

(RoHS) RoHS-Compliant

5-Phase Stepping Motor and Driver Package

RK Series

- Standard Type
- TH Geared Type
- PN Geared Type
- Harmonic Geared Type



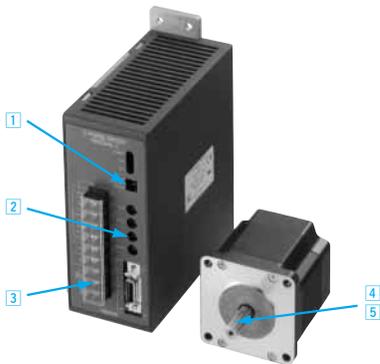
RK Series



The **RK** Series incorporates new functions and state-of-the-art technologies to achieve the ultimate utility of a control motor. The series offers various types including the standard type, IP65 rated motor type, and three geared types. Three frame sizes of 42 mm (1.65 in.), 60 mm (2.36 in.) and 85 mm (3.35 in.) [90 mm (3.54 in.)] are available. The wide-ranging motor variations and affordable price make the **RK** Series a perfect solution for your various applications.

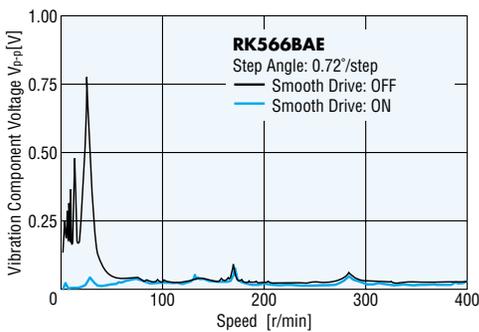


Features

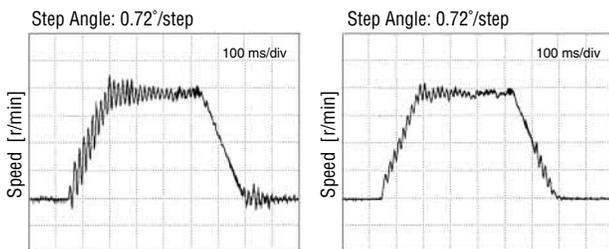


1 Smooth Drive Function

The 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.



The smooth drive function of the **RK** Series improves rotor settling time performance.



Conventional Model

RK (Smooth Drive: ON)

2 Microstep Drive System

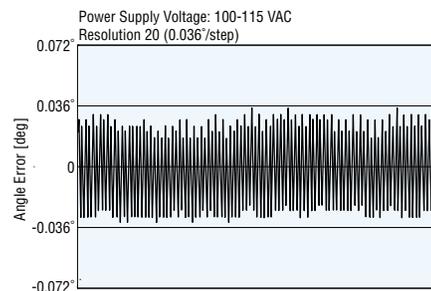
The motor's basic step angle is divided by a maximum of 1/250 without the use of a reduction mechanism or other mechanical means. 16 resolution levels are available to set the desired resolution. This enables fine positioning and the further reduction of vibration and noise. A motion sequence of "low-speed 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 VAC, 200-230 VAC Power Source Variation

The **RK** Series can be used with most common power supplies available around the world. They also comply with the international standards, ensuring safe operation.

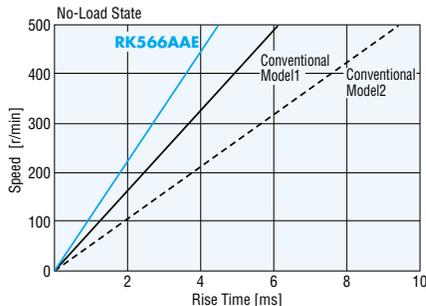
4 Improved Angle Accuracy

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.



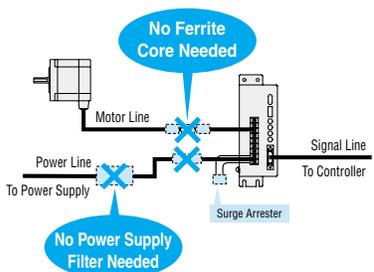
5 Improved Response

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.



Safe Operation in Major Countries around the World Compliance with Safety Standards

The **RK Series** complies with the UL/CSA and EN standards. (With the **RK54** type, only the driver conforms to the CSA standard.) 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 arrester. The **RK Series** doesn't require an external ferrite core or filter in the motor line or power line.



Protective Earth Terminal

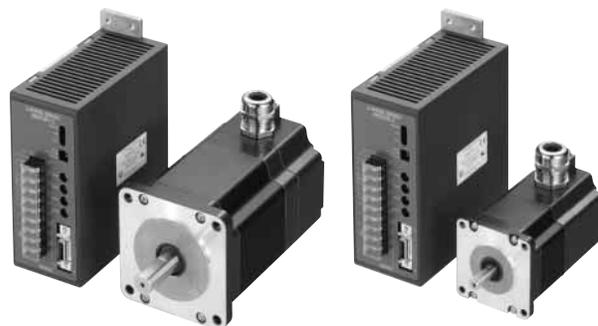
[Excluding motors with a frame size of 42 mm (1.65 in.)]



Extended Bearing Life

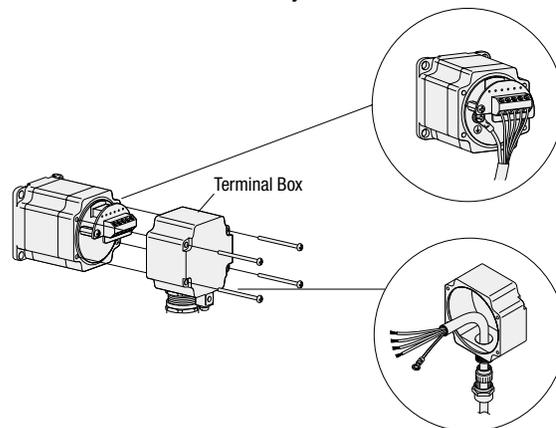
The life of a motor is affected by its bearing. The **RK Series** achieves approximately twice the life of a conventional motor by adopting a modified bearing. [Available only with the standard type with a frame size of 60 mm (2.36 in.) or 85 mm (3.35 in.)]

New IP65 Rated Motor Conforming to the IP65 Standard for Ingress Protection against Dust and Water



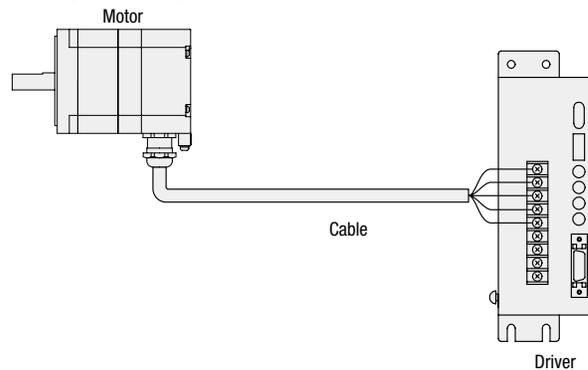
Terminal-Block Connection Design

The motor can be wired directly to its terminal block.



No Motor/Driver Relay

Since the motor cable can be connected directly with the driver terminals, there is no need for wire connection or soldering on a relay terminal block.



RoHS RoHS-Compliant

The **RK Series** conforms to the RoHS Directive that prohibits the use of six chemical substances including lead and cadmium.

RoHS (Restriction of Hazardous Substances) Directive: Directive on restriction of the use of certain hazardous substances in electrical and electronic equipment (2002/95/EC). The RoHS Directive prohibits the use of six chemical substances in electrical and electronic products sold in the E.U. member countries on or after July 1, 2006. The six controlled substances are: lead, hexavalent chromium, cadmium, mercury and two specific brominated flame-retardants (PBB and PBDE).

Wide Variety

The **RK** Series offers a range of motor frame sizes depending on the motor type and power supply voltage specification, as shown below. ["□42 (□1.65)" indicates a motor frame size of 42 mm (1.65 in.).]

	Power Supply Voltage	Standard Type	Standard Type IP65 Rated Motor	TH Geared Type	PN Geared Type	Harmonic Geared Type
	Single-Phase 100-115 VAC	<input type="checkbox"/> 42 (□1.65) <input type="checkbox"/> 60 (□2.36) <input type="checkbox"/> 85 (□3.35)	<input type="checkbox"/> 60 (□2.36) <input type="checkbox"/> 85 (□3.35)	<input type="checkbox"/> 42 (□1.65) <input type="checkbox"/> 60 (□2.36) <input type="checkbox"/> 90 (□3.54)	<input type="checkbox"/> 42 (□1.65) <input type="checkbox"/> 60 (□2.36) <input type="checkbox"/> 90 (□3.54)	<input type="checkbox"/> 42 (□1.65) <input type="checkbox"/> 60 (□2.36) <input type="checkbox"/> 90 (□3.54)
	Single-Phase 200-230 VAC	<input type="checkbox"/> 60 (□2.36) <input type="checkbox"/> 85 (□3.35)	<input type="checkbox"/> 60 (□2.36) <input type="checkbox"/> 85 (□3.35)	<input type="checkbox"/> 60 (□2.36) <input type="checkbox"/> 90 (□3.54)	<input type="checkbox"/> 60 (□2.36) <input type="checkbox"/> 90 (□3.54)	<input type="checkbox"/> 60 (□2.36) <input type="checkbox"/> 90 (□3.54)

Standard Type/Standard Type IP65 Rated Motor

Easy-to-use standard types offer balanced performance. The IP65 rated motor conforms to the IP65 standard for ingress protection against dust and water.



PN Geared Type (Non-backlash)

A high-accuracy geared motor achieves a backlash of 3 arc minutes or less. It also provides high strength and wide gear ratios.



TH Geared Type (Low backlash)

A low-cost geared motor offers low backlash.



Harmonic Geared Type (Non-backlash)

A high-accuracy, backlash-free geared motor adopts a newly developed harmonic gear. It ensures high strength in a compact body.



Characteristics Comparison for Geared Motors

Wide variety of geared motors are available according to your needs.

Geared Type	Features	Permissible Torque (Maximum Torque) [N·m (lb-in.)]	Backlash [min]	Basic Resolution [deg/step]	Output Shaft Speed [r/min]
Low backlash  TH Geared (Parallel Shaft)	-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	12 (106)	45	0.024	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 ratios: 5:1, 7.2:1, 10:1, 25:1, 36:1, 50:1	Permissible Torque 37 (320) Maximum Torque 60 (530)	3	0.0144	600
Non-backlash  New Construction Harmonic Geared (Harmonic Drive)	-High positioning precision -High permissible/maximum torque -High gear ratio, high resolution -Centered output shaft -Gear ratios: 50:1, 100:1	Permissible Torque 37 (320) Maximum Torque 55 (480)	0	0.0072	70

Note:

- The values shown above must be used as reference. These values vary depending on the series, frame size and gear ratio.

Safety Standards and CE Marking

Model	Standards	Certification Body	Standards File No.	CE Marking
Stepping Motor	UL 1004 UL 2111 CSA C22.2 No.100*1 CSA C22.2 No.77*1	UL	File No. E64199	Low Voltage Directives EMC Directives
	EN 60950-1 EN 60034-1 EN 60034-5	VDE*2	Licence No. 114293	
	UL 508C*3 CSA C22.2 No.14 EN 50178	UL	File No. E171462	

*1 Except for **RK54**□ type.

*2 Except for **RK56**□ and **RK59**□ type motors, **PN** geared type **RK544-N**□ motors and harmonic geared type **RK543-H**□ motors.

*3 Test Condition is Maximum Surrounding Air Temperature 50°C (122°F) according to UL Standards. (UL 508C)

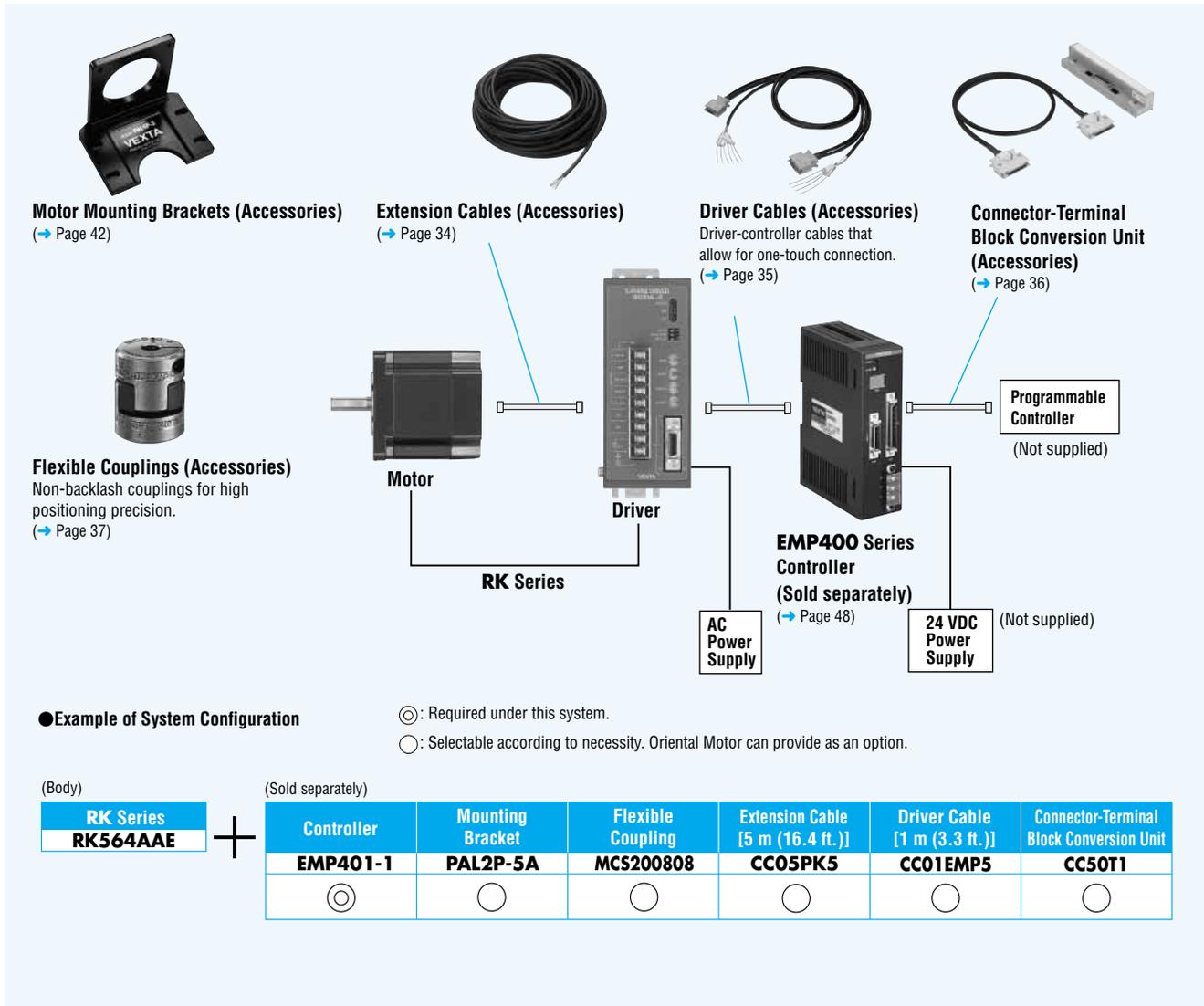
- When the system is approved under various safety standards, the model names in the motor and driver nameplates are the approved model names.

List of Motor and Driver Combinations → Page 33

- 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 system configuration with the **EMP400** Series controller.



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

Product Number Code

RK 5 6 6 B A E - N 5

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

①	Series RK: RK Series
②	5: 5-Phase
③	Motor Frame Size 4: 42 mm (1.65 in.) 6: 60 mm (2.36 in.) 9: 85 mm (3.35 in.) [90 mm (3.54 in.) sq. for Geared Type]
④	Motor Case Length
⑤	Motor Shaft Type A: Single Shaft B: Double Shaft
⑥	Power Supply Voltage A: Single-Phase 100-115 VAC C: Single-Phase 200-230 VAC
⑦	Motor Classification
⑧	Type Blank: Standard Type T: TH Geared Type N: PN Geared Type H: Harmonic Geared Type
⑨	Gear Ratio

Product Line

Standard Type

Power Supply Voltage	Model (Single Shaft)	Model (Double Shaft)
Single-Phase 100-115 VAC	RK543AA	RK543BA
	RK544AA	RK544BA
	RK545AA	RK545BA
	RK564AAE <small>NEW</small>	RK564BAE <small>NEW</small>
	RK566AAE <small>NEW</small>	RK566BAE <small>NEW</small>
	RK569AAE <small>NEW</small>	RK569BAE <small>NEW</small>
	RK596AAE <small>NEW</small>	RK596BAE <small>NEW</small>
	RK599AAE <small>NEW</small>	RK599BAE <small>NEW</small>
Single-Phase 200-230 VAC	RK5913AAE <small>NEW</small>	RK5913BAE <small>NEW</small>
	RK564ACE <small>NEW</small>	RK564BCE <small>NEW</small>
	RK566ACE <small>NEW</small>	RK566BCE <small>NEW</small>
	RK569ACE <small>NEW</small>	RK569BCE <small>NEW</small>
	RK596ACE <small>NEW</small>	RK596BCE <small>NEW</small>
	RK599ACE <small>NEW</small>	RK599BCE <small>NEW</small>
	RK5913ACE <small>NEW</small>	RK5913BCE <small>NEW</small>

Standard Type IP65 Rated Motor

Power Supply Voltage	Model
Single-Phase 100-115 VAC	RK564AAT <small>NEW</small>
	RK566AAT <small>NEW</small>
	RK569AAT <small>NEW</small>
	RK596AAT <small>NEW</small>
	RK599AAT <small>NEW</small>
Single-Phase 200-230 VAC	RK5913AAT <small>NEW</small>
	RK564ACT <small>NEW</small>
	RK566ACT <small>NEW</small>
	RK569ACT <small>NEW</small>
	RK596ACT <small>NEW</small>
RK599ACT <small>NEW</small>	
RK5913ACT <small>NEW</small>	

TH Geared Type

Power Supply Voltage	Model (Single Shaft)	Model (Double Shaft)
Single-Phase 100-115 VAC	RK543AA-T3.6	RK543BA-T3.6
	RK543AA-T7.2	RK543BA-T7.2
	RK543AA-T10	RK543BA-T10
	RK543AA-T20	RK543BA-T20
	RK543AA-T30	RK543BA-T30
	RK564AAE-T3.6 <small>NEW</small>	RK564BAE-T3.6 <small>NEW</small>
	RK564AAE-T7.2 <small>NEW</small>	RK564BAE-T7.2 <small>NEW</small>
	RK564AAE-T10 <small>NEW</small>	RK564BAE-T10 <small>NEW</small>
	RK564AAE-T20 <small>NEW</small>	RK564BAE-T20 <small>NEW</small>
	RK564AAE-T30 <small>NEW</small>	RK564BAE-T30 <small>NEW</small>
	RK596AAE-T3.6 <small>NEW</small>	RK596BAE-T3.6 <small>NEW</small>
	RK596AAE-T7.2 <small>NEW</small>	RK596BAE-T7.2 <small>NEW</small>
	RK596AAE-T10 <small>NEW</small>	RK596BAE-T10 <small>NEW</small>
	RK596AAE-T20 <small>NEW</small>	RK596BAE-T20 <small>NEW</small>
	RK596AAE-T30 <small>NEW</small>	RK596BAE-T30 <small>NEW</small>
	Single-Phase 200-230 VAC	RK564ACE-T3.6 <small>NEW</small>
RK564ACE-T7.2 <small>NEW</small>		RK564BCE-T7.2 <small>NEW</small>
RK564ACE-T10 <small>NEW</small>		RK564BCE-T10 <small>NEW</small>
RK564ACE-T20 <small>NEW</small>		RK564BCE-T20 <small>NEW</small>
RK564ACE-T30 <small>NEW</small>		RK564BCE-T30 <small>NEW</small>
RK596ACE-T3.6 <small>NEW</small>		RK596BCE-T3.6 <small>NEW</small>
RK596ACE-T7.2 <small>NEW</small>		RK596BCE-T7.2 <small>NEW</small>
RK596ACE-T10 <small>NEW</small>		RK596BCE-T10 <small>NEW</small>
RK596ACE-T20 <small>NEW</small>		RK596BCE-T20 <small>NEW</small>
RK596ACE-T30 <small>NEW</small>		RK596BCE-T30 <small>NEW</small>

Features

Line-up

System Configuration

Product Line

Specifications and Characteristics

Dimensions

Connection and Operation

List of Motor and Driver Combinations

Accessories

Before Using a Stepping Motor

Controllers

● PN Geared Type

Power Supply Voltage	Model (Single Shaft)	Model (Double Shaft)
Single-Phase 100-115 VAC	RK544AA-N5	RK544BA-N5
	RK544AA-N7.2	RK544BA-N7.2
	RK544AA-N10	RK544BA-N10
	RK566AAE-N5 	RK566BAE-N5 
	RK566AAE-N7.2 	RK566BAE-N7.2 
	RK566AAE-N10 	RK566BAE-N10 
	RK564AAE-N25 	RK564BAE-N25 
	RK564AAE-N36 	RK564BAE-N36 
	RK564AAE-N50 	RK564BAE-N50 
	RK599AAE-N5 	RK599BAE-N5 
	RK599AAE-N7.2 	RK599BAE-N7.2 
	RK599AAE-N10 	RK599BAE-N10 
	RK596AAE-N25 	RK596BAE-N25 
	RK596AAE-N36 	RK596BAE-N36 
	RK596AAE-N50 	RK596BAE-N50 
Single-Phase 200-230 VAC	RK566ACE-N5 	RK566BCE-N5 
	RK566ACE-N7.2 	RK566BCE-N7.2 
	RK566ACE-N10 	RK566BCE-N10 
	RK564ACE-N25 	RK564BCE-N25 
	RK564ACE-N36 	RK564BCE-N36 
	RK564ACE-N50 	RK564BCE-N50 
	RK599ACE-N5 	RK599BCE-N5 
	RK599ACE-N7.2 	RK599BCE-N7.2 
	RK599ACE-N10 	RK599BCE-N10 
	RK596ACE-N25 	RK596BCE-N25 
	RK596ACE-N36 	RK596BCE-N36 
	RK596ACE-N50 	RK596BCE-N50 

● Harmonic Geared Type

Power Supply Voltage	Model (Single Shaft)	Model (Double Shaft)
Single-Phase 100-115 VAC	RK543AA-H50	RK543BA-H50
	RK543AA-H100	RK543BA-H100
	RK564AAE-H50 	RK564BAE-H50 
	RK564AAE-H100 	RK564BAE-H100 
	RK596AAE-H50 	RK596BAE-H50 
RK596AAE-H100 	RK596BAE-H100 	
Single-Phase 200-230 VAC	RK564ACE-H50 	RK564BCE-H50 
	RK564ACE-H100 	RK564BCE-H100 
	RK596ACE-H50 	RK596BCE-H50 
	RK596ACE-H100 	RK596BCE-H100 

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

Specifications RoHS



● With the **RK54** type, only the driver conforms to the CSA standard.

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

How to Read Specifications Table → See the following descriptions.

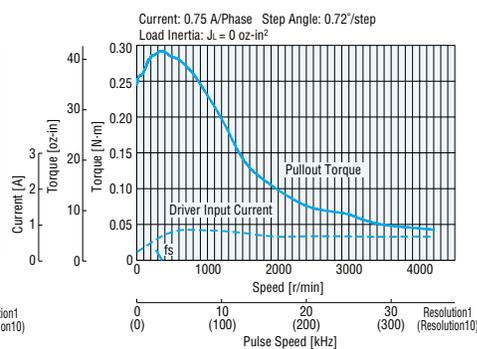
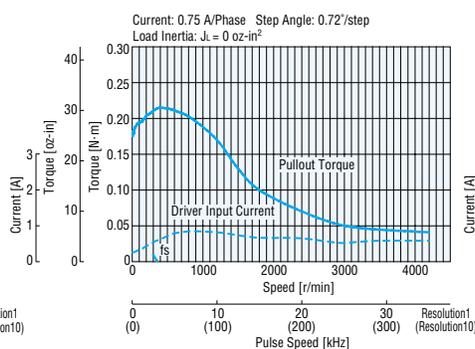
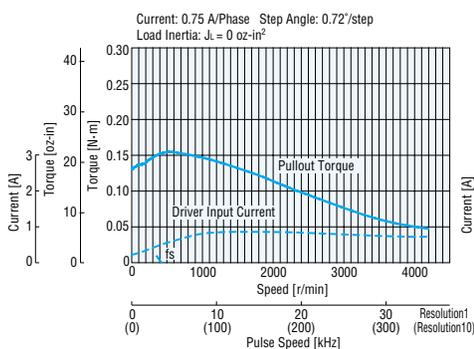
*Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Speed – Torque Characteristics fs: Maximum Starting Frequency

RK543AA/RK543BA

RK544AA/RK544BA

RK545AA/RK545BA



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

Notes:

● Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions.

Be sure to keep the temperature of the motor case under 100°C (212°F).

[Under 75°C (167°F) is required to comply with UL or CSA standards.]

● When using the motor with the dedicated driver, the driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 50%.

How to Read Specifications Table

Please read the following information before examining the specifications on pages 9 to 18.

Maximum Holding Torque: The holding torque (5-Phase: 5-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%.

Permissible Torque: The permissible torque represents the torque value limited by the mechanical strength of the gear when operated at a constant speed. For the types excluding **PN** and harmonic geared type, the total torque including acceleration/deceleration torque should not exceed this value.

Maximum Torque: 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. (**PN** geared, harmonic geared type only)

Angle Error: Difference between the theoretical angle of rotation of the output shaft as calculated from the input pulses, and the actual angle of rotation. (**PN** geared type only)

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

Specifications RoHS



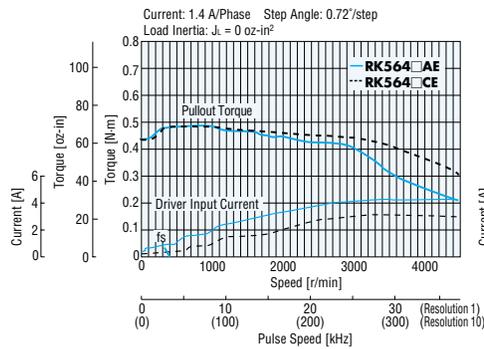
Model	Single-Phase	Single Shaft	RK564AAE	RK566AAE	RK569AAE	RK596AAE	RK599AAE	RK5913AAE
	100-115 VAC	Double Shaft	RK564BAE	RK566BAE	RK569BAE	RK596BAE	RK599BAE	RK5913BAE
Model	Single-Phase	Single Shaft	RK564ACE	RK566ACE	RK569ACE	RK596ACE	RK599ACE	RK5913ACE
	200-230 VAC	Double Shaft	RK564BCE	RK566BCE	RK569BCE	RK596BCE	RK599BCE	RK5913BCE
Maximum Holding Torque	N·m (oz-in)		0.42 (59)	0.83 (117)	1.66 (230)	2.1 (290)	4.1 (580)	6.3 (890)
Rotor Inertia	J: kg·m ² (oz-in ²)		175×10 ⁻⁷ (0.96)	280×10 ⁻⁷ (1.53)	560×10 ⁻⁷ (3.1)	1400×10 ⁻⁷ (7.7)	2700×10 ⁻⁷ (14.8)	4000×10 ⁻⁷ (22)
Rated Current	A/Phase		1.4					
Basic Step Angle			0.72°					
Power Source			Single-Phase 100-115 VAC ±15% 50/60 Hz 4.5 A Single-Phase 200-230 VAC $\pm 10\%$ / -15% 50/60 Hz 3.5 A					
Excitation Mode			Microstep Basic Angle/n* (/step)					
Mass	Motor	kg (lb.)	0.6 (1.3)	0.8 (1.8)	1.3 (2.9)	1.7 (3.7)	2.8 (6.2)	3.8 (8.4)
	Driver	kg (lb.)	0.85 (1.9)					
Dimension No.	Motor		2			3		
	Driver		16					

How to Read Specifications Table → Page 9

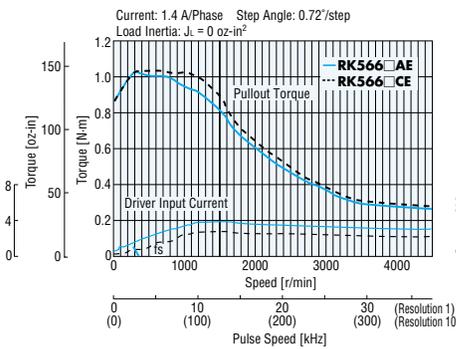
*Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Speed – Torque Characteristics fs: Maximum Starting Frequency

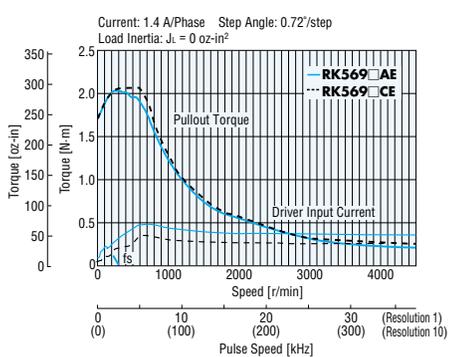
RK564□AE/RK564□CE



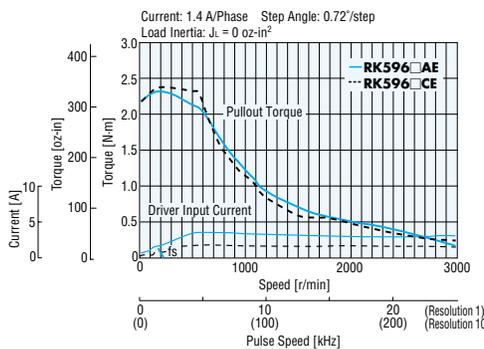
RK566□AE/RK566□CE



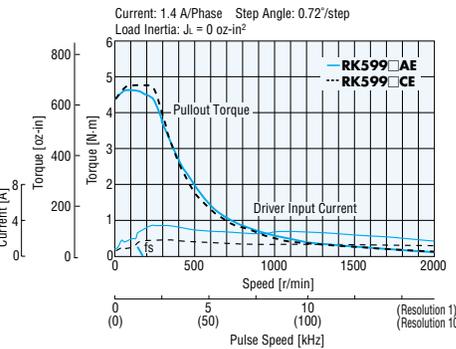
RK569□AE/RK569□CE



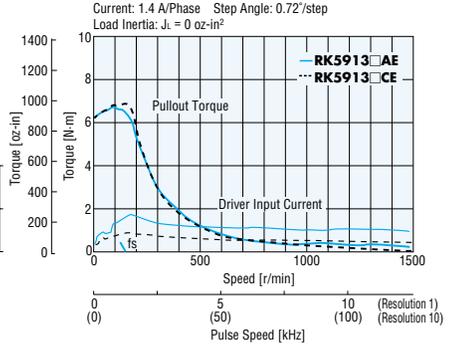
RK596□AE/RK596□CE



RK599□AE/RK599□CE



RK5913□AE/RK5913□CE



● Enter **A** (Single shaft) or **B** (Double shaft) in the box (□) within the model name.

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

Notes:

● Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions.

Be sure to keep the temperature of the motor case under 100°C (212°F).

[Under 75°C (167°F) is required to comply with UL or CSA standards.]

● When using the motor with the dedicated driver, the driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 50%.

Standard Type IP65 Rated Motor Motor Frame Size 60 mm (2.36 in.), 85 mm (3.35 in.)

Specifications **RoHS**



Model	Single-Phase 100-115 VAC	RK564AAT	RK566AAT	RK569AAT	RK596AAT	RK599AAT	RK5913AAT
	Single-Phase 200-230 VAC	RK564ACT	RK566ACT	RK569ACT	RK596ACT	RK599ACT	RK5913ACT
Maximum Holding Torque	N·m (oz·in)	0.42 (59)	0.83 (117)	1.66 (230)	2.1 (290)	4.1 (580)	6.3 (890)
Rotor Inertia	J: kg·m ² (oz·in ²)	175×10 ⁻⁷ (0.96)	280×10 ⁻⁷ (1.53)	560×10 ⁻⁷ (3.1)	1400×10 ⁻⁷ (7.7)	2700×10 ⁻⁷ (14.8)	4000×10 ⁻⁷ (22)
Rated Current	A/Phase	1.4					
Basic Step Angle		0.72°					
Power Source		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 ^{*1} (/step)					
Insulation Class		Motor: IP65*2 Driver: IP10					
Mass	Motor kg (lb.)	0.8 (1.8)	1.1 (2.4)	1.6 (3.5)	2.2 (4.8)	3.3 (7.3)	4.4 (9.7)
	Driver kg (lb.)	0.85 (1.9)					
Dimension No.	Motor	4				5	
	Driver	16					

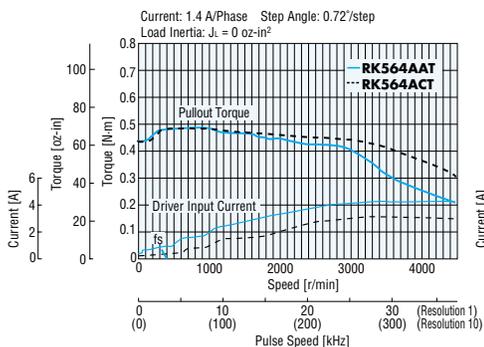
How to Read Specifications Table → Page 9

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

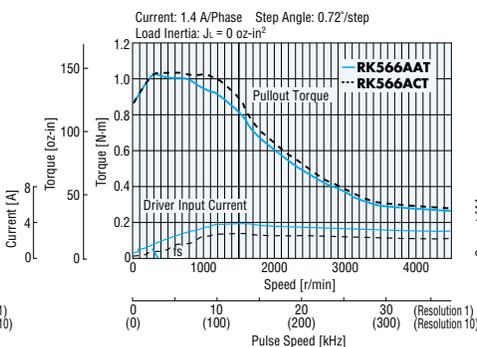
*2 Excluding the gap between the shaft and the flange

Speed – Torque Characteristics fs: Maximum Starting Frequency

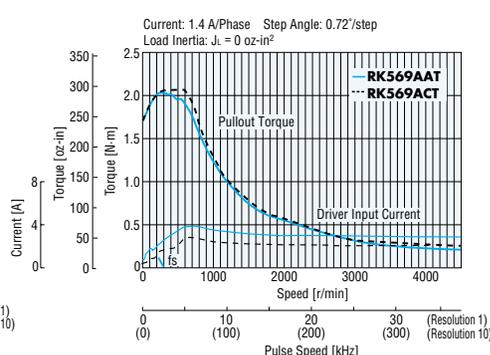
RK564AAT/RK564ACT



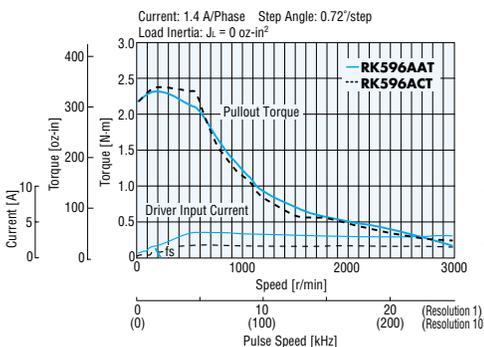
RK566AAT/RK566ACT



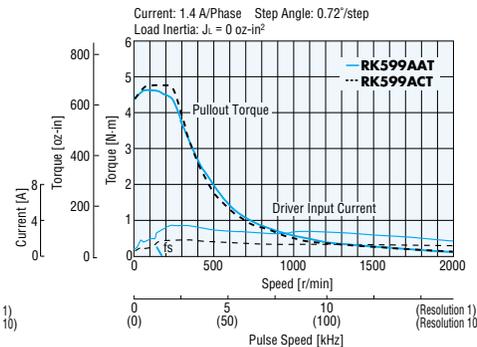
RK569AAT/RK569ACT



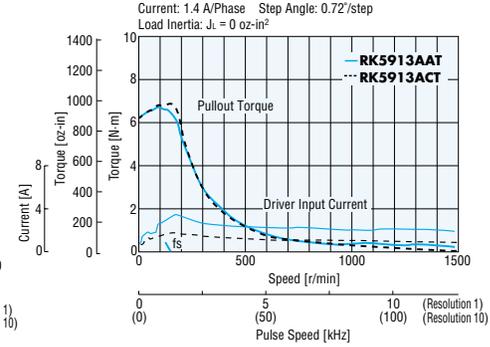
RK596AAT/RK596ACT



RK599AAT/RK599ACT



RK5913AAT/RK5913ACT



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

Notes:

● Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions.

Be sure to keep the temperature of the motor case under 100°C (212°F).

[Under 75°C (167°F) is required to comply with UL or CSA standards.]

● When using the motor with the dedicated driver, the driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 50%.

Features
Line-up
System Configuration
Product Line
Specifications and Characteristics
Dimensions
Connection and Operation
List of Motor and Driver Combinations
Accessories
Before Using a Stepping Motor
Controllers

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

Specifications RoHS



● With the **RK54**□ type, only the driver conforms to the CSA standard.

Model	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	N·m (lb·in)		0.35 (3)	0.7 (6.1)	1 (8.8)	1.5 (13.2)	
Rotor Inertia	J: kg·m ² (oz·in ²)		35×10 ⁻⁷ (0.191)				
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	N·m (lb·in)		0.35 (3)	0.7 (6.1)	1 (8.8)	1.5 (13.2)	
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	Single-Phase 100-115 VAC±15% 50/60 Hz 1 A						
Excitation Mode	Microstep Basic Angle/n* (/step)						
Mass	Motor	kg (lb.)	0.35 (0.77)				
	Driver	kg (lb.)	0.4 (0.88)				
Dimension No.	Motor		6				
	Driver		15				

How to Read Specifications Table → Page 9

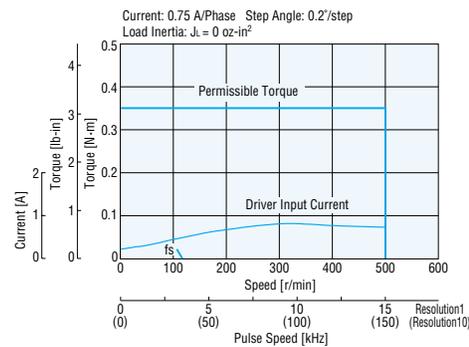
*Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Note:

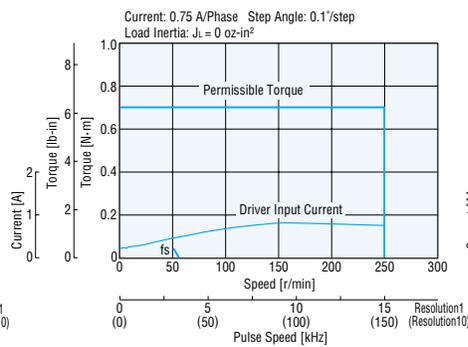
● Direction of rotation of the motor and that of the gear output shaft are the same for models with gear ratios of 3.6:1, 7.2:1 and 10:1. It is opposite for 20:1 and 30:1 gear ratio models.

Speed – Torque Characteristics fs: Maximum Starting Frequency

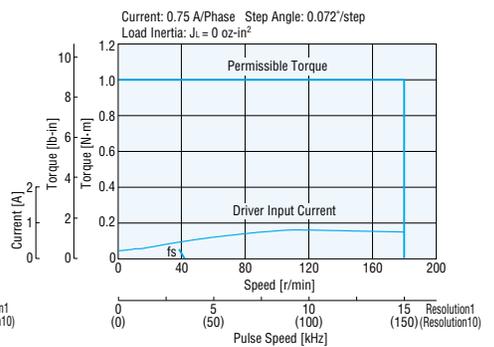
RK543AA-T3.6/RK543BA-T3.6



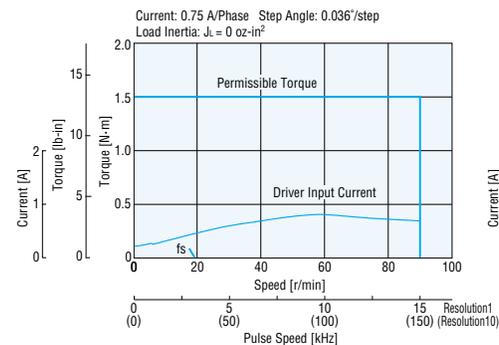
RK543AA-T7.2/RK543BA-T7.2



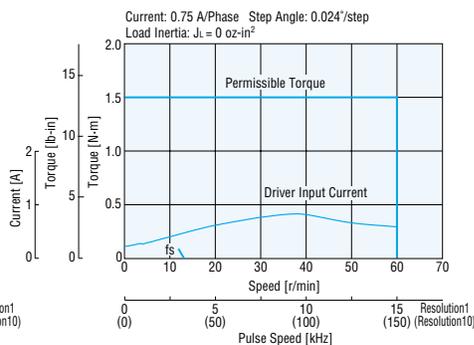
RK543AA-T10/RK543BA-T10



RK543AA-T20/RK543BA-T20



RK543AA-T30/RK543BA-T30



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

Notes:

● Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions.

Be sure to keep the temperature of the motor case under 100°C (212°F).

[Under 75°C (167°F) is required to comply with UL or CSA standards.]

● When using the motor with the dedicated driver, the driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 50%.

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

Specifications RoHS



Model	Single Shaft		RK564AAE-T3.6	RK564AAE-T7.2	RK564AAE-T10	RK564AAE-T20	RK564AAE-T30
	Double Shaft		RK564BAE-T3.6	RK564BAE-T7.2	RK564BAE-T10	RK564BAE-T20	RK564BAE-T30
Model	Single Shaft		RK564ACE-T3.6	RK564ACE-T7.2	RK564ACE-T10	RK564ACE-T20	RK564ACE-T30
	Double Shaft		RK564BCE-T3.6	RK564BCE-T7.2	RK564BCE-T10	RK564BCE-T20	RK564BCE-T30
Maximum Holding Torque	N·m (lb·in)		1.25 (11)	2.5 (22)	3 (26)	3.5 (30)	4 (35)
Rotor Inertia	J: kg·m ² (oz·in ²)		175×10 ⁻⁷ (0.96)				
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	N·m (lb·in)		1.25 (11)	2.5 (22)	3 (26)	3.5 (30)	4 (35)
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			Single-Phase 100-115 VAC ±15% 50/60 Hz 4.5 A		Single-Phase 200-230 VAC ±15% 50/60 Hz 3.5 A		
Excitation Mode			Microstep Basic Angle/n* (/step)				
Mass	Motor	kg (lb.)	0.95 (2.1)				
	Driver	kg (lb.)	0.85 (1.9)				
Dimension No.	Motor		7				
	Driver		16				

How to Read Specifications Table → Page 9

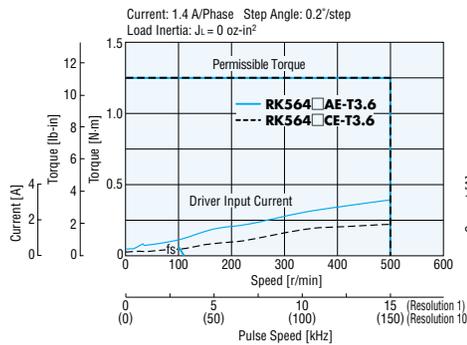
*Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Note:

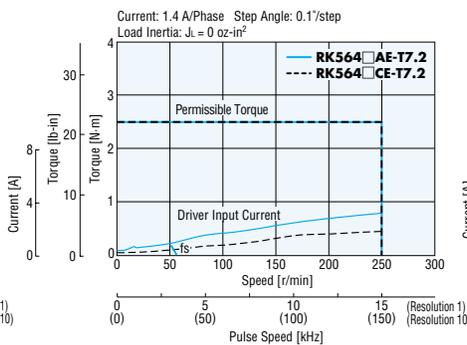
- Direction of rotation of the motor and that of the gear output shaft are the same for models with gear ratios of 3.6:1, 7.2:1 and 10:1. It is opposite for 20:1 and 30:1 gear ratio models.

Speed – Torque Characteristics fs: Maximum Starting Frequency

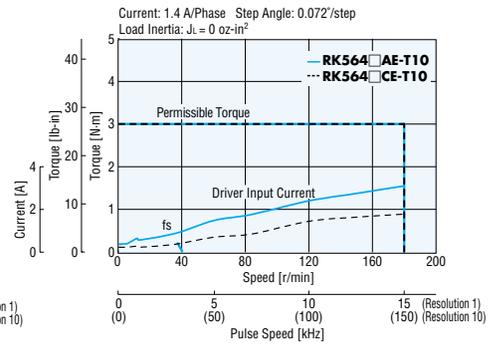
RK564□AE-T3.6/RK564□CE-T3.6



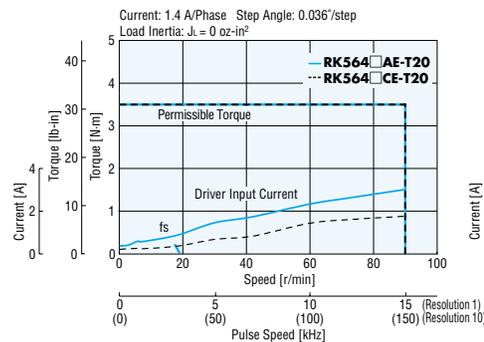
RK564□AE-T7.2/RK564□CE-T7.2



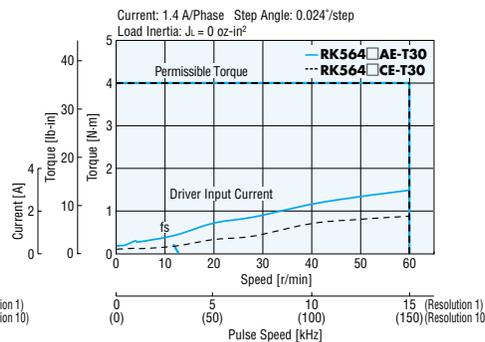
RK564□AE-T10/RK564□CE-T10



RK564□AE-T20/RK564□CE-T20



RK564□AE-T30/RK564□CE-T30



- Enter **A** (Single shaft) or **B** (Double shaft) in the box (□) within the model name.
- The pulse input circuit responds to approximately 200 kHz with a pulse duty of 50%.

Notes:

- Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions.
Be sure to keep the temperature of the motor case under 100°C (212°F).
[Under 75°C (167°F) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 50%.

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

Specifications RoHS



Model	Single-Phase 100-115 VAC		RK596AAE-T3.6	RK596AAE-T7.2	RK596AAE-T10	RK596AAE-T20	RK596AAE-T30
	Single Shaft	Double Shaft	RK596BAE-T3.6	RK596BAE-T7.2	RK596BAE-T10	RK596BAE-T20	RK596BAE-T30
Model	Single-Phase 200-230 VAC		RK596ACE-T3.6	RK596ACE-T7.2	RK596ACE-T10	RK596ACE-T20	RK596ACE-T30
	Single Shaft	Double Shaft	RK596BCE-T3.6	RK596BCE-T7.2	RK596BCE-T10	RK596BCE-T20	RK596BCE-T30
Maximum Holding Torque	N·m (lb-in)		4.5 (39)	9 (79)		12 (106)	
Rotor Inertia	J: kg·m ² (oz-in ²)		1400×10 ⁻⁷ (7.7)				
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	N·m (lb-in)		4.5 (39)	9 (79)		12 (106)	
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			Single-Phase 100-115 VAC ±15% 50/60 Hz 4.5 A		Single-Phase 200-230 VAC $\pm 10\%$ / $\pm 15\%$ 50/60 Hz 3.5 A		
Excitation Mode			Microstep Basic Angle/n* (/step)				
Mass	Motor	kg (lb.)	2.85 (6.3)				
	Driver	kg (lb.)	0.85 (1.9)				
Dimension No.	Motor		8				
	Driver		16				

How to Read Specifications Table → Page 9

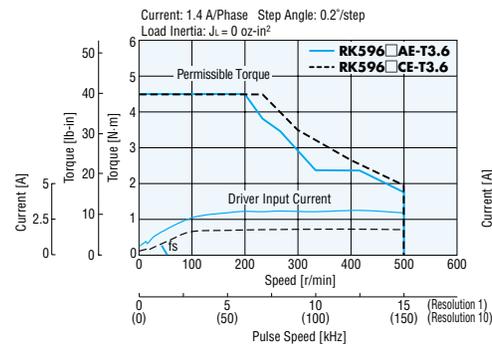
*Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Note:

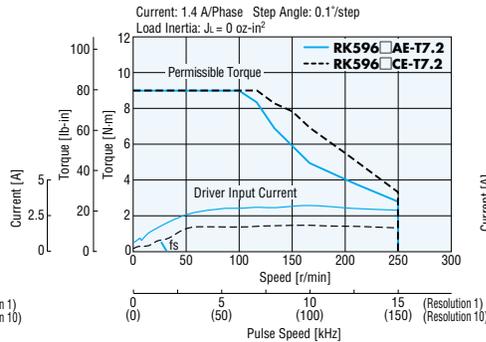
- Direction of rotation of the motor and that of the gear output shaft are the same for models with gear ratios of 3.6:1, 7.2:1 and 10:1. It is opposite for 20:1 and 30:1 gear ratio models.

Speed – Torque Characteristics fs: Maximum Starting Frequency

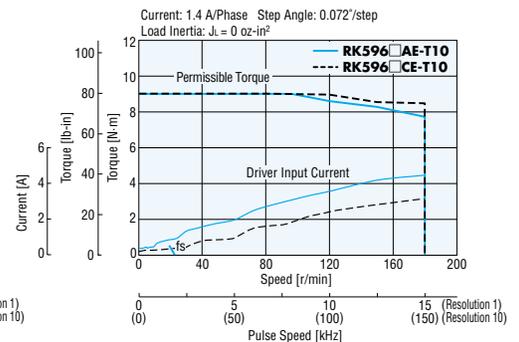
RK596□AE-T3.6/RK596□CE-T3.6



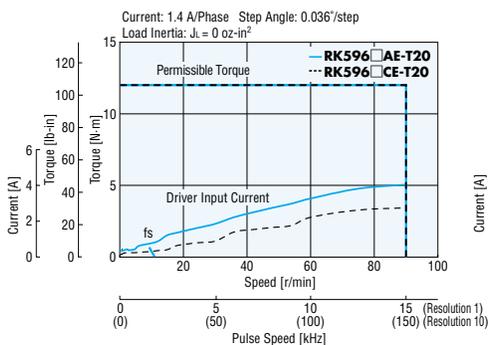
RK596□AE-T7.2/RK596□CE-T7.2



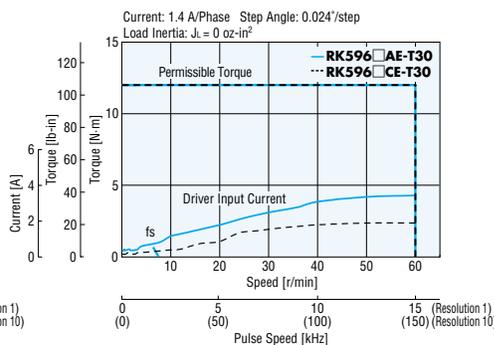
RK596□AE-T10/RK596□CE-T10



RK596□AE-T20/RK596□CE-T20



RK596□AE-T30/RK596□CE-T30



- Enter **A** (Single shaft) or **B** (Double shaft) in the box (□) within the model name.
- The pulse input circuit responds to approximately 200 kHz with a pulse duty of 50%.

Notes:

- Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 100°C (212°F). [Under 75°C (167°F) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 50%.

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

Specifications RoHS



● With the **RK54** type, only the driver conforms to the CSA standard.

Model	Single Shaft		RK544AA-N5	RK544AA-N7.2	RK544AA-N10
	Single-Phase 100-115 VAC	Double Shaft	RK544BA-N5	RK544BA-N7.2	RK544BA-N10
Maximum Holding Torque	N·m (lb·in)		0.8 (7)	1.2 (10.6)	1.5 (13.2)
Rotor Inertia	J: kg·m ² (oz·in ²)		54×10 ⁻⁷ (0.30)		
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	N·m (lb·in)		0.8 (7)	1.2 (10.6)	1.5 (13.2)
Maximum Torque*1	N·m (lb·in)		1.5 (13.2)	2 (17.7)	2 (17.7)
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	Single-Phase 100-115 VAC±15% 50/60 Hz 1 A				
Excitation Mode	Microstep Basic Angle/n*2 (/step)				
Mass	Motor	kg (lb.)	0.56 (1.23)		
	Driver	kg (lb.)	0.4 (0.88)		
Dimension No.	Motor		9		
	Driver		15		

How to Read Specifications Table → Page 9

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

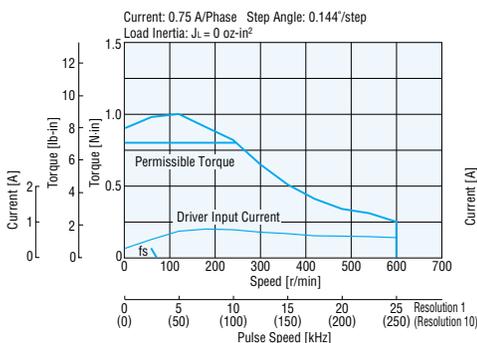
*2 Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Note:

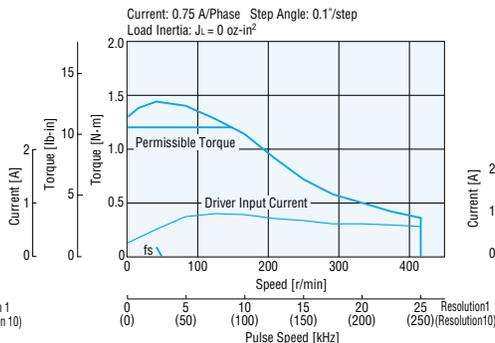
- Direction of rotation of the motor shaft and that of the gear output shaft are the same.

Speed – Torque Characteristics fs: Maximum Starting Frequency

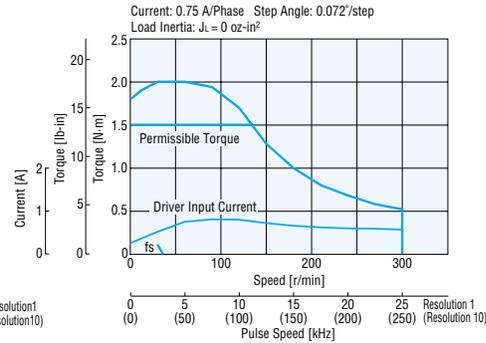
RK544AA-N5/RK544BA-N5



RK544AA-N7.2/RK544BA-N7.2



RK544AA-N10/RK544BA-N10



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

Notes:

- Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 100°C (212°F). [Under 75°C (167°F) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 50%.

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

Specifications RoHS



Model	Single-Phase 100-115 VAC		RK566AAE-N5	RK566AAE-N7.2	RK566AAE-N10	RK564AAE-N25	RK564AAE-N36	RK564AAE-N50
	Double Shaft		RK566BAE-N5	RK566BAE-N7.2	RK566BAE-N10	RK564BAE-N25	RK564BAE-N36	RK564BAE-N50
Model	Single-Phase 200-230 VAC		RK566ACE-N5	RK566ACE-N7.2	RK566ACE-N10	RK564ACE-N25	RK564ACE-N36	RK564ACE-N50
	Double Shaft		RK566BCE-N5	RK566BCE-N7.2	RK566BCE-N10	RK564BCE-N25	RK564BCE-N36	RK564BCE-N50
Maximum Holding Torque	N·m (lb·in)		3.5 (30)	4 (35)	5 (44)	8 (70)		
Rotor Inertia	J: kg·m ² (oz·in ²)		280×10 ⁻⁷ (1.53)			175×10 ⁻⁷ (0.96)		
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	N·m (lb·in)		3.5 (30)	4 (35)	5 (44)	8 (70)		
Maximum Torque*1	N·m (lb·in)		7 (61)	9 (79)	11 (97)	16 (141)	20 (177)	
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			Single-Phase 100-115 VAC±15%		50/60 Hz	4.5 A		
			Single-Phase 200-230 VAC		±10% 50/60 Hz	3.5 A		
Excitation Mode			Microstep Basic Angle/n*2 (/step)					
Mass	Motor	kg (lb.)	1.5 (3.3)					
	Driver	kg (lb.)	0.85 (1.9)					
Dimension No.	Motor		10					
	Driver		16					

How to Read Specifications Table → Page 9

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

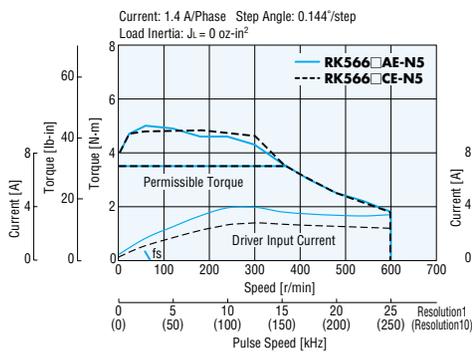
*2 Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Note:

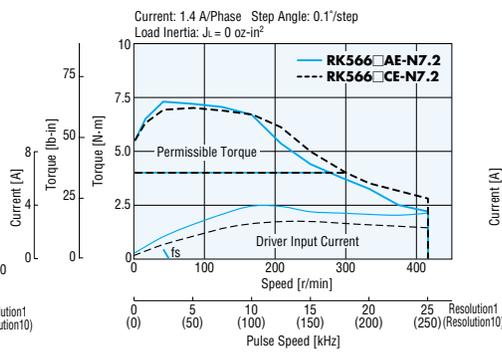
- Direction of rotation of the motor shaft and that of the gear output shaft are the same.

Speed – Torque Characteristics fs: Maximum Starting Frequency

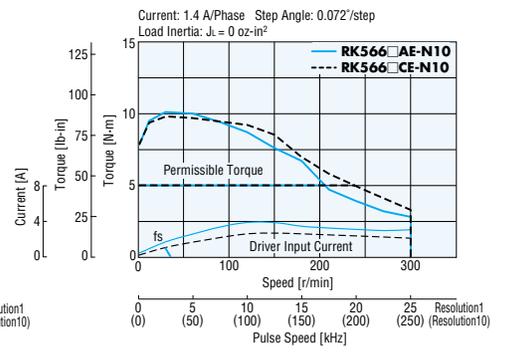
RK566□AE-N5/RK566□CE-N5



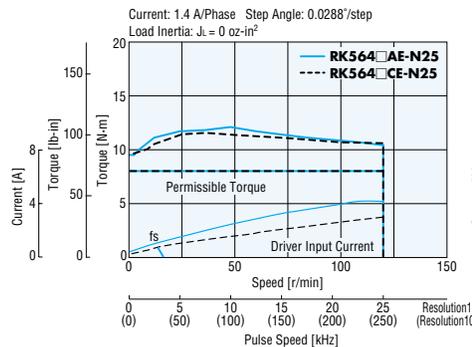
RK566□AE-N7.2/RK566□CE-N7.2



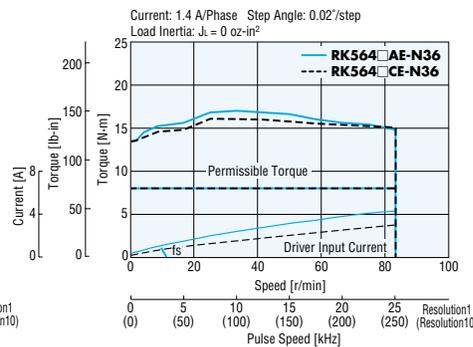
RK566□AE-N10/RK566□CE-N10



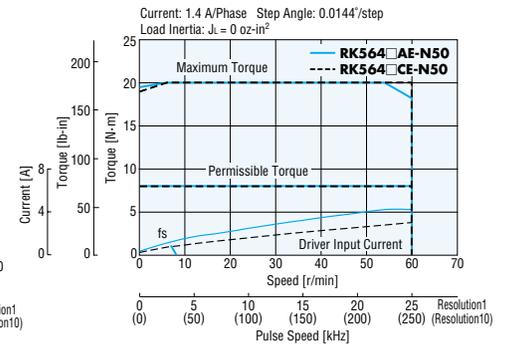
RK564□AE-N25/RK564□CE-N25



RK564□AE-N36/RK564□CE-N36



RK564□AE-N50/RK564□CE-N50



- Enter **A** (Single shaft) or **B** (Double shaft) in the box (□) within the model name.
- The pulse input circuit responds to approximately 200 kHz with a pulse duty of 50%.

Notes:

- Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions.
Be sure to keep the temperature of the motor case under 100°C (212°F).
[Under 75°C (167°F) is required to comply with UL or CSA standards.]
- When using the motor with the dedicated driver, the driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 50%.

PN Geared Type Motor Frame Size 90 mm (3.54 in.)

Specifications (RoHS)



Model	Single-Phase 100-115 VAC		RK599AAE-N5	RK599AAE-N7.2	RK599AAE-N10	RK596AAE-N25	RK596AAE-N36	RK596AAE-N50
	Double Shaft		RK599BAE-N5	RK599BAE-N7.2	RK599BAE-N10	RK596BAE-N25	RK596BAE-N36	RK596BAE-N50
Model	Single-Phase 200-230 VAC		RK599ACE-N5	RK599ACE-N7.2	RK599ACE-N10	RK596ACE-N25	RK596ACE-N36	RK596ACE-N50
	Double Shaft		RK599BCE-N5	RK599BCE-N7.2	RK599BCE-N10	RK596BCE-N25	RK596BCE-N36	RK596BCE-N50
Maximum Holding Torque	N·m (lb·in)		14 (123)		20 (177)		37 (320)	
Rotor Inertia	J: kg·m ² (oz·in ²)		2700×10 ⁻⁷ (14.8)				1400×10 ⁻⁷ (7.7)	
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	N·m (lb·in)		14 (123)		20 (177)		37 (320)	
Maximum Torque*1	N·m (lb·in)		28 (240)	35 (300)	56 (490)	60 (530)		
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			Single-Phase 100-115 VAC ±15%		50/60 Hz	4.5 A		
			Single-Phase 200-230 VAC ±15%		50/60 Hz	3.5 A		
Excitation Mode			Microstep Basic Angle/n*2 (/step)					
Mass	Motor	kg (lb.)	5 (11)			4.7 (10.3)		
	Driver	kg (lb.)				0.85 (1.9)		
Dimension No.	Motor		11					
	Driver		16					

How to Read Specifications Table → Page 9

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

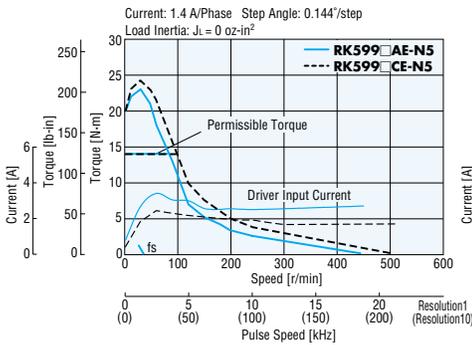
*2 Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Note:

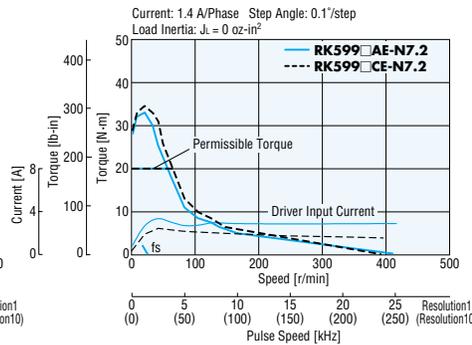
● Direction of rotation of the motor shaft and that of the gear output shaft are the same.

Speed – Torque Characteristics fs: Maximum Starting Frequency

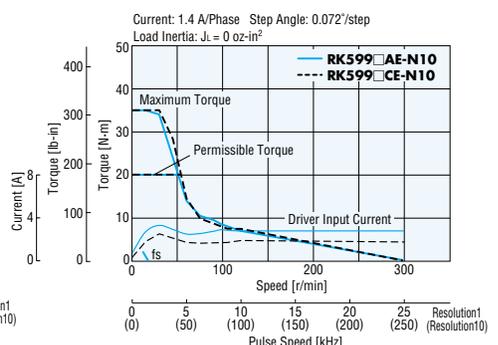
RK599□AE-N5/RK599□CE-N5



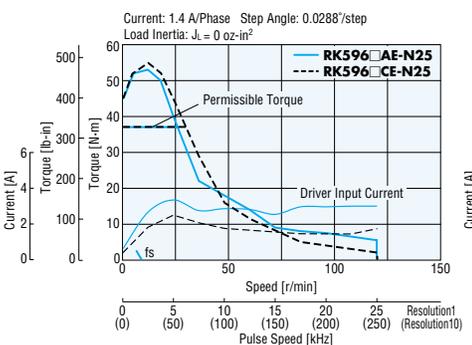
RK599□AE-N7.2/RK599□CE-N7.2



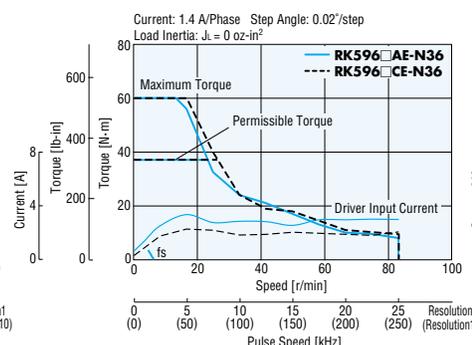
RK599□AE-N10/RK599□CE-N10



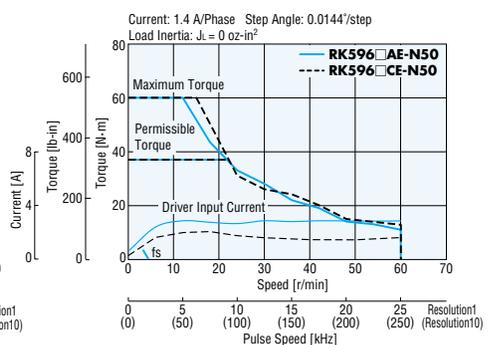
RK596□AE-N25/RK596□CE-N25



RK596□AE-N36/RK596□CE-N36



RK596□AE-N50/RK596□CE-N50



● Enter **A** (Single shaft) or **B** (Double shaft) in the box (□) within the model name.

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

Notes:

● Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions.

Be sure to keep the temperature of the motor case under 100°C (212°F).

[Under 75°C (167°F) is required to comply with UL or CSA standards.]

● When using the motor with the dedicated driver, the driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 50%.

Features

Line-up

System Configuration

Product Line

Specifications and Characteristics

Dimensions

Connection and Operation

List of Motor and Driver Combinations

Accessories

Before Using a Stepping Motor

Controllers

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

Specifications RoHS



With the **RK54** type, only the driver conforms to the CSA standard.

Model	Single-Phase 100-115 VAC		RK543AA-H50	RK543AA-H100	RK564AAE-H50	RK564AAE-H100	RK596AAE-H50	RK596AAE-H100
	Single Shaft	Double Shaft	RK543BA-H50	RK543BA-H100	RK564BAE-H50	RK564BAE-H100	RK596BAE-H50	RK596BAE-H100
	Single-Phase 200-230 VAC		—	—	RK564ACE-H50	RK564ACE-H100	RK596ACE-H50	RK596ACE-H100
	Single Shaft	Double Shaft	—	—	RK564BCE-H50	RK564BCE-H100	RK596BCE-H50	RK596BCE-H100
Maximum Holding Torque	N·m (lb·in)		3.5 (30)	5 (44)	5.5 (48)	8 (70)	25 (220)	37 (320)
Rotor Inertia	J: kg·m ² (oz·in ²)		52×10 ⁻⁷ (0.28)		210×10 ⁻⁷ (1.15)		1600×10 ⁻⁷ (8.8)	
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	N·m (lb·in)		3.5 (30)	5 (44)	5.5 (48)	8 (70)	25 (220)	37 (320)
Maximum Torque*1	N·m (lb·in)		8.3 (73)	11 (97)	18 (158)	28 (240)	35 (300)	55 (480)
Lost Motion (Load Torque)	arc minute		1.5 max. (±0.16 N·m)	1.5 max. (±0.2 N·m)	0.7 max. (±0.28 N·m)	0.7 max. (±0.39 N·m)	1.5 max. (±1.2 N·m)	
Permissible Speed Range	r/min		0~70	0~35	0~70	0~35	0~70	0~35
Power Source			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*2 (/step)					
Mass	Motor	kg (lb.)	0.46 (1.01)		1.08 (2.4)		3.7 (8.1)	
	Driver	kg (lb.)	0.4 (0.88)		0.85 (1.9)			
Dimension No.	Motor		12		13		14	
	Driver		15		16			

How to Read Specifications Table → Page 9

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

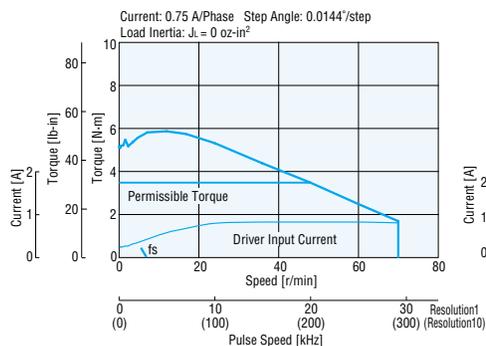
*2 Sixteen resolutions are available, where n=1, 2, 2.5, 4, 5, 8, 10, 20, 25, 40, 50, 80, 100, 125, 200 and 250.

Notes:

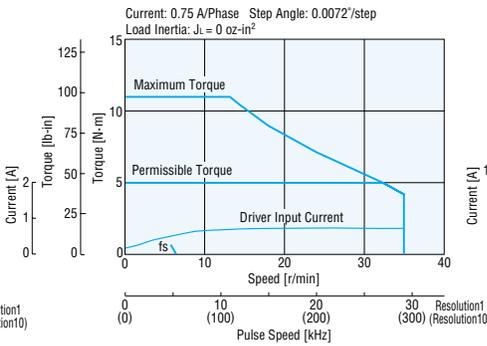
- The inertia represents a sum of the inertia of the harmonic gear converted to a motor shaft value, and the rotor inertia.
- Direction of rotation of the motor and that of the gear output shaft are the opposite.

Speed – Torque Characteristics fs: Maximum Starting Frequency

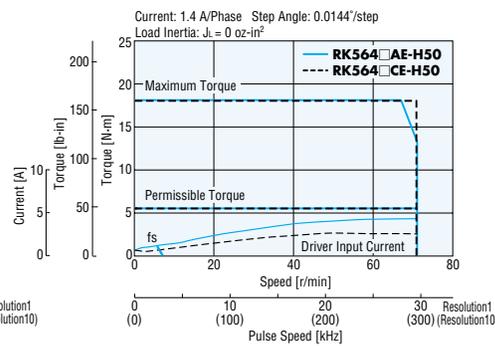
RK543 A-H50



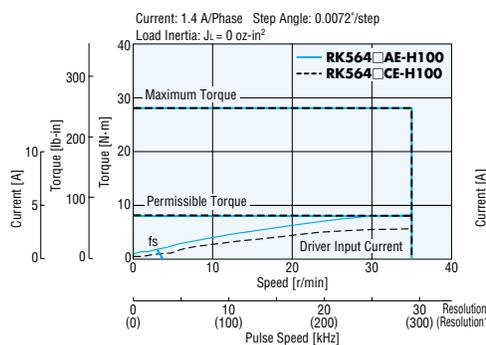
RK543 A-H100



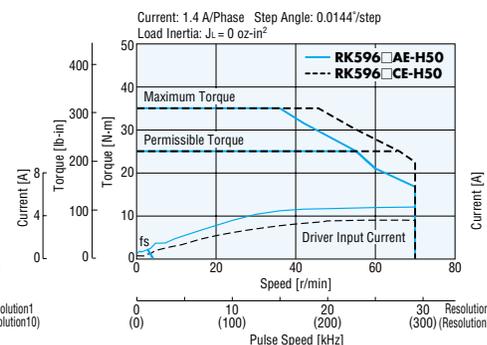
RK564 AE-H50/RK564 CE-H50



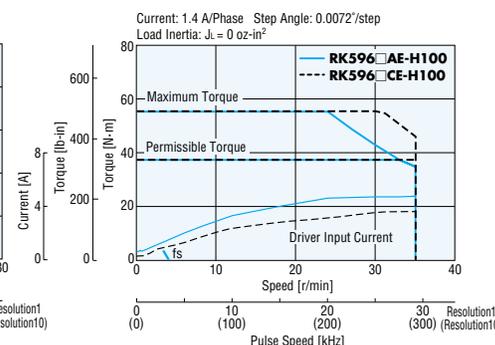
RK564 AE-H100/RK564 CE-H100



RK596 AE-H50/RK596 CE-H50



RK596 AE-H100/RK596 CE-H100



● Enter **A** (Single shaft) or **B** (Double shaft) in the box () within the model name.

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

Notes:

- Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions.
Be sure to keep the temperature of the motor case under 100°C (212°F).
[Under 75°C (167°F) 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 70°C (158°F).
- When using the motor with the dedicated driver, the driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 50%.

Driver Specifications

Input Signals	Input Mode	Photocoupler input, Input resistance: 220 Ω; Input current: 10~20 mA Photocoupler ON: +4.5 V~+5 V, Photocoupler 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), Negative logic pulse input 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 pulse duty is 50%)
	Rotation Direction Signal (CCW Pulse Signal)	Rotation direction signal, Photocoupler ON: CW, Photocoupler OFF: CCW (CCW direction operation command pulse signal when in 2-pulse input mode), Negative logic pulse input 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 pulse 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 shaft can be rotated manually. (When rotating the motor shaft manually, release the brake) When in the "photocoupler OFF" state, the current is supplied to the motor.
	Step Angle Select Signal	Step angle specified by DATA1 when photocoupler OFF Step angle specified by DATA2 when photocoupler ON
Output Signals	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) Example) 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 80°C (176°F) or above. (Photocoupler: OFF)
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 [130°C (266°F)] [Recognized as Class A 105°C (221°F) by UL 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 - Signal input/output terminals - Power input terminal - Signal input/output terminals - Motor output terminal
Dielectric Strength	Sufficient to withstand 1.5 kV (1.0 kV for RK54 □), 50 Hz or 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 1.5 k VAC 50 Hz or 60 Hz - Motor output terminal - Protective earth terminal 1.5 k VAC 50 Hz or 60 Hz - Signal input/output terminals - Power input terminal 1.8 k VAC 50 Hz or 60 Hz - Signal input/output terminals - Motor output terminal 1.8 k VAC 50 Hz or 60 Hz
Operating Environment (In Operation)	Ambient Temperature	-10°C ~ +50°C (+14°F ~ +122°F) (nonfreezing): Standard type, TH, PN geared type 0°C ~ +40°C (+32°F ~ +104°F) (nonfreezing): Harmonic geared type
	Ambient Humidity	85% or less (noncondensing)
	Atmosphere	No corrosive gases, dust, water or oil. (Standard type IP65 rated motor: No corrosive gases)
Temperature Rise	Temperature rise of the coil measured by the Change Resistance Method is 80°C (144°F) or less. (at rated current, at standstill, five phases energized)	-
Stop Position Accuracy*1	± 3 arc minutes (± 0.05°)	-
Shaft Runout	0.05 T.I.R. (mm)*4	-
Radial Play*2	0.025 mm max. of 5 N (1.12 lb.)	-
Axial Play*3	0.075 mm max. of 10 N (2.2 lb.)	-
Concentricity	0.075 T.I.R. (mm)*4	-
Perpendicularity	0.075 T.I.R. (mm)*4	-

*1 This value is for 0.72°/step under no load. (The value changes with the size of the load.)

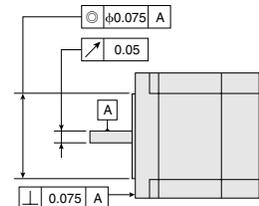
*2 Radial Play: Displacement in shaft position in the radial direction, when a 5 N (1.12 lb.) load is applied in the vertical direction to the tip of the motor's shaft.

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

*4 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.



Permissible Overhung Load and Permissible Thrust Load

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

Type	Model	Gear Ratio	Overhung Load Distance from Shaft End mm (in.)					Thrust Load
			0 (0)	5 (0.2)	10 (0.39)	15 (0.59)	20 (0.79)	
Standard Type Standard Type IP65 Rated Motor	RK543□A RK544□A RK545□A RK543AMA RK544AMA RK545AMA	–	20 4.5	25 5.6	34 7.6	52 11.7	–	The permissible thrust load shall be no greater than the motor mass.
	RK564□□E, RK564A□T RK566□□E, RK566A□T RK569□□E, RK569A□T RK564AM□E RK566AM□E RK569AM□E	–	63 14.1	75 16.8	95 21	130 29	190 42	
	RK596□□E, RK596A□T RK599□□E, RK599A□T RK5913□□E, RK5913A□T RK596AM□E RK599AM□E RK5913AM□E	–	260 58	290 65	340 76	390 87	480 108	
TH Geared Type	RK543□A-T□	3.6, 7.2, 10, 20, 30	10 2.2	14 3.1	20 4.5	30 6.7	–	15 3.3
	RK564□□E-T□		70 15.7	80 18	100 22	120 27	150 33	40 9
	RK596□□E-T□		220 49	250 56	300 67	350 78	400 90	100 22
PN Geared Type	RK544□A-N□	5, 7.2, 10	100 22	120 27	150 33	190 42	–	100 22
	RK566□□E-N5	–	200 45	220 49	250 56	280 63	320 72	
	RK566□□E-N□	7.2, 10	250 56	270 60	300 67	340 76	390 87	
	RK564□□E-N□	25, 36, 50	330 74	360 81	400 90	450 101	520 117	
	RK599□□E-N5	–	480 108	520 117	550 123	580 130	620 139	300 67
	RK599□□E-N□	7.2, 10	480 108	540 121	600 135	680 153	790 177	
	RK596□□E-N25	–	850 191	940 210	1050 230	1110 240	1190 260	
	RK596□□E-N36	–	930 200	1030 230	1150 250	1220 270	1300 290	
RK596□□E-N50	–	1050 230	1160 260	1300 290	1380 310	1490 330		
Harmonic Geared Type	RK543□A-H□	50, 100	180 40	220 49	270 60	360 81	510 114	220 49
	RK564□□E-H□	50, 100	320 72	370 83	440 99	550 123	720 162	450 101
	RK596□□E-H□	50, 100	1090 204	1150 250	1230 270	1310 290	1410 310	1300 290

● Enter **A** (Single shaft) or **B** (Double shaft) in the box (□) within the model name.

Enter the power supply voltage **A** or **C** in the box (□) within the model name.

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

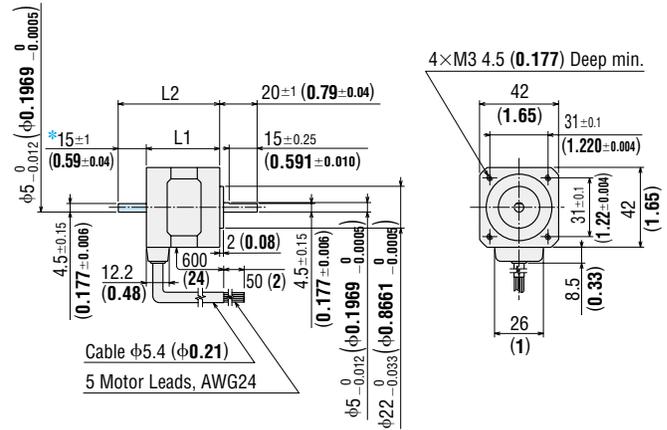
Dimensions Unit = mm (inch)

● Motor

◇ Standard Type

1 □ 42 mm (□ 1.65 in.)

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

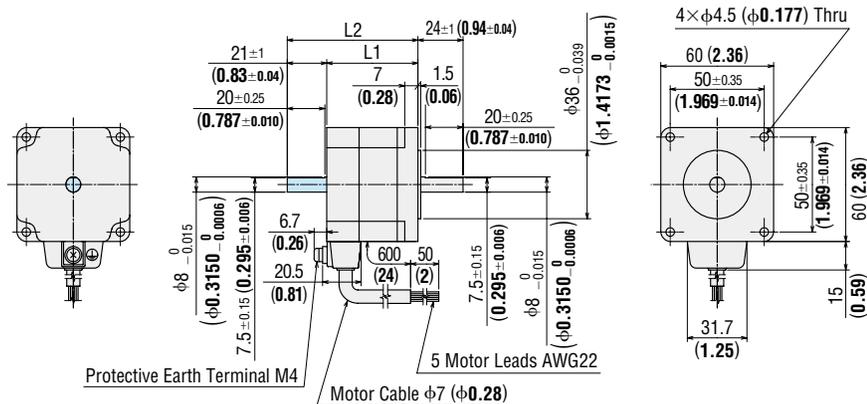


*The length of machining on double shaft model is 15±0.25 (0.591±0.010).

2 □ 60 mm (□ 2.36 in.)

Model	Motor Model	L1	L2	Mass kg (lb.)	CAD
RK564A□E	PK564AE	48.5 (1.91)	—	0.6 (1.3)	B382
RK564B□E	PK564BE		69.5 (2.74)		
RK566A□E	PK566AE	59.5 (2.34)	—	0.8 (1.8)	B383
RK566B□E	PK566BE		80.5 (3.17)		
RK569A□E	PK569AE	89 (3.50)	—	1.3 (2.9)	B384
RK569B□E	PK569BE		110 (4.33)		

● Enter the power supply voltage **A** or **C** in the box (□) within the model name.

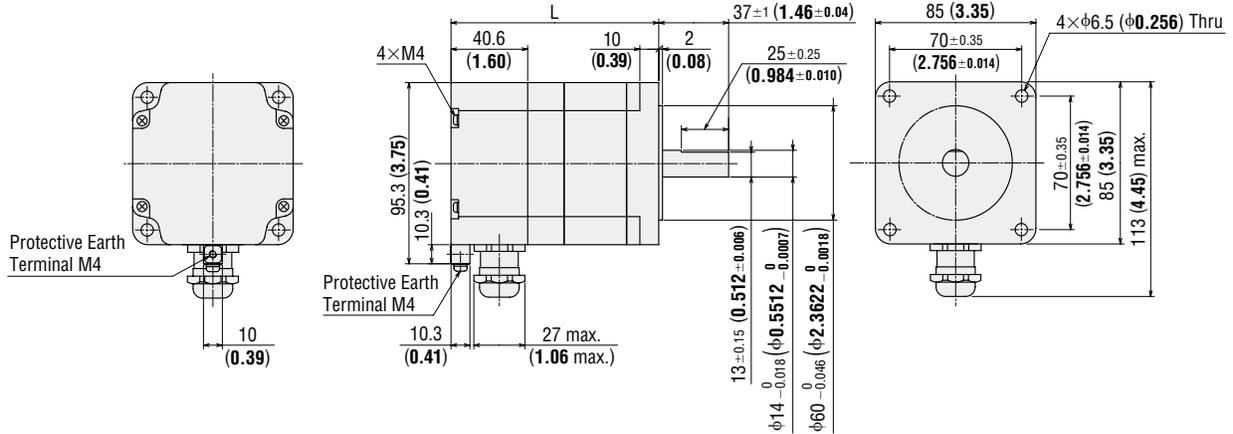


● These dimensions are for double shaft models. For single shaft models, ignore the blue shaded areas.

5 □ 85 mm (□ 3.35 in.)

Model	Motor Model	L	Mass kg (lb.)	CAD
RK596A □T	PK596AT	110 (4.33)	2.2 (4.8)	B369
RK599A □T	PK599AT	140 (5.51)	3.3 (7.3)	B370
RK5913A □T	PK5913AT	170 (6.69)	4.4 (9.7)	B371

● Enter the power supply voltage **A** or **C** in the box (□) within the model name.



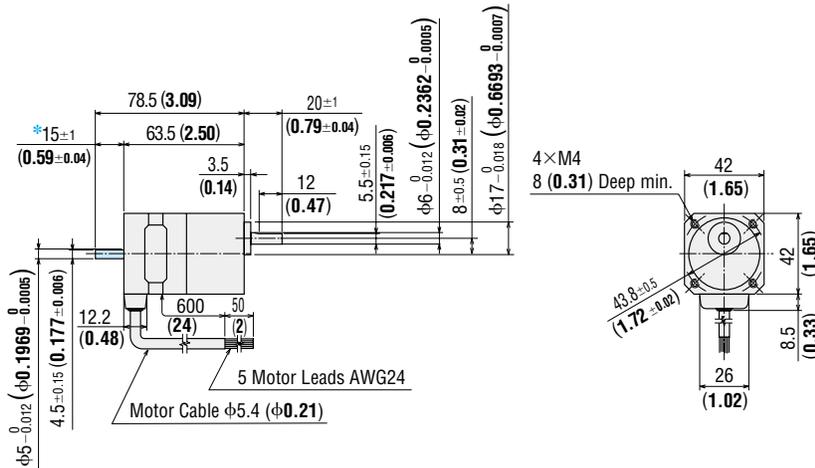
● The outer diameter of the applicable cable (VCT) is φ7 mm (φ0.28 in.) to φ13 mm (φ0.51 in.).
An optional motor cable (with protective earth wire) is also available (sold separately). → Page 34

◇ TH Geared Type

6 □ 42 mm (□ 1.65 in.)

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

● Enter the gear ratio in the box (□) within the model name.



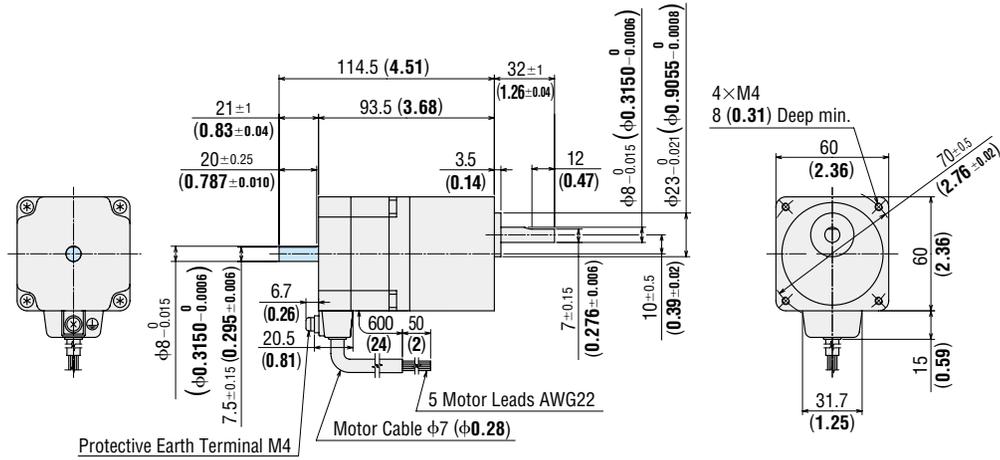
*The length of machining on double shaft model is 15±0.25 (0.591±0.010).

● These dimensions are for double shaft models. For single shaft models, ignore the blue □ areas.

7 60 mm (2.36 in.)

Model	Motor Model	Gear Ratio	Mass kg (lb.)	CAD
RK564A <input type="checkbox"/> E-T <input type="checkbox"/>	PK564AE-T <input type="checkbox"/>	3.6, 7.2, 10, 20, 30	0.95	B394
RK564B <input type="checkbox"/> E-T <input type="checkbox"/>	PK564BE-T <input type="checkbox"/>		(2.1)	

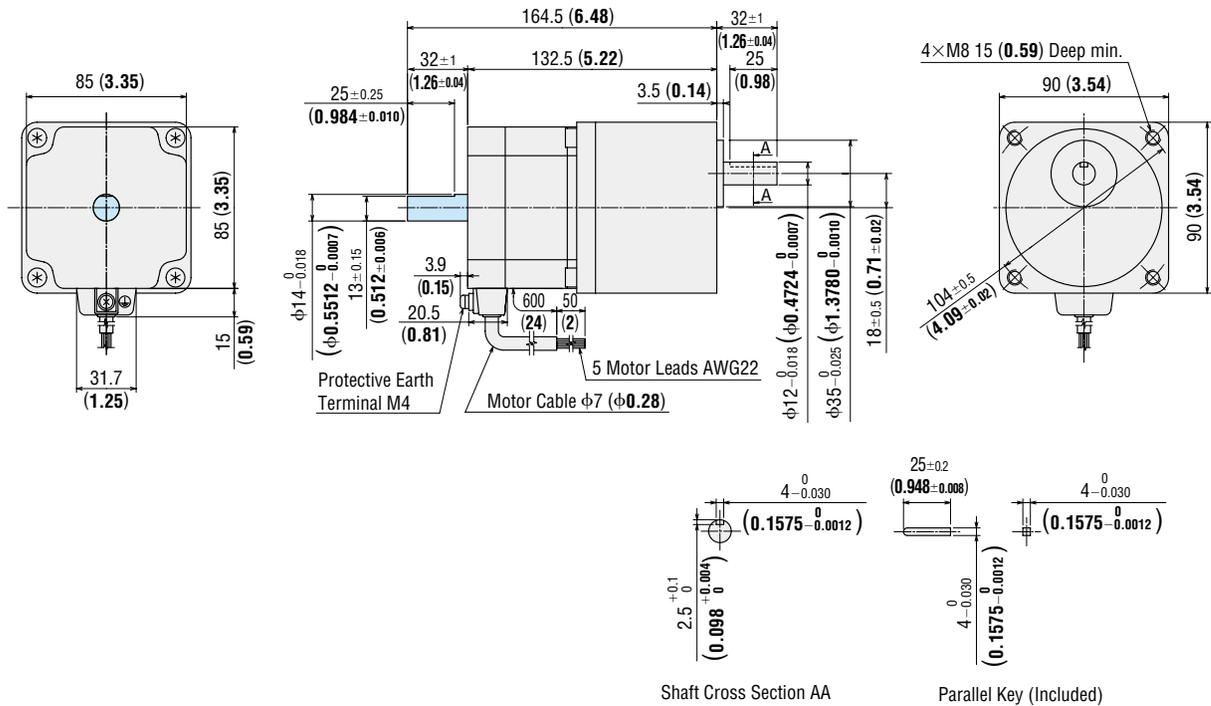
● Enter the power supply voltage **A** or **C** in the box () within the model name.
Enter the gear ratio in the box () within the model name.



8 90 mm (3.54 in.)

Model	Motor Model	Gear Ratio	Mass kg (lb.)	CAD
RK596A <input type="checkbox"/> E-T <input type="checkbox"/>	PK596AE-T <input type="checkbox"/>	3.6, 7.2	2.85 (6.3)	B395
RK596A <input type="checkbox"/> E-T <input type="checkbox"/>	PK596AE1-T <input type="checkbox"/>	10, 20, 30		
RK596B <input type="checkbox"/> E-T <input type="checkbox"/>	PK596BE-T <input type="checkbox"/>	3.6, 7.2		
RK596B <input type="checkbox"/> E-T <input type="checkbox"/>	PK596BE1-T <input type="checkbox"/>	10, 20, 30		

● Enter the power supply voltage **A** or **C** in the box () within the model name.
Enter the gear ratio in the box () within the model name.



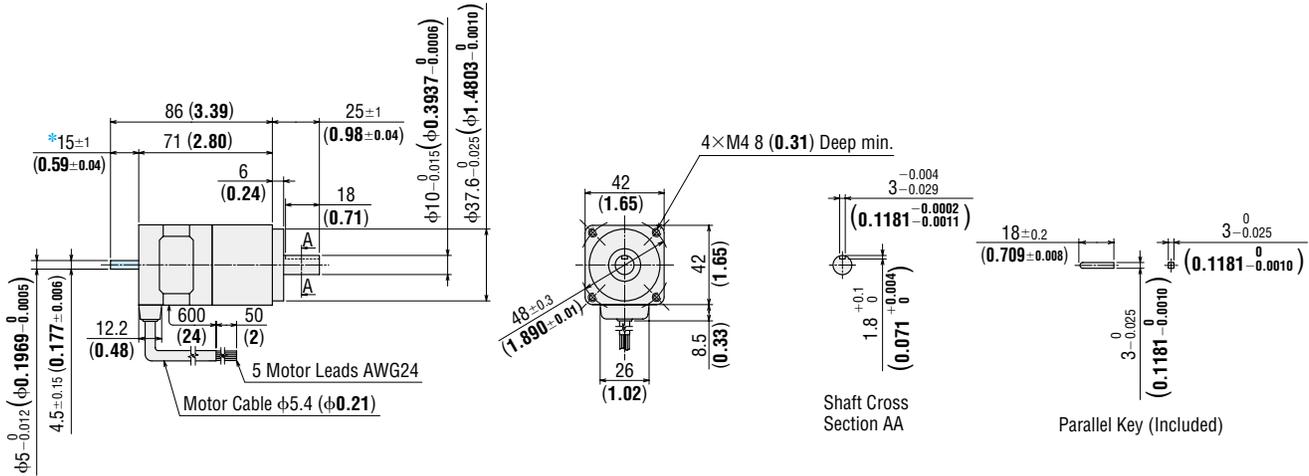
● These dimensions are for double shaft models. For single shaft models, ignore the blue areas.

◆ PN Gearing Type

9 □ 42 mm (□ 1.65 in.)

Model	Motor Model	Gear Ratio	Mass kg (lb.)	CAD
RK544AA-N □	PK544AW-N □	5, 7.2, 10	0.56 (1.23)	B312
RK544BA-N □	PK544BW-N □			

● Enter the gear ratio in the box (□) within the model name.



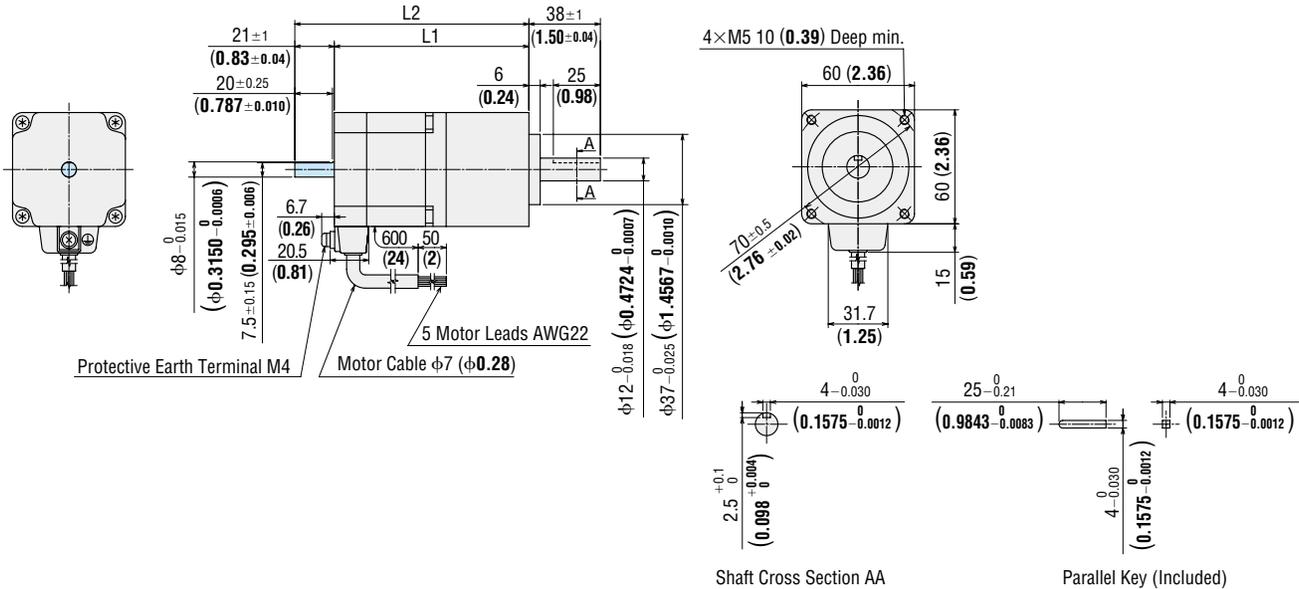
*The length of machining on double shaft model is 15±0.25 (0.591±0.010).

10 □ 60 mm (□ 2.36 in.)

Model	Motor Model	Gear Ratio	L1	L2	Mass kg (lb.)	CAD
RK566A □ E-N □	PK566AE-N □	5, 7.2, 10	103.5 (4.07)	—	1.5 (3.3)	B400
RK566B □ E-N □	PK566BE-N □			124.5 (4.90)		
RK564A □ E-N □	PK564AE-N □	25, 36, 50	108.5 (4.27)	—	1.5 (3.3)	B401
RK564B □ E-N □	PK564BE-N □			129.5 (5.1)		

● Enter the power supply voltage **A** or **C** in the box (□) within the model name.

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



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

Features

Line-up

System Configuration

Product Line

Specifications and Characteristics

Dimensions

Connection and Operation

List of Motor and Driver Combinations

Accessories

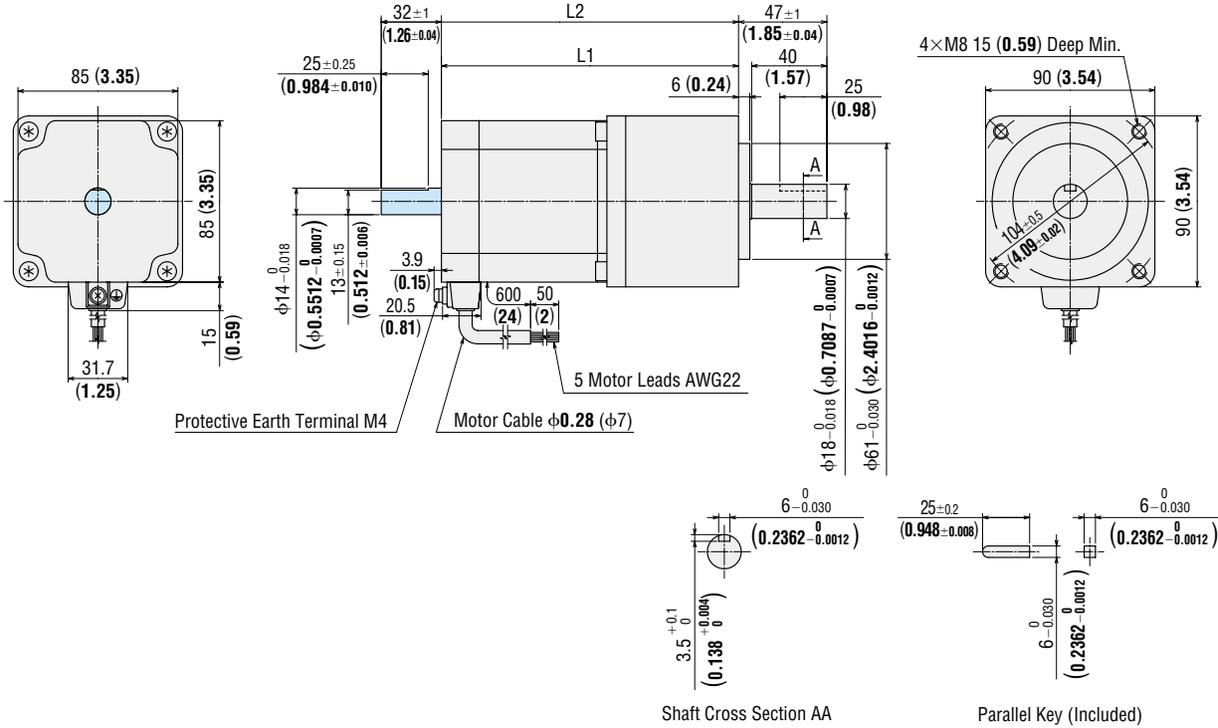
Before Using a Stepping Motor

Controllers

11 90 mm (3.54 in.)

Model	Motor Model	Gear Ratio	L1	L2	Mass kg (lb.)	CAD
RK599A <input type="checkbox"/> E-N <input type="checkbox"/>	PK599AE-N <input type="checkbox"/>	5, 7.2, 10	158 (6.22)	—	5 (11)	B402
RK599B <input type="checkbox"/> E-N <input type="checkbox"/>	PK599BE-N <input type="checkbox"/>		190 (7.48)			
RK596A <input type="checkbox"/> E-N <input type="checkbox"/>	PK596AE-N <input type="checkbox"/>	25, 36, 50	151 (5.94)	—	4.7 (10.3)	B403
RK596B <input type="checkbox"/> E-N <input type="checkbox"/>	PK596BE-N <input type="checkbox"/>		183 (7.20)			

Enter the power supply voltage **A** or **C** in the box within the model name.
Enter the gear ratio in the box within the model name.

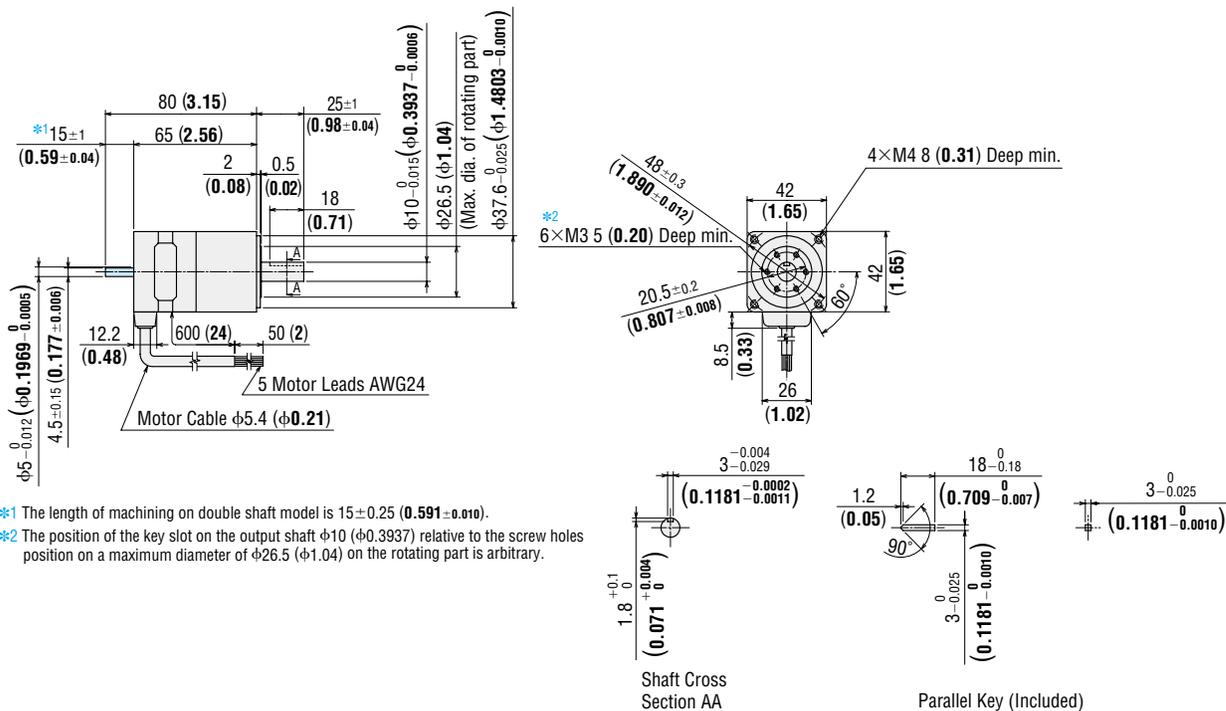


◇ Harmonic Geared Type

12 42 mm (1.65 in.)

Model	Motor Model	Gear Ratio	Mass kg (lb.)	CAD
RK543AA-H <input type="checkbox"/>	PK543AW-H <input type="checkbox"/> S <input type="checkbox"/>	50, 100	0.46	B313
RK543BA-H <input type="checkbox"/>	PK543BW-H <input type="checkbox"/> S <input type="checkbox"/>		1.01	

Enter the gear ratio in the box within the model name.



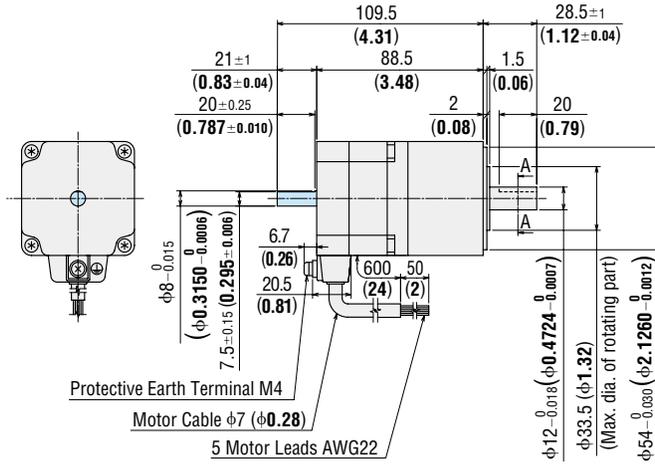
*1 The length of machining on double shaft model is 15 ± 0.25 (0.591 \pm 0.010).
*2 The position of the key slot on the output shaft $\phi 10$ ($\phi 0.3937$) relative to the screw holes position on a maximum diameter of $\phi 26.5$ ($\phi 1.04$) on the rotating part is arbitrary.

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

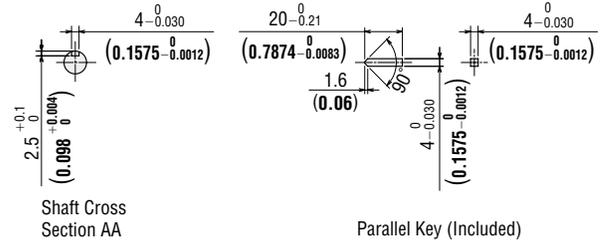
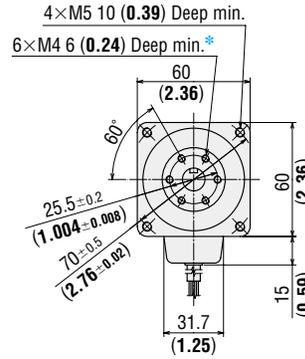
13 □ 60 mm (□ 2.36 in.)

Model	Motor Model	Gear Ratio	Mass kg (lb.)	CAD
RK564A □ E-H □	PK564AE-H□S	50, 100	1.08	B404
RK564B □ E-H □	PK564BE-H□S		(2.4)	

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



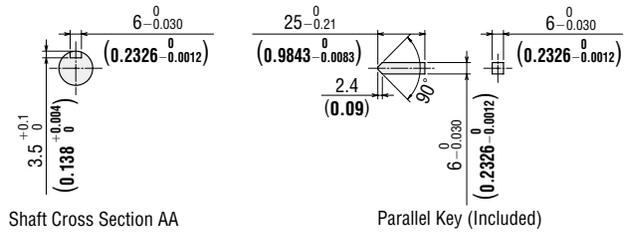
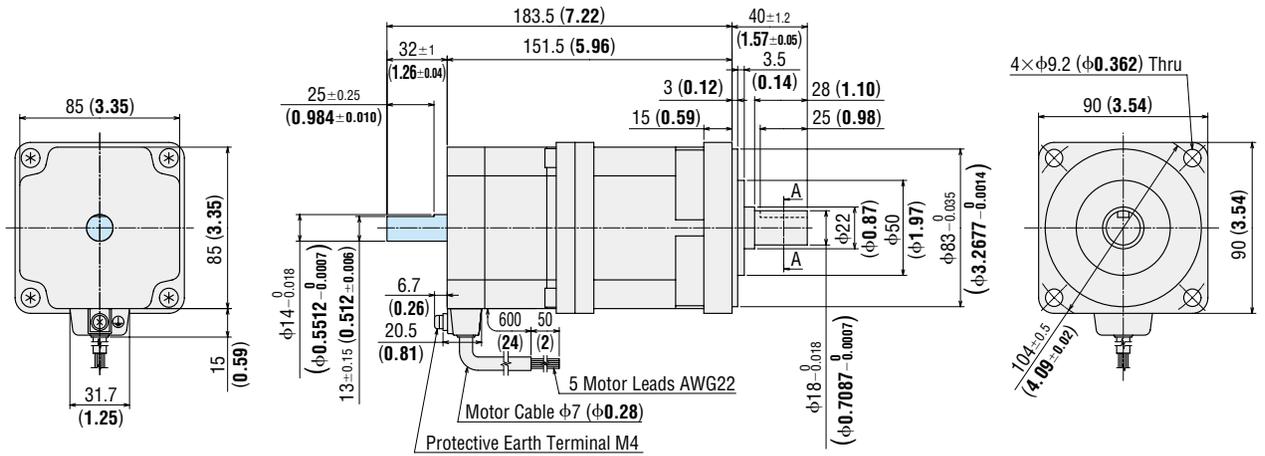
* The position of the key slot on the output shaft φ12 (φ0.4724) relative to the screw holes position on a maximum diameter of φ33.5 (φ1.32) on the rotating part is arbitrary.



14 □ 90 mm (□ 3.54 in.)

Model	Motor Model	Gear Ratio	Mass kg (lb.)	CAD
RK596A □ E-H □	PK596AE1-H□	50, 100	3.7	B405
RK596B □ E-H □	PK596BE1-H□		(8.1)	

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



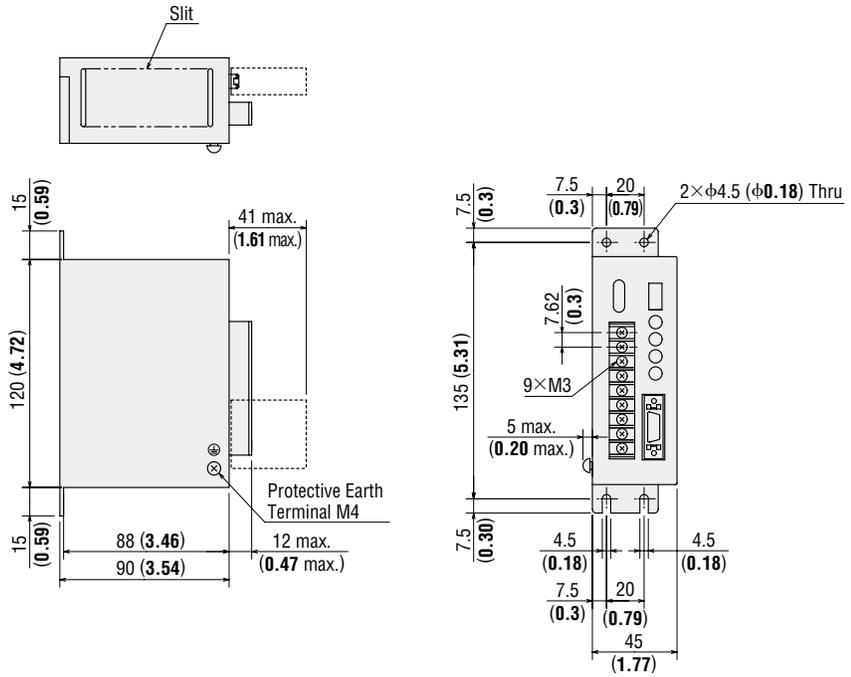
These dimensions are for double shaft models. For single shaft models, ignore the blue shaded areas.

● **Driver**

15 Driver Model: RKD507-A
RKD507M-A

Mass: 0.4 kg (0.88 lb.)

CAD B315



● I/O Connector (Included)

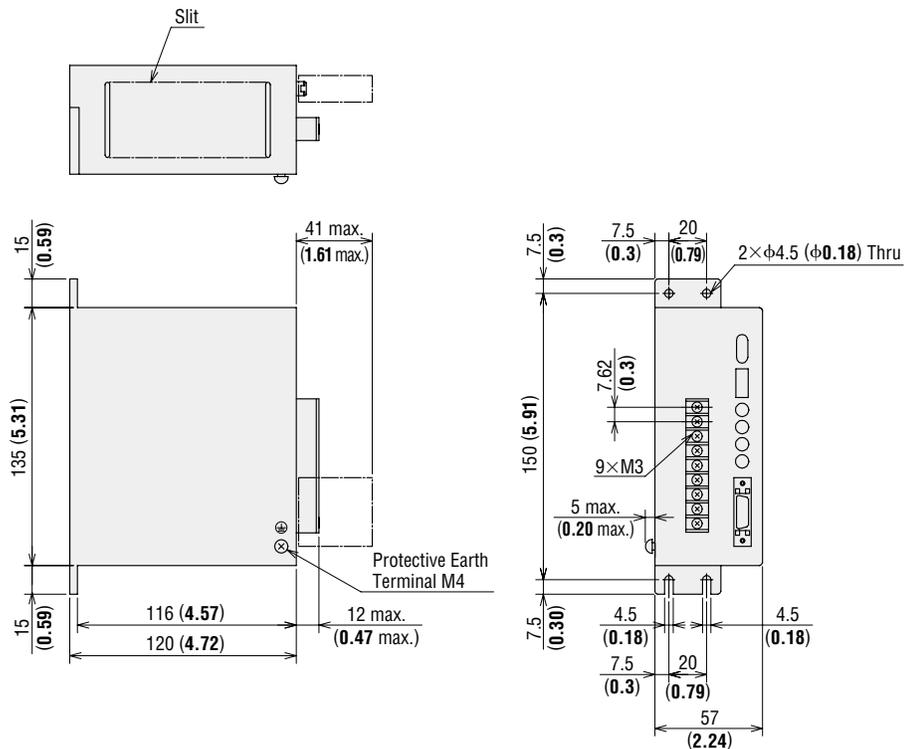
Cover Assembly: 54331-0201 (MOLEX)

Connector: 54306-2019 (MOLEX)

16 Driver Model: RKD514L-A, RKD514L-C
RKD514H-A, RKD514H-C
RKD514LM-A, RKD514LM-C
RKD514HM-A, RKD514HM-C

Mass: 0.85 kg (1.9 lb.)

CAD B284



● I/O Connector (Included)

Cover Assembly: 54331-0201 (MOLEX)

Connector: 54306-2019 (MOLEX)

Connection and Operation

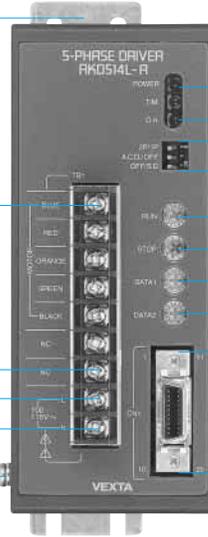
Names and Functions of Driver Parts

The driver is designed for easy mounting, so it is easy to design the base.

Motor Terminals
The one-touch terminal block cover adopts an anti-slide shape to prevent the installed cover from detaching.

Power Input Terminals

Protective Earth Terminal



- 1 Signal Monitor Display
The signal monitor displays allows you to check the driver's operating condition at a glance.
- 2 Function Select Switches
The driver functions can be easily operated/set using the switches on the front panel.
- 3 Current Adjustment Switches
- 4 Step Angle Select Switches
- 5 Input/Output Signals

1 Signal 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 80°C (176°F), this function automatically switches the motor current off. The function can be set or deactivated 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 or deactivated 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 motor current at standstill.

4 Step Angle 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		

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°

◇ Setting the Step Angles

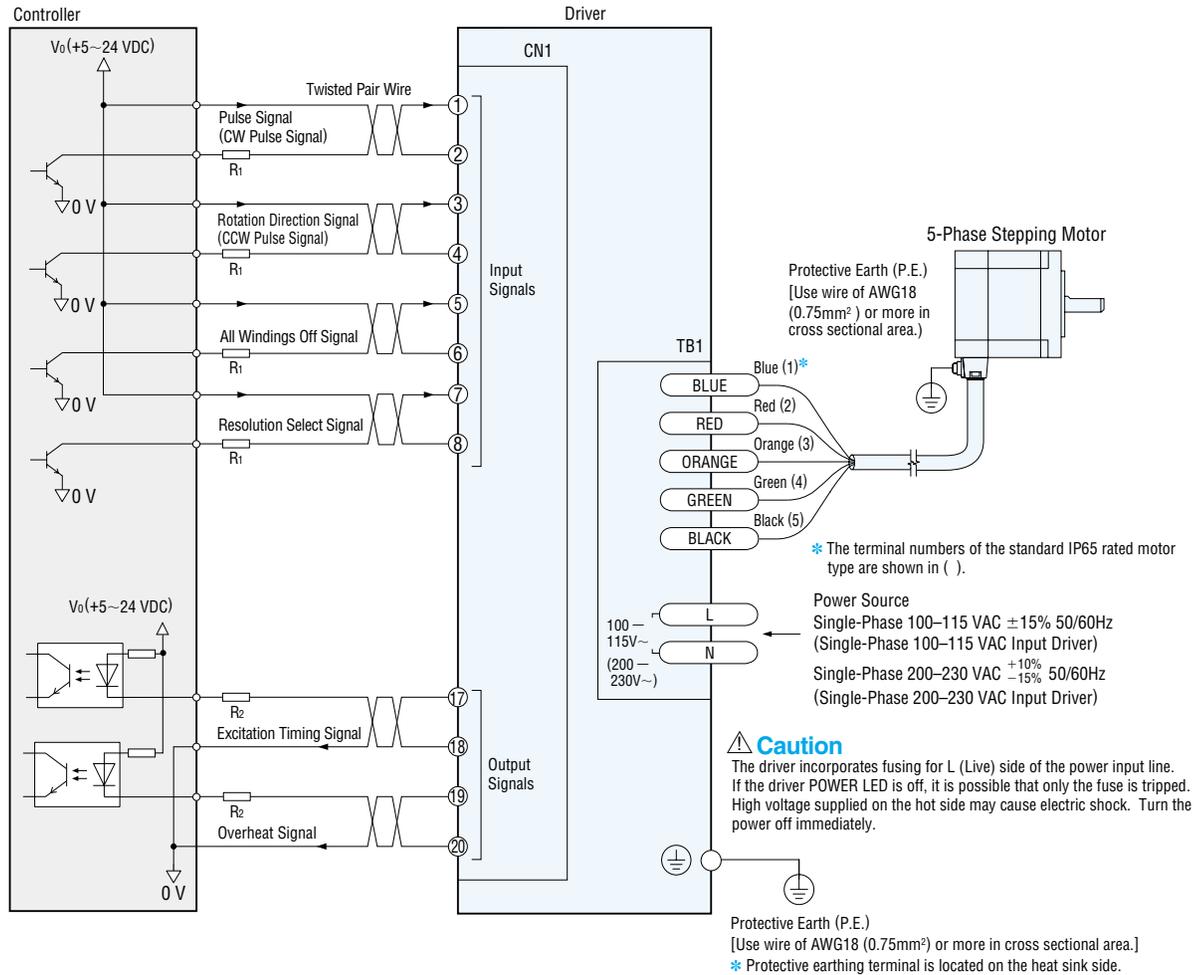
Selects and switches between the two step angle switches (DATA1 and DATA2).
Use the step angle select signal to change the step angle.
Photocoupler OFF: Step angle (resolution) set by DATA1 is selected.
Photocoupler ON: Step angle (resolution) set by DATA2 is selected.

5 Input/Output Signals

Indication	Input/Output Signals	Pin No.	Terminal Name	Function
CN1	Input Signals	1	Pulse Signal (CW Pulse Signal)	Operation command pulse signal (The motor will rotate in the CW direction when in 2-pulse input mode)
		2	Rotation Direction Signal (CCW Pulse Signal)	Rotation direction signal Photocoupler ON: CW, Photocoupler OFF: CCW (The motor will rotate in the CCW direction when in 2-pulse input mode)
		3	All Windings Off Signal	Cuts the output current to the motor and allows the motor shafts to be rotated manually.
		4	Step Angle Select Signal	Switches to step angle set in DATA1 and DATA2.
		5	Excitation Timing Signal	Outputs signals when the excitation sequence is at STEP 0.
		6		
		7	Overheat Signal	When the temperature inside the driver rises above 80°C (176°F), this function automatically turns the output signal off.
		8		
	Output Signals	17	Excitation Timing Signal	Outputs signals when the excitation sequence is at STEP 0.
		18		
19				
20				

*Refer to Page 31 for details of the signals.

● Connection Diagrams



◇ Connecting Input Signal

Keep the input signal voltage to 5 VDC. When the voltage is equal to 5 VDC, the external resistor R_1 is not necessary. When the voltage is above 5 VDC, connect R_1 as shown in the diagram to keep the input current to 20 mA or below. Example) If V_0 is 24 VDC, R_1 must be 1.5 to 2.2 k Ω , 0.5 W or more.

◇ Connecting Output Signal

Keep the output signal voltage and current to 24 VDC and 10 mA or below, respectively. When the current is above 10 mA, connect the external resistor R_2 as shown in the diagram to keep it to 10 mA or below.

◇ Power Supply

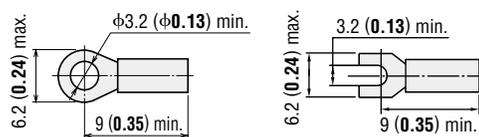
Use a power supply that can supply sufficient input current. When power supply capacity is insufficient, a decrease in motor output can cause the following malfunctions:

- Motor does not rotate properly at high-speed
- Slow motor startup and stopping

◇ Notes:

- Use twisted-pair wire of AWG24 or thicker and 2 m (6.6 ft.) or less in length for the signal line.
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.
- Use AWG22 or thicker for motor lines (when extended) and power supply lines, and use AWG18 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 10 cm (3.9 in.) away from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.

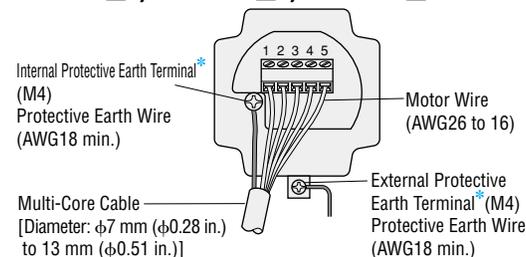
◇ Recommended Crimp Terminals



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

● Connection of Standard Type IP65 Rated Motor

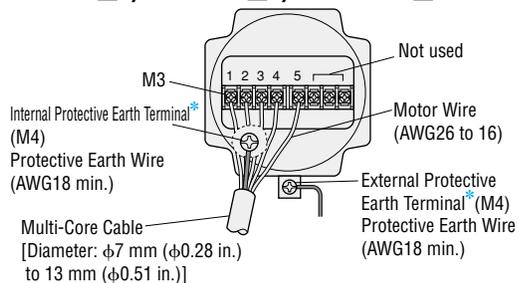
RK564A □ T, RK566A □ T, RK569A □ T



*Use either the internal or external protective earth terminal for grounding.

● Enter the power supply voltage **A** or **C** in the box (□) within the model name.

RK596A □ T, RK599A □ T, RK5913A □ T



● Description of Input/Output Signals

Indication of Input/Output Signal "ON""OFF"

Input (Output) "ON" indicates that the current is sent into the photocoupler (transistor) inside the driver. Input (Output) "OFF" indicates that the current is not sent into the photocoupler (transistor) inside the driver. The input/output remains "OFF" if nothing is connected.

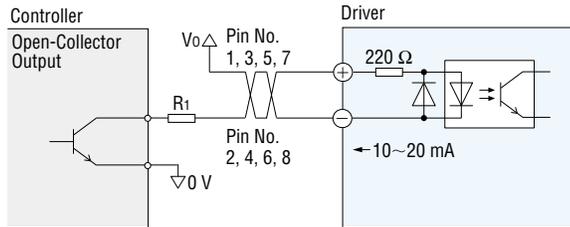
Photocoupler OFF ON

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

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

Step Angle Select (C/S) Input Signal

◇ Input Circuit and Sample Connection

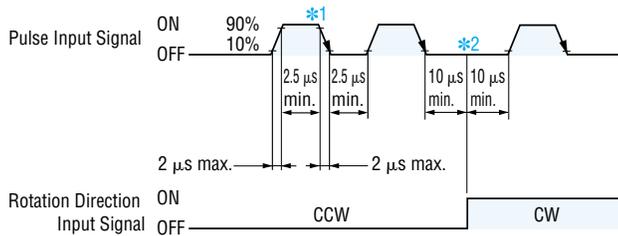


Keep the voltage V_0 between 5 VDC and 24 VDC. When V_0 is equal to 5 VDC, the external resistor R_1 is not necessary. When V_0 is above 5 VDC, connect R_1 to keep the current between 10 mA and 20 mA.

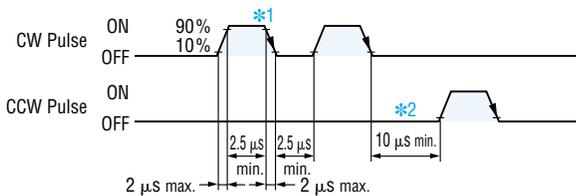
◇ Pulse (CW) and Rotation Direction (CCW) Input Signal

Pulse Waveform Characteristics

<In 1-pulse Input Mode>



<In 2-pulse Input Mode>



Pulse duty: 50% and below

*1 The shaded area indicates when the photocoupler diode is ON. The motor moves when the photocoupler state changes from ON to OFF.

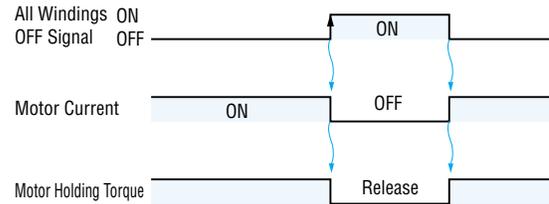
*2 The minimum interval time when changing rotation direction is 20 μ s (10 μ s minimum in 2-pulse input mode). This value varies greatly depending on the motor type, pulse frequency and load inertia.

◇ Pulse Signal Characteristics

- Keep the pulse signal at the "photocoupler OFF" state when no pulses are being input.
- Do not input a CW pulse and CCW pulse simultaneously.
- 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

- Inputting this signal puts the motor in a non-excitation (free) state.
- This signal is used when moving the motor by external force or manual home position is desired. The photocoupler must be "OFF" when operating the motor.



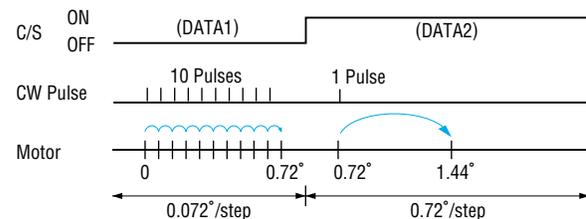
The colored area indicates that the motor provides holding torque in proportion to standstill current set by STOP switch.

- Switching the "All Windings Off" (A.W. 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 $\pm 3.6^\circ$ (Geared type: $\pm 3.6^\circ/\text{gear ratio}$) from the position set after the "All Windings Off" signal is released.

◇ Step Angle Select (C/S) Input Signal

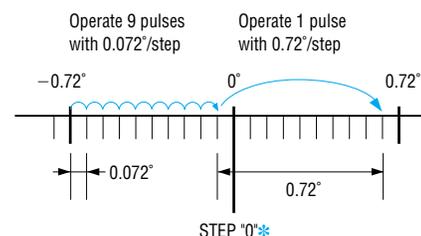
- You may select two step angles (resolutions) from 16 available step angles (resolutions) with the step angle select switches DATA1 and DATA2.
- When the signal is at "photocoupler OFF", a step angle set by DATA1 is selected; at "photocoupler ON", DATA2 is selected.

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



- 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.
- When the step angle is changed by the "C/S" signal, the "TIMING" signal output 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° .

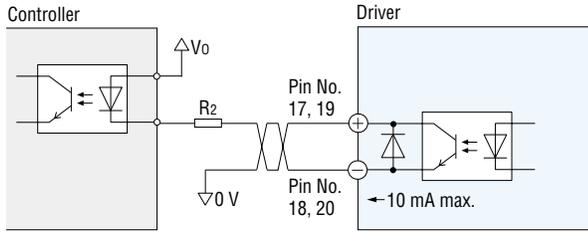
Example: After operate 9 pulses with $0.072^\circ/\text{step}$ setting, change the step angle $0.72^\circ/\text{step}$ and operate with 1 pulse. In this case, "Excitation Timing" signal will not be output because step "0" position is skipped.



* "Excitation Timing" signal is only output at step "0" sequence.

[Excitation Timing (TIM.) Output Signal Overheat (O.H.) Output Signal]

◇ Output Circuit and Sample Connection



Keep the voltage V_0 between 5 VDC and 24 VDC. Keep the current below 10 mA. If the current exceeds 10 mA, connect external resistor R_2 .

◇ Excitation Timing (TIM.) Output Signal

● 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 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.

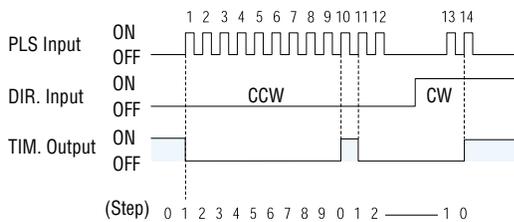
Resolution 1: Signal is output once every 10 pulses.

Resolution 10: Signal is output once every 100 pulses.

The TIM. LED on the front panel lights when the "Excitation Timing" signal is output.

Timing chart at 0.72°/step (Resolution 1)

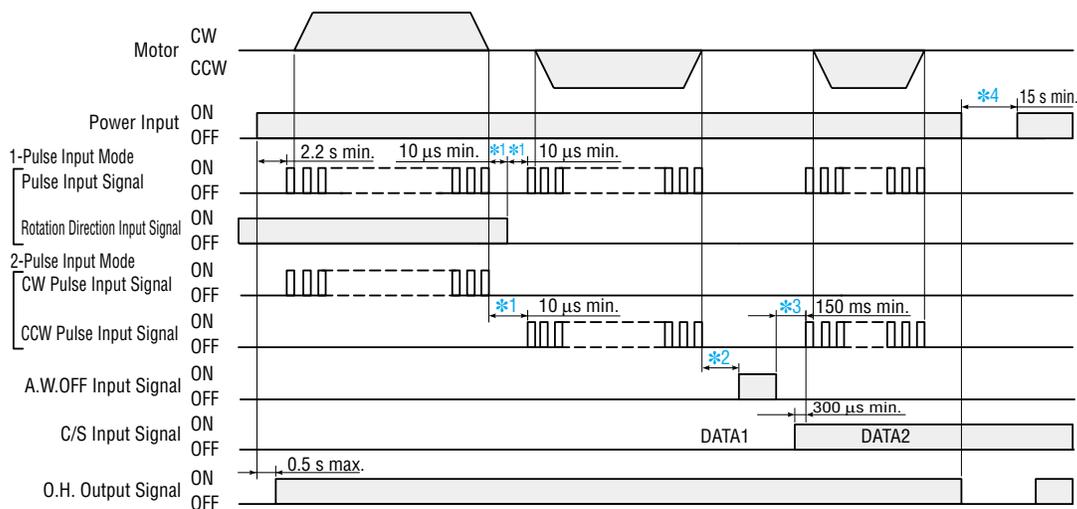
*When connected as shown in the example connection, the signal will be "photocoupler ON" at step "0".



Note:

● When power is turned ON, the excitation sequence is reset to step "0" and the "TIM." signal is output.

● Timing Chart



*1 Switching time to change direction (1-pulse input mode), and switching time to change CW, CCW pulse (2-pulse input mode) 10 μs 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 Windings Off" signal to the "photocoupler OFF" state. The motor may not start.

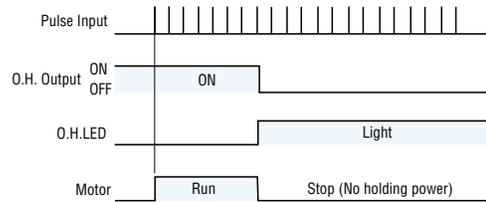
*4 Wait at least 15 seconds before turning on the power.

◇ Overheat (O.H.) Output Signal

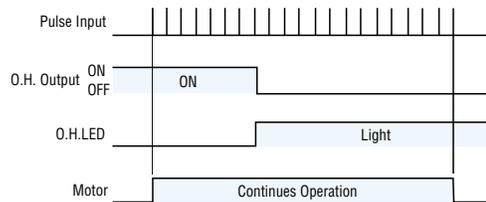
● The "Overheat" signal is output to protect the driver from heat damage if the internal temperature of the driver rises above 80°C. The Overheat LED lights on the front panel when the "Overheat" signal is output.

● You can select whether to stop the motor or continue the operation when an overheat signal is output.

● If the "Automatic Current Off" function switch is set to "A.C.O" position, output current is shut off to stop the motor when the overheat signal is output.



● If the "Automatic Current Off" function switch is set to "OFF" position, the motor continues operation when the overheat signal is output.



● To clear the "Overheat" signal, first resolve the cause and check for safety, then turn power on again.

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

List of Motor and Driver Combinations

Model names for motor and driver combinations are shown below.

Type	Model	Motor Model	Driver Model
Standard Type	RK543 <input type="checkbox"/> A RK544 <input type="checkbox"/> A RK545 <input type="checkbox"/> A	PK543 <input type="checkbox"/> W PK544 <input type="checkbox"/> W PK545 <input type="checkbox"/> W	RKD507-A
	RK564 <input type="checkbox"/> AE RK566 <input type="checkbox"/> AE RK569 <input type="checkbox"/> AE	PK564 <input type="checkbox"/> E PK566 <input type="checkbox"/> E PK569 <input type="checkbox"/> E	RKD514L-A
	RK596 <input type="checkbox"/> AE RK599 <input type="checkbox"/> AE RK5913 <input type="checkbox"/> AE	PK596 <input type="checkbox"/> E PK599 <input type="checkbox"/> E PK5913 <input type="checkbox"/> E	RKD514H-A
	RK564 <input type="checkbox"/> CE RK566 <input type="checkbox"/> CE RK569 <input type="checkbox"/> CE	PK564 <input type="checkbox"/> E PK566 <input type="checkbox"/> E PK569 <input type="checkbox"/> E	RKD514L-C
	RK596 <input type="checkbox"/> CE RK599 <input type="checkbox"/> CE RK5913 <input type="checkbox"/> CE	PK596 <input type="checkbox"/> E PK599 <input type="checkbox"/> E PK5913 <input type="checkbox"/> E	RKD514H-C
Standard Type IP65 Rated Motor	RK564AAT RK566AAT RK569AAT	PK564AT PK566AT PK569AT	RKD514L-A
	RK596AAT RK599AAT RK5913AAT	PK596AT PK599AT PK5913AT	RKD514H-A
	RK564ACT RK566ACT RK569ACT	PK564AT PK566AT PK569AT	RKD514L-C
	RK596ACT RK599ACT RK5913ACT	PK596AT PK599AT PK5913AT	RKD514H-C
TH Geared Type	RK543 <input type="checkbox"/> A-T3.6 RK543 <input type="checkbox"/> A-T7.2 RK543 <input type="checkbox"/> A-T10 RK543 <input type="checkbox"/> A-T20 RK543 <input type="checkbox"/> A-T30	PK543 <input type="checkbox"/> W-T3.6 PK543 <input type="checkbox"/> W-T7.2 PK543 <input type="checkbox"/> W-T10 PK543 <input type="checkbox"/> W-T20 PK543 <input type="checkbox"/> W-T30	RKD507-A
	RK564 <input type="checkbox"/> AE-T3.6 RK564 <input type="checkbox"/> AE-T7.2 RK564 <input type="checkbox"/> AE-T10 RK564 <input type="checkbox"/> AE-T20 RK564 <input type="checkbox"/> AE-T30	PK564 <input type="checkbox"/> E-T3.6 PK564 <input type="checkbox"/> E-T7.2 PK564 <input type="checkbox"/> E-T10 PK564 <input type="checkbox"/> E-T20 PK564 <input type="checkbox"/> E-T30	RKD514L-A
	RK596 <input type="checkbox"/> AE-T3.6 RK596 <input type="checkbox"/> AE-T7.2 RK596 <input type="checkbox"/> AE-T10 RK596 <input type="checkbox"/> AE-T20 RK596 <input type="checkbox"/> AE-T30	PK596 <input type="checkbox"/> E-T3.6 PK596 <input type="checkbox"/> E-T7.2 PK596 <input type="checkbox"/> E1-T10 PK596 <input type="checkbox"/> E1-T20 PK596 <input type="checkbox"/> E1-T30	RKD514H-A
	RK564 <input type="checkbox"/> CE-T3.6 RK564 <input type="checkbox"/> CE-T7.2 RK564 <input type="checkbox"/> CE-T10 RK564 <input type="checkbox"/> CE-T20 RK564 <input type="checkbox"/> CE-T30	PK564 <input type="checkbox"/> E-T3.6 PK564 <input type="checkbox"/> E-T7.2 PK564 <input type="checkbox"/> E-T10 PK564 <input type="checkbox"/> E-T20 PK564 <input type="checkbox"/> E-T30	RKD514L-C
	RK596 <input type="checkbox"/> CE-T3.6 RK596 <input type="checkbox"/> CE-T7.2 RK596 <input type="checkbox"/> CE-T10 RK596 <input type="checkbox"/> CE-T20 RK596 <input type="checkbox"/> CE-T30	PK596 <input type="checkbox"/> E-T3.6 PK596 <input type="checkbox"/> E-T7.2 PK596 <input type="checkbox"/> E1-T10 PK596 <input type="checkbox"/> E1-T20 PK596 <input type="checkbox"/> E1-T30	RKD514H-C

● Enter **A** (Single shaft) or **B** (Double shaft) in the box () within the model name.

Type	Model	Motor Model	Driver Model
PN Geared Type	RK544 <input type="checkbox"/> A-N5 RK544 <input type="checkbox"/> A-N7.2 RK544 <input type="checkbox"/> A-N10	PK544 <input type="checkbox"/> W-N5 PK544 <input type="checkbox"/> W-N7.2 PK544 <input type="checkbox"/> W-N10	RKD507-A
	RK566 <input type="checkbox"/> AE-N5 RK566 <input type="checkbox"/> AE-N7.2 RK566 <input type="checkbox"/> AE-N10 RK564 <input type="checkbox"/> AE-N25 RK564 <input type="checkbox"/> AE-N36 RK564 <input type="checkbox"/> AE-N50	PK566 <input type="checkbox"/> E-N5 PK566 <input type="checkbox"/> E-N7.2 PK566 <input type="checkbox"/> E-N10 PK564 <input type="checkbox"/> E-N25 PK564 <input type="checkbox"/> E-N36 PK564 <input type="checkbox"/> E-N50	RKD514L-A
	RK599 <input type="checkbox"/> AE-N5 RK599 <input type="checkbox"/> AE-N7.2 RK599 <input type="checkbox"/> AE-N10 RK596 <input type="checkbox"/> AE-N25 RK596 <input type="checkbox"/> AE-N36 RK596 <input type="checkbox"/> AE-N50	PK599 <input type="checkbox"/> E-N5 PK599 <input type="checkbox"/> E-N7.2 PK599 <input type="checkbox"/> E-N10 PK596 <input type="checkbox"/> E-N25 PK596 <input type="checkbox"/> E-N36 PK596 <input type="checkbox"/> E-N50	RKD514H-A
	RK566 <input type="checkbox"/> CE-N5 RK566 <input type="checkbox"/> CE-N7.2 RK566 <input type="checkbox"/> CE-N10 RK564 <input type="checkbox"/> CE-N25 RK564 <input type="checkbox"/> CE-N36 RK564 <input type="checkbox"/> CE-N50	PK566 <input type="checkbox"/> E-N5 PK566 <input type="checkbox"/> E-N7.2 PK566 <input type="checkbox"/> E-N10 PK564 <input type="checkbox"/> E-N25 PK564 <input type="checkbox"/> E-N36 PK564 <input type="checkbox"/> E-N50	RKD514L-C
	RK599 <input type="checkbox"/> CE-N5 RK599 <input type="checkbox"/> CE-N7.2 RK599 <input type="checkbox"/> CE-N10 RK596 <input type="checkbox"/> CE-N25 RK596 <input type="checkbox"/> CE-N36 RK596 <input type="checkbox"/> CE-N50	PK599 <input type="checkbox"/> E-N5 PK599 <input type="checkbox"/> E-N7.2 PK599 <input type="checkbox"/> E-N10 PK596 <input type="checkbox"/> E-N25 PK596 <input type="checkbox"/> E-N36 PK596 <input type="checkbox"/> E-N50	RKD514H-C
	RK543 <input type="checkbox"/> A-H50 RK543 <input type="checkbox"/> A-H100	PK543 <input type="checkbox"/> W-H50S PK543 <input type="checkbox"/> W-H100S	RKD507-A
	RK564 <input type="checkbox"/> AE-H50 RK564 <input type="checkbox"/> AE-H100	PK564 <input type="checkbox"/> E-H50S PK564 <input type="checkbox"/> E-H100S	RKD514L-A
	RK596 <input type="checkbox"/> AE-H50 RK596 <input type="checkbox"/> AE-H100	PK596 <input type="checkbox"/> E1-H50 PK596 <input type="checkbox"/> E1-H100	RKD514H-A
	RK564 <input type="checkbox"/> CE-H50 RK564 <input type="checkbox"/> CE-H100	PK564 <input type="checkbox"/> E-H50S PK564 <input type="checkbox"/> E-H100S	RKD514L-C
	RK596 <input type="checkbox"/> CE-H50 RK596 <input type="checkbox"/> CE-H100	PK596 <input type="checkbox"/> E1-H50 PK596 <input type="checkbox"/> E1-H100	RKD514H-C

● Enter **A** (Single shaft) or **B** (Double shaft) in the box () within the model name.

Features

Line-up

System
Configuration

Product Line

Specifications and
Characteristics

Dimensions

Connection
and Operation

List of Motor and
Driver Combinations

Accessories

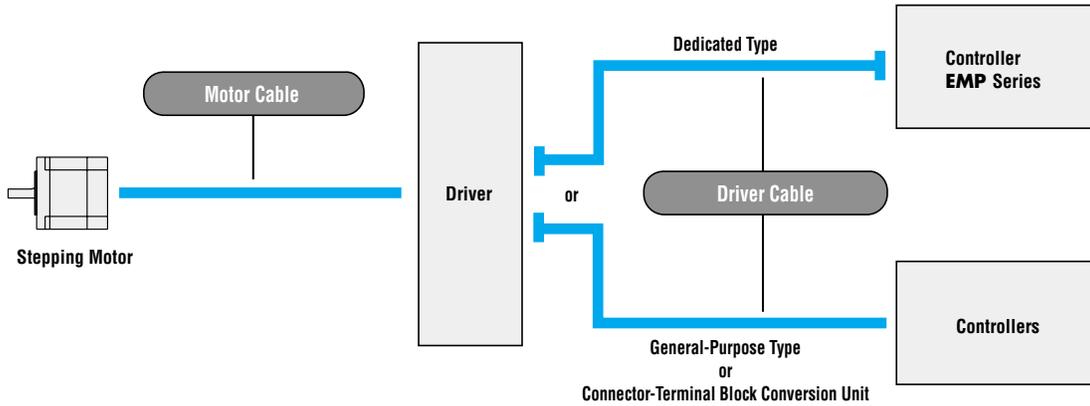
Before Using
a Stepping Motor

Controllers

Cables

Extension cables provide convenient connection between a motor, driver and controller.

Type of Cables



Motor Cables

Use this cable to extend the wiring distance between the motor and driver, or connect the IP65 rated motor and driver.

Cable Name	Page
Extention Cable	34
Motor cable (with protective earth wire)	34

Driver Cables

Use this cable to connect the driver to a controller. Choose the dedicated cable that allows for one-touch connection with an **EMP**-Series controller, the general-purpose cable to be combined with a connector appropriate for the specific controller used, or the connector-terminal block conversion unit that permits connection between the driver and host controller using a terminal block.

Cable Name	Page	
Driver Cable	Dedicated Type	35
	General-Purpose Type	35
Connector-Terminal Block Conversion Unit	36	

Motor Cables Extension Cables RoHS



These extension cables are used between **RK** Series motors and dedicated drivers (except for electromagnetic brake type). They come in three lengths: 5 m (16.4 ft.), 10 m (32.8 ft.), and 20 m (65.6 ft.).

Product Line

Model	Length m (ft.)	Conductors
CC05PK5	5 (16.4)	5
CC10PK5	10 (32.8)	
CC20PK5	20 (65.6)	

- Conductor configuration: 5
- Conductor size: AWG22
- Finished outer diameter: ϕ 7.2 mm (ϕ 0.28 in.)
- Cable rating: 105°C (221°F)
- Outer casing: Oil-resistant, heat-resistant, non-migrating vinyl

Motor Cable RoHS (with protective earth wire)

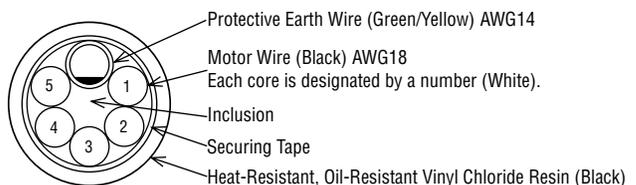


A cable for connection between the IP65 rated motor and driver

Product Line

Model	Length m (ft.)	Conductors
CC03PKT	3 (9.8)	6

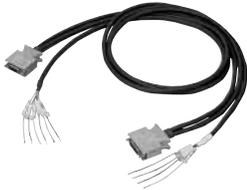
- Conductor configuration: 6
- Conductor size: Motor wire AWG18, Protective earth wire AWG14
- Finished outer diameter: ϕ 12 mm (ϕ 0.47 in.)
- Cable rating: 105°C (221°F) 600 VAC
- Outer casing: Heat-resistant, oil-resistant vinyl chloride resin
- Applicable standards: UL758 (AWM) VW-1, UL Style 2586



Driver Cables

These shielded cables are convenient for connecting **RK** Series drivers to controllers. Dedicated type (equipped with the connector for the **EMP** Series controller) and general-purpose type are available.

Dedicated Type RoHS (Conforms to **EMP** Series)



One end of the cable is a half-pitch connector that snaps into the driver for **RK** Series. The other end of the cable is equipped with the connector for the **EMP** Series controller.

Note:

● Note that as the length of the pulse signal line increases, the maximum transmission frequency decrease.

General-Purpose Type RoHS



This is a shielded cable equipped with, at one end of the cable, the half-pitch connector that snaps into the driver for **RK** Series.

Notes:

- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.
- Install a connector that matches the controller you are using to the other end of the cable.

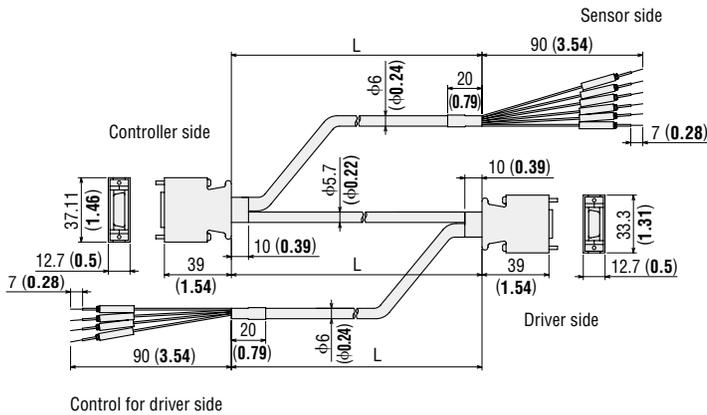
Product Line

Model	Length L m (ft.)
CC01EMP5	1 (3.3)
CC02EMP5	2 (6.6)

Product Line

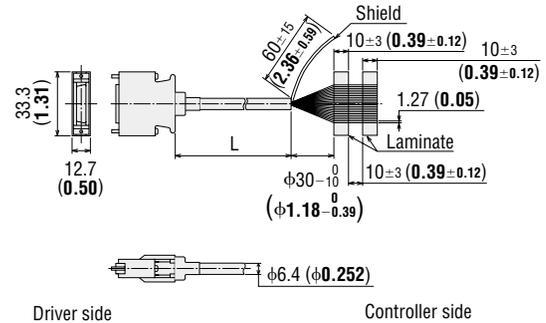
Model	Length L m (ft.)
CC20D1-1	1 (3.3)
CC20D2-1	2 (6.6)

Dimensions Unit = mm (inch)



Dimensions Unit = mm (inch)

Conductor: AWG28



Connector-Terminal Block Conversion Unit RoHS NEW

A conversion unit that connects a driver to a host controller using a terminal block.

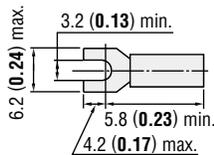


- With a signal name plate for easy, one-glance identification of driver signal names
- DIN-rail mountable
- Cable length: 1 m (3.3 ft.)

Product Line

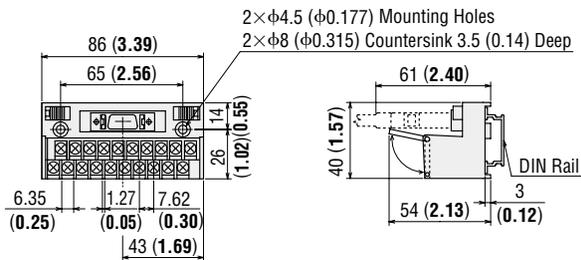
Model	Length m (ft.)
CC20T1	1 (3.3)

- Recommended Crimp Terminals
- Terminal screw size: M3
- Tightening torque: 1.2 N·m (170 oz-in)
- Applicable minimum lead wire: AWG22



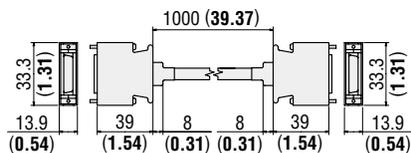
Dimensions Unit = mm (inch)

CAD B437



Terminal block pin configuration

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20



Flexible Couplings RoHS NEW

A flexible coupling ideal for your motor is available. Once you have decided on a motor and gear, you can select the recommended coupling easily. All motor shaft diameters of stepping motor packages are available (including geared motors).



Features of MCS Couplings

This three-piece coupling adopts an aluminum alloy hub and a resin spider. The simple construction ensures that the high torque generated by a geared motor can be transmitted reliably. The proper elasticity of the spider suppresses motor vibration.

- High accuracy (usable for geared motor) has been realized.
- A spider (material: polyurethane) controls the vibration generated by the motor.
- No backlash.

Product Number Code

MCS 30 08 12

①	②	③	④
①	MCS Couplings		
②	Outer Diameter of Coupling		
③	Inner Diameter d1 (Smaller Side) [F04] represents $\phi 6.35$ mm ($\phi 0.25$ in.)		
④	Inner Diameter d2 (Larger Side) [F04] represents $\phi 6.35$ mm ($\phi 0.25$ in.)		

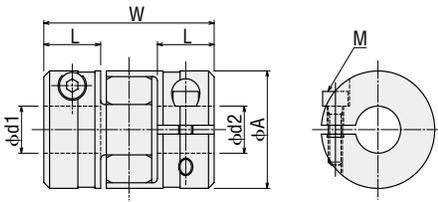
Coupling Selection Table

Applicable Motor RK Series	Gear Ratio	Motor Shaft Diameter mm (in.)	Type	Driven Shaft Diameter mm (in.)														
				$\phi 4$ ($\phi 0.1575$)	$\phi 5$ ($\phi 0.1969$)	$\phi 6$ ($\phi 0.2362$)	$\phi 6.35$ ($\phi 0.2500$)	$\phi 8$ ($\phi 0.3150$)	$\phi 10$ ($\phi 0.3937$)	$\phi 12$ ($\phi 0.4724$)	$\phi 14$ ($\phi 0.5512$)	$\phi 15$ ($\phi 0.5906$)	$\phi 16$ ($\phi 0.6299$)	$\phi 18$ ($\phi 0.7087$)	$\phi 20$ ($\phi 0.7874$)	$\phi 25$ ($\phi 0.9843$)		
RK543□A RK544□A RK545□A	-	$\phi 5$ ($\phi 0.1969$)	MCS14	●	●	●												
RK543□A-T3.6 RK543□A-T	7.2, 10	$\phi 6$ ($\phi 0.2362$)		●	●	●												
RK564□E, RK564A□T RK566□E, RK566A□T	-	$\phi 8$ ($\phi 0.3150$)	MCS20		●	●	●	●	●									
RK544□A-N	5, 7.2	$\phi 10$ ($\phi 0.3937$)				●	●	●	●									
RK543□A-T	20, 30	$\phi 6$ ($\phi 0.2362$)	MCS30			●	●	●	●									
RK569□E, RK569A□T	-	$\phi 8$ ($\phi 0.3150$)				●	●	●	●	●								
RK564□E-T	3.6, 7.2	$\phi 10$ ($\phi 0.3937$)					●	●	●	●	●							
RK544□A-N10	-	$\phi 10$ ($\phi 0.3937$)					●	●	●	●	●							
RK596□E, RK596A□T	-	$\phi 14$ ($\phi 0.5512$)	MCS40					●	●	●			●					
RK564□E-T	10, 20, 30	$\phi 8$ ($\phi 0.3150$)						●	●	●			●					
RK543□A-H	50, 100	$\phi 10$ ($\phi 0.3937$)						●	●	●			●					
RK566□E-N	5, 7.2	$\phi 12$ ($\phi 0.4724$)	MCS55					●	●	●			●					
RK596□E-T	3.6, 7.2, 10, 20, 30	$\phi 12$ ($\phi 0.4724$)									●	●	●	●				
RK566□E-N10	-											●	●	●	●			
RK564□E-N	25, 36, 50										●	●	●	●				
RK564□E-H	50, 100										●	●	●	●				
RK599□E, RK599A□T RK5913□E, RK5913A□T	-	$\phi 14$ ($\phi 0.5512$)	MCS65							●	●	●	●					
RK599□E-N5	-	$\phi 18$ ($\phi 0.7087$)										●	●	●	●			
RK599□E-N	7.2, 10	$\phi 18$ ($\phi 0.7087$)											●	●	●	●		
RK596□E-N	25, 36, 50												●	●	●	●		
RK596□E-H	50, 100												●	●	●	●		

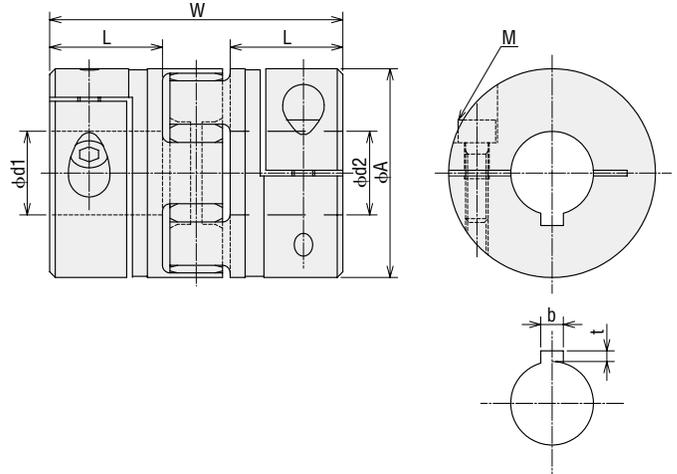
- Enter **A** (Single shaft) or **B** (Double shaft) in the box (□) within the model name.
- Enter the power supply voltage **A** or **C** in the box (□) within the model name.
- Enter the gear ratio in the box (□) within the model name.

Dimensions

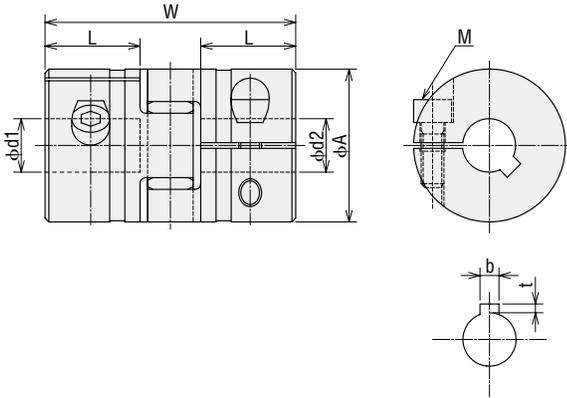
MCS14 Mass: 6.7 g (0.23 oz)
MCS20 Mass: 19.8 g (0.69 oz)
MCS30 Mass: 44.6 g (1.57 oz)



MCS55 Mass: 282 g (10 oz)
MCS65 Mass: 535 g (18.9 oz)



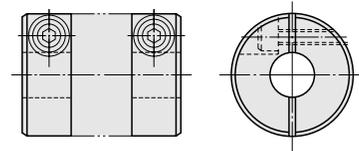
MCS40 Mass: 139 g (4.9 oz)



Mounting to a Shaft

Clamp Type

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.



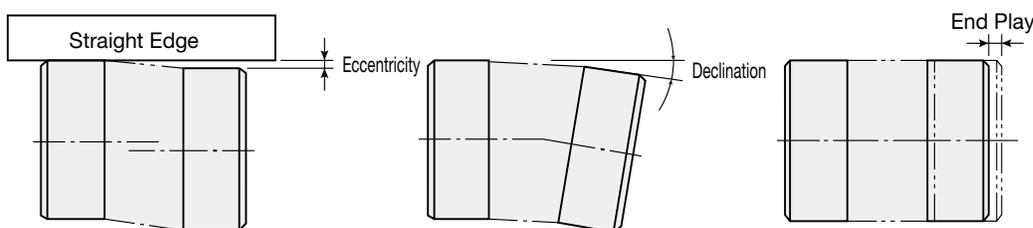
Type	MCS14	MCS20	MCS30	MCS40	MCS55	MCS65	
Tightening Torque	N·m (oz·in)	0.37 (52)	0.76 (107)	1.34 (190)	10.5 (1490)	10.5 (1490)	25 (3550)

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.

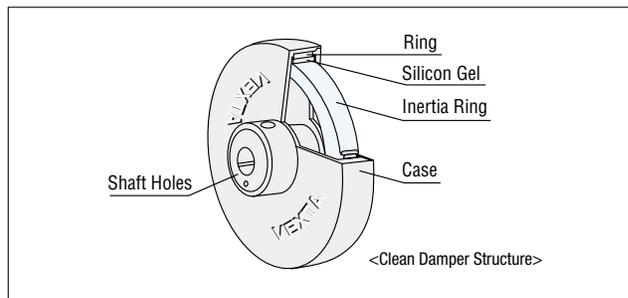
Clean Dampers RoHS

Mechanical dampers suppress stepping motor vibration and improve high-speed performance. An inertial body and silicon gel are hermetically sealed in a plastic case.



Features

- **Excellent vibration absorption**
The doughnut-shaped internal inertia body and silicon gel absorb vibration. This feature enables a stable damping effect.
- **Since there is no frictional dust as in conventional magnetic dampers, it can be used in environments where higher degrees of cleanness is needed.**
- **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.**
- **Machine part is sealed hermetically in a plastic case.**
This ensures safety and doesn't generate noise.
- **This clean damper is an option for double-shaft types. It can be used for various geared motors with double-shaft.**



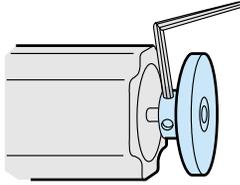
Product Line

Model	Inertia kg-m ² (oz-in ²)	Mass g (lb.)	Applicable Motor
D4CL-5.0F	34 × 10 ⁻⁷ (0.186)	24 (0.053)	RK54□BA RK543BA-T□ RK544BA-N□ RK543BA-H□
D6CL-8.0F	140 × 10 ⁻⁷ (0.77)	61 (0.13)	RK56□BE RK564BE-T□ RK56□BE-N□ RK564BE-H□
D9CL-14F	870 × 10 ⁻⁷ (4.8)	105 (0.23)	RK59□BE RK596BE-T□ RK59□BE-N□ RK596BE-H□

Ambient Temperature: -20°C ~ +80°C (-4°F ~ +176°F)

- Enter the motor case length in the box (□) within the model name.
Enter the power supply voltage **A** or **C** in the box (□) within the model name.
Enter the gear ratio in the box (□) within the model name.

Installation of the Clean Damper



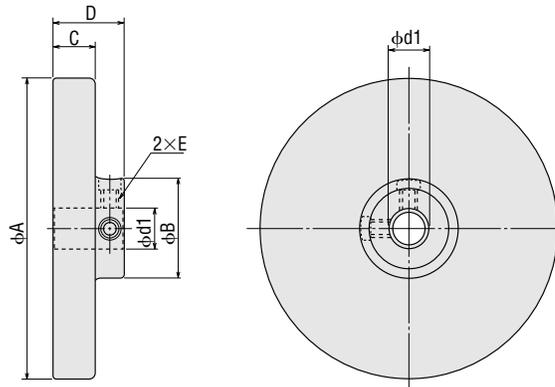
Point the mounting screws of the clean damper toward the motor case, fasten to the shaft and tighten the damper's mounting screws (2 places) with a hexagonal wrench to secure it to the shaft.

Model	D4CL-5.0F	D6CL-8.0F	D9CL-14F	
Tightening Torque	N-m (oz-in)	0.4 (56)	1.5 (210)	1.5 (210)

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.

Dimensions Unit = mm (inch)



Model	φd1	φA	φB	C	D	E
D4CL-5.0F	$\phi 5^{+0.018}_0$ ($\phi 0.1969^{+0.0007}_0$)	$\phi 36 \pm 0.5$ ($\phi 1.42 \pm 0.02$)	$\phi 13 \pm 0.5$ ($\phi 0.51 \pm 0.02$)	9 ± 0.3 (0.354 ± 0.012)	15 ± 0.5 (0.591 ± 0.02)	M3
D6CL-8.0F	$\phi 8^{+0.022}_0$ ($\phi 0.3150^{+0.0009}_0$)	$\phi 44.5 \pm 0.5$ ($\phi 1.75 \pm 0.02$)	$\phi 20 \pm 0.5$ ($\phi 0.79 \pm 0.02$)	15 ± 0.3 (0.591 ± 0.012)	22 ± 0.5 (0.87 ± 0.02)	M4
D9CL-14F	$\phi 14^{+0.027}_0$ ($\phi 0.5512^{+0.0011}_0$)	$\phi 79.5 \pm 0.5$ ($\phi 3.13 \pm 0.02$)	$\phi 26 \pm 0.5$ ($\phi 1.02 \pm 0.02$)	11 ± 0.3 (0.433 ± 0.012)	19 ± 0.5 (0.75 ± 0.02)	M4

Motor Mounting Brackets

Mounting brackets are convenient for installation and securing a stepping motor and geared stepping motor.



Product Line

Standard Type

Material: Aluminum die cast

Mounting Bracket Models	Applicable Motor
PAFOP	RK54 <input type="checkbox"/> A
PALOP	RK54 <input type="checkbox"/> A
PAL2P-5A	RK56 <input type="checkbox"/> AE
	RK56 <input type="checkbox"/> CE
	RK56 <input type="checkbox"/> AAT
	RK56 <input type="checkbox"/> ACT
PAL4P-5A	RK59 <input type="checkbox"/> AE
	RK59 <input type="checkbox"/> CE
	RK59 <input type="checkbox"/> AAT
	RK59 <input type="checkbox"/> ACT

- Enter the motor case length in the box () within the model name.
Enter **A** (Single shaft) or **B** (Double shaft) in the box () within the model name.
- The mounting bracket base is built with holes large enough to allow for alignment adjustments in the horizontal direction.
- These mounting brackets can be perfectly fitted to the pilot of the stepping motors. (except for **PALOP**)

Note:

- They cannot be used with geared stepping motors.

Geared Type

Material: Aluminum die cast

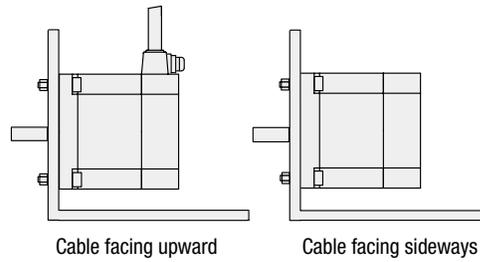


Mounting Bracket Models	Applicable Motor
SOLOB-A	RK543 <input type="checkbox"/> A-T <input type="checkbox"/>
SOL2A-A	RK564 <input type="checkbox"/> AE-T <input type="checkbox"/>
	RK564 <input type="checkbox"/> CE-T <input type="checkbox"/>
SOL5B-A	RK596 <input type="checkbox"/> AE-T <input type="checkbox"/>
	RK596 <input type="checkbox"/> CE-T <input type="checkbox"/>

- Enter the motor case length in the box () within the model name.
Enter **A** (Single shaft) or **B** (Double shaft) in the box () within the model name.
Enter the gear ratio in the box () within the model name.
- The mounting bracket base is built with holes large enough to allow for alignment adjustments in the horizontal direction.
- No screws are supplied for installing. Provide appropriate screws separately.

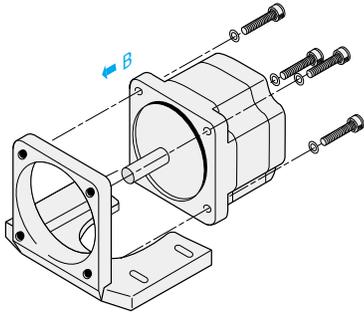
Motor Installation Direction

The motor cable comes out at right angles to the motor. Orient the motor so that the cable faces either upward or sideways.



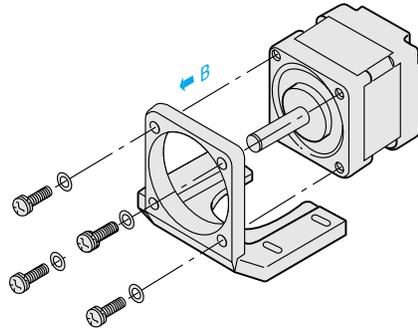
Mounting the Motor

1 PAL2P-5A, PAL4P-5A



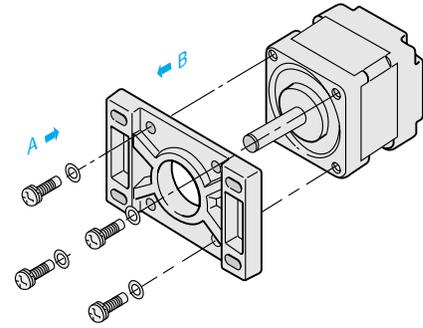
- ① Use the screws provided to secure the motor to the mounting bracket.
- ② Attach the motor from the direction shown by the arrow (B).

2 PALOP, SOLOB-A, SOL2A-A, SOL5B-A



- ① Use the screws provided to secure the motor to the mounting bracket. (No screws are supplied for **SOLOB-A**, **SOL2A-A** and **SOL5B-A**. Provide appropriate screws separately.)
- ② Attach the motor from the direction shown by the arrow (B).

3 PAFOP



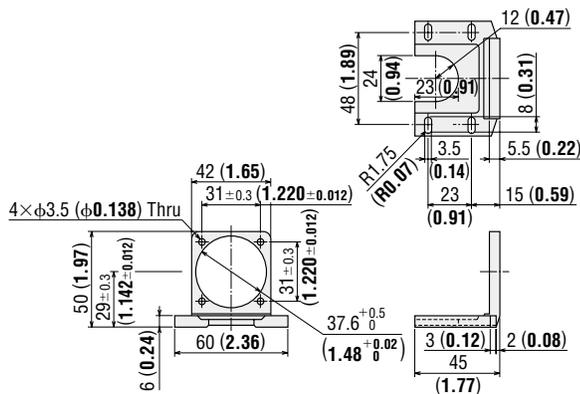
- ① Use the screws provided to secure the motor to the mounting bracket.
- ② Attach motor from the direction shown by either arrow (A) or arrow (B).

Dimensions Unit = mm (inch)

PALOP

Mass: 35 g (1.24 oz.)

CAD B139



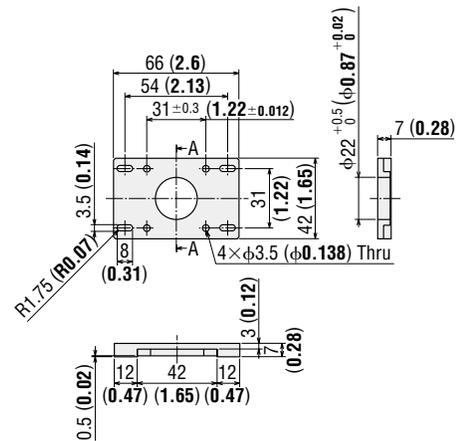
● Screws (included)
M3P0.5, 10 mm (0.39 in.) length, 4 pieces

● Screws (Included)
M3P0.5 Length 10 mm (0.39 in.) --- 4 Pieces

PAFOP

Mass: 30 g (1.06 oz.)

CAD B140

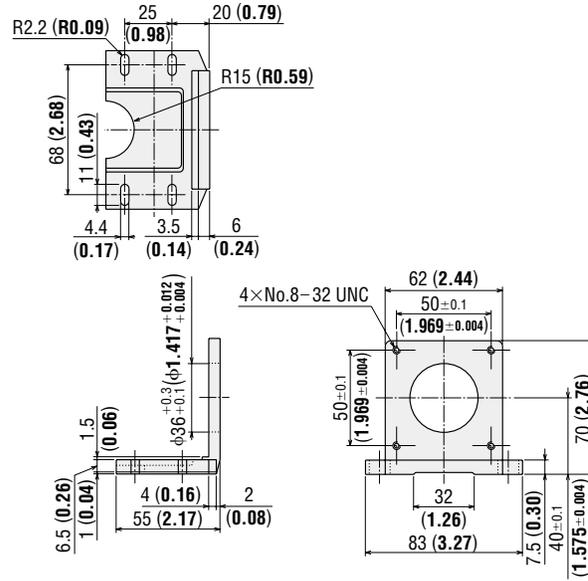


● Screws (Included)
M3P0.5 Length 7 mm (0.28 in.) --- 4 Pieces

PAL2P-5A

Mass: 110 g (3.9 oz.)

CAD B143

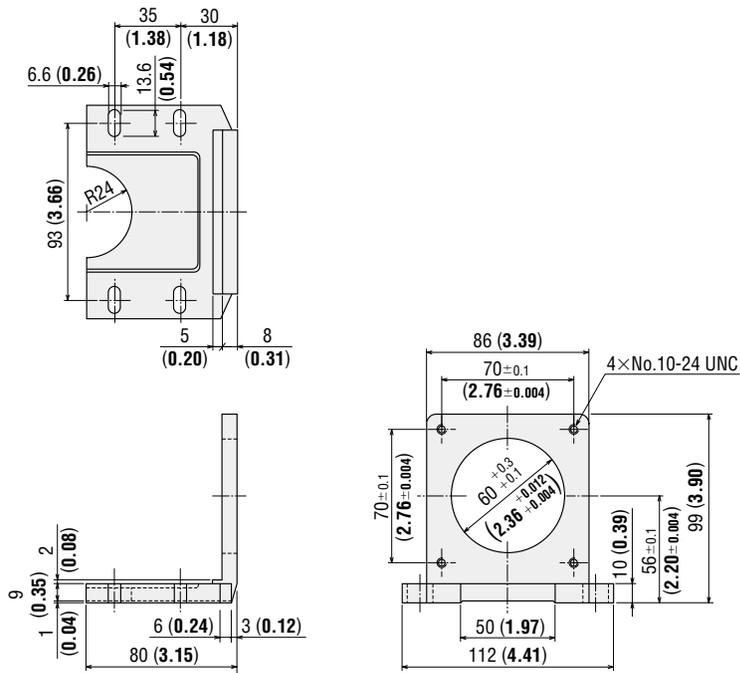


- Screws (Included)
No.8-32 UNC ... 4 Pieces

PAL4P-5A

Mass: 250 g (8.8 oz.)

CAD B145

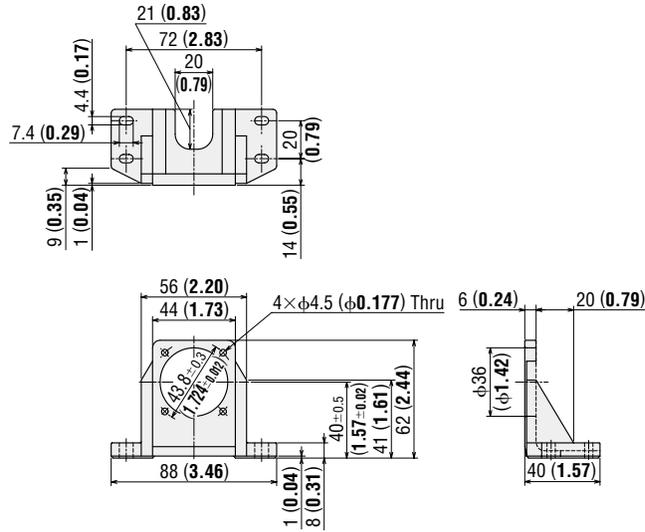


- Screws (Included)
No.10-24 UNC ... 4 Pieces

SOL0B-A

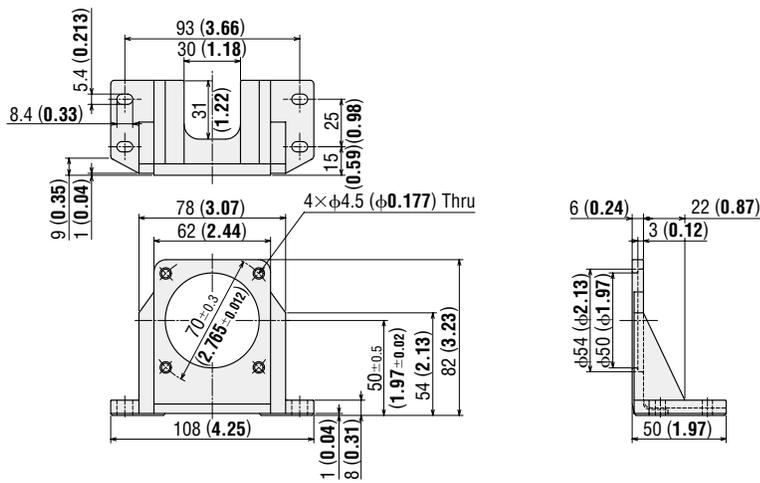
Mass: 85 g (3.0 oz.)

CAD B267

**SOL2A-A**

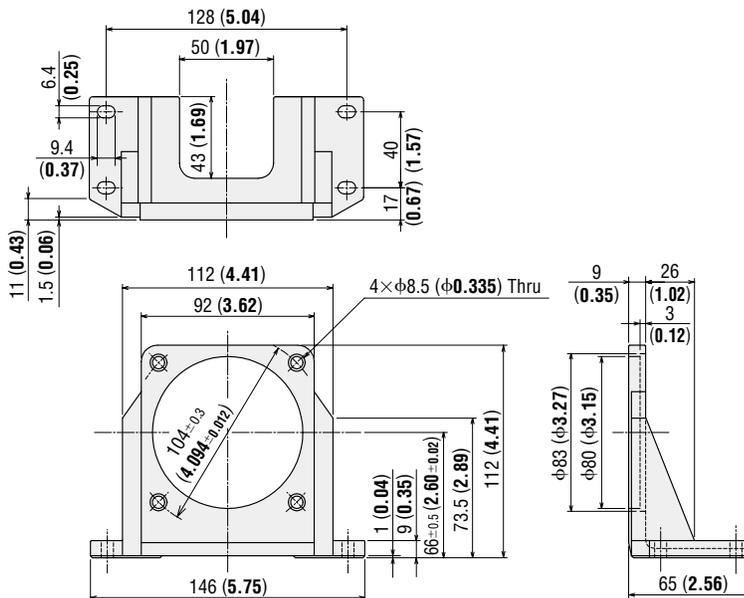
Mass: 120 g (4.2 oz.)

CAD B268

**SOL5B-A**

Mass: 270 g (9.5 oz.)

CAD B271



Features

Line-up

System Configuration

Product Line

Specifications and Characteristics

Dimensions

Connection and Operation

List of Motor and Driver Combinations

Accessories

Before Using a Stepping Motor

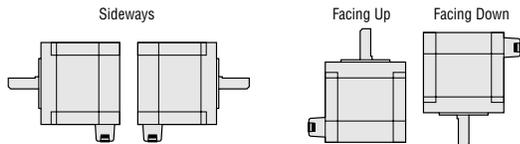
Controllers

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:

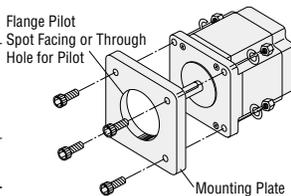
- Do not disassemble the motors.
- Do not apply any shock load to the motor.

Mounting Method

Considering heat radiation and vibration isolation as much as possible, mount the motor tightly against a metal surface.

Through Hole Type

Model	Thickness of the Mounting Plate
RK56 <input type="checkbox"/> AE RK56 <input type="checkbox"/> CE RK56 <input type="checkbox"/> AAT RK56 <input type="checkbox"/> ACT	5 mm (0.20 in.) min.
RK59 <input type="checkbox"/> AE RK59 <input type="checkbox"/> CE RK59 <input type="checkbox"/> AAT RK59 <input type="checkbox"/> ACT	8 mm (0.31 in.) min.
RK596 <input type="checkbox"/> AE-H RK596 <input type="checkbox"/> CE-H	12 mm (0.47 in.) min.



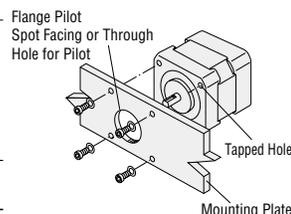
- Enter the motor case length in the box (□) within the model name.

Enter **A** (Single shaft) or **B** (Double shaft) in the box (□) within the model name.

Enter the gear ratio in the box (■) within the model name.

Tapped Hole Type

Model	Thickness of the Mounting Plate
RK54 <input type="checkbox"/> A	3 mm (0.12 in.) min.
RK543 <input type="checkbox"/> A-T RK544 <input type="checkbox"/> A-N RK543 <input type="checkbox"/> A-H RK564 <input type="checkbox"/> AE-T RK564 <input type="checkbox"/> CE-T	5 mm (0.20 in.) min.
RK56 <input type="checkbox"/> AE-N RK56 <input type="checkbox"/> CE-N RK564 <input type="checkbox"/> AE-H RK564 <input type="checkbox"/> CE-H RK596 <input type="checkbox"/> AE-T RK596 <input type="checkbox"/> CE-T	8 mm (0.31 in.) min.
RK59 <input type="checkbox"/> AE-N RK59 <input type="checkbox"/> CE-N	12 mm (0.47 in.) min.



- Enter the motor case length in the box (□) within the model name.

Enter **A** (Single shaft) or **B** (Double shaft) in the box (□) within the model name.

Enter the gear ratio in the box (■) within the model name.

Driver Installation

Installation Direction and Method

Drivers are designed to dissipate heat through natural convection. Install the driver vertically as shown in the photograph.

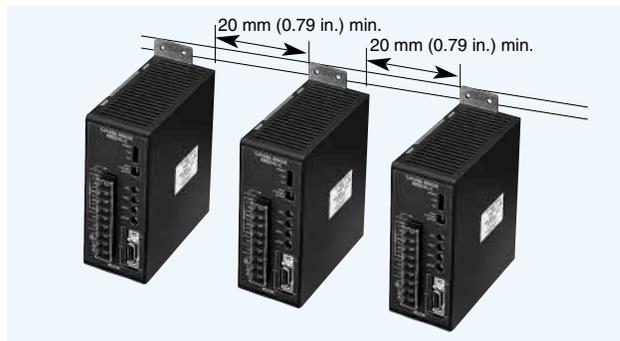


- Firmly install on a metal plate that has good heat conductivity, such as iron or aluminum 2 mm (0.08 in.) or more in thickness.

Using Multiple Axes

When using multiple stepping motor axes, driver temperature rise will cause ambient temperatures to rise. At least 20 mm (0.79 in.) must be allowed between driver units and at least 25 mm (0.98 in.) between drivers and other equipment or structures.

Install a forced-air cooling fan if ambient temperatures exceed 50°C (122°F).



Installation Conditions

Install the motor and the driver in a location that meets the following conditions, or the product may be damaged.

- Indoors (This product is designed and manufactured to be installed within another device)
- Ambient temperature: 0°C to +50°C (+32°F to +122°F) (nonfreezing)
- Ambient humidity: 85% or less (noncondensing)
- Not exposed to explosive, flammable, or corrosive gas
- Not exposed to direct sunlight
- Not exposed to dust
- Not exposed to water or oil (except for IP65 rated motor)
- 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.

Controllers

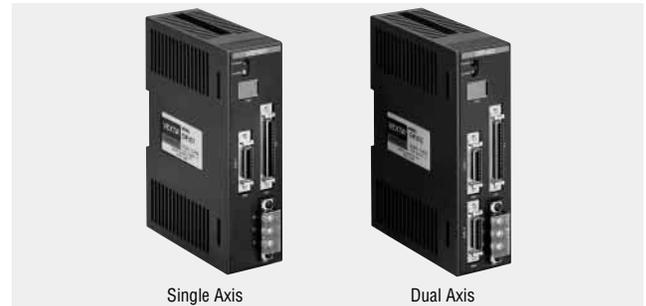
Types of Controllers

We offer an extensive range of controllers that are designed with Oriental Motor's superior technologies to achieve various operations at will.

Choose the optimal controller to match your application.

		Stored Program Controller	Stored Data Controller
		EMP400 Series	SG8030J
			
Program	Number of Programs	32	-
	Capacity	1000 commands	-
	Input Method	Command input via terminal program	-
	Number of Control Tasks	Main: 1, Sub: 0	-
Positioning Data	Number of Settings	-	4 steps Sequential-step positioning type Step-select positioning type
	Setting Mode	-	Set with touch key on front panel
Oscillator Specifications	Number of Control Axes	Single axis, Dual axis	Single axis
	Pulse Output Mode	1-pulse output/2-pulse output mode	1-pulse output/2-pulse output mode
	Acceleration/Deceleration Pattern	Linear Jerk-limit control	Linear Jerk-limit control
Operation Pattern	Relative Positioning Operation	<input type="radio"/>	<input type="radio"/>
	Absolute Positioning Operation	<input type="radio"/>	-
	Continuous Operation	<input type="radio"/>	<input type="radio"/>
	Return to Mechanical Home Operation	<input type="radio"/>	<input type="radio"/>
	Dual Axis Linear Interpolation Operation	<input type="radio"/>	-
	Multistep Speed-Change Operation	<input type="radio"/>	-
Features	<ul style="list-style-type: none"> ·General-purpose inputs: 8 points ·General-purpose outputs: 6 points ·Carefully selected functions and commands to achieve motor operation with greater ease ·Teaching function (when the optional operator interface unit OP300 is used) ·No special software ·Program input using Windows's standard communication application 	<ul style="list-style-type: none"> ·Compact, simple and less wiring ·Jerk limit control function for work transfer applications with low vibration 	
General Specifications	Power Source	24 VDC	
	Dimensions	W 40 mm (1.57 in.) × H 135 mm (5.31 in.) × D 100 mm (3.94 in.)	W 48 mm (1.89 in.) × H 48 mm (1.89 in.) × D 83.7 mm (3.30 in.) (Except for the socket)
Page		48	59

EMP400 Series RoHS



■ Features

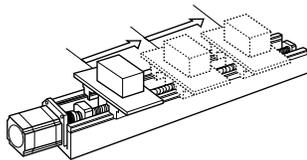
● Allowing the Input of 32 Sequence Programs

The **EMP400** Series can store 32 different operation programs. You can select and execute a desired program or programs using an external input signal. For example, you can create a dedicated sequence program for each work for selection/execution as necessary. In addition to the 32 programs, you can input one sequence program that runs automatically when the power is turned on. A maximum of 1000 steps can be stored when all sequence programs are combined together.

● Various Operation Patterns

◇ Repeated Positioning

Simple movements like "repeating positioning operation for a specified number of times and then return to the home at the end" can be implemented effortlessly.



Example of Repeated Positioning

◇ Stopping via Sensor Input

You can start an operation from a desired position using a general-purpose input and cause the motor to decelerate to a stop upon sensor detection.

◇ Linear Interpolation between Two Axes

Positioning operations involving two axes can be performed simultaneously via linear interpolation.

◇ Continuous Operation at Variable Speeds

You can change the speed to desired levels during continuous operation.

● Teaching Function

You can adjust the travel amount or monitor the current position via teaching, using an optional **OP300** operational unit.

● No Need for Dedicated Software

Sequence programs are input from HyperTerminal, a standard Windows application, so no dedicated software is necessary.

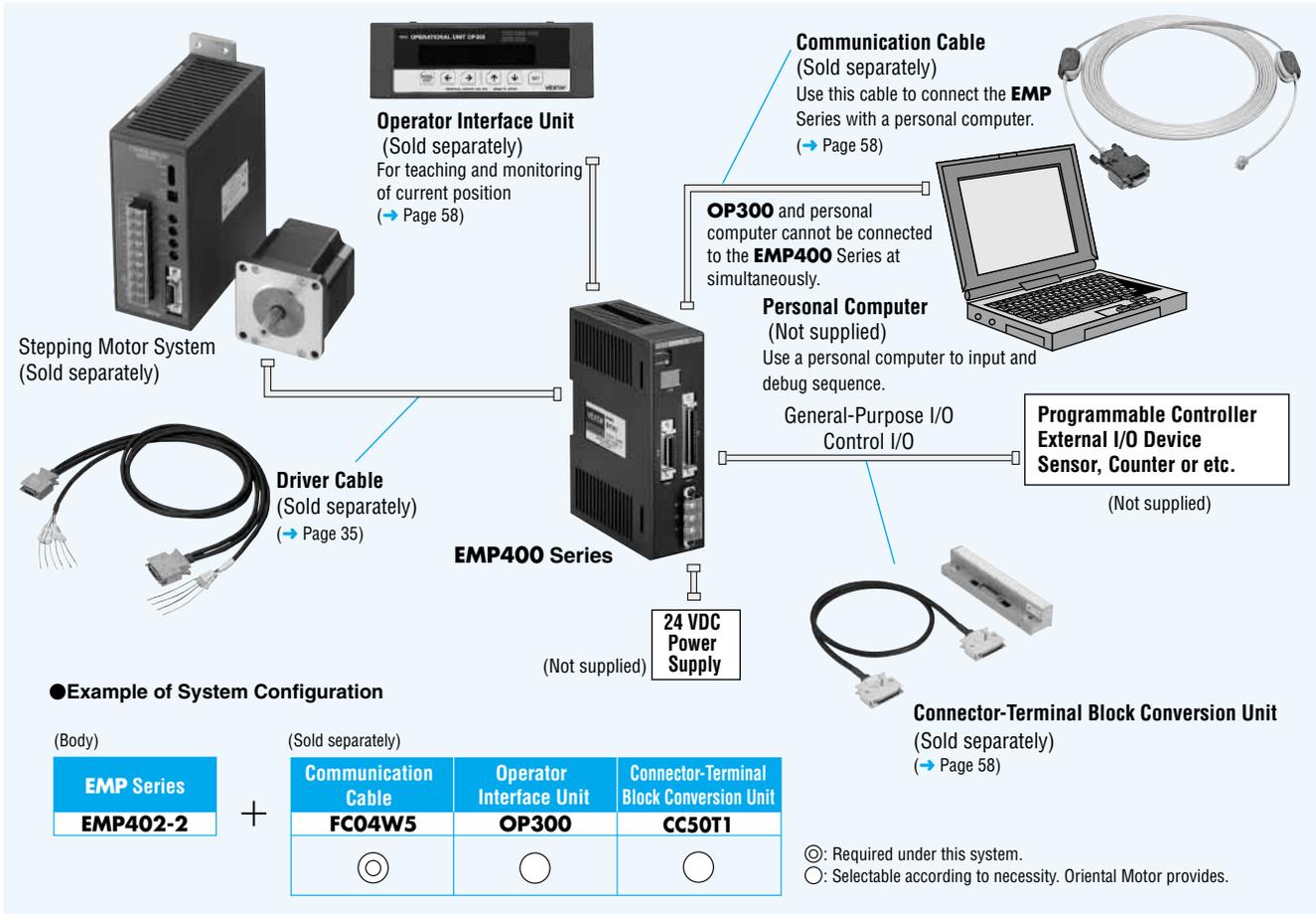
```
EMP400
Controller
Software Version *.*
Copyright 2000
ORIENTAL MOTOR CO.,LTD.

0>edit 4
Seq 4
[1] PULSE2 2
[2] T2 30
[3] V2 1000
[4] VS2 500
[5] H2 *
[6] D2 1000
[7] INC2
[8] END

----->Select:Ax, Ix, or Dx(Alt/Ins/Del/Q=exit)
>>Command:
```


● EMP400 Series

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



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

Functions

Pulse Oscillation

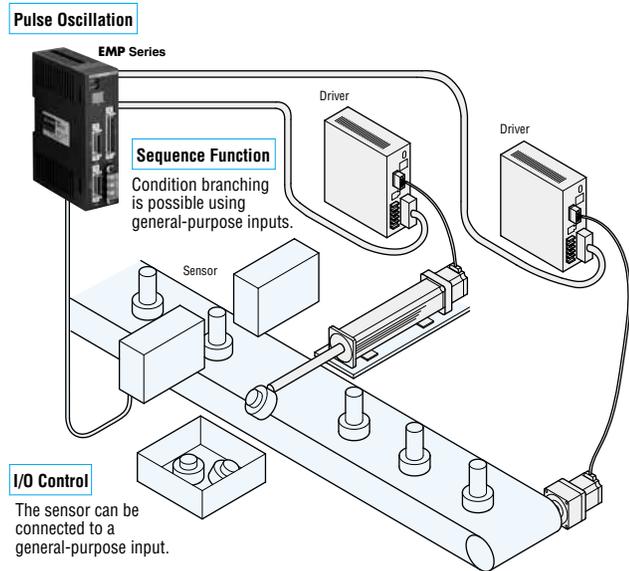
Various operation patterns are provided standard from positioning and origin return to two-axis linear interpolation. All you need is to set the necessary parameters.

Sequence Function

A series of operation patterns can be programmed using dedicated commands. 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.

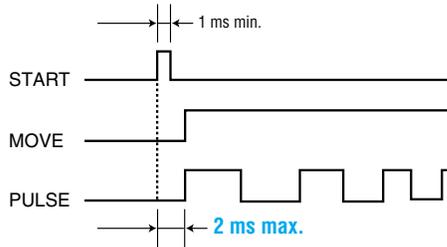


Pulse Oscillation

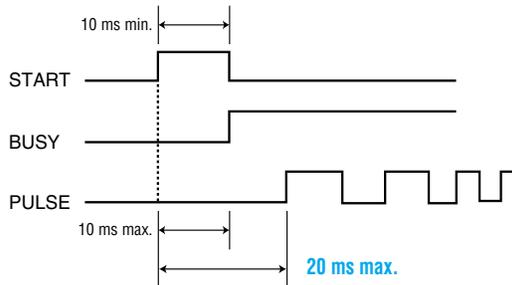
Fast Response Time

The time between a START signal input and a pulse output is 2 ms or less.

Pulse Oscillating Time of EMP400 Series



Pulse Oscillating Time of Conventional Controller

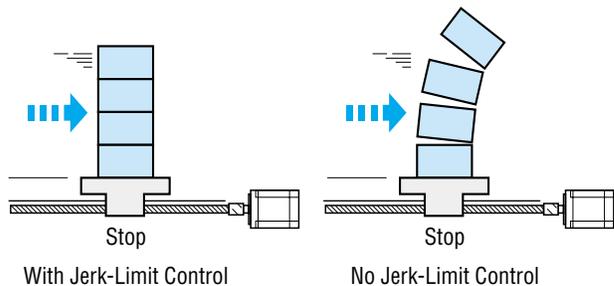
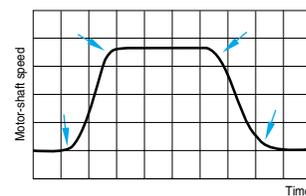


High-Speed Positioning and Low Vibration

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.

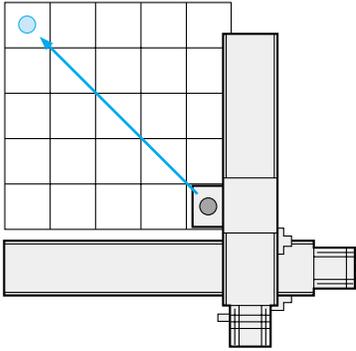


● Positioning Operation

Supports both incremental mode (travel amount) and absolute mode (absolute-position).

● Linear Interpolation Operation

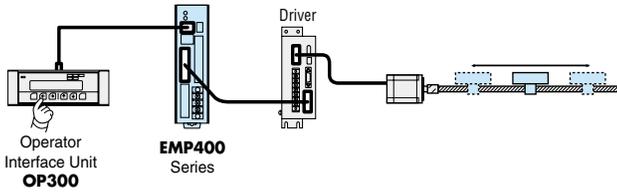
Two axes are controlled simultaneously, allowing direct movement to a target position.



● Teaching Function

The amount of travel can be changed by jogging the load into position via the **OP300** interface.

EMP400 Series



● Continuous Operation

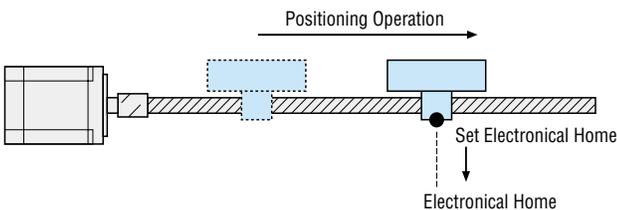
Pulse output continues until a specified input is received or a specified time is reached.

● Set Electronical Home (Clears the Current Position)

Use the RTNCR command

◇ Electronical Home

The controller has an internal position counter. "0" position in this counter is soft home. The ability to set a voluntary position to soft home is available.



● Return to Mechanical Home Operation

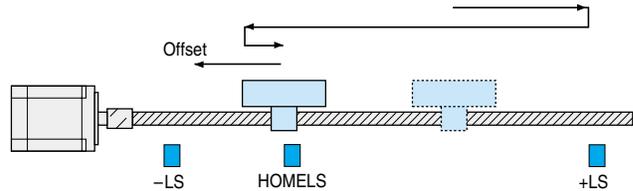
Ability to seek for a sensor representing a positioning reference point (home) is available.

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.

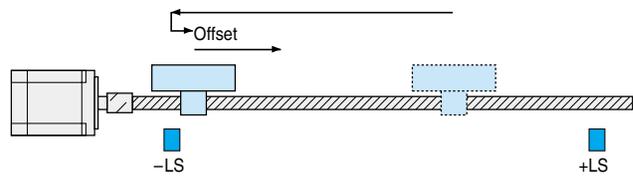
Since it's possible to specify the direction in which the home sensor is entered, backlash error doesn't occur in applications where positioning accuracy is critical.



◇ Constant-Speed Return (Two-Sensor Mode)

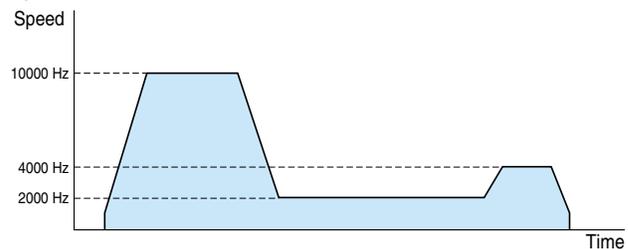
The mechanical unit returns home at a constant speed.

This mode is effective when a compact slider is operated, since the stroke can be fully utilized.



● Multistep Speed-Change Operation

Speed can be changed on the fly during continuous operation.

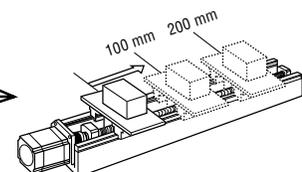
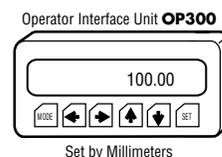
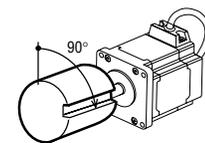
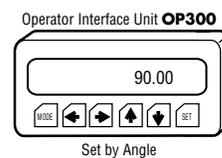


● Variable Acceleration/Deceleration Patterns

Each operation can be specified with a linear acceleration /deceleration pattern or jerk limit control.

● Distance Options

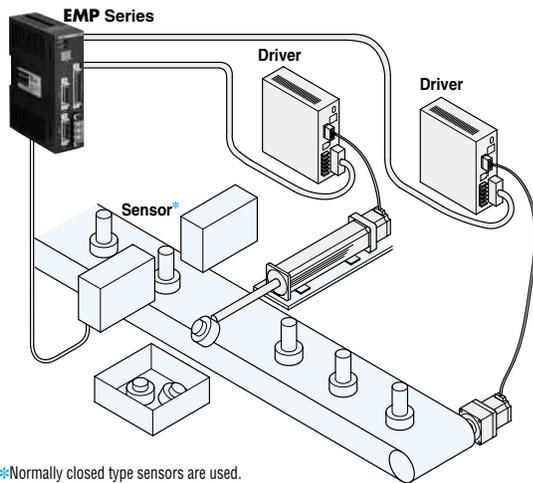
Set travel amount using various scaling units such as pulses, millimeters, or degrees.



Sequence Function

Stopping via Sensor Input

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 general-purpose input 1.



*Normally closed type sensors are used.

Application Description

- ① Transfer products via an index move of 30000 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 30000 pulses and eject the nonconforming product (axis 2). Return to ② and perform acceptability judgment for the next product.

◇ Sample Code for Application Example

```

Seq 1
[1] V1 10000 ; Axis 1 (transfer) Operating speed 10 kHz
[2] D1 +30000 ; Axis 1 (transfer) Travel amount 30000 pulses
① → [3] INC1 ; Axis 1 (transfer) Incremental positioning operation
[4] DELAY 0.5 ; Wait for 0.5 sec.
② ③ → [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 5000 Hz
[9] D2 +1000 ; Axis 2 (ejection) Travel amount 1000 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

Full Range of I/O

In addition to the signals for controlling the **EMP** 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.

General Purpose I/O

8 inputs
6 outputs

These signals can be easily controlled using conditional branching and timer processing.

Motor Control I/O (Dedicated)

PULSE Output
CCR Output
ALARM Input
END Input
TIMING Input
LD Input
HOMELS Input
SLIT Input
etc.

EMP400 Series 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.
Data setting	S	Decelerate the motor to a stop.
	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.
Program control	V	Set the operating speed.
	VS	Set the starting speed.
	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.
Hardware setting	ENDL	End the loop section.
	END	End the sequence program.
	IN	Wait for input.
	OUT	Control the general-purpose output.
	ACTL	Switch the logic setting for the sensor and alarm.
	EEN	Set the use of END input.
	ETIME	Set the END output time.
Others	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.
	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

Line-up

System Configuration

Product Line

Specifications and Characteristics

Dimensions

Connection and Operation

List of Motor and Driver Combinations

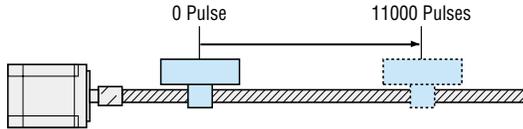
Accessories

Before Using a Stepping Motor

Controllers

Sample Programs

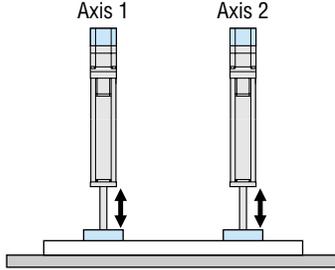
Sample. 1 Positioning operation



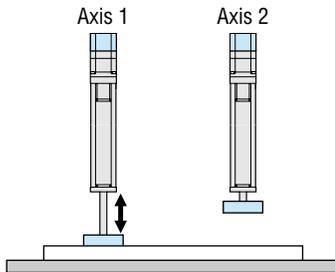
```
[1] VS1 500 ; Starting speed 500 Hz
[2] V1 1000 ; Operating speed 1000 Hz
[3] T1 30.0 ; Acceleration/deceleration rate 30.0 ms/kHz
[4] D1 +11000 ; Travel amount 11000 pulses in CW direction
[5] INC1 ; Execute relative positioning operation
```

Sample. 2 Inputting multiple operation patterns

Simultaneous positioning of two axes



Axis 2 moves after axis 1 moves.

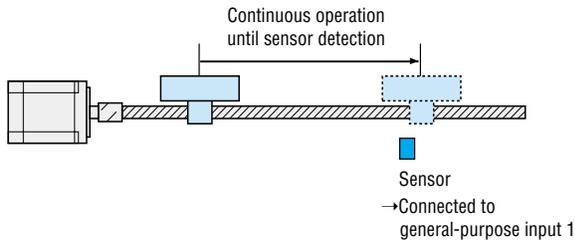


```
Seq 99 ; Hardware Setting
[1] UNIT1 0.02,1 ; Axis 1 Change to travel amount mm
[2] UNIT2 0.02,1 ; Axis 2 Change to travel amount mm

Seq 1 ; 2 axis execute at same time
[1] V1 1000 ; Axis 1 Operating speed 1000 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 1000 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 2000 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
```

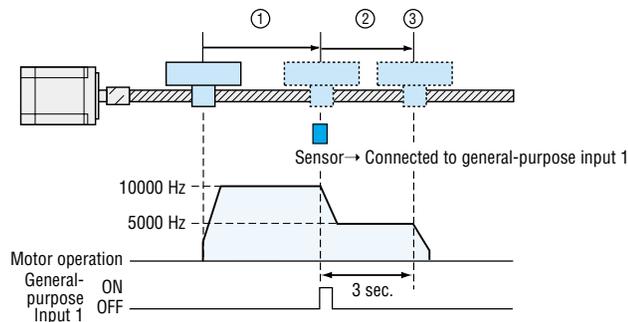
Sample. 3 Positioning using a sensor



```
[1] VS1 500 ; Starting speed 500 Hz
[2] V1 20000 ; Operating speed 20000 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 10000 Hz
- ② Decelerate to 5000 Hz upon sensor detection
- ③ Decelerate to a stop after three seconds



```
[1] VS1 500 ; Starting speed 500 Hz
[2] V1 10000 ; Operating speed 10000 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 5000 Hz
[8] DELAY 3.0 ; Wait time 3 seconds
[9] S1 ; Decelerate to a stop
```

Product Number Code

EMP40 1 - 1

① ② ③

①	Series EMP400 Series
②	Number of axes 1 : Single axis 2 : Dual axis
③	Connector 1 : Without connectors 2 : With connectors

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

Specifications

Series		EMP400 Series
Program	Number of programs	32
	Capacity	1000 commands
	Input method	Command input via terminal program
	Number of control tasks	Main: 1 Sub: 0
Oscillator Specifications	Number of control axes	EMP401 : Single axis, EMP402 : Dual axis
	Pulse output mode	1-pulse output/2-pulse output mode
	Frequency	10 Hz to 200 kHz (1-Hz increment) Pulse duty 50% (Fixed)
	Acceleration/deceleration rate	0.5 to 1000 ms/kHz (0.1 - ms/kHz increments)
	Acceleration/deceleration pattern	Linear/jerk-limit control
Operation Pattern	Travel amount	Relative: -16 777 215 ~ +16 777 215 pulse Absolute: -8 388 608 ~ +8 388 607 pulse
	Relative positioning operation	<input type="radio"/>
	Absolute positioning operation	<input type="radio"/>
	Continuous operation	<input type="radio"/>
	Return to mechanical home operation	<input type="radio"/>
	Dual axis liner interpolation operation	<input type="radio"/>
Communication Specifications	Multistep speed-change operation	Available at continuous operation
	Communication method	RS-232C based (3-wire)
	Transmission rate	9600 bps
Input/Output Signal Specifications	Inputs (START, E-STOP, etc.)	3 photocoupler inputs 24 VDC, Input resistance 5.4 kΩ
	Outputs (MOVE, ALM, etc.)	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 photocoupler inputs/axis 12 VDC, input resistance 2.7 kΩ
	Driver outputs	3 open-collector outputs/axis 12 VDC, 20 mA max. each
Encoder Input	Input frequency	No encoder input
	Count method	
	Count range	
	Interface	
General Specifications	Power supply voltage	24 VDC±5%, Current consumption 0.45 A
	Dimensions	W 40 mm (1.57 in.) × H 135 mm (5.31 in.) × D 100 mm (3.94 in.)
	Mass	0.26 kg (0.57 lb.)
	Ambient temperature	0°C ~ +50°C (+32°F ~ +122°F) (nonfreezing)
	Ambient humidity	20% ~ 85% (noncondensing)

Features

Line-up

System Configuration

Product Line

Specifications and Characteristics

Dimensions

Connection and Operation

List of Motor and Driver Combinations

Accessories

Before Using a Stepping Motor

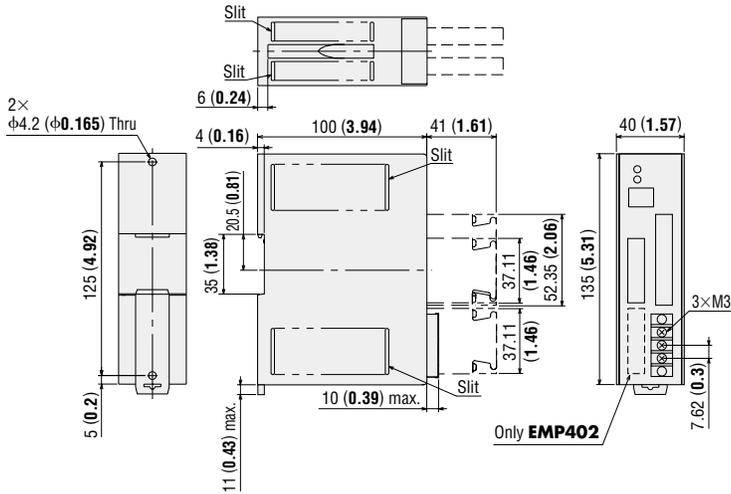
Controllers

■ Dimensions Unit = mm (inch)

● EMP400 Series

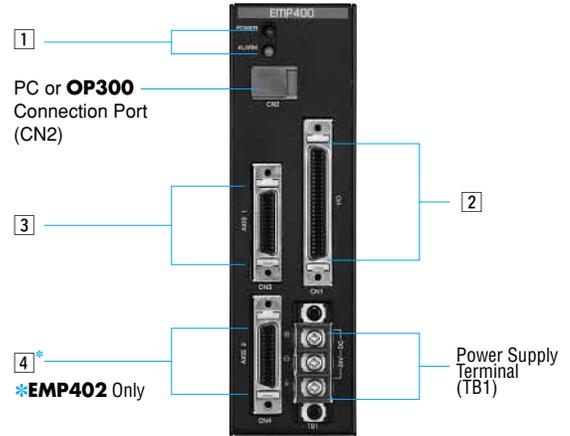
Mass: 0.26 kg (0.57 lb.)

CAD B295



■ Connection and Operation

● Connector Layout



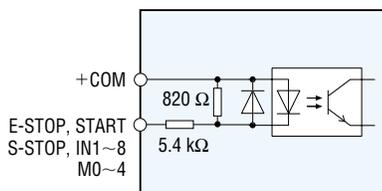
1 LED Monitor Display

Indication	Condition when LED ON
POWER	Lights during 24 VDC input.
ALARM	Lights during alarm signal output.

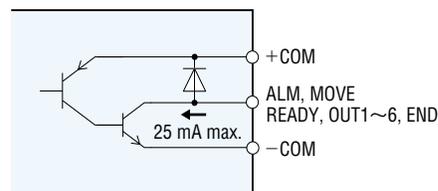
2 CN1 I/O Signal Connector

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	28	—	Not used
4	S-STOP Input	Cease Sequence Execution	29	MOVE Output	Output when 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 (+24 VDC)
8	IN1 Input	General Inputs	33	M0 Input	Sequence Number Selection
9	IN2 Input				
10	IN3 Input				
11	IN4 Input				
12	IN5 Input				
13	IN6 Input				
14	IN7 Input				
15	IN8 Input				
16	+COM Input	I/O Power Supply (+24 VDC)	34	M1 Input	Not used
17	OUT1 Output	General Outputs	35	M2 Input	
18	OUT2 Output				
19	OUT3 Output				
20	OUT4 Output				
21	OUT5 Output				
22	OUT6 Output				
23	—		Not used	36	M3 Input
24	—	Not used	37	M4 Input	
25	—COM Input	GND for I/O	38	—	Not used
			39	—	Not used
			40	—	Not used
			41	—	Not used
			42	—	Not used
			43	—	Not used
			44	—	Not used
			45	—	Not used
			46	—	Not used
			47	—	Not used
			48	—	Not used
			49	END Output	End Signal
			50	—COM Input	GND for I/O

Internal Input Circuit



Internal Output Circuit

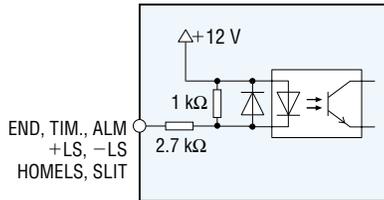


3 CN3 Axis-1 Driver Connector
 4 CN4 Axis-2 Driver Connector

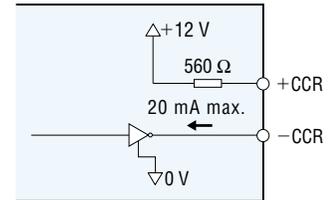
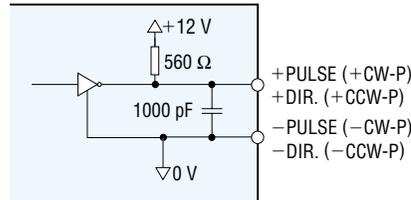
Pin No.	Signal	Description	Pin No.	Signal	Description
1	+PULSE output (+CW-P output)*	Pulse (CW pulse)*	14	–	Not used
2	–PULSE output (–CW-P output)*		15	–	Not used
3	+DIR. output (+CCW-P output)*	Direction of rotation (CCW pulse)*	16	+CCR output	Counter-clear
4	–DIR. output (–CCW-P output)*		17	–CCR 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 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 signal names in parentheses are for 2-pulse output mode. The other signal names are for 1-pulse output mode.

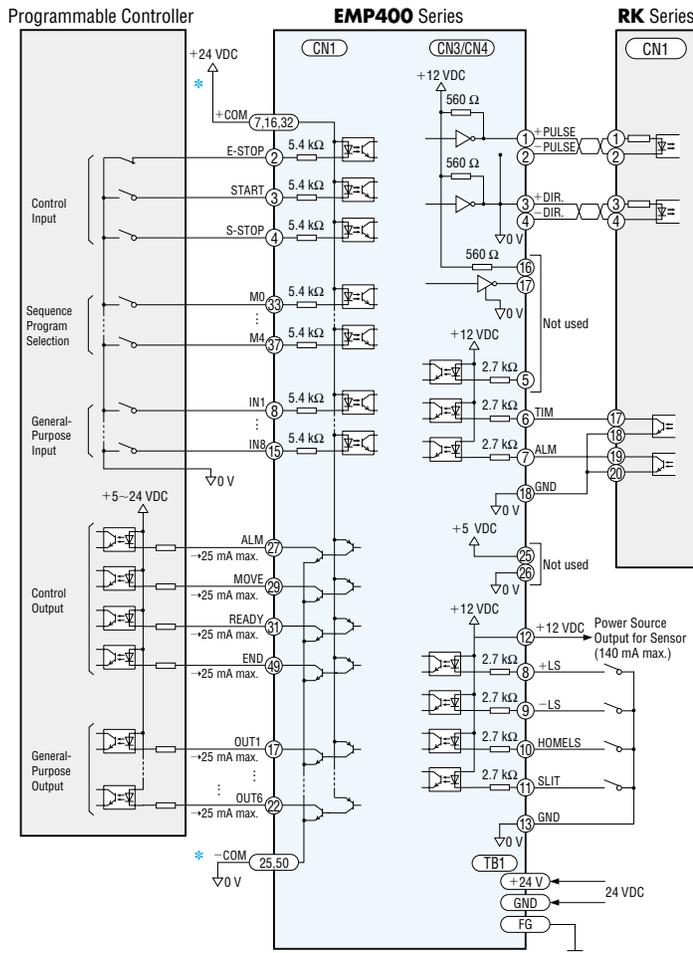
Internal Input Circuit



Internal Output Circuit



Connection Diagrams



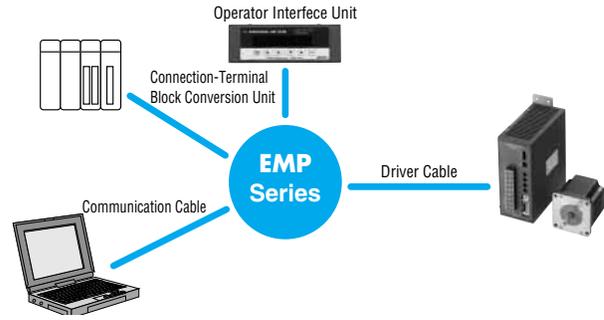
*When the I/O signals from CN1 are used, connect 24 VDC to the +COM and –COM input terminals separately from the power source input.

Note:

● Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.

Accessories (Sold Separately)

We have a range of optional cables that achieve one-touch connection between the **EMP400** Series and peripherals, as well as an operational unit used for teaching operation.



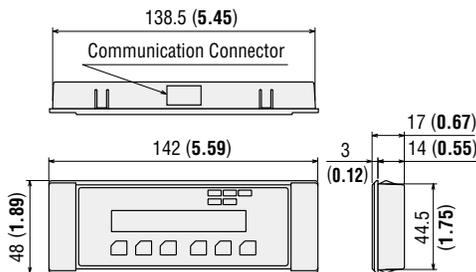
Operator Interface Unit **OP300** (RoHS)

Set the travel amount via teaching or monitor the current position. The unit comes with a 2 m (6.6 ft.) cable for connection with the **EMP400** Series.

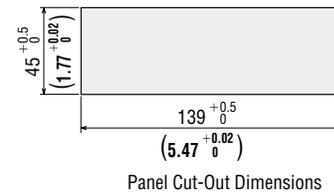


Dimensions Unit = mm (inch)

CAD B297



Panel Cut-Out



Communication Cable **FC04W5** (RoHS)

A communication cable [length: 5 m (16.4 ft.)] for connecting the **EMP** Series to a PC. A D-sub, 9-pin (female) connector is attached on the PC end of the communication cable.



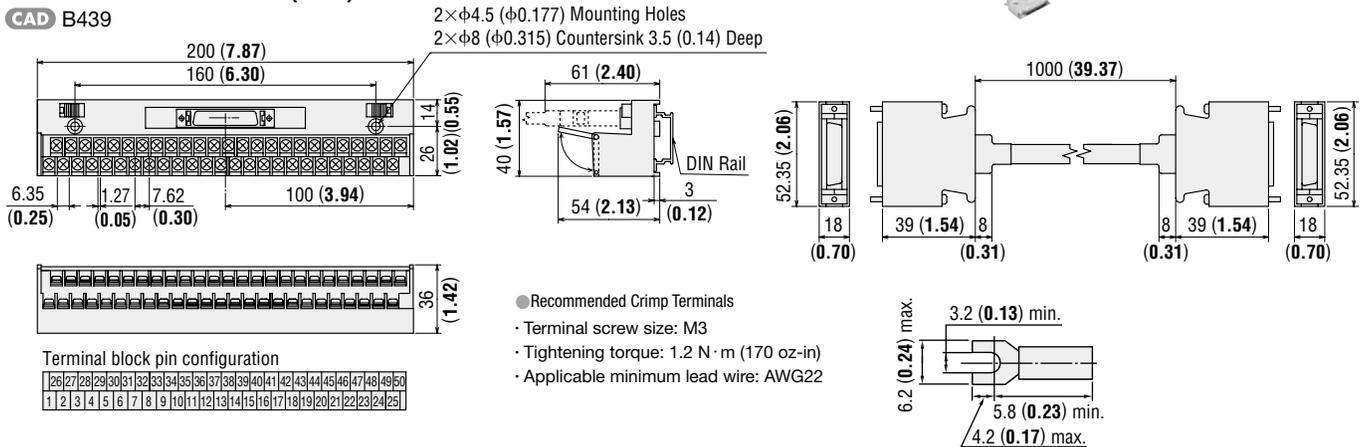
Connector-Terminal Block Conversion Unit **CC50T1** (RoHS) **NEW**

The **EMP** Series and programmable controller can be connected via a terminal block. Cable Length: 1 m (3.3 ft.)



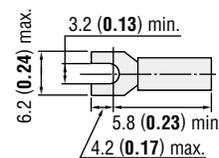
Dimensions Unit = mm (inch)

CAD B439



Driver Cables Dedicated Type (RoHS)

This is a shielded cable equipped with, at one end of the cable, the half-pitch connector that snaps into the driver for **RK** Series. The other end of the cable is equipped with the connector for the **EMP** Series controller.



Controller with Jerk Limiting Control Function Step-Select Positioning Type/Sequential-Step Positioning Type

SG8030J RoHS

Controller for Stepping Motor

With the **SG8030** Series, all operations including data setting can easily be performed using the four touch-screen buttons on the top panel. In addition, the number of signal lines is reduced to a minimum for easy connection.

Features

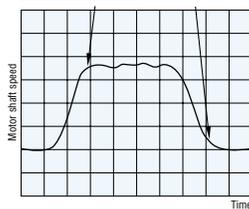
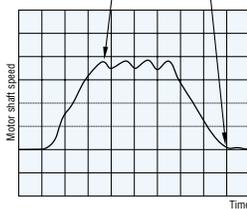
● Jerk Limiting Control Function Suppresses Motor Drive Vibrations

The "Jerk limiting control function" effectively minimizes vibrations during motor drive and stop. This is especially useful in applications such as driving a belt pulley, to ensure smooth motion of transported works.

- Measurement conditions
Application: Belt drive
Operation mode: Positioning operation
Load: 10 kg

Motor vibrations when switching between acceleration/deceleration and constant speed cause mechanical vibrations.

Motor vibrations when switching between acceleration/deceleration and constant speed are minimized, resulting in less mechanical vibrations.



Linear controlled acceleration/deceleration pattern

Jerk controlled acceleration/deceleration pattern

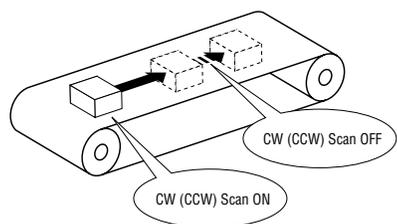
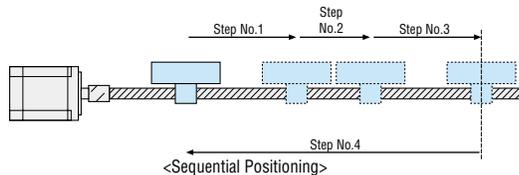
*These diagrams are simulated. Actual effect will differ depending on mechanical construction.

To achieve the same positioning time with jerk controlled acceleration/deceleration, set the acceleration/deceleration rate to 1/2 that of linear controlled acceleration/deceleration.

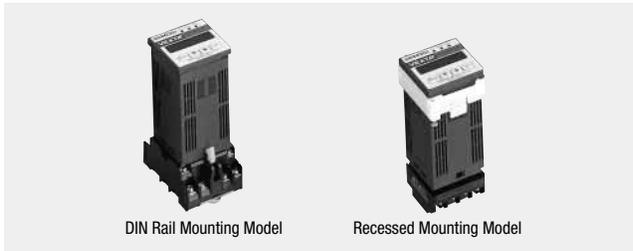
● Sequential Positioning Operation/External Signal Operation Possible

In "Sequential positioning operation", the start signal always causes execution from step No. 1 in a preselected sequence.

In "External signal operation", when the CW scan (or CCW scan) signal input goes ON, operation starts. When the signal goes OFF, slowdown stop occurs. This is useful for moving the work manually to a desired position.



<Operation of External Signals>



DIN Rail Mounting Model

Recessed Mounting Model

● Maximum Oscillation Frequency 200 kHz

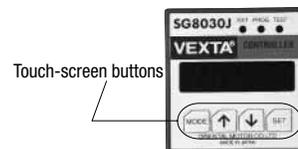
The "Maximum oscillation frequency of 200 kHz" allows motor control in micro steps.

● 1-Pulse Output/2-Pulse Output Mode Select Possible

In addition to the 2-pulse output mode, the controller can also provide 1-pulse operation mode, which makes it compatible with a wide range of motor drivers.

● Top Panel Single Interface for All Settings and Operation Checks

All operations including setting of various data can be performed using the four touch-screen buttons on the top panel. You can also check the status of each operation simply by checking the display on the top panel.

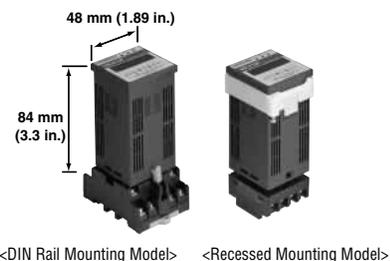


Touch-screen buttons

● 48×48 mm (1.89×1.89 in) DIN Size and Two Mounting Configurations Are Provided.

The unit is very compact, measuring only 48 (W)×48 (D)×84 (H) mm [1.89 (W)×1.89 (D)×3.3 (H) in.].

Two mounting configurations are available, for DIN rail mounting and recessed mounting.

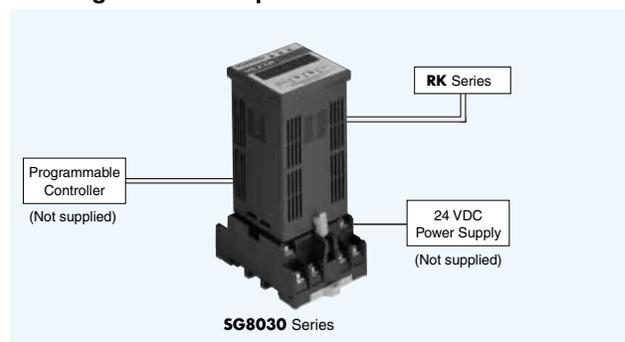


<DIN Rail Mounting Model>

<Recessed Mounting Model>

System Configuration

● Configuration Example of Combination with RK Series



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	
Number of Settings	4 steps	
Positioning Data	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 rates: *)	
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) 1-Pulse operation (JOG operation: Test mode only)	
Control Modes	External input mode (EXT) Program mode (PROG) Test mode (TEST)	
Number of Maximum Return Pulses	-	
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 24 VDC max. 25 mA max.	
Power Supply Voltage	24 VDC±5% current consumption 0.1 A	
Ambient Temperature	0°C~+40°C (+32°F~+104°F) (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

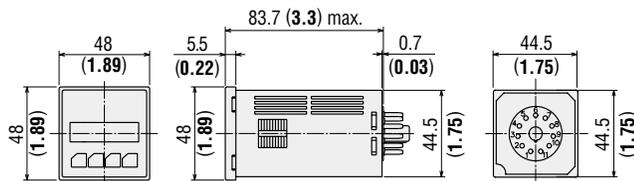
Dimensions Unit = mm (inch)

●DIN Rail Mounting Model

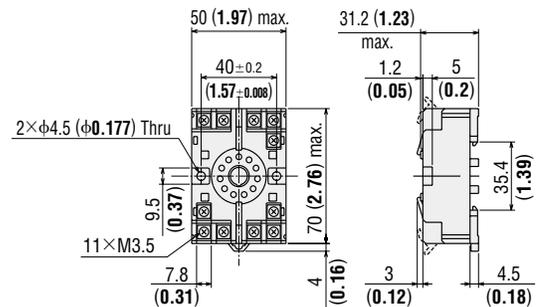
◇SG8030J-D

Mass: 0.17 kg (0.37 lb.)

CAD B094



◇Flush Connection Socket (Included)

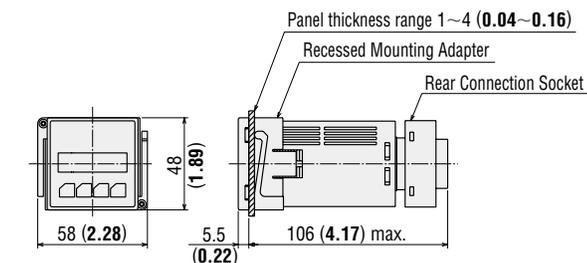


●Recessed Mounting Model

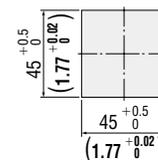
◇SG8030J-U

Mass: 0.15 kg (0.33 lb.)

CAD B095



◇Panel Mounting Cut-Out Dimensions



Connection and Operation

Names and Functions of Controller Parts

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

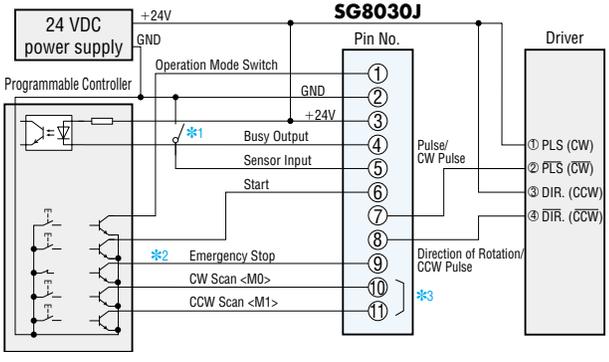
Connection Socket Signal Table

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	GND connecting terminal
3	+24V	Input	24 VDC power supply input terminal
4	BUSY	Output	Output during pulse oscillation
5	HOMELS	Input	Mechanical home detection sensor
6	Start	Input	Start signal
7	Pulse/CW Pulse	Output	1 pulse output mode: Pulse 2 pulse output mode: CW Pulse
8	Rotation Direction/CCW Pulse	Output	1 pulse output mode: Direction of rotation 2 pulse output mode: CCW
9	Emergency Stop	Input	Stop all operations (including busy output)
10*	S: CW Scan D: M0 [CW Scan]	Input	S: CW continuous operation D: M0 data select signal [CW continuous operation]
11*	S: CCW Scan D: M1 [CCW Scan]	Input	S: CCW continuous operation D: M1 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.

Wiring Diagram

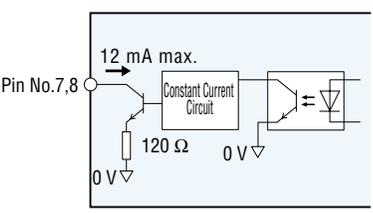
Connection between SG8030J and RK Series



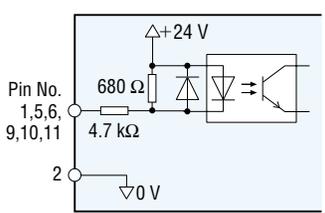
*1 This is the mechanical home detection sensor. Use a sensor rated for 24 VDC.
 *2 Connect to the ground (normally closed) in normal operation.
 *3 Designations in < > brackets are for data selection mode.
Note:
 ● Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.

Description of Input/Output Signal

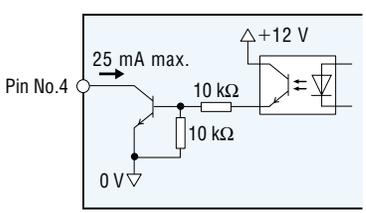
Output Signals to Driver



Input Signals from Programmable Controller and Limit Sensor



Output Signals to Programmable Controller



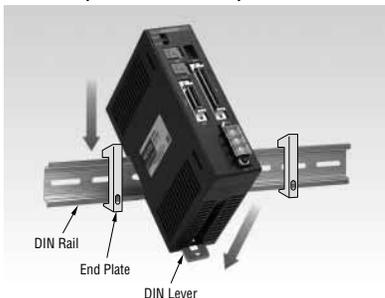
Before Using a Controller

Installation Method

●EMP400 Series

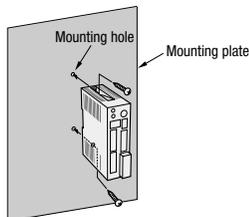
◇DIN Rail Mounting

- Use DIN rails with a width of 35 mm (1.38 in.).
- Use end plates to secure the controller.
- DIN rails and end plates are not provided with the unit.



◇Screw Mounting

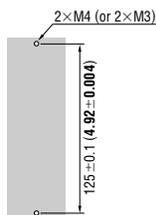
- To fasten the unit with screws, use the two screw holes at the top and bottom.
- The mounting holes should be machined for either M3 or M4 size screws. Use washers to secure the controller.
- The installation area is made of resin, so handle this area carefully to prevent damage.



Note:

- Mounting screws are not provided with the unit.

Mounting Holes Dimensions Unit = mm (inch)

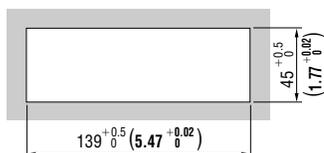


◇Installation Method of the OP300

- The **OP300** can be affixed to a plate of 1 mm (0.04 in.) to 3 mm (0.12 in.) in thickness. The connection cables cannot be installed if the plate is thicker than 3 mm (0.12 in.), so exercise caution.
- Push in the unit from the front side of the mounting plate.



Panel Cut-Out Dimensions Unit = mm (inch)



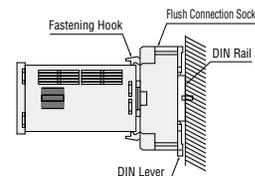
Note:

- Do not suspend the **OP300** from the connection cables.

●SG8030 Series

◇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 (two places) of the flush connection socket on the controller to secure the assembly.



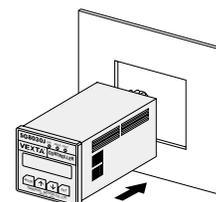
Note:

- Mount the controller only after connecting all required leads to the terminals of the flush connection socket.

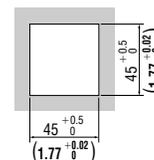
◇Panel Mounting Using Rear Connection Socket

- The **SG8030** Series can be affixed to a plate of 1 mm (0.04 in.) to 4 mm (0.16 in.) in thickness.

1. Push in the controller from the front side of the mounting plate.
2. Insert the burying-type adapter from the back and push it in until the gap with the mounting plate becomes minimal.
3. Affix with the fixing screws (two locations) of the burying-type adapter.
4. Insert the controller terminals firmly into the rear connection socket.



Panel Mounting Cut-Out Dimensions Unit = mm (inch)



Installation Location

- **Indoors, ambient temperature 0°C~+50°C (+32°F~+122°F)**
[0°C~+40°C (+32°F~+104°F) for **SG8030 Series**]
(Nonfreezing)
- If the ambient temperature exceeds 50°C (122°F) [40°C (104°F) for **SG8030 Series**], use a fan to provide forced cooling. Otherwise internal heat buildup may lead to damage.
- When attaching 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 controllers from overheating.
- **Ambient humidity 85% maximum (Noncondensing)**
- **Not exposed to corrosive gases 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 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, 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 be damaged.

This product is manufactured at a plant certified with the international standards **ISO 9001** (for quality assurance) and **ISO 14001** (for systems of environmental management).

Specifications are subject to change without notice.
This catalog was published in July, 2006.

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