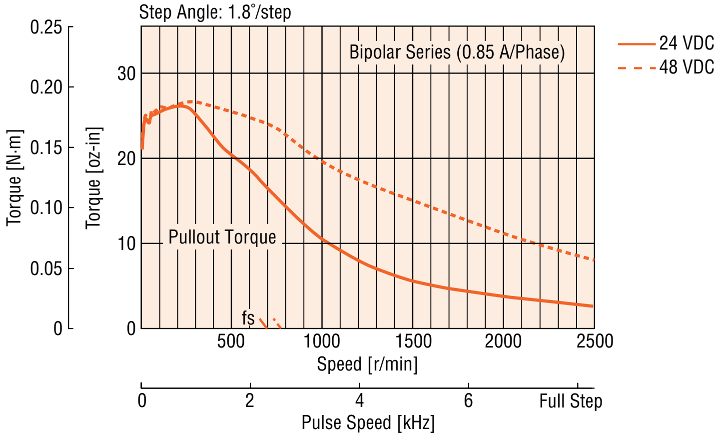
The following housing and contacts must be purchased separately.
Housing: 51103-0600 (MOLEX, Positive Lock Type) or
51102-0600 (MOLEX, Friction Lock Type)
Contact: 50351-8100 (MOLEX)
Connector Assembly Tool: 57295-5000 (MOLEX)

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

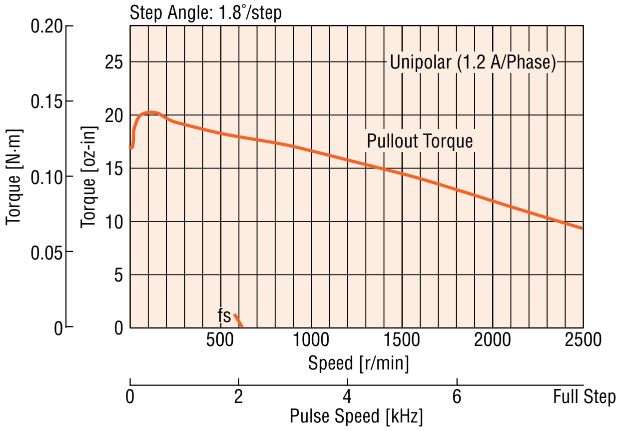
● **PK233PB** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in² (34×10⁻⁷ kg·m²)
Step Angle: 1.8°/step



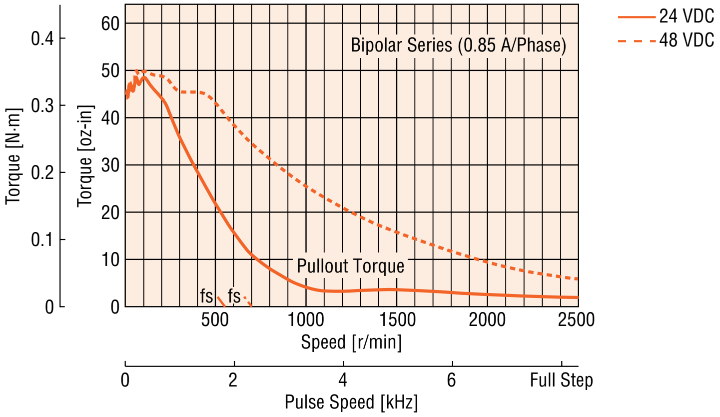
● **PK233PB** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in² (34 × 10⁻⁷ kg·m²)
Step Angle: 1.8°/step



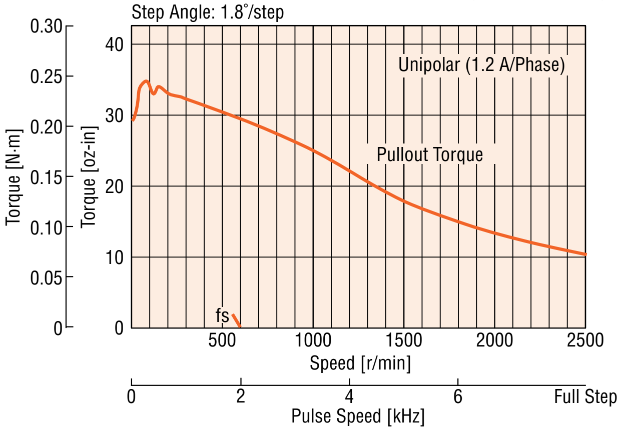
● **PK235PB** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in² (34×10⁻⁷ kg·m²)
Step Angle: 1.8°/step



● **PK235PB** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in² (34 × 10⁻⁷ kg·m²)
Step Angle: 1.8°/step



Motor Cables (Sold separately)

These cables make it easy to connect the Standard **P** type motor. The crimped connectors eliminate the need for assembly. There are two cable lengths to choose from.

Model	Cable Length feet (m)	Number of Leads	Lead Specifications	
			UL Style No.	AWG No.
LC2U06B	2 (0.6)	6 Leads	3265	24
LC2U10B	3.3 (1)			

Connection Diagrams C-189 General Specifications C-240

□1.65 in. (□42 mm)

Step Angle 1.8°

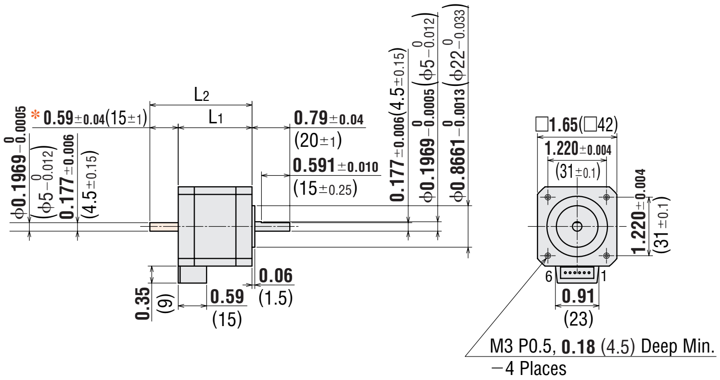
PK Series Standard P Type (High Torque)

Specifications

Model Single Shaft Double Shaft	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J		Lead Wires (Pins)
		oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2	
PK244PA	Bipolar (Series)	68	0.48	0.85	6.8	8	15.6	0.31	57×10^{-7}	6
PK244PB	Unipolar	55	0.39	1.2	4.8	4	3.9			
PK246PA	Bipolar (Series)	132	0.93	0.85	10	12	26	0.62	114×10^{-7}	6
PK246PB	Unipolar	106	0.75	1.2	7.2	6	6.5			

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189

Dimensions Scale 1/4, Unit = **inch** (mm)



✻ The length of machining on double shaft model is 0.591±0.010 (15±0.25).

- These dimensions are for double shaft models. For single shaft models, ignore the shaded area.

Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PK244PA	1.54 (39)	—	0.66 (0.3)	B331
PK244PB		2.13 (54)		
PK246PA	2.32 (59)	—	1.1 (0.5)	B332
PK246PB		2.91 (74)		

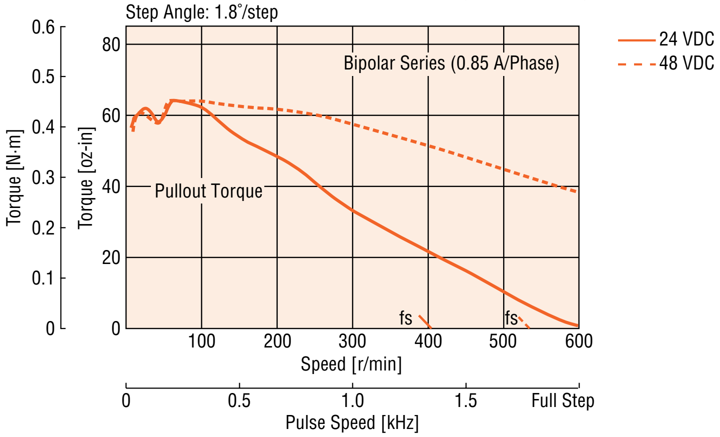
Applicable Connector
The following housing and contacts must be purchased separately.
Housing: 51103-0600 (MOLEX, Positive Lock Type) or
51102-0600 (MOLEX, Friction Lock Type)
Contact: 50351-8100 (MOLEX)
Connector Assembly Tool: 57295-5000 (MOLEX)

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

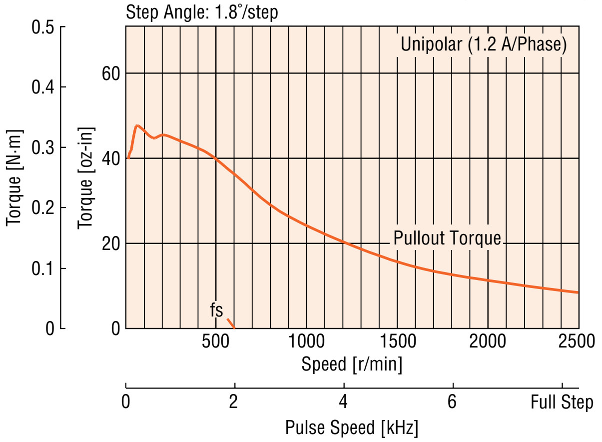
● **PK244PB** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



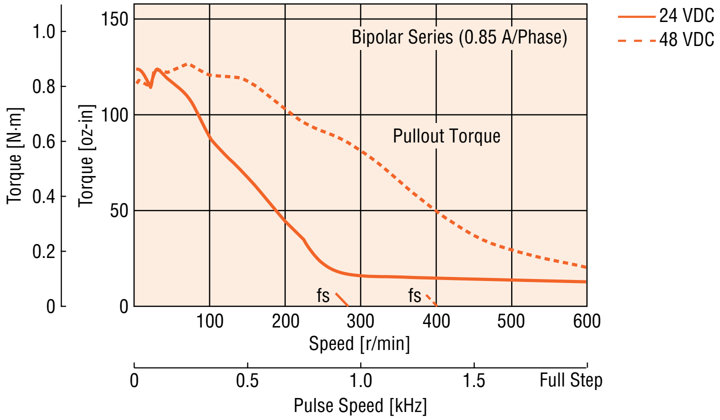
● **PK244PB** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



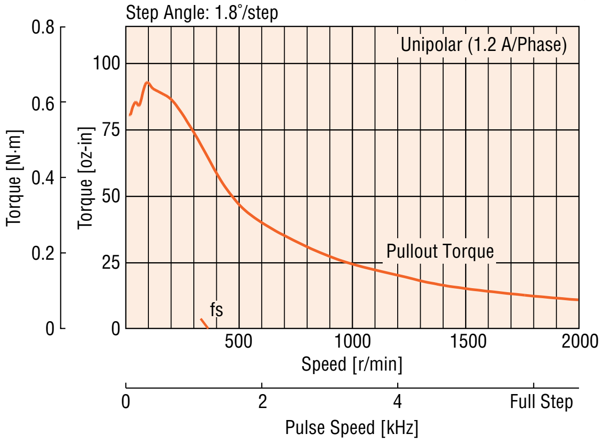
● **PK246PB** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



● **PK246PB** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



Motor Cables (Sold separately)

These cables make it easy to connect the Standard **P** type motor. The crimped connectors eliminate the need for assembly. There are two cable lengths to choose from.

Model	Cable Length feet	Cable Length (m)	Number of Leads	Lead Specifications UL Style No.	Lead Specifications AWG No.
LC2U06B	2	(0.6)	6 Leads	3265	24
LC2U10B	3.3	(1)			

Connection Diagrams C-189 General Specifications C-240

□ 1.65 in. (□ 42 mm)

Step Angle 1.8°

PK Series Standard Type

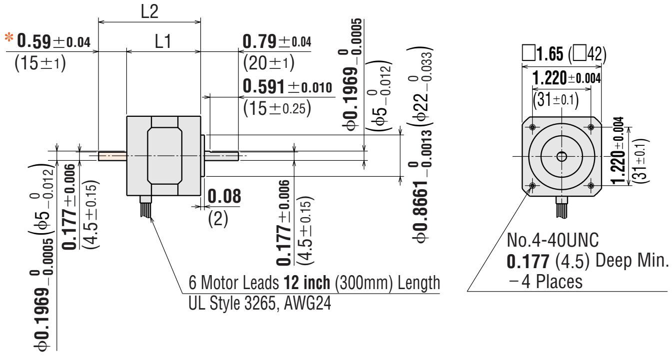
Specifications

Model Single Shaft Double Shaft	Connection Type	Holding Torque oz-in	Holding Torque N·m	Current per Phase A/phase	Voltage VDC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J oz-in²	Rotor Inertia J kg·m²	Lead Wires	Corresponding AC/DC-Input Motor & Driver Package
PK243-01AA	Bipolar (Series)	28	0.2	0.67	5.6	8.4	10	0.191	35×10^{-7}	6	**UMK243□A/ CSK243-□TA**
PK243-01BA	Unipolar	22	0.16	0.95	4	4.2	2.5				
PK243-02AA	Bipolar (Series)	28	0.2	0.28	13	48	60	0.191	35×10^{-7}	6	—
PK243-02BA	Unipolar	22	0.16	0.4	9.6	24	15				
PK243-03AA	Bipolar (Series)	28	0.2	0.22	17	77	84	0.191	35×10^{-7}	6	—
PK243-03BA	Unipolar	22	0.16	0.31	12	38.5	21				
PK244-01AA	Bipolar (Series)	46	0.33	0.85	5.6	6.6	12.8	0.3	54×10^{-7}	6	**UMK244□A/ CSK244-□TA**
PK244-01BA	Unipolar	36	0.26	1.2	4	3.3	3.2				
PK244-02AA	Bipolar (Series)	46	0.33	0.57	8.6	15	26.8	0.3	54×10^{-7}	6	—
PK244-02BA	Unipolar	36	0.26	0.8	6	7.5	6.7				
PK244-03AA	Bipolar (Series)	46	0.33	0.28	17	60	120	0.3	54×10^{-7}	6	—
PK244-03BA	Unipolar	36	0.26	0.4	12	30	30				
PK244-04AA	Bipolar (Series)	46	0.33	0.14	34	240	428	0.3	54×10^{-7}	6	—
PK244-04BA	Unipolar	36	0.26	0.2	24	120	107				
PK245-01AA	Bipolar (Series)	61	0.43	0.85	5.6	6.6	11.2	0.37	68×10^{-7}	6	**UMK245□A/ CSK245-□TA**
PK245-01BA	Unipolar	45	0.32	1.2	4	3.3	2.8				
PK245-02AA	Bipolar (Series)	61	0.43	0.57	8.6	15	28.4	0.37	68×10^{-7}	6	—
PK245-02BA	Unipolar	45	0.32	0.8	6	7.5	7.1				
PK245-03AA	Bipolar (Series)	61	0.43	0.28	17	60	100	0.37	68×10^{-7}	6	—
PK245-03BA	Unipolar	45	0.32	0.4	12	30	25				

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189

Dimensions

Scale 1/4, Unit = **inch** (mm)



Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PK243-0□AA	1.30 (33)	—	0.46 (0.21)	B081U
PK243-0□BA		1.89 (48)		
PK244-0□AA	1.54 (39)	—	0.59 (0.27)	B082U
PK244-0□BA		2.13 (54)		
PK245-0□AA	1.85 (47)	—	0.77 (0.35)	B083U
PK245-0□BA		2.44 (62)		

- Enter the winding specification in the box (□) within the model number.

*The length of machining on double shaft model is 0.591±0.010 (15±0.25).

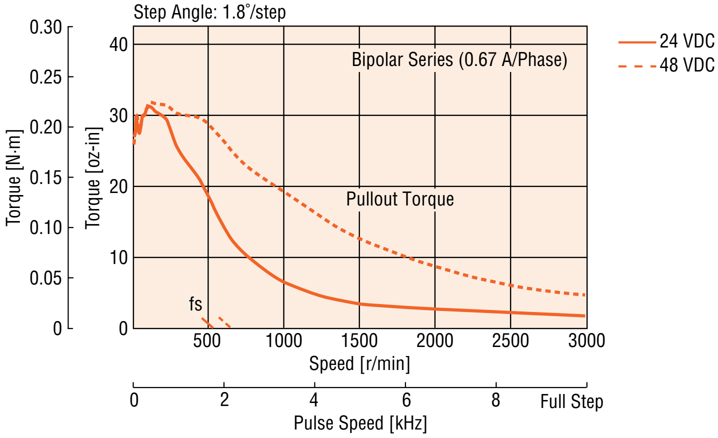
- These dimensions are for double shaft models. For single shaft models, ignore the shaded area.

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

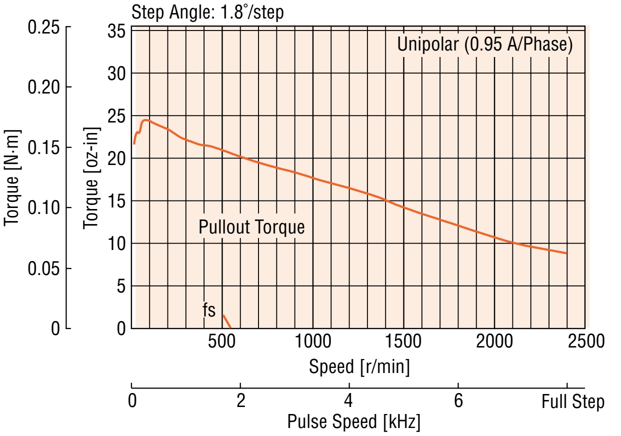
● **PK243-01BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



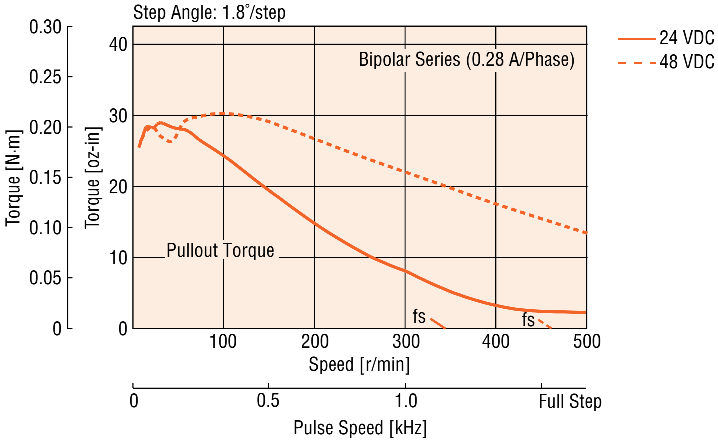
● **PK243-01BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



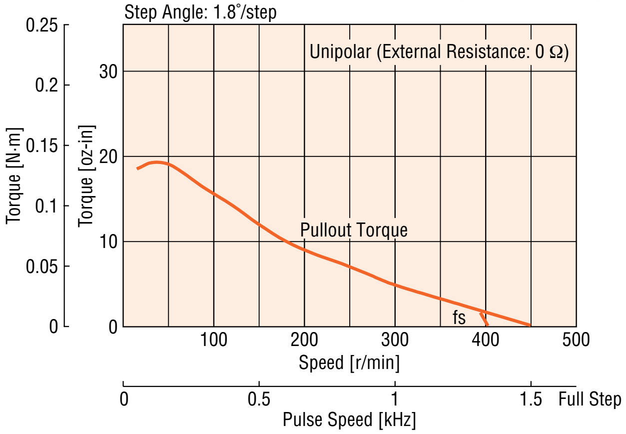
● **PK243-02BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



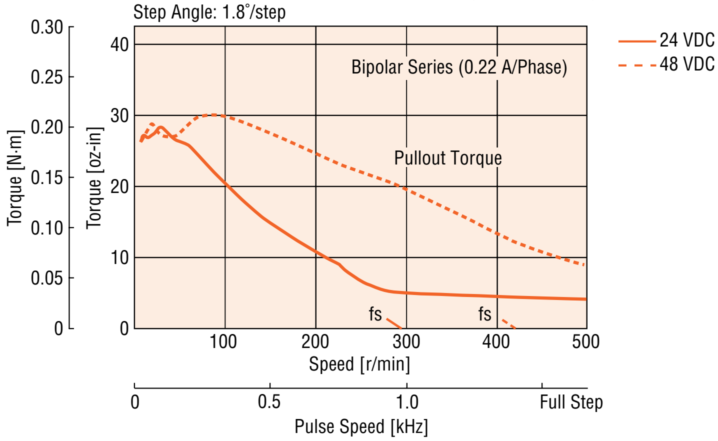
● **PK243-02BA** Unipolar

Power Input: 11.5 VDC Unipolar Constant Voltage Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



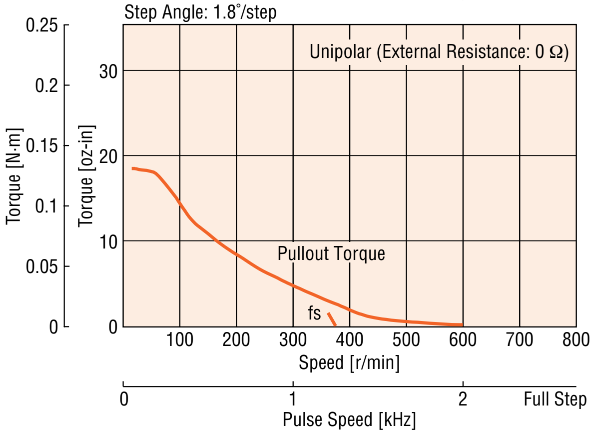
● **PK243-03BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



● **PK243-03BA** Unipolar

Power Input: 13.6 VDC Unipolar Constant Voltage Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



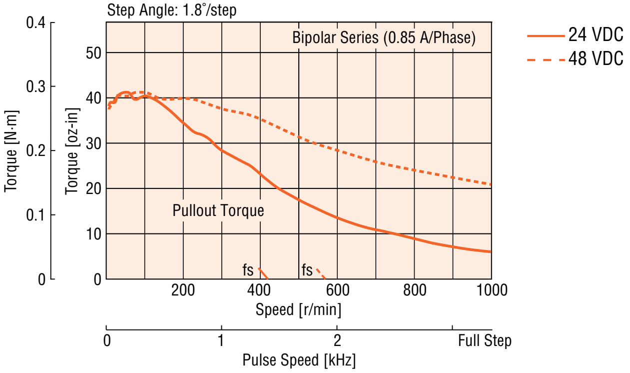
Connection Diagrams C-189 General Specifications C-240

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

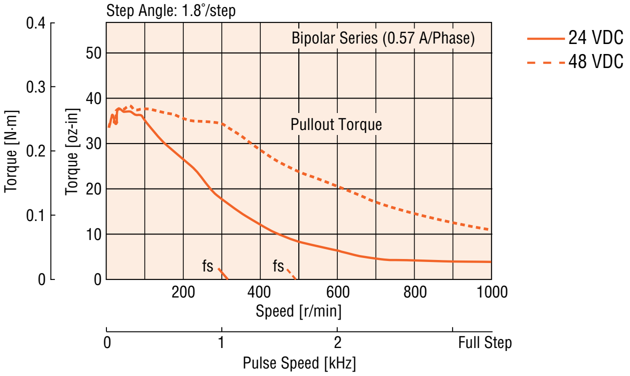
● **PK244-01BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



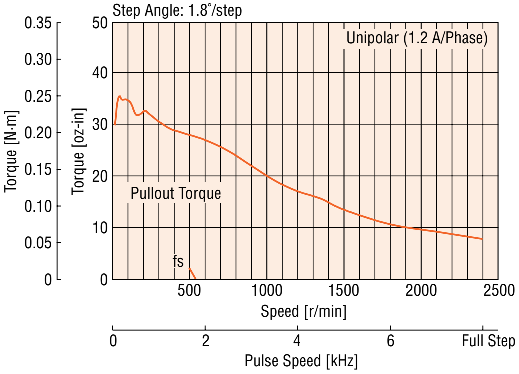
● **PK244-02BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



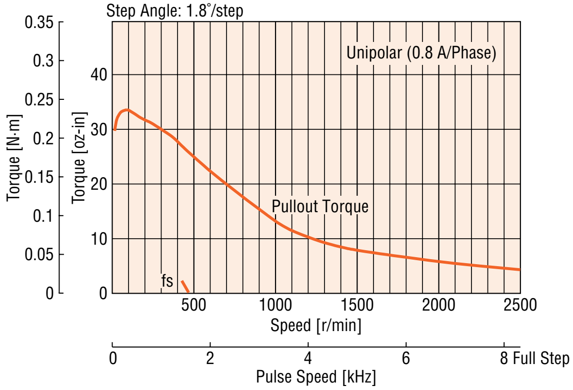
● **PK244-01BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



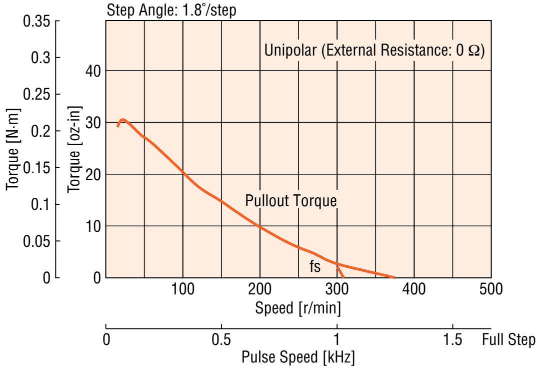
● **PK244-02BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



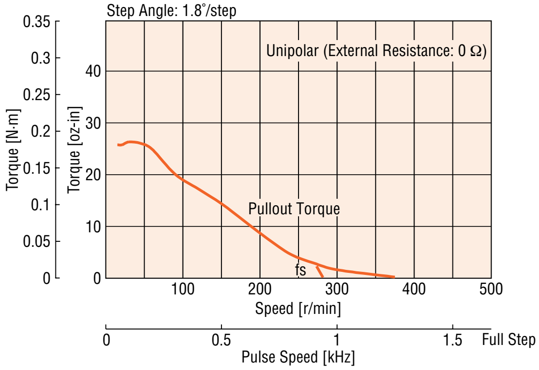
● **PK244-03BA** Unipolar

Power Input: 13.7 VDC Unipolar Constant Voltage Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



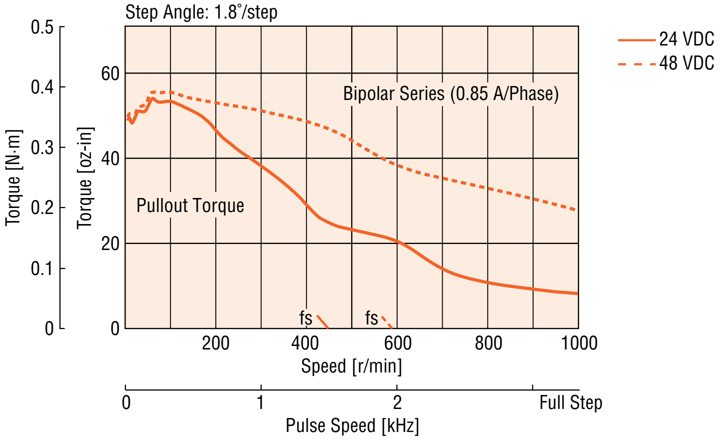
● **PK244-04BA** Unipolar

Power Input: 25.5 VDC Unipolar Constant Voltage Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



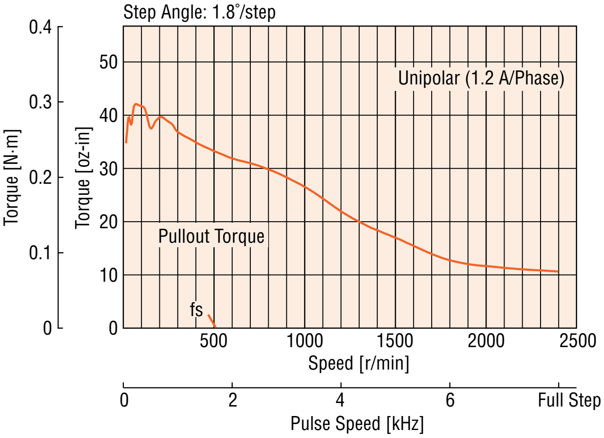
PK245-01BA Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



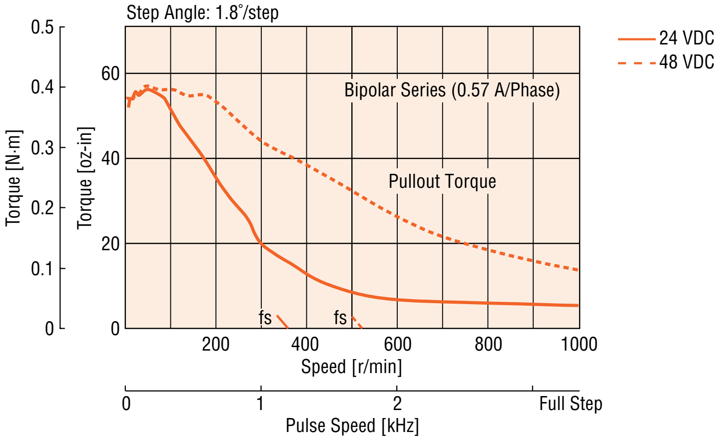
PK245-01BA Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



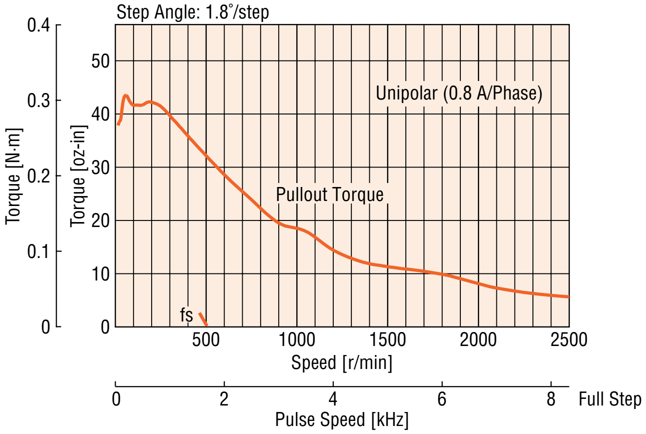
PK245-02BA Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



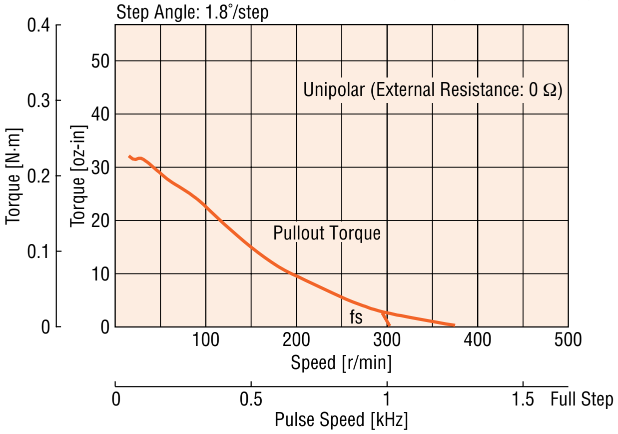
PK245-02BA Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



PK245-03BA Unipolar

Power Input: 13.7 VDC Unipolar Constant Voltage Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 1.8°/step



Connection Diagrams C-189 General Specifications C-240

□1.65 in. (□42 mm)

Step Angle 0.9°

PK Series High Resolution Type

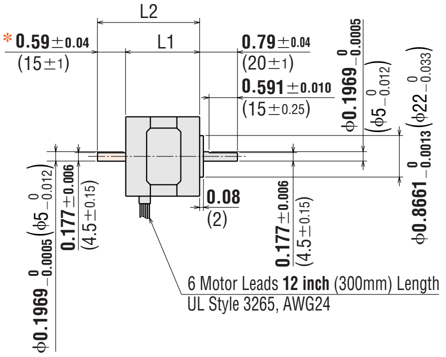
Specifications

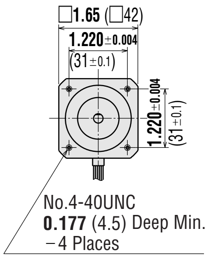
Model Single Shaft Double Shaft	Connection Type	Holding Torque oz-in	Holding Torque N·m	Current per Phase A/phase	Voltage VDC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J oz-in²	Rotor Inertia J kg·m²	Lead Wires	Corresponding AC/DC-Input Motor & Driver Package
PK243M-01AA	Bipolar (Series)	28	0.2	0.67	5.6	8.4	15.2	0.191	35×10^{-7}	6	**UMK243M□A/** **CSK243M-□TA**
PK243M-01BA	Unipolar	22	0.16	0.95	4	4.2	3.8				
PK243M-02AA	Bipolar (Series)	28	0.2	0.42	8.4	20	38.8	0.191	35×10^{-7}	6	—
PK243M-02BA	Unipolar	22	0.16	0.6	6	10	9.7				
PK243M-03AA	Bipolar (Series)	28	0.2	0.22	17	77	136	0.191	35×10^{-7}	6	—
PK243M-03BA	Unipolar	22	0.16	0.31	12	38.5	34				
PK244M-01AA	Bipolar (Series)	44	0.31	0.85	5.6	6.6	17.2	0.3	54×10^{-7}	6	**UMK244M□A/** **CSK244M-□TA**
PK244M-01BA	Unipolar	36	0.26	1.2	4	3.3	4.3				
PK244M-02AA	Bipolar (Series)	44	0.31	0.57	8.6	15	38.8	0.3	54×10^{-7}	6	—
PK244M-02BA	Unipolar	36	0.26	0.8	6	7.5	9.7				
PK244M-03AA	Bipolar (Series)	44	0.31	0.28	17	60	152	0.3	54×10^{-7}	6	—
PK244M-03BA	Unipolar	36	0.26	0.4	12	30	38				
PK245M-01AA	Bipolar (Series)	53	0.38	0.85	5.6	6.6	15.6	0.37	68×10^{-7}	6	**UMK245M□A/** **CSK245M-□TA**
PK245M-01BA	Unipolar	45	0.32	1.2	4	3.3	3.9				
PK245M-02AA	Bipolar (Series)	53	0.38	0.57	8.6	15	39.6	0.37	68×10^{-7}	6	—
PK245M-02BA	Unipolar	45	0.32	0.8	6	7.5	9.9				
PK245M-03AA	Bipolar (Series)	53	0.38	0.28	17	60	128	0.37	68×10^{-7}	6	—
PK245M-03BA	Unipolar	45	0.32	0.4	12	30	32				

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189

Dimensions

Scale 1/4, Unit = **inch** (mm)





Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PK243M-0□AA	1.30 (33)	—	0.53 (0.24)	B081U
PK243M-0□BA		1.89 (48)		
PK244M-0□AA	1.54 (39)	—	0.66 (0.3)	B082U
PK244M-0□BA		2.13 (54)		
PK245M-0□AA	1.85 (47)	—	0.81 (0.37)	B083U
PK245M-0□BA		2.44 (62)		

- Enter the winding specification in the box (□) within the model number.

* The length of machining on double shaft model is 0.591±0.010 (15±0.25).

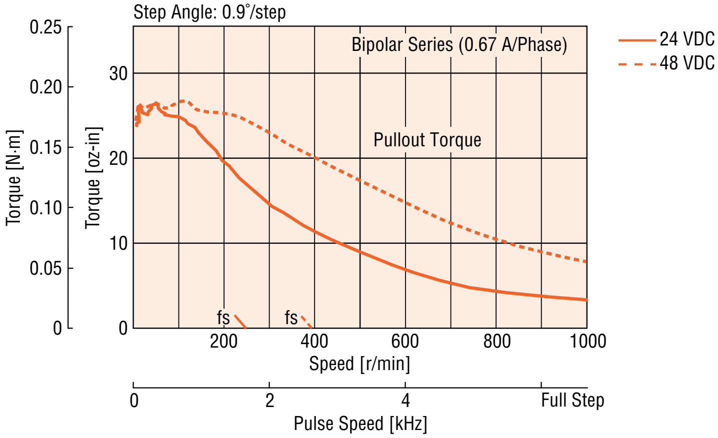
- These dimensions are for double shaft models. For single shaft models, ignore the shaded area.

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

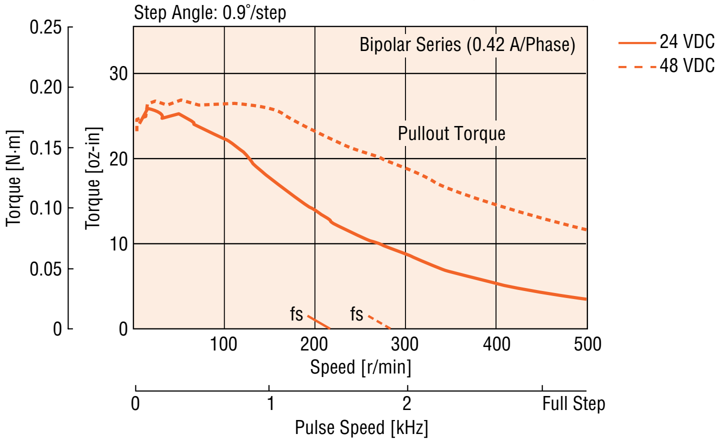
● **PK243M-01BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 0.9°/step



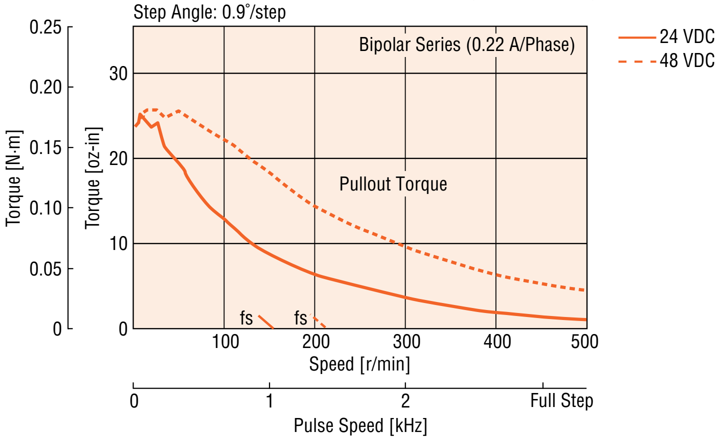
● **PK243M-02BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 0.9°/step



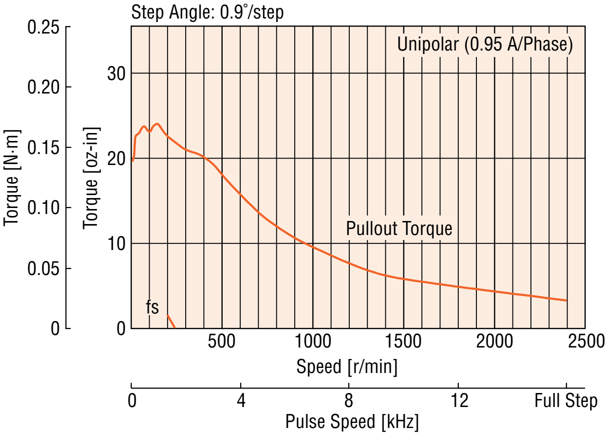
● **PK243M-03BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 0.9°/step



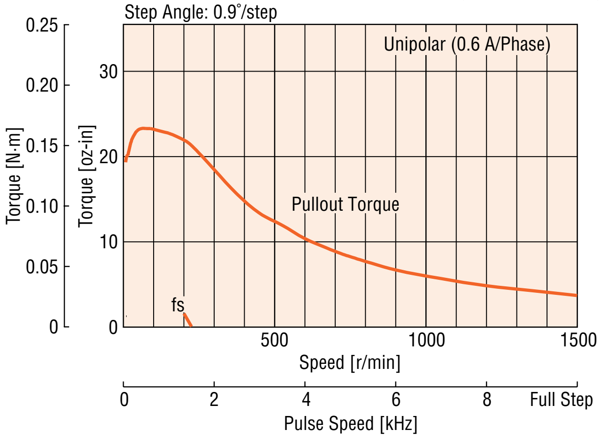
● **PK243M-01BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 0.9°/step



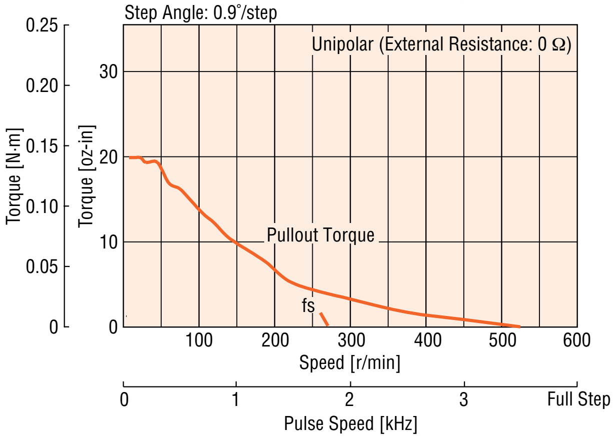
● **PK243M-02BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34 × 10^{-7} kg·m^2)
Step Angle: 0.9°/step



● **PK243M-03BA** Unipolar

Power Input: 13.5 VDC Unipolar Constant Voltage Driver
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34 × 10^{-7} kg·m^2)
Step Angle: 0.9°/step



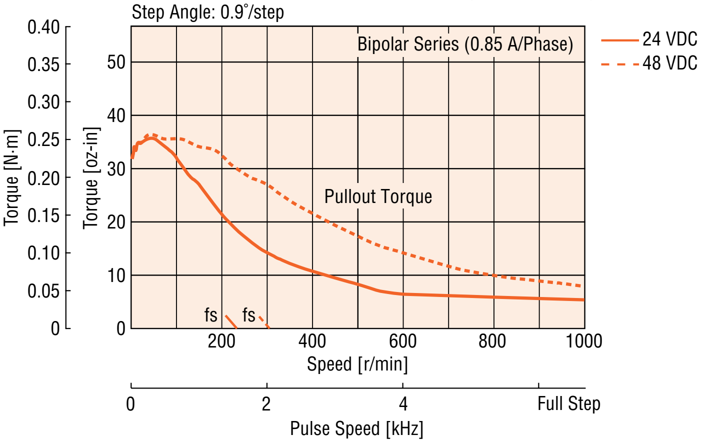
Connection Diagrams C-189 General Specifications C-240

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

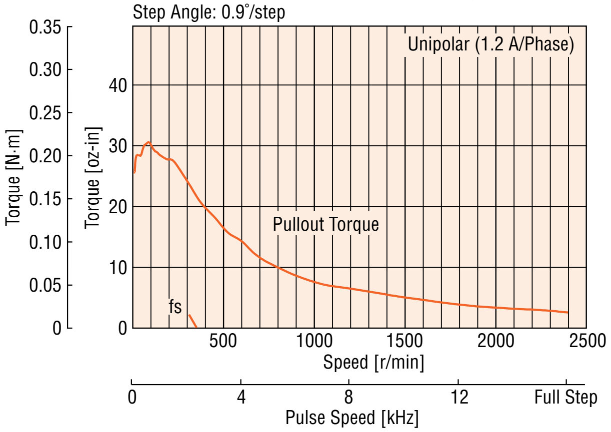
● **PK244M-01BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: JL = 0.186 oz-in² (34×10⁻⁷ kg·m²)
Step Angle: 0.9°/step



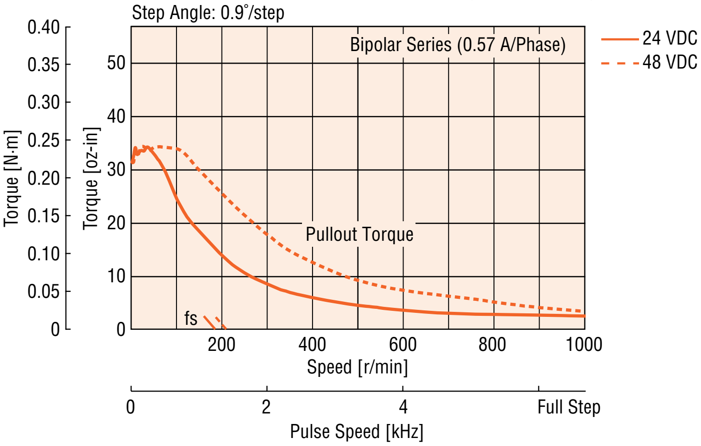
● **PK244M-01BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: JL = 0.186 oz-in² (34×10⁻⁷ kg·m²)
Step Angle: 0.9°/step



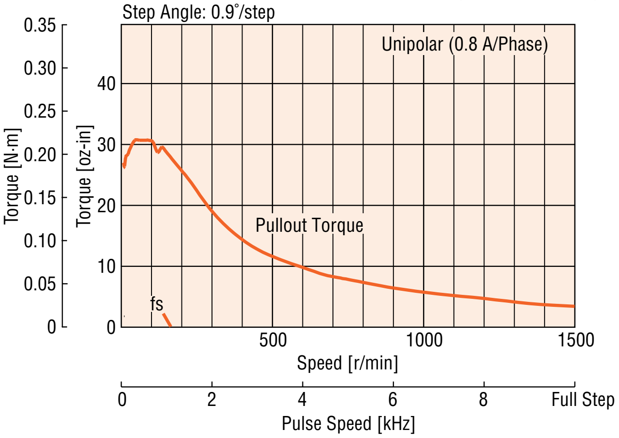
● **PK244M-02BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: JL = 0.186 oz-in² (34×10⁻⁷ kg·m²)
Step Angle: 0.9°/step



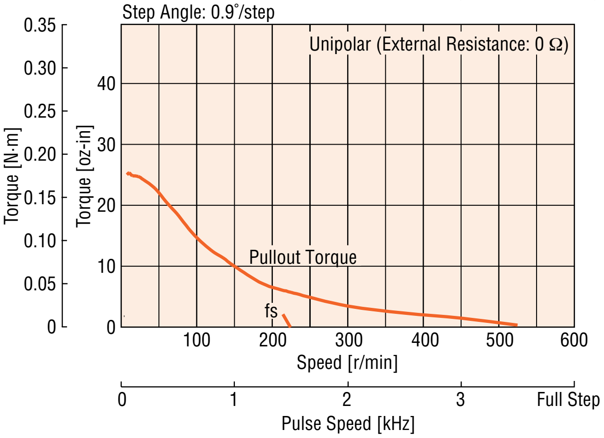
● **PK244M-02BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: JL = 0.186 oz-in² (34 × 10⁻⁷ kg·m²)
Step Angle: 0.9°/step



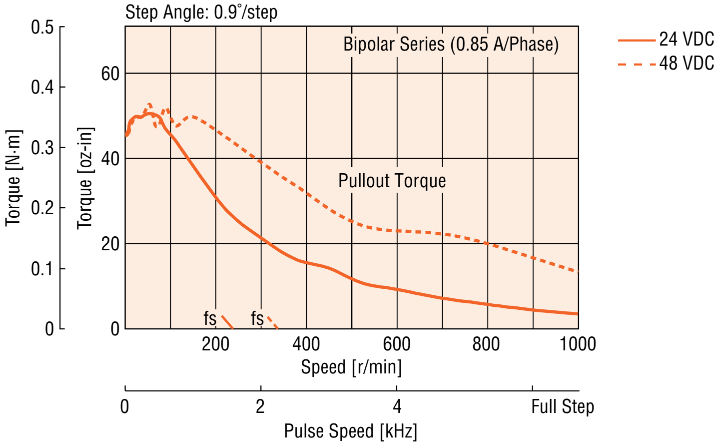
● **PK244M-03BA** Unipolar

Power Input: 13.5 VDC Unipolar Constant Voltage Driver
With Damper **D4CL-5.0F**: JL = 0.186 oz-in² (34 × 10⁻⁷ kg·m²)
Step Angle: 0.9°/step



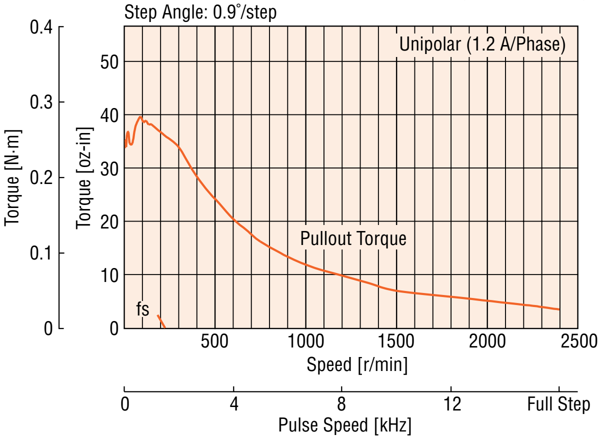
● **PK245M-01BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 0.9°/step



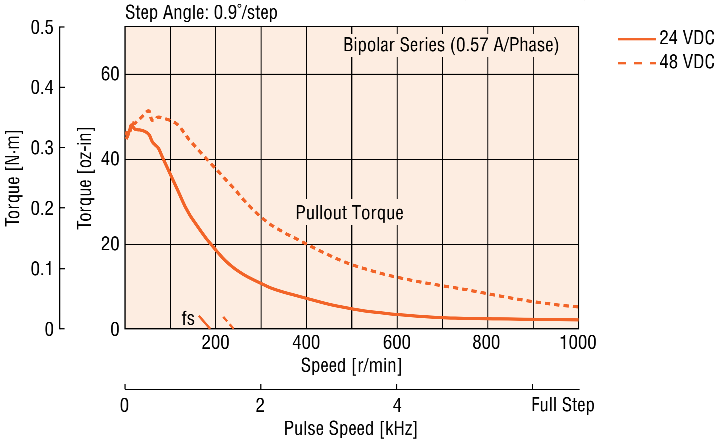
● **PK245M-01BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 0.9°/step



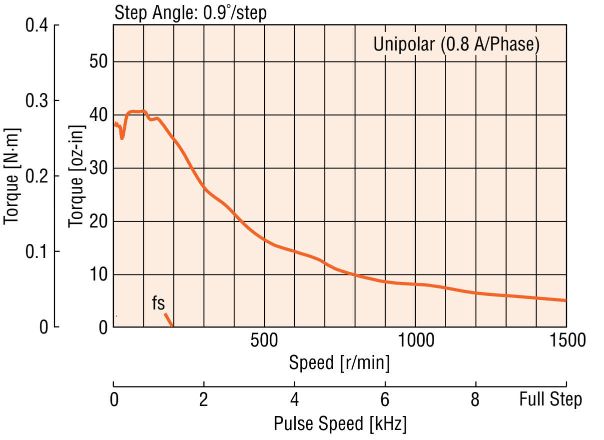
● **PK245M-02BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34×10^{-7} kg·m^2)
Step Angle: 0.9°/step



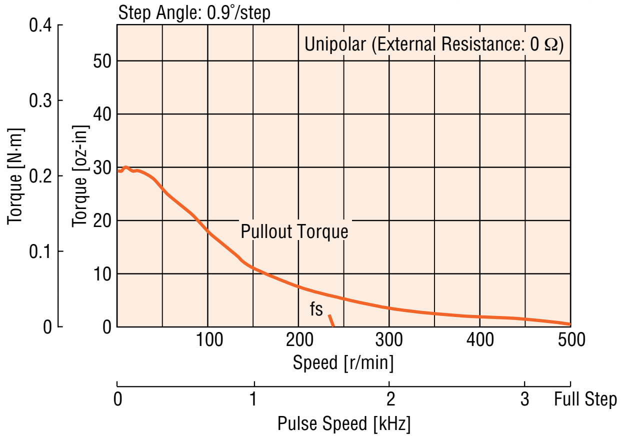
● **PK245M-02BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)
Step Angle: 0.9°/step



● **PK245M-03BA** Unipolar

Power Input: 13.5 VDC Unipolar Constant Voltage Driver
With Damper **D4CL-5.0F**: J_L = 0.186 oz-in^2 (34 × 10^{-7} kg·m^2)
Step Angle: 0.9°/step



Connection Diagrams C-189 General Specifications C-240

□1.65 in. (□42 mm)

PK Series SH Geared Type

Specifications

Motor Specifications

Model Single Shaft Double Shaft	Connection Type	Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J		Lead Wires	Corresponding DC-Input Motor & Driver Package
		A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2		
PK243A1A-SG□	Bipolar (Series)	0.67	5.6	8.4	10	0.191	35×10^{-7}	6	**CSK243□TA-SG□**
PK243B1A-SG□	Unipolar	0.95	4.0	4.2	2.5				
PK243A2A-SG□	Bipolar (Series)	0.28	13	48	60	0.191	35×10^{-7}	6	—
PK243B2A-SG□	Unipolar	0.4	9.6	24	15				

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189
- Enter the gear ratio in the box (□) within the model number.

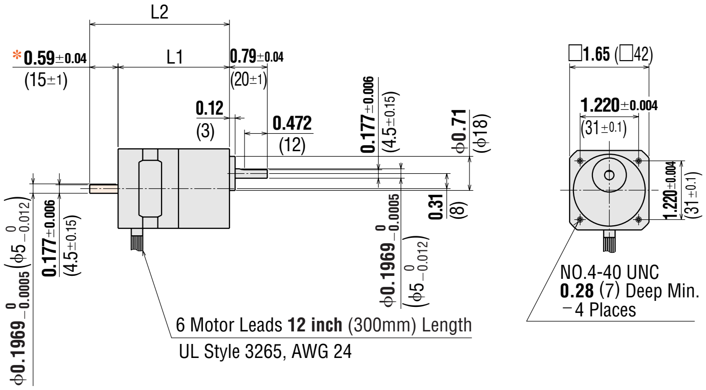
Gearmotor Specifications

Model Single Shaft Double Shaft	Gear Ratio	Holding Torque*		Step Angle	Permissible Speed
		lb-in	N·m		r/min
PK243A1A-SG3.6, PK243A2A-SG3.6 **PK243B1A-SG3.6, PK243B2A-SG3.6**	3.6:1	1.77	0.2	0.5°	500
PK243A1A-SG7.2, PK243A2A-SG7.2 **PK243B1A-SG7.2, PK243B2A-SG7.2**	7.2:1	3.5	0.4	0.25°	250
PK243A1A-SG9, PK243A2A-SG9 **PK243B1A-SG9, PK243B2A-SG9**	9:1	4.4	0.5	0.2°	200
PK243A1A-SG10, PK243A2A-SG10 **PK243B1A-SG10, PK243B2A-SG10**	10:1	4.9	0.56	0.18°	180
PK243A1A-SG18, PK243A2A-SG18 **PK243B1A-SG18, PK243B2A-SG18**	18:1	7.0	0.8	0.1°	100
PK243A1A-SG36, PK243A2A-SG36 **PK243B1A-SG36, PK243B2A-SG36**	36:1	7.0	0.8	0.05°	50

* Holding torque is the same regardless of the connection type, due to the permissible torque limit of the gearhead.

Dimensions

Scale 1/4, Unit = **inch** (mm)



* The length of machining on double shaft model is 0.591±0.010 (15±0.25).
- These dimensions are for double shaft models. For single shaft models, ignore the shaded area.

Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PK243A▨A-SG□	2.32 (59)	—	0.77 (0.35)	B091U
PK243B▨A-SG□		2.91 (74)		

- Enter the winding specification in the box (▨) within the model number.
- Enter the gear ratio in the box (□) within the model number.

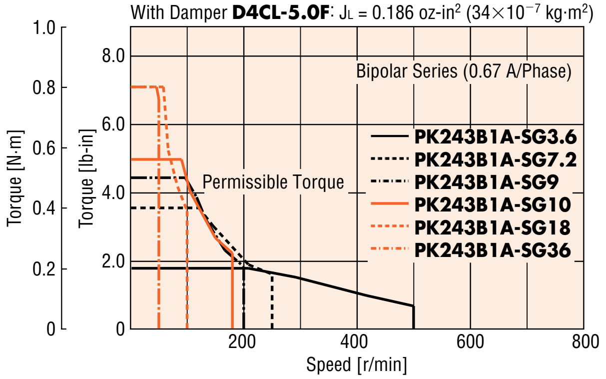
Mounting Screws (included)
No.4-40 UNC 0.39 in. (10 mm)

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

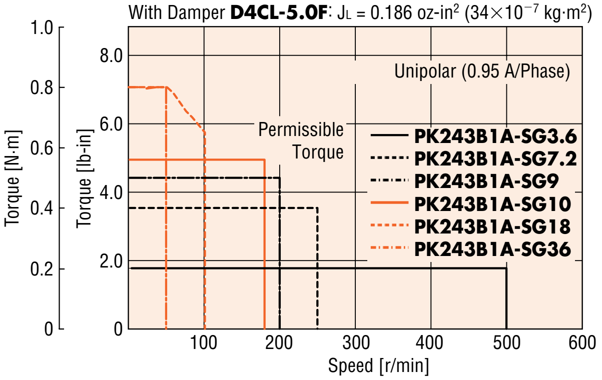
● PK243B1A-SG☐ Bipolar (Series) 24 VDC

Power Input: 24 VDC Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)



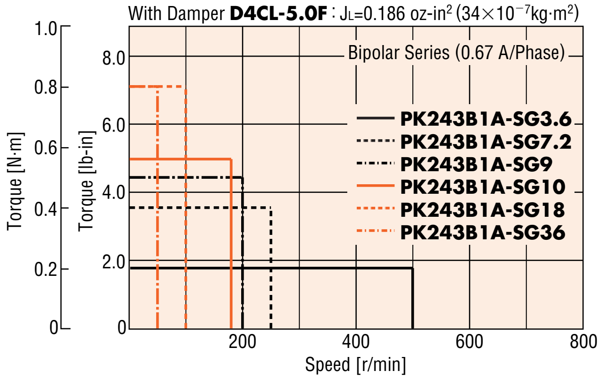
● PK243B1A-SG☐ Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)



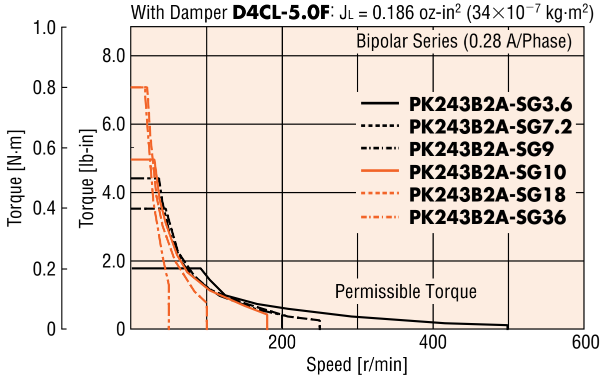
● PK243B1A-SG☐ Bipolar (Series) 48 VDC

Power Input: 48 VDC Bipolar Constant Current Driver
With Damper **D4CL-5.0F** : J_L=0.186 oz-in^2 (34×10^{-7}kg·m^2)



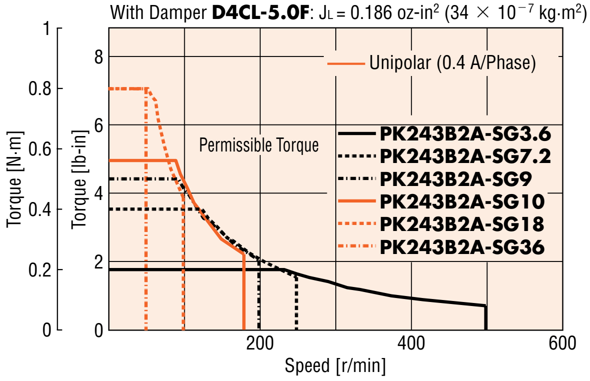
● PK243B2A-SG☐ Bipolar (Series) 24 VDC

Power Input: 24 VDC Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)



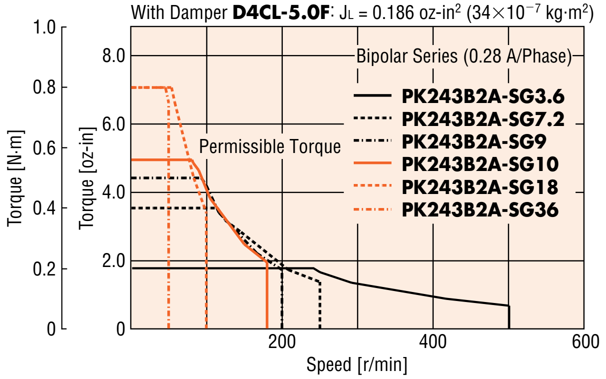
● PK243B2A-SG☐ Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)



● PK243B2A-SG☐ Bipolar (Series) 48 VDC

Power Input: 48 VDC Bipolar Constant Current Driver
With Damper **D4CL-5.0F**: $J_L = 0.186$ oz-in^2 (34×10^{-7} kg·m^2)



Connection Diagrams C-189 General Specifications C-240

□2.22 in. (□56.4 mm)

Step Angle 1.8°

PK Series Standard Type

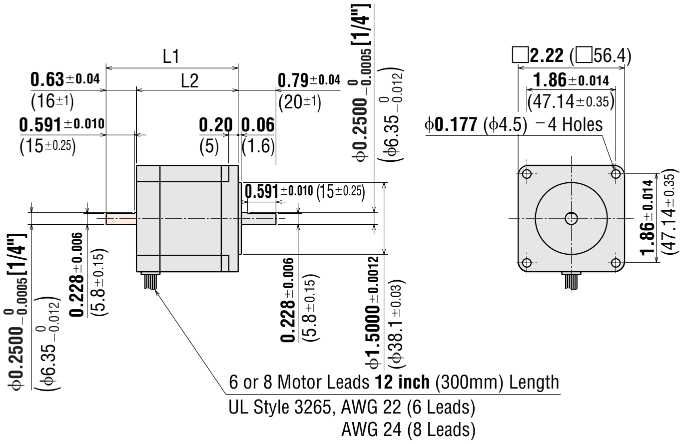
Specifications

Model	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J		Lead Wires	Corresponding AC/DC-Input Motor & Driver Package
Single Shaft Double Shaft		oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2		
PK264-01A	Bipolar (Series)	68	0.48	0.71	8.1	11.4	21.6	0.66	120×10^{-7}	6	—
PK264-01B	Unipolar	55	0.39	1	5.7	5.7	5.4				
PK264-02A	Bipolar (Series)	68	0.48	1.4	3.9	2.8	5.6	0.66	120×10^{-7}	6	**UMK264□A/ CSK264-□TA**
PK264-02B	Unipolar	55	0.39	2	2.8	1.4	1.4				
PK264-03A	Bipolar (Series)	68	0.48	2.1	2.6	1.26	2.4	0.66	120×10^{-7}	6	—
PK264-03B	Unipolar	55	0.39	3	1.9	0.63	0.6				
PK264-E2.0A PK264-E2.0B	Bipolar (Parallel)	68	0.48	2.8	1.96	0.7	1.4	0.66	120×10^{-7}	8	—
	Bipolar (Series)	68	0.48	1.4	3.9	2.8	5.6				
	Unipolar	55	0.39	2	2.8	1.4	1.4				
PK266-01A	Bipolar (Series)	166	1.17	0.71	11	14.8	40	1.64	300×10^{-7}	6	—
PK266-01B	Unipolar	127	0.9	1	7.4	7.4	10				
PK266-02A	Bipolar (Series)	166	1.17	1.4	5	3.6	10	1.64	300×10^{-7}	6	**UMK266□A/ CSK266-□TA**
PK266-02B	Unipolar	127	0.9	2	3.6	1.8	2.5				
PK266-03A	Bipolar (Series)	166	1.17	2.1	3.2	1.5	4.4	1.64	300×10^{-7}	6	—
PK266-03B	Unipolar	127	0.9	3	2.3	0.75	1.1				
PK266-E2.0A PK266-E2.0B	Bipolar (Parallel)	166	1.17	2.8	2.52	0.9	2.5	1.64	300×10^{-7}	8	—
	Bipolar (Series)	166	1.17	1.4	5	3.6	10				
	Unipolar	127	0.9	2	3.6	1.8	2.5				
PK268-01A	Bipolar (Series)	240	1.75	0.71	12	17.2	56	2.6	480×10^{-7}	6	—
PK268-01B	Unipolar	191	1.35	1	8.6	8.6	14				
PK268-02A	Bipolar (Series)	240	1.75	1.4	6.3	4.5	14.4	2.6	480×10^{-7}	6	**UMK268□A/ CSK268-□TA**
PK268-02B	Unipolar	191	1.35	2	4.5	2.25	3.6				
PK268-03A	Bipolar (Series)	240	1.75	2.1	4.2	2	6.4	2.6	480×10^{-7}	6	—
PK268-03B	Unipolar	191	1.35	3	3	1	1.6				
PK268-E2.0A PK268-E2.0B	Bipolar (Parallel)	240	1.75	2.8	3.16	1.13	3.6	2.6	480×10^{-7}	8	—
	Bipolar (Series)	240	1.75	1.4	6.3	4.5	14.4				
	Unipolar	191	1.35	2	4.5	2.25	3.6				

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189

Dimensions

Scale 1/4, Unit = **inch** (mm)



- These dimensions are for double shaft models. For single shaft models, ignore the shaded area.

Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PK264-0□A PK264-E2.0A	1.54 (39)	—	0.99 (0.45)	B084
PK264-0□B PK264-E2.0B		2.17 (55)		
PK266-0□A PK266-E2.0A	2.13 (54)	—	1.5 (0.7)	B085
PK266-0□B PK266-E2.0B		2.76 (70)		
PK268-0□A PK268-E2.0A	2.99 (76)	—	2.2 (1)	B086
PK268-0□B PK268-E2.0B		3.62 (92)		

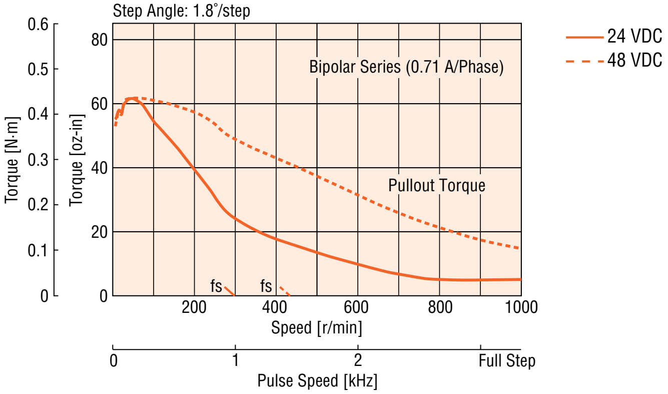
- Enter the winding specification in the box (□) within the model number.

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

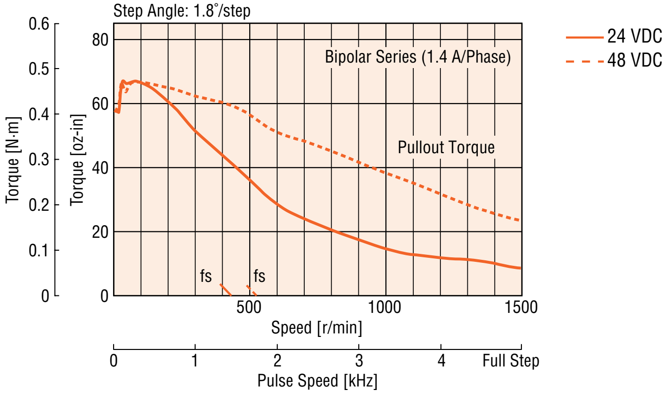
● PK264-01B Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



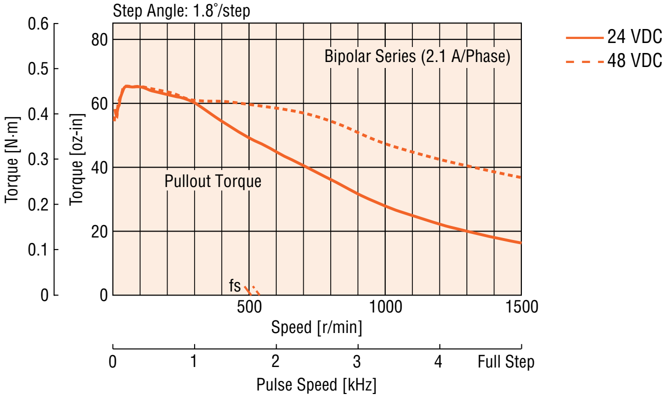
● PK264-02B Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



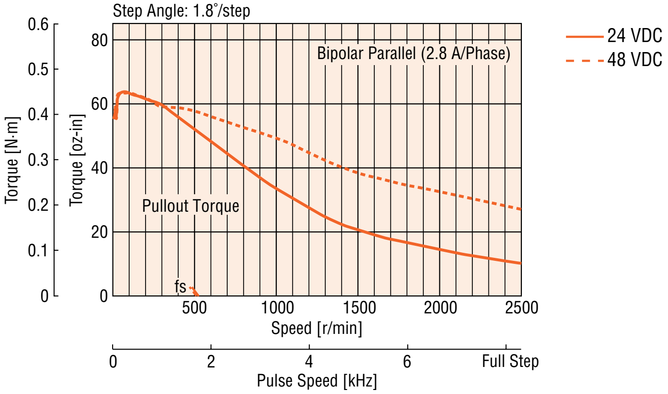
● PK264-03B Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



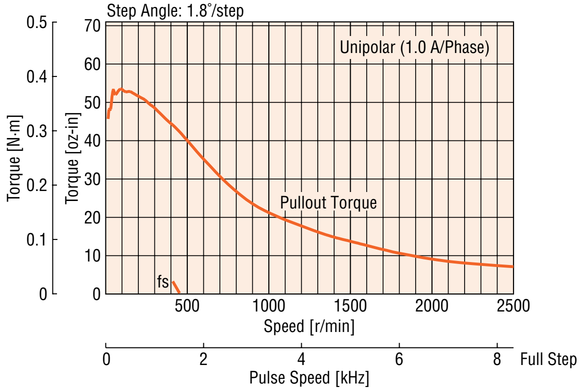
● PK264-E2.0B Bipolar (Parallel)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



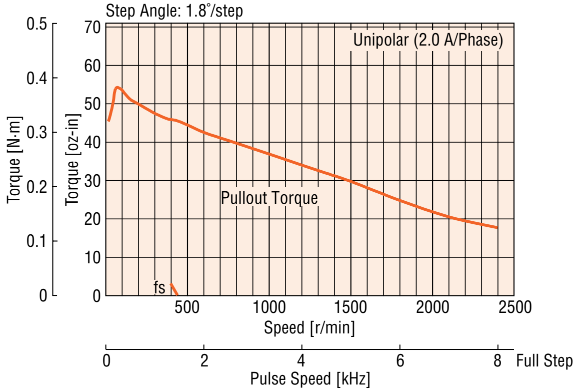
● PK264-01B Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



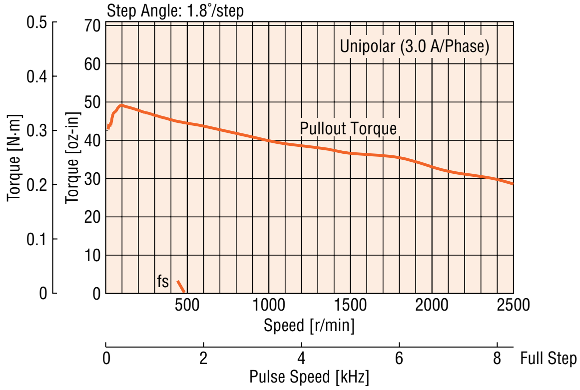
● PK264-02B Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L=0.77 oz-in^2 (140×10^{-7}kg·m^2)
Step Angle: 1.8°/step



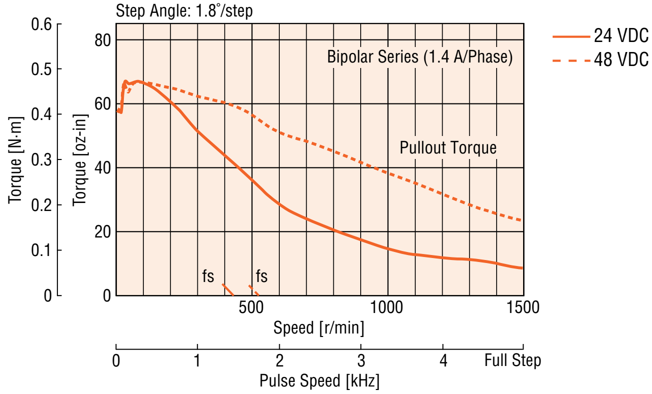
● PK264-03B Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



● PK264-E2.0B Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



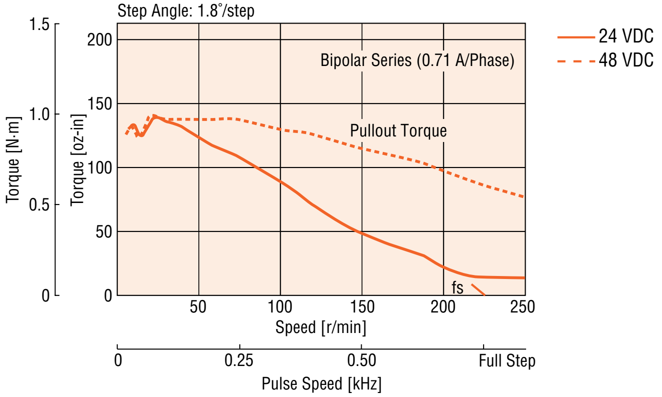
Connection Diagrams C-189
General Specifications C-240

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

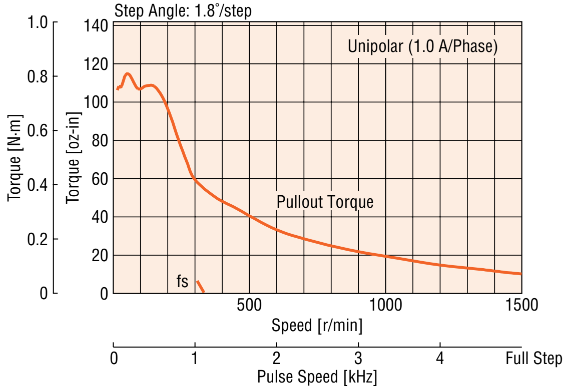
● **PK266-01B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



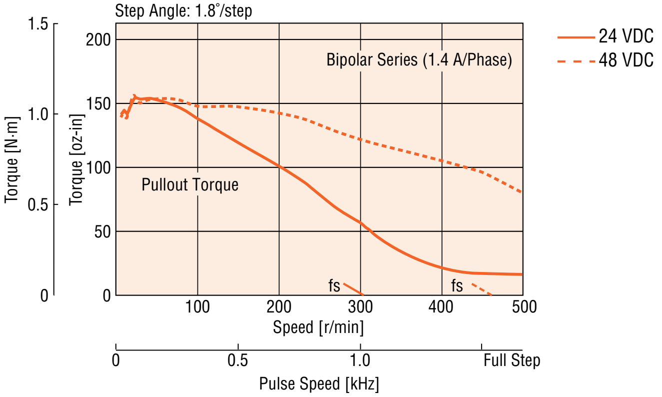
● **PK266-01B** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



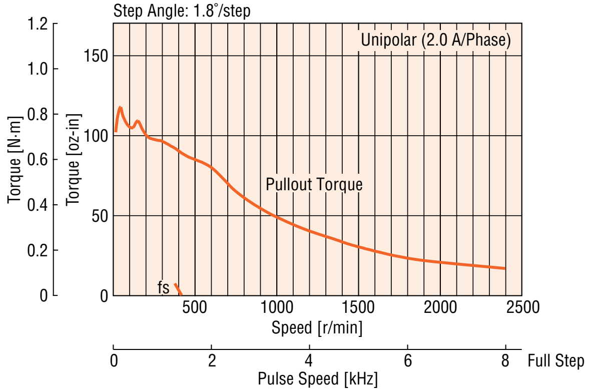
● **PK266-02B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



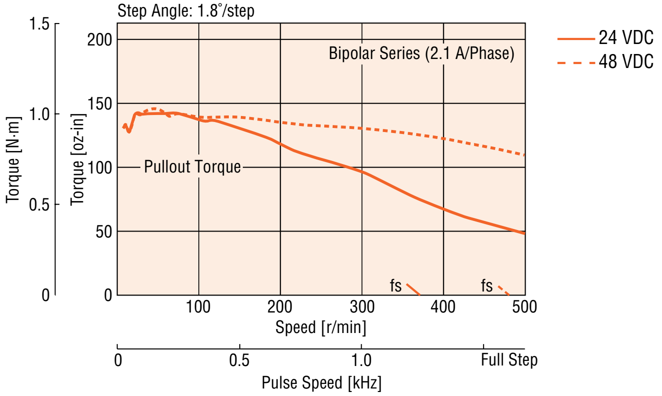
● **PK266-02B** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L=0.77 oz-in^2 (140×10^{-7}kg·m^2)
Step Angle: 1.8°/step



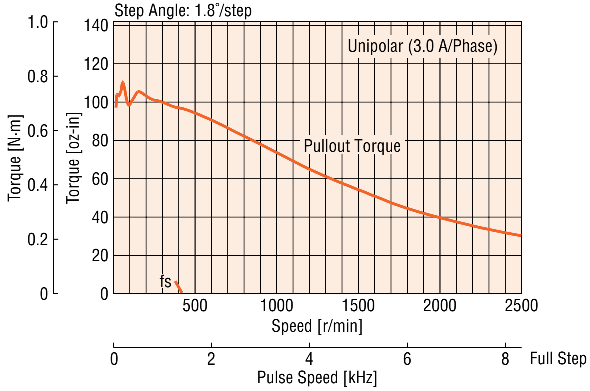
● **PK266-03B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



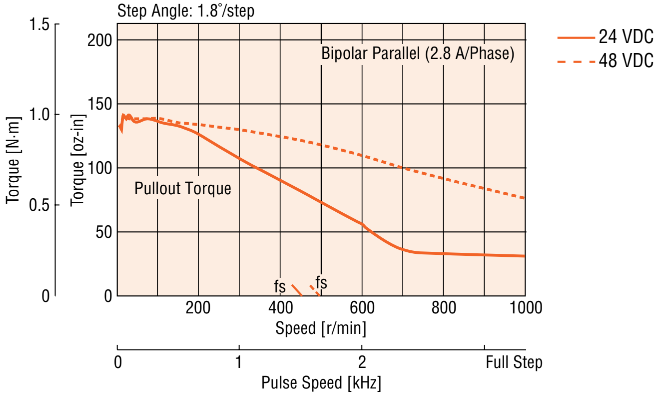
● **PK266-03B** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



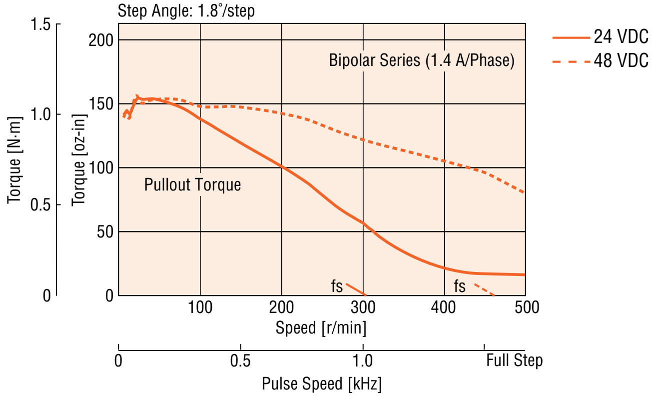
● **PK266-E2.0B** Bipolar (Parallel)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



● **PK266-E2.0B** Bipolar (Series)

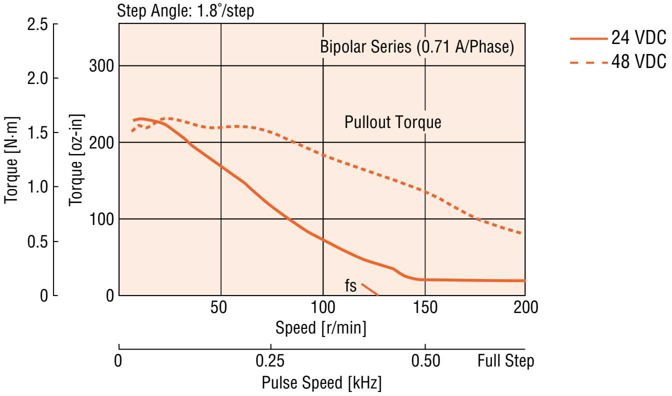
Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



Features C-184 Accessories C-185

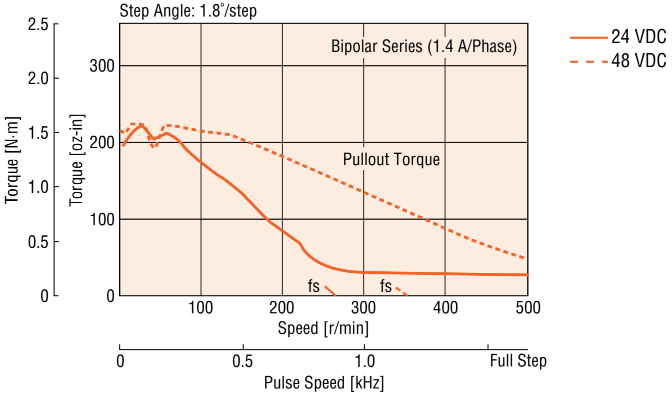
● **PK268-01B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



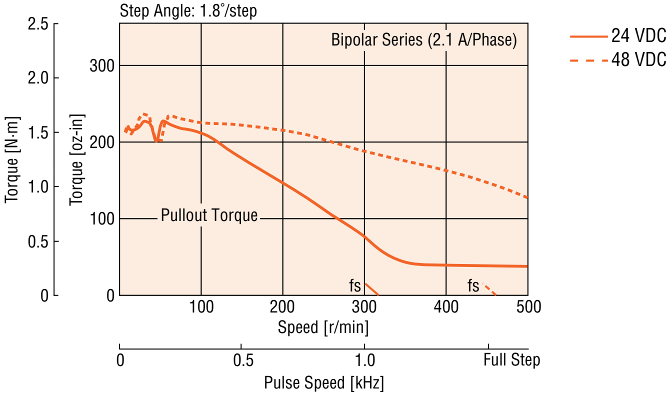
● **PK268-02B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



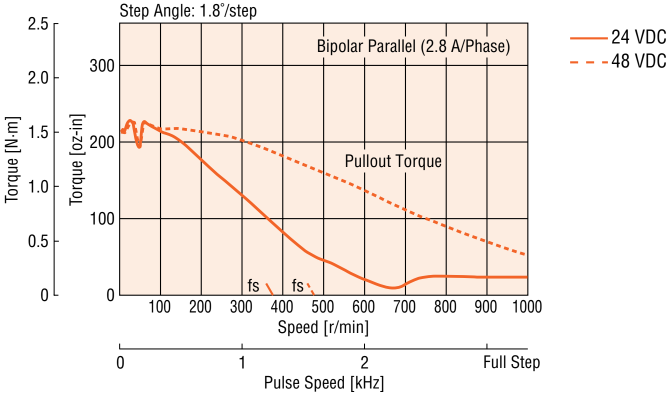
● **PK268-03B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



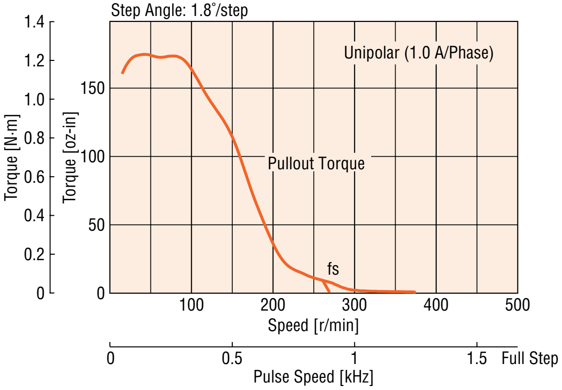
● **PK268-E2.0B** Bipolar (Parallel)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



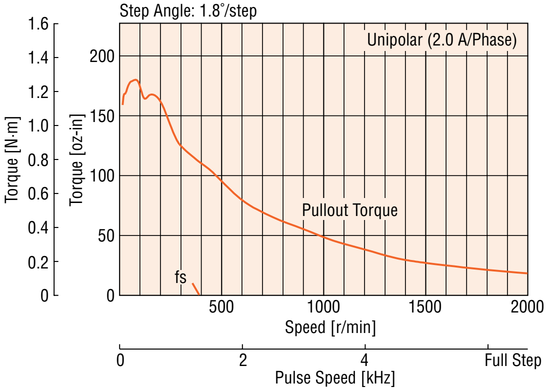
● **PK268-01B** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



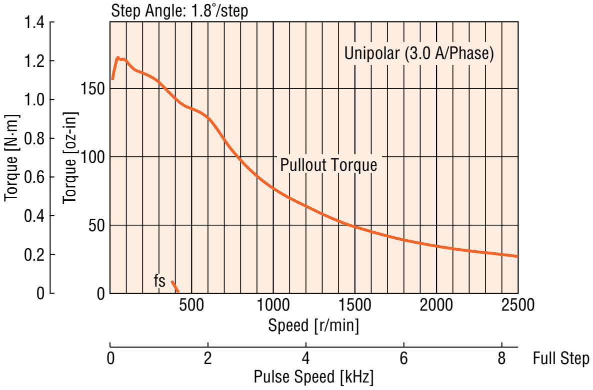
● **PK268-02B** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



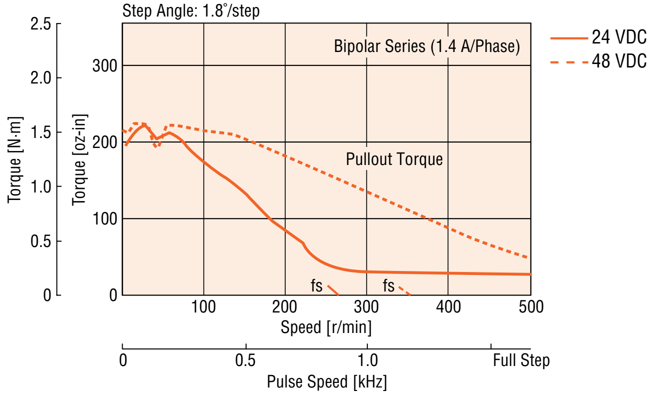
● **PK268-03B** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



● **PK268-E2.0B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



Connection Diagrams C-189
General Specifications C-240

□2.22 in. (□56.4 mm)

Step Angle 0.9°

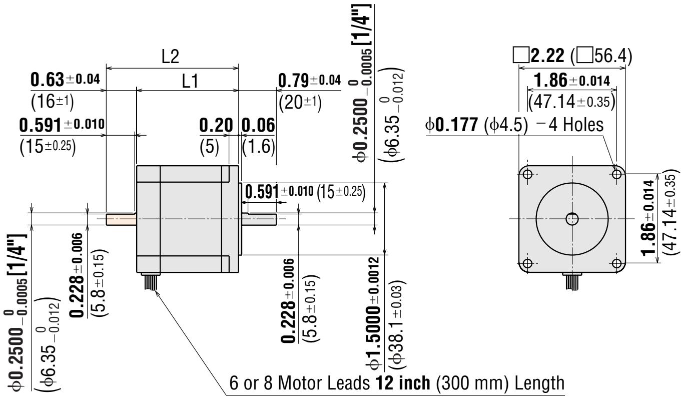
PK Series High Resolution Type

Specifications

Model Single Shaft Double Shaft	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J		Lead Wires	Corresponding AC/DC-Input Motor & Driver Package
		oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in²	kg·m²		
PK264M-01A	Bipolar (Series)	68	0.48	0.71	8.1	11.4	26	0.66	120×10^{-7}	6	—
PK264M-01B	Unipolar	55	0.39	1	5.7	5.7	6.5				
PK264M-02A	Bipolar (Series)	68	0.48	1.4	3.9	2.8	6.8	0.66	120×10^{-7}	6	**UMK264M□A/ CSK264M-□TA**
PK264M-02B	Unipolar	55	0.39	2	2.8	1.4	1.7				
PK264M-03A	Bipolar (Series)	68	0.48	2.1	2.6	1.26	3	0.66	120×10^{-7}	6	—
PK264M-03B	Unipolar	55	0.39	3	1.9	0.63	0.75				
PK264M-E2.0A PK264M-E2.0B	Bipolar (Parallel)	68	0.48	2.8	1.96	0.7	1.7	0.66	120×10^{-7}	8	—
	Bipolar (Series)	68	0.48	1.4	3.9	2.8	6.8				
	Unipolar	55	0.39	2	2.8	1.4	1.7				
PK266M-01A	Bipolar (Series)	166	1.17	0.71	11	14.8	50.8	1.64	300×10^{-7}	6	—
PK266M-01B	Unipolar	127	0.9	1	7.4	7.4	12.7				
PK266M-02A	Bipolar (Series)	166	1.17	1.4	5	3.6	12.8	1.64	300×10^{-7}	6	**UMK266M□A/ CSK266M-□TA**
PK266M-02B	Unipolar	127	0.9	2	3.6	1.8	3.2				
PK266M-03A	Bipolar (Series)	166	1.17	2.1	3.2	1.5	5.8	1.64	300×10^{-7}	6	—
PK266M-03B	Unipolar	127	0.9	3	2.3	0.75	1.45				
PK266M-E2.0A PK266M-E2.0B	Bipolar (Parallel)	166	1.17	2.8	2.52	0.9	3.2	1.64	300×10^{-7}	8	—
	Bipolar (Series)	166	1.17	1.4	5	3.6	12.8				
	Unipolar	127	0.9	2	3.6	1.8	3.2				
PK268M-01A	Bipolar (Series)	240	1.75	0.71	12	17.2	77.6	2.6	480×10^{-7}	6	—
PK268M-01B	Unipolar	191	1.35	1	8.6	8.6	19.4				
PK268M-02A	Bipolar (Series)	240	1.75	1.4	6.3	4.5	19.2	2.6	480×10^{-7}	6	**UMK268M□A/ CSK268M-□TA**
PK268M-02B	Unipolar	191	1.35	2	4.5	2.25	4.8				
PK268M-03A	Bipolar (Series)	240	1.75	2.1	4.2	2	8.4	2.6	480×10^{-7}	6	—
PK268M-03B	Unipolar	191	1.35	3	3	1	2.1				
PK268M-E2.0A PK268M-E2.0B	Bipolar (Parallel)	240	1.75	2.8	3.16	1.13	4.8	2.6	480×10^{-7}	8	—
	Bipolar (Series)	240	1.75	1.4	6.3	4.5	19.2				
	Unipolar	191	1.35	2	4.5	2.25	4.8				

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189

Dimensions Scale 1/4, Unit = **inch** (mm)



- These dimensions are for double shaft models. For single shaft models, ignore the shaded area.

Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PK264M-0□A PK264M-E2.0A	1.54 (39)	—	0.99 (0.45)	B084
PK264M-0□B PK264M-E2.0B		2.17 (55)		
PK266M-0□A PK266M-E2.0A	2.13 (54)	—	1.54 (0.7)	B085
PK266M-0□B PK266M-E2.0B		2.76 (70)		
PK268M-0□A PK268M-E2.0A	2.99 (76)	—	2.2 (1)	B086
PK268M-0□B PK268M-E2.0B		3.62 (92)		

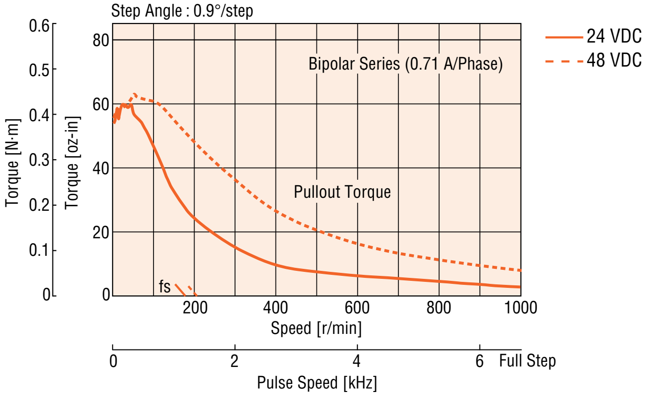
- Enter the winding specification in the box (□) within the model number.

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

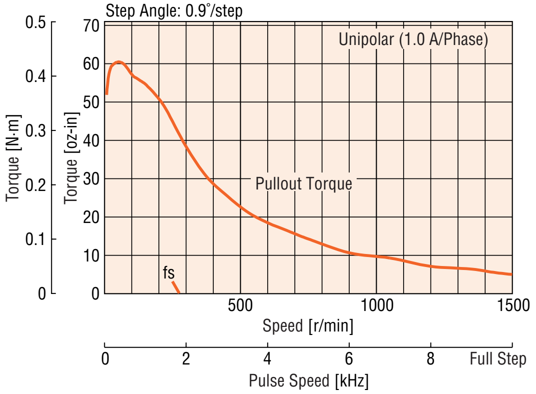
● **PK264M-01B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)
Step Angle: 0.9°/step



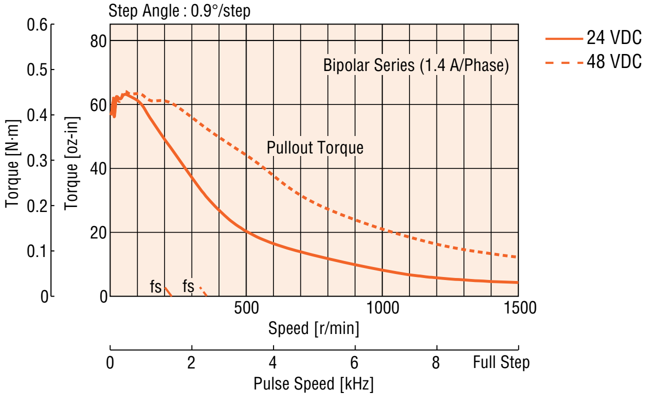
● **PK264M-01B** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3 F**: J_L = 0.77 oz-in² (140 × 10⁻⁷ kg·m²)
Step Angle: 0.9°/step



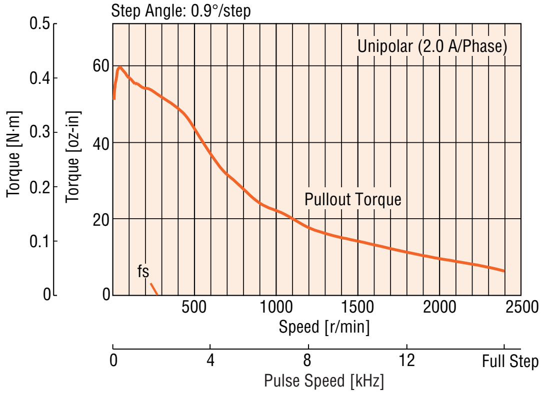
● **PK264M-02B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)
Step Angle: 0.9°/step



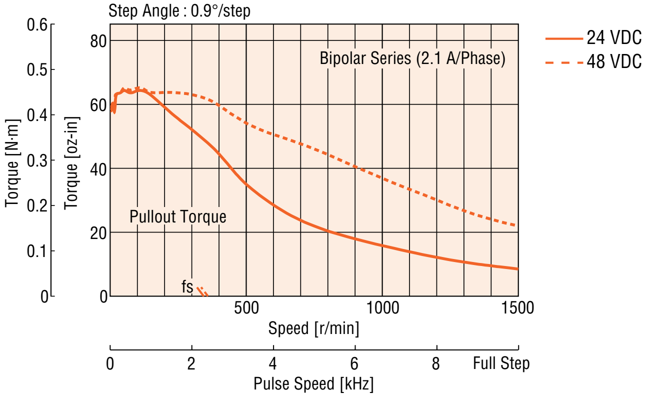
● **PK264M-02B** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3 F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)
Step Angle: 0.9°/step



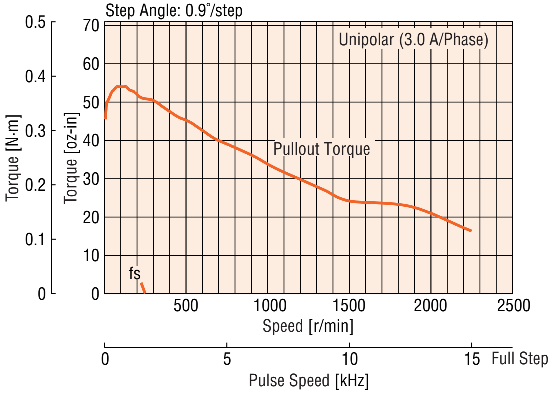
● **PK264M-03B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)
Step Angle: 0.9°/step



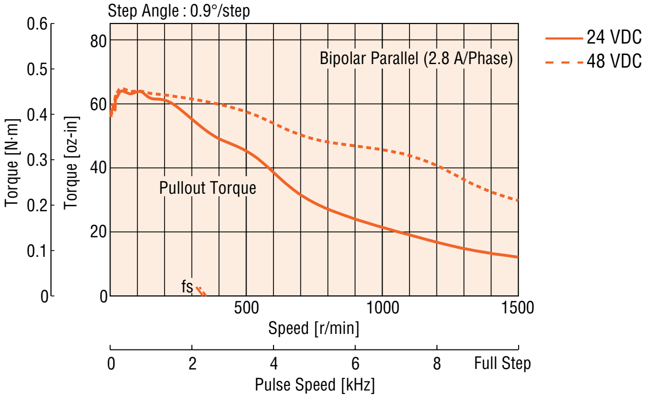
● **PK264M-03B** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3 F**: J_L = 0.77 oz-in² (140 × 10⁻⁷ kg·m²)
Step Angle: 0.9°/step



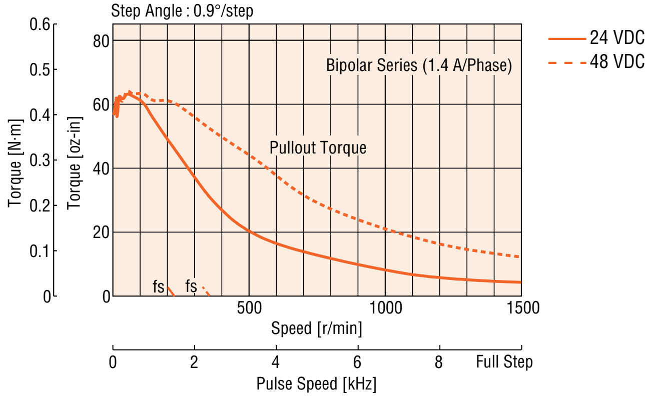
● **PK264M-E2.0B** Bipolar (Parallel)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)
Step Angle: 0.9°/step



● **PK264M-E2.0B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F**: J_L = 0.77 oz-in² (140×10⁻⁷ kg·m²)
Step Angle: 0.9°/step



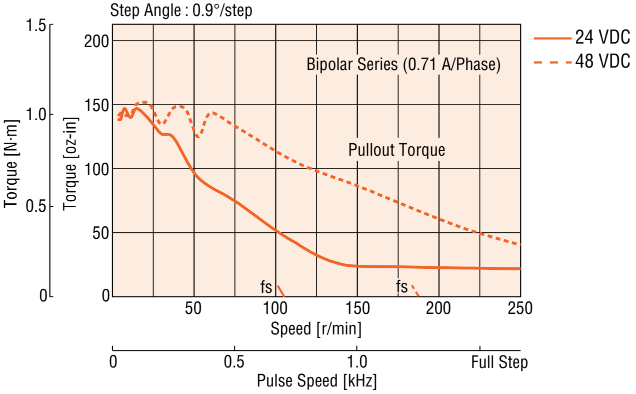
Connection Diagrams C-189 General Specifications C-240

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

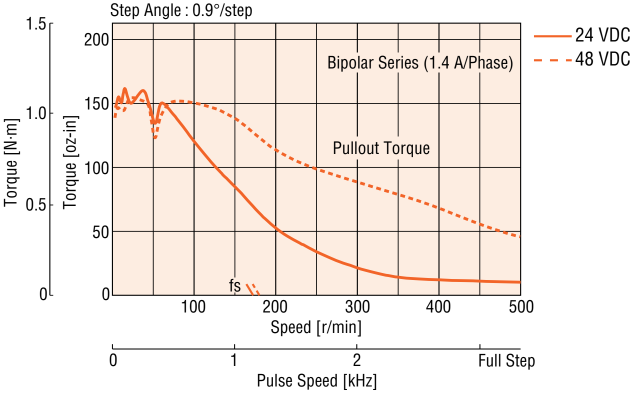
● **PK266M-01B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



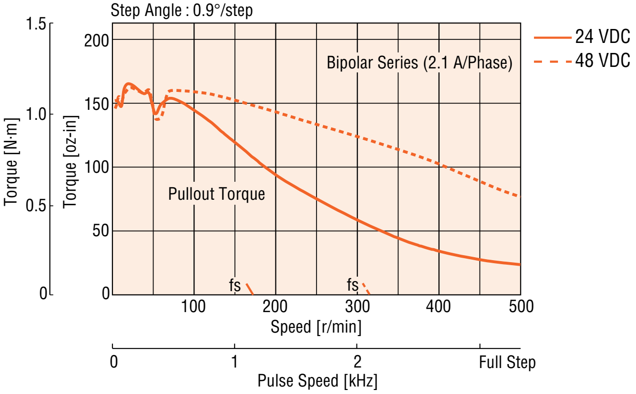
● **PK266M-02B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



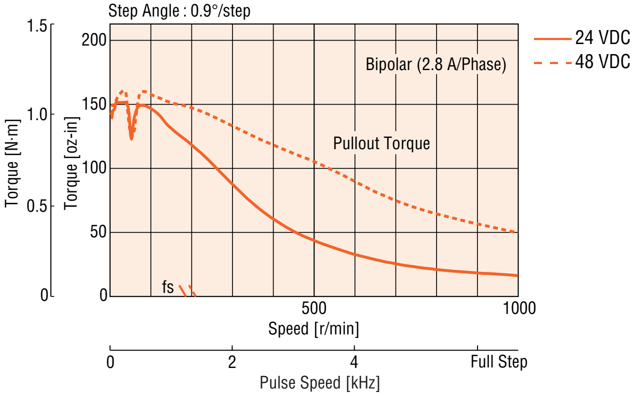
● **PK266M-03B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



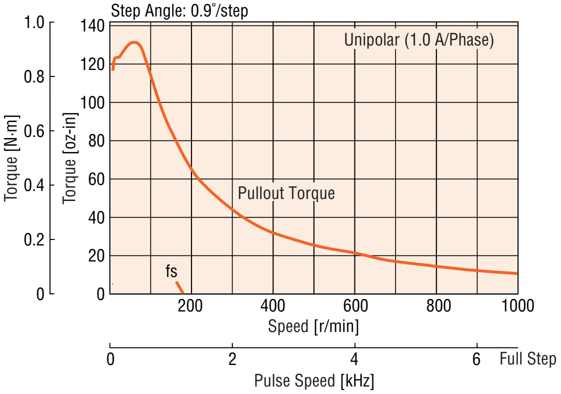
● **PK266M-E2.0B** Bipolar (Parallel)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



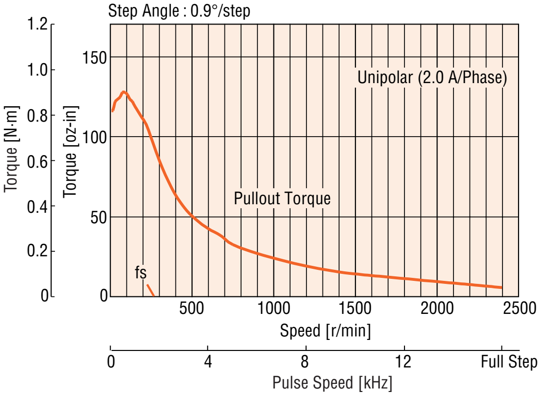
● **PK266M-01B** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 0.9°/step



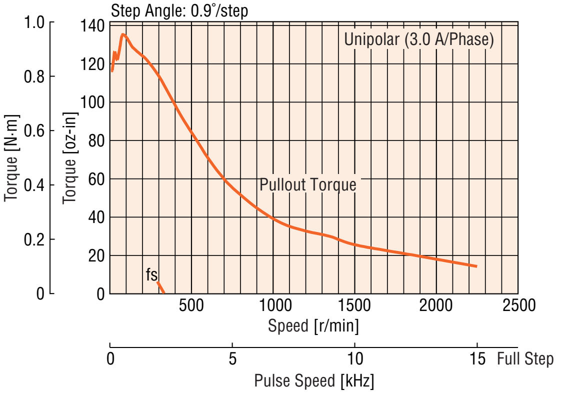
● **PK266M-02B** Unipolar

Power Input : 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



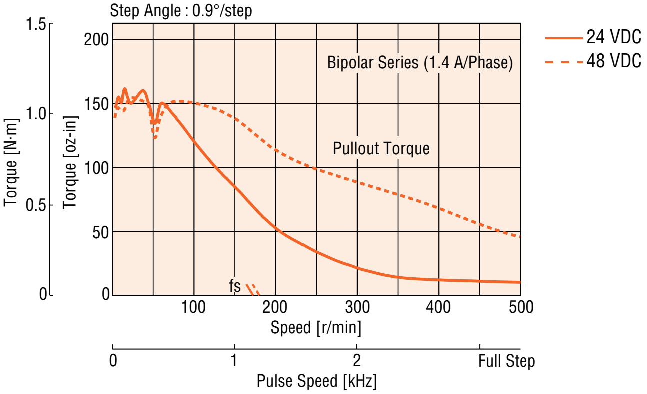
● **PK266M-03B** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 0.9°/step



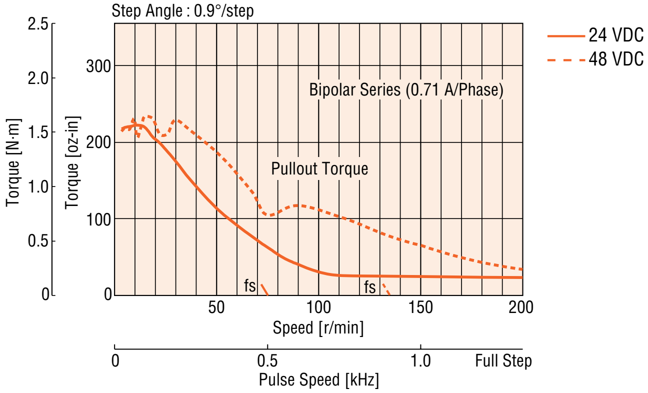
● **PK266M-E2.0B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



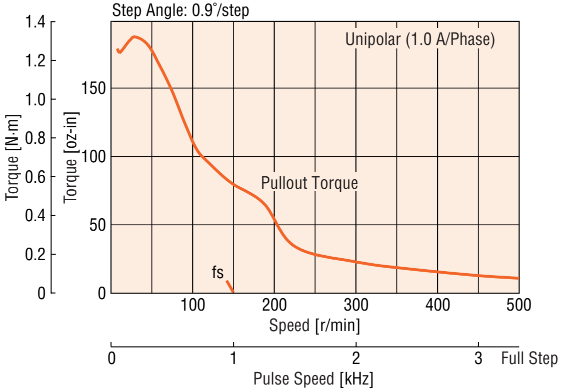
● **PK268M-01B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



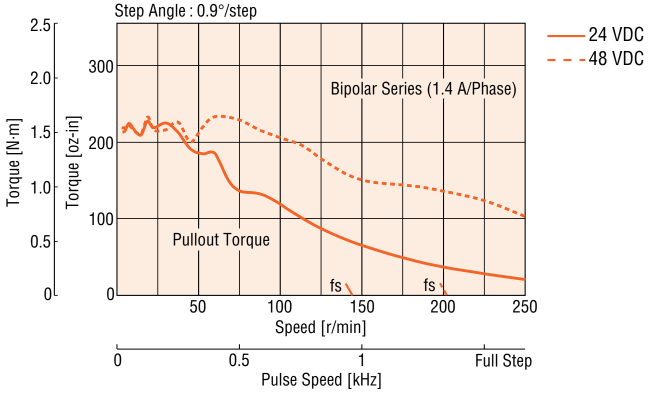
● **PK268M-01B** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 0.9°/step



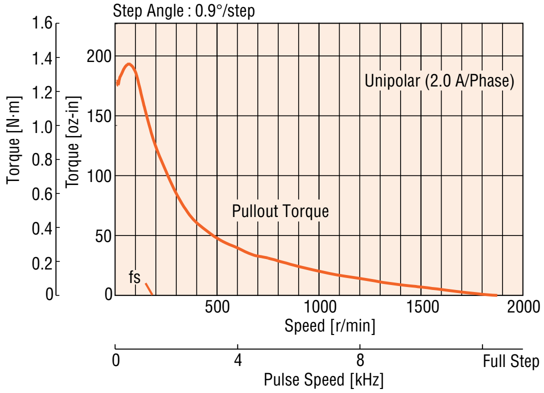
● **PK268M-02B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



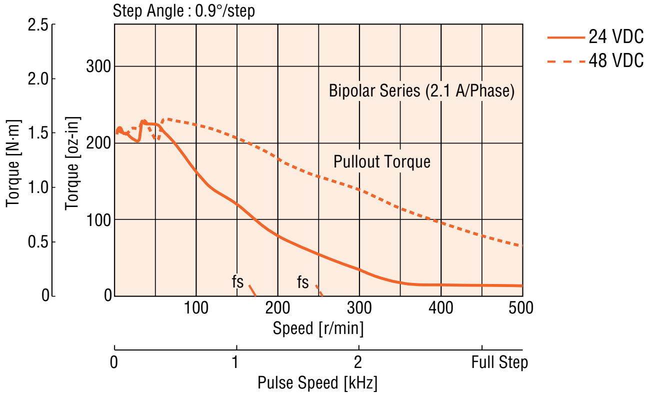
● **PK268M-02B** Unipolar

Power Input : 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



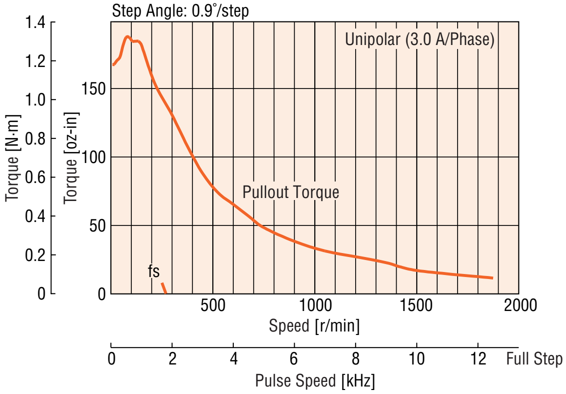
● **PK268M-03B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



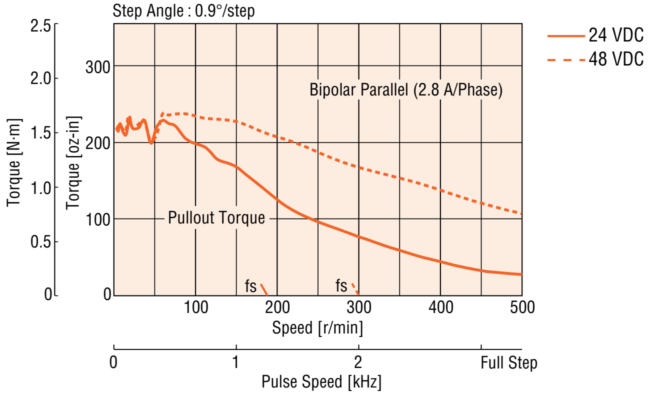
● **PK268M-03B** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 0.9°/step



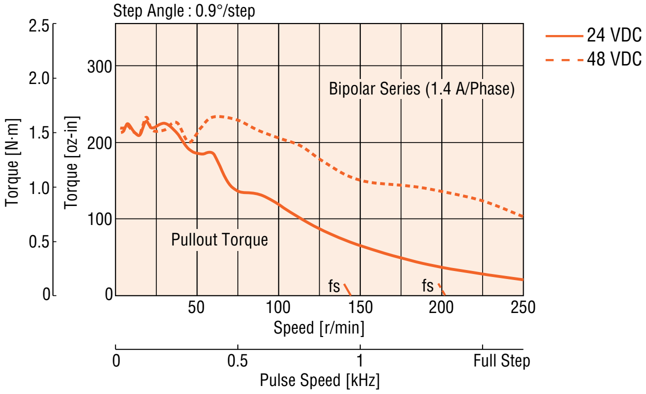
● **PK268M-E2.0B** Bipolar (Parallel)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



● **PK268M-E2.0B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3 F** : $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



Connection Diagrams C-189 General Specifications C-240

□2.36 in. (□60 mm)

PK Series SH Geared Type

Specifications

Motor Specifications

Model Single Shaft Double Shaft	Connection Type	Current per Phase A/phase	Voltage VDC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J oz-in²	 kg·m²	Lead Wires	Corresponding DC-Input Motor & Driver Package
PK264A1A-SG□	Bipolar (Series)	0.71	8.1	11.4	21.6	0.66	120×10⁻⁷	6	—
PK264B1A-SG□	Unipolar	1	5.7	5.7	5.4				
PK264A2A-SG□	Bipolar (Series)	1.4	3.9	2.8	5.6	0.66	120×10⁻⁷	6	**CSK264□TA-SG□**
PK264B2A-SG□	Unipolar	2	2.8	1.4	1.4				

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189
- Enter the gear ratio in the box (□) within the model number.

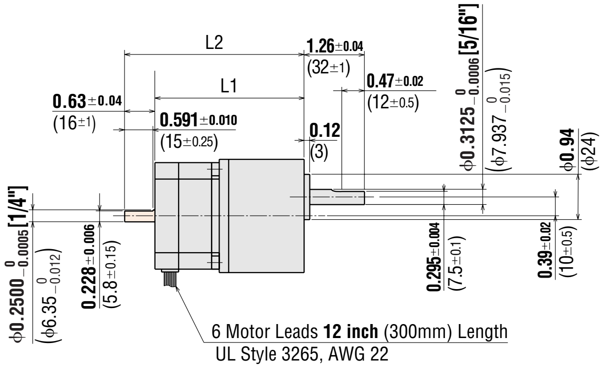
Gearmotor Specifications

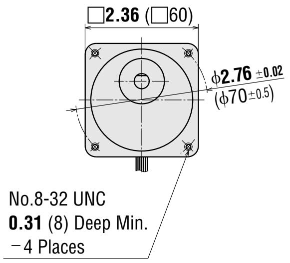
Model Single Shaft Double Shaft	Gear Ratio	Holding Torque* lb-in	 N·m	Step Angle	Permissible Speed r/min
PK264A1A-SG3.6, PK264A2A-SG3.6 **PK264B1A-SG3.6, PK264B2A-SG3.6**	3.6:1	8.8	1	0.5°	500
PK264A1A-SG7.2, PK264A2A-SG7.2 **PK264B1A-SG7.2, PK264B2A-SG7.2**	7.2:1	17.7	2	0.25°	250
PK264A1A-SG9, PK264A2A-SG9 **PK264B1A-SG9, PK264B2A-SG9**	9:1	22	2.5	0.2°	200
PK264A1A-SG10, PK264A2A-SG10 **PK264B1A-SG10, PK264B2A-SG10**	10:1	23	2.7	0.18°	180
PK264A1A-SG18, PK264A2A-SG18 **PK264B1A-SG18, PK264B2A-SG18**	18:1	26	3	0.1°	100
PK264A1A-SG36, PK264A2A-SG36 **PK264B1A-SG36, PK264B2A-SG36**	36:1	35	4	0.05°	50

* Holding torque is the same regardless of the connection type, due to the permissible torque limit of the gearhead.

Dimensions

Scale 1/4, Unit = **inch** (mm)





Mounting Screws (included)
No.8-32 UNC 0.59 in. (15 mm) length, 4 pieces

- These dimensions are for double shaft models. For single shaft models, ignore the shaded area.

Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PK264A□A-SG□	3.11 (79)	—	1.7 (0.75)	B092U
PK264B□A-SG□		3.74 (95)		

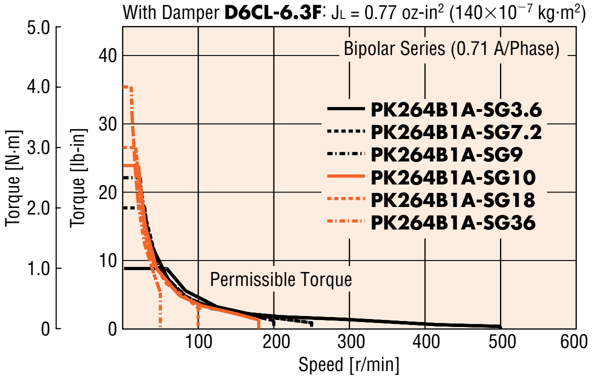
- Enter the winding specification in the box (□) within the model number.
- Enter the gear ratio in the box (□) within the model number.

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

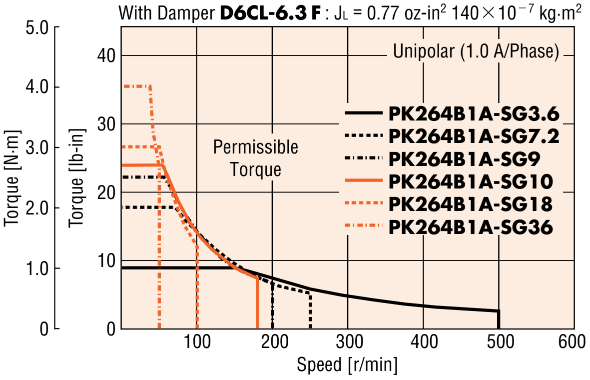
● PK264B1A-SG Bipolar (Series) 24 VDC

Power Input: 24 VDC Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



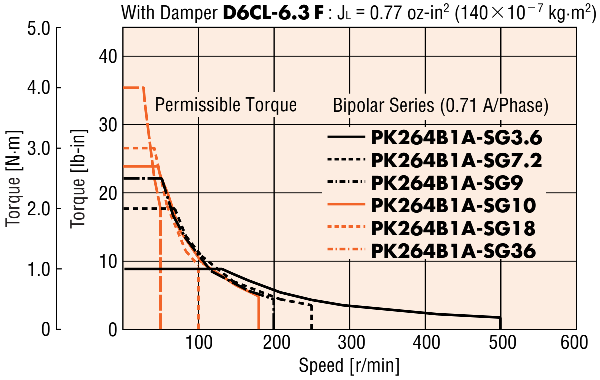
● PK264B1A-SG Unipolar

Power Input : 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3 F** : J_L = 0.77 oz-in^2 140×10^{-7} kg·m^2



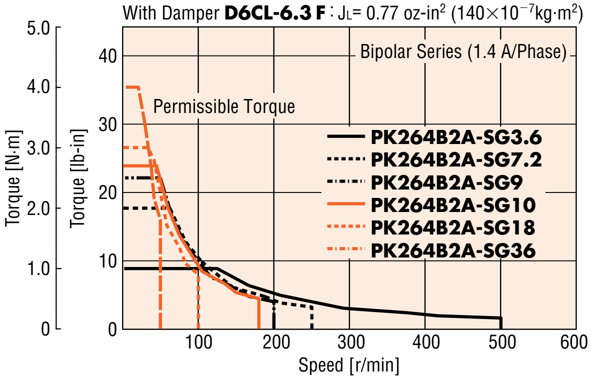
● PK264B1A-SG Bipolar (Series) 48 VDC

Power Input : 48 VDC Bipolar Constant Current Driver
With Damper **D6CL-6.3 F** : J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



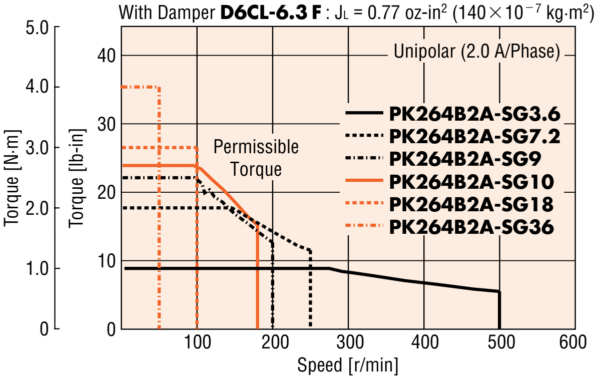
● PK264B2A-SG Bipolar (Series) 24 VDC

Power Input: 24 VDC Bipolar Constant Current Driver
With Damper **D6CL-6.3 F** : J_L= 0.77 oz-in^2 (140×10^{-7}kg·m^2)



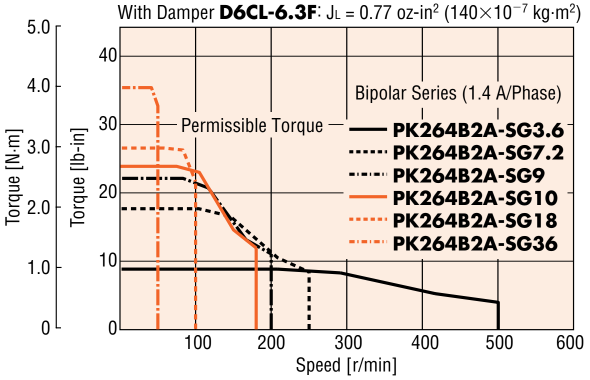
● PK264B2A-SG Unipolar

Power Input : 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3 F** : J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)



● PK264B2A-SG Bipolar (Series) 48 VDC

Power Input: 48 VDC Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)

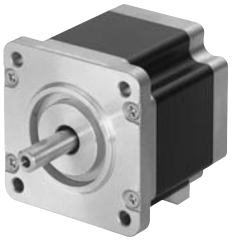


Connection Diagrams C-189 General Specifications C-240

□ 2.36 in. (□ 60 mm)

Step Angle 1.8°

PV Series (High Inertia Capability)



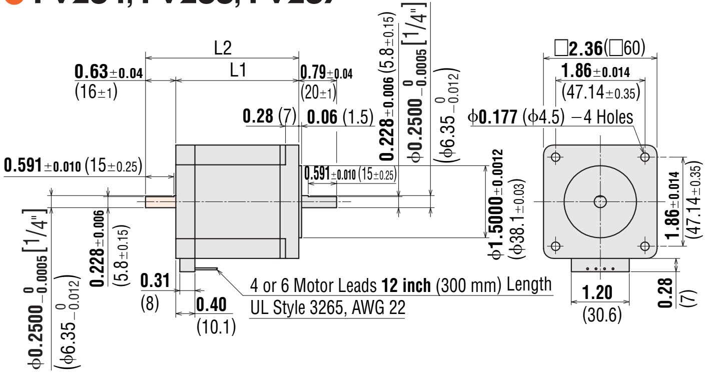
Specifications

Model Single Shaft Double Shaft	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J		Lead Wires
		oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2	
PV264-D2.8AA **PV264-D2.8BA**	Bipolar	150	1.06	2.8	2.1	0.73	1.8	1.53	280×10^{-7}	4
PV264-02AA **PV264-02BA**	Bipolar (Series)	150	1.06	1.4	4.1	2.92	7.2	1.53	280×10^{-7}	6
	Unipolar	106	0.75	2	2.9	1.46	1.8			
PV266-D2.8AA **PV266-D2.8BA**	Bipolar	240	1.75	2.8	2.8	1	3.05	2.5	450×10^{-7}	4
PV266-02AA **PV266-02BA**	Bipolar (Series)	240	1.75	1.4	5.6	4	12.2	2.5	450×10^{-7}	6
	Unipolar	191	1.35	2	4	2	3.05			
PV267-D2.8AA **PV267-D2.8BA**	Bipolar	310	2.2	2.8	3.4	1.2	3.54	3.1	570×10^{-7}	4
PV267-02AA **PV267-02BA**	Bipolar (Series)	310	2.2	1.4	6.7	4.8	14.2	3.1	570×10^{-7}	6
	Unipolar	240	1.7	2	4.8	2.4	3.54			
PV269-D2.8AA **PV269-D2.8BA**	Bipolar	440	3.1	2.8	4.2	1.49	5.7	4.9	900×10^{-7}	4
PV269-02AA **PV269-02BA**	Bipolar (Series)	440	3.1	1.4	8.3	5.96	22.8	4.9	900×10^{-7}	6
	Unipolar	310	2.2	2	6	2.98	5.7			

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189

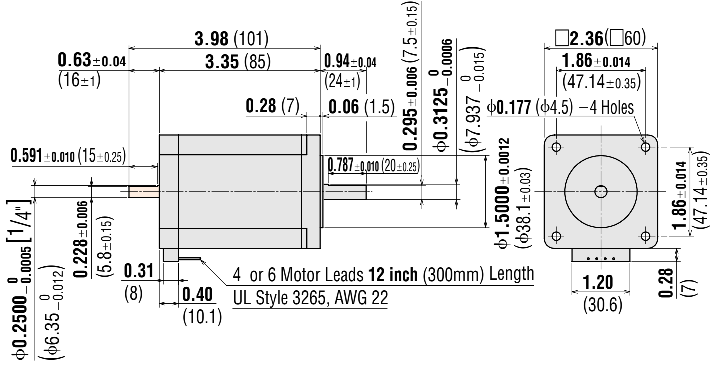
Dimensions Scale 1/4, Unit = **inch** (mm)

PV264, PV266, PV267



Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PV264-D2.8AA **PV264-02AA**	1.71 (43.5)	—	1.3 (0.6)	B279U
PV264-D2.8BA **PV264-02BA**		2.34 (59.5)		
PV266-D2.8AA **PV266-02AA**	2.13 (54)	—	1.8 (0.83)	B232U
PV266-D2.8BA **PV266-02BA**		2.76 (70)		
PV267-D2.8AA **PV267-02AA**	2.56 (65)	—	2.2 (1.02)	B813U
PV267-D2.8BA **PV267-02BA**		3.19 (81)		

PV269



Model	Weight lb. (kg)	DXF
PV269-D2.8AA **PV269-02AA**	3.1 (1.43)	B814U
PV269-D2.8BA **PV269-02BA**		

- These dimensions are for double shaft models. For single shaft models, ignore the shaded area.

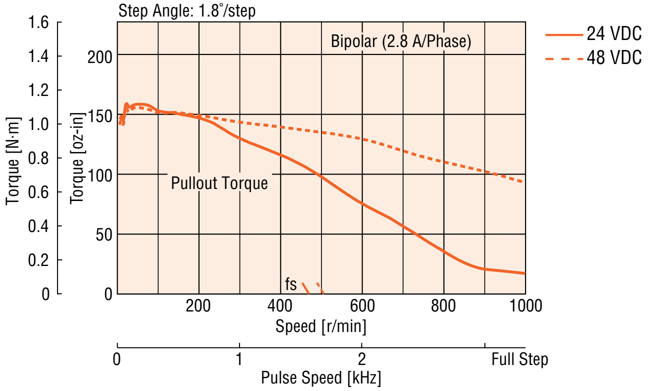
Features C-184 Accessories C-185

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

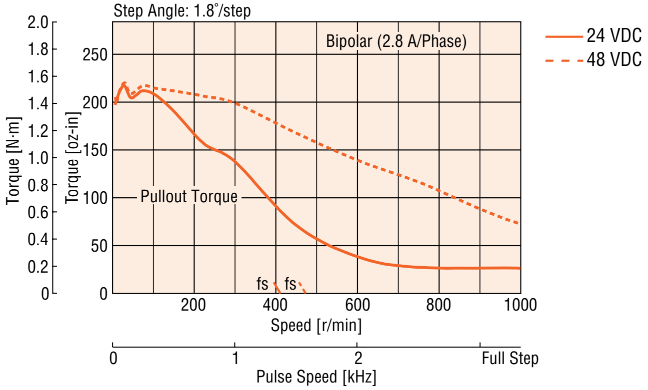
● **PV264-D2.8BA** Bipolar

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



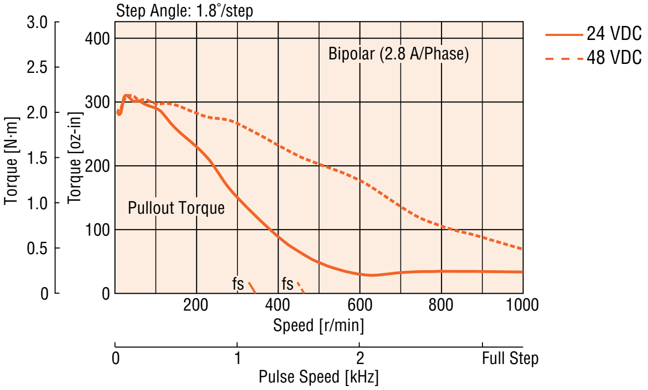
● **PV266-D2.8BA** Bipolar

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



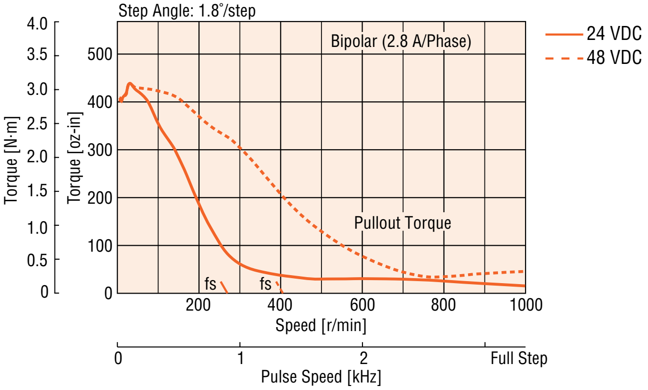
● **PV267-D2.8BA** Bipolar

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



● **PV269-D2.8BA** Bipolar

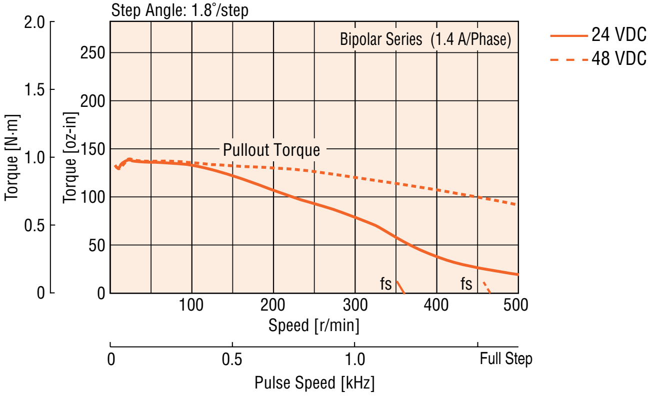
Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



Connection Diagrams C-189 General Specifications C-240

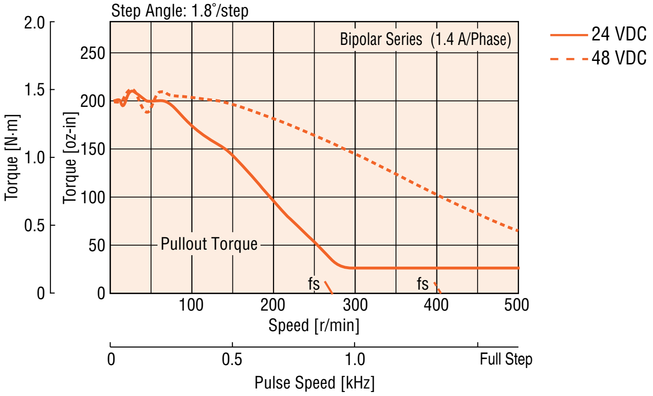
● **PV264-02BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140 $\times 10^{-7}$ kg·m^2)
Step Angle: 1.8°/step



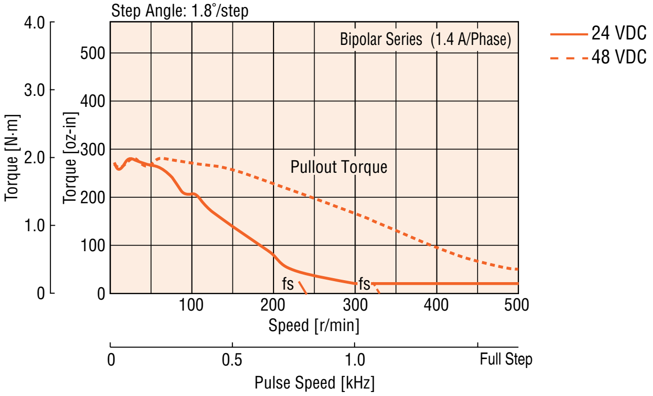
● **PV266-02BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140 $\times 10^{-7}$ kg·m^2)
Step Angle: 1.8°/step



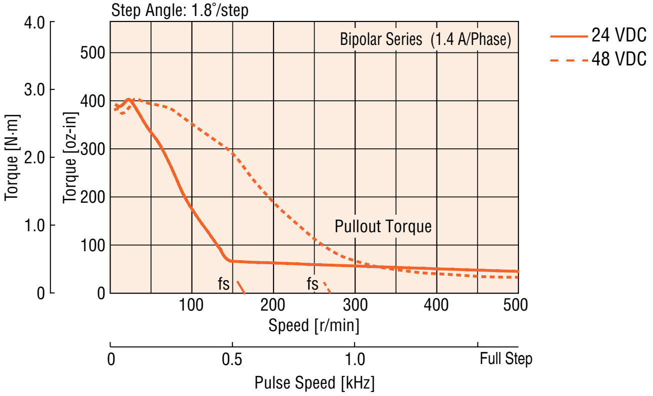
● **PV267-02BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140 $\times 10^{-7}$ kg·m^2)
Step Angle: 1.8°/step



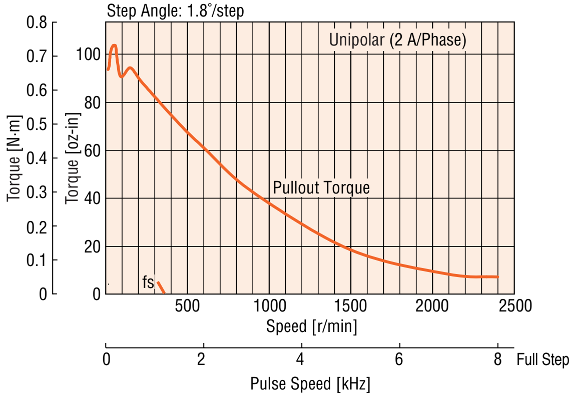
● **PV269-02BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140 $\times 10^{-7}$ kg·m^2)
Step Angle: 1.8°/step



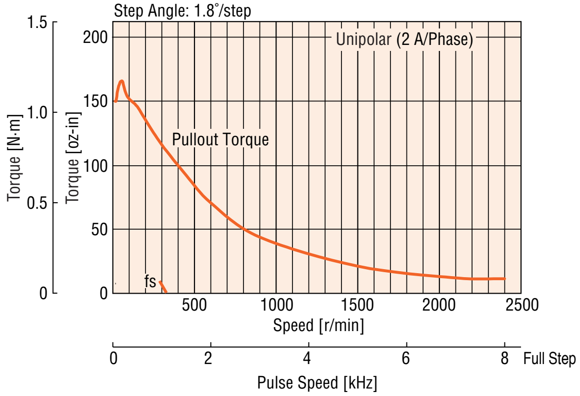
● **PV264-02BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140 $\times 10^{-7}$ kg·m^2)
Step Angle: 1.8°/step



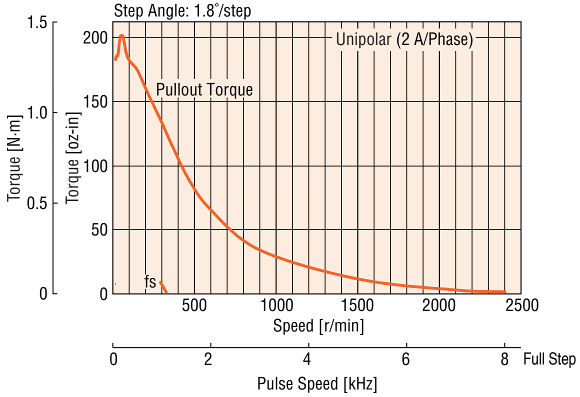
● **PV266-02BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140 $\times 10^{-7}$ kg·m^2)
Step Angle: 1.8°/step



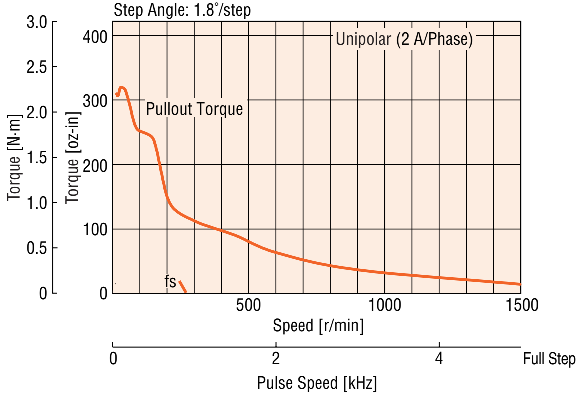
● **PV267-02BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140 $\times 10^{-7}$ kg·m^2)
Step Angle: 1.8°/step



● **PV269-02BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D6CL-6.3F**: $J_L = 0.77$ oz-in^2 (140 $\times 10^{-7}$ kg·m^2)
Step Angle: 1.8°/step



□ 3.35 in. (□ 85 mm)

Step Angle 1.8°

PK Series Standard Type

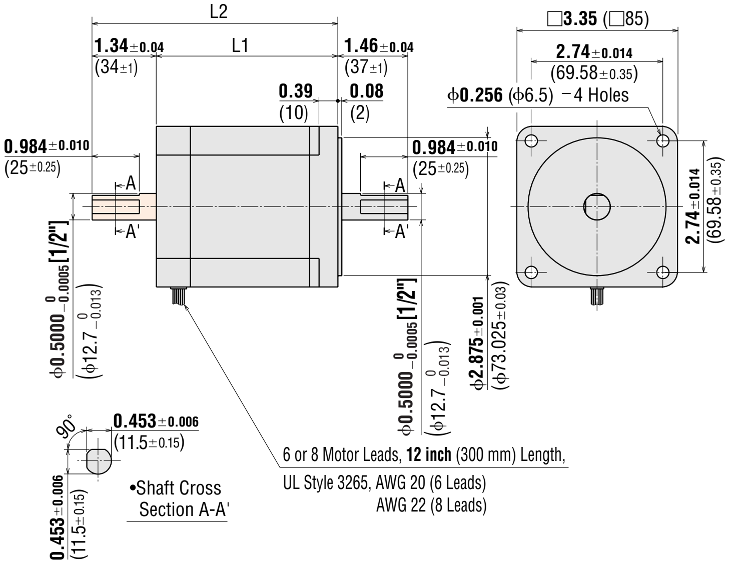
Specifications

Model Single Shaft Double Shaft	Connection Type	Holding Torque oz-in	N·m	Current per Phase A/phase	Voltage VDC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J oz-in²	kg·m²	Lead Wires	Corresponding AC-Input Motor & Driver Package
PK296-01AA	Bipolar (Series)	440	3.1	1.4	6.2	4.4	30.8	7.7	1400×10^{-7}	6	—
PK296-01BA	Unipolar	310	2.2	2	4.4	2.2	7.7				
PK296-02AA	Bipolar (Series)	440	3.1	2.1	4.2	2	14	7.7	1400×10^{-7}	6	—
PK296-02BA	Unipolar	310	2.2	3	3	1	3.5				
PK296-03AA	Bipolar (Series)	440	3.1	3.18	2.8	0.96	6	7.7	1400×10^{-7}	6	**UMK296□A/ UMK296AAT**
PK296-03BA	Unipolar	310	2.2	4.5	2	0.48	1.5				
PK296-F4.5A PK296-F4.5B	Bipolar (Parallel)	440	3.1	6.3	1.4	0.24	1.5	7.7	1400×10^{-7}	8	—
	Bipolar (Series)	440	3.1	3.18	2.8	0.96	6				
	Unipolar	310	2.2	4.5	2	0.48	1.5				
PK299-01AA	Bipolar (Series)	880	6.2	1.4	9	6.4	56	14.8	2700×10^{-7}	6	—
PK299-01BA	Unipolar	620	4.4	2	6.4	3.2	14				
PK299-02AA	Bipolar (Series)	880	6.2	2.1	6	3	24	14.8	2700×10^{-7}	6	—
PK299-02BA	Unipolar	620	4.4	3	4.2	1.5	6				
PK299-03AA	Bipolar (Series)	880	6.2	3.18	3.9	1.32	10	14.8	2700×10^{-7}	6	**UMK299□A/ UMK299AAT**
PK299-03BA	Unipolar	620	4.4	4.5	2.8	0.66	2.5				
PK299-F4.5A PK296-F4.5B	Bipolar (Parallel)	880	6.2	6.3	1.9	0.33	2.5	14.8	2700×10^{-7}	8	—
	Bipolar (Series)	880	6.2	3.18	3.9	1.32	10				
	Unipolar	620	4.4	4.5	2.8	0.66	2.5				
PK2913-01AA	Bipolar (Series)	1320	9.3	1.4	10	7.6	76.8	22	4000×10^{-7}	6	—
PK2913-01BA	Unipolar	930	6.6	2	7.6	3.8	19.2				
PK2913-02AA	Bipolar (Series)	1320	9.3	2.8	5.3	1.94	16.8	22	4000×10^{-7}	6	**UMK2913□A/ UMK2913AAT**
PK2913-02BA	Unipolar	930	6.6	4	3.8	0.97	4.2				
PK2913-F4.0A PK2913-F4.0B	Bipolar (Parallel)	1320	9.3	5.6	2.6	0.49	4.2	22	4000×10^{-7}	8	—
	Bipolar (Series)	1320	9.3	2.8	5.3	1.94	16.8				
	Unipolar	930	6.6	4	3.8	0.97	4.2				

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189

Dimensions

Scale 1/4, Unit = **inch** (mm)



- These dimensions are for double shaft models. For single shaft models, ignore the shaded area.

Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PK296-0□AA PK296-F4.5A	2.60 (66)	—	3.7 (1.7)	B122U
PK296-0□BA PK296-F4.5B		3.94 (100)		
PK299-0□AA PK299-F4.5A	3.78 (96)	—	6.2 (2.8)	B123U
PK299-0□BA PK299-F4.5B		5.12 (130)		
PK2913-0□AA PK2913-F4.0A	4.96 (126)	—	8.4 (3.8)	B124U
PK2913-0□BA PK2913-F4.0B		6.30 (160)		

- Enter the winding specification in the box (□) within the model name.

Connection Diagrams C-189
General Specifications C-240

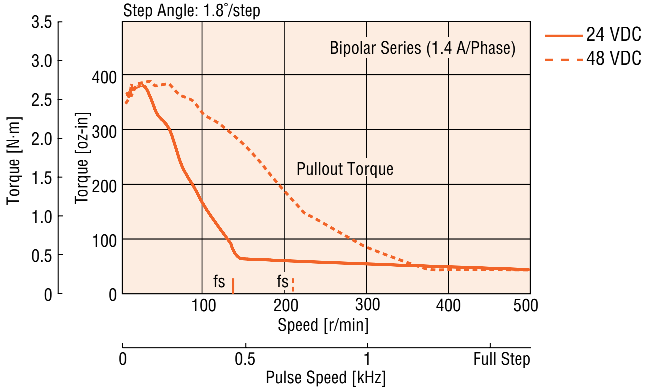
□1.10 in. (□28 mm)
□1.38 in. (□35 mm)
□1.65 in. (□42 mm)
□2.22 in. (□56.4 mm)
□2.36 in. (□60 mm)
□3.35 in. (□85 mm)
□3.54 in. (□90 mm)

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

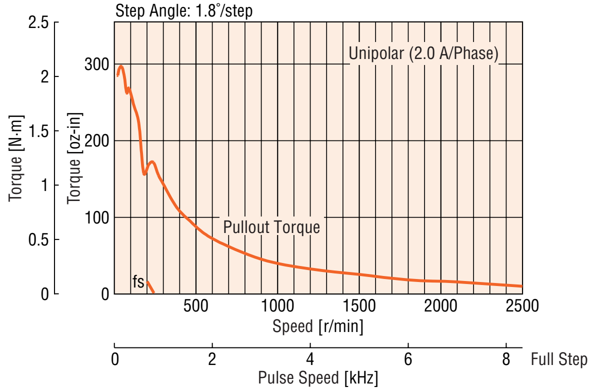
● **PK296-01BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



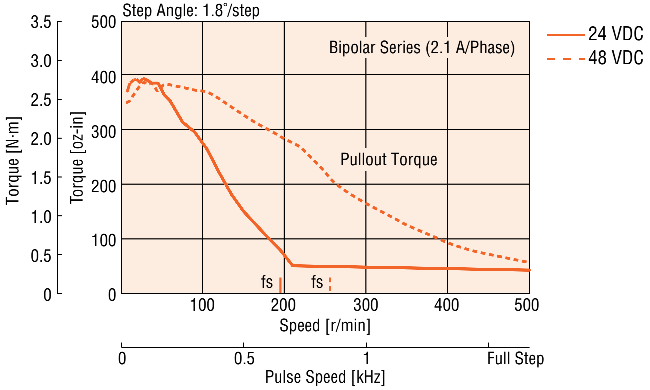
● **PK296-01BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



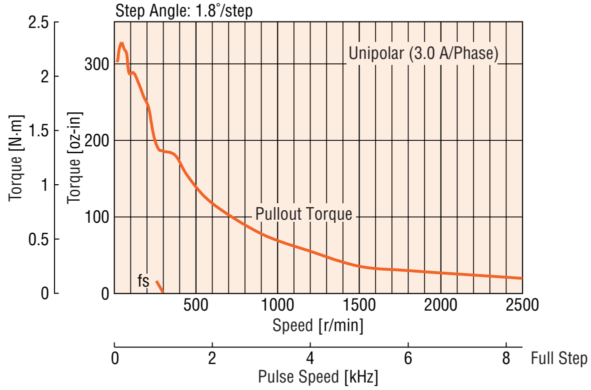
● **PK296-02BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



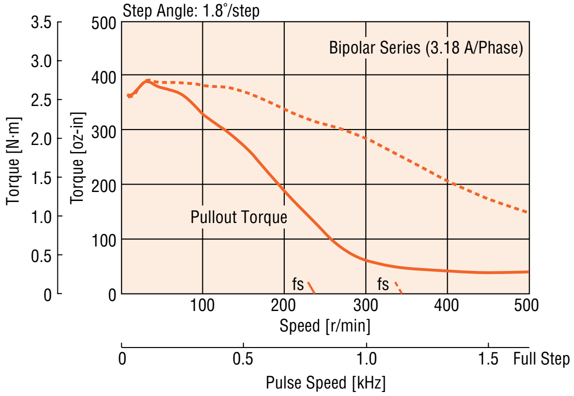
● **PK296-02BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



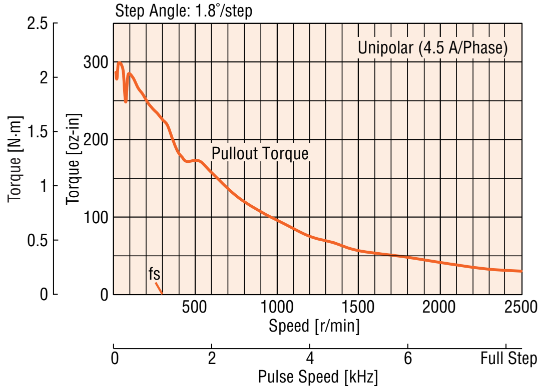
● **PK296-03BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



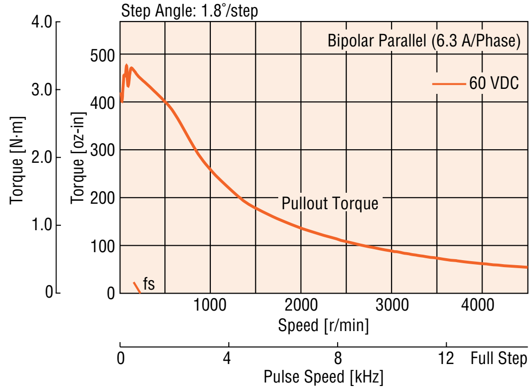
● **PK296-03BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



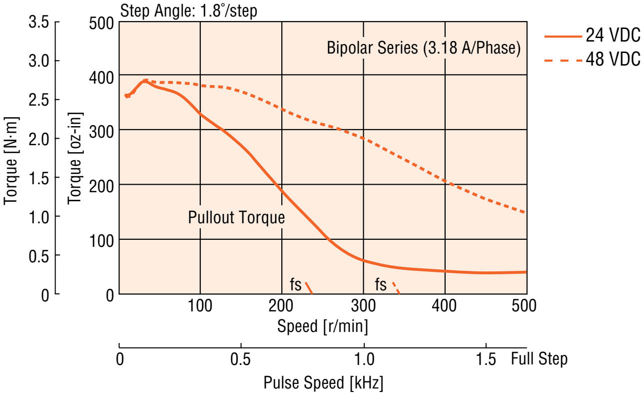
● **PK296-F4.5B** Bipolar (Parallel)

Power Input: 60 VDC Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



● **PK296-F4.5B** Bipolar (Series)

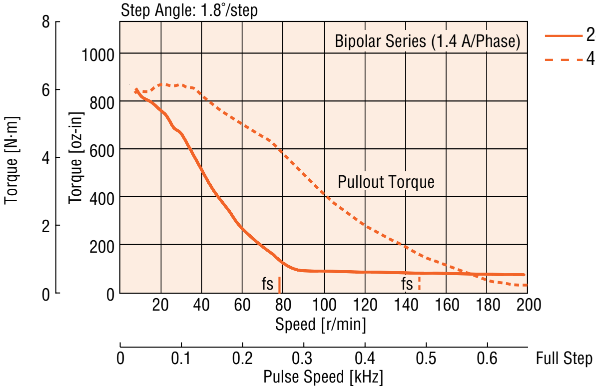
Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



Features C-184 Accessories C-185

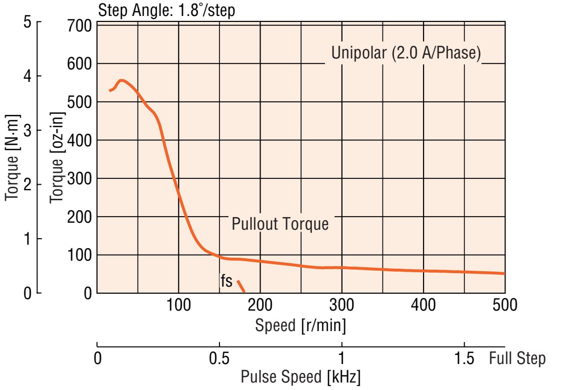
● **PK299-01BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: JL = 4.8 oz-in² (870 × 10^{-7} kg·m²)
Step Angle: 1.8°/step



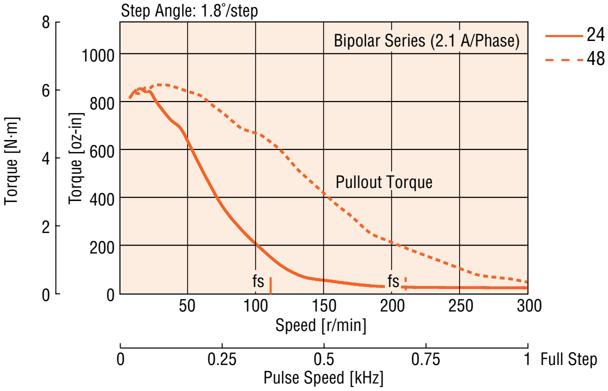
● **PK299-01BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D9CL-12.7F**: JL = 4.8 oz-in² (870 × 10^{-7} kg·m²)
Step Angle: 1.8°/step



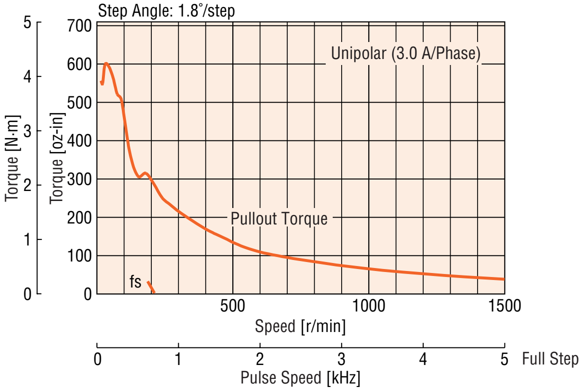
● **PK299-02BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: JL = 4.8 oz-in² (870 × 10^{-7} kg·m²)
Step Angle: 1.8°/step



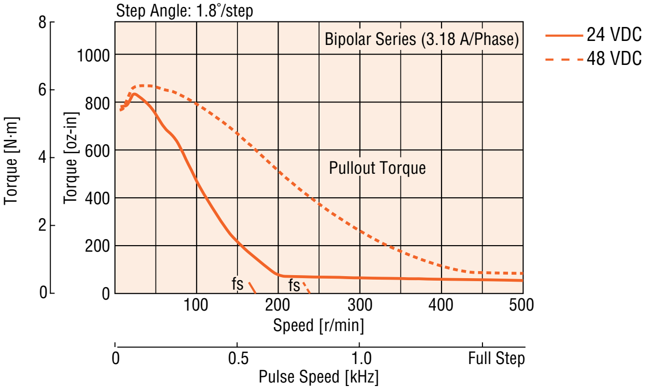
● **PK299-02BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D9CL-12.7F**: JL = 4.8 oz-in² (870 × 10^{-7} kg·m²)
Step Angle: 1.8°/step



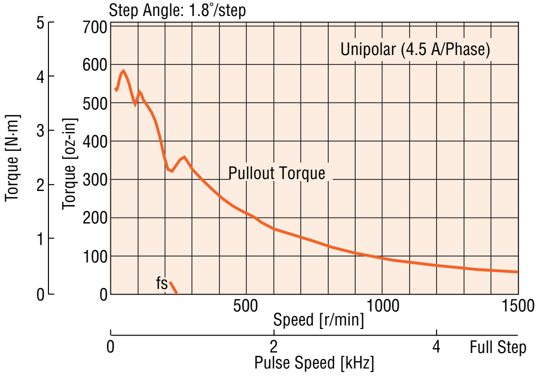
● **PK299-03BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: JL = 4.8 oz-in² (870 × 10^{-7} kg·m²)
Step Angle: 1.8°/step



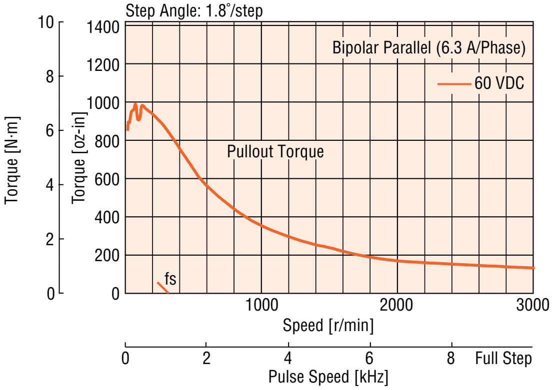
● **PK299-03BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
Load Inertia: JL = 4.8 oz-in² (870 × 10^{-7} kg·m²)
Step Angle: 1.8°/step



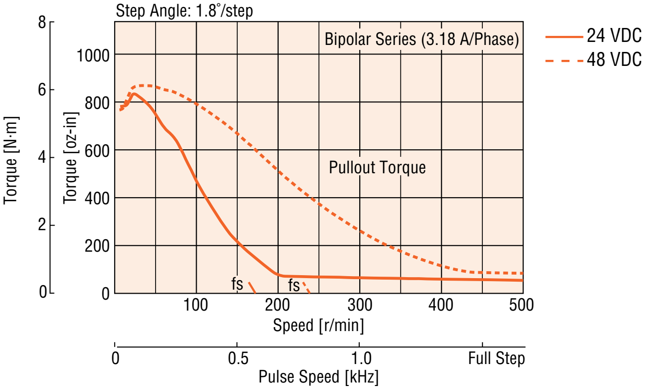
● **PK299-F4.5B** Bipolar (Parallel)

Power Input: 60 VDC Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: JL = 4.8 oz-in² (870 × 10^{-7} kg·m²)
Step Angle: 1.8°/step



● **PK299-F4.5B** Bipolar (Series)

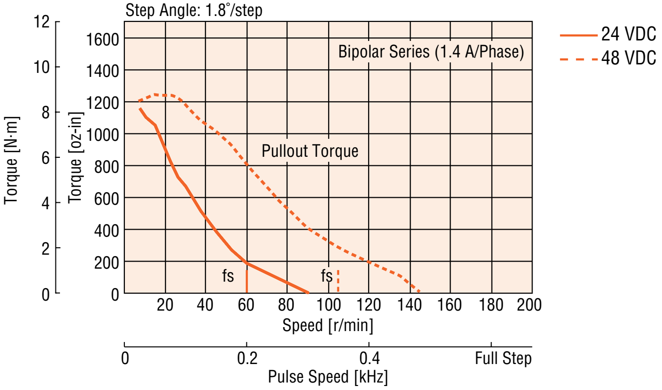
Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: JL = 4.8 oz-in² (870 × 10^{-7} kg·m²)
Step Angle: 1.8°/step



Connection Diagrams C-189 General Specifications C-240

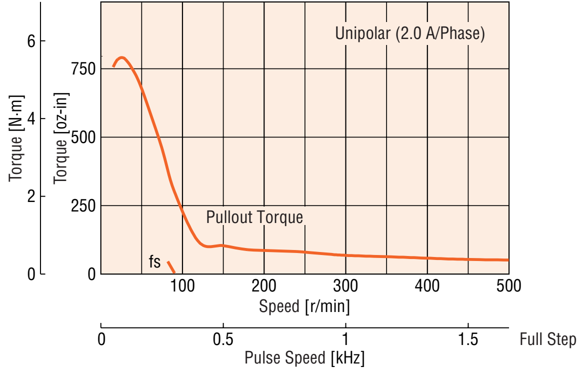
● **PK2913-01BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



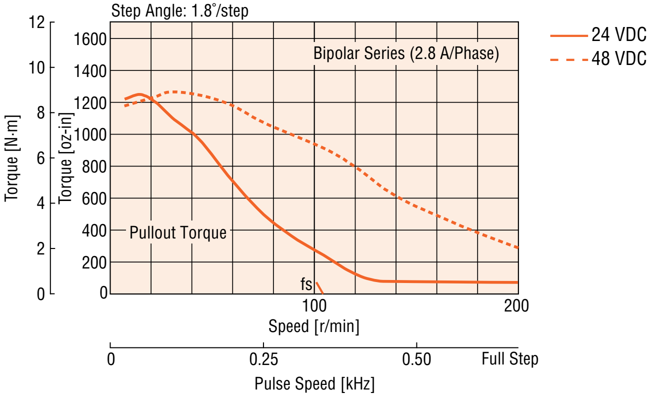
● **PK2913-01BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



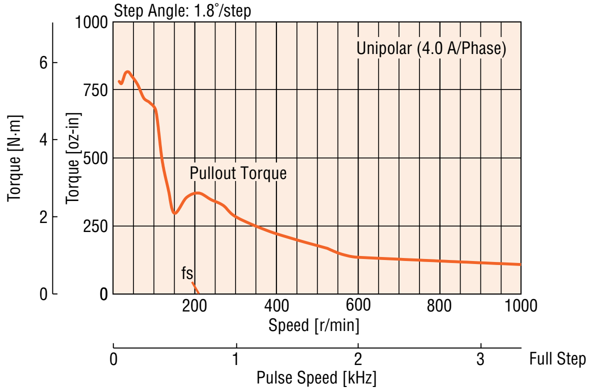
● **PK2913-02BA** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



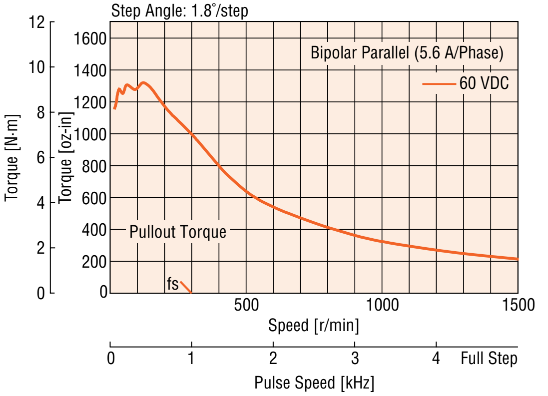
● **PK2913-02BA** Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



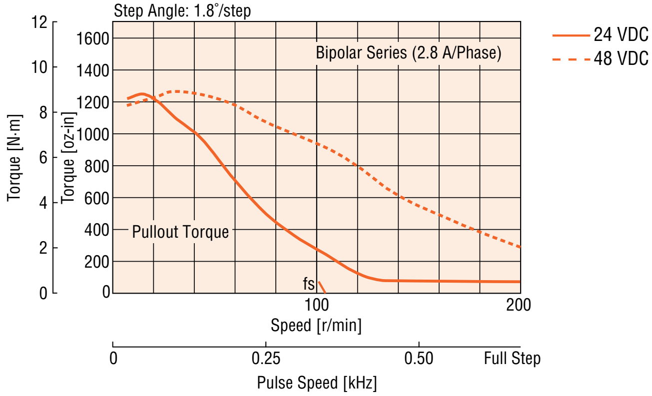
● **PK2913-F4.0B** Bipolar (Parallel)

Power Input: 60 VDC Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



● **PK2913-F4.0B** Bipolar (Series)

Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in^2 (870 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



Features C-184 Accessories C-185

□ 3.54 in. (□ 90 mm)

PK Series SH Geared Type

Specifications

Motor Specifications

Model Single Shaft Double Shaft	Connection Type	Current per Phase A/phase	Voltage VDC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J oz-in^2	 kg·m^2	Lead Wires
PK296A1A-SG□	Bipolar (Series)	1	4.4	4.4	30.8	7.7	1400×10^{-7}	6
PK296B1A-SG□	Unipolar	1.5	3.3	2.2	7.7			
PK296A2A-SG□	Bipolar (Series)	2.1	2	0.96	6	7.7	1400×10^{-7}	6
PK296B2A-SG□	Unipolar	3	1.4	0.48	1.5			

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189

- Enter the gear ratio in the box (□) within the model name.

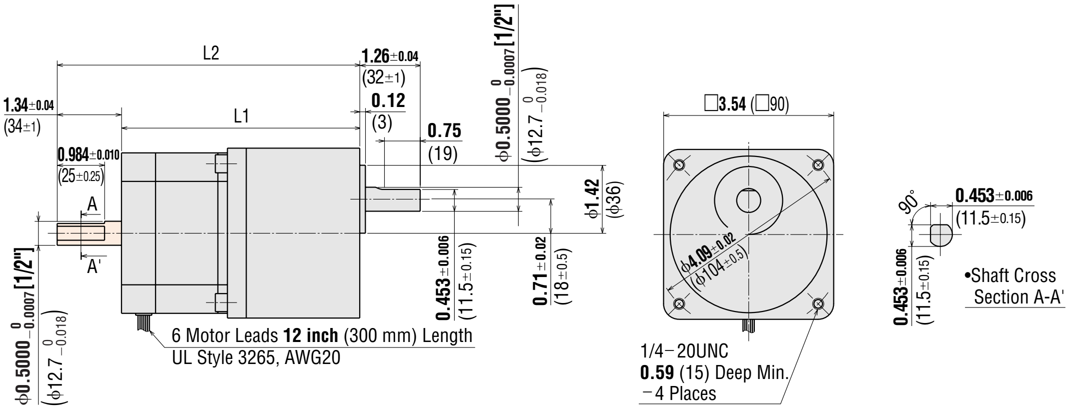
Gearmotor Specifications

Model Single Shaft Double Shaft	Gear Ratio	Holding Torque* lb-in	 N·m	Step Angle	Permissible Speed r/min
PK296A1A-SG3.6, PK296A2A-SG3.6 **PK296B1A-SG3.6, PK296B2A-SG3.6**	3.6:1	22	2.5	0.5°	500
PK296A1A-SG7.2, PK296A2A-SG7.2 **PK296B1A-SG7.2, PK296B2A-SG7.2**	7.2:1	44	5	0.25°	250
PK296A1A-SG9, PK296A2A-SG9 **PK296B1A-SG9, PK296B2A-SG9**	9:1	55	6.3	0.2°	200
PK296A1A-SG10, PK296A2A-SG10 **PK296B1A-SG10, PK296B2A-SG10**	10:1	61	7	0.18°	180
PK296A1A-SG18, PK296A2A-SG18 **PK296B1A-SG18, PK296B2A-SG18**	18:1	79	9	0.1°	100
PK296A1A-SG36, PK296A2A-SG36 **PK296B1A-SG36, PK296B2A-SG36**	36:1	106	12	0.05°	50

* Holding torque is the same regardless of the connection type, due to the permissible torque limit of the gearhead.

Dimensions

Scale 1/4, Unit = **inch** (mm)



- Screws (included)
  1/4 -20 UNC, 0.75 inch (19 mm) length, 4 pieces
- These dimensions are for double shaft models. For single shaft models, ignore the shaded area.

Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PK296A□A-SG□	4.96 (126)	—	6.2 (2.8)	B242U
PK296B□A-SG□		6.3 (160)		

- Enter the winding specification in the box (□) within the model number.
- Enter the gear ratio in the box (□) within the model number.

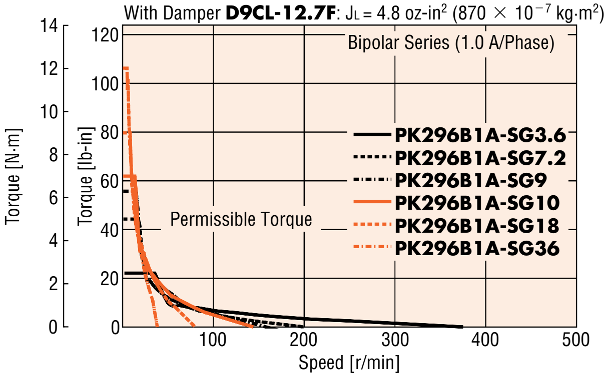
Connection Diagrams C-189 General Specifications C-240

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

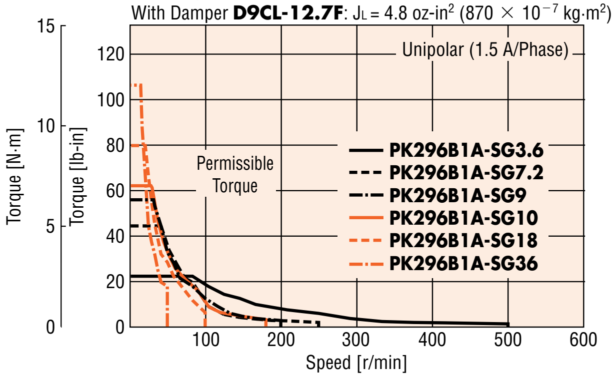
PK296B1A-SG☐ Bipolar (Series) 24 VDC

Power Input: 24 VDC Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in² (870 × 10^{-7} kg·m²)



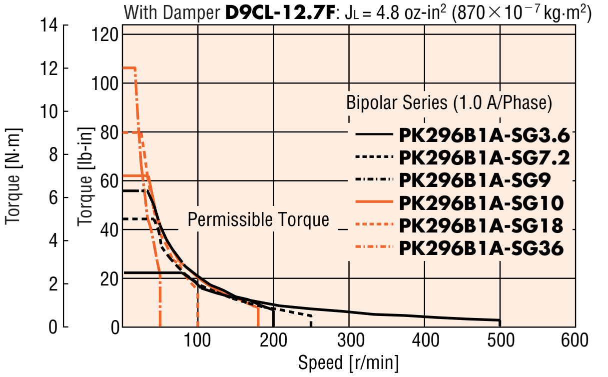
PK296B1A-SG☐ Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in² (870 × 10^{-7} kg·m²)



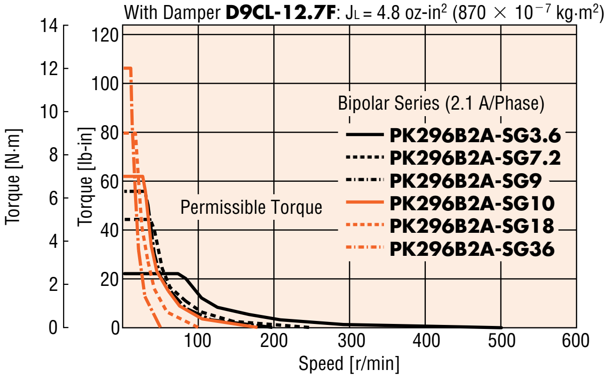
PK296A1B-SG☐ Bipolar (Series) 48 VDC

Power Input: 48 VDC Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in² (870×10^{-7} kg·m²)



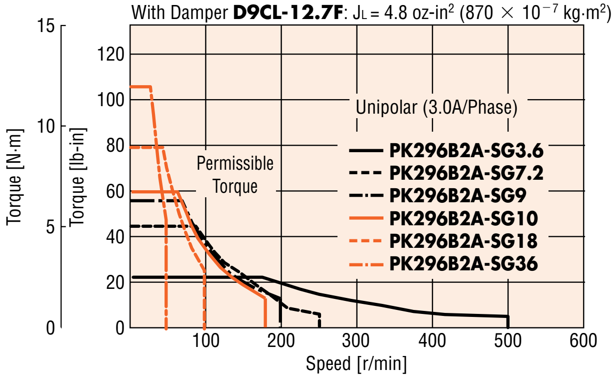
PK296B2A-SG☐ Bipolar (Series) 24 VDC

Power Input: 24 VDC Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in² (870 × 10^{-7} kg·m²)



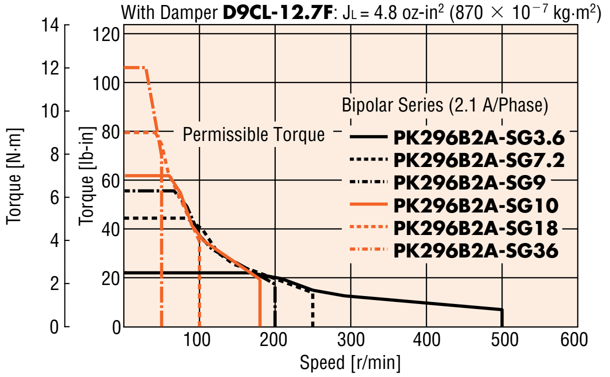
PK296B2A-SG☐ Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in² (870 × 10^{-7} kg·m²)



PK296B2A-SG☐ Bipolar (Series) 48 VDC

Power Input: 48 VDC Bipolar Constant Current Driver
With Damper **D9CL-12.7F**: J_L = 4.8 oz-in² (870 × 10^{-7} kg·m²)



Features C-184 Accessories C-185

□ 2.22 in. (□ 56.4 mm)

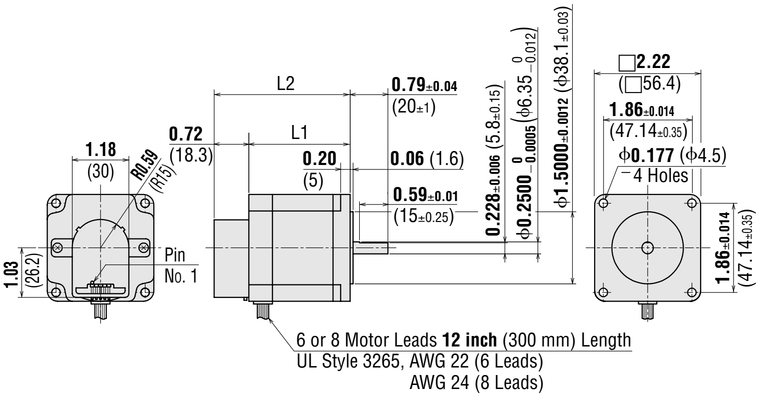
PK Series Standard Type with Encoder

Specifications

Model	Basic Step Angle	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J		Lead Wires
Single Shaft			oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in^2	kg·m^2	
PK264-01AR11	1.8 °	Bipolar (Series)	68	0.48	0.71	8.1	11.4	21.6	0.66	120×10^{-7}	6
PK264-01AR12		Unipolar	55	0.39	1	5.7	5.7	5.4			
PK264-02AR11	1.8 °	Bipolar (Series)	68	0.48	1.4	3.9	2.8	5.6	0.66	120×10^{-7}	6
PK264-02AR12		Unipolar	55	0.39	2	2.8	1.4	1.4			
PK264-03AR11	1.8 °	Bipolar (Series)	68	0.48	2.1	2.6	1.26	2.4	0.66	120×10^{-7}	6
PK264-03AR12		Unipolar	55	0.39	3	1.9	0.63	0.6			
PK264-E2.0AR11 **PK264-E2.0AR12**	1.8 °	Bipolar (Parallel)	68	0.48	2.8	1.96	0.7	1.4	0.66	120×10^{-7}	8
		Bipolar (Series)	68	0.48	1.4	3.9	2.8	5.6			
		Unipolar	55	0.39	2	2.8	1.4	1.4			
PK266-01AR11	1.8 °	Bipolar (Series)	166	1.17	0.71	11	14.8	40	1.64	300×10^{-7}	6
PK266-01AR12		Unipolar	127	0.9	1	7.4	7.4	10			
PK266-02AR11	1.8 °	Bipolar (Series)	166	1.17	1.4	5	3.6	10	1.64	300×10^{-7}	6
PK266-02AR12		Unipolar	127	0.9	2	3.6	1.8	2.5			
PK266-03AR11	1.8 °	Bipolar (Series)	166	1.17	2.1	3.2	1.5	4.4	1.64	300×10^{-7}	6
PK266-03AR12		Unipolar	127	0.9	3	2.3	0.75	1.1			
PK266-E2.0AR11 **PK266-E2.0AR12**	1.8 °	Bipolar (Parallel)	166	1.17	2.8	2.52	0.9	2.5	1.64	300×10^{-7}	8
		Bipolar (Series)	166	1.17	1.4	5	3.6	10			
		Unipolar	127	0.9	2	3.6	1.8	2.5			

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189

Dimensions Scale 1/4, Unit = **inch** (mm)



Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PK264-0□AR11 **PK264-0□AR12** **PK264-E2.0AR11** **PK264-E2.0AR12**	1.54 (39)	2.26 (57.3)	1.03 (0.47)	B808U
PK266-0□AR11 **PK266-0□AR12** **PK266-E2.0AR11** **PK266-E2.0AR12**	2.13 (54)	2.85 (72.3)	1.58 (0.72)	B809U

- Enter the winding specification in the box (□) within the model number.

Encoder Specifications → Page C-239

Connection Diagrams C-189 General Specifications C-240

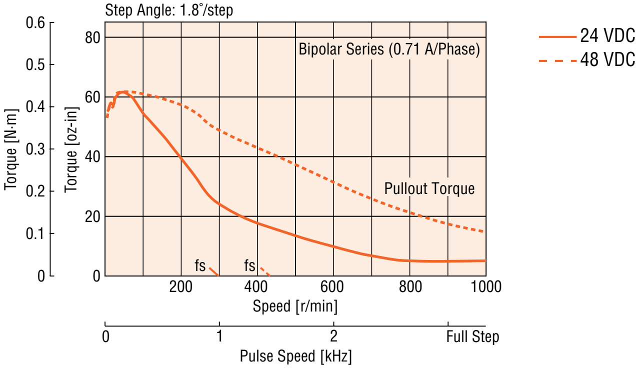
Stepping Motors
□1.10 in. (□28 mm)
□1.38 in. (□35 mm)
□1.65 in. (□42 mm)
□2.22 in. (□56.4 mm)
□2.36 in. (□60 mm)
□3.35 in. (□85 mm)
□3.54 in. (□90 mm)

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

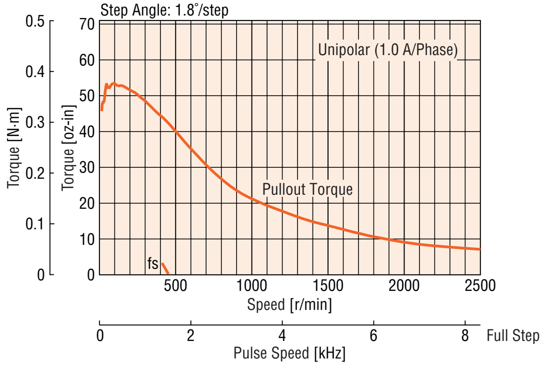
● PK264-01AR11
PK264-01AR12 Bipolar (Series)

Bipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



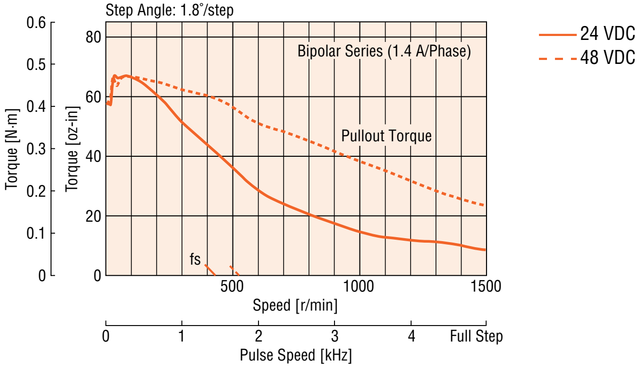
● PK264-01AR11
PK264-01AR12 Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



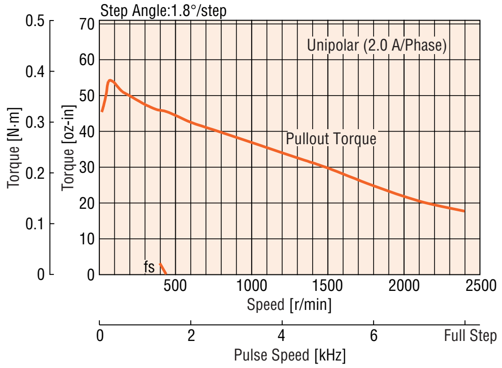
● PK264-02AR11
PK264-02AR12 Bipolar (Series)

Bipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



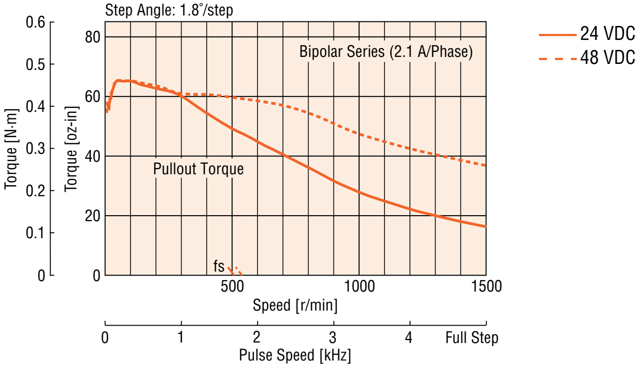
● PK264-02AR11
PK264-02AR12 Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle:1.8°/step



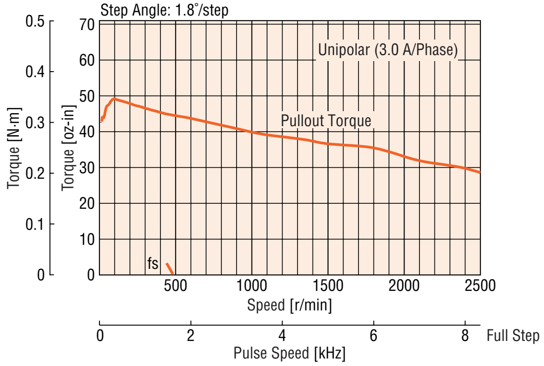
● PK264-03AR11
PK264-03AR12 Bipolar (Series)

Bipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



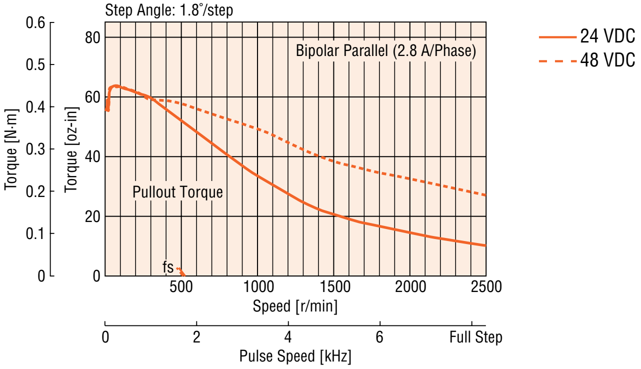
● PK264-03AR11
PK264-03AR12 Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



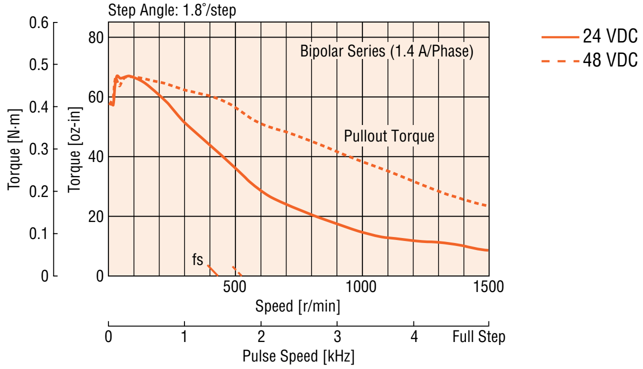
● PK264-E2.0AR11
PK264-E2.0AR12 Bipolar (Parallel)

Bipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



● PK264-E2.0AR11
PK264-E2.0AR12 Bipolar (Series)

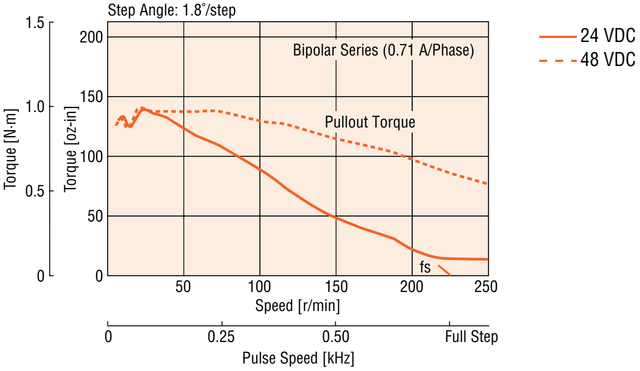
Bipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



Features C-184 Accessories C-185

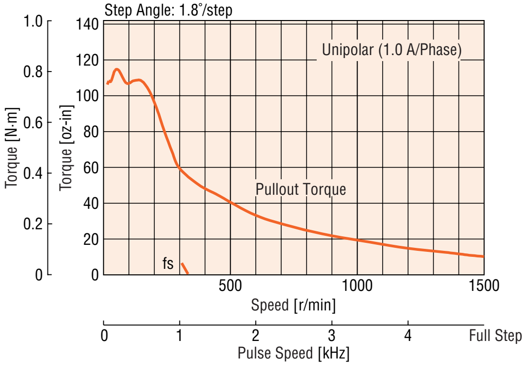
PK266-01AR11
PK266-01AR12 Bipolar (Series)

Bipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



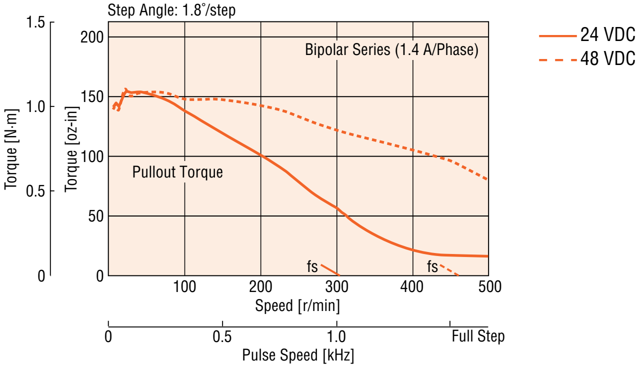
PK266-01AR11
PK266-01AR12 Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



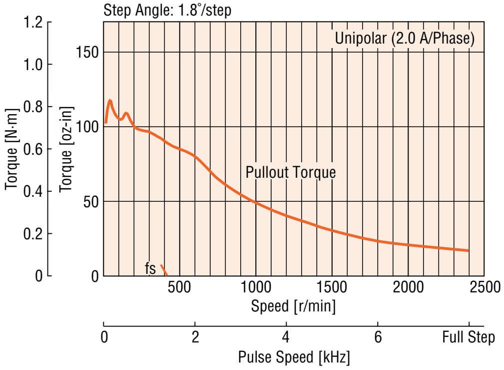
PK266-02AR11
PK266-02AR12 Bipolar (Series)

Bipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



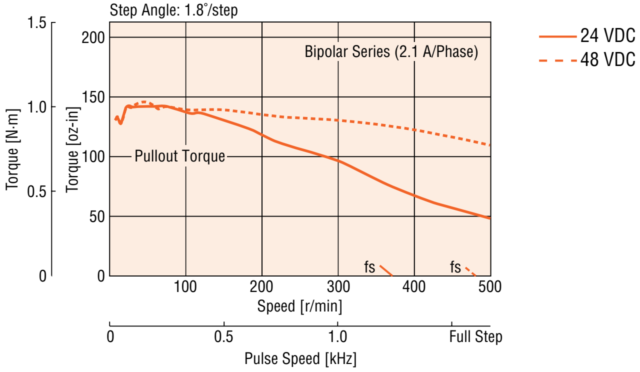
PK266-02AR11
PK266-02AR12 Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
Load Inertia: J_L=0.77 oz-in^2 (140×10^{-7}kg·m^2)
Step Angle: 1.8°/step



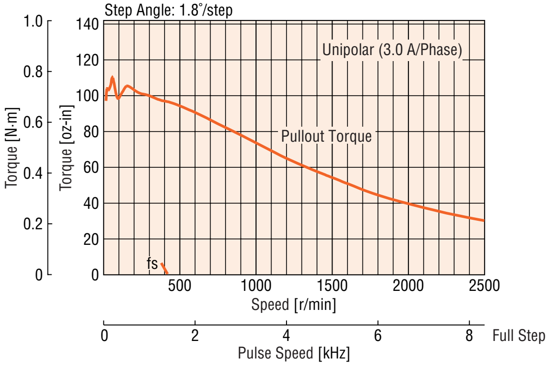
PK266-03AR11
PK266-03AR12 Bipolar (Series)

Bipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



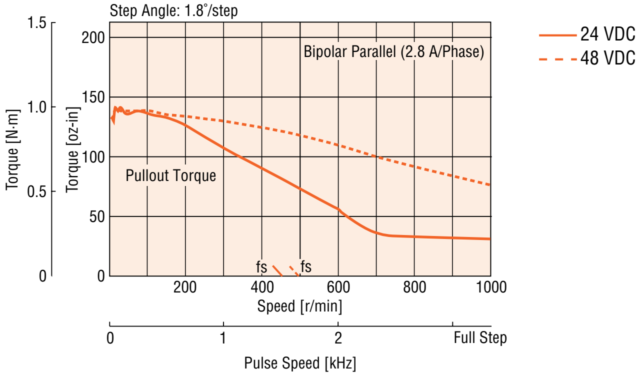
PK266-03AR11
PK266-03AR12 Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 1.8°/step



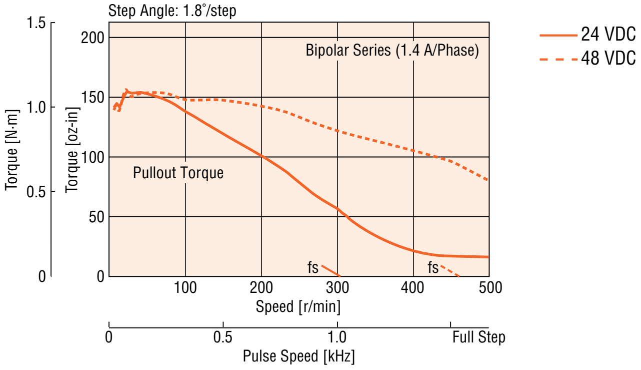
PK266-E2.0AR11
PK266-E2.0AR12 Bipolar (Parallel)

Bipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



PK266-E2.0AR11
PK266-E2.0AR12 Bipolar (Series)

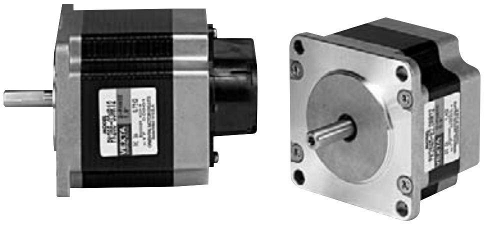
Bipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 1.8°/step



Connection Diagrams C-189 General Specifications C-240

□2.22 in. (□56.4 mm)

PK Series High Resolution Type with Encoder



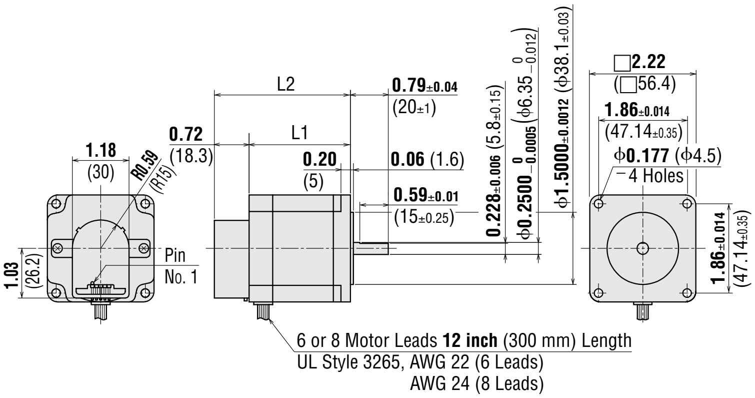
Specifications

Model Single Shaft	Basic Step Angle	Connection Type	Holding Torque		Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J		Lead Wires
			oz-in	N·m	A/phase	VDC	Ω/phase	mH/phase	oz-in²	kg·m²	
PK264M-01AR11	0.9°	Bipolar (Series)	68	0.48	0.71	8.1	11.4	26	0.66	120×10^{-7}	6
PK264M-01AR12		Unipolar	55	0.39	1	5.7	5.7	6.5			
PK264M-02AR11	0.9°	Bipolar (Series)	68	0.48	1.4	3.9	2.8	6.8	0.66	120×10^{-7}	6
PK264M-02AR12		Unipolar	55	0.39	2	2.8	1.4	1.7			
PK264M-03AR11	0.9°	Bipolar (Series)	68	0.48	2.1	2.6	1.26	3	0.66	120×10^{-7}	6
PK264M-03AR12		Unipolar	55	0.39	3	1.9	0.63	0.75			
PK264M-E2.0AR11 **PK264M-E2.0AR12**	0.9°	Bipolar (Parallel)	68	0.48	2.8	1.96	0.7	1.7	0.66	120×10^{-7}	8
		Bipolar (Series)	68	0.48	1.4	3.9	2.8	6.8			
		Unipolar	55	0.39	2	2.8	1.4	1.7			
PK266M-01AR11	0.9°	Bipolar (Series)	166	1.17	0.71	11	14.8	50.8	1.64	300×10^{-7}	6
PK266M-01AR12		Unipolar	127	0.9	1	7.4	7.4	12.7			
PK266M-02AR11	0.9°	Bipolar (Series)	166	1.17	1.4	5	3.6	12.8	1.64	300×10^{-7}	6
PK266M-02AR12		Unipolar	127	0.9	2	3.6	1.8	3.2			
PK266M-03AR11	0.9°	Bipolar (Series)	166	1.17	2.1	3.2	1.5	5.8	1.64	300×10^{-7}	6
PK266M-03AR12		Unipolar	127	0.9	3	2.3	0.75	1.45			
PK266M-E2.0AR11 **PK266M-E2.0AR12**	0.9°	Bipolar (Parallel)	166	1.17	2.8	2.52	0.9	3.2	1.64	300×10^{-7}	8
		Bipolar (Series)	166	1.17	1.4	5	3.6	12.8			
		Unipolar	127	0.9	2	3.6	1.8	3.2			

How to Read Specifications→Page C-9
Motor Wiring Diagrams→Page C-189

Dimensions

Scale 1/4, Unit = **inch** (mm)



Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
PK264M-0□AR11 **PK264M-0□AR12** **PK264M-E2.0AR11** **PK264M-E2.0AR12**	1.54 (39)	2.26 (57.3)	1.03 (0.47)	B808U
PK266M-0□AR11 **PK266M-0□AR12** **PK266M-E2.0AR11** **PK266M-E2.0AR12**	2.13 (54)	2.85 (72.3)	1.58 (0.72)	B809U

- Enter the winding specification in the box (□) within the model number.

Encoder Specifications

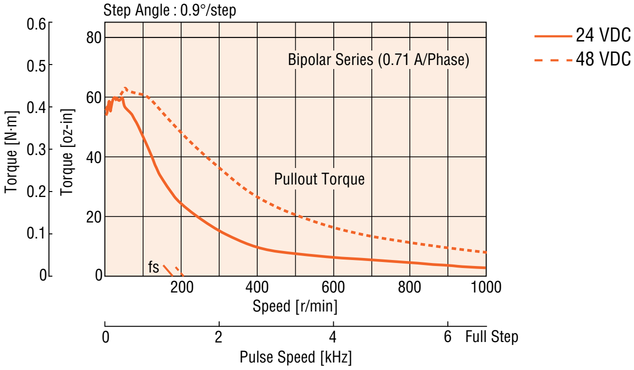
→ Page C-239

Speed–Torque Characteristics

How to Read Speed-Torque Characteristics→Page C-10

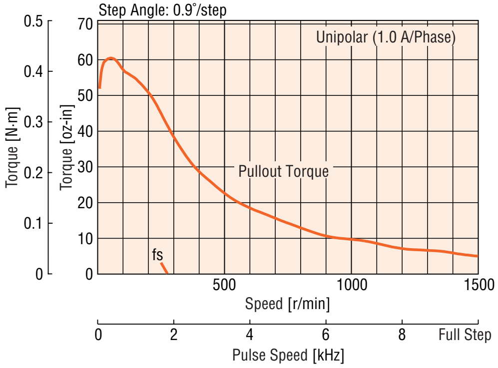
● PK264M-01AR11
PK264M-01AR12 Bipolar (Series)

Bipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



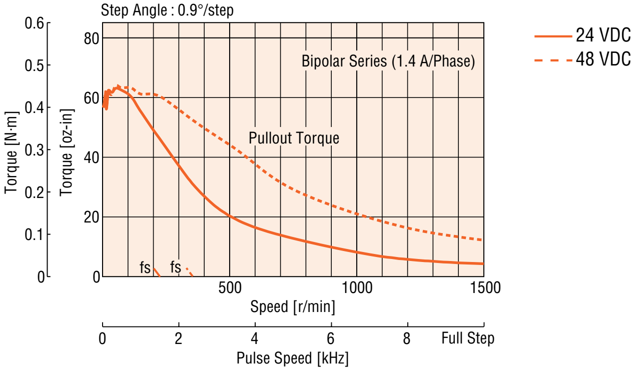
● PK264M-01AR11
PK264M-01AR12 Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 0.9°/step



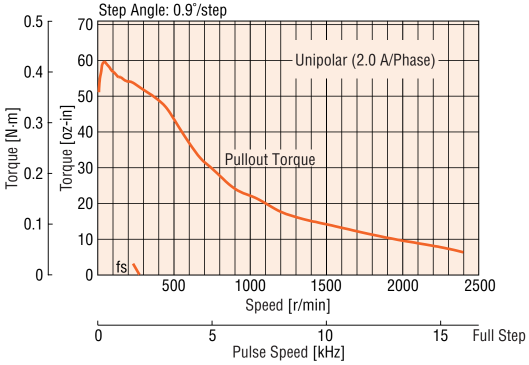
● PK264M-02AR11
PK264M-02AR12 Bipolar (Series)

Bipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



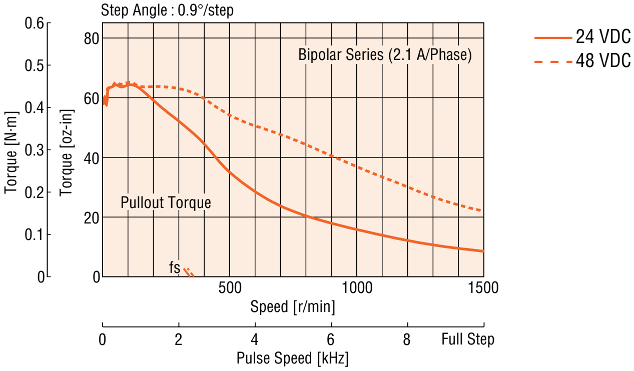
● PK264M-02AR11
PK264M-02AR12 Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 0.9°/step



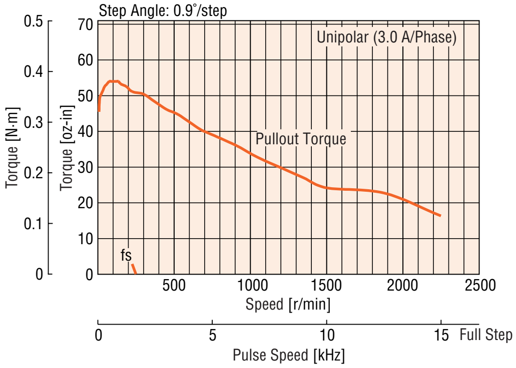
● PK264M-03AR11
PK264M-03AR12 Bipolar (Series)

Bipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



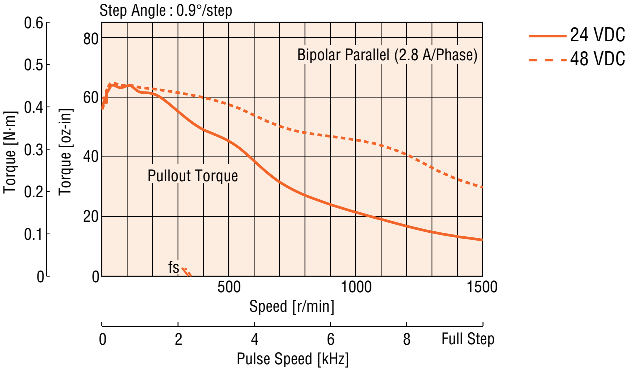
● PK264M-03AR11
PK264M-03AR12 Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140 × 10^{-7} kg·m^2)
Step Angle: 0.9°/step



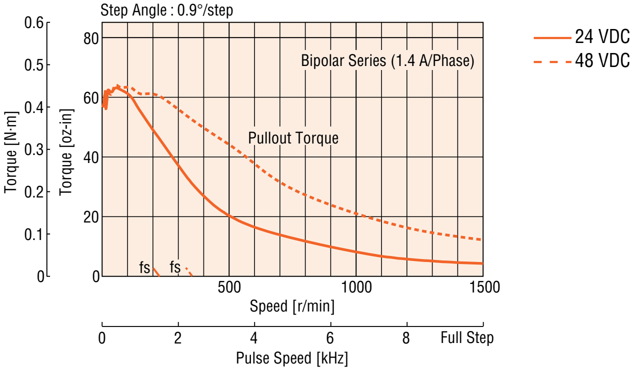
● PK264M-E2.0AR11
PK264M-E2.0AR12 Bipolar (Parallel)

Bipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



● PK264M-E2.0AR11
PK264M-E2.0AR12 Bipolar (Series)

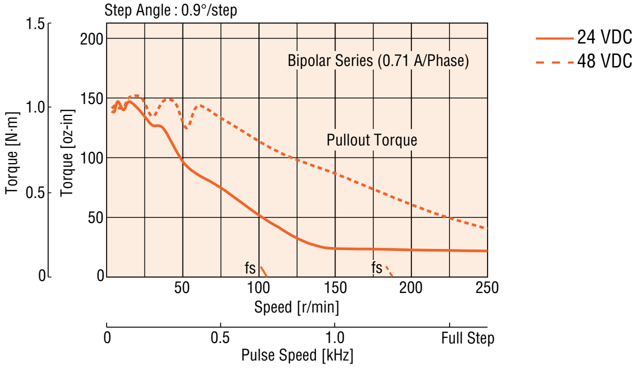
Bipolar Constant Current Driver
Load Inertia: J_L = 0.77 oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



Connection Diagrams C-189 General Specifications C-240

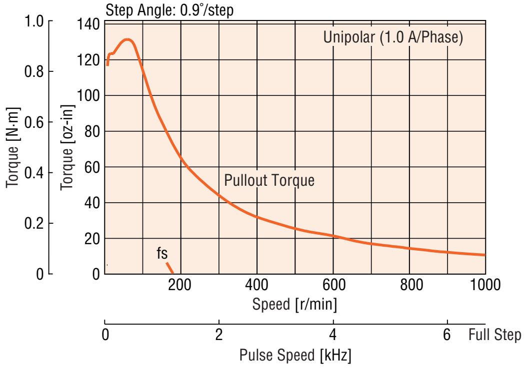
● PK266M-01AR11
PK266M-01AR12 Bipolar (Series)

Bipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



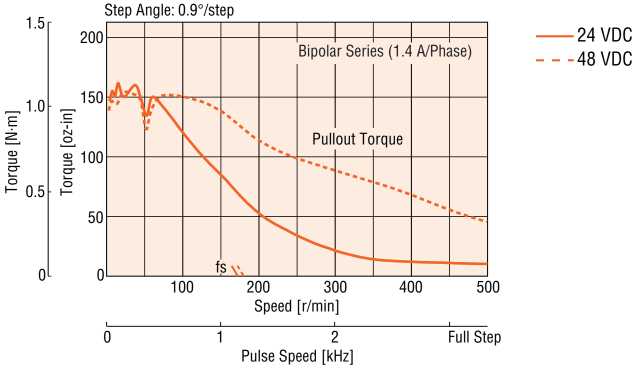
● PK266M-01AR11
PK266M-01AR12 Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 0.9°/step



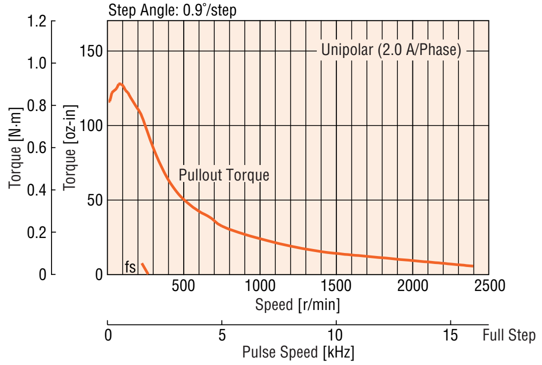
● PK266M-02AR11
PK266M-02AR12 Bipolar (Series)

Bipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 0.9°/step



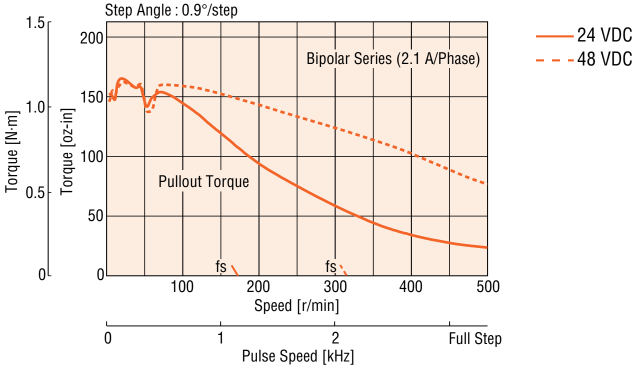
● PK266M-02AR11
PK266M-02AR12 Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 0.9°/step



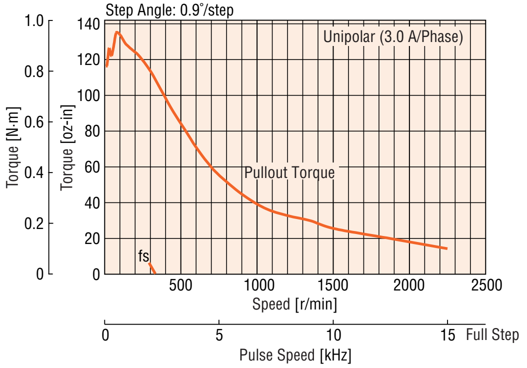
● PK266M-03AR11
PK266M-03AR12 Bipolar (Series)

Bipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



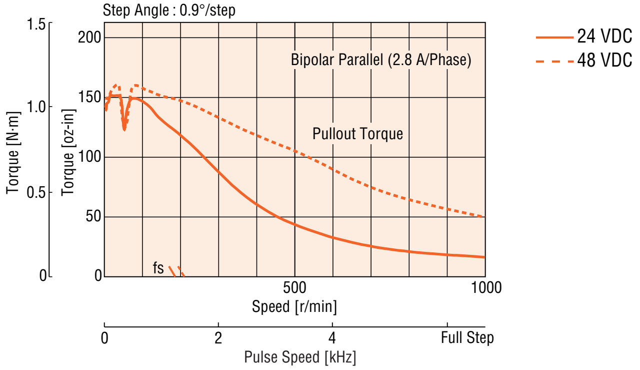
● PK266M-03AR11
PK266M-03AR12 Unipolar

Power Input: 24 VDC Unipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 0.9°/step



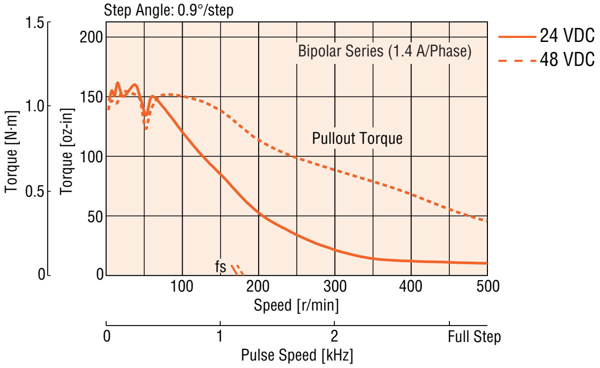
● PK266M-E2.0AR11
PK266M-E2.0AR12 Bipolar (Parallel)

Bipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle : 0.9°/step



● PK266M-E2.0AR11
PK266M-E2.0AR12 Bipolar (Series)

Bipolar Constant Current Driver
Load Inertia: $J_L = 0.77$ oz-in^2 (140×10^{-7} kg·m^2)
Step Angle: 0.9°/step



Encoder Specifications

Note:

- Use the motor within the encoder specifications.
  HEDS-5600 series encoders by Agilent Technologies, Inc. are used.

Recommended Operating Ranges

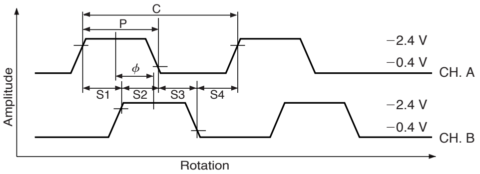
Item	Symbol	Min	TYP.	MAX.	Note
Supplied Voltage	Vcc	4.5 V	5.0 V	5.5 V	Ripple<100 mVp-p
Load Capacity	Cl	—	—	100 pF	2.7 Ω, pull-up
Response Frequency	f	—	—	100 kHz	Rotating speed (r/min)×(N/60)

N=Encoder Resolution

Note:

- The encoder specifications are designed to guarantee operation based on a response frequency of 100 kHz. However, the encoder can be operated at a minimum response frequency of 100 kHz.

Output Waveform



Encoder Characteristics

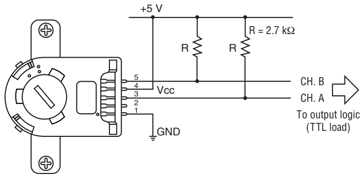
Unless otherwise specified, the following characteristics assume that the encoder is installed within the allowable ranges of error and operated under the recommended operating conditions. Each characteristic value indicates the worst value within one rotation of the code wheel.

Item	Symbol	TYP.*	Max.
Pulse-width error	ΔP	7°e	45°e
Logic-width error	ΔS	5°e	45°e
Phase error	Δϕ	2°e	20°e
Position error	Δθ	10 arc min.	40 arc min.
Cycle error	ΔC	3°e	5.5°e

* TYP values are based on Vcc = 5.0 V and TA = 77°F (25°C).

Encoder Electrical Interface

We recommend that the CH.A and CH.B outputs be pulled up with a resistance of 2.7 kΩ (±10%) in order to shorten the rise time of the output pulse. Install the pull-up resistor near the encoder [within 6.6 feet (1m)].



Pull-up of Encoder Output

Applicable Connectors

Manufacturer	Model Numbers
AMP®	103686-4
	640442-5
DUPONT®	65039-032 (housing)
	4825X-000 (contact)
Agilent Technologies®	HEDS-8902 (for 2 channels: 4 lead wires)
MOLEX®	2695 series (housing)
	2759 series (contact)

Connection Diagrams C-189 General Specifications C-240

General Specifications

Item	Specifications
Shaft Runout	0.002 inch (0.05 mm) T.I.R at top of output shaft ✻1
Perpendicularity	0.003 inch (0.075 mm) T.I.R ✻1
Concentricty	0.003 inch (0.075 mm) T.I.R ✻1
Shaft Radial Play ✻2	0.001 inch (0.025 mm) max. of 1.12 lb. (5 N)
Shaft Axial Play ✻3	0.003 inch (0.075 mm) max. of 2.2 lb. (10 N)
Step Accuracy ✻4	**PK** Series: ±3 arc min. (±0.05°) **PV** Series: ±2 arc min. (±0.034°)
Insulation Resistance	100 MΩ minimum under normal temperature and humidity, when measured by a 500 VDC megger between the motor coils and the motor casing.
Dielectric Strength ✻5	Sufficient to withstand 1.0 kV, 60 Hz applied between the motor coils and casing for one minute, under normal ambient temperature and humidity.
Insulation Class	Class B [266°F (130°C)]
Temperature Rise	Temperature rise of the coil measured by the Change Resistance Method is 144°F (80°F) or less. (at standstill, two phases energized)
Ambient Temperature Range	14°F (−10°C)~122°F (+50°C)

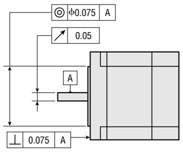
✻1 T.I.R. (Total Indicator Reading): Refers to the total dial gauge reading when the measurement section is rotated one revolution centered on the reference axis center.

✻2 Radial Play: Refers to the displacement in shaft position in the radial direction, when a 1.12 lb. (5 N) load is applied in the radial direction to the motor shaft tip.

✻3 Axial Play: Refers to the displacement in shaft position in the axial direction, when a 2.2 lb. (10 N) load is applied to the motor shaft in the axial direction.

✻4 This value is for full step with no load. (The value changes with size of load.)

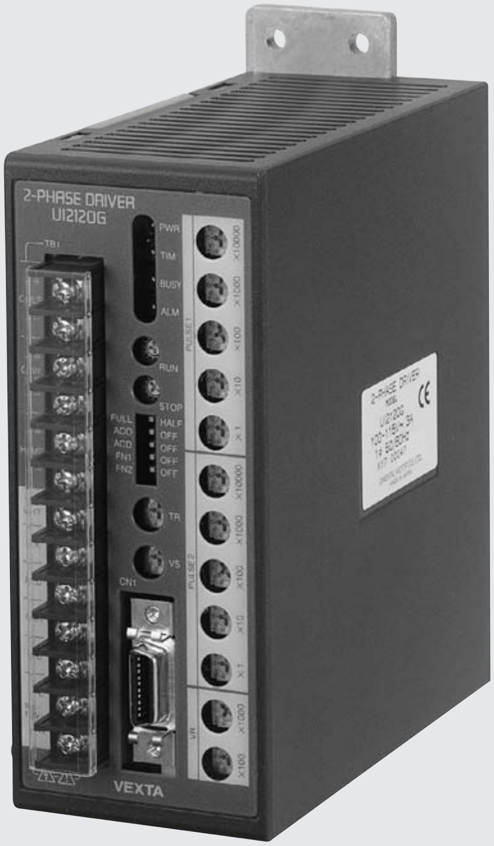
✻5 For motors with a frame size of 1.65 inch sq. (42 mm sq.) or less, 60 Hz, 0.5 kV for 1 minute.



Permissible Overhung Load and Permissible Thrust Load

Unit = Upper values: lb./Lower values: N

Type	Model	Overhung Load Distance from Shaft End [inch (mm)]					Thrust Load
		0	0.2 (5)	0.39 (10)	0.59 (15)	0.79 (20)	
PK Series Standard **P** Type (High Torque)	**PK223P** **PK224P** **PK225P**	5.6 25	7.6 34	11.7 52	—	—	The permissible thrust load [lb. (N)] shall be no greater than the motor mass.
	PK233P, PK235P	4.5 20	5.6 25	7.6 34	11.7 52	—	
	PK244P, PK246P	4.5 20	5.6 25	7.6 34	11.7 52	—	
PK Series Standard Type	**PK243** **PK244** **PK245**	4.5 20	5.6 25	7.6 34	11.7 52	—	
	PK264 **PK264-AR11** **PK264-AR12** **PK266** **PK266-AR11** **PK266-AR12** **PK268**	12.1 54	15 67	20 89	29 130	—	
	PK296 **PK299** **PK2913**	58 260	65 290	76 340	87 390	108 480	
PV Series	**PV264, PV266** **PV267, PV269**	11.2 50	13.5 60	16.8 75	22 100	33 150	
PK Series High Resolution Type	**PK243M** **PK244M** **PK245M**	4.5 20	5.6 25	7.6 34	11.7 52	—	
	PK264M **PK264M-AR11** **PK264M-AR12** **PK266M** **PK266M-AR11** **PK266M-AR12** **PK268M**	12.1 54	15 67	20 89	29 130	—	
PK Series **SH** Geared Type	**PK223-SG□**	3.3 15	3.8 17	4.5 20	5.1 23	—	2.2 10
	PK243-SG□	2.2 10	3.3 15	4.5 20	6.7 30	—	3.3 15
	PK264-SG3.6 **PK264-SG7.2** **PK264-SG9** **PK264-SG10**	6.7 30	9 40	11.2 50	13.5 60	15.7 70	6.7 30
	PK264-SG18 **PK264-SG36** **PK264-SG50** **PK264-SG100**	18 80	22 100	27 120	31 140	36 160	
	PK296-SG□	49 220	56 250	67 300	78 350	90 400	22 100



2-Phase Stepping Motor Driver with Built-in Indexer

UI2120G

Additional Information

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

The **UI2120G** Intelligent Stepping Motor Driver combines a high performance stepping motor driver with microprocessor intelligence and an integrated pulse generator. Motion control features include built-in digital switches to control the amount of travel, initial speed, running speed, acceleration, and deceleration.

Model: **UI2120G**

Features

Minimal Wiring

A driver with an incorporated pulse generator offers simple wiring and easy setup.

Easy Operation

The **UI2120G** includes all functions necessary for controlling a 2-phase stepping motor. Motion control settings include: start, stop, rotation direction, travel amount, speed, acceleration, deceleration, step angle, and return to mechanical home. Data can be easily set by switches on the front control panel.

Compatible Motors

PK Series Standard Type

Motor Frame Size	Model		Basic Step Angle	Maximum Holding Torque		Current A/phase	Page
	Single Shaft	Double Shaft		oz-in	N·m		
1.65 in. 42 mm	**PK243-01AA**	**PK243-01BA**	1.8°	22	0.16	0.95	C-204
	PK244-01AA	**PK244-01BA**		36	0.26	1.2	
	PK245-01AA	**PK245-01BA**		45	0.32	1.2	
2.22 in. 56.4 mm	**PK264-02A**	**PK264-02B**		55	0.39	2	C-214
	PK264-02AR11 **PK264-02AR12**	—		55	0.39	2	C-233
	PK266-02A	**PK266-02B**		127	0.9	2	C-214
	PK266-02AR11 **PK266-02AR12**	—		127	0.9	2	C-233
	PK268-02A	**PK268-02B**		191	1.35	2	C-214
3.35 in. 85 mm	**PK296-01AA**	**PK296-01BA**		310	2.2	2	C-227
	PK299-01AA	**PK299-01BA**		620	4.4	2	
	PK2913-01AA	**PK2913-01BA**		930	6.6	2	

PK Series High Resolution Type

Motor Frame Size	Model		Basic Step Angle	Maximum Holding Torque		Current A/phase	Page
	Single Shaft	Double Shaft		oz-in	N·m		
1.65 in. 42 mm	**PK243M-01AA**	**PK243M-01BA**	0.9°	22	0.16	0.95	C-208
	PK244M-01AA	**PK244M-01BA**		36	0.26	1.2	
	PK245M-01AA	**PK245M-01BA**		45	0.32	1.2	
2.22 in. 56.4 mm	**PK264M-02A**	**PK264M-02B**		55	0.39	2	C-218
	PK264M-02AR11 **PK264M-02AR12**	—		55	0.39	2	C-236
	PK266M-02A	**PK266M-02B**		127	0.9	2	C-218
	PK266M-02AR11 **PK266M-02AR12**	—		127	0.9	2	C-236
	PK268M-02A	**PK268M-02B**		191	1.35	2	C-218

PK Series SH Geared Type

Motor Frame Size	Model		Basic Step Angle	Maximum Holding Torque		Current A/phase	Page
	Single Shaft	Double Shaft		lb-in	N·m		
1.65 in. 42 mm	**PK243A1A-SG3.6**	**PK243B1A-SG3.6**	0.5°	1.77	0.2	0.95	C-212
	PK243A1A-SG7.2	**PK243B1A-SG7.2**	0.25°	3.5	0.4		
	PK243A1A-SG9	**PK243B1A-SG9**	0.2°	4.4	0.5		
	PK243A1A-SG10	**PK243B1A-SG10**	0.18°	4.9	0.56		
	PK243A1A-SG18	**PK243B1A-SG18**	0.1°	7	0.8		
	PK243A1A-SG36	**PK243B1A-SG36**	0.05°	7	0.8		
2.36 in. 60 mm	**PK264A2A-SG3.6**	**PK264B2A-SG3.6**	0.5°	8.8	1	2	C-222
	PK264A2A-SG7.2	**PK264B2A-SG7.2**	0.25°	17.7	2		
	PK264A2A-SG9	**PK264B2A-SG9**	0.2°	22	2.5		
	PK264A2A-SG10	**PK264B2A-SG10**	0.18°	23	2.7		
	PK264A2A-SG18	**PK264B2A-SG18**	0.1°	26	3		
	PK264A2A-SG36	**PK264B2A-SG36**	0.05°	35	4		
3.54 in. 90 mm	**PK296A1A-SG3.6**	**PK296B1A-SG3.6**	0.5°	22	2.5	1.5	C-231
	PK296A1A-SG7.2	**PK296B1A-SG7.2**	0.25°	44	5		
	PK296A1A-SG9	**PK296B1A-SG9**	0.2°	55	6.3		
	PK296A1A-SG10	**PK296B1A-SG10**	0.18°	61	7		
	PK296A1A-SG18	**PK296B1A-SG18**	0.1°	79	9		
	PK296A1A-SG36	**PK296B1A-SG36**	0.05°	106	12		

Dimensions C-245
Connection and Operation C-246

Specifications

Model	**UI2120G**	
Power Source	Single-phase 100 V±15% 50/60 Hz 115 V±15% 60 Hz 3.0 A	
Drive Method	Unipolar constant current drive	
Output Current	2.0 A/phase or less	
Excitation Mode	Full Step (2 phase excitation): 1.8 degree/step Half step (1-2 phase excitation): 0.9 degree/step	
Operation Mode	Positioning Return to Electrical Home Operation Return to Mechanical Home Operation Continuous Operation JOG Operation	
Operating Pulse Speed Setting Range	50 Hz, and 100 Hz to 9900 Hz (100 Hz Units)	
Starting Pulse Speed Setting Range	50 Hz to 900 Hz (10 Hz Units)	
Acceleration/Deceleration Rate Setting Range	0 to 90 ms/kHz (10 ms/kHz Units)	
Move Distance Setting Range	0 to 99999 pulses (1 pulse Units), 2 Settings	
Max. Return Pulse Count	−16,777,215∼+16,777,215	
Input Signals	Start Slowdown stop Emergency stop Rotation direction Index selection Operation mode Output current off signal	Photocoupler input Internal pull-up −10 VDC, 2.2 kΩ, Source current 4.5 mA TYP
	Limit sensor (CWLS, CCWLS and HOME)	Photocoupler input Input resistance 4.7k Ω, 24 VDC maximum, Input current 5 mA maximum
Output Signals	Excitation timing BUSY Alarm	Photocoupler, Open collector output (emitter common) External use condition 24 VDC maximum, 10 mA maximum
Functions	Step angle switch, Automatic current off, Automatic current cutback, Limit sensor input method switch, Rotation direction switch for return to mechanical home	
	Alarm output	Overheat detection, Limit sensor detection, Failure in return to mechanical home position
Indicators (LED)	Power input, Excitation timing output, BUSY output, Alarm output	
Cooling Method	Convection	
Weight	1.8 lb (0.8 kg)	
Insulation Resistance	100MΩ minimum under normal temperature and humidity, when measured by a 500 VDC megger between the following places: ● Power input terminal – ground terminal ● Motor output terminal – ground terminal ● Signal input / output terminals – power input terminal ● Signal input / output terminals – motor output terminal	
Dielectric Strength	Sufficient to withstand the following for one minute, under normal temperature and humidity: ● Power input terminal – ground terminal 1.5 kVAC 50 Hz ● Motor output terminal – ground terminal 1.5 kVAC 50 Hz ● Signal input / output terminals – power input terminal 3.0 kVAC 50 Hz ● Signal input / output terminals – motor output terminal 3.0 kVAC 50 Hz	
Ambient Temperature Range	32 °F∼104°F (0°C∼+40 °C) (nonfreezing)	

Notes:
- Power supply input current value is the maximum input current value of the driver. It differs according to the motor used, current setting and pulse rate.
- Do not test the insulation resistance or dielectric strength when the motor and driver are connected.

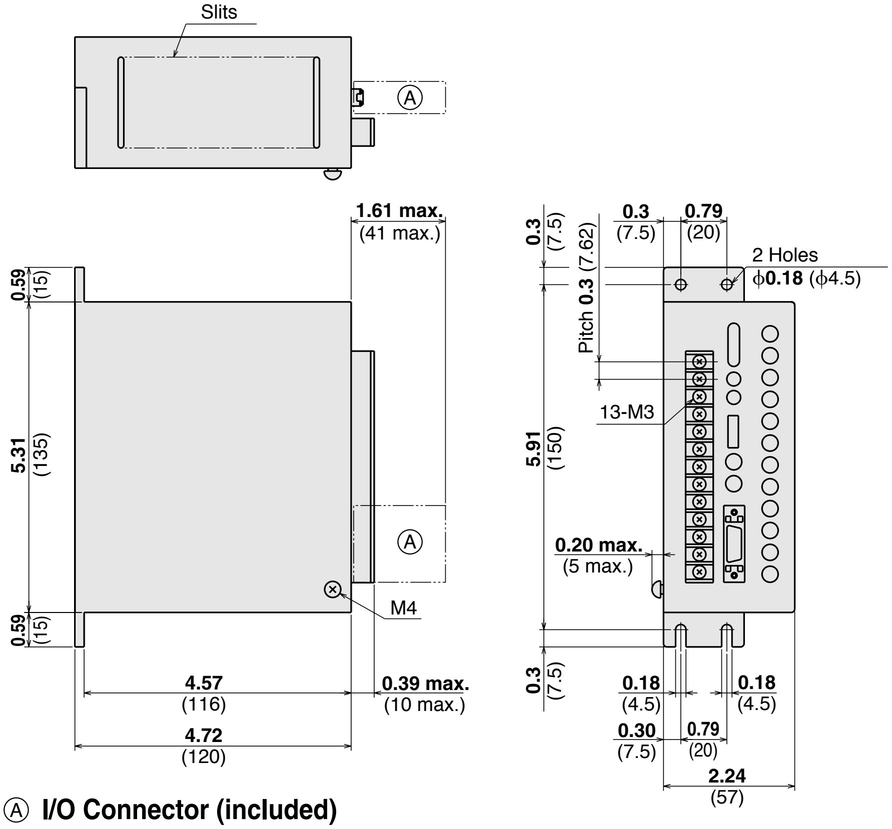
Features C-242 Compatible Motors C-243 Specifications C-244

Dimensions Scale 1/4, Unit = **inch** (mm)

UI2120G

Weight: 1.8 lb. (0.8 kg)

DXF B265



Ⓐ **I/O Connector (included)**

Connector: 54306-2011 (MOLEX)

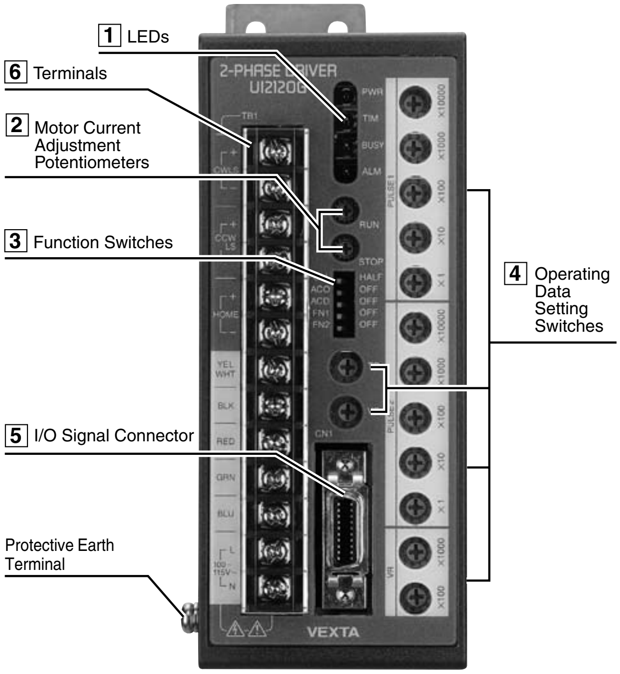
Connector Cover: 54331-1201 (MOLEX)

Dimensions C-245 Connection and Operation C-246

Connection and Operation

Driver Functions

Driver Front Panel



1 Signal Monitor Display

LED Monitor Display

Indication	LED Name	Color	Condition when LED ON
PWR	Power input	Green	Lights during single phase 100 VAC±15% 50/60 Hz input 115 VAC±15% 60 Hz input
TIM	Excitation timing output	Green	Lights during excitation timing signal output.
BUSY	Busy output	Green	Lights during busy signal output.
ALM	Alarm output	Red	Lights or flashes during alarm signal output.

2 Motor Current Adjustment Potentiometers

Indication	Potentiometer Name	Factory Setting	Function
RUN	RUN	Min. Value	For adjusting current when the motor is operating.
STOP	STOP	Min. Value	For adjusting current reduced by automatic current cutback function at motor standstill.

3 Function Switches

Indication	Switch Name	Factory Setting	Function
FULL/HALF	Step angle	FULL	Selects full or half step.
ACO/OFF	Automatic current off	ACO	Turns off motor current automatically when the driver's internal temperature rises to 185 °F (+85 °C) or more.
ACD/OFF	Automatic current cutback	ACD	Reduces motor current automatically at motor standstill.
FN1/OFF	Limit sensor input method	FN1	Selects NO or NC-type sensor. NO sensor selected when set to FN1. NC sensor selected when set to OFF.
FN2/OFF	Rotation direction for return to mechanical home	FN2	Rotation starts in clockwise direction when set to FN2, and in counterclockwise direction when set to OFF.

4 Operating Data Setting Switch

Indication	Switch Name	Factory Setting	Function
PULSE1	Index #1 selector	All 0	Sets the number of motor steps. Five switches allow for settings from 0 to 99,999 steps.
PULSE2	Index #2 selector	All 0	Sets the number of motor steps. Five switches allow for settings from 0 to 99,999 steps.
VR	Operating pulse rate setting	All 0	Sets the output pulse rate of the built-in generator. Motor speed depends on the output pulse rate.
TR	Acceleration/deceleration rate setting	0	Sets the pulse acceleration and deceleration rates. The lower the switch setting, the higher the acceleration/deceleration rate. When the switch is set to 0, operation is performed without acceleration or deceleration.
VS	Starting pulse rate setting	0	Sets the first pulse rate when pulse generation starts. Motion starts at the VS set value and accelerates until VR is reached. Slowdown starts at the VR set value and decelerates to reach the VS set value.

Features C-242 Compatible Motors C-243 Specifications C-244

5 I/O Signal Connector

Pin No.	Type	Signal	Description
1	Input Signals	Start signal	Starts operation in each mode.
2		Slowdown/stop	Slows the motor during positioning operation and stops it. In continuous operation mode, speed is reduced to VS and operation is continued at a constant speed. This is disabled in the return to mechanical home mode.
3		Emergency stop signal	Stops operation in any mode.
4		Rotation direction signal	Selects the rotation direction in each operation mode (except for return to mechanical home and return modes).
5		Travel index signal	Selects the index number in positioning mode.
6, 7, 8		Operation mode signal	Selects operation mode.
9		Output current off signal	Stops the supply of current to the motor. When this signal is input, the motor does not function even if a start signal is input.
10		GND	For input signals.
11	Output Signals	Excitation timing signal	Shows that the motor excitation sequence is at step 0; output when the motor excitation (winding where current flows) is in the initial state.
12		Busy signal	Output when the motor is running or the driver cannot accept the start signal.
13		Alarm signal	Output when the temperature within the driver has risen to 185 °F (+85 °C) or when the limit switch has tripped .
20		COM	For output signals.

Operation Mode Switching Signal

Operation Mode Switching Signal Input			Operation Mode
Pin No. 6	Pin No. 7	Pin No. 8	
OFF	OFF	OFF	Positioning
ON	OFF	OFF	Return to electrical home
OFF	ON	OFF	Return to mechanical home
ON	ON	OFF	Return to mechanical home based on timing signal synchronization
OFF	OFF	ON	Continuous
ON	OFF	ON	JOG

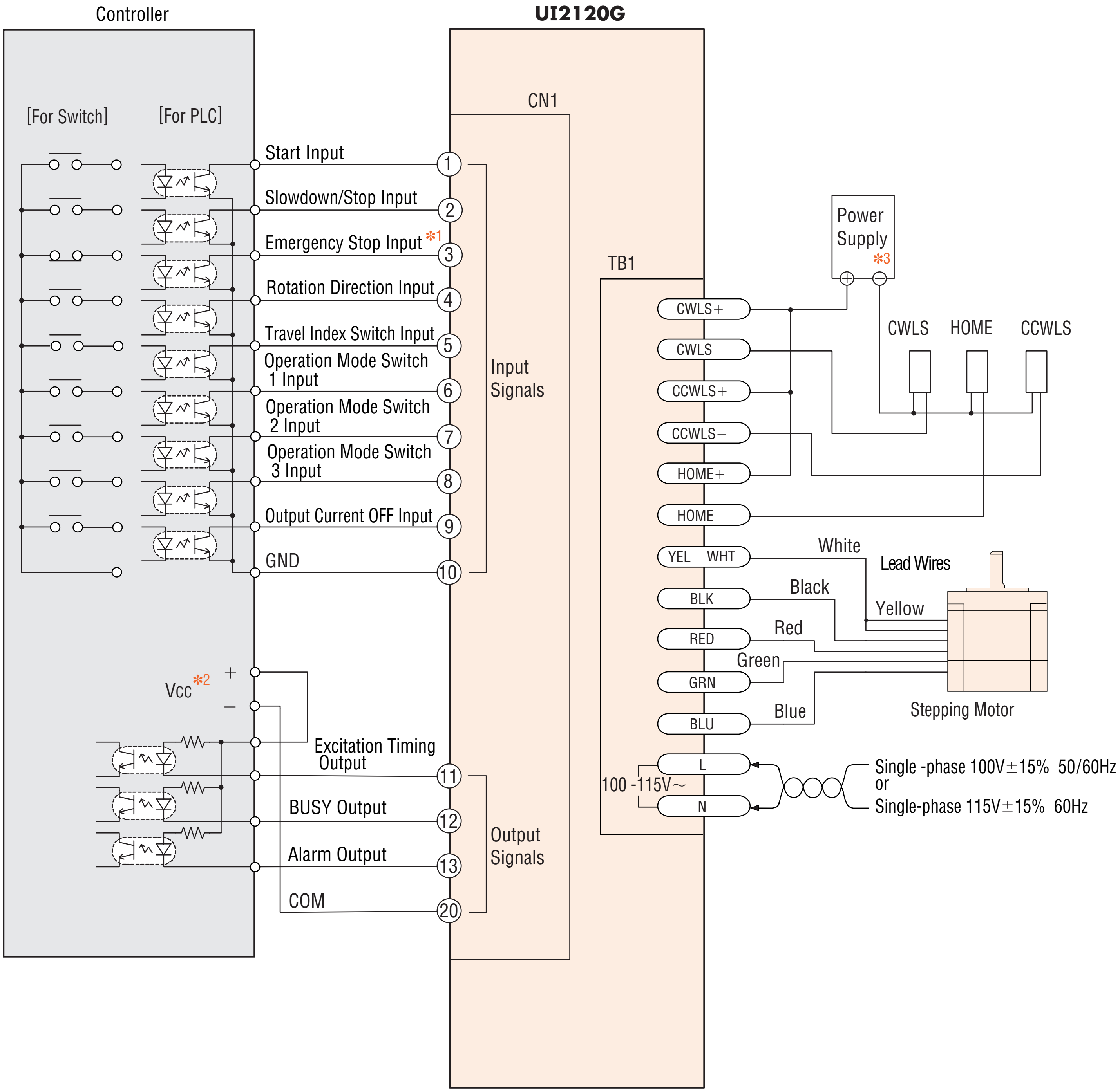
- Any combination not in the table above is ignored and operation is not performed even if the startup signal is input.

6 Terminals

Pin No.	Indication		Terminal Name	Connection
1	CWLS	+	CW limit sensor/ switch input	Limit sensor for the clockwise direction
2		−		
3	CCWLS	+	CCW limit sensor/ switch input	Limit sensor for the counterclockwise direction
4		−		
5	HOME	+	Home position sensor input	Mechanical home position sensor
6		−		
7	YEL / WHT		Yellow/white motor lead connection	Yellow/white motor lead wire
8	BLK		Black motor lead connection	Black motor lead wire
9	RED		Red motor lead connection	Red motor lead wire
10	GRN		Green motor lead connection	Green motor lead wire
11	BLU		Blue motor lead connection	Blue motor lead wire
12	100-115 VAC	L	Power connection	Single-phase 100 VAC±15% 50/60 Hz 115 VAC±15% 60 Hz
13		N		

Dimensions C-245 Connection and Operation C-246

Connection Diagrams



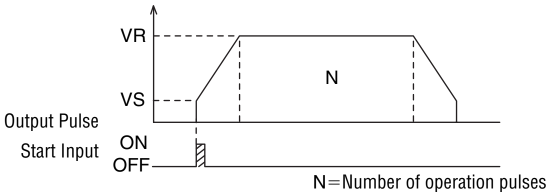
*1 Always use the emergency stop input in the ON (Normally Closed) state.
*2 The voltage of Vcc should not be over 24 VDC and 10 mA.
*3 24 VDC or less, input current 5 mA or less.

Features C-242 Compatible Motors C-243 Specifications C-244

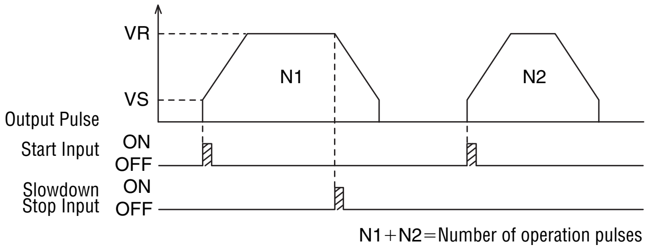
Operation Modes

Positioning Mode

This is the mode where the distance traveled is performed automatically based on the number of operation pulses set on the travel setting switch (PULSE 1 or PULSE 2), and is stopped after that. Operation is performed at the speed set on the **VR** switch.



If slowdown/stop signals are input during positioning operation, the motor will stop after slowdown. If you input the start signal again, the motor rotates the remaining number of the set pulses for operation.

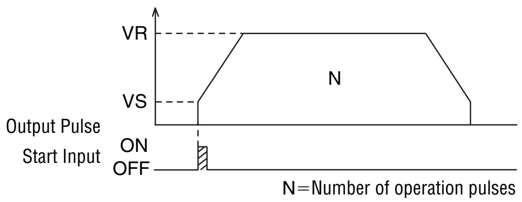


Return Operation Mode

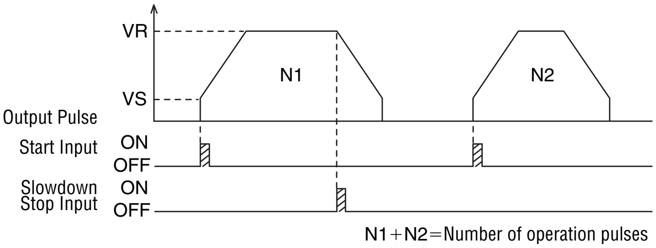
In this mode, the amount of travel is calculated between the current position and the start point (electrical home position) where positioning is started, and the motor return automatically to the start point.

(Automatic calculation is possible when the total travel is within ±16777215 pulses. If this range is exceeded, you cannot go back to the start position.)

When the emergency stop is input, that position becomes the new start point.



When the slowdown/stop signal is input during the return operation, the motor stops after slowdown. If a start signal is input, the motor restarts the return operation to move to the electrical home position.



Return to Mechanical Home Operation Mode

The mechanical home position refers to the reference position of the equipment set by the home sensor. This is the operation mode where the CW and CCW limit sensors mounted on the equipment are used to perform rotation automatically to reach the home position (mechanical home position) where rotation stops. Return to the home position is possible from any position according to a specified sequence while checking the current positions by three sensors. You can change the direction of starting the operation using the selector switch (FN2/OFF).

Operation example: The startup point is between the CCWLS and HOME

(When the switch to select the rotation direction in return to mechanical home position is FN2)

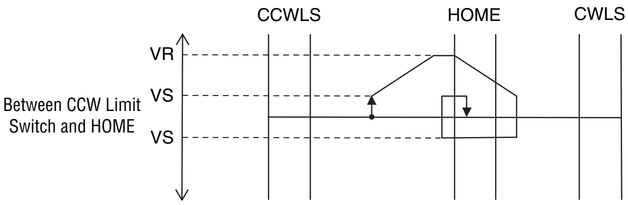
① Operation is started in the clockwise direction by the input of a start signal.

② When the home position has been detected, operation starts at the VS in the reverse direction after a slowdown and stop.

③ When the home position is detected again and is turned off, operation starts at the VS in the reverse direction.

④ When HOME is input, the motor stops.

Home position detection operation startup direction: CW



Notes:

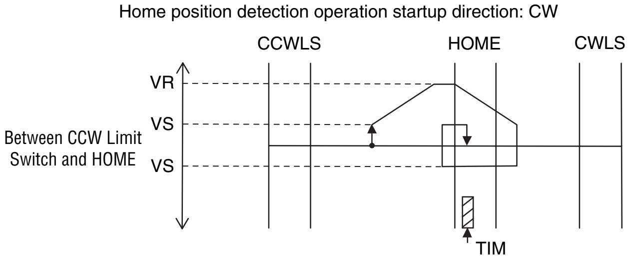
- Return to mechanical home operation varies according to the motor position when start signal is input.
- After return to mechanical home operation, the mechanical home position will become the electrical home position.

Return to Mechanical Home Operation Based on Timing Signal Synchronization

For return to mechanical home operations using only the home position sensor, the home position may deviate or vary due to the home position sensor error or installation error. In this case, you can maintain accuracy by AND-ing the timing signal produced by the driver and the signal of home position sensor. Use of the timing synchronization function allows the home position detecting accuracy to be kept within ±1 pulse of the motor.

Return to mechanical home operation based on timing signal synchronization is the return to mechanical home operation AND-ed automatically with timing signal inside the driver. The operation is the same as that of normal return to mechanical home operation.

- The home sensor position must be adjusted to the position where the driver timing signal is generated.



Note:
Return to mechanical home operation based on timing signal synchronization varies according to the motor position when start signal is input.

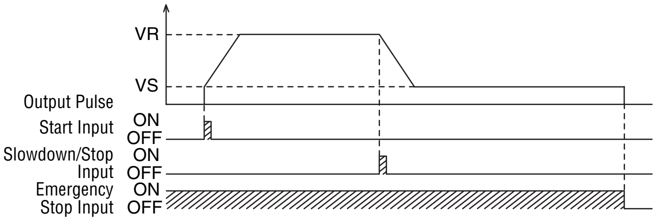
◆ Jog Operation Mode

This is a pulse-by-pulse operation mode convenient for fine positioning of the stepping motor shaft. When the startup signal is input, the motor moves only one step. If startup signal input is continued for one second or more in the jog operation mode, continuous operation will be started at 30 Hz and the motor is stopped when the start signal input is stopped.

◆ Continuous Operation Mode

In this mode, operation is continued until the emergency stop signal is input.

If the slowdown/stop signal is input during the operation, the speed is reduced to the startup pulse speed (VS); then rotation is carried out at a constant speed until the emergency stop is input.



Controllers for Stepping Motors

Additional Information

Controllers for Stepping Motors

EMP400 Series

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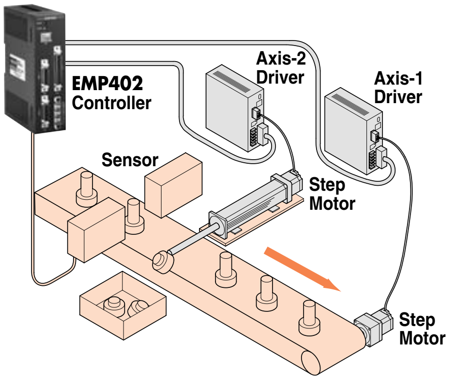
- Coordinated 2-axis moves via linear interpolation operation
- Step pulse rate up to 200 kHz
- General I/O: 8 inputs and 6 outputs
- Optional **OP300** operator interface unit available
- Ability to change velocity “on the fly”
- Also available as a single axis controller



SC8800
SC8800E

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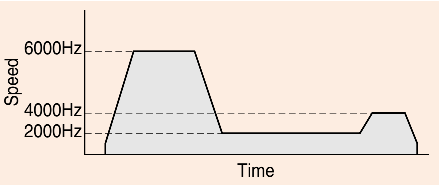
- Encoder feedback
- Stand-alone single axis operation
- Select programs using a programmable controller
- Step pulse rate up to 800 kHz
- General I/O: 4 inputs and 2 outputs
- Daisy chain up to 35 axes



SG8030J

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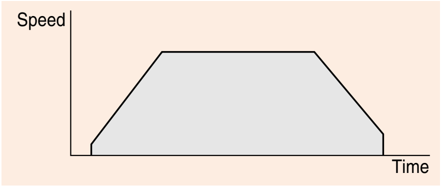
- Compact and simple controller
- Sequence control of four positioning operations
- Selective control of four positions
- Select operating modes using a programmable controller
- Step pulse rate up to 200 kHz

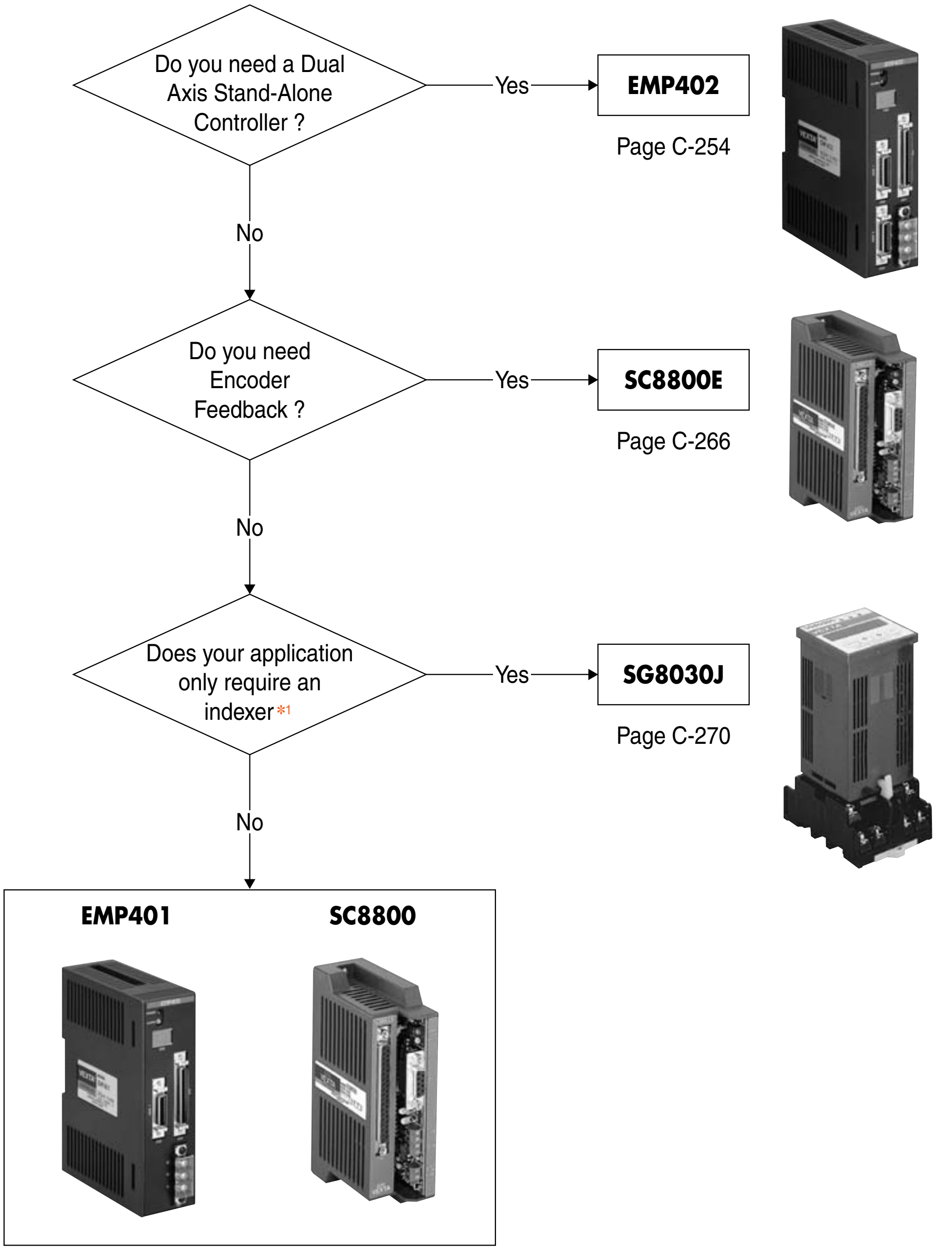
DIN Rail-Mount Model
SG8030J-D

Panel-Mount Model
SG8030J-U



Controller Selection Guide

Based on the needs of your application, determine the controller which best fits your needs.



[1] An Indexer is a device that provides step and direction output pulses, but does not have general (programmable) inputs or outputs.

Controller Comparison

	Dual Axis Motion Control	Serial Communication Port (RS232C)	Daisy Chain [2]	Math Function	Encoder Feedback Connection	Sequences	Startup Program [3]	Homing Function	Maximum Pulse Frequency	Inputs	Outputs
EMP402	YES	YES	NO	NO	NO	33 (1000 commands max.)	YES	YES	200 kHz	8 General + 22 Dedicated	6 General + 10 Dedicated
EMP401	NO	YES	NO	NO	NO	33 (1000 commands max.)	YES	YES	200 kHz	8 General + 15 Dedicated	6 General + 7 Dedicated
SC8800E	NO	YES	35 Devices	YES	YES	50 or 8 Kb of memory	YES	YES	800 kHz	4 General + 9 Dedicated	2 General + 4 Dedicated
SC8800	NO	YES	35 Devices	YES	NO	50 or 8 Kb of memory	YES	YES	800 kHz	4 General + 6 Dedicated	2 General + 4 Dedicated
SG8030J	NO	NO	NO	NO	NO	1 Sequence or 4 Data Positions	NO	YES	200 kHz	6 Dedicated	3 Dedicated

[2] Multiple controllers connected to one host communication port.

[3] A startup program executes when the controller is powered on. The **SG8030J** uses a START input to execute a sequence.

Programmable Motion Controller
EMP400 Series

The **EMP400** Series controllers allow easy programming using simple commands. The dual axis model provides coordinated moves via linear interpolation.
Various motion profiles can be achieved by using up to 32 sequence programs. 1 program can be dedicated as a STARTUP program.

Single axis model: **EMP401**

Dual axis model: **EMP402**

Features

Pulse Oscillation

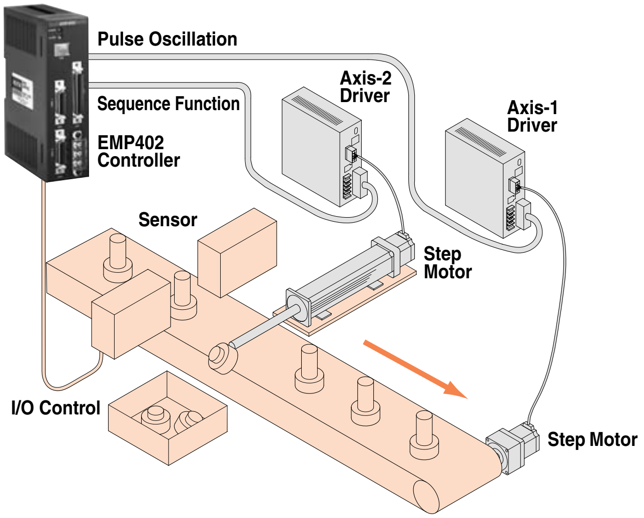
Various operation commands are provided for positioning operation, return-to-home operation and dual axis linear interpolation functions. The operator only needs to set the parameters.

Sequence Function

A series of operation patterns can be programmed using dedicated commands. This is an ideal function for distributed system control.

I/O Control

General-purpose I/O signals are provided in addition to dedicated I/Os such as pulse output and limit-sensor input. Synchronization with peripherals is also possible.



Function

Pulse Oscillation

● Fast Response Time

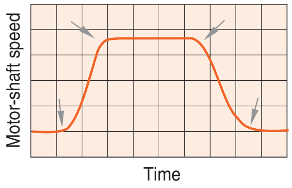
The time between a START signal input and a pulse output is 2 ms or less.

● High-Speed Positioning & Low Vibration

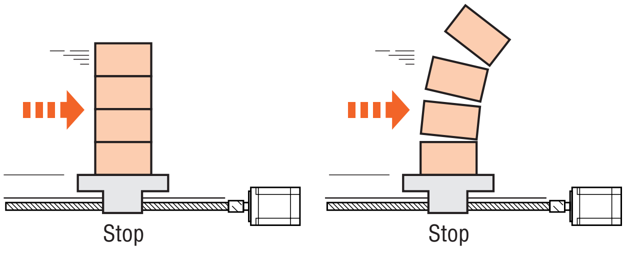
The jerk-limit control function allows you to set a shorter acceleration/deceleration time compared with the use of linear acceleration/deceleration patterns. This reduces the overall positioning time.

> **What is jerk-limit control?**
> This term refers to the acceleration/deceleration patterns used to ensure the smoothness of speed change at the start of operation or when the machine enters a constant-speed mode from an acceleration mode. Since speed change becomes more smooth, vibration is reduced.

Motor Velocity Profile



Effect of Type on Positioning Time



With jerk-limit control

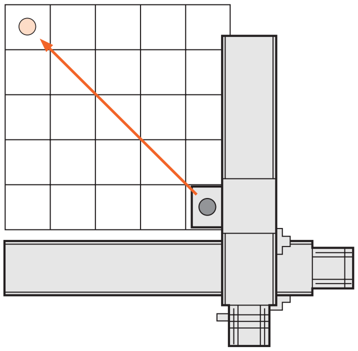
No jerk-limit control

● Positioning Operation

Supports both incremental mode (travel amount) and absolute mode (absolute-position).

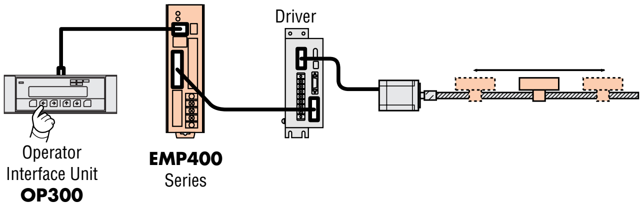
● Linear Interpolation Operation

Two axes are controlled simultaneously, allowing direct movement to a target position.



● Teaching Function

The amount of travel can be changed by jogging the load into position via the **OP300** interface.

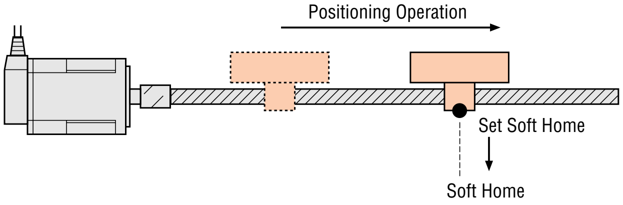


● Continuous Operation

Pulse output continues until a specified input is received or a specified time is reached.

● Set Soft Home (Clears the current position)

The controller has an internal absolute position counter. “0” position in this counter is soft home. The ability to set a voluntary position to soft home is available using RTNCR command.



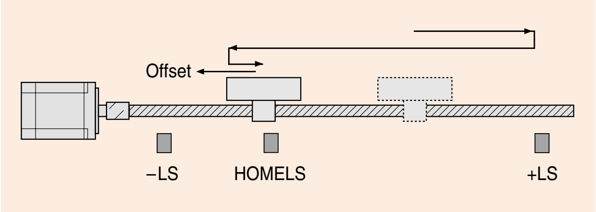
● Homing

Ability to seek for a sensor representing a positioning reference point (home) is available.
Also available is the ability to set an offset from the home position.

High-speed return (three-sensor mode)

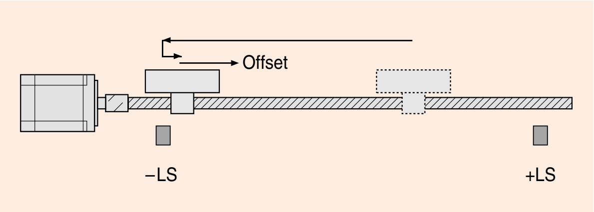
Using a predetermined sequence, the mechanical unit returns home at high speed from any position with three sensors monitoring the current position.

Since it’s possible to specify the direction in which the home sensor is entered, backlash error doesn’t occur in applications where positioning accuracy is critical.



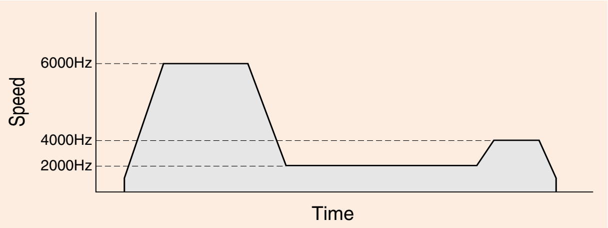
Constant-speed return (two-sensor mode)

The mechanical unit returns home at a constant speed. This mode is effective when a compact slider is operated, since the stroke can be fully utilized.



● Speed Change on the Fly

Speed can be changed on the fly during continuous operation.

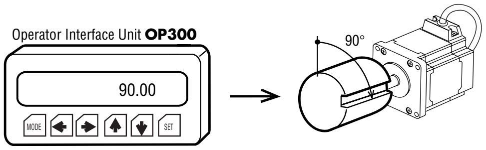


● A Choice of Acceleration/Deceleration Patterns

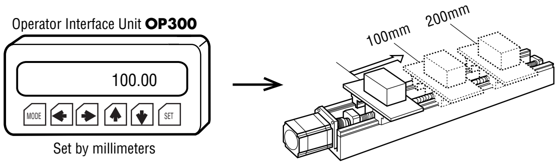
Each operation can be programmed using linear patterns or jerk-limit control.

● Distance Options

Set travel amount using various scaling units such as pulses, millimeters, or degrees.



Set by angle

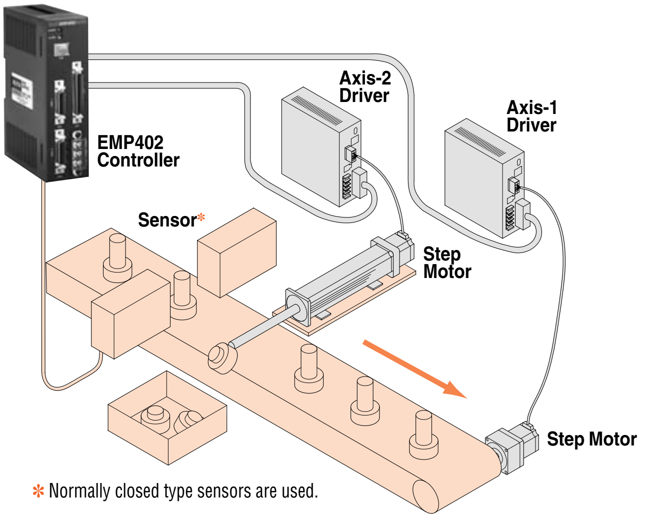


Set by millimeters

Dimensions C-260 Connection and Operation C-261 Accessories C-264

Sequence Function

Connect a motor for transferring products to axis 1, another motor for ejecting nonconforming products to axis 2, and a sensor for detecting the height of transferred products to one of the general-purpose inputs.



✻ Normally closed type sensors are used.

● Application Description

① Transfer products via an index move of 30,000 pulses (axis 1).
② Detect the height of the product using the sensor (general-purpose input 1).
③ Return to ① if the detection result is acceptable.
④ If the detection result is not acceptable, perform an index move of 30,000 pulses and eject the nonconforming product (axis 2). Return to ② and perform acceptability judgment for the next product.

Sample Code for Application Example

```
     [ 1] V1 10000    ; Axis 1 (transfer)      Operating speed 10 kHz
     [ 2] D1 +30000   ; Axis 1 (transfer)      Travel amount 30,000 pulses
 ①→[ 3] INC1        ; Axis 1 (transfer)      Incremental positioning operation
     [ 4] DELAY 0.5   ; Wait for 0.5 sec.
②③→[ 5] CJMP 1,0,3  ; Acceptability judgment (general-purpose input 1 = sensor)
                      ; OFF = Go to step [3] if OK
                      ; ON = Go to next step if NG
 ④→[ 6] INC1        ; Axis 1 (transfer)      Incremental positioning operation
     [ 7] DELAY 0.5   ; Wait for 0.5 sec.
     [ 8] V2 5000     ; Axis 2 (ejection)      Operating speed 5,000 Hz
     [ 9] D2 +1000    ; Axis 2 (ejection)      Travel amount 1,000 pulses
     [10] ABS2        ; Axis 2 (ejection)      Absolute positioning operation
     [11] D2 0        ; Axis 2 (ejection)      Travel amount 0 pulse
     [12] ABS2        ; Axis 2 (ejection)      Absolute positioning operation
     [13] JMP 5       ; Jump to step [5]
```

I/O Control

In addition to the signals for controlling the **EMP400** series (e.g., start, emergency stop, ready), a full range of other signals are available, including those necessary for motor control (e.g., pulse, alarm, limit sensor, home sensor) and general-purpose I/Os.

Control I/O (Dedicated)

START Input
E-STOP Input
READY Output
MOVE Output
END Output
etc.

Motor Control I/O (Dedicated)

PULSE Output
DIRECTION Output
CCR Output
ALARM Input
END Input
TIMING Input
HOMELS Input
SLIT Input
etc.

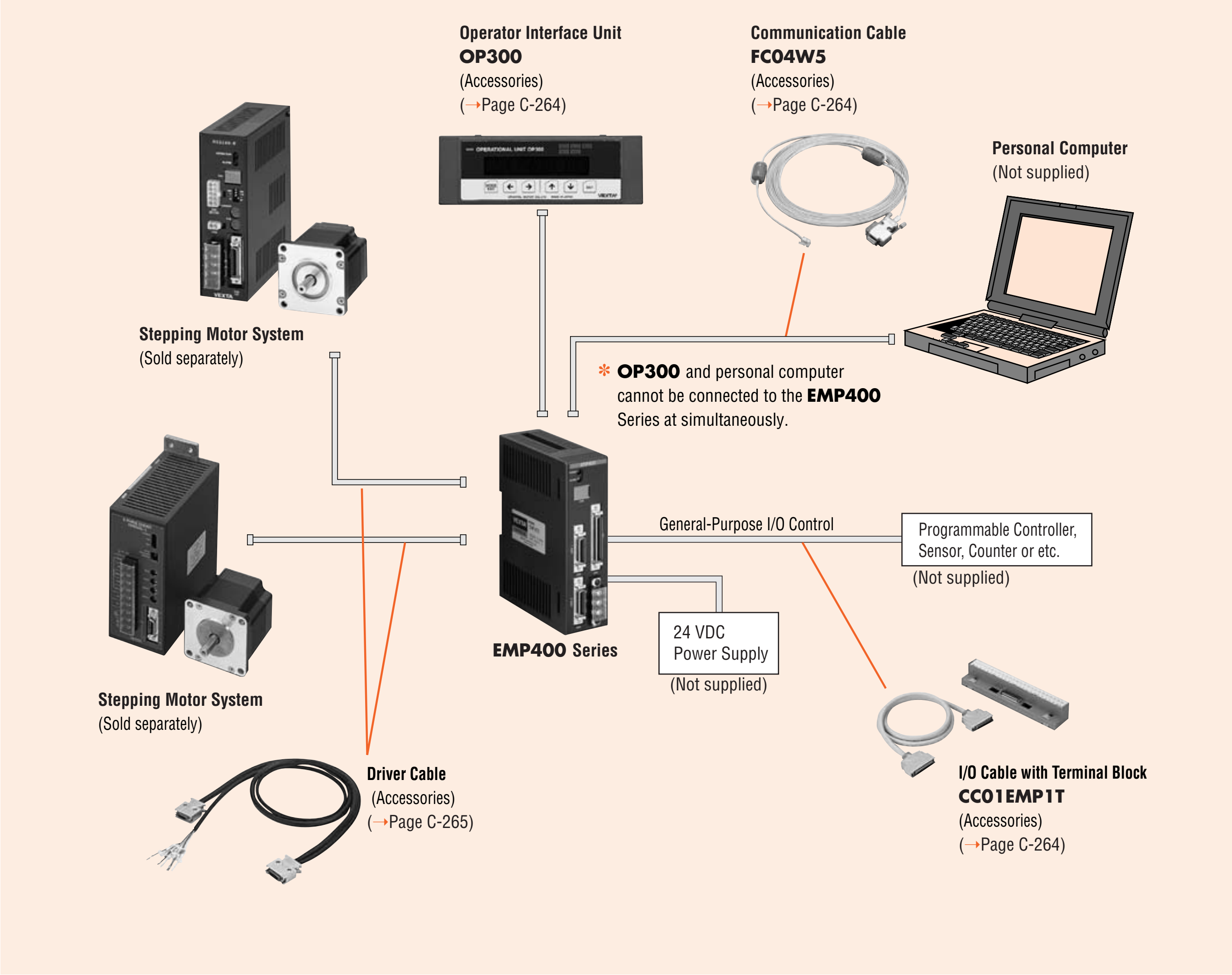
General Purpose I/O

8 inputs
6 outputs

These signals can be easily controlled using conditional branching and timer processing.

Features C-254 System Configuration C-257 Specifications C-260

System Configuration



Product Number Code

EMP40 1 - 1

Connector
1: Without connectors
2: With connectors

Number of axes
1: Single axis
2: Dual axis

EMP400 Series

Product Line

Type	Number of Axes	Connector
EMP401-1	Single axis	Without connectors
EMP401-2		With connectors
EMP402-1	Dual axis	Without connectors
EMP402-2		With connectors

Dimensions C-260 Connection and Operation C-261 Accessories C-264

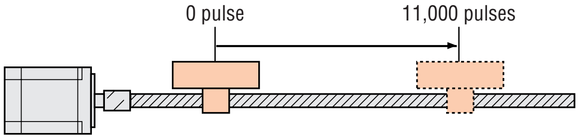
Command List

Command		Description
Motor control	ABS	Perform the positioning operation with the absolute position specified.
	INC	Perform the positioning operation with the relative position specified.
	MHOME	Perform the return to mechanical home operation.
	SCAN	Perform continuous operation.
	RESET	Reset the software.
	RTNCR	Set the current position to 0 (clear).
	RUN	Execute the sequence program.
	S	Decelerate the motor to a stop.
Data setting	D	Set the travel amount and positioning data.
	DOWEL	Set the operating intervals (dwell time).
	H	Set the direction of rotation.
	OFS	Set the offset travel amount.
	RAMP	Set the acceleration/deceleration pattern and jerk limit time.
	T	Set the acceleration/deceleration rate.
	V	Set the operating speed.
	VS	Set the starting speed.
Program control	CJMP	Jump to a specified step when a given condition is satisfied.
	JMP	Jump to a specified step.
	DELAY	Set the delay time.
	MU	Set parallel processing.
	LOOP	Set the loop.
	ENDL	End the loop section.
	END	End the sequence program.
	IN	Wait for input.
	OUT	Control the general-purpose output.
Hardware setting	ACTL	Switch the logic setting for the sensor and alarm.
	EEN	Set the use of END input.
	ETIME	Set the END output time.
	ID	Perform the initial setting for a linear motion product.
	PULSE	Set the pulse-output mode.
	SEN	Set the home-detection mode.
	TIM	Set the use of TIM input and SLIT input.
	UNIT	Set the unit for travel amount.
Others	EDIT	Edit the sequence program.
	DEL	Delete the sequence program.
	DWNLD	Download the sequence program.
	UPLD	Upload the sequence program.
	R	Check the system conditions.

Features C-254 System Configuration C-257 Specifications C-260

Sample Programs

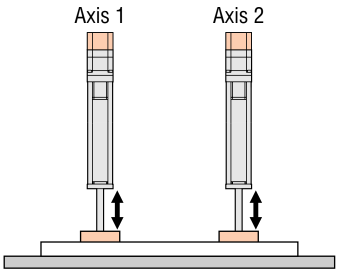
Sample. 1 Positioning operation



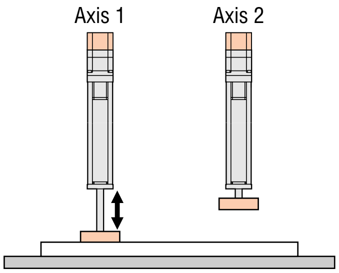
```
[1] VS1 500        ; Starting speed   500 Hz
[2] V1 1000        ; Operating speed   1,000 Hz
[3] T1 30.0        ; Acceleration/deceleration rate   30.0 ms/kHz
[4] D1 +11000      ; Travel amount   11,000 pulses
[5] INC1           ; Execute relative positioning operation
```

Sample. 2 Inputting multiple operation patterns

Simultaneous positioning of two axes



Axis 2 moves after axis 1 moves.

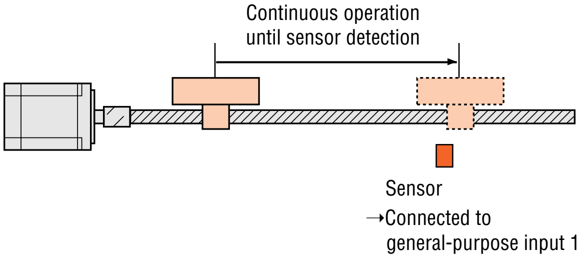


```
Seq 99             ; Hardware Setting
[1] UNIT1 0.02,1   ; Axis 1   Change to travel amount mm
[2] UNIT2 0.02,1   ; Axis 2   Change to travel amount mm

Seq 1              ; 2 axis execute at same time
[1] V1 1000        ; Axis 1   Operating speed 1,000 Hz
[2] D1 +50         ; Axis 1   Travel amount 50 mm
[3] D2 +50         ; Axis 2   Travel amount 50 mm
[4] ABSC           ; Axes 1, 2  Execute absolute positioning operation
[5] DELAY 1.0      ; Pause at 1-second internal timer
[6] D1 0           ; Axis 1   Travel amount 0 mm
[7] D2 0           ; Axis 2   Travel amount 0 mm
[8] ABSC           ; Axes 1, 2  Execute absolute positioning operation

Seq 2              ; After axis 1 executes, axis 2 executes
[1] V1 1000        ; Axis 1   Operating speed 1,000 Hz
[2] D1 +50         ; Axis 1   Travel amount 50 mm
[3] ABS1           ; Axis 1   Execute absolute positioning operation
[4] D1 0           ; Axis 1   Travel amount 0 mm
[5] ABS1           ; Axis 1   Execute absolute positioning operation
[6] V2 2000        ; Axis 2   Operating speed 2,000 Hz
[7] D2 +50         ; Axis 2   Travel amount 50 mm
[8] ABS2           ; Axis 2   Execute absolute positioning operation
[9] D2 0           ; Axis 2   Travel amount 0 mm
[10] ABS2          ; Axis 2   Execute absolute positioning operation
```

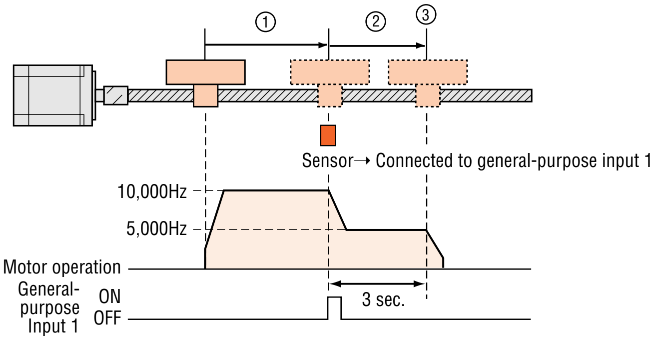
Sample. 3 Positioning using a sensor



```
[1] VS1 500        ; Starting speed   500 Hz
[2] V1 20000       ; Operating speed   20,000 Hz
[3] T1 30.0        ; Acceleration/deceleration rate   30.0 ms/kHz
[4] H1 +           ; Direction of rotation   + (CW direction)
[5] SCAN1          ; Start continuous operation
[6] IN 1,1         ; General-purpose input 1   Waiting for ON
[7] S1             ; Decelerate to a stop
```

Sample. 4 Multistep speed-change operation

① Continuous operation at 10,000 Hz
② Decelerate to 5,000 Hz upon sensor detection
③ Decelerate to a stop after three seconds



```
[1] VS1 500        ; Starting speed   500 Hz
[2] V1 10000       ; Operating speed   10,000 Hz
[3] T1 30.0        ; Acceleration/deceleration rate   30.0 ms/kHz
[4] H1 +           ; Direction of rotation   + (CW direction)
[5] SCAN1          ; Start continuous operation
[6] IN 1,1         ; General-purpose input 1   Waiting for ON
[7] V1 5000        ; Decelerate to 5,000 Hz
[8] DELAY 3.0      ; Wait time 3 seconds
[9] S1             ; Decelerate to a stop
```

Specifications

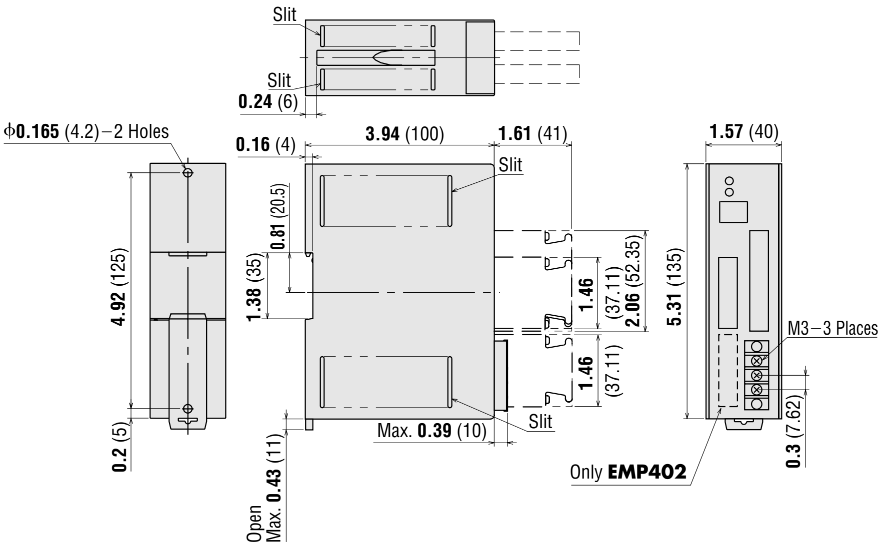
Program	Number of programs	32			
	Capacity	1,000 commands			
	Input method	Command input via terminal program			
Oscillator Specifications	Number of control axes	**EMP401**: Single axis · **EMP402**: Dual axis			
	Pulse output mode	1- or 2-pulse output mode			
	Frequency	10 to 200 kHz (1-Hz increment) Pulse duty 50% (Fixed)			
	Acceleration/deceleration rate	0.5 to 1,000 ms/kHz (0.1 - ms/kHz increments)			
	Acceleration/deceleration pattern	Linear/jerk-limit control			
	Travel amount	Incremental: −16,777,215∼+16,777,215 pulse Absolute: −8,388,608∼+8,388,607 pulse			
Operation Pattern		Incremental Operation	Absolute Operation	Mechanical Home Seeking	Continuous Operation
	Linear acceleration/deceleration	✔	✔	✔	✔
	Jerk-limit control	✔	✔	✔	✔
	Dual axis linear interpolation operation	✔	✔	×	×
	Speed change on the fly	×	×	×	✔
Communication Specifications	Communication method	RS-232C based (3-wire)			
	Parameters	Baud rate fixed at 9,600, 8 data bits, 1 stop bit, no parity			
Input/Output Signal Specifications	Inputs (START, E-STOP, S-STOP)	3 photocoupler inputs 24 VDC, Input resistance 5.4 kΩ			
	Outputs (MOVE, ALM, READY, END)	4 open-collector outputs 24 VDC, 25 mA Max. each			
	General-purpose inputs	8 photocoupler inputs 24 VDC, Input resistance 5.4 kΩ			
	General-purpose outputs	6 open-collector outputs 24 VDC, 25 mA Max. each			
	Driver and sensor inputs	7 (**EMP401**) / 14 (**EMP402**) photocoupler inputs 12 VDC, input resistance 2.7 kΩ			
	Driver outputs	3 (**EMP401**) / 6 (**EMP402**) open-collector outputs 12 VDC, 20 mA Max. each			
General Specifications	Power requirement	24 VDC ±5%, Current Consumption 0.45 A			
	Dimensions	W 1.57 in. (40 mm) × H 5.31 in. (135 mm) × D 3.94 in. (100 mm)			
	Weight	0.57 lb. (0.26 kg)			
	Ambient temperature	32°F∼122°F (0°C∼+50°C) (nonfreezing)			
	Ambient humidity	20% ∼ 85% (noncondensing)			

✔ : Available × : Not Available

Dimensions Scale 1/4, Unit = **inch** (mm)

Weight: 0.57 lb. (0.26 kg)

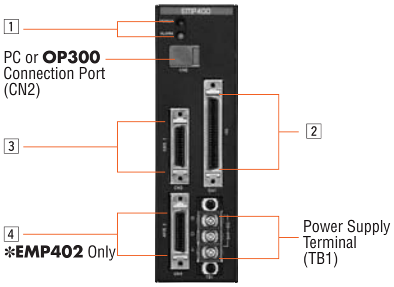
DXF B295



Features C-254 System Configuration C-257 Specifications C-260

Connection and Operation

Connector Layout



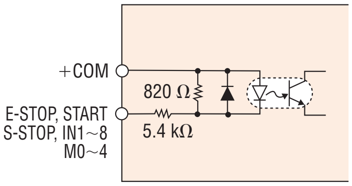
1 LED Monitor Display

Indication	Condition when LED ON
POWER	Lights during 24 VDC input.
ALARM	Lights during alarm signal output.

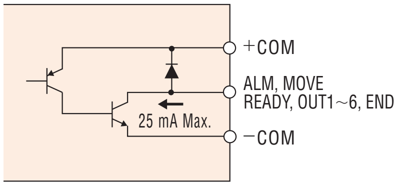
2 CN1 I/O Signal Connector

Pin No.	Signal	Description	Pin No.	Signal	Description
1	—	Not used	26	—	Not used
2	E-STOP Input	Emergency Stop	27	ALM Output	Alarm
3	START Input	Execute Sequence Program	28	—	Not used
4	S-STOP Input	Cease Sequence Execution	29	MOVE Output	Outputting Pulses
5	—	Not used	30	—	Not used
6	—	Not used	31	READY Output	Ready to accept START input
7	+COM Input	I/O Power Supply (+24 VDC)	32	+COM Input	I/O Power Supply (+24V)
8	IN1 Input	General Inputs	33	M0 Input	Sequence Number Selection
9	IN2 Input		34	M1 Input	
10	IN3 Input		35	M2 Input	
11	IN4 Input		36	M3 Input	
12	IN5 Input		37	M4 Input	
13	IN6 Input		38	—	Not used
14	IN7 Input		39	—	Not used
15	IN8 Input		40	—	Not used
16	+COM Input	I/O Power Supply (+24 VDC)	41	—	Not used
17	OUT1 Output	General Outputs	42	—	Not used
18	OUT2 Output		43	—	Not used
19	OUT3 Output		44	—	Not used
20	OUT4 Output		45	—	Not used
21	OUT5 Output		46	—	Not used
22	OUT6 Output		47	—	Not used
23	—	Not used	48	—	Not used
24	—	Not used	49	END Output	End Signal
25	−COM Input	GND for I/O	50	−COM Input	GND for I/O

Internal Input Circuit



Internal Output Circuit



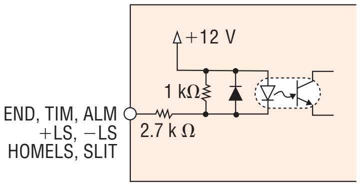
Dimensions C-260 | Connection and Operation C-261 | Accessories C-264

3 CN3 Axis-1 Driver Connector
4 CN4 Axis-2 Driver Connector

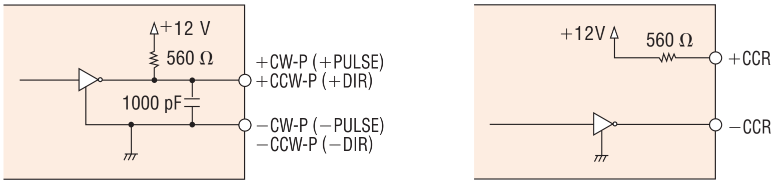
Pin No.	Signal	Description	Pin No.	Signal	Description
1	+CW-P output (+PULSE output) *	CW pulse (pulse) *	14	—	Not used
2	−CW-P output (−PULSE output) *		15	—	Not used
3	+CCW-P output (+DIR output) *	CCW pulse (Direction of rotation) *	16	+CCR output	Counter-clear
4	−CCW-P output (−DIR output) *		17	−CCR output	
5	END input	END signal from driver	18	GND	GND signal from driver
6	TIM input	Timing signal from driver	19	—	Not used
7	ALM input	Alarm signal from driver	20	—	Not used
8	+LS input	CW limit sensor	21	—	Not used
9	−LS input	CCW limit sensor	22	—	Not used
10	HOMELS input	Home limit sensor	23	—	Not used
11	SLIT input	Slit sensor	24	—	Not used
12	+12 V output	Power source for sensor (140 mA max.)	25	+5 V output	Power source for timing signal (20 mA max.)
13	GND	GND for sensor	26	GND	GND for timing signal

* The values in parentheses are for 1-pulse output mode. The other values are for 2-pulse output mode.

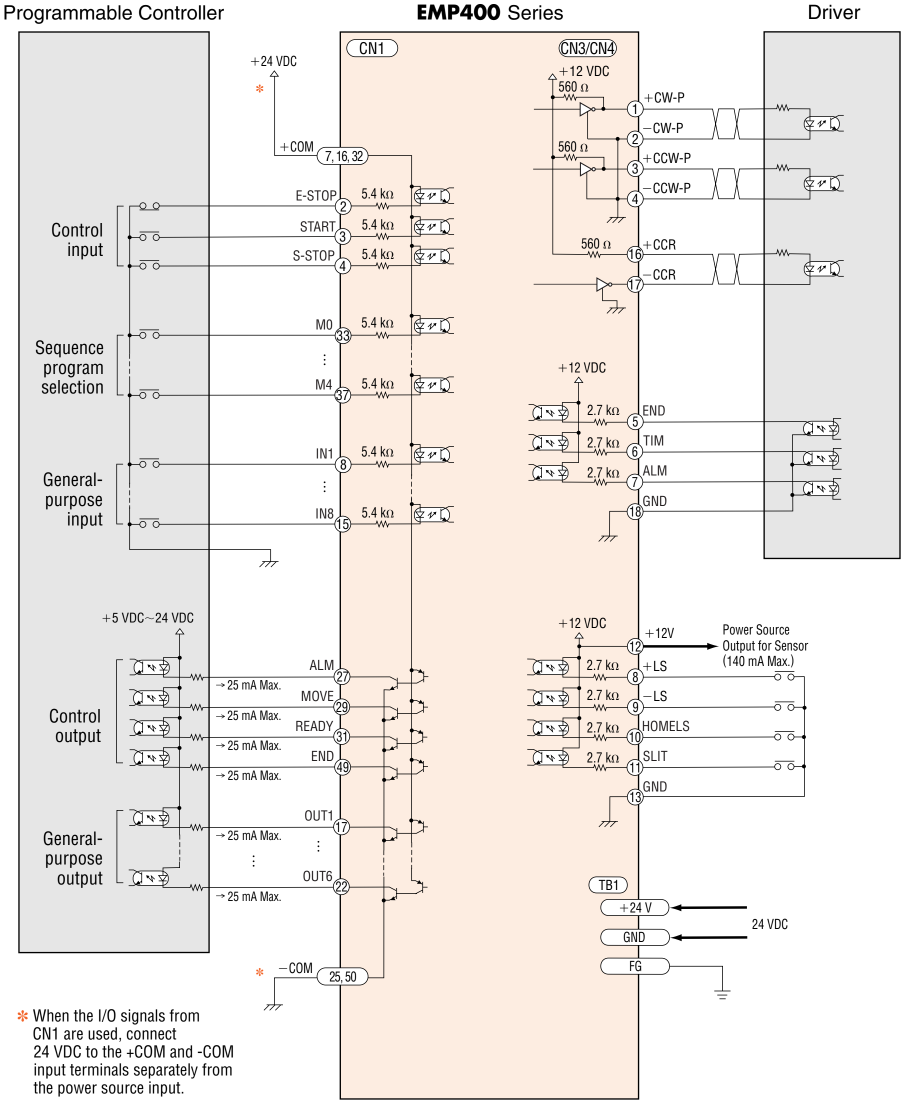
Internal Input Circuit



Internal Output Circuit



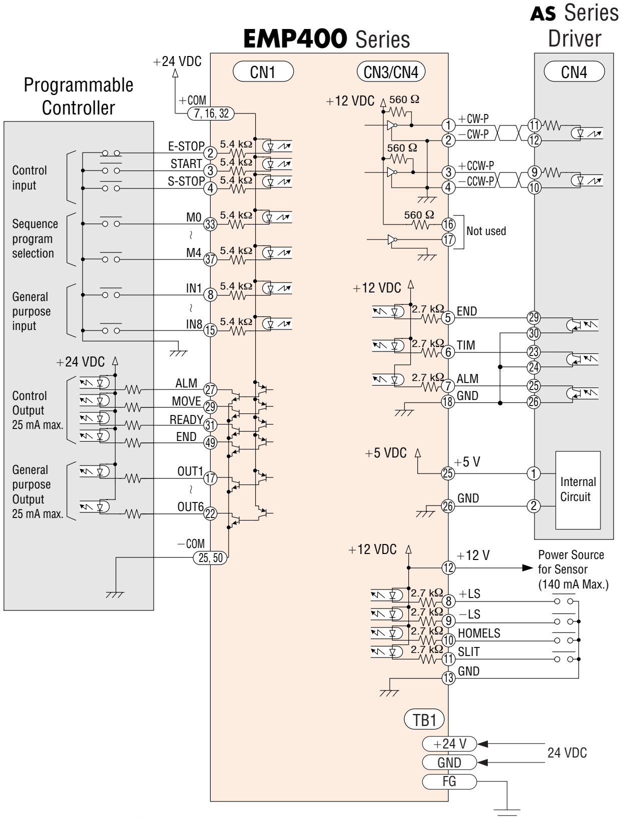
Connection Diagrams



* When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power source input.

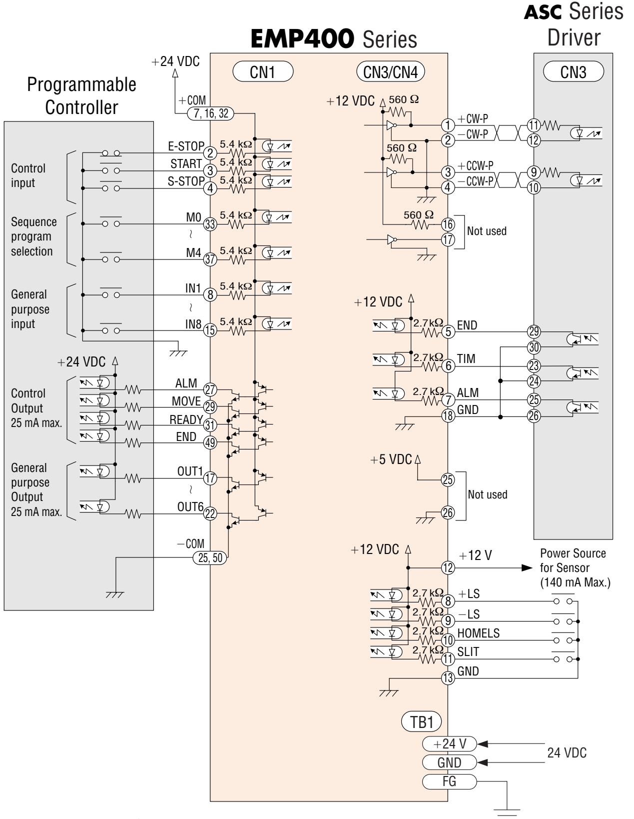
Connection Diagrams

αSTEP **AS** Series



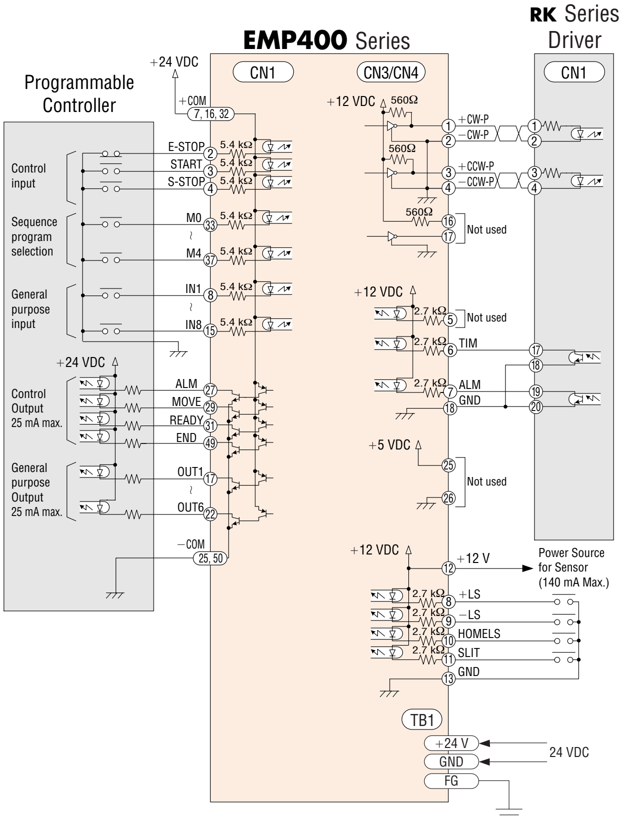
Note: The Pulse frequency will become lower as the signal lines becomes longer.

αSTEP **ASC** Series



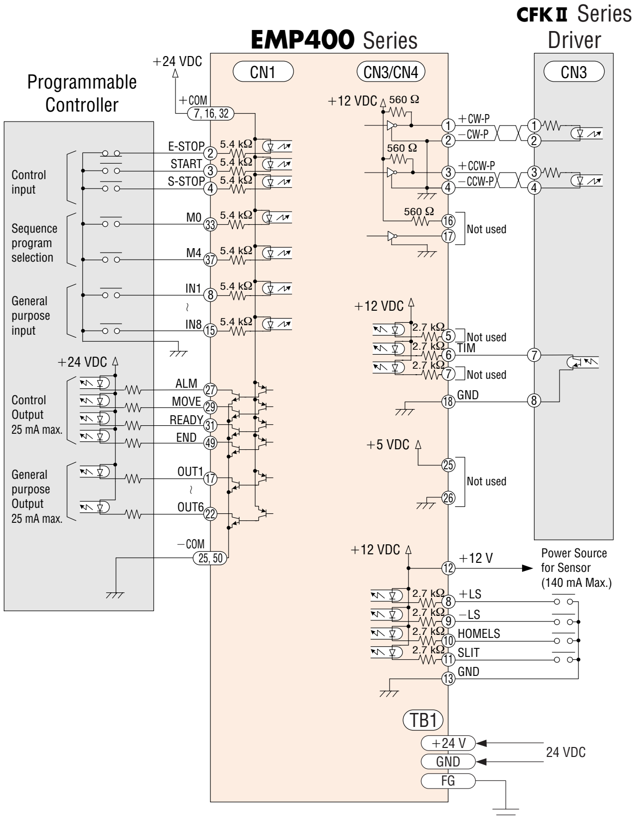
Note: The Pulse frequency will become lower as the signal lines becomes longer.

RK Series



Note: The Pulse frequency will become lower as the signal lines becomes longer.

Nano Step CFKⅡ Series



Note: The Pulse frequency will become lower as the signal lines becomes longer.

Accessories (sold separately)

Operator Interface Unit

Model: **OP300**

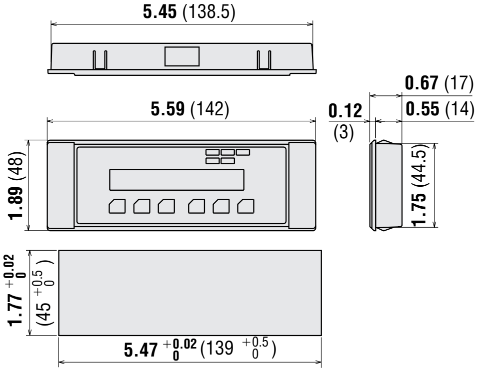
Set the travel amount via teaching or monitor the current position.

The unit comes with a cable 6.6 ft. (2 m) for connection with the **EMP400** Series.

✻ A personal computer cannot be connected while the **OP300** is connected.

Dimensions Scale 1/4, Unit = **inch** (mm)

DXF B297



Panel Cut-out Dimensions

I/O Cable with Terminal Block

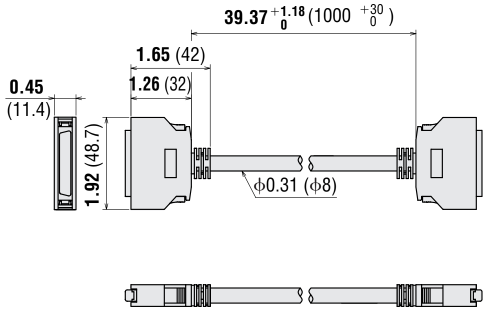
Model: **CC01EMP1T**

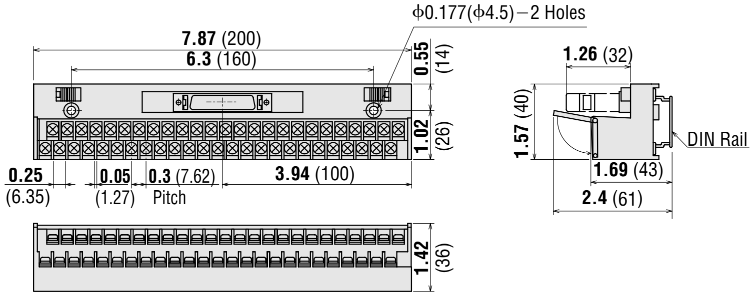
The **EMP400** Series, programmable controller, and I/O signals can all be connected via a terminal block.

Cable length: 3.3 ft. (1 m)

Dimensions Scale 1/4, Unit = **inch** (mm)

DXF B300





Terminal block pin configuration

26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Communication Cable

Model: **FC04W5**

Input programs from a PC

Use this 16.4 ft. (5 m) communication cable to connect the **EMP400** Series to a PC.
(DSUB9F to RJ 11 cable)

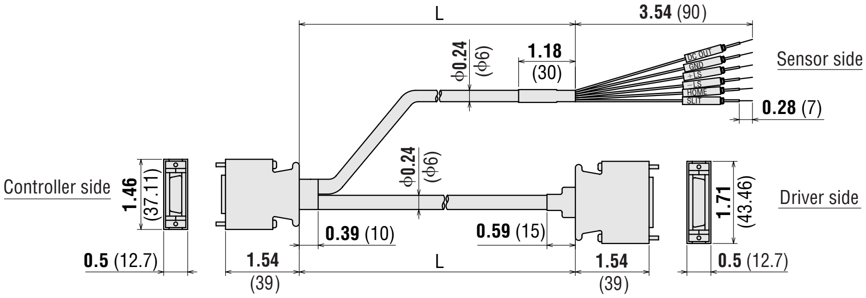
Features C-254 System Configuration C-257 Specifications C-260

● Driver Cables

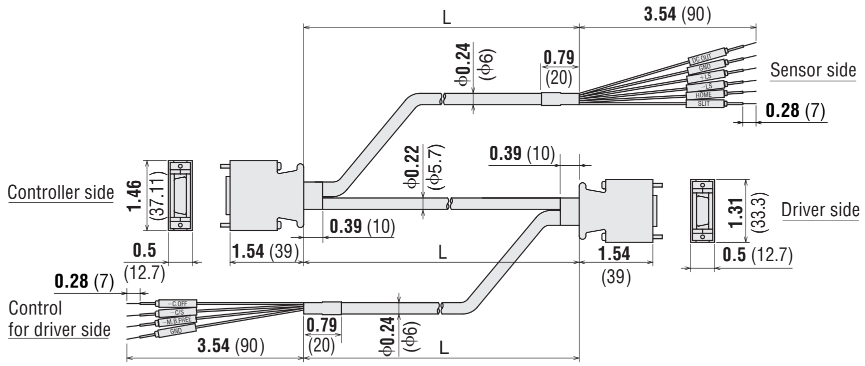
Model	Length (L)	Applicable Product	Connector Number
CC01EMP4	3.3 ft. (1 m)	**AS**, **ASC** Series	CN3 & CN4
CC02EMP4	6.6 ft. (2 m)	**AS**, **ASC** Series	
CC01EMP5	3.3 ft. (1 m)	**RK** Series	
CC02EMP5	6.6 ft. (2 m)	**RK** Series	

◆ Dimensions Scale 1/4, Unit = inch (mm)

● CC□□EMP4



● CC□□EMP5



RS232C-Compatible Controller

SC8800/SC8800E for Stepping Motor Systems

The **SC8800** and **SC8800E** controllers can be programmed from a computer or ASCII terminal via a standard RS-232C port.

Features

Easy-to-Use

- The instruction set software is built into the controller. There is no need for set-up diskettes.
- Can be pre-programmed prior to installation.
- An easy-to-learn instruction set allows for complete system operation.
- End-of-travel and home positions can be easily determined by the three dedicated limit switch inputs.
- Operates on 10 to 28 VDC so the controller can be powered by a standard power supply.

Programming Options

- Can be controlled or programmed directly from a computer or ASCII terminal via a standard RS-232C port.
- Can be controlled by industry-standard programmable logic controllers so it can run off any already existing PLC.
- Linear, S-curve and parabolic acceleration/deceleration profiles are available.

Flexible I/O

- There are four programmable inputs and two programmable outputs to give the controller the ability to control other functions within the machine. All inputs and outputs are optically isolated.
- Step and direction signal outputs are industry standard TTL level signals in either 1-pulse or 2-pulse modes so the **SC8800** and the **SC8800E** can be used with any industry-standard stepping motor and driver package.
- All I/Os can be driven by an external DC power supply of 5 to 24 VDC.

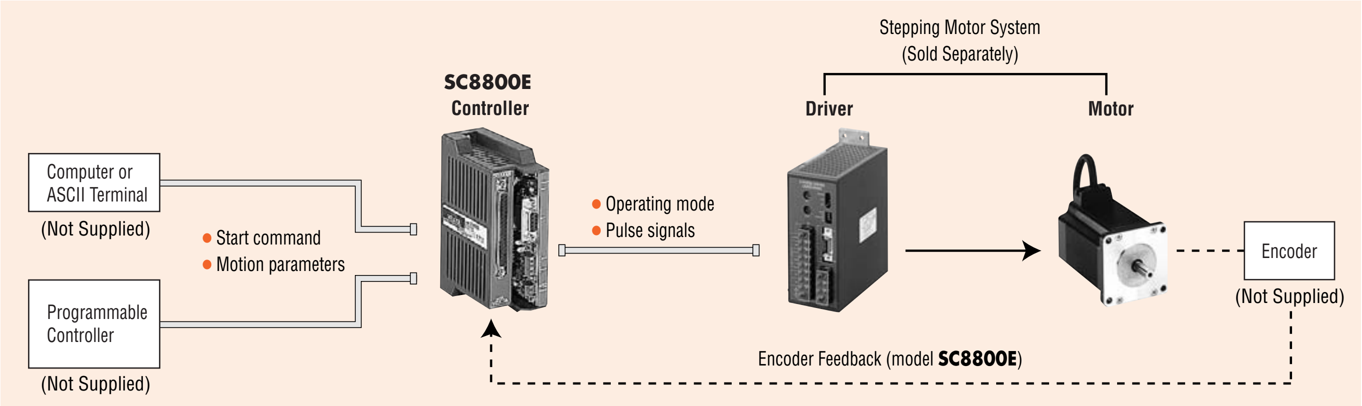
Encoder Feedback Capabilities (Model **SC8800E**)

- Nearly every known feedback device can be recognized since the controller can use two or three channels in either single-ended or differential modes.

Daisy-Chain Capabilities

- Up to 35 different axes can be controlled from one computer or ASCII terminal by daisy-chaining up to 35 **SC8800** or **SC8800E** controllers together.
- Available with an optional encoder input for position verification (model **SC8800E**).

System Configuration



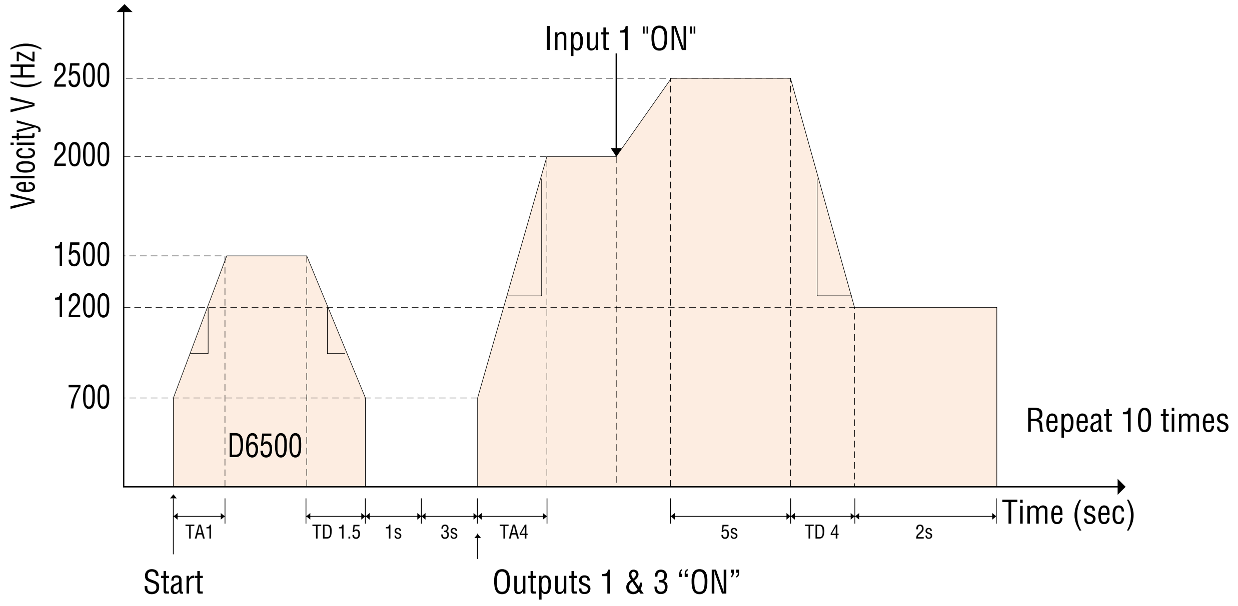
Features C-266 System Configuration C-266

Specifications

Parameter			Value
Input Power			10~28 VDC, 3.0 watts max.
Performance	Stepping Accuracy		±0 steps from preset total
	Velocity Accuracy		±0.05% of preset rate
	Velocity Repeatability		±0.01% of max. rate
	Position Range		0 to ±999,999,999 steps, when DSCALE is active
	Velocity Range		1 to 800,000 steps/sec
	Acceleration Rate		0.001 to 10 sec
Motion Types	Absolute		Move to specified internal counter position
	Index		Move specified distance
	Continuous		Move at specified speed until commanded to stop
	Go Home		Move to Home limit switch
	Move Time		Move specified distance in specified time
Sequence Execution	Via RS-232C		Sequence may be executed from RS-232C interface with the RUN command
	Via Power-up Auto Run		Execute any sequence, 0~15 upon power-up
	Via Programmable Input		Sequences may be selected using an external device
Programming Language			Simple, high-level programming language
Non-Volatile Memory	Sequence Length		8k or up to available remaining memory
	Number of Programs		50 max. or up to available memory
Inputs	Command Interface	Type	RS-232C serial type, 3-wire implementation (Tx, Rx, Gnd)
		Parameters	Baud rate fixed at 9600, 8 data bits, 1 stop bit, no parity
		Configuration	35 units max. can be controlled via a single port in the daisy-chain configuration
	CW, CCW and Home Limits		+5 to +30 VDC, Optically Isolated
	Programmable Inputs		Four to be used for machine interaction and/or sequence selection, +5 to +30 VDC, Optically Isolated
	TIM		Phase zero indicator, +5 to +30 VDC, Optically Isolated
	Encoder		Model **SC8800E** accepts 2 or 3 channel, 2-phase quadrature incremental encoders with differential or single ended outputs, 5 VDC TTL compatible, 400 kHz (quadrature), max.
Outputs	Step and Direction		TTL, High: 4~5 VDC, Low: 0~0.5 VDC, Pulse width: 0.5 ms min., Rise/Fall time: 0.2 ms max.
	Programmable		Two, Open collector, 1~24 VDC, 80 mA max.
	Status		Fault & Busy, Open collector, 1~24 VDC, 80 mA max.
Mechanical	Dimensions		L 3.35 in. (85 mm) × W 1.57 in. (40 mm) × H 4.72 in. (120 mm)
	I/O Connectors		Combination of fixed screw terminal and D-type
Environmental	Cooling Method		Natural Ventilation
	Ambient Temperature Range		32°F~122°F (0°C~+50°C)
	Humidity		20~ 85% (noncondensing)
Weight			0.68 lb. (0.31 kg)

Specifications C-267 Dimensions C-269

Programming Example



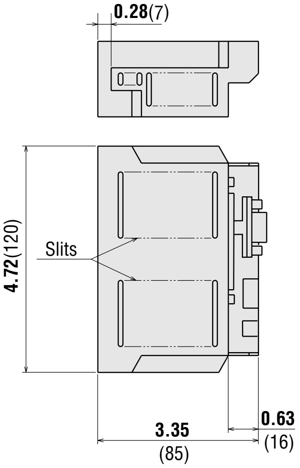
The two moves shown above can be executed with the following program commands :

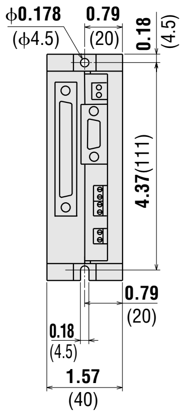
Commands		Description
1	LOOP 10	*Loop this program 10 times*
2	SAS Push START to begin	*Echo message to screen*
3	VS700; V1500	*Set start and run velocities for the first move*
4	TA1; TD1.5	*Set Accel time to 1 sec & Decel time to 1.5 sec*
When start signal is input, program begins		
5	PC0; EC0	*Set position and encoder counters to zero*
6	H+	*Set direction to CW*
7	D6500	*Set distance to 6500 steps*
8	MI	*Execute the Index move*
9	DELAY1	*Delay 1 second*
10	IF (CP!=0)	*If encoder position is incorrect,*
11	THEN JMP1	*Then, restart program*
12	ELSE DELAY3	*Else Delay 3 seconds.*
13	OUT=101	*Turn on Outputs 1 and 3*
14	V2000	*Set velocity to 2000 steps/sec*
15	T4	*Set Accel & Decel time to 4 sec. for second move*
16	WHILE (IN1=0)	*While Input #1 is off,*
17	MC	*Move continuously*
18	ENDW	*End the while loop*
19	V2500; MC	*Change speed to 2500 steps/sec*
20	DELAY5	*Delay 5 seconds*
21	V1200	*Change speed to 1200 step/sec*
22	DELAY2	*Delay 2 seconds*
23	STOP	*Stop moving*
24	ENDL	*Return to beginning of loop*

Dimensions Scale 1/4, Unit = **inch** (mm)

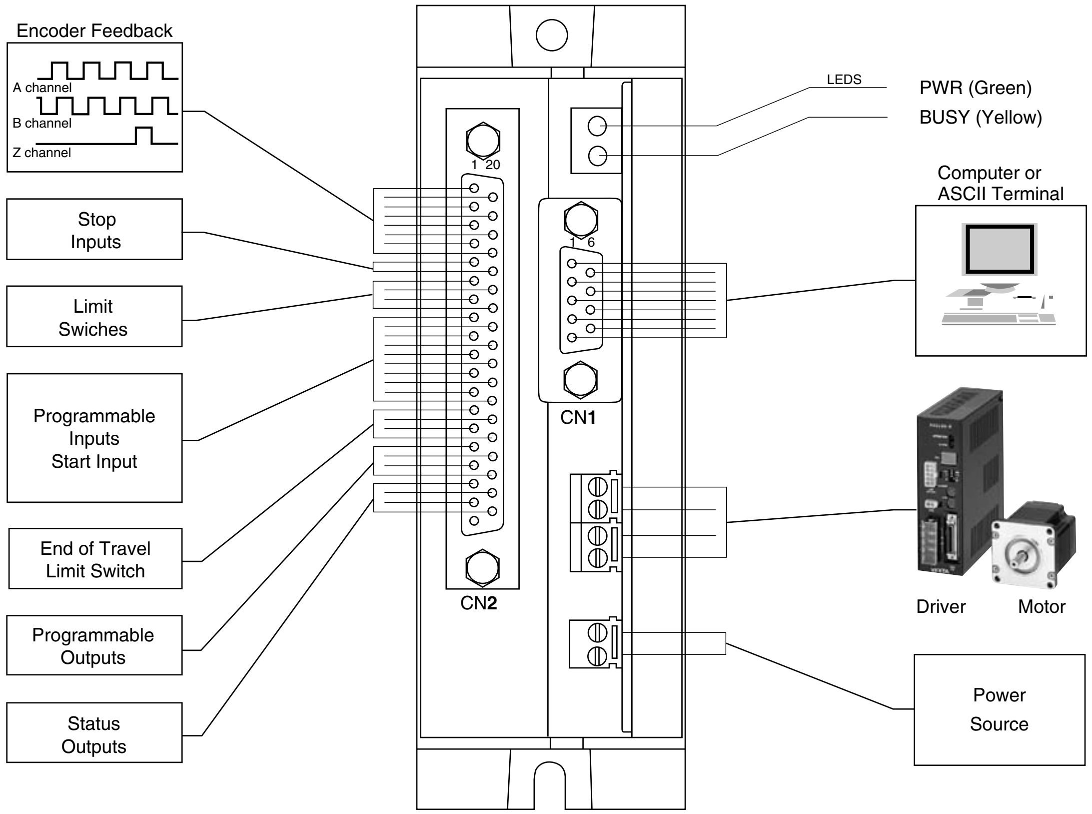
SC8800
SC8800E

Weight: 0.68 lb. (0.31 kg)





System Layout



Stepping Motor Controller

SG8030J

The **SG8030J** is a compact controller that switches between two control methods according to the application: sequential positioning and data selection positioning.

With sequential positioning mode, up to four positioning control operations can be executed in the pre-determined sequence by simply inputting the start command from a programmable controller. In data selection positioning mode, positioning is controlled by selecting one of four sets of pre-registered positioning data and inputting the start command from a programmable controller.

DIN Rail Mounting Model

Recessed Mounting Model

Features

High Performance, Compact Size

With dimensions of 1.89 in.×1.89 in.×3.3 in. (48 mm×48 mm ×84 mm), the **SG8030J** is the smallest Oriental Motor controller. They come in DIN-rail-mount and panel mount versions.

High-Speed Positioning & Low Vibration

The jerk-limit control function allows you to set a shorter acceleration/deceleration time compared with the use of linear acceleration/deceleration patterns. This reduces the overall positioning time.

Switch Control Methods Easily

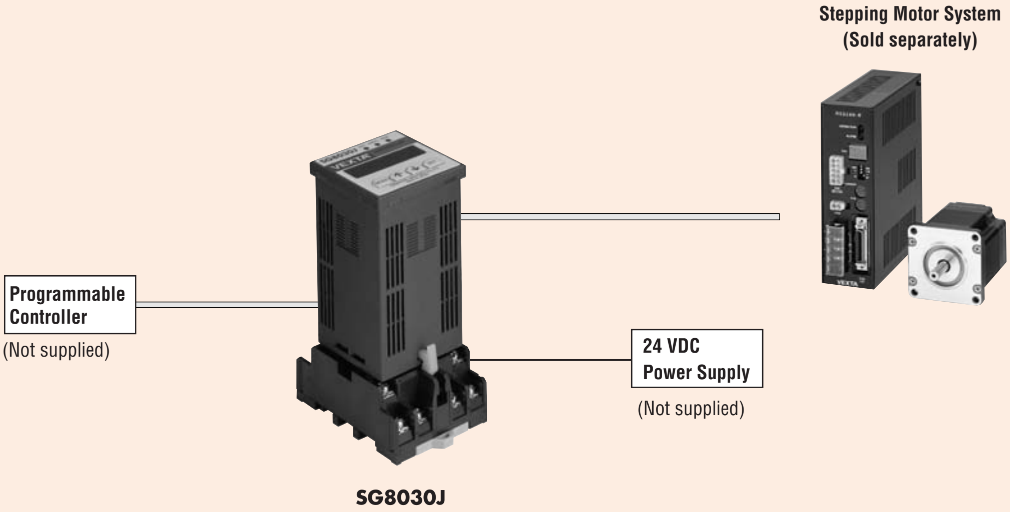
Switch control between sequential positioning and data selection positioning.

Functions

The **SG8030J** offers commonly used functions including:

- Control modes: External, program, test
- Operating modes: Positioning, return to mechanical home, continuous operation

System Configuration



Features C-270 System Configuration C-270 Specifications C-271

Product Line

Type	Model
DIN Rail Mounting Model	**SG8030J-D**
Recessed Mounting Model	**SG8030J-U**

Specifications

Model		**SG8030J-D** **SG8030J-U**
Number of Control Axes		1 Axis
Positioning Data	Number of Settings	4 Profiles
	Setting Mode	Set with touch key on front panel (stored in EEPROM)
	Setting Method	Incremental Mode (point to point)
Positioning Control	Mode	Sequential-Step Positioning Step-Select Positioning
	Move Distance Setting Range	Incremental 1~99999 Pulses
	Starting Pulse Speed Setting Range (VS)	100 Hz~10 kHz (100 Hz Units)
	Operating Pulse Speed Setting Range (VR)	100 Hz~200 kHz (100 Hz Units)
	Acceleration/Deceleration Rate Setting Range (TR)	1~100 ms/kHz (28 rate✻)
Pulse Output Mode		1-Pulse Output/2-Pulse Output Mode select possible
Operation Modes		Positioning Operation (INDEX Operation) Return to Mechanical Home Operation (HOME Operation) Continuous Operation (SCAN Operation) JOG Operation ✻ Test mode only
Control Modes		External Input Mode (EXT) Program Mode (PROG) Test Mode (TEST)
Mechanical Home Return Function		Sensor detection of home through designation of mechanical home detection direction of rotation
Input Signals		24 VDC Photocoupler Input, Input Resistance 4.7 kΩ
Output Signals		Transistor Output Linked to Photocoupler 24VDC 25 mA maximum
Power Supply Input		24 VDC±5% Current Consumption 0.1 A
Ambient Temperature		32˚F~104˚F (0˚C~+40˚C) (Nonfreezing)
Ambient Humidity		20%~85% (Noncondensing)

✻ The following 28 acceleration/deceleration rates can be selected. (unit: ms/kHz)
1, 2, 4, 5, 6, 8, 10, 12, 14, 15, 16, 18, 20, 22, 24, 25, 26, 28, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100

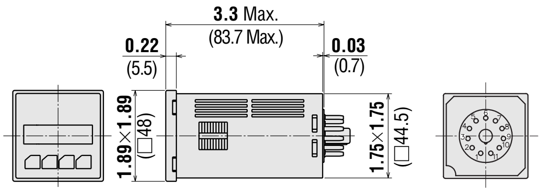
Dimensions Scale 1/4, Unit = **inch** (mm)

● DIN Rail Mounting Model

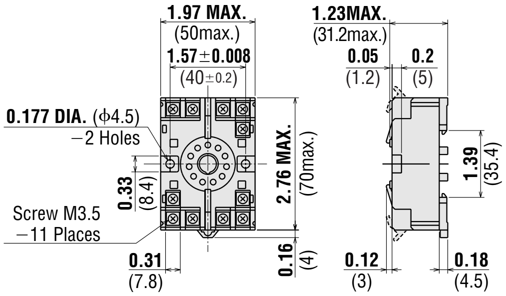
◆ SG8030J-D

Weight: 0.37 lb. (0.17 kg)

DXF B094



◆ Flush Connection Socket (Included)

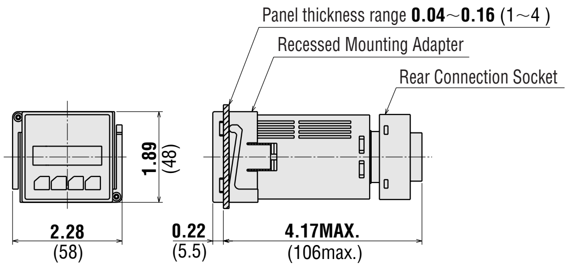


● Recessed Mounting Model

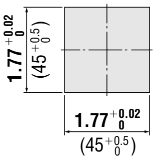
◆ SG8030J-U

Weight: 0.33 lb. (0.15 kg)

DXF B095

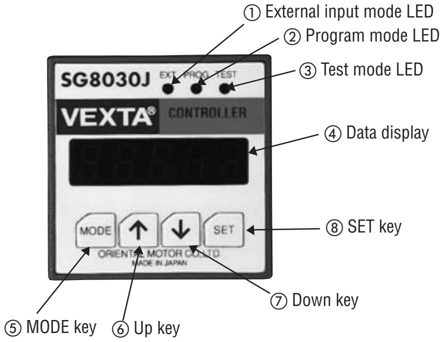


◆ Panel Mounting Cut-Out Dimensions



Dimensions C-271
Connection and Operation C-272

Connection and Operation



①	EXT (LED): Lights up when external input is selected.
②	PROG (LED): Lights up when program mode is selected.
③	TEST (LED): Lights up when test mode is selected.
④	Data display: Shows operation and setting status.
⑤	MODE key
⑥	↑ key
⑦	↓ key
⑧	SET key

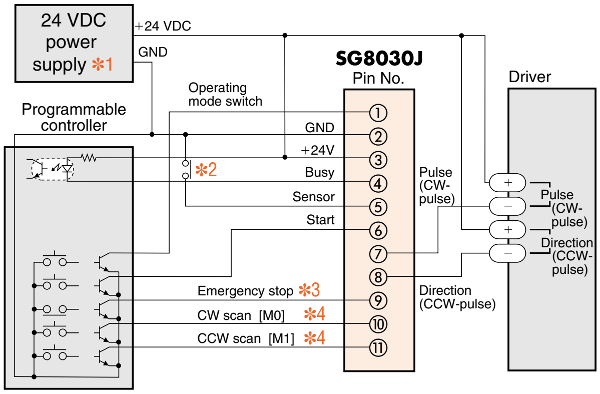
◆ Connection Socket Signal Table

Pin No.	Signal Designation	I/O	Function
1	Operation Mode Input	Input	S: Switching Positioning/Home Detection Operation D: Switching Positioning/Home Detection Operation and Continuous Operation
2	GND	Input	24 VDC Power Supply
3	+24 VDC	Input	
4	Busy	Output	Output during Pulse Oscillation
5	Sensor	Input	Mechanical Home Detection Sensor
6	Start	Input	Start Signal
7	CW Pulse/Pulse	Output	CW Pulse (2-pulse input mode)/Pulse (1-pulse input mode)
8	CCW Pulse/Rotation Direction	Output	CCW Pulse (2-pulse input mode)/Rotation Direction (1-pulse input mode)
9	Emergency Stop	Input	Stop all operations (including busy output)
10	S: CW Scan D: M0 [CW Scan]	Input	S: CW Continuous Operation D: Data Select Signal [CW Continuous Operation]
11	S: CCW Scan D: M1 [CCW Scan]	Input	S: CCW Continuous Operation D: Data Select Signal [CCW Continuous Operation]

Indications in brackets [ ] apply to state when mode switching signal was input.

✻ Only pins 1, 10, 11 differ for sequential positioning and selection positioning.
"S" in the table indicates sequential positioning and "D" indicates selection positioning.

● Connection Diagram



✻1 The pulse output section uses a constant-current circuit, so no external resistor is required.
Connect+5 V power directly to the driver +terminals and connect the 24 VDC and 5 VDC GND terminals to each other.

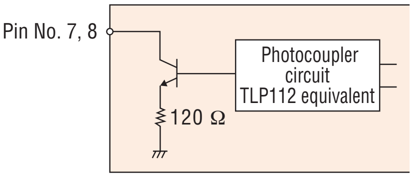
✻2 Use a 24 VDC home sensor.

✻3 This should be normally closed during normal operation.
When not using the emergency stop input signal, always connect to the +24 VDC terminal.
The "E.STOP" message is displayed when the power supply turns off.

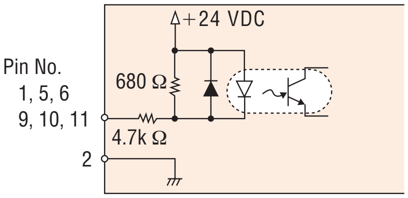
✻4 The names in brackets [ ] are for data selection positioning type.

Description of Input/Output Signals

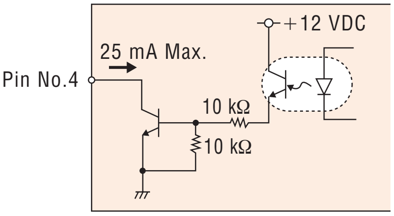
◆ Output Signals to Driver

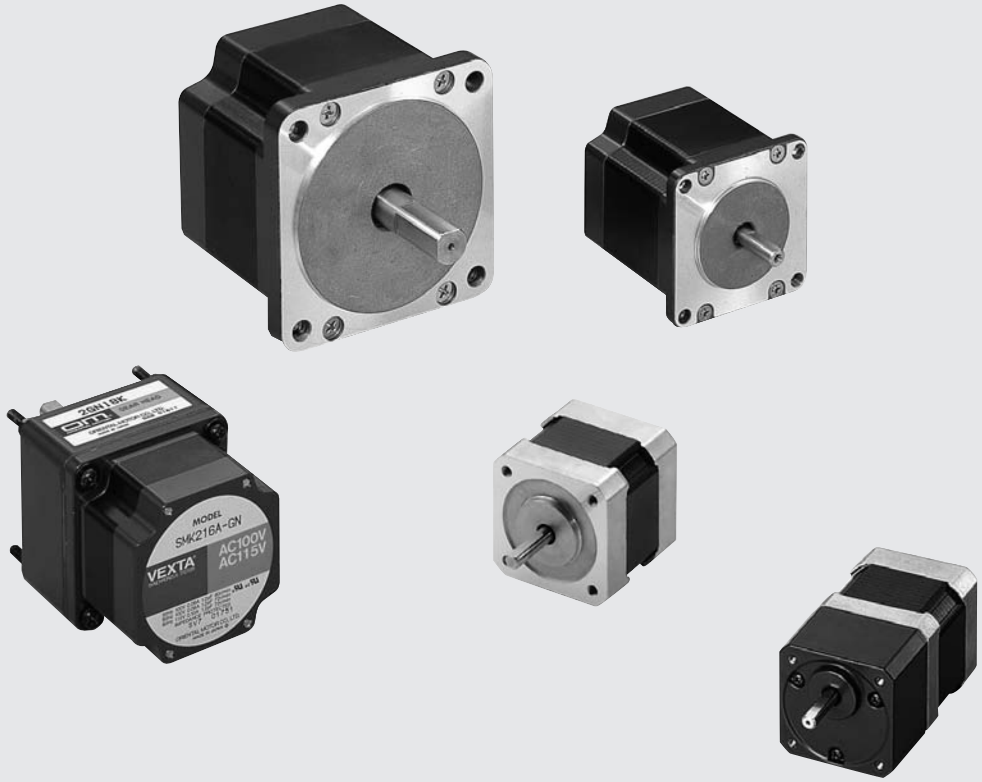


◆ Input Signals from Programmable Controller and Limit Sensor



◆ Output Signals to Programmable Controller





Low-Speed Synchronous Motors

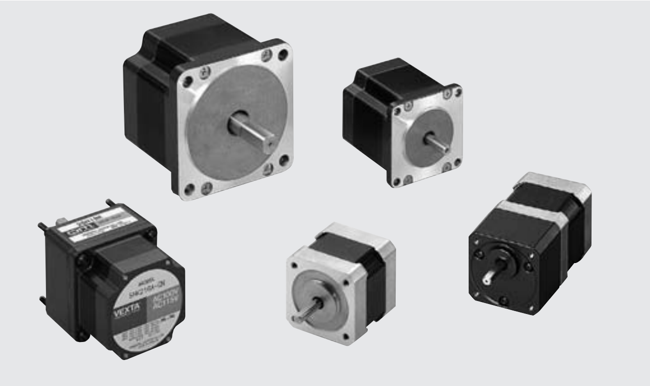
SMK Series

Additional Information

Low-Speed Synchronous Motors

SMK Series

Low-speed synchronous motors provide highly precise speed regulation, low-speed rotation, and quick bi-directional rotation. The basic construction of low-speed synchronous motors is the same as that of stepping motors. Since they can be driven by an AC power supply, they are sometimes called AC stepping motors.



Features

● Low-Speed·Synchronous Rotation

The motor rotates at a speed proportional to and accurately synchronized with the frequency of the power supply.
A fluctuation in load does not affect the rotation speed.

At 50 Hz 60 r/min (*30 r/min)
At 60 Hz 72 r/min (*36 r/min)
* For **SMK014MA-□**

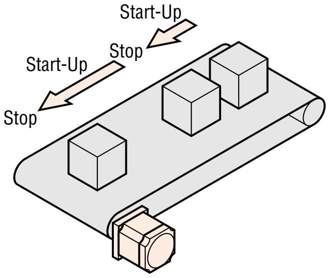
● Continuous Rated Capacitor-Run Motor

This motor can be driven at a continuous rating even when bi-directional operation is required.

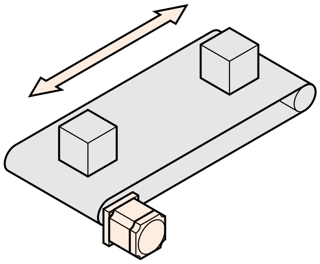
● Superb Starting, Stopping and Reversing Characteristics

If operated within the permissible load inertia, the motor can start, stop and reverse within 1.5 cycles (0.03 sec at 50 Hz, 0.025 sec at 60 Hz) of the power supply frequency.

- **Suitable for equipment that starts and stops repeatedly such as conveyors.**



- **Bi-directional operation can be repeated continuously.**

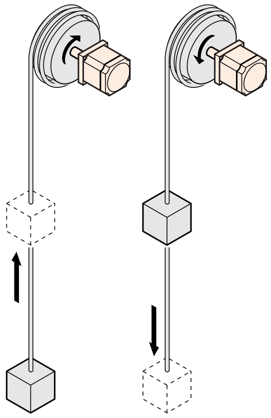


● Precise Positioning

The motor can be stopped instantly by turning off the power supply. The stopping accuracy within the motor's permissible load inertia is ±10°. When a precision switch is used, simple and precise positioning is possible.

● Lowering Applications

Constant speed can be maintained even during lowering operations. Low-speed synchronous motors are suitable for applications, where vertical operation at a constant speed is required.



● Holding Torque

Since a permanent-magnet, multi-poled rotor is used, the motor has holding torque even when the motor is not energized. When used with a gearhead, comparatively high holding torque can be utilized.

- When a larger holding torque is required, a DC power supply can be connected as soon as the AC power supply is cut off.

DC Excitation → Page C-281

● Low-Noise Gearheads

Pinion shaft models are available that can be connected directly to standard Oriental Motor **GN**-type low-noise gearheads.

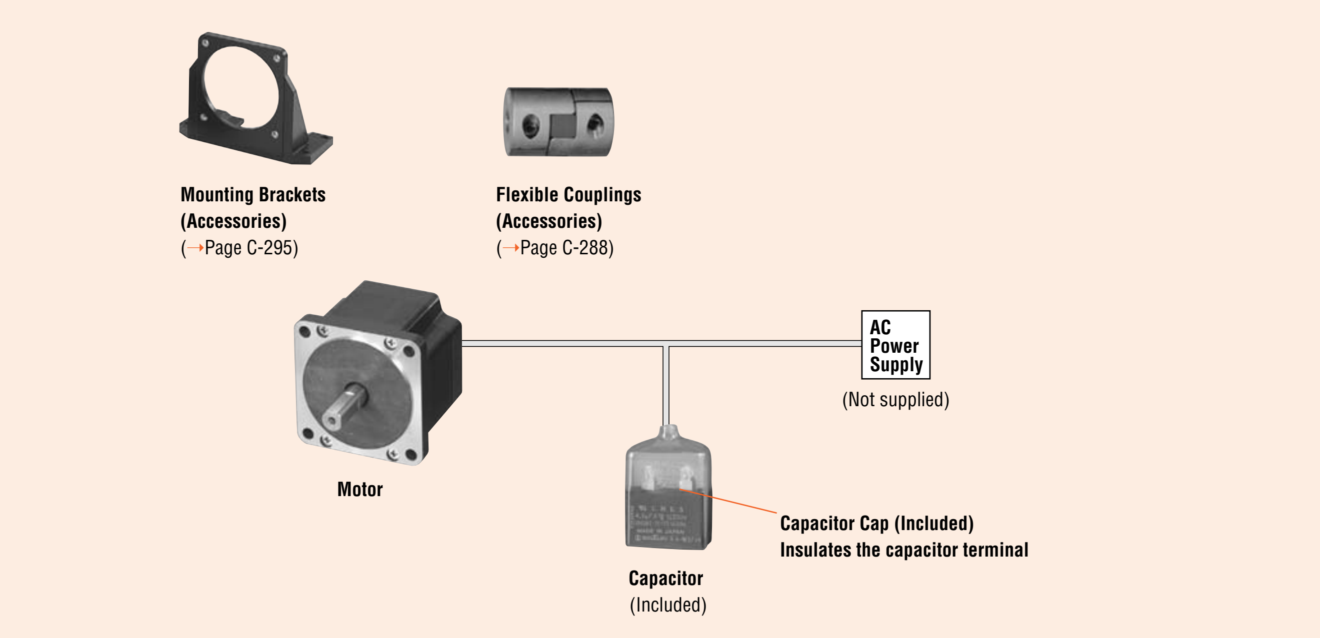
Features C-274 System Configuration C-275 Specifications C-276

Safety Standards and CE Marking

Model	Standards	Certification Body	Standards File No.	CE Marking
Motor	UL1004 UL519 CSA C22.2 No.100 CSA C22.2 No.77	UL	E64199	Low Voltage Directives

(**SMK014, SMK0A**□ are not recognized.)
Details of Safety Standards→Page G-2

System Configuration



Mounting Brackets (Accessories)
(→Page C-295)

Flexible Couplings (Accessories)
(→Page C-288)

AC Power Supply
(Not supplied)

Motor

Capacitor Cap (Included)
Insulates the capacitor terminal

Capacitor
(Included)

Product Number Code

Motor

SMK 0 14 M A - A □

A: USA Version
Shaft Type **A**: Round Shaft
GN: Pinion Shaft (for use with **GN** type gearhead)
Voltage **A**: Single-Phase 100/115 VAC
Speed **Blank**: 60/72 r/min (50/60 Hz)
M: 30/36 r/min (50/60 Hz)
Motor Torque
Motor Frame Size **0**: 1.65 in. sq. (42 mm sq.)
2: 2.22 in. sq. (56.4 mm sq.) or 2.36 in. sq. (60 mm sq.)
5: 3.35 in. sq. (85 mm sq.) or 3.54 in. sq. (90 mm sq.)
SMK Series

Gearhead

5 GN 50 KA

Type of Bearings and Shaft Size
KA: Ball bearing type and inch-sized output shaft
Gear Ratio (Example)
50: Gear Ratio of 50:1
Gearhead Type **GN**: **GN** type (for use with **GN**-type Pinion Shaft Motor)
Gearhead Frame Size **2**: 2.36 inch sq. (60 mm sq.)
5: 3.54 inch sq. (90 mm sq.)

Geared Motor

SMK 0 A - 120 A

Shaft Type **A**: Single Shaft
Gear Ratio
(Example) **120**: Gear Ratio of 120:1
Voltage **A**: Single-Phase 100/115 VAC
Motor Frame Size **0**: 1.65 in. sq. (42 mm sq.)
SMK Series

Dimensions C-278 Connection and Operation C-280

Product Line

Motor

Model
SMK014A-A
SMK014MA-A
SMK237A-A
SMK5100A-AA
SMK5160A-AA
SMK216A-GN (**GN**-type Pinion Shaft)
SMK550A-GN (**GN**-type Pinion Shaft)

Geared Motor

Model	Gear Ratio
SMK0A-□A	**3~120**

- Enter the gear ratio in the box (□) within the model number.

Gearheads (Sold Separately)

Model	Gear Ratio
2GN□KA	**3~180**
5GN□KA	**3~180**

- Enter the gear ratio in the box (□) within the model number.

Specifications — Continuous Rating

Motor

c UL us CE (Except for **SMK014**)

Model	Voltage VAC	Frequency Hz	Current A	Torque oz-in N·m	Speed r/min	Holding Torque oz-in mN·m	Holding Inertia J oz-in^2 kg·m^2	Capacitor μF	External Resistor	
									Ω	W
SMK014A-A	Single-Phase 100	50	0.043	15.6 (0.11)	60	1.27 (9)	0.3 (55×10^{-7})	0.6	—	—
		60	0.046	17.0 (0.12)	72					
	Single-Phase 115	60	0.053	18.4 (0.13)	72					
SMK014MA-A	Single-Phase 100	50	0.043	15.6 (0.11)	30	0.63 (4.5)	0.3 (55×10^{-7})	0.6	—	—
		60	0.046	17.0 (0.12)	36					
	Single-Phase 115	60	0.053	18.4 (0.13)	36					
SMK237A-A	Single-Phase 100	50	0.08	52 (0.37)	60	3.5 (25)	1.64 (300×10^{-7})	1.2	—	—
		60	0.09	52 (0.37)	72					
	Single-Phase 115	60	0.10	52 (0.37)	72					
SMK216A-GN	Single-Phase 100	50	0.08	22 (0.16)	60	2.1 (15)[✻2]	0.66 (120×10^{-7})	1.2	—	—
		60	0.09	22 (0.16)	72					
	Single-Phase 115	60	0.10	22 (0.16)	72					
SMK5100A-AA	Single-Phase 100	50	0.17	142 (1.0)	60	5.1 (36)	7.7 (1400×10^{-7})	2.5	400	30
		60	0.20	142 (1.0)	72					
	Single-Phase 115	60	0.21	156 (1.1)	72					
SMK5160A-AA	Single-Phase 100	50	0.23	220 (1.6)	60	12.6 (89)	14.8 (2700×10^{-7})	2.5	400	30
		60	0.26	250 (1.8)	72					
	Single-Phase 115	60	0.28	290 (2.1)	72					
SMK550A-GN	Single-Phase 100	50	0.06	71 (0.5)	60	5.1 (36)[✻2]	7.7 (1400×10^{-7})	0.6	400	30
		60	0.07	71 (0.5)	72					
	Single-Phase 115	60	0.07	71 (0.5)	72					

Geared Motor

Model	Voltage VAC	Frequency Hz	Current A	Speed[✻1] r/min	Holding Torque[✻2] oz-in mN·m	Rotor Inertia J oz-in^2 kg·m^2	Capacitor μF
SMK0A-□A	Single-Phase 100	50	0.043	60	1.27 (9)	0.3 (55×10^{-7})	0.6
		60	0.046	72			
	Single-Phase 115	60	0.053	72			

[✻1] 50 Hz: Gear output shaft speed = 60/Gear Ratio [r/min]
60 Hz: Gear output shaft speed = 72/Gear Ratio [r/min]

[✻2] This value applies to round shaft motors. To calculate holding torque for gearmotors, use the following formula: listed holding torque × gear ratio.
Note that the gearmotor holding torque should be lower than the permissible torque on the gear output shaft. **Permissible Torque with Gearhead Attached**→Page C-277

Features C-274 System Configuration C-275 Specifications C-276

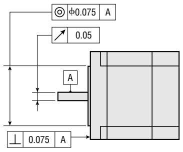
General Specifications

Item	Specifications
Shaft Runout	0.002 inch (0.05 mm) T.I.R.*1
Concentricity	0.003 inch (0.075 mm) T.I.R.*1
Perpendicularity	0.003 inch (0.075 mm) T.I.R.*1
Shaft Radial Play*2	0.001 inch (0.025 mm) maximum [Load 1.12 lb. (5 N)]
Shaft Axial Play*3	0.003 inch (0.075 mm) maximum [Load 2.2 lb. (10 N)]
Step Accuracy	±3.6°
Insulation Resistance	100 MΩ or more when the megger reading between the windings and the case is 500 VDC.
Dielectric Strength	Sufficient to withstand 1.5 kV at 60 Hz applied between the windings and the case for one minute.
Insulation Class	Class E [248°F (120°C)] *Recognized as Class A [221°F (105°C)]by UL and CSA standard
Temperature Rise	99°F (55°C) or less as measured by thermometer method after rated operation.
Ambient Temperature Range	14°F~104°F (−10°C~+40°C) (nonfreezing)

*1 T.I.R. (Total Indicator Reading): Total dial gauge reading when the measurement section is rotated 1 revolution, centered on the reference axis center.

*2 Radial Play: Displacement in shaft position in the radial direction when a 1.12 lb. (5 N) load is applied to the motor shaft tip in a radial direction.

*3 Axial Play: Displacement in shaft position in the axial direction when a 2.2 lb. (10 N) load is applied to the motor shaft in the axial direction.



Permissible Torque with Gearhead Attached

Unit = Upper values: lb-in/Lower values: N·m

Gear Ratio / Motor/Gearhead	3	3.6	5	6	7.5	9	12.5	15	18	25	30	36	50	60	75	90	100	120	150	180
SMK216A-GN/2GN□KA *1	3.5	4.4	6.1	7	8.8	10.6	13.2	15.9	16.8	18.5	21	24	26	26	26	26	26	26	26	26
	0.4	0.5	0.7	0.8	1	1.2	1.5	1.8	1.9	2.1	2.4	2.8	3	3	3	3	3	3	3	3
SMK550A-GN/5GN□KA *1	12.3	15	20	24	30	38	39	44	53	66	79	79	88	88	88	88	88	88	88	88
	1.4	1.7	2.3	2.8	3.5	4.3	4.5	5	6	7.5	9	9	10	10	10	10	10	10	10	10
SMK0A-□A	1.32	1.59	—	—	3	3	—	3	3	—	3	3.2	3.6	4.1	—	—	4.1	4.9	—	—
	0.15	0.18			0.35	0.35		0.35	0.35		0.35	0.37	0.41	0.47			0.47	0.56		

*1 Gearheads are sold separately.

- The box (□) represents the desired gear ratio, which becomes part of the product number for the gearhead or gearmotor.
- A white background indicates that the output shaft of the gearhead rotates in the same direction as the output shaft of the motor. A colored background indicates rotation in the opposite direction.

Permissible Overhung Load and Permissible Thrust Load

Motor, Geared Motor

Unit = Upper values: lb./Lower values: N

Model	Overhung Load Distance from Shaft End [inch (mm)]					Thrust Load
	0	0.2 (5)	0.39 (10)	0.59 (15)	0.79 (20)	
SMK014	4.5	5.6	7.6	11.7	—	The permissible thrust load shall be no greater than the motor mass.
	20	25	34	52		
SMK237	12.1	15	20	29	—	
	54	67	89	130		
SMK5100, SMK5160	58	65	76	87	108	
	260	290	340	390	480	
SMK0A-□	2.2	3.3	4.5	6.7	—	3.3
	10	15	20	30		15

Gearhead

Unit = Upper values: lb./Lower values: N

Model	Gear Ratio	Overhung Load Distance from Shaft End [inch (mm)]		Thrust Load
		0.39 (10)	0.79 (20)	
2GN□KA	**3~18**	11.2	18	6.7
		50	80	30
	25~180	27	40	
		120	180	
5GN□KA	**3~18**	56	78	22
		250	350	100
	25~180	67	101	
		300	450	

Dimensions C-278 Connection and Operation C-280

Permissible Load Inertia

Starting, stopping and reversing characteristics vary according to the amount of load inertia directly coupled to the motor. Permissible load inertia, therefore, refers to the upper limit of load inertia under which the motor can be operated normally when the load is connected directly to the motor shaft. When the amount of load inertia is too great, the motor may vibrate or reverse direction. It is recommended to use flexible couplings when connecting the load to the motor shaft.

Motor

Model	Permissible Load Inertia: J oz-in^2 ($\times10^{-4}$ kg·m^2)
SMK014A-A	1.50 (0.275)
SMK014MA-A	
SMK237A-A	13.7 (2.5)
SMK5100□-AA	38 (7)
SMK5160A-AA	66 (12)

Permissible Load Inertia for Geared Motors (J)

Motor/Gearhead

Unit = Upper values: lb-in^2/Lower values: $\times10^{-4}$kg·m^2

Gear Ratio Motor/Gearhead	3	3.6	5	6	7.5	9	12.5	15	18	25	30	36	50	60	75	90	100	120	150	180
SMK216A-GN/2GN□KA	1.85	2.6	5.1	7.4	11.5	16.6	32	46	53	53	53	53	53	53	53	53	53	53	53	53
	5.4	7.7	15	21.6	33.7	48.6	93.7	135	155	155	155	155	155	155	155	155	155	155	155	155
SMK550A-GN/5GN□KA	22	31	60	86	135	194	370	540	640	640	640	640	640	640	640	640	640	640	640	640
	63	90.7	175	252	393.7	567	1093	1575	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875	1875

Geared Motor

Unit = Upper values: lb-in^2/Lower values: $\times10^{-4}$kg·m^2

Gear Ratio Gearmotor	3	3.6	7.5	9	15	18	30	36	50	60	100	120
SMK0A-□A	0.82	1.2	5.1	7.5	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7
	2.4	3.5	15	22	40	40	40	40	40	40	40	40

Dimensions

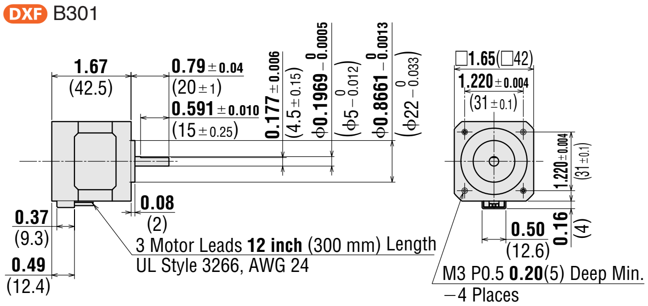
Scale 1/4, Unit = **inch** (mm)

Motor

SMK014A-A, SMK014MA-A

Weight: 0.66 lb. (0.3 kg)

DXF B301

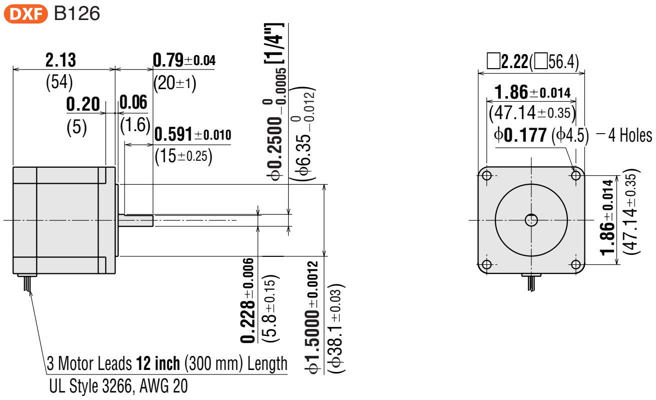


Motor

SMK237A-A

Weight: 1.5 lb. (0.7 kg)

DXF B126

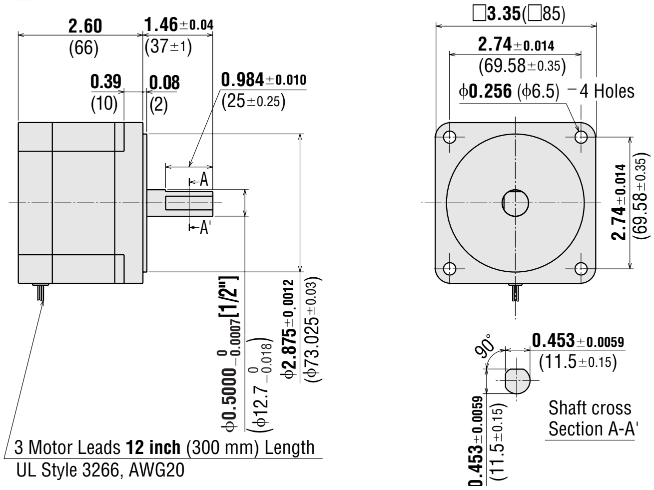


Motor

SMK5100A-AA

Weight: 3.7 lb. (1.7 kg)

DXF B127U

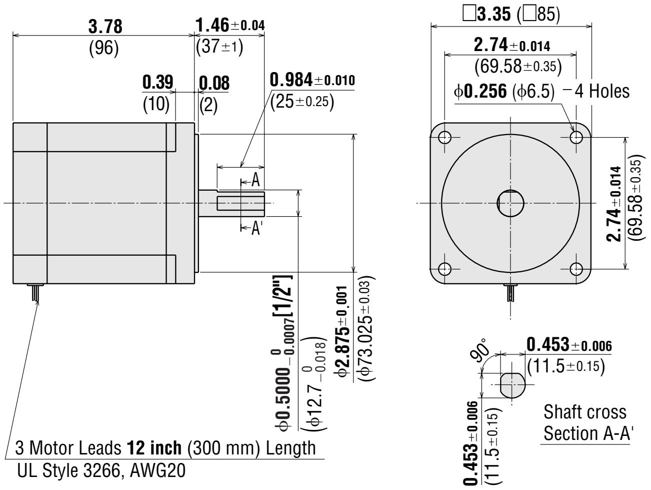


Motor

SMK5160A-AA

Weight: 6.2 lb. (2.8 kg)

DXF B128U



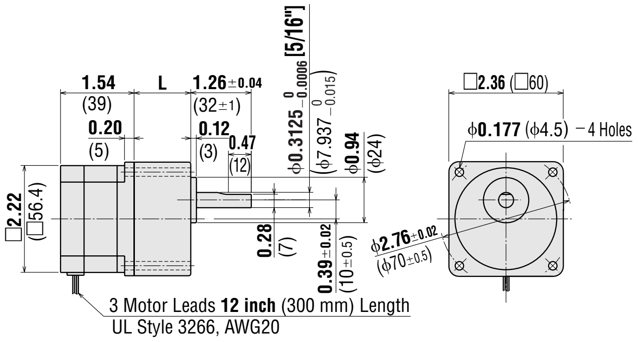
Features C-274 System Configuration C-275 Specifications C-276

Motor/Gearhead

SMK216A-GN/2GN□KA

Weight: 1.9 lb. (0.85 kg)

DXF B129AU (**2GN3K**~**18KA**)
B129BU (**2GN25K**~**180KA**)



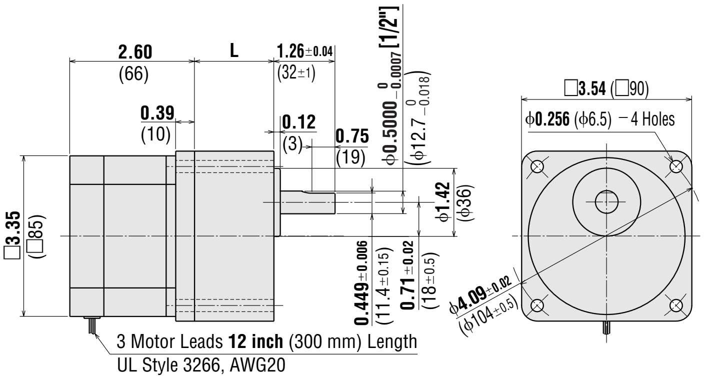
2GN3KA~18KA: L = **1.18** (30)
2GN25KA~180KA: L = **1.57** (40)

Motor/Gearhead

SMK550A-GN/5GN□KA

Weight: 7.0 lb. (3.2 kg)

DXF B130AU (**5GN3KA**~**18KA**)
B130BU (**5GN25KA**~**180KA**)



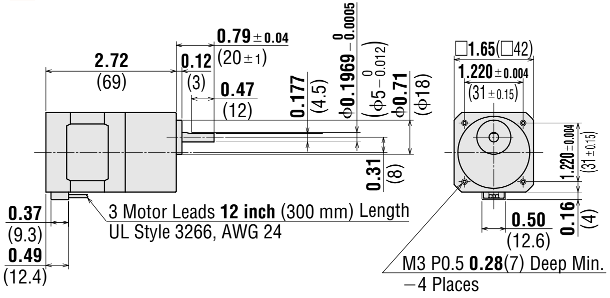
5GN3KA~18KA: L = **1.65** (42)
5GN25KA~180KA: L = **2.36** (60)

Geared Motor

SMK0A-□A

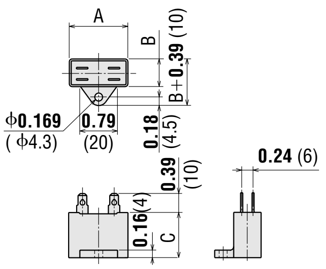
Weight: 1.1 lb. (0.5 kg)

DXF B323

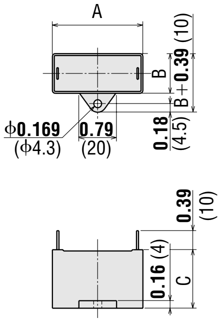


Capacitor (included with the motor) Unit = inch (mm)

①



②

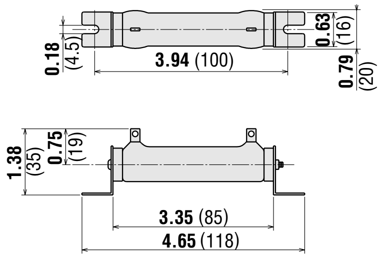


Motor Model	Capacitor Model	Dimensions inch (mm)			Weight oz. (g)	No.
		A	B	C		
SMK014A-A **SMK014MA-A** **SMK0A-□A**	CH06BFAUL	1.22 (31)	0.57 (14.5)	0.93 (23.5)	0.53 (15)	①
SMK216A-GN **SMK237A-A**	CH12UL	1.22 (31)	0.57 (14.5)	0.93 (23.5)	0.6 (17)	②
SMK550A-GN	CH06BUL	1.22 (31)	0.57 (14.5)	0.93 (23.5)	0.53 (15)	②
SMK5100A-AA **SMK5160A-AA**	CH25UL	1.22 (31)	0.67 (17)	1.07 (27)	0.71 (20)	②

- Capacitor cap is included with the capacitor.

External Resistor (included with SMK5□ only)

Weight: 2.1 oz. (60 g)

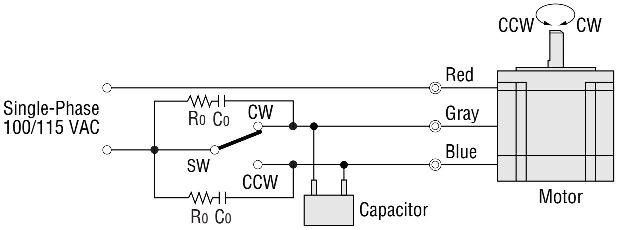


Dimensions C-278
Connection and Operation C-280

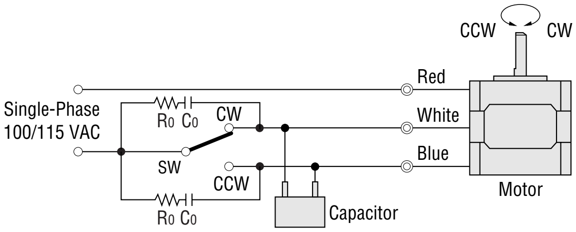
Connection and Operation

When the switch is set to “CW”, the motor rotates in the clockwise direction. When set to “CCW”, the motor rotates in the counterclockwise direction. The motor can be stopped instantly by turning off the power supply. The direction of motor rotation is as viewed from the shaft end of the motor. The capacitor and external resistor (for **SMK5**□ only) are included with the motor.

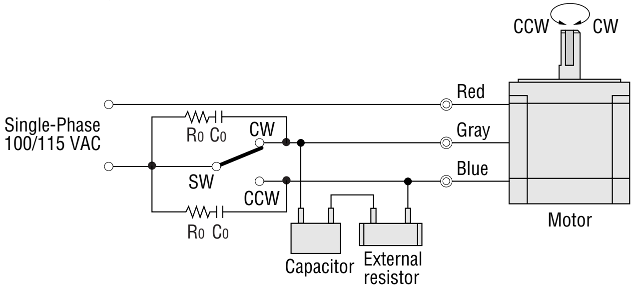
SMK2 Type



SMK0 Type



SMK5 Type



- To protect the contact point of relays and switches, always connect the accessory surge suppressor. CR circuit for surge suppression is available as an accessory.
→Page A-218
- When the gearedmotor or **GN** gearheads are used, the rotating direction of output shaft differs according to the gear ratio.

Starting Time

Low-speed synchronous motors offer superb starting, stopping and reversing characteristics. Provided that the motor is operating within permissible load inertia limits, it can be started, stopped or reversed within 1.5 cycles of the applied frequency. The motor will start and reach a steady speed in the time shown in the table.
As seen in this table, there is a certain amount of variation in the time required for the motor to reach the set speed. This is attributable to factors linked with the phase of the power source and the relative positions of the rotor and stator when the current is applied. One method of reducing these vibrations is to use a zero cross switch. Other possibilities include the use of special control circuits.

Model	Load Inertia: J		Starting Time (ms)		Stopping Time (ms)	
	oz-in^2	kg·m^2	Start Up	Settling	Settle Down	Settling
SMK014A-A	0	0	2~15	19~37	3~5	7~23
SMK014MA-A	0.75	137×10^{-7}	3~16	25~38	4~7	11~27
SMK0A-□A	1.50	275×10^{-7}	6~22	14~48	5~9	23~32
SMK237A-A	0	0	2~15	19~37	3~5	7~23
	6.8	1250×10^{-7}	3~16	25~38	4~7	11~27
	13.7	2500×10^{-7}	6~22	14~48	5~9	23~32
SMK216A-GN	0	0	2~15	19~37	3~5	7~23
	1.64	300×10^{-7}	3~16	25~38	4~7	11~27
	3.3	600×10^{-7}	6~22	14~48	5~9	23~32
SMK5100A-AA **SMK550A-GN**	0	0	2~15	19~37	3~5	7~23
	19.1	3500×10^{-7}	3~16	25~38	4~7	11~27
	38	7000×10^{-7}	6~22	14~48	5~9	23~32
SMK5160A-AA	0	0	2~15	19~37	3~5	7~23
	33	6000×10^{-7}	3~16	25~38	4~7	11~27
	66	12000×10^{-7}	6~22	14~48	5~9	23~32

- Enter the gear ratio in the box (□) within the model number.

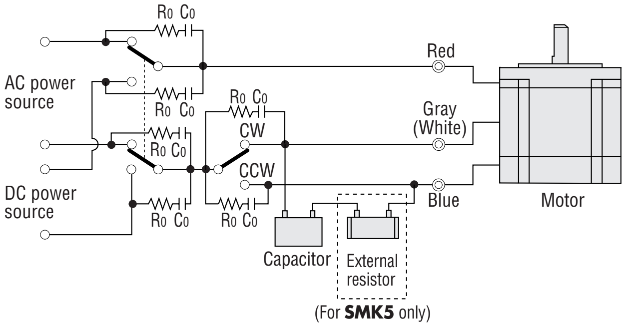
Features C-274 System Configuration C-275 Specifications C-276

DC Excitation

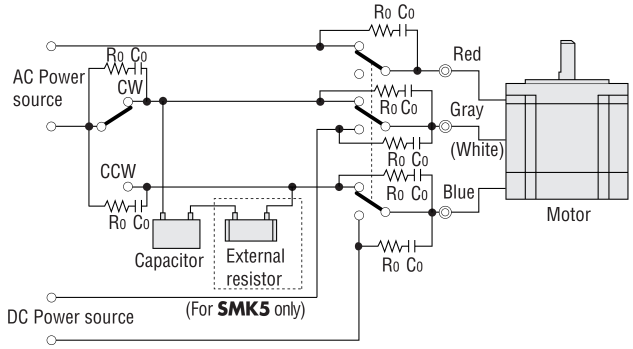
When a holding torque larger than the static holding torque of the stopped motor is required, apply a DC voltage simultaneously while turning the AC power supply off.

Connection Diagrams

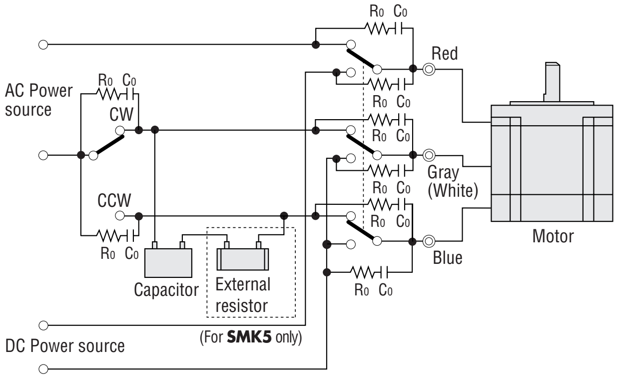
1-Phase Excitation



2-Phase Excitation (Series)



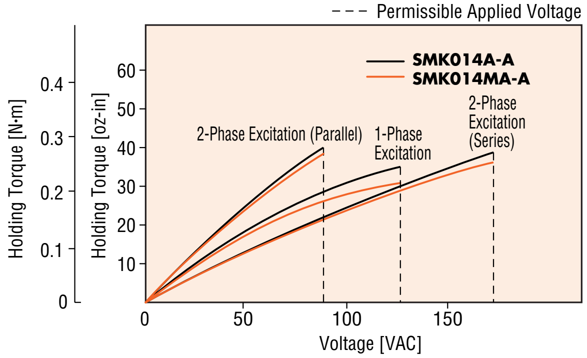
2-Phase Excitation (Parallel)



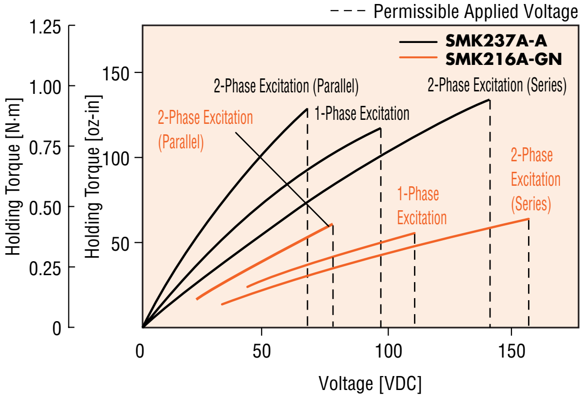
- The white leads listed in parentheses are only for the **SMK0**.
- Connect the supplied external resistor to the capacitor in series for the **SMK5** model.
- External resistors are not needed for the **SMK0** and **SMK2** models.
- To prevent DC power supply damage caused by voltage surges, connect a surge suppressor circuit between the contact points of the relay switches. The **EPCR1201-2** surge suppressor circuit is available as an accessory. → Page A-218

Characteristics for DC Excitation

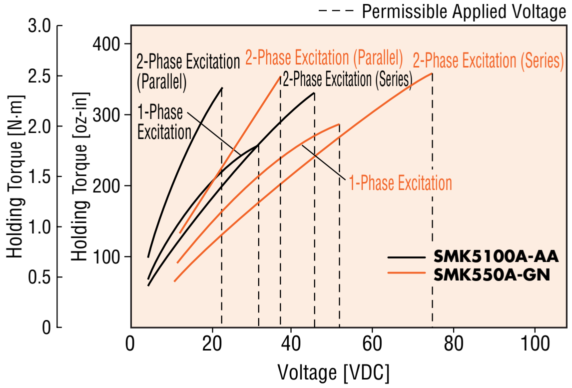
SMK014A-A, SMK014MA-A, SMK0A-□A *



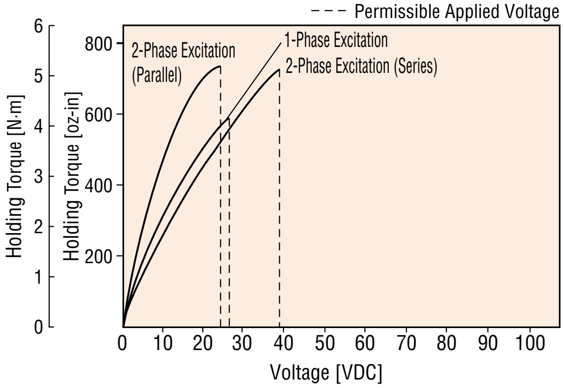
SMK237A-A, SMK216A-GN *



SMK5100A-AA, SMK550A-GN *



SMK5160A-AA



* These values apply to round shaft motors. To calculate holding torque for gearmotors, use the following formula: listed holding torque × gear ratio
Note that the gearmotor holding torque should be lower than the permissible torque on the gear output shaft. **Permissible Torque with Gearhead Attached**→Page C-277

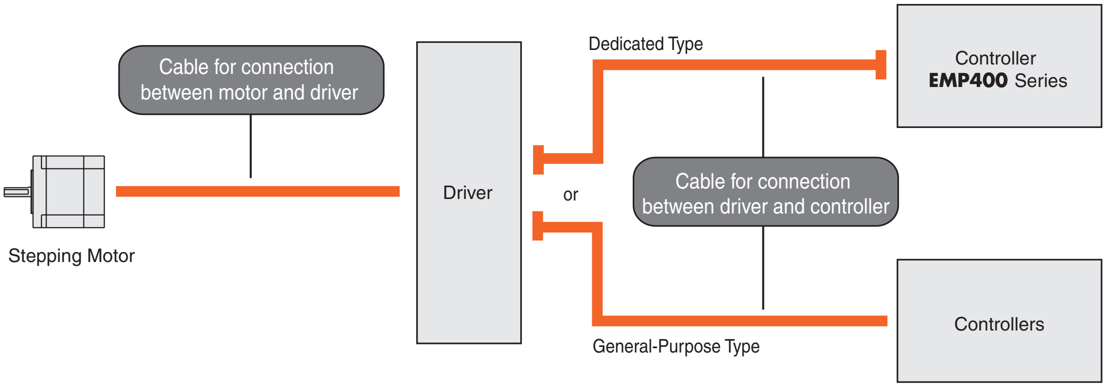
Dimensions C-278
Connection and Operation C-280

Accessories

Cables

Extension cables provide convenient connection between a motor, driver and controller.

Type of Cables



For Connection between a Motor and Driver

These cables are available to extend the distance between the motor and the driver for αSTEP and **RK** Series.

Cable Name	Page		Applicable Series
Extension Cable	C-286	3	**RK** Series
Extension Cable	C-286	4	αSTEP
Flexible Cable	C-286	5	αSTEP
Motor Cable	C-287	6	**PK** Series Standard **P** Type

For Connection between a Driver and Controller

These cables are available to extend the connection between the driver and controller. There are both dedicated cables for connection between the **EMP400** and the αSTEP or **RK** Series, as well as general purpose cables for the αSTEP and **RK** Series.

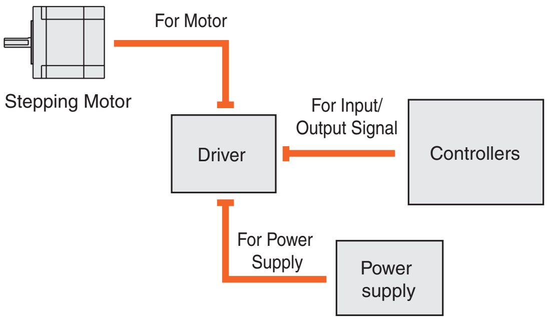
Cable Name		Page		Applicable Series
Driver Cable	Dedicated Type	C-285	1	αSTEP
				RK Series
	General-Purpose Type	C-285	2	αSTEP
				RK Series
				UI2120G

Cable set for DC input stepping motor & driver package

As an option for DC input drivers, lead wires with connectors are available.
Crimping is not necessary, and the connection with the motor, power supply, input/output signal is also easy.

Cable Name	Page		Applicable Series
Optional Cables	C-287	7	5-phase **PMC** Series

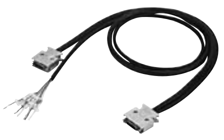
The optional cable includes three cables (for motor, power supply and input/output signal).



Driver Cables

These cables are convenient for connecting **αSTEP** and **RK** series drivers to controllers. General-Purpose Type and Dedicated Type (equipped with the connector for the **EMP** series controller) are available.

1 Dedicated Type



One end of the cable is a half-pitch connector that snaps into the driver for **αSTEP** and **RK** series. The other end of the cable is equipped with the connector for the **EMP400** series controller.

Note:
Note that as the length of the pulse signal line increases, the maximum transmission frequency decrease. (→Technical Reference Page F-36)

● Product Line

◆ For αSTEP

Model	Applicable Series	Length L ft. (m)
CC01EMP4	**AS, ASC** Series	3.3 (1)
CC02EMP4		6.6 (2)

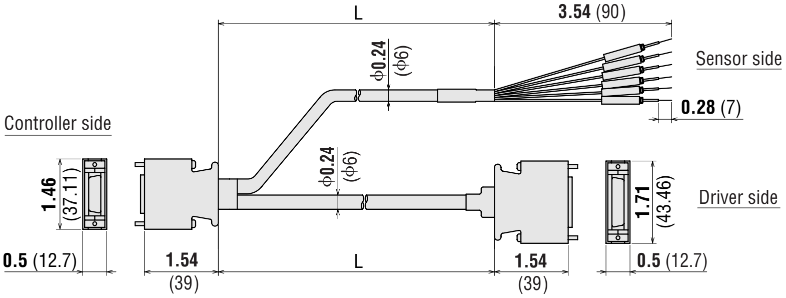
Note:
- The alarm clear signal of the AS and ASC series cannot be used with the EMP400 series controller.

● For RK Series

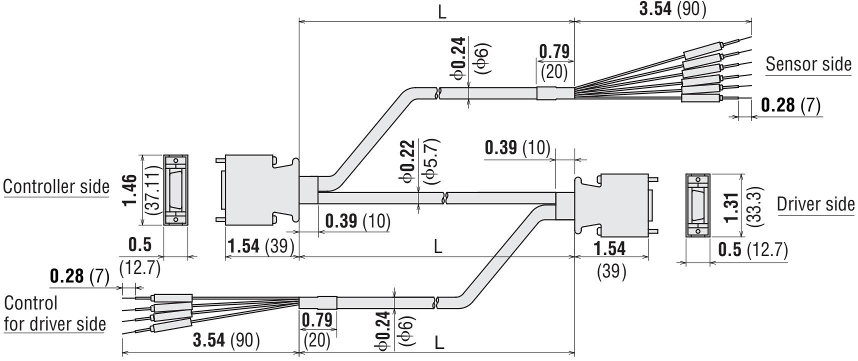
Model	Length L ft. (m)
CC01EMP5	3.3 (1)
CC02EMP5	6.6 (2)

● Dimensions Scale 1/4, Unit = **inch** (mm)

◆ For αSTEP



◆ For RK Series



2 General-Purpose Type

This is a ribbon cable equipped with, at one end of the cable, the half-pitch connector that snaps into the driver for **αSTEP**, **RK** series and **UI2120G**.

Note:
Note that as the length of the pulse signal line increases, the maximum transmission frequency decrease. (→Technical Reference Page F-36)
- Install a connector that matches the controller you are using to the other end of the cable.

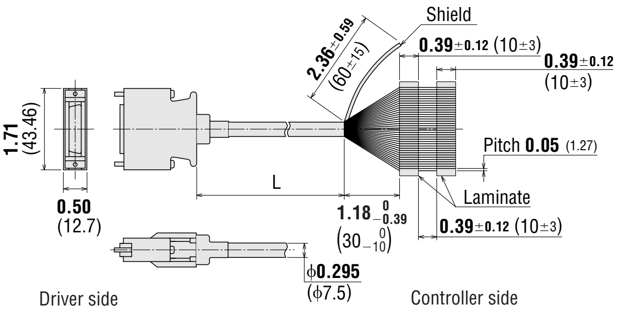
● Product Line

Model	Applicable Series	Length L ft. (m)
CC36D1-1	**αSTEP**	3.3 (1)
CC36D2-1		6.6 (2)
CC20D1-1	**αSTEP AS PLUS** **RK** Series **UI2120G**	3.3 (1)
CC20D2-1		6.6 (2)

● Dimensions Scale 1/4, Unit = **inch** (mm)

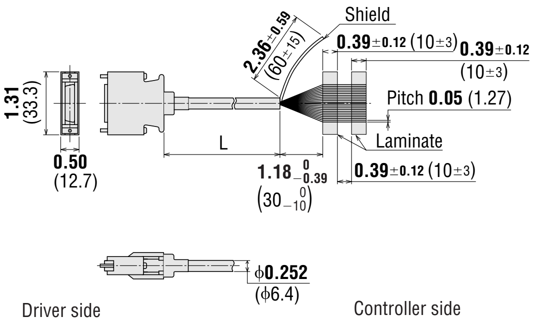
◆ For αSTEP

Conductor: AWG28



◆ For αSTEP (AS PLUS), RK Series and UI2120G

Conductor: AWG28



3 Extension Cable (For **RK** Series)

These extension cables are used between **RK** series motors and dedicated drivers. They come in three lengths: 16.4 feet (5 m), 32.8 feet (10 m), and 65.6 feet (20 m).

Model	Length L ft. (m)	Conductors
CC05PK5	16.4 (5)	5
CC10PK5	32.8 (10)	
CC20PK5	65.6 (20)	

- Conductor size: AWG22
- Finished outer diameter: ϕ0.28 inch (ϕ7.2mm)
- Cable rating: 221˚F (105°C)
- Outer casing: oil-resistant, heat-resistant, non-migrating vinyl

Note:
These extension cables are only for the **RK** Series. Do not use them on other stepping motor & driver packages.

4 Extension Cable (For αSTEP)

These extension cables are convenient when using the αSTEP stepping motor and driver more than 1.31 feet (0.4 m) apart from each other.

It's not necessary when the following products are used where the distance between the driver and the motor is 1.31 ft. (0.4 m) or less.

- **AS**, **AS PLUS**, **ASC** Series w/o electromagnetic brake
- **AS**, **AS PLUS**, **ASC** Series electromagnetic brake type [Motor Frame Size: 1.65 inch (42 mm)]

● Product Line

◆ For Standard

Model	Length L feet (m)
CC01AIP	3.3 (1)
CC02AIP	6.6 (2)
CC03AIP	9.8 (3)
CC05AIP	16.4 (5)
CC07AIP	23 (7)
CC10AIP	32.8 (10)
CC15AIP	49.2 (15)*
CC20AIP	65.6 (20)*

◆ For with Electromagnetic Brake

Model	Length L feet (m)
CC01AIPM	3.3 (1)
CC02AIPM	6.6 (2)
CC03AIPM	9.8 (3)
CC05AIPM	16.4 (5)
CC07AIPM	23 (7)
CC10AIPM	32.8 (10)
CC15AIPM	49.2 (15)*
CC20AIPM	65.6 (20)*

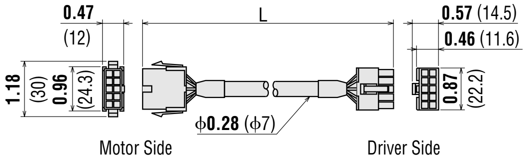
Note:

- Electromagnetic Brake models must use an extension cable for an Electromagnetic Brake. But motor frame size □1.65 in. (□42 mm) model can use a standard extension cable for the Electromagnetic Brake.

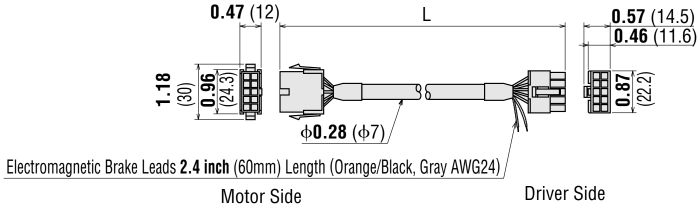
* **ASC** Series can not use extension cable with 49.2 ft. (15 m), 65.6 ft. (20 m) length.

● Dimensions Scale 1/4, Unit = **inch** (mm)

For Standard



For with Electromagnetic Brake



5 Flexible Cable (For αSTEP)

This flexible cable is used between αSTEP motors and dedicated drivers. We recommend this cable when the motor is installed on a moving section and the cable is repeatedly bent and extended.

It is not necessary when the following products are used where the distance between the driver and the motor is 1.31 ft. (0.4 m) or less.

- **AS** Series, **AS PLUS**, **ASC** Series w/o electromagnetic brake
- **AS** Series, **AS PLUS**, **ASC** Series electromagnetic brake type [Motor Frame Size: 1.65 inch (42 mm)]

● Product Line

◆ For Standard

Model	Length L feet (m)
CC01SAR	3.3 (1)
CC02SAR	6.6 (2)
CC03SAR	9.8 (3)
CC05SAR	16.4 (5)
CC07SAR	23 (7)
CC10SAR	32.8 (10)

◆ For with Electromagnetic Brake

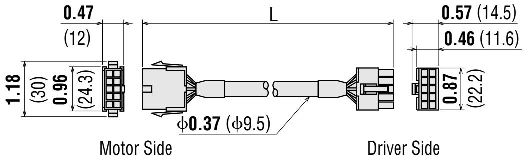
Model	Length L feet (m)
CC01SARM2	3.3 (1)
CC02SARM2	6.6 (2)
CC03SARM2	9.8 (3)
CC05SARM2	16.4 (5)
CC07SARM2	23 (7)
CC10SARM2	32.8 (10)

Note:

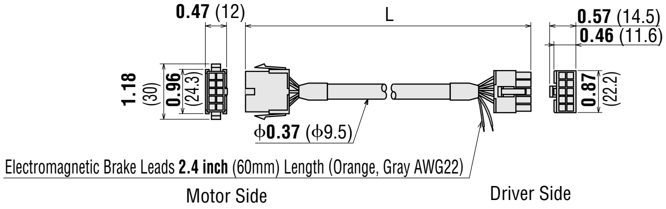
- Electromagnetic Brake models must use an extension cable for an Electromagnetic Brake. But motor frame size □1.65 in. (□42 mm) model can use a standard extension cable for the Electromagnetic Brake.

● Dimensions Scale 1/4, Unit = **inch** (mm)

For Standard



For with Electromagnetic Brake



- When only the extension between motor and driver is needed, use an extension cable.

6 Motor Cables

As an option, lead wires with connectors are available. A 2 ft. (0.6 m) lead wire connector is included with the motor and driver packages.

Product Line

Model	Package	Motor only	Length ft. (m)
LC5N06A	**CFK513P□**	**PK513P□**	2 (0.6)
LC5N10A			3.3 (1)
LC2U06A	—	**PK22□P**	2 (0.6)
LC2U10A		**PK223-SG□**	3.3 (1)
LC2U06B	—	**PK23□P**	2 (0.6)
LC2U10B		**PK24□P**	3.3 (1)

7 Optional Cables

As an option for DC input drivers, lead wires with a connector are available.
Crimping is not necessary, and the connection with the motor, power supply, input/output signal is also easy. The optional cable includes three cables (for motor, power supply and input/output signal).

Product Line

Model	Applicable Series	Applicable Driver	Length ft. (m)
LCS01PMC	**PMC** Series	PMD03CA	2 (0.6)

Flexible Couplings

MC Motor Couplings

Selecting an **MC** Coupling

Once you have decided on a motor and the shaft diameter of the equipment to be connected, determine the proper flexible coupling to use. Oriental Motor flexible couplings are available in external diameter sizes that provide the strength required for the motor torque.
All motor shaft diameters of stepping motor units are available with the exception of geared models.
There are three broad categories for the shaft diameter on the equipment to be connected based on the motor shaft diameter (except for some clamp types).

Features

- No backlash.
- Plate springs formed of slits reliably absorb eccentricity, declination and end play.
- Torsional rigidity is high, responsiveness excellent.
- Characteristics are the same in forward and reverse.
- Maintenance free (excellent resistance to oil and chemicals).
- Aluminum alloy construction.
- Standardized shaft hole sizes for motor shafts and driven shafts of different diameters.

Product Number Code

MC 25 F 04 F 04 C

Connection Method
C: Clamp Type
Inner Diameter
Shaft Hole Size
Blank: Metric Size
F: Inch Size
Inner Diameter
Shaft Hole Size
Blank: Metric Size
F: Inch Size
Outer Diameter of Coupling
MC Couplings

Examples **MC 25 08 F 04 C**
Internal Diameter **Internal Diameter**

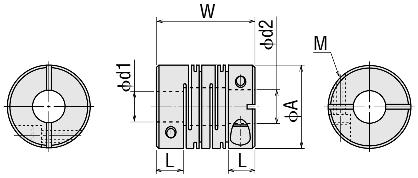
① When the motor is a **RK566AA** [outer diameter of shaft: 0.315 inch (8 mm) and the shaft diameter of the equipment to be connected to the motor is 0.25 inch (6.35 mm)] use **MC2508F04C**.
② When the motor is a **RK5913AA** [outer diameter of shaft: 0.5512 inch (14 mm)] and the shaft diameter of the equipment to be connected to the motor is 0.5 inch (12.7 mm)] use **MC5014F08C**.

MC coupling can be selected using with motor sizing calculation result (→Page F-2). Select a coupling which has rated torque bigger than motor required torque. In this way, smaller coupling may be able to use.

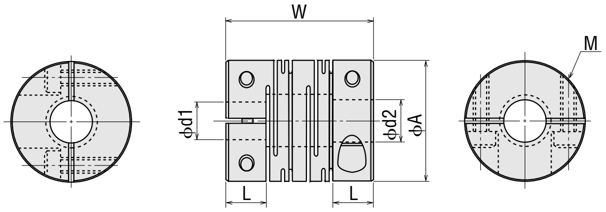
Type	Shaft Diameter in. (mm)	αSTEP	5-Phase Stepping Motors	2-Phase Stepping Motor Package	2-Phase Stepping Motors	Low-Speed Synchronous Motors	Driven Shaft Diameter in. (mm)					
							0.1875 (4.763)	0.25 (6.35)	0.3125 (7.938)	0.375 (9.525)	0.5 (12.7)	0.625 (15.875)
MC12	ϕ0.1969 (ϕ5)	—	**RK543, CFK53□, CFK543, CSK543, PMC3□**	**UMK243, CSK243**	**PK22□P**	**SMK014**	○					
MC16	ϕ0.1969 (ϕ5)	**AS46A(M), ASC34AK, ASC36AK, ASC46A(M)K**	**RK544, RK545, CFK544, CFK545, CSK544, CSK545**	**UMK244, CSK244**	**PK233P, PK243**		○	○				
MC20	ϕ0.1969 (ϕ5)	—	—	**UMK245, CSK245**	**PK235P, PK244, PK245**	—	○	○	○			
MC25	ϕ0.25 (ϕ6.35)	—	—	**UMK264, CSK264** **UMK266, CSK266**	**PK264**	**SMK237**		○	○	○		
	ϕ0.312 (ϕ7.937)	—	**CFK564, CFK566** **CSK564, CSK566**	—	—	—		○				
	ϕ0.315 (ϕ8)	—	**RK564, RK566**	—	—	—		○	○	○		
MC32	ϕ0.25 (ϕ6.35)	—	—	**UMK268, CSK268**	**PK266, PK268** **PV264, PV266**	—		○	○	○		
	ϕ0.312 (ϕ7.937)	—	**CFK569,CSK569**	—	—	—		○				
	ϕ0.315 (ϕ8)	**AS66A(M), AS69A(M)** **ASC66A(M)K**	**RK569**	—	—	—		○	○	○		
MC40	ϕ0.5 (ϕ12.7)	—	**CFK596, CFK599, CSK596, CSK599**	**UMK296, UMK299, CSK296, CSK299**	**PK296**	**SMK5100** **SMK5160**				○	○	○
	ϕ0.5512 (ϕ14)	**AS98A(M), AS911A**	**RK596, RK599**	—	—					○	○	○
MC50	ϕ0.5 (ϕ12.7)	—	**CFK5913, CSK5913**	**UMK2913, CSK2913**	**PK299, PK2913**	—					○	○
	ϕ0.5512 (ϕ14)	—	**RK5913**	—	—	—					○	○

Dimensions Unit = **inch** (mm)

● MC12-C, MC16-C, MC20-C, MC25-C, MC32-C



● MC40-C, MC50-C



Specifications

Model	Dimensions						Rated Torque oz-in (N·m)	Weight oz. (g)	Inertia oz-in^2 (kg·m^2)	Static Torsion Spring Constant lb-in/rad (N·m/rad)	Permissible Eccentricity in. (mm)	Permissible Declination degrees	Permissible End Play in. (mm)
	Outer Diameter φA in.(mm)	Length W in.(mm)	Shaft Hole Diameter d1 in. (mm)	Shaft Hole Diameter d2 in. (mm)	L in.(mm)	Screw Used M							
MC1205F03C	0.472 (12)	0.73 (18.5)	$\phi0.1969^{+0.0007}_{0}$ $(\phi5^{+0.018}_{0})$	$\phi0.1875^{+0.0007}_{0}$ $(\phi4.763^{+0.018}_{0})$	0.2 (5)	M2	28 (0.2)	0.14 (4)	0.0055 (1×10^{-7})	280 (32)	0.0039 (0.1)	2	±0.011 (±0.3)
MC1605F03C	0.63 (16)	0.91 (23)	$\phi0.1969^{+0.0007}_{0}$ $(\phi5^{+0.018}_{0})$	$\phi0.1875^{+0.0007}_{0}$ $(\phi4.763^{+0.018}_{0})$	0.26 (6.5)	M2.5	42 (0.3)	0.32 (9)	0.022 (4×10^{-7})	390 (45)	0.0039 (0.1)	2	±0.015 (±0.4)
MC1605F04C				$\phi0.2500^{+0.0009}_{0}$ $(\phi6.35^{+0.022}_{0})$									
MC2005F03C	0.79 (20)	1.02 (26)	$\phi0.1969^{+0.0007}_{0}$ $(\phi5^{+0.018}_{0})$	$\phi0.1875^{+0.0007}_{0}$ $(\phi4.763^{+0.018}_{0})$	0.3 (7.5)	M2.5	71 (0.5)	0.67 (19)	0.06 (11×10^{-7})	750 (85)	0.0039 (0.1)	2	±0.015 (±0.4)
MC2005F04C				$\phi0.2500^{+0.0009}_{0}$ $(\phi6.35^{+0.022}_{0})$									
MC2005F05C				$\phi0.3125^{+0.0009}_{0}$ $(\phi7.938^{+0.022}_{0})$									
MC2008F04C			$\phi0.3150^{+0.0009}_{0}$ $(\phi8^{+0.022}_{0})$	$\phi0.2500^{+0.0009}_{0}$ $(\phi6.35^{+0.022}_{0})$									
MC2008F05C				$\phi0.3125^{+0.0009}_{0}$ $(\phi7.938^{+0.022}_{0})$									
MC25F04F04C	0.98 (25)	1.22 (31)	$\phi0.2500^{+0.0009}_{0}$ $(\phi6.35^{+0.022}_{0})$	$\phi0.2500^{+0.0009}_{0}$ $(\phi6.35^{+0.022}_{0})$	0.33 (8.5)	M3	142 (1)	1.2 (34)	0.175 (32×10^{-7})	2000 (230)	0.0059 (0.15)	2	±0.019 (±0.5)
MC25F04F05C				$\phi0.3125^{+0.0009}_{0}$ $(\phi7.938^{+0.022}_{0})$									
MC25F04F06C				$\phi0.3750^{+0.0009}_{0}$ $(\phi9.525^{+0.022}_{0})$									
MC2508F04C			$\phi0.3150^{+0.0009}_{0}$ $(\phi8^{+0.022}_{0})$	$\phi0.2500^{+0.0009}_{0}$ $(\phi6.35^{+0.022}_{0})$									
MC2508F05C				$\phi0.3125^{+0.0009}_{0}$ $(\phi7.938^{+0.022}_{0})$									
MC2508F06C				$\phi0.3750^{+0.0009}_{0}$ $(\phi9.525^{+0.022}_{0})$									
MC32F04F04C	1.26 (32)	1.61 (41)	$\phi0.2500^{+0.0009}_{0}$ $(\phi6.35^{+0.022}_{0})$	$\phi0.2500^{+0.0009}_{0}$ $(\phi6.35^{+0.022}_{0})$	0.47 (12)	M4	280 (2)	2.6 (75)	0.66 (120×10^{-7})	3100 (360)	0.0059 (0.15)	2	±0.019 (±0.5)
MC32F04F05C				$\phi0.3125^{+0.0009}_{0}$ $(\phi7.938^{+0.022}_{0})$									
MC32F04F06C				$\phi0.3750^{+0.0009}_{0}$ $(\phi9.525^{+0.022}_{0})$									
MC3208F04C			$\phi0.3150^{+0.0009}_{0}$ $(\phi8^{+0.022}_{0})$	$\phi0.2500^{+0.0009}_{0}$ $(\phi6.35^{+0.022}_{0})$									
MC3208F05C				$\phi0.3125^{+0.0009}_{0}$ $(\phi7.938^{+0.022}_{0})$									
MC3208F06C				$\phi0.3750^{+0.0009}_{0}$ $(\phi9.525^{+0.022}_{0})$									
MC40F08F06C	1.57 (40)	2.2 (56)	$\phi0.5000^{+0.0011}_{0}$ $(\phi12.7^{+0.027}_{0})$	$\phi0.3750^{+0.0009}_{0}$ $(\phi9.525^{+0.022}_{0})$	0.59 (15)	M5	710 (5)	5.6 (160)	2.2 (400×10^{-7})	6700 (760)	0.0078 (0.2)	2	±0.019 (±0.5)
MC40F08F08C				$\phi0.5000^{+0.0011}_{0}$ $(\phi12.7^{+0.027}_{0})$									
MC40F08F10C				$\phi0.6250^{+0.0011}_{0}$ $(\phi15.875^{+0.027}_{0})$									
MC4014F06C			$\phi0.5512^{+0.0011}_{0}$ $(\phi14^{+0.027}_{0})$	$\phi0.3750^{+0.0009}_{0}$ $(\phi9.525^{+0.022}_{0})$									
MC4014F08C				$\phi0.5000^{+0.0011}_{0}$ $(\phi12.7^{+0.027}_{0})$									
MC4014F10C				$\phi0.6250^{+0.0011}_{0}$ $(\phi15.875^{+0.027}_{0})$									
MC50F08F08C	1.97 (50)	2.8 (71)	$\phi0.5000^{+0.0011}_{0}$ $(\phi12.7^{+0.027}_{0})$	$\phi0.5000^{+0.0011}_{0}$ $(\phi12.7^{+0.027}_{0})$	0.71 (18)	M6	1420 (10)	12 (330)	6.6 (1200×10^{-7})	26000 (3000)	0.0078 (0.2)	2	±0.019 (±0.5)
MC50F08F10C				$\phi0.6250^{+0.0011}_{0}$ $(\phi15.875^{+0.027}_{0})$									
MC5014F08C			$\phi0.5512^{+0.0011}_{0}$ $(\phi14^{+0.027}_{0})$	$\phi0.5000^{+0.0011}_{0}$ $(\phi12.7^{+0.027}_{0})$									
MC5014F10C				$\phi0.6250^{+0.0011}_{0}$ $(\phi15.875^{+0.027}_{0})$									

MCL Geared Motor Couplings

Selecting an **MCL** Coupling

Once you have decided on a motor and the shaft diameter of the equipment to be connected to it, determine the proper flexible coupling to use. Oriental Motor flexible coupling are available external diameter in sizes that provide the strength required for the motor torque.

These flexible couplings are clamp types and connect geared stepping motors to other shafts. Select the coupling to match the motor.

Features

- Couplings come with shaft holes and have standardized combinations of different diameter shaft holes.
- Characteristics are the same for clockwise and counterclockwise rotation.
- Oil-resistant and electrically insulated couplings are available.
- Aluminum alloy construction.
- The shaft being driven is not damaged, since shafts are joined by clamping.
- Easy installation due to separating hub and sleeve design.

Product Number Code

MCL 40 F 06 F 08

Inner Diameter d2

F: Inch Size

Inner Diameter d1

Shaft Hole Size
Blank: Metric Size
F: Inch Size

Outer Diameter of Coupling

MCL Couplings

Examples **MCL 30 F 05 F 06**

Internal Diameter d1 **Internal Diameter d2**

When the motor is **CSK264ATA-SG3.6** [outer diameter of shaft: 0.3125 inch (7.938 mm)] and the axis diameter of the equipment to be connected to the motor is 0.375 inch (9.525 mm), use **MCL30F05F06**.

Type	Shaft Diameter in. (mm)	5-Phase Stepping Motors	2-Phase Stepping Motors	Low-Speed Synchronous Motor	Driven Shaft Diameter in. (mm)					
					0.1875 (4.763)	0.25 (6.35)	0.3125 (7.938)	0.375 (9.525)	0.5 (12.7)	0.625 (15.875)
MCL20	ϕ0.1968 (ϕ5)	**PMC33-MG□**	**CSK243-SG□, PK223-SG□** **PK243-SG□**	**SMK0A-□A**	○	○	○			
MCL30	ϕ0.25 (ϕ6.35)	—	—	**SMK216-GN / 2GN□KA**			○			
	ϕ0.3125 (ϕ7.938)	—	**CSK264-SG□** **PK264-SG□**	—				○	○	
MCL40	ϕ0.5 (ϕ12.7)	—	**PK296-SG□**	**SMK550-GN / 5GN□KA**				○	○	○

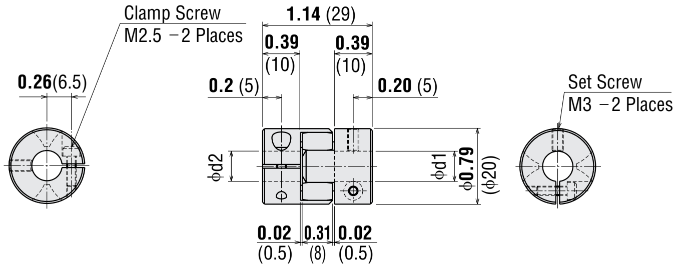
Specifications

Model	Dimensions				Normal Torque	Weight	Inertia	Permissible Eccentricity	Permissible Declination	Permissible End Play
	Outer Diameter in. (mm)	Length in. (mm)	Axis Hole Diameter d1 in. (mm)	Axis Hole Diameter d2 in. (mm)	lb-in (N·m)	oz. (g)	oz-in² (kg·m²)	in. (mm)	degrees	in. (mm)
MCL2005F03	0.79 (20)	1.14 (29)	$\phi0.1969^{+0.0007}_{0}$ $(\phi5^{+0.018}_{0})$	$\phi0.1875^{+0.0007}_{0}$ $(\phi4.763^{+0.018}_{0})$	44 (5.0)	0.67 (19)	0.055 (1.0×10^{-6})	0.0059 (0.15)	1°	$^{+0.0315}_{0}$ $\left(^{+0.8}_{0}\right)$
MCL2005F04				$\phi0.2500^{+0.0009}_{0}$ $(\phi6.35^{+0.022}_{0})$						
MCL2005F05				$\phi0.3125^{+0.0009}_{0}$ $(\phi7.938^{+0.022}_{0})$						
MCL30F04F05	1.18 (30)	1.71 (43.5)	$\phi0.2500^{+0.0009}_{0}$ $(\phi6.35^{+0.022}_{0})$	$\phi0.3125^{+0.0009}_{0}$ $(\phi7.938^{+0.022}_{0})$	110 (12.5)	2.3 (66)	0.45 (8.3×10^{-6})	0.0079 (0.2)	1°	$^{+0.0394}_{0}$ $\left(^{+1.0}_{0}\right)$
MCL30F05F05			$\phi0.3125^{+0.0009}_{0}$ $(\phi7.938^{+0.022}_{0})$	$\phi0.3125^{+0.0009}_{0}$ $(\phi7.938^{+0.022}_{0})$						
MCL30F05F06				$\phi0.3750^{+0.0009}_{0}$ $(\phi9.525^{+0.022}_{0})$						
MCL40F06F08	1.57 (40)	2.52 (64)	$\phi0.3750^{+0.0009}_{0}$ $(\phi9.525^{+0.022}_{0})$	$\phi0.5000^{+0.0011}_{0}$ $(\phi12.7^{+0.027}_{0})$	220 (25.0)	5.3 (150)	1.97 (3.6×10^{-5})	0.0079 (0.2)	1°	$^{+0.0472}_{0}$ $\left(^{+1.2}_{0}\right)$
MCL40F08F08			$\phi0.5000^{+0.0011}_{0}$ $(\phi12.7^{+0.027}_{0})$	$\phi0.5000^{+0.0011}_{0}$ $(\phi12.7^{+0.027}_{0})$						
MCL40F08F10				$\phi0.6250^{+0.0011}_{0}$ $(\phi15.875^{+0.027}_{0})$						

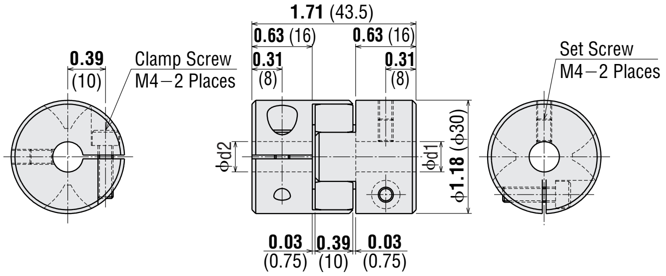
Dimensions

Scale 1/2, Unit = **inch** (mm)

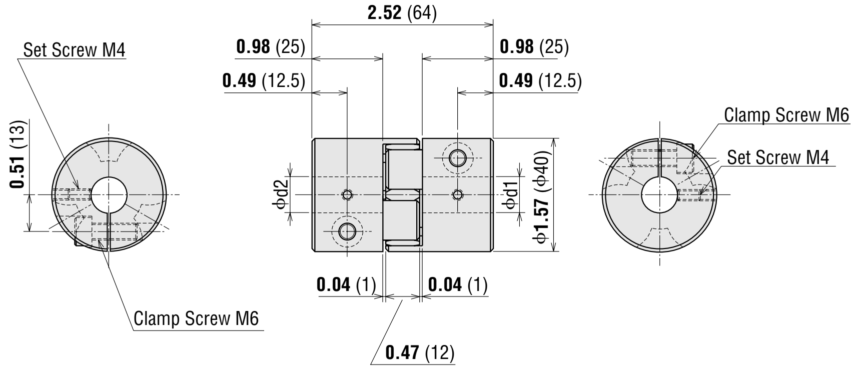
MCL20



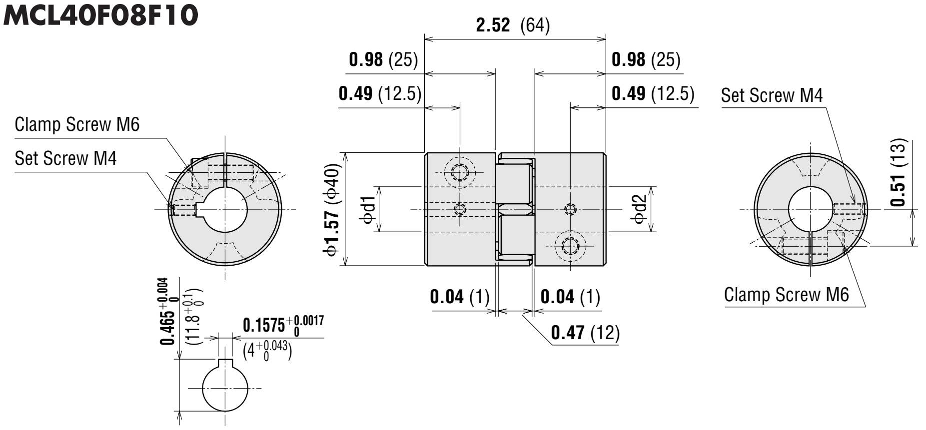
MCL30



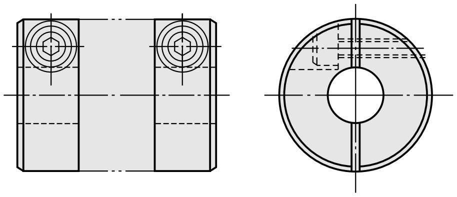
MCL40F06F08
MCL40F08F08



MCL40F08F10



Mounting to a Shaft



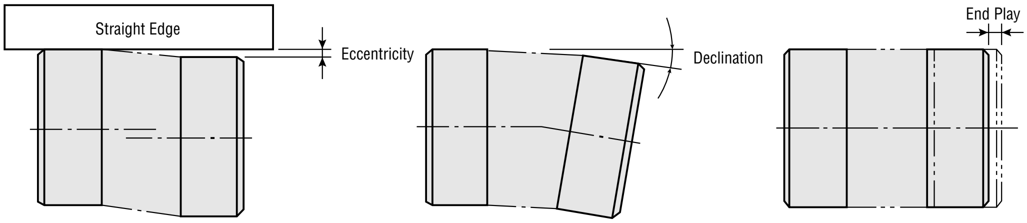
Clamp couplings use the binding force of the screw to compress the shaft hole diameter and thereby fasten the coupling to the shaft. This does not damage the shaft and is easy to mount and remove. The following table shows the screw binding torque. We recommend use of a torque wrench to fasten the coupling.

		MC12-C	**MC16-C** **MC20-C** **MCL20**	**MC25-C**	**MC32-C** **MCL30**	**MC40-C**	**MC50-C**	**MCL40**
Tightening Torque	oz-in (N·m)	71 (0.5)	142 (1)	210 (1.5)	350 (2.5)	560 (4)	1130 (8)	1700 (12)
Tightening Torque of key press screw for **MCL** coupling	oz-in (N·m)	—	99 (0.7)	—	280 (1.7)	—	—	2400 (17)

Alignment Adjustment

Flexible couplings tolerate misalignment of the axis center and transfer rotational angle and torque, but produce vibration when the permissible value for misalignment is exceeded. This can dramatically shorten the coupling's service life. This requires alignment adjustment.

Misalignment of the axis center includes eccentricity (parallel error of both centers), declination (angular error of both centers) and end play (shaft movement in the axial direction). To keep misalignment within the permissible value, always check and adjust the alignment. To increase the service life of the coupling, we recommend keeping misalignment to below 1/3 of the permissible value.

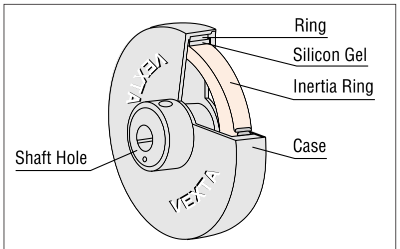


Notes:

- When misalignment exceeds the permissible value or excessive torque is applied, the coupling's shape will deform, and service life is shortened.
- When the coupling emits a metallic sound during operation, stop operation immediately and ensure there is no misalignment, axis interference or loose screws.
- When load changes are large, paint the coupling set screw with an adhesive to prevent the coupling screw from loosening or substitute a coupling one size larger.

Clean Dampers

Mechanical dampers suppress stepping motor vibration and improve high-speed performance. An inertial body and silicon gel are hermetically sealed in a plastic case. This offers the following advantages over conventional magnetic dampers.

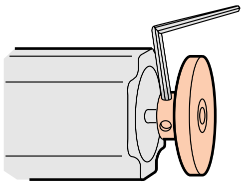


Clean Damper Structure

Features

- Since there is no frictional dust as in conventional magnetic dampers, it can be used in environments where higher degrees of cleanness is needed.
- Excellent vibration absorption
- The doughnut-shaped internal inertia body and silicon gel absorb vibration. This feature enables a stable damping effect.
- High reliability
- It holds up well in harsh environments and changes little with age because the silicon gel and plastic case used are heat resistant.

Installation of the Clean Damper



Point the mounting screws of the clean damper toward the motor case, fasten to the shaft and tighten the damper's mounting screws (2 places) with a hexagonal wrench to secure it to the shaft.

Notes:

- There are mounting screws with hexagonal holes in two damper locations, so tighten them both before running the motor.
- The damper rotates at the same speed as the motor shaft, so do not touch it while the motor is running.

Product Line

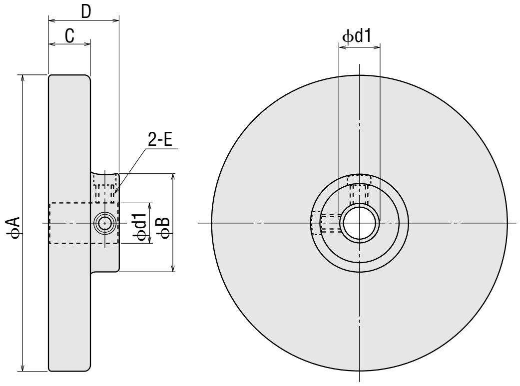
Model	Inertia oz-in^2 (kg·m^2)	Weight lb. (g)	Compatible Motors	
			5-Phase	2-Phase
D4CL-5.0F	0.186 (34×10^{-7})	0.053 (24)	**RK54□, RK54□-T, RK54□-N, RK54□-H CFK53□, CFK54□ CSK54□, CSK543-TG□ PMC3□, PMC33-MG□, PMC33-HG□**	**UMK24□, UMK24□M CSK24□, CSK24□M, CSK243-SG□ PK22□P PK23□P PK24□P PK24□, PK24□M PK223-SG□, PK243-SG□ UMK26□**
D6CL-6.3F	0.77 (140×10^{-7})	0.14 (62)		**UMK26□M CSK26□ CSK26□M CSK264-SG□ PK26□ PK26□M PK264-SG□ PV264, 266, 267**
D6CL-8.0F	0.77 (140×10^{-7})	0.13 (61)	**RK56□, RK56□-T, RK56□-N, RK56□-H CFK56□, CFK56□H**	
D9CL-12.7F	4.8 (870×10^{-7})	0.23 (105)	**CFK59□, CFK59□H CSK59□**	**CSK29□ PK29□, PK296-SG**
D9CL-14F	4.8 (870×10^{-7})	0.23 (105)	**RK59□ RK59□-T RK59□-N RK59□-H**	

Ambient Temperature: −4°F~+176°F (−20°C~+80°C)

✻ Insert the motor case length into the □ of the model name. The character of **A**, **B** and **M** which show the shaft type and electromagnetic brake type are omitted.

Dimensions → page C-294

Dimensions Unit = **inch** (mm)



Model	d1	A	B	C	D	E
D4CL-5.0F	$0.1969^{+0.0007}_{0}$ $(5^{+0.018}_{0})$	φ1.42 ±0.02 (φ36 ±0.5)	φ0.51 ±0.02 (φ13 ±0.5)	0.354 ±0.012 (9 ±0.3)	0.591 ±0.012 (15 ±0.5)	M3 2 Places
D6CL-6.3F	$0.2500^{+0.0009}_{0}$ $(6.35^{+0.022}_{0})$	φ1.75 ±0.02 (φ44.5 ±0.5)	φ0.79 ±0.02 (φ20 ±0.5)	0.591 ±0.012 (15 ±0.3)	0.87 ±0.02 (22 ±0.5)	M4 2 Places
D6CL-8.0F	$0.3150^{+0.0009}_{0}$ $(8^{+0.022}_{0})$					
D9CL-12.7F	$0.500^{+0.0011}_{0}$ $(12.7^{+0.027}_{0})$	φ3.13 ±0.02 (φ79.5 ±0.5)	φ1.02 ±0.02 (φ26 ±0.5)	0.433 ±0.012 (11 ±0.3)	0.75 ±0.02 (19 ±0.5)	M4 2 Places
D9CL-14F	$0.5512^{+0.0011}_{0}$ $(14^{+0.027}_{0})$					

Mounting Brackets for Stepping Motors

Mounting brackets are convenient for installing maintaining proper alignment between the motor shaft and the load.

Product Line

There are 10 types of mounting brackets for stepping motors.

● Standard Type, Standard **P** Type, High-Speed Type, High-Resolution Type, High Inertia Type (**PV** Series)

Material: Aluminum die cast

Mounting Bracket Models	Applicable Motor Type			
	αSTEP	5-Phase Stepping Motors	2-Phase Stepping Motors	Low-Speed Synchronous Motors
PAL0PA	—	**CSK54□** **CFK54□**	**UMK24□, UMK24□M** **CSK24□, CSK24□M** **PK24□, PK24□M**	
PAF0P	**AS46A, AS46M** **ASC46AK, ASC46MK**	**RK54□**	**PK24□P**	**SMK014A-A** **SMK014MA-A**
PAL2P-5A	**AS66A, AS69A** **AS66M, AS69M** **ASC66AK, ASC66MK**	**RK56□** **CSK56□** **CFK56□, CFK56□H**	—	—
PAL2P-2	—	—	**UMK26□, UMK26□M** **CSK26□, CSK26□M** **PK26□, PK26□M** **PV26□**	**SMK237A-A**
PAL4P-5A	**AS98A, AS98M** **AS911A**	**RK59□** **CSK59□, CFK59□H**	—	—
PAL4P-2	—	—	**CSK29□** **PK29□**	**SMK5100A-AA** **SMK5160A-AA**

- Insert the motor case length in the □ of the model name.
  The character of **A** and **B** which show the shaft type are omitted (except for Low Speed Synchronous Motor).
- The mounting bracket base is built with holes large enough to allow for alignment adjustments in the horizontal direction. (Adjustable range: Approximately 0.24 inch [6 mm])
- These mounting brackets can be perfectly fitted to the pilot of the stepping motors. (except for **PAL0PA**)

Notes:

- These mounting brackets are for stepping motors only. They cannot be used with compact AC motors.
- They cannot be used with geared stepping motors.

● Geared Type

Material: Aluminum die cast

Mounting Bracket Models	Applicable Motor Type			
	αSTEP	5-Phase Stepping Motors	2-Phase Stepping Motors	SMK
SOL0A-A	—	—	**CSK243-SG□** **PK243-SG□**	**SMK0A-□**
SOL0B-A	**AS46-T□** **ASC46-T□**	**RK543-T□** **CSK543-T□**	—	—
SOL2A-A	**AS66-T□** **ASC66-T□**	**RK564-T□** **CSK564-T□**	**CSK264-SG□** **PK264-SG□**	—
SOL5B-A	**AS98-T□**	**RK596-T□**	**PK296-SG□**	—

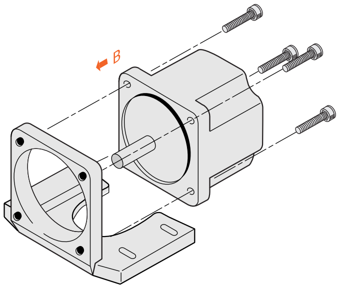
- Insert the gear ratio in the □ of the model name.
  The character of **A** and **B** which show the shaft type and the length of the motor case are partly omitted.
- The mounting bracket base is built with holes large enough to allow for alignment adjustments in the horizontal direction.
- When mounting, use the screws included with the geared motor. (except for αSTEP)

Note:

- These mounting brackets are for geared stepping motors only. They cannot be used with compact AC motors or stepping motors with gearheads.

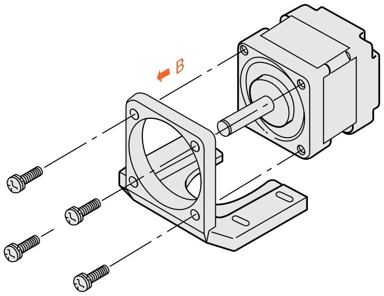
Mounting the Motor

1 PAL2P-□, PAL4P-□



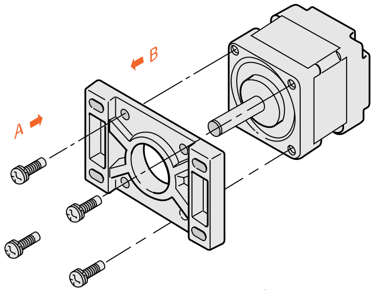
① Use the screws provided to secure the motor to the mounting bracket.
② Attach the motor from the direction shown by the arrow (B).

2 PAL0PA SOL0□, SOL2□, SOL5□



① Use the screws provided to secure the motor to **PAL0PA**.
② Attach the motor from the direction shown by the arrow (B).

3 PAF0P



① Use the screws provided to secure the motor to **PAF0P**.
② Motor can be attached from either side (A, B).

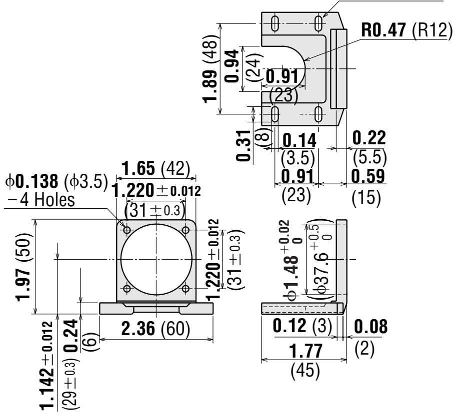
Dimensions

Unit = **inch** (mm)

PAL0PA

Weight: 1.24 oz. (35 g)

DXF B139

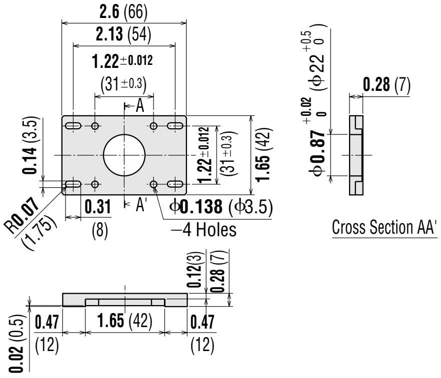


- Screws (included) No.4-40 UNC, 4 pieces

PAF0P

Weight: 1.06 oz. (30 g)

DXF B140

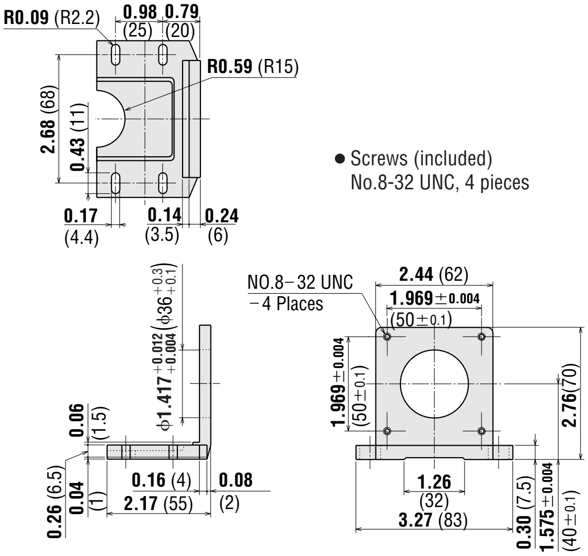


- Screws (included) M3 P0.5, 0.28 inch (7 mm) length, 4 pieces

PAL2P-5A

Weight: 3.9 oz. (110 g)

DXF B143

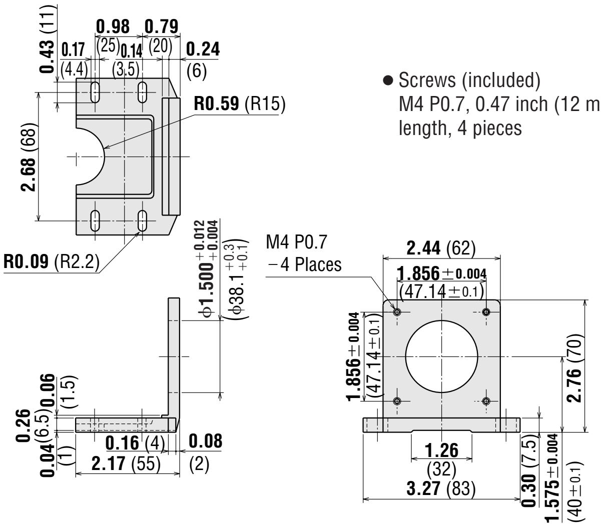


- Screws (included) No.8-32 UNC, 4 pieces

PAL2P-2

Weight: 3.9 oz. (110 g)

DXF B144

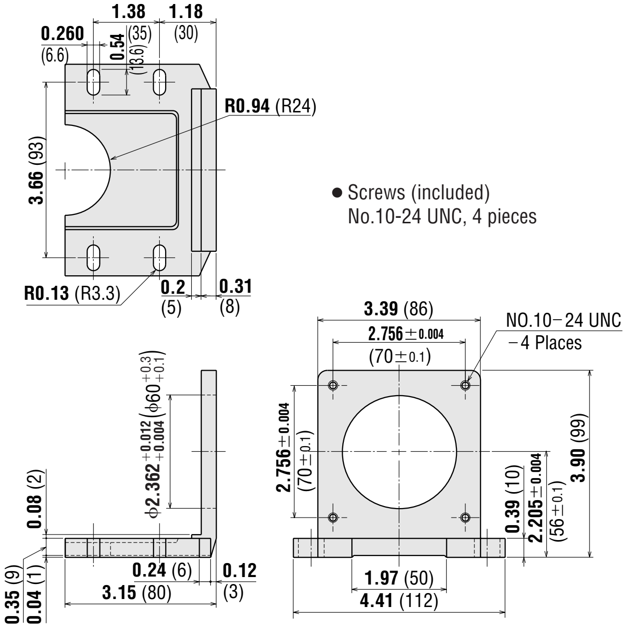


- Screws (included) M4 P0.7, 0.47 inch (12 mm) length, 4 pieces

PAL4P-5A

Weight: 8.8 oz. (250 g)

DXF B145

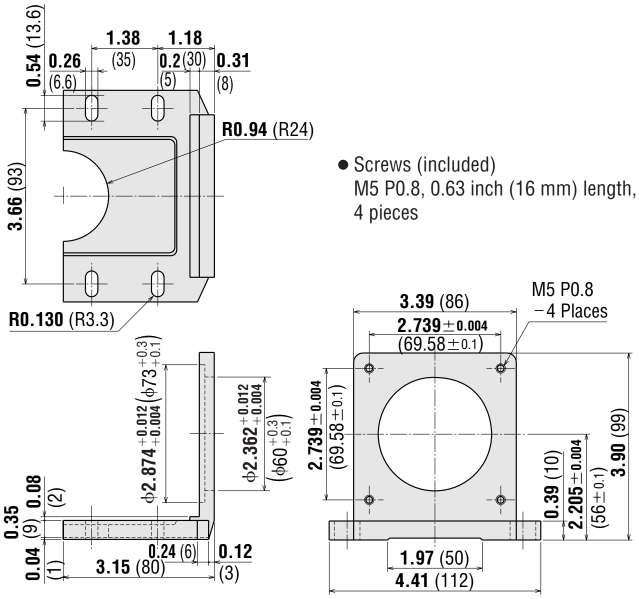


- Screws (included)
  No.10-24 UNC, 4 pieces

PAL4P-2

Weight: 8.8 oz. (250 g)

DXF B146



- Screws (included)
  M5 P0.8, 0.63 inch (16 mm) length,
  4 pieces

SOL0A-A

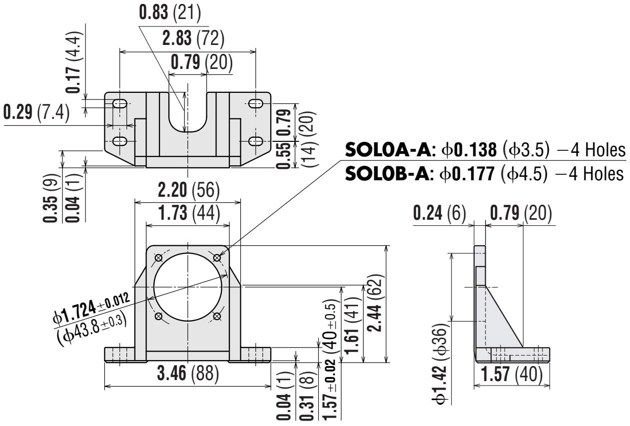
Weight: 2.8 oz. (80 g)

DXF B266

SOL0B-A

Weight: 2.8 oz. (80 g)

DXF B267

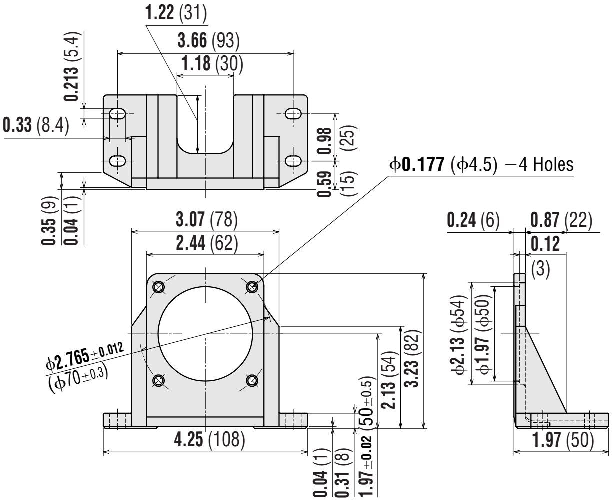


SOL0A-A: ϕ**0.138** (ϕ3.5) −4 Holes
SOL0B-A: ϕ**0.177** (ϕ4.5) −4 Holes

SOL2A-A

Weight: 4.2 oz. (120 g)

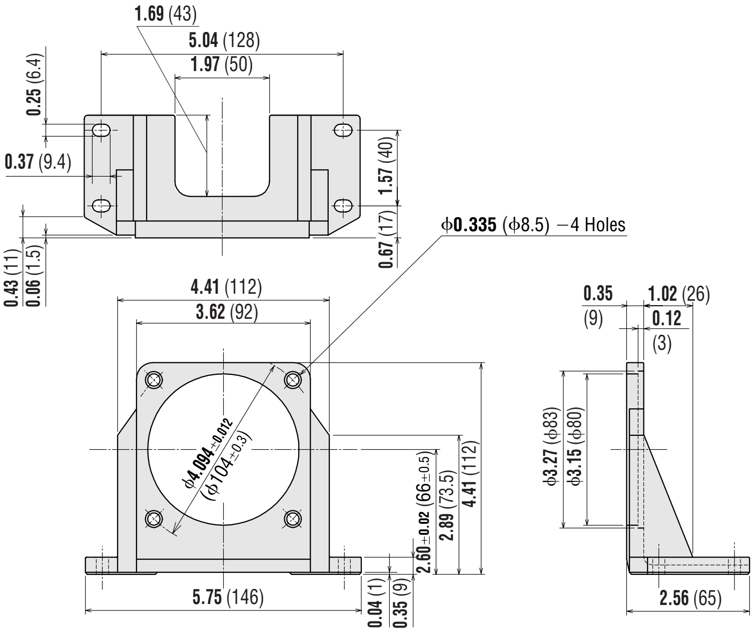
DXF B268



SOL5B-A

Weight: 9.5 oz. (270 g)

DXF B271



DIN Rail Mounting Plate

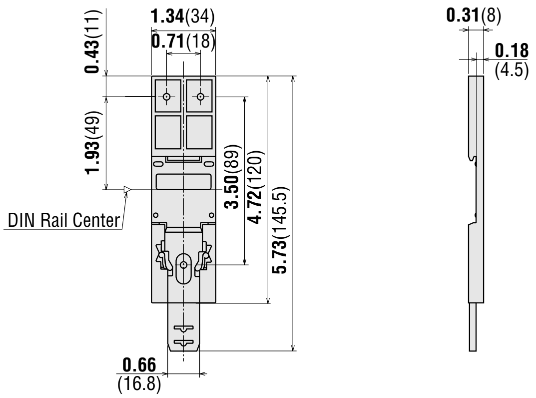
This installation plate is convenient for installing the driver on DIN rails with ease. The required installation screws come with this installation plate.

- Model: **PADP01**
  Applicable Product: αSTEP **AS** Series driver

Dimensions Unit = **inch** (mm)

Weight: 0.71 oz. (20 g)

- Screws (included)
  M3 P0.5, 0.31 inch (8 mm) length, 3 pieces



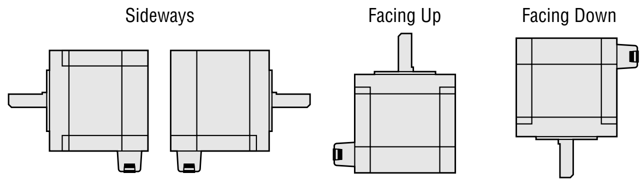
Before Using a Stepping Motor

Before Using a Stepping Motor

Motor Installation

Direction of Mounting

Motors can be mounted freely in any direction as shown below. Regardless of how the motor is mounted, take care not to apply an overhung load or thrust load on the shaft. Make sure the cable does not contact the mounting surface causing undesirable force on the cable.

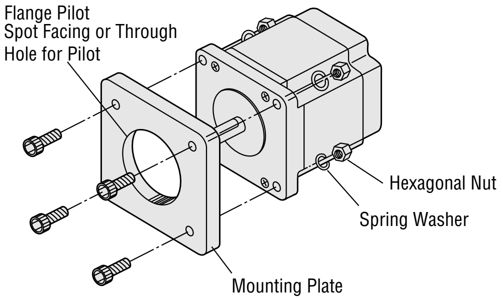


Notes:
- Do not disassemble the motors.
- Do not apply any shock to the motor.

Mounting Method

Considering heat radiation and vibration isolation as much as possible, mount the motor tightly against a metal surface.

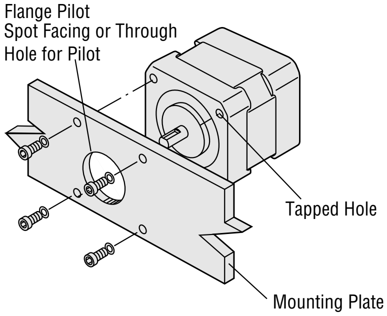
Through Hole Type



Thickness of the Mounting Plate (Through Hole Type)

Type	Model	Thickness of the Mounting Plate
αSTEP	**AS6□, ASC66**	0.2 in. (5 mm) min.
	AS9□	0.31 in. (8 mm) min.
	AS98-H	0.47 in. (12 mm) min.
5-Phase	**RK56□, CSK56□, CFK56□**	0.20 in. (5 mm) min.
	RK59□, CSK59□, CFK59□	0.31 in. (8 mm) min.
	RK59□-H	0.47 in. (12 mm) min.
2-Phase	**UMK26□, UMK26□M, CSK26□, CSK26□M PK26□, PK26□M, PV26□**	0.20 in. (5 mm) min.
	CSK29□, PK29□	0.31 in. (8 mm) min.

Tapped Hole Type



Thickness of the Mounting Plate (Tapped Hole Type)

Type	Model	Thickness of the Mounting Plate
αSTEP	**AS46, ASC3□, ASC46, ASC34-H**	0.12 in. (3 mm) min.
	AS46-T/N/H, AS66-T ASC46-T/N/H, ASC66-T	0.20 in. (5 mm) min.
	AS98-T, AS66-N/H, ASC66-N/H	0.31 in. (8 mm) min.
	AS98-N	0.47 in. (12 mm) min.
5-Phase	**CFK513, CFK53□, PMC3□**	0.08 in. (2 mm) min.
	RK54□, CSK54□, CFK54□, PMC33-M	0.12 in. (3 mm) min.
	RK54□-T/N/H, RK564-T CSK54□-T, CSK564-T, PMC33-H	0.20 in. (5 mm) min.
	RK56□-N/H, RK596-T	0.31 in. (8 mm) min.
	RK59□-N	0.47 in. (12 mm) min.
2-Phase	**PK22□P**	0.08 in. (2 mm) min.
	UMK24□, UMK24□M, CSK24□, CSK24□M, CSK243-SG, PK23□P, PK24□, PK24□P, PK24□M, PK223-SG, PK243-SG	0.12 in. (3 mm) min.
	CSK264-SG, PK264-SG	0.20 in. (5 mm) min.
	PK296-SG	0.31 in. (8 mm) min.

Driver Installation

AC Input Type

Installation Direction and Method

Drivers are designed to dissipate heat through natural convection. Install the driver vertically as shown in the photograph.

When installing the separate bracket model driver vertically in the device, use bracket A; when installing the driver parallel to the bottom, use bracket B.

Models with Built-In Brackets

- Applicable Products:
  RK Series
  UI2120G

Separate Bracket Models

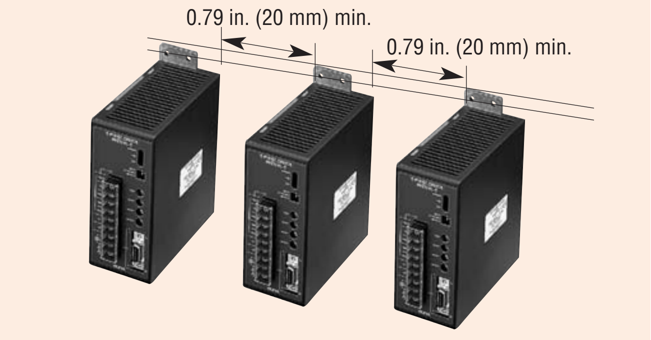
- Applicable Products:
  αSTEP **AS** Series
  UMK Series

- Firmly install on a metal plate that has good heat conductivity, such as iron or aluminum 0.08 inch (2 mm) or more in thickness.
- To directly install the driver without using the screws provided, pay particular attention to the length of the screws used for the tapped holes.

● Using Multiple Axes

When using multiple stepping motor axes, driver temperature rises will cause ambient temperatures to rise. At least 0.79 inch (20 mm) must be allowed between driver units and at least 0.98 inch (25 mm) between drivers and other equipment or structures.

Install a forced-air cooling fan if ambient temperatures exceed 122°F (50°C) [104°F (40°C) for some products].



● Installation Conditions

Install the driver in a location that meets the following conditions. Using the product under conditions other than this could cause it to be damaged.

- Indoors (This product is designed and manufactured to be installed within another device)
- Ambient temperature:
  32°F to 122°F (0°C to +50°C) (nonfreezing)
  32°F to 104°F (0°C to +40°C) [for **UMK** Series driver and **UI2120G**]
- Ambient humidity: 85% maximum (noncondensing)
- Not exposed to explosive, flammable, or corrosive gas
- Not exposed to direct sunlight
- Not exposed to dust
- Not exposed to water or oil
- A place where heat can escape easily
- Not exposed to continuous vibration or excessive impact

Notes:

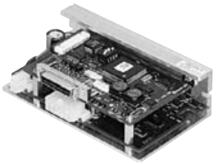
- When installing the driver in an enclosed space such as a control box, or somewhere close to a heat-radiating object, vent holes should be used to prevent the driver from overheating.
- Do not install the driver in a location where a source of vibration will cause the driver to vibrate.
- In situations where drivers are located close to a large noise source such as high frequency welding machines or large electromagnetic switches, take steps to prevent noise interference, either by inserting noise filters or connecting the driver to a separate circuit.
- Take care that pieces of conductive material (filings, pins, pieces of wire, etc.) do not enter the drivers.

DC Input Type

● Installation Direction

Considering heat radiation, install the driver vertically or board side down. Install the driver in a way that the power element side faces up and the aluminum electrolytic capacitor side faces down.

◆ Horizontal Installation



◆ Vertical Installation

Note:

- The driver can generate a great deal of heat depending on the operating conditions. Make sure that the temperature of the heat sink does not exceed 176°F (80°C).✻ (When the temperature of the heat sink exceeds 176°F (80°C), forced cooling is required.)

✻ CSD5828N-T: 194°F (90°C)

● Installation Conditions

Install the driver in a location that meets the following conditions. Using the product under conditions other than this could cause it to be damaged.

- Indoors (This product is designed and manufactured to be installed within another device)
- Ambient temperature: 32°F to 104°F (0°C～+40°C) (nonfreezing)
- Ambient humidity: 85% maximum (noncondensing)
- Not exposed to explosive, flammable, or corrosive gas
- Not exposed to direct sunlight
- Not exposed to dust
- Not exposed to water or oil
- A place where heat can escape easily
- Not exposed to continuous vibration or excessive impact

Notes:

- When installing the driver in an enclosed space such as a control box, or somewhere close to a heat-radiating object, vent holes should be used to prevent the driver from overheating.
- In situations where drivers are located close to a large noise source such as high frequency welding machines or large electromagnetic switches, take steps to prevent noise interference, either by inserting noise filters or connecting the driver to a separate circuit.

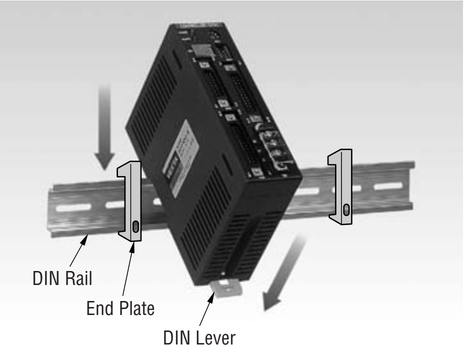
Before Using a Controller

Installation Method

EMP400 Series

DIN Rail Mounting

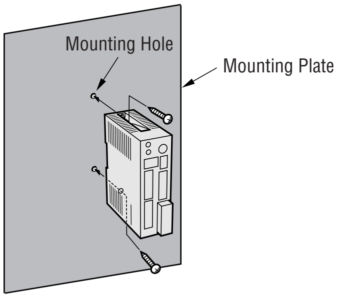
- Use DIN rails with a width of 1.38 in. (35 mm).
- Use end plates to secure the controller.
- DIN rails and end plates are not provided with the unit.



EMP400 Series, **SC8800/SC8800E**

Screw Mounting

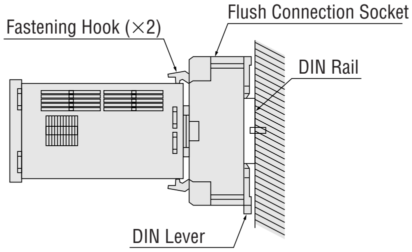
- To fasten the unit with screws, use the two screw holes at the top and bottom.
- The mounting holes should be machined for either M3 or M4 size screws. Use washers to secure the controller.



SG8030J

DIN Rail Mounting using Flush Connection Socket

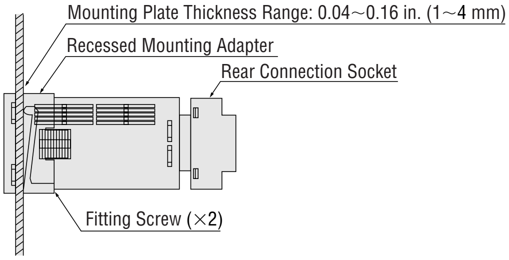
1. Mount the flush connection socket to the DIN rail. (The DIN lever should face down.)
2. Insert the controller terminals firmly into the flush connection socket.
3. Engage the fastening hooks of the flush connection socket on the controller to secure the assembly.



Note:
- Mount the controller only after connecting all required leads to the terminals of the flush connection socket.

Panel Mounting using Rear Connection Socket

1. Insert the controller into the mounting cutout from the front.
2. Insert the flush mount adapter from the rear and push it in to eliminate mounting panel clearance.
3. Fasten the adapter with the fitting screws (2 locations).
4. Insert the controller terminals firmly into the rear connection socket.



- For information on mounting cutout dimensions, see page C-271.

Installation Location

Indoors, ambient temperature 32°F to 122°F (0˚C to +50˚C) [32°F to 104°F (0˚C to +40˚C) for **SG8030J**] (Nonfreezing)

- If the ambient temperature exceeds 122°F (+50°C) [104˚F (+40˚C) for **SG8030J**], use a fan to provide forced cooling. Otherwise the internal heat buildup may lead to damage.
- When installing the controller in an enclosed space such as a control box, or somewhere close to a heat-radiating object, ventilation holes should be used to prevent the controller from overheating.

Ambient humidity 85% maximum (Noncondensing)

Not exposed to corrosive gass or dust

Take care that pieces of conductive material (filing, pins, pieces of wire, etc.) do not enter the controllers. Otherwise circuit damage may occur.

Not exposed to water or oil

Exposure to liquids can lead to corrosion or short-circuits.

Not exposed to direct sunlight

Not in the vicinity of noise sources

In situations where controllers are located close to an electrical noise source such as high frequency welding machines or large electromagnetic switches, take steps to prevent noise interference, either by inserting noise filters, using shielded wires or connecting the controller to a separate circuit.

Not in the vicinity of vibration sources

When the controller is to be installed in a location where a source of vibration will cause the controller to vibrate as well, install a shock absorber.

Do not overtighten screws

When fastening the unit with screws, use appropriate tightening torque. Take care not to damage the case by overtightening.