

VEXTA[®]

2-Phase Stepping Motors

PK Series



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PK Series



Features

Stepping motors are capable of highly precise and reliable operation without the use of position detectors. Motor operation is controlled directly through pulse signals, whereby the current flowing through the motor's windings is switched with each pulse signal input, causing the motor to rotate in steps at fixed angles.

||| 1 Wide Variety

Six frame sizes are available in a range from 28mm to 85mm. In addition to the standard type, we offer **P** type (High response), **J** type (High inertia capability), **M** type (High resolution), **SH** geared type. The coil also comes in various specifications.

||| 2 High Torque

This high torque of the **PK** series motor makes it possible to drive large equipment and is effective for equipment downsizing and for keeping heat generation low.



||| **3 Low Vibration**

The **PK** series motors do more than provide high torque: they were also designed to achieve smooth operations. This make **PK** series motors the ideal choice for micro-step driving.

||| **4 Low Audible Noise**

The **PK** series motor was designed to produce low audible noise.

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□ 28mm

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□ 35mm

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□ 42mm

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□ 56.4mm

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□ 60mm

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□ 85mm

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Variations

Type \ Size	Motor Frame Size (mm)					
	□28	□35	□42	□56.4	□60	□85
Standard Type	—	—	○	○	—	○
Standard Terminal Box Type	—	—	—	—	—	○
P Type (High Response)	○	○	○	—	—	—
J Type (High Inertia Capability)	—	—	—	—	○	—
M Type (High Resolution)	—	—	○	○	—	—
SH Geared Type	○	—	○	○*1	—	○*2

*1 Gearhead frame size is □60mm

*2 Gearhead frame size is □90mm

Standard Type

The base model of the **PK** Series 2-phase stepping motor offers balanced performance enhanced by high torque, low vibration and low noise. You can choose the optimal motor size and coil specification from a wide range of possible variations.

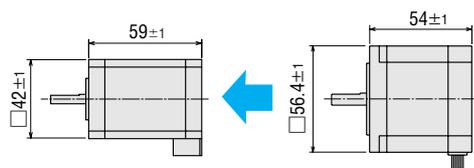
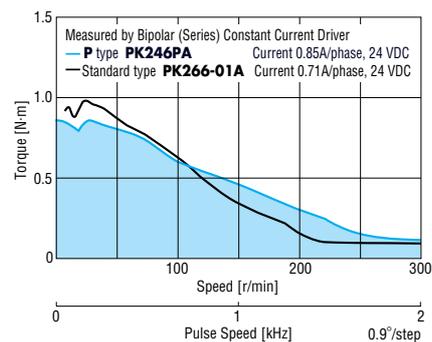
Standard Terminal Box Type

The standard type with a frame size of 85 mm has a terminal-box variation, which employs a terminal block at the motor connection part for a more secure connection. The terminal box type meets the protection degree of IP65 (except for mounting surface).

P Type (High Response)

■ High torque

This type combines high torque and a compact body. Three frame sizes, 28 mm, 35 mm and 42 mm, are available. Each specification provides torque equivalent to a motor of the next higher class, supporting high-torque operation even in the high-speed range. For example, **P** type **PK246PA** (motor frame size □42mm) has the same holding torque as the standard type **PK266-01A** (motor frame size □56.4mm). You can choose smaller size motor to attain the same torque. It contributes to miniaturizing and making equipment lightweight.



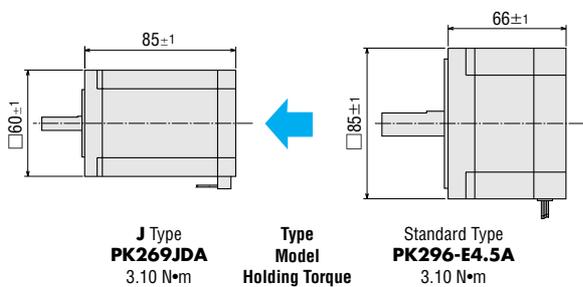
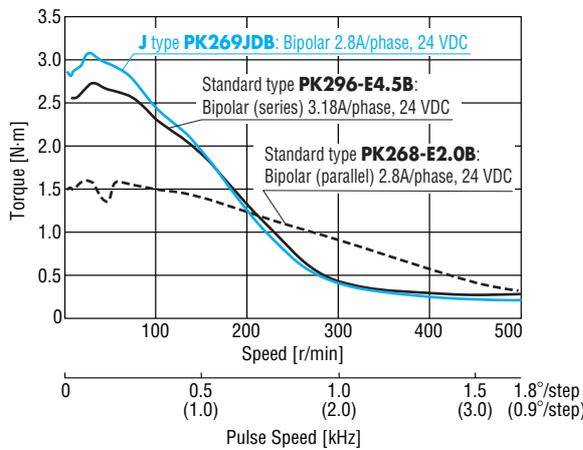
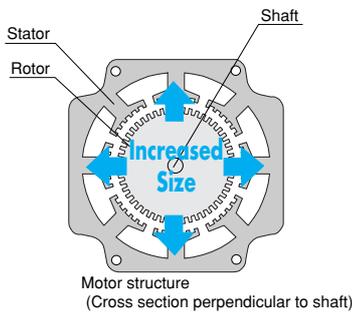
P type PK246PA	Type Model	Standard type PK266-01A
0.93 N·m	Holding Torque	1.17 N·m
$114 \times 10^{-7} \text{ kg} \cdot \text{m}^2$	Rotor Inertia	$300 \times 10^{-7} \text{ kg} \cdot \text{m}^2$

J Type (High Inertia Capability)

Ideal for driving loads subject to large inertia. A large rotor size means the rotor's inertia is large, as well. Motor response improves as the ratio of the equipment's external inertia and rotor inertia decreases and the generated torque increases. Therefore, if the total inertia of the setup is large, the **J** type is the best choice, since it offers high power and large rotor inertia.

High Torque

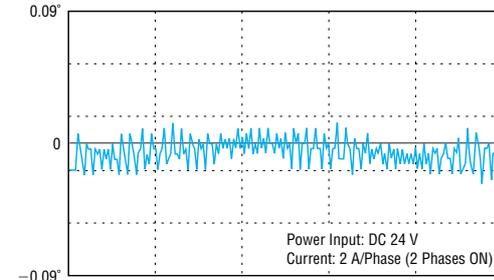
The **J** type provides, on average, 1.5 times higher torque than the standard type. With the rotor size larger, the rotor is composed of permanent magnets, its higher torque is successfully realized. Our skillful winding technology makes it possible to maximize the rotor space.



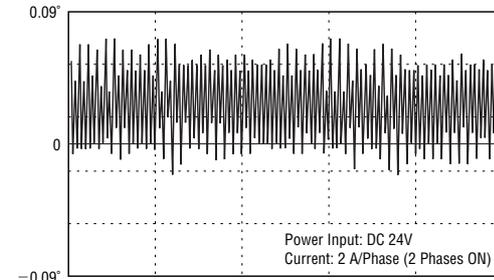
High Positioning Accuracy

The **J** type has dramatically improved accuracy, with a static angle error $\pm 0.034^\circ$ (standard type: $\pm 0.05^\circ$). The **J** type is better at overcoming external and load forces, providing your equipment with more accurate positioning and stability.

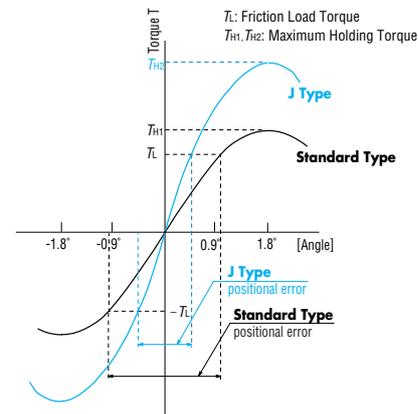
J Type



Standard Type



Angle-Torque Characteristics



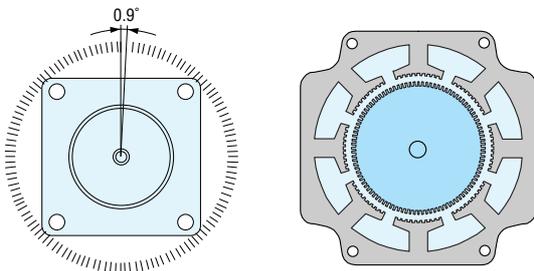
All equipment has friction load, and the motor stops when the motor output torque and friction load torque are balanced. As shown in the characteristics above, the larger the output torque per step angle, the less the motor is influenced by friction load, so positioning accuracy is improved. Stop positioning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

M Type (High Resolution)

The 2-phase, high resolution stepping motor has half the step angle of the standard stepping motor. The **M** Type increases motor resolution from 200 steps/revolution to 400 steps/revolution. If an even smaller step-angle is needed, half-step driving and micro-step driving are other options. Such options, however, do not improve accuracy. The excitation coil of the 2-phase, high resolution stepping motor is located in exactly the same position, the number of rotor teeth is twice as many as standard stepping motors. Other structures are exactly the same as the standard motors.

High Resolution

Even with the same fundamental structure as the standard stepping motor, doubling the number of rotor teeth (100 rotor teeth) produces high resolution with 0.9° per step (400 pulses per revolution).

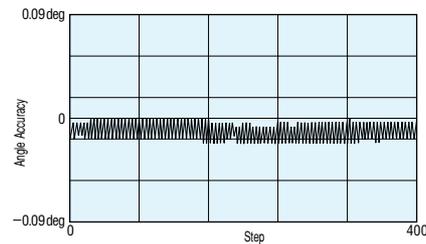


Superior Angle accuracy

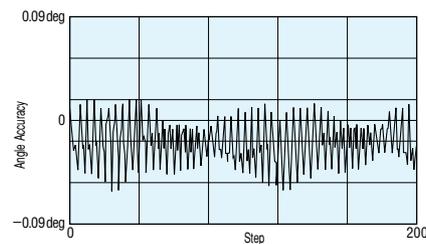
There are a variety of reasons why step angle errors can occur. In most cases, angle differentials occur in conjunction with the total accuracy of the machinery. Each part of the motor is manufactured with high accuracy. However, when they are assembled, composite errors usually occur. Static angle differential is less than 0.05°, under no-load condition. The angle discrepancy is closely related to the number of teeth. About 0.5-1 % of the pitch angle of the teeth causes such errors. The following figures show the static angle discrepancy for each (1) full-step 2-phase high resolution stepping motor, (2) full-step 2-phase standard stepping motor, (3) half-step 2-phase standard stepping motor.

Even though (1) and (3) rotate with the same 0.9°, (1) shows smaller errors. Comparing (2) and (3) indicates that the half-step driving of the standard stepping motor does not improve accuracy.

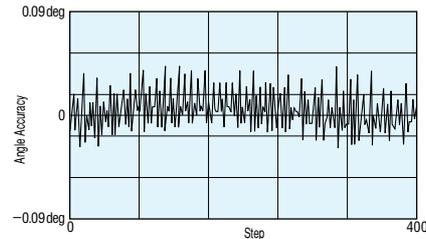
In short, although it is possible to make each step-angle smaller by the driver, it does not contribute to increasing accuracy. Rather, angle discrepancy per step increases. The 2-phase standard stepping motor (1.8° per step) can use half step driving to achieve 0.9° per step. However, this does not produce the same accuracy as the 2-phase high resolution stepping motor (0.9° per step) run at full step. Half-step driving is not for improving accuracy, but for solving other problems like vibration and irregular rotation.



(1) M Type (0.9°/step)



(2) Standard Type (1.8°/step)



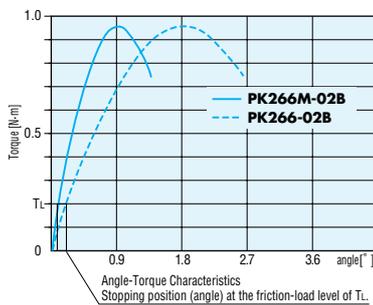
(3) Standard Type (0.9°/step)

Angle Accuracy

■ Less Positional Error

The positional errors of machinery do not depend solely on the angle accuracy of the motor. Different load levels for each step naturally contribute to positional inaccuracy. Even under stable loading, it creates positional inaccuracy when used in bi-directional positioning. In such cases, the magnitude of the positional accuracy is several times worse than the angle inaccuracy of the motor itself.

The following figure shows one of the fundamental characteristics of two stepping motors. Those curves compare the 2-phase standard stepping motor and the 2-phase high resolution stepping motor, by showing their angle-torque characteristics. The peak of each curve illustrates its holding torque (maximum static torque at excitation).



Angle - Torque Characteristics (Unipolar)

These curves display the angle discrepancy between ideal and actual positions, against loading under static excitation status.

The 2-phase high resolution stepping motor reaches its peak at half angle, comparing to the 2-phase standard motor. The slope of the high resolution motor's load-torque characteristic curve is steeper than the one for the standard motor's. The former yields half the discrepancy of the latter, even under the same load. Since the slope of the curve varies, based on the number of teeth and torque. The positional accuracy of the high resolution motor under actual load is quite higher. When a stepping motor is used in practice for the purposes mentioned above, sufficiently large torque is normally selected, in the attempt to minimize the positional discrepancy on loading. The 2-phase high resolution stepping motor is the most suitable.

SH Geared Type

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

■ Smooth Rotation at Low Speeds

When operated independently, motors develop high rotational vibration at low speeds, which makes step-like motion more noticeable. Reducing motor speed by means of the gear unit results in much smoother low-speed rotation.

■ Six Reduction Gear Ratios

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

* **PK223-SG** type has five gear ratios except 1:3.6.

■ Ideal for High Inertia Drive

The stepping motor itself can drive the inertia of 10 times the rotor inertia. The geared type can drive this inertia multiple by the square of the speed reduction ratio. Therefore, the geared type is suitable for driving a inertial body.

Before Using a Stepping Motor

■ Precautions

1. Precautions for Installation

- Do not use in a place where there is flammable gas and/or corrosive gas.
- The motor must be properly grounded.
- When installing the motor into your equipment, ensure that the motor lead wires are fixed and do not move. In addition, do not apply any pressure to these lead wires.
- Installation must be performed by a qualified installer.
- Use a DC power supply with reinforced insulation for the primary side. Otherwise, there is a danger of electrical shock.

2. Precautions for Operation

- Always turn off the power to the driver before conducting checks or performing work on the product.
- The surface temperature of motors can exceed 70°C (depending on operation conditions). In case this product is accessible during operation, please attach the following warning label so that it is clearly visible.



Warning Label

- Do not touch these terminals while the power is ON. Contact could cause electric shock or fire.

3. Precautions for Troubleshooting

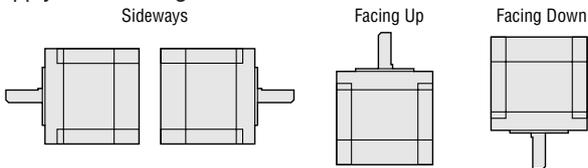
- Refer to the troubleshooting section of the operation manual if the motor is not functioning properly. If the problem cannot be corrected, contact your nearest Oriental Motor office. Do not disassemble the motor.

■ Motor Installation

1. Direction of mounting

There are no restrictions on the direction of mounting, but motors are usually mounted sideways. They can also be mounted facing up or down.

Regardless of how the motor is mounted, take care not to apply an overhung load or thrust load on the shaft.



Note:

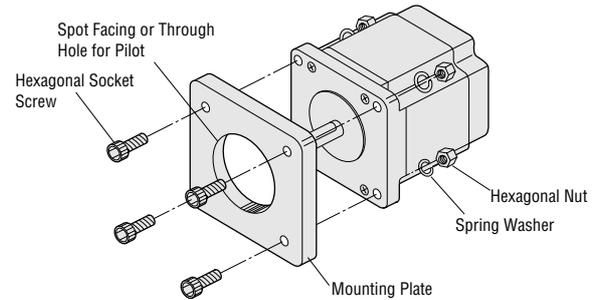
1. Do not disassemble the motors.
2. Do not apply any type of shock to the motor shaft.

2. Mounting

Mount the motor tightly against a metal surface with good thermal conductivity such as steel or aluminum. Secure the motor firmly using a hexagonal socket screw, nut, etc.

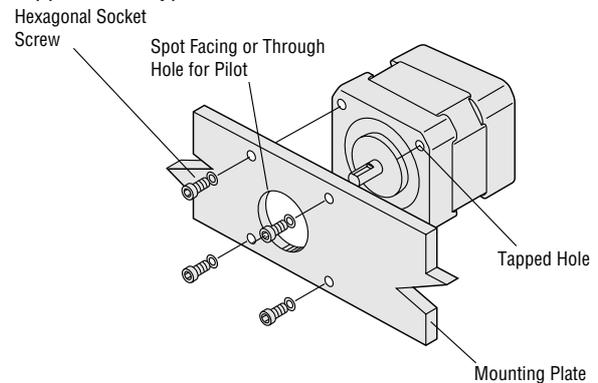
Refer to the table below to determine the proper thickness of the mounting plate.

● Through Hole Type



Model	Minimum Thickness of the Mounting Plate
PK26□	4 mm or more
PK29□	8 mm or more

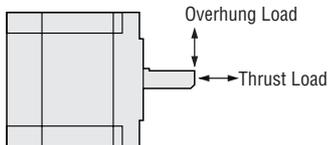
● Tapped Hole Type



Model	Minimum Thickness of the Mounting Plate
PK22□, PK23□ PK24□	3 mm or more
PK223-SG PK243-SG	3 mm or more
PK264-SG	5 mm or more
PK296-SG	8 mm or more

3. Permissible Overhung Load and Permissible Thrust Load

Overhung loads and thrust loads that exceed the permitted values shorten bearing life and cause fatigue by repeated load on the output shaft. Keep overhung loads to within the permissible values of the tables below. Keep thrust loads below the weight of the motor used.



Model	Overhung Load Distance form Shaft End (mm)					Thrust Load [N]	
	0	5	10	15	20		
PK22□	25	34	52	—	—	Below the weight of the motor	
PK23□	20	25	34	52	—		
PK24□	20	25	34	52	—		
PK26□	54	67	89	130	—		
PK26□J	50	60	75	100	150		
PK29□	260	290	340	390	480		
PK223-SG	15	17	20	23	—	10	
PK243-SG	10	15	20	30	—	15	
PK264-SG	3.6-10	30	40	50	60	70	30
	18, 36	80	100	120	140	160	
PK296-SG	220	250	300	350	400	100	

4. Installing Conditions

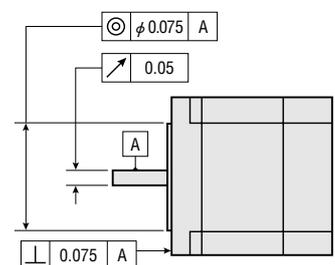
Install the motor in a location that meets the following conditions. Using the product under conditions other than this could cause it to be damaged.

- Indoors (this product is designed and manufactured to be installed within another device)
- Ambient temperature : -10°C~+50°C (non-freezing)
- Ambient humidity : 85% maximum. (non-condensing)
- Not exposed to explosive, flammable, or corrosive gas
- Not exposed to direct sunlight
- Not exposed to dust
- Not exposed water or oil
- A place where heat can escape easily
- Not exposed to continuous vibration or excessive Impact

General Specifications

Item	Specifications
Shaft Runout	0.05 T.I.R (mm)*1
Perpendicularity	0.075 T.I.R (mm)*1
Concentricity	0.075 T.I.R (mm)*1
Shaft Raadial Play*2	0.025 mm Maximum of 5 N
Shaft Axial Play*3	0.075 mm Maximum of 10 N
Stop position Accuracy*4	±0.05° (J type: ±0.034°)
Insulation Resistance	100 MΩ or more under normal ambient temperature and humidity when the megger reading between the windings and frame is DC500 V.
Dielectric Strength	Under normal ambient temperature and humidity, sufficient to withstand 1 kV (0.5 kV*5, 1.5 kV*6) at 50 Hz applied between the windings and the case for one minute following a period of continuous operation.
Insulation Class	Class B (130°C)
Temperature Rise	80°C or less as measured by the Resistance Change method when 2 phases are excited at rated voltage at rest.
Ambient Temperature Range	-10°C~+50°C

- *1 T.I.R (Total Indicator Reading): It refers to the total dial gage reading when the measurement section is rotated 1 revolution centered on the reference axis center.
- *2 Radial Play: It refers to the displacement in shaft position in the radial direction when a 5 N load is placed vertically on the motor shaft tip.
- *3 Axial Play: It refers to the displacement in shaft position in the axial direction when a 10 N load is placed on the motor shaft in the axial direction.
- *4 Stop position Accuracy: This value is for full step with no load. (The value changed with size of load.)
- *5 For motors with a motor size of 42 mm × 42 mm or less, 50 Hz, 0.5 kV for 1 minute.
- *6 For standard terminal box type motors with a motor size of 85 mm × 85 mm, 50 Hz, 1.5 kV for 1 minute.



Wirings and Connections

Motor Wirings

4 Leads Motor	6 Leads Motor	8 Leads Motor
<p>A Phase: Black, Green B Phase: Red, Blue</p>	<p>A Phase: Black (4), Yellow (5), Green (6) B Phase: Red (3), White (2), Blue (1)</p>	<p>A Phase: Black, Yellow, Orange, Green B Phase: Red, White, Brown, Blue</p>

* The numbers inside the parentheses indicate the connector pin No. of **P** type motor.

Wirings Connection Diagram

1 4 Leads Bipolar Connection	2 6 Leads Unipolar Connection	3 6 Leads Bipolar (Series) Connection
4 8 Leads Unipolar Connection	5 8 Leads Bipolar (Series) Connection	6 8 Leads Bipolar (Parallel) Connection

* The numbers inside the parentheses indicate the connector pin No. of **P** type motor.

Notes on Characteristic Diagrams

The speed-torque characteristics featured in this catalogue are as measured on a constant-current driver.

The actual characteristics will vary depending on the driver used. Please use these diagrams only for reference purposes when selecting a motor.

You must also conduct a thorough evaluation with the actual driver to be used.

Clean Damper

Since stepping motors rotate by repeating step actions in accordance with pulse input, vibration (angular speed fluctuation) may increase, depending on the speed and service condition. The use of a damper is the simplest, most effective way to suppress this vibration.



● Better for Clean Rooms

Since there is no frictional dust as in conventional magnetic dampers, it can be used in environments where higher degrees of cleanness is needed.

● Excellent Vibration Absorption

The doughnut-shaped internal inertial body and silicon gel absorb vibration.

● 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.

■ Product Number Code

D **6** **CL** - **6.3** **F**

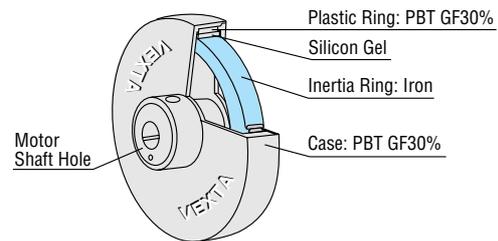
- ① Damper
- ② Frame Size of Applicable Motor
 - 4**: □28mm, □35mm, □42mm
 - 6**: □56.4mm, □60mm
 - 9**: □85mm, □90mm
- ③ Better for clean environments
- ④ Shaft Diameter of Applicable Motor
 - 5.0**: φ5mm
 - 6.3**: φ6.35mm
 - 8.0**: φ8mm
 - 14**: φ14mm
- ⑤ Material of Inertia Ring
 - F**: Iron

■ Specifications

Model	Inertia [kg·m ²]	Mass [g]
D4CL-5.0F	34×10 ⁻⁷	24
D6CL-6.3F	140×10 ⁻⁷	62
D6CL-8.0F	140×10 ⁻⁷	61
D9CL-14F	870×10 ⁻⁷	105

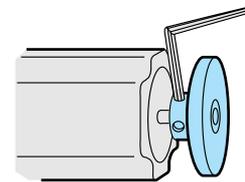
■ Structure

Inertial body and silicon gel are hermetically sealed in a plastic case.



■ 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.



Note:

- There are mounting screws with hexagonal holes in two damper locations, so tighten them both before running the motor.
- The damper rotates at the same speed as the motor shaft, so do not touch it while the motor is running.

Product Specifications (Bipolar Series)

Frame Size 28 mm PK22□

Type	Model Single Shaft Double Shaft	Basic Step Angle	Holding Torque N·m	Current per Phase A/phase	Voltage V DC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J kg·m ²	Mass kg	page
P Type (High Response)	PK223PA PK223PB	1.8°	0.065	0.67	3.8	5.6	4	9×10 ⁻⁷	0.11	16
	PK224PA PK224PB		0.097		4.6	6.8	4.8	12×10 ⁻⁷	0.14	
	PK225PA PK225PB		0.11		6.2	9.2	5.6	18×10 ⁻⁷	0.2	
SH Geared Type	PK223PA-SG7.2 PK223PB-SG7.2	0.25°	0.3	0.67	3.8	5.6	4	9×10 ⁻⁷	0.16	18
	PK223PA-SG9 PK223PB-SG9	0.2°					4			
	PK223PA-SG10 PK223PB-SG10	0.18°					4			
	PK223PA-SG18 PK223PB-SG18	0.1°	4							
	PK223PA-SG36 PK223PB-SG36	0.05°	4							
			0.4							

* The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Frame Size 35 mm PK23□

Type	Model Single Shaft Double Shaft	Basic Step Angle	Holding Torque N·m	Current per Phase A/phase	Voltage V DC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J kg·m ²	Mass kg	page
P Type (High Response)	PK233PA PK233PB	1.8°	0.2	0.85	4.6	5.4	5.6	24×10 ⁻⁷	0.18	20
	PK235PA PK235PB		0.37		5.8	6.8	8	50×10 ⁻⁷	0.285	

* The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Frame Size 42 mm PK24□

Type	Model Single Shaft Double Shaft	Basic Step Angle	Holding Torque N·m	Current	Voltage	Resistance	Inductance	Rotor Inertia J kg·m ²	Mass kg	page
				per Phase A/phase	V DC	per Phase Ω/phase	mH/phase			
Standard Type	PK243-01A PK243-01B	1.8°	0.2	0.67	5.6	8.4	10	35×10 ⁻⁷	0.21	22
	PK243-02A PK243-02B			0.28	13	48	60			
	PK243-03A PK243-03B			0.22	17	77	84			
	PK244-01A PK244-01B		0.33	0.85	5.6	6.6	12.8	54×10 ⁻⁷	0.27	
	PK244-02A PK244-02B			0.57	8.6	15	26.8			
	PK244-03A PK244-03B			0.28	17	60	120			
	PK245-01A PK245-01B		0.43	0.85	5.6	6.6	11.2	68×10 ⁻⁷	0.35	
	PK245-02A PK245-02B			0.57	8.6	15	28.4			
	PK245-03A PK245-03B			0.28	17	60	100			
P Type (High Response)	PK244PA PK244PB	1.8°	0.48	0.85	6.8	8	15.6	57×10 ⁻⁷	0.3	26
	PK246PA PK246PB		0.93	0.85	10	12	26	114×10 ⁻⁷	0.5	
M Type (High Resolution)	PK243M-01A PK243M-01B	0.9°	0.2	0.67	5.6	8.4	15.2	35×10 ⁻⁷	0.24	28
	PK243M-02A PK243M-02B			0.42	8.4	20	38.8			
	PK243M-03A PK243M-03B			0.22	17	77	136			
	PK244M-01A PK244M-01B		0.31	0.85	5.6	6.6	17.2	54×10 ⁻⁷	0.3	
	PK244M-02A PK244M-02B			0.57	8.6	15	38.8			
	PK244M-03A PK244M-03B			0.28	17	60	152			
	PK245M-01A PK245M-01B		0.38	0.85	5.6	6.6	15.6	68×10 ⁻⁷	0.37	
	PK245M-02A PK245M-02B			0.57	8.6	15	39.6			
	PK245M-03A PK245M-03B			0.28	17	60	128			
SH Geared Type	PK243A1-SG3.6 PK243B1-SG3.6	0.5°	0.2	0.67	5.6	8.4	10	35×10 ⁻⁷	0.35	32
	PK243A1-SG7.2 PK243B1-SG7.2	0.25°	0.4							
	PK243A1-SG9 PK243B1-SG9	0.2°	0.5							
	PK243A1-SG10 PK243B1-SG10	0.18°	0.56							
	PK243A1-SG18 PK243B1-SG18	0.1°	0.8							
	PK243A1-SG36 PK243B1-SG36	0.05°	0.8							

* The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Frame Size 56.4 mm PK26 (Frame size of **SH** geared type is 60mm)

Type	Model Single Shaft Double Shaft	Basic Step Angle	Holding Torque N·m	Current per Phase A/phase	Voltage V DC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J kg·m ²	Mass kg	page			
Standard Type	PK264-01A PK264-01B	1.8°	0.48	0.71	8.1	11.4	21.6	120×10 ⁻⁷	0.45	34			
	PK264-02A PK264-02B			1.4	3.9	2.8	5.6						
	PK264-03A PK264-03B			2.1	2.6	1.26	2.4						
	PK264-E2.0A PK264-E2.0B			1.4	3.9	2.8	5.6						
	PK266-01A PK266-01B		1.17	0.71	11	14.8	40	300×10 ⁻⁷	0.7				
	PK266-02A PK266-02B			1.4	5	3.6	10						
	PK266-03A PK266-03B			2.1	3.2	1.5	4.4						
	PK266-E2.0A PK266-E2.0B			1.4	5	3.6	10						
	PK268-01A PK268-01B		1.75	0.71	12	17.2	56	480×10 ⁻⁷	1				
	PK268-02A PK268-02B			1.4	6.3	4.5	14.4						
	PK268-03A PK268-03B			2.1	4.2	2	6.4						
	PK268-E2.0A PK268-E2.0B			1.4	6.3	4.5	14.4						
	M Type (High Resolution)		PK264M-01A PK264M-01B	0.9°	0.48	0.71	8.1	11.4	26		120×10 ⁻⁷	0.45	39
			PK264M-02A PK264M-02B			1.4	3.9	2.8	6.8				
			PK264M-03A PK264M-03B			2.1	2.6	1.26	3				
			PK264M-E2.0A PK264M-E2.0B			1.4	3.9	2.8	6.8				
PK266M-01A PK266M-01B		1.17	0.71		11	14.8	50.8	300×10 ⁻⁷	0.7				
PK266M-02A PK266M-02B			1.4		5	3.6	12.8						
PK266M-03A PK266M-03B			2.1		3.2	1.5	5.8						
PK266M-E2.0A PK266M-E2.0B			1.4		5	3.6	12.8						
PK268M-01A PK268M-01B		1.75	0.71		12	17.2	77.6	480×10 ⁻⁷	1				
PK268M-02A PK268M-02B			1.4		6.3	4.5	19.2						
PK268M-03A PK268M-03B			2.1		4.2	2	8.4						
PK268M-E2.0A PK268M-E2.0B			1.4		6.3	4.5	19.2						
SH Geared Type		PK264AE-SG3.6 PK264BE-SG3.6	0.5°		1	1.4	3.9	2.8	5.6	120×10 ⁻⁷	0.75	44	
		PK264AE-SG7.2 PK264BE-SG7.2	0.25°		2								
		PK264AE-SG9 PK264BE-SG9	0.2°		2.5								
		PK264AE-SG10 PK264BE-SG10	0.18°		2.7								
	PK264AE-SG18 PK264BE-SG18	0.1°	3										
	PK264AE-SG36 PK264BE-SG36	0.05°	4										

* The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Frame Size 60 mm PK26□J

Type	Model		Basic Step Angle	Holding Torque N·m	Current per Phase A/phase	Voltage V DC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J kg·m ²	Mass kg	page
	Single Shaft	Double Shaft									
J Type (High Inertia Capability)	PK264JDA	PK264JDB	1.8°	1.06	2.8	2.1	0.73	1.8	280×10 ⁻⁷	0.6	46
	PK264JA	PK264JB		1.06	1.4	4.1	2.92	7.2			
	PK266JDA	PK266JDB		1.75	2.8	2.8	1	3.05	450×10 ⁻⁷	0.83	
	PK266JA	PK266JB		1.75	1.4	5.6	4	12.2			
	PK267JDA	PK267JDB		2.2	2.8	3.4	1.2	3.54	570×10 ⁻⁷	1.02	
	PK267JA	PK267JB		2.2	1.4	6.7	4.8	14.2			
	PK269JDA	PK269JDB		3.1	2.8	4.2	1.49	5.7	900×10 ⁻⁷	1.43	
	PK269JA	PK269JB		3.1	1.4	8.3	5.96	22.8			

* The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

Frame Size 85 mm PK29□ (Frame size of SH geared type is 90mm)

Type	Model		Basic Step Angle	Holding Torque N·m	Current per Phase A/phase	Voltage V DC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J kg·m ²	Mass kg	page
	Single Shaft	Double Shaft									
Standard Type	PK296-E4.5A	PK296-E4.5B	1.8°	3.1	3.18	2.8	0.96	6	1400×10 ⁻⁷	1.7	50
	PK299-E4.5A	PK299-E4.5B		6.2	3.18	3.9	1.32	10	2700×10 ⁻⁷	2.8	
	PK2913-E4.0A	PK2913-E4.0B		9.3	2.8	5.3	1.94	16.8	4000×10 ⁻⁷	3.8	
Standard Terminal Box Type	PK296-E4.5T		1.8°	3.1	3.18	2.8	0.96	6	1400×10 ⁻⁷	2.1	50
	PK299-E4.5T			6.2	3.18	3.9	1.32	10	2700×10 ⁻⁷	3.2	
	PK2913-E4.0T			9.3	2.8	5.3	1.94	16.8	4000×10 ⁻⁷	4.3	
SH Geared Type	PK296AE-SG3.6	PK296BE-SG3.6	0.5°	2.5	2.1	2	0.96	6.0	1400×10 ⁻⁷	2.8	54
	PK296AE-SG7.2	PK296BE-SG7.2	0.25°	5							
	PK296AE-SG9	PK296BE-SG9	0.2°	6.3							
	PK296AE-SG10	PK296BE-SG10	0.18°	7							
	PK296AE-SG18	PK296BE-SG18	0.1°	9							
	PK296AE-SG36	PK296BE-SG36	0.05°	12							

* The value given for holding torque is the value when operated with rated voltage and 2-phase excitation.

□ **28 mm**

Step Angle 1.8°
P Type (High Response)



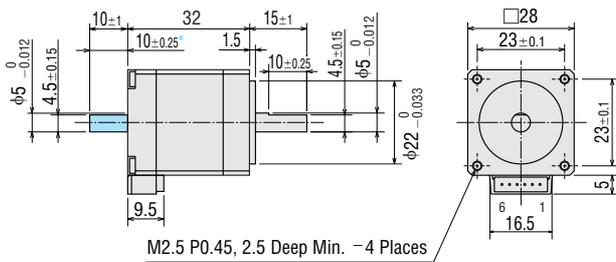
Specifications

Model	Connection Type	Holding Torque	Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J	Lead Wires (Pin)	Connection Diagram (see page 10)
Single Shaft Double Shaft		N·m	A/phase	V DC	Ω/phase	mH/phase	kg·m ²		
PK223PA	Bipolar (Series)	0.065	0.67	3.8	5.6	4	9×10 ⁻⁷	6	3
PK223PB	Unipolar	0.05	0.95	2.66	2.8	1			2
PK224PA	Bipolar (Series)	0.097	0.67	4.6	6.8	4.8	12×10 ⁻⁷	6	3
PK224PB	Unipolar	0.075	0.95	3.2	3.4	1.2			2
PK225PA	Bipolar (Series)	0.11	0.67	6.2	9.2	5.6	18×10 ⁻⁷	6	3
PK225PB	Unipolar	0.09	0.95	4.4	4.6	1.4			2

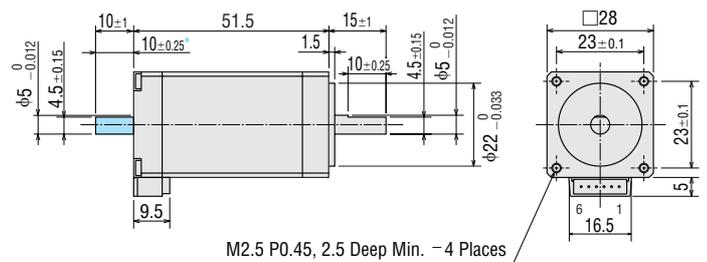
●Degree of Protection: IP30

■ **Dimensions unit: mm**

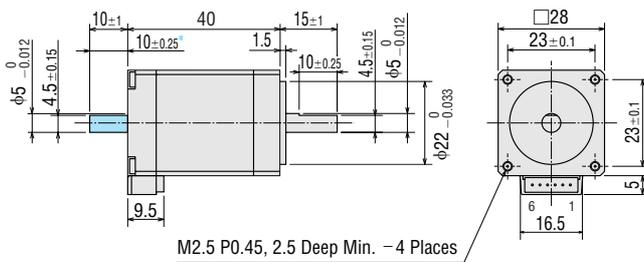
- PK223PA** (Single Shaft) Mass 0.11 kg
- PK223PB** (Double Shaft) Mass 0.11 kg



- PK225PA** (Single Shaft) Mass 0.2 kg
- PK225PB** (Double Shaft) Mass 0.2 kg



- PK224PA** (Single Shaft) Mass 0.14 kg
- PK224PB** (Double Shaft) Mass 0.14 kg



*10±0.25 indicates the length of milling on motor shaft.

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

Applicable Connector

The following housing and contacts must be purchased separately.

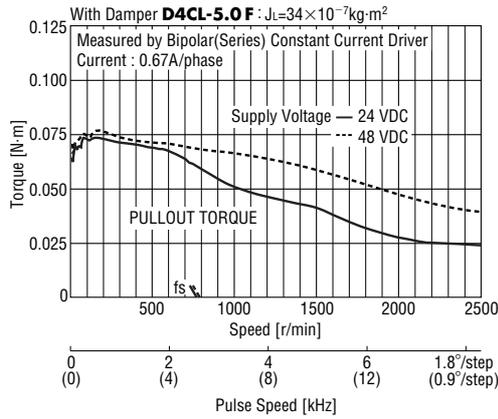
Housing: 51065-0600 (MOLEX)

Contact: 50212-8XXX (MOLEX)

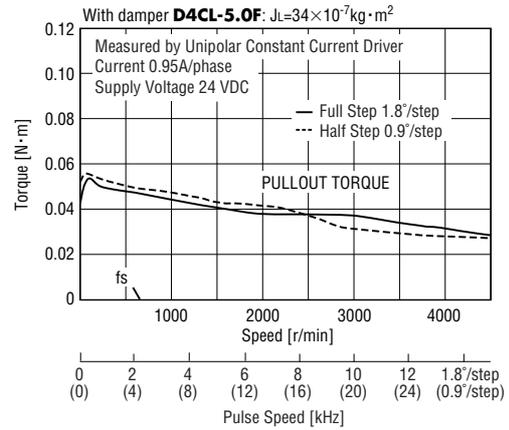
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

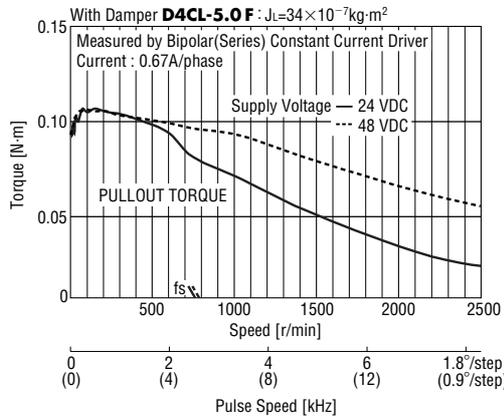
PK223PB Bipolar (Series)



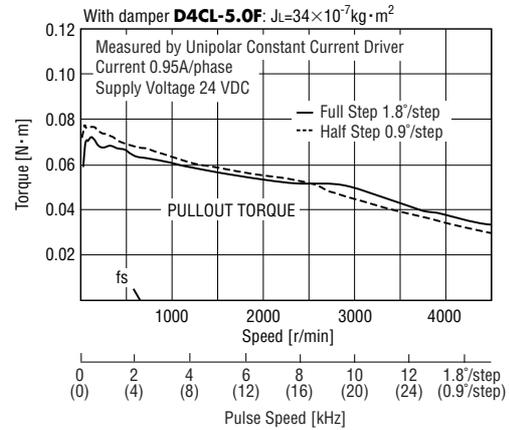
PK223PB Unipolar



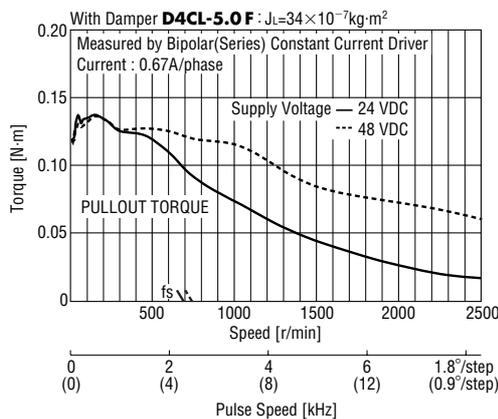
PK224PB Bipolar (Series)



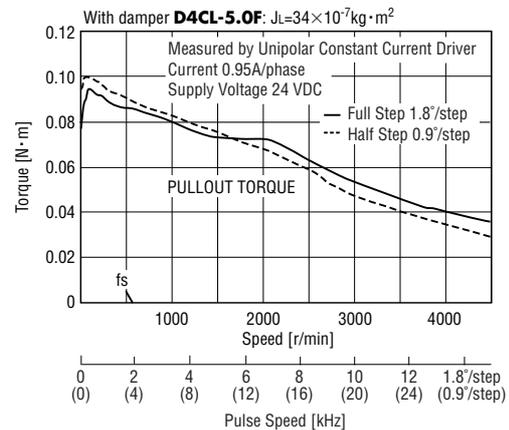
PK224PB Unipolar



PK225PB Bipolar (Series)



PK225PB Unipolar



Optional Cable (Sold separately)

These connectorized cables make it easy to connect the **P** type motor. The crimped connectors eliminate the need for assembly. There are two cable lengths to choose from.

Model	Cable Length (mm)	Number of Leads	Leads Specifications	
			UL Style No.	AWG No.
LC2U06A	600	6 Leads	3265	24
LC2U10A	1000			



□ 28 mm

SH Geared Type



Specifications

● Motor Specifications

Model	Connection Type	Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J	Lead Wires (Pin)	Connection Diagram (see page 10)
Single Shaft Double Shaft		A/phase	V DC	Ω/phase	mH/phase	kg·m ²		
PK223PA-SG □	Bipolar (Series)	0.67	3.8	5.6	4	9×10 ⁻⁷	6	3
PK223PB-SG □	Unipolar	0.95	2.66	2.8	1			2

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

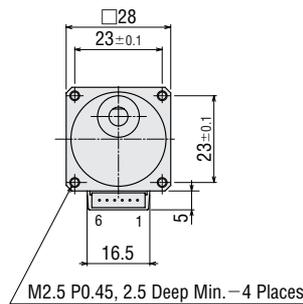
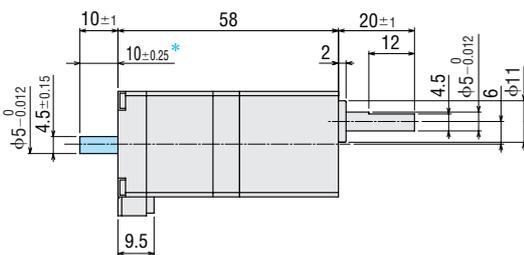
●Degree of Protection: IP30

● Gearmotor Specifications

Model	Gear Ratio	Holding Torque	Step Angle	Permissible Speed	Permissible Thrust Load	Permissible Overhung Load (at 10mm from shaft end)
Single Shaft Double Shaft		N·m		r/min	N	N
PK223PA-SG7.2 PK223PB-SG7.2	1:7.2	0.3	0.25°	250	10	20
PK223PA-SG9 PK223PB-SG9	1:9	0.3	0.2°	200	10	20
PK223PA-SG10 PK223PB-SG10	1:10	0.3	0.18°	180	10	20
PK223PA-SG18 PK223PB-SG18	1:18	0.4	0.1°	100	10	20
PK223PA-SG36 PK223PB-SG36	1:36	0.4	0.05°	50	10	20

■ Dimensions unit: mm

- **PK223PA-SG**□ (Single Shaft) Mass 0.16 kg
- **PK223PB-SG**□ (Double Shaft) Mass 0.16 kg



Mounting Screws (included)
M2.5 P0.45 8mm long: 4 pieces

*10±0.25 indicates the length of milling on motor shaft.

●This dimension is for double shaft models. For single shaft, ignore the colored area.

Applicable Connector

The following housing and contacts must be purchased separately.

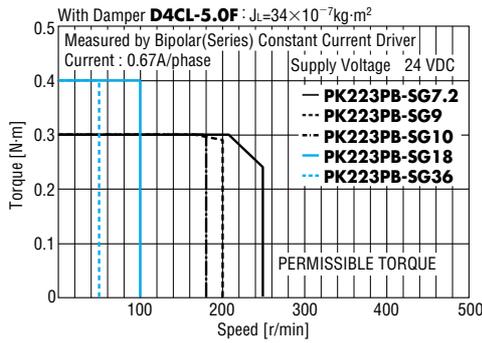
Housing: 51065-0600 (MOLEX)

Contact: 50212-8XXX (MOLEX)

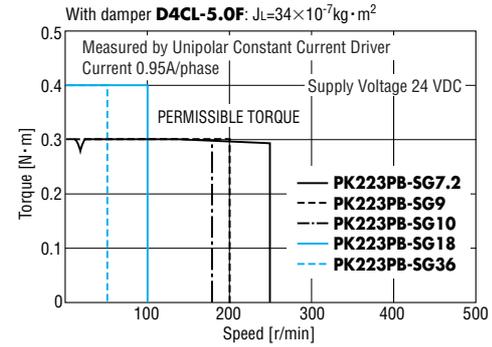
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

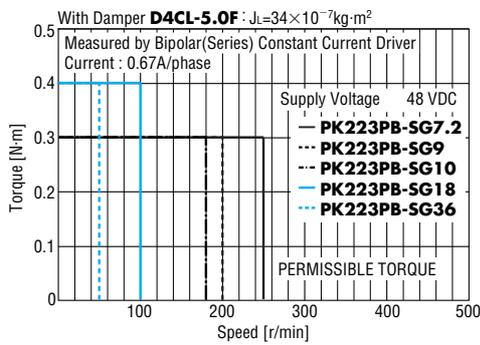
●PK223PB-SG □ Bipolar (Series) 24 VDC



●PK223PB-SG □ Unipolar



●PK223PB-SG □ Bipolar (Series) 48 VDC



Optional Cable (Sold separately)

These connectorized cables make it easy to connect the **P** type motor. The crimped connectors eliminate the need for assembly. There are two cable lengths to choose from.

Model	Cable Length (mm)	Number of Leads	Leads Specifications	
			UL Style No.	AWG No.
LC2U06A	600	6 Leads	3265	24
LC2U10A	1000			



□ **35 mm**

Step Angle 1.8°
P Type (High Response)



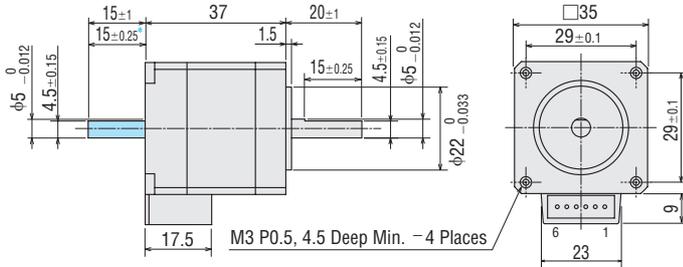
Specifications

Model	Connection Type	Holding Torque N·m	Current per Phase A/phase	Voltage V DC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J kg·m ²	Lead Wires (Pin)	Connection Diagram (see page 10)
PK233PA Single Shaft	Bipolar (Series)	0.2	0.85	4.6	5.4	5.6	24×10 ⁻⁷	6	3
PK233PB Double Shaft	Unipolar	0.16	1.2	3.24	2.7	1.4			2
PK235PA Single Shaft	Bipolar (Series)	0.37	0.85	5.8	6.8	8	50×10 ⁻⁷	6	3
PK235PB Double Shaft	Unipolar	0.3	1.2	4.08	3.4	2			2

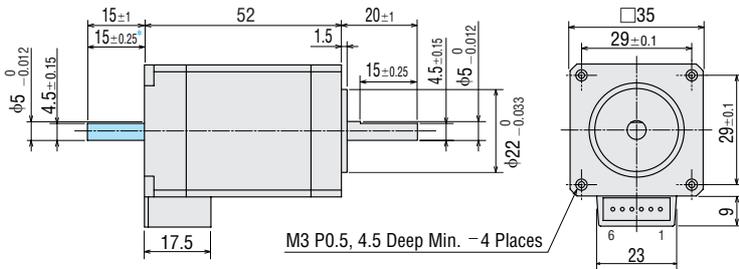
●Degree of Protection: IP30

■ **Dimensions unit: mm**

- PK233PA** (Single Shaft) Mass 0.18 kg
- PK233PB** (Double Shaft) Mass 0.18 kg



- PK235PA** (Single Shaft) Mass 0.285 kg
- PK235PB** (Double Shaft) Mass 0.285 kg



*15±0.25 indicates the length of milling on motor shaft.

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

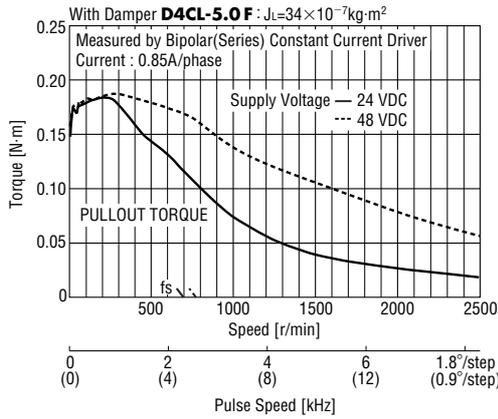
Applicable Connector

The following housing and contacts must be purchased separately.
Housing: 51103-0600 (MOLEX) or 51102-0600 (MOLEX)
Contact: 50351-8XXX (MOLEX)

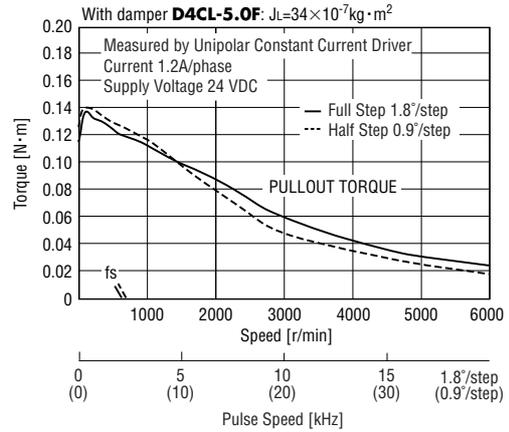
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

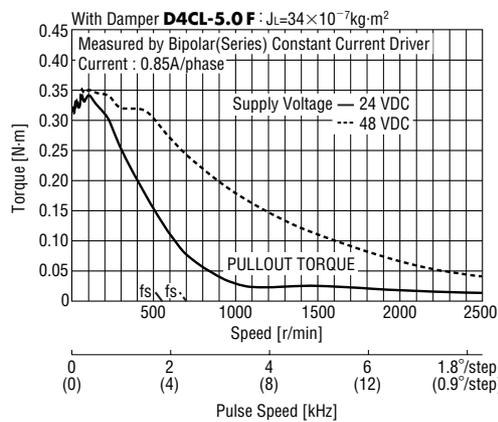
PK233PB Bipolar (Series)



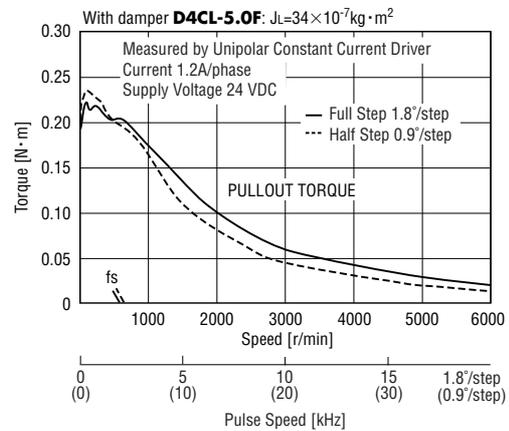
PK233PB Unipolar



PK235PB Bipolar (Series)



PK235PB Unipolar



Optional Cable (Sold separately)

These connectorized cables make it easy to connect the **P** type motor. The crimped connectors eliminate the need for assembly. There are two cable lengths to choose from.

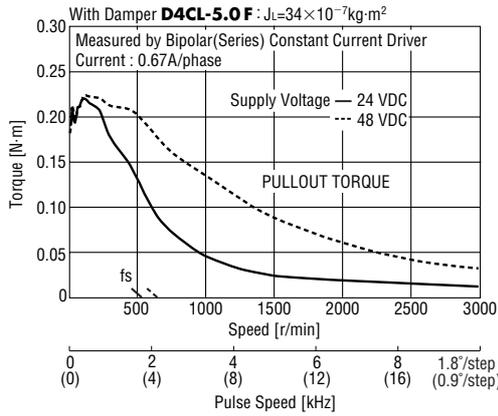
Model	Cable Length (mm)	Number of Leads	Leads Specifications	
			UL Style No.	AWG No.
LC2U06B	600	6 Leads	3265	24
LC2U10B	1000			



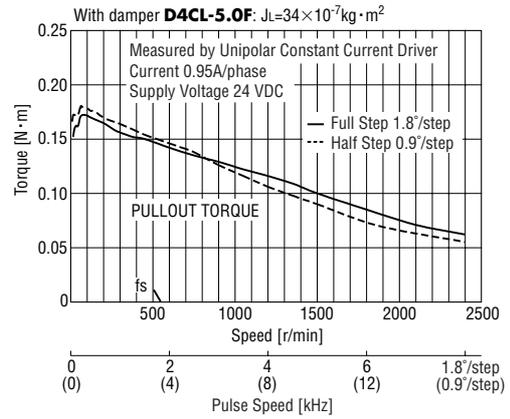
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

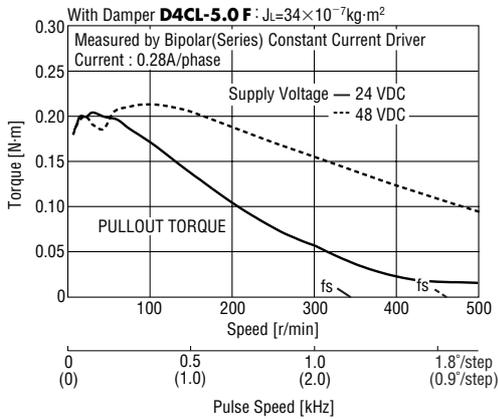
PK243-01B Bipolar (Series)



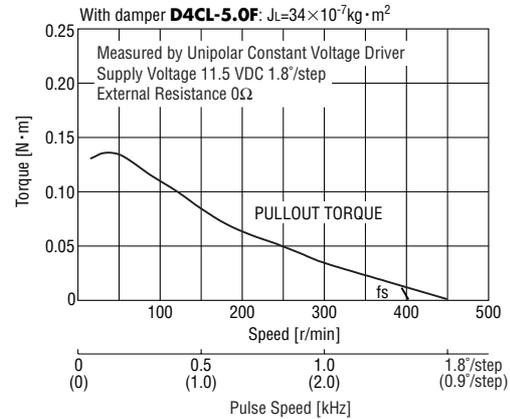
PK243-01B Unipolar



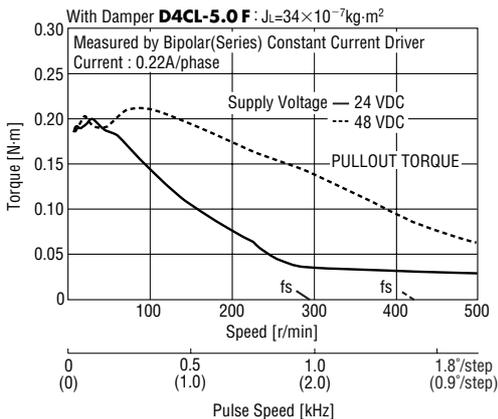
PK243-02B Bipolar (Series)



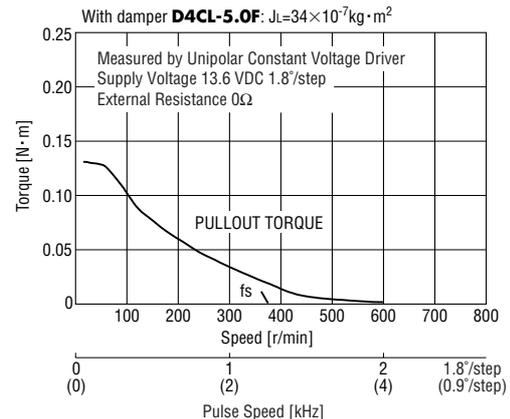
PK243-02B Unipolar



PK243-03B Bipolar (Series)



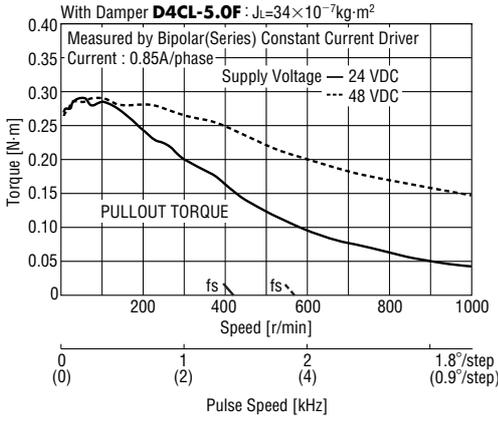
PK243-03B Unipolar



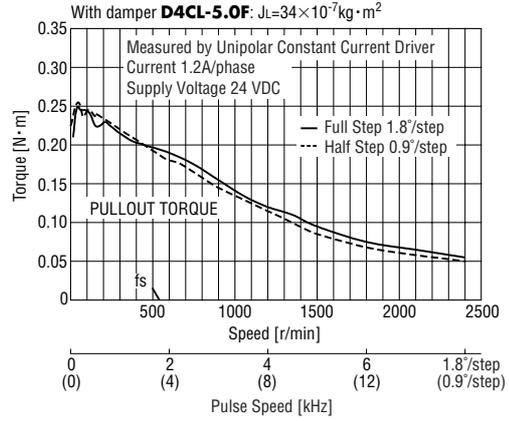
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

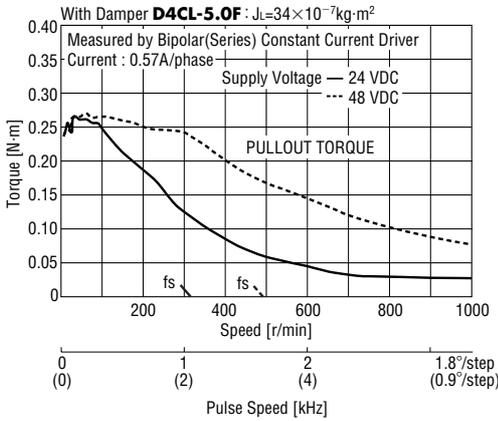
● **PK244-01B Bipolar (Series)**



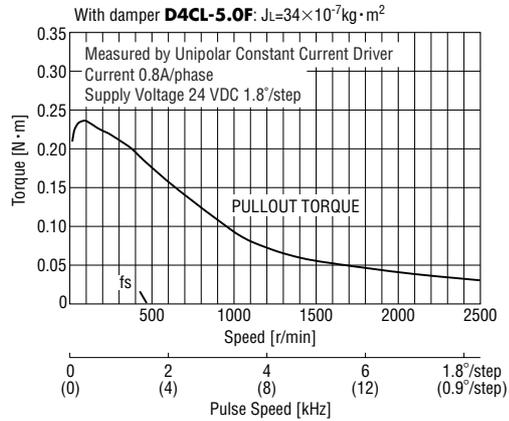
● **PK244-01B Unipolar**



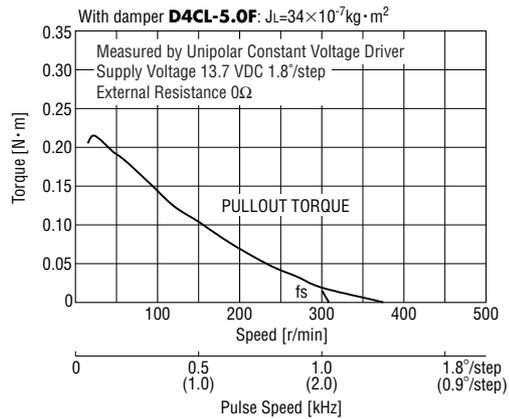
● **PK244-02B Bipolar (Series)**



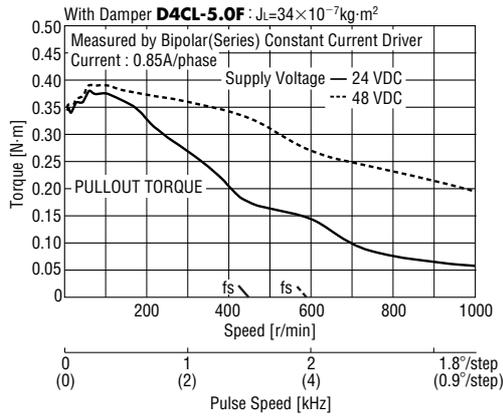
● **PK244-02B Unipolar**



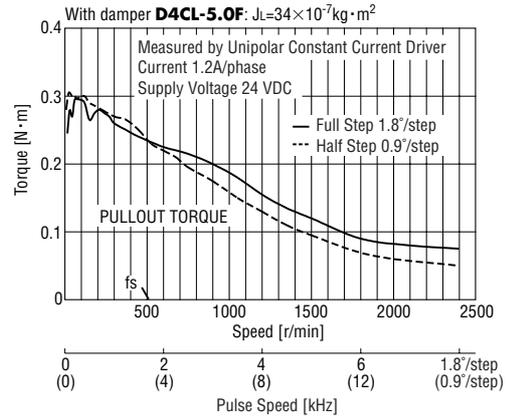
● **PK244-03B Unipolar**



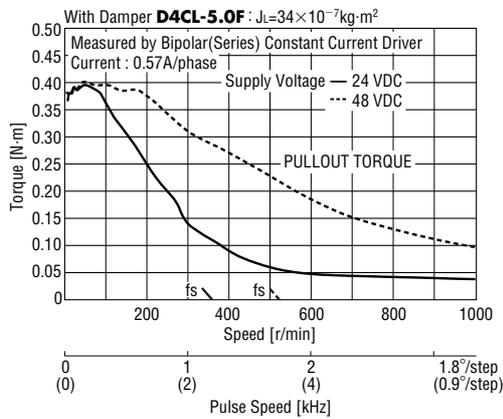
● **PK245-01B Bipolar (Series)**



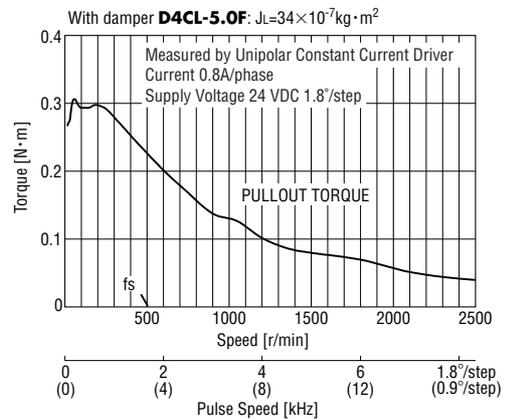
● **PK245-01B Unipolar**



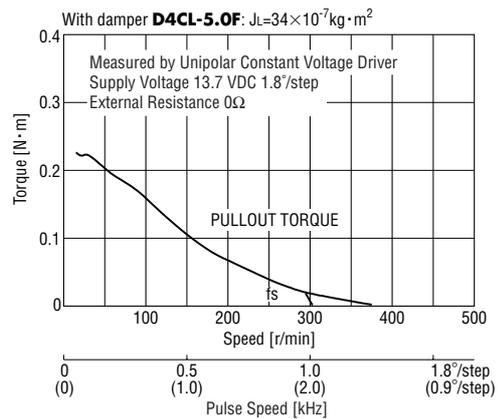
● **PK245-02B Bipolar (Series)**



● **PK245-02B Unipolar**



● **PK245-03B Unipolar**



□ 42 mm

Step Angle 1.8°
P Type (High Response)



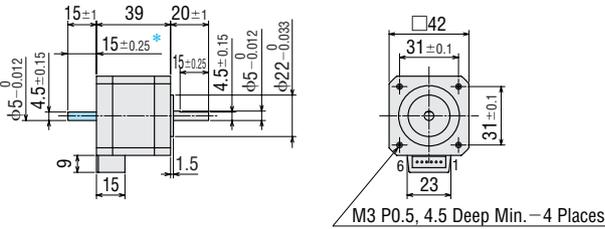
Specifications

Model	Connection Type	Holding Torque N·m	Current per Phase A/phase	Voltage V DC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J kg·m ²	Lead Wires (Pin)	Connection Diagram (see page 10)
PK244PA PK244PB	Bipolar (Series)	0.48	0.85	6.8	8	15.6	57×10 ⁻⁷	6	3
	Unipolar	0.39	1.2	4.8	4	3.9			2
PK246PA PK246PB	Bipolar (Series)	0.93	0.85	10	12	26	114×10 ⁻⁷	6	3
	Unipolar	0.75	1.2	7.2	6	6.5			2

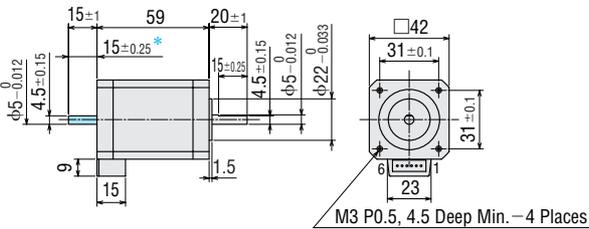
●Degree of Protection: IP30

■ Dimensions unit: mm

- PK244PA** (Single Shaft) Mass 0.3 kg
- PK244PB** (Double Shaft) Mass 0.3 kg



- PK246PA** (Single Shaft) Mass 0.5 kg
- PK246PB** (Double Shaft) Mass 0.5 kg



*15±0.25 indicates the length of milling on motor shaft.

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

Applicable Connector

The following housing and contacts must be purchased separately.

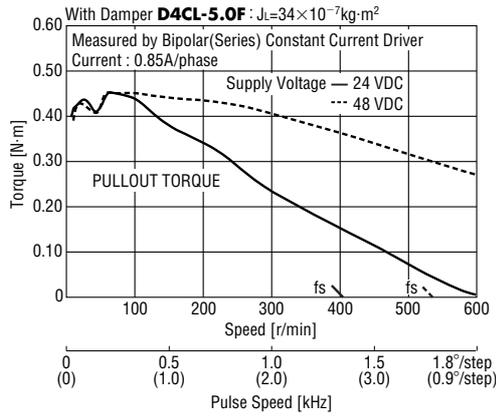
Housing: 51103-0600 (MOLEX) or 51102-0600 (MOLEX)

Contact: 50351-8XXX (MOLEX)

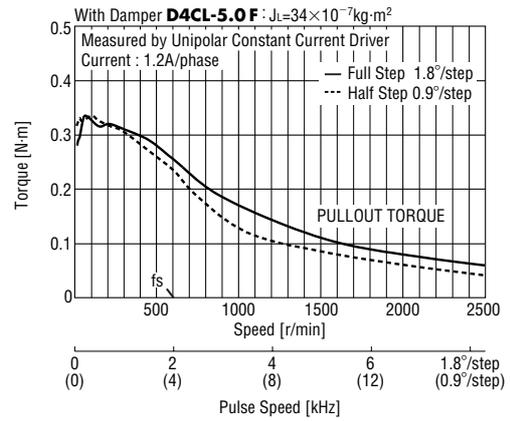
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

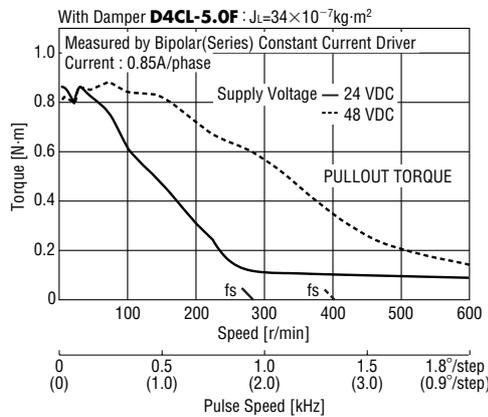
PK244PB Bipolar (Series)



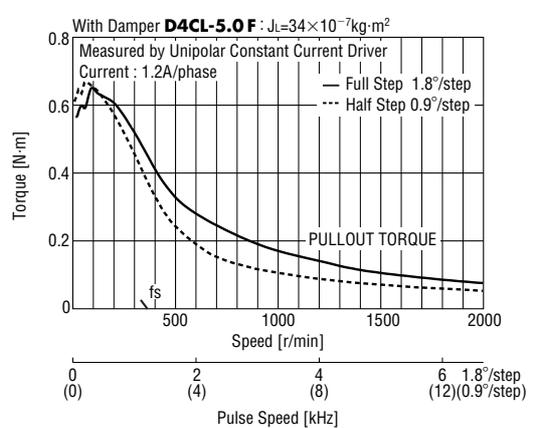
PK244PB Unipolar



PK246PB Bipolar (Series)



PK246PB Unipolar



Optional Cable (Sold separately)

These connectorized cables make it easy to connect the **P** type motor. The crimped connectors eliminate the need for assembly. There are two cable lengths to choose from.

Model	Cable Length (mm)	Number of Leads	Leads Specifications	
			UL Style No.	AWG No.
LC2U06B	600	6 Leads	3265	24
LC2U10B	1000			



42 mm

Step Angle 0.9°
M Type (High Resolution)



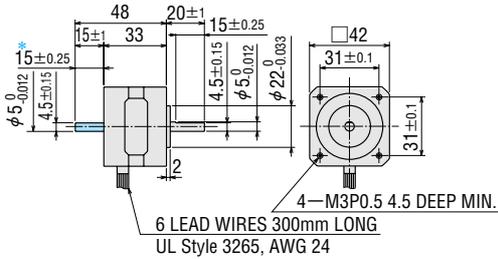
Specifications

Model	Connection Type	Holding Torque	Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J	Lead Wires (Pin)	Connection Diagram (see page 10)
Single Shaft Double Shaft		N·m	A/phase	V DC	Ω/phase	mH/phase	kg·m ²		
PK243M-01A	Bipolar (Series)	0.2	0.67	5.6	8.4	15.2	35×10 ⁻⁷	6	3
PK243M-01B	Unipolar	0.16	0.95	4	4.2	3.8			2
PK243M-02A	Bipolar (Series)	0.2	0.42	8.4	20	38.8	35×10 ⁻⁷	6	3
PK243M-02B	Unipolar	0.16	0.6	6	10	9.7			2
PK243M-03A	Bipolar (Series)	0.2	0.22	17	77	136	35×10 ⁻⁷	6	3
PK243M-03B	Unipolar	0.16	0.31	12	38.5	34			2
PK244M-01A	Bipolar (Series)	0.31	0.85	5.6	6.6	17.2	54×10 ⁻⁷	6	3
PK244M-01B	Unipolar	0.26	1.2	4	3.3	4.3			2
PK244M-02A	Bipolar (Series)	0.31	0.57	8.6	15	38.8	54×10 ⁻⁷	6	3
PK244M-02B	Unipolar	0.26	0.8	6	7.5	9.7			2
PK244M-03A	Bipolar (Series)	0.31	0.28	17	60	152	54×10 ⁻⁷	6	3
PK244M-03B	Unipolar	0.26	0.4	12	30	38			2
PK245M-01A	Bipolar (Series)	0.38	0.85	5.6	6.6	15.6	68×10 ⁻⁷	6	3
PK245M-01B	Unipolar	0.32	1.2	4	3.3	3.9			2
PK245M-02A	Bipolar (Series)	0.38	0.57	8.6	15	39.6	68×10 ⁻⁷	6	3
PK245M-02B	Unipolar	0.32	0.8	6	7.5	9.9			2
PK245M-03A	Bipolar (Series)	0.38	0.28	17	60	128	68×10 ⁻⁷	6	3
PK245M-03B	Unipolar	0.32	0.4	12	30	32			2

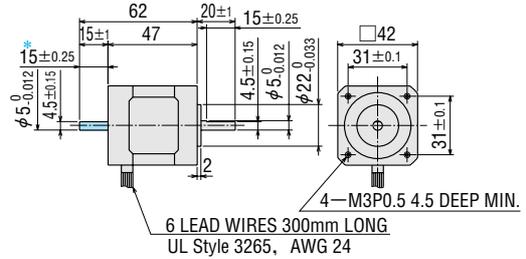
●Degree of Protection: IP30

Dimensions unit: mm

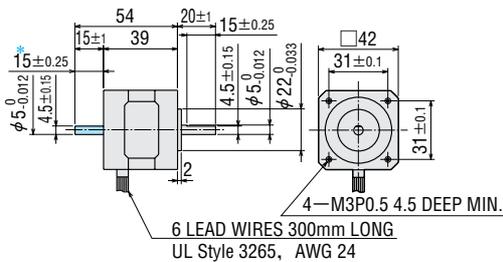
- PK243M-0□A (Single Shaft) Mass 0.24 kg
- PK243M-0□B (Double Shaft) Mass 0.24 kg



- PK245M-0□A (Single Shaft) Mass 0.37 kg
- PK245M-0□B (Double Shaft) Mass 0.37 kg



- PK244M-0□A (Single Shaft) Mass 0.3 kg
- PK244M-0□B (Double Shaft) Mass 0.3 kg



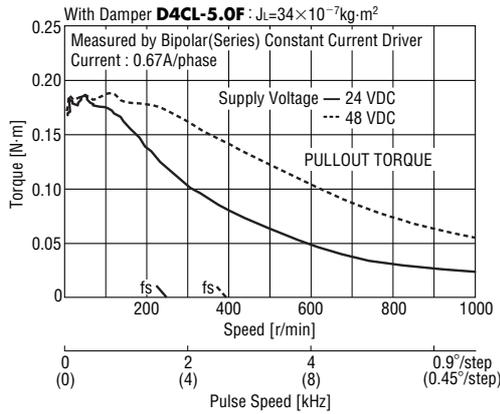
*15±0.25 indicates the length of milling on motor shaft.

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

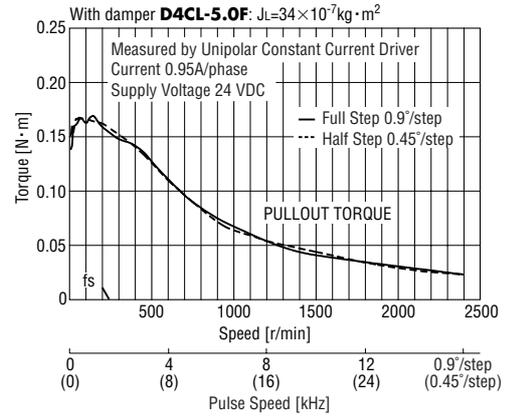
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

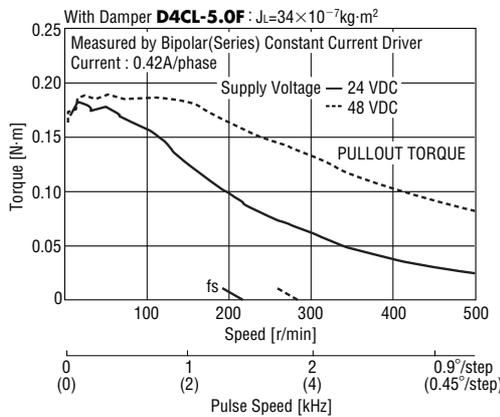
PK243M-01B Bipolar (Series)



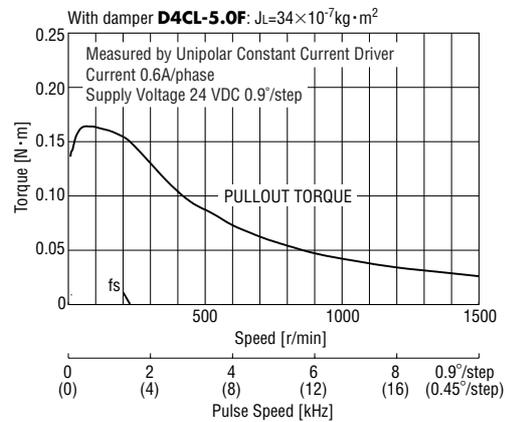
PK243M-01B Unipolar



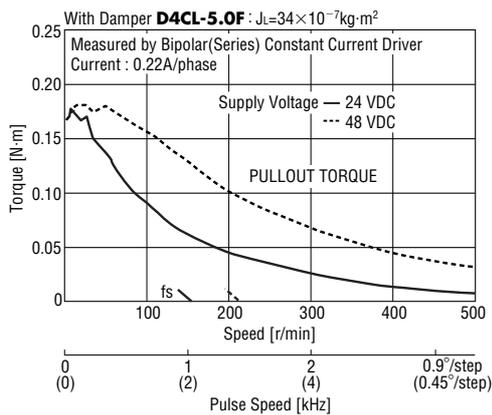
PK243M-02B Bipolar (Series)



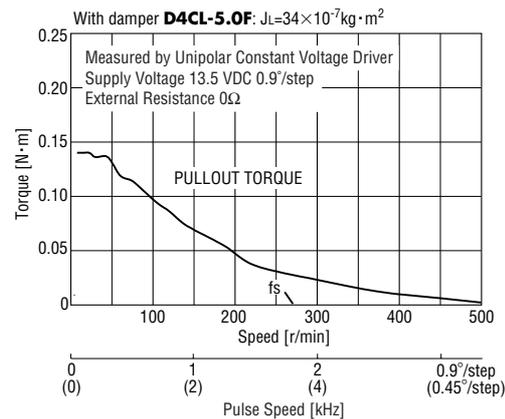
PK243M-02B Unipolar



PK243M-03B Bipolar (Series)



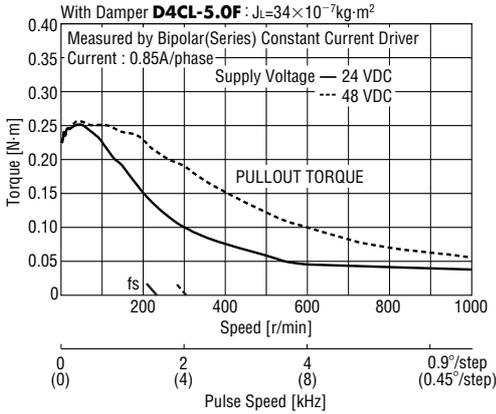
PK243M-03B Unipolar



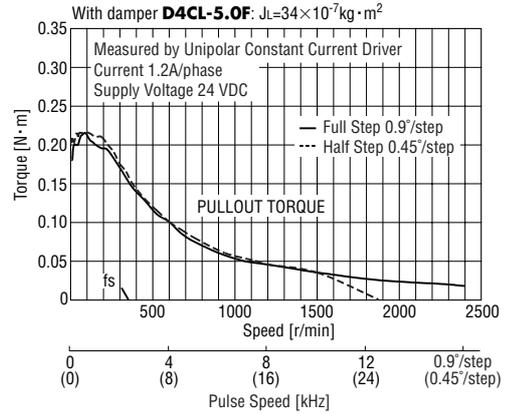
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

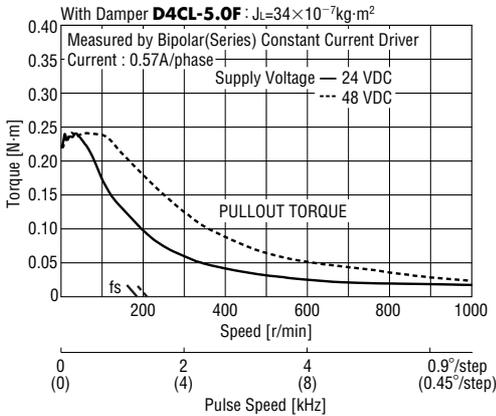
● **PK244M-01B** Bipolar (Series)



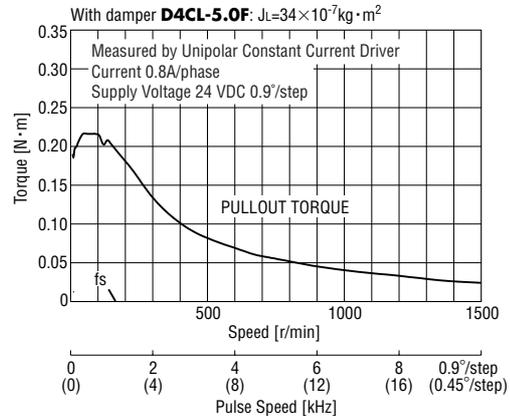
● **PK244M-01B** Unipolar



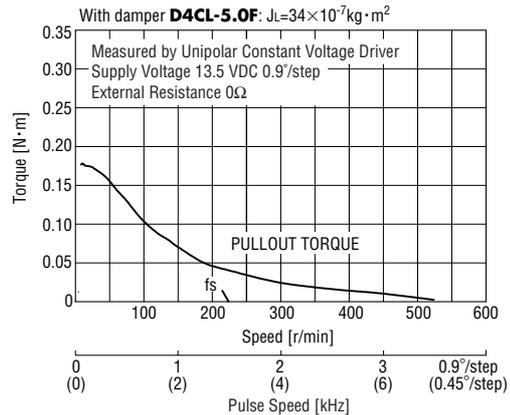
● **PK244M-02B** Bipolar (Series)



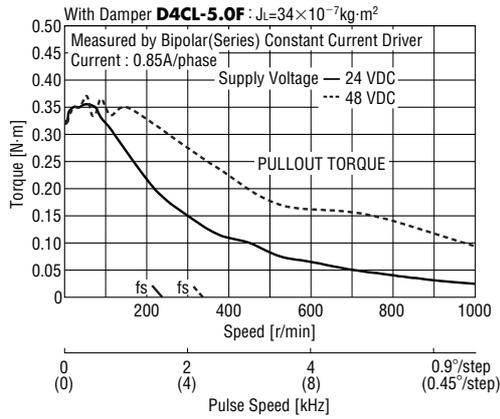
● **PK244M-02B** Unipolar



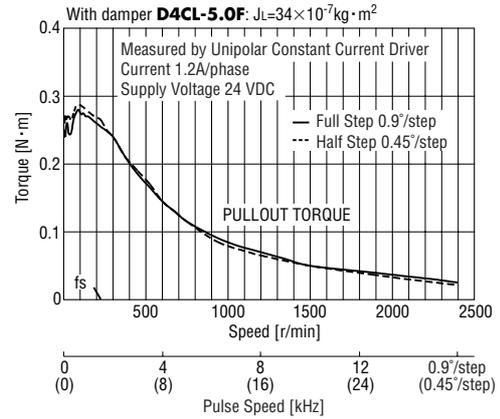
● **PK244M-03B** Unipolar



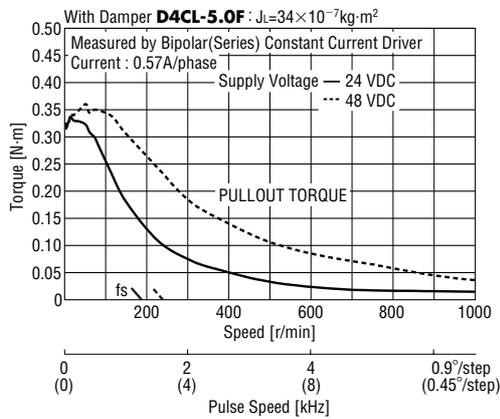
● **PK245M-01B Bipolar (Series)**



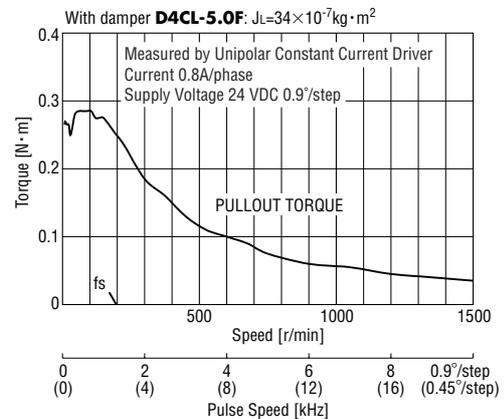
● **PK245M-01B Unipolar**



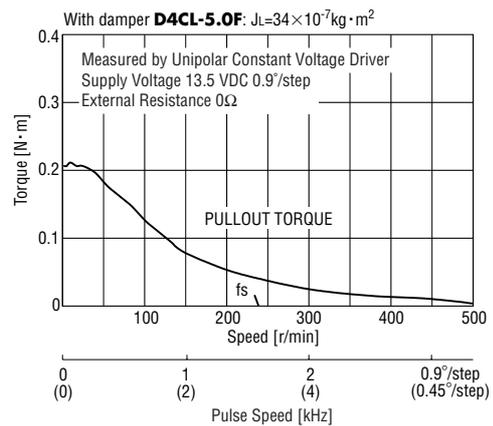
● **PK245M-02B Bipolar (Series)**



● **PK245M-02B Unipolar**



● **PK245M-03B Unipolar**



□ 42 mm

SH Geared Type



Specifications

● Motor Specifications

Model Single Shaft Double Shaft	Connection Type	Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J	Lead Wires (Pin)	Connection Diagram (see page 10)
		A/phase	V DC	Ω/phase	mH/phase	kg·m ²		
PK243A1-SG □	Bipolar (Series)	0.67	5.6	8.4	10	35×10 ⁻⁷	6	3
PK243B1-SG □	Unipolar	0.95	4.0	4.2	2.5			2

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

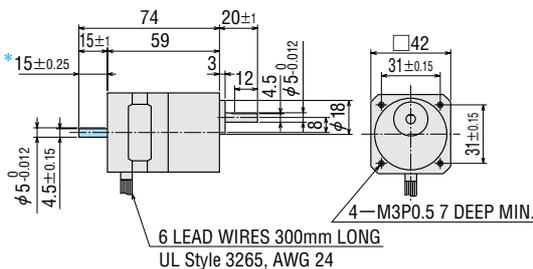
●Degree of Protection: IP30

● Gearmotor Specifications

Model Single Shaft Double Shaft	Gear Ratio	Holding Torque	Step Angle	Permissible Speed	Permissible Thrust Load	Permissible Overhung Load (at 10mm from shaft end)
		N·m		r/min	N	N
PK243A1-SG3.6 PK243B1-SG3.6	1:3.6	0.2	0.5°	500	15	20
PK243A1-SG7.2 PK243B1-SG7.2	1:7.2	0.4	0.25°	250	15	20
PK243A1-SG9 PK243B1-SG9	1:9	0.5	0.2°	200	15	20
PK243A1-SG10 PK243B1-SG10	1:10	0.56	0.18°	180	15	20
PK243A1-SG18 PK243B1-SG18	1:18	0.8	0.1°	100	15	20
PK243A1-SG36 PK243B1-SG36	1:36	0.8	0.05°	50	15	20

■ Dimensions unit: mm

- **PK243A1-SG**□ (Single Shaft) Mass 0.35 kg
- **PK243B1-SG**□ (Double Shaft) Mass 0.35 kg



Mounting Screws (included)
M3 P0.5 10mm long: 4 pieces

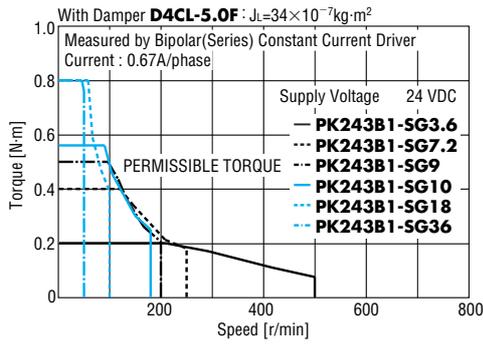
*15±0.25 indicates the length of milling on motor shaft.

●This dimension is for double shaft models. For single shaft, ignore the colored area.

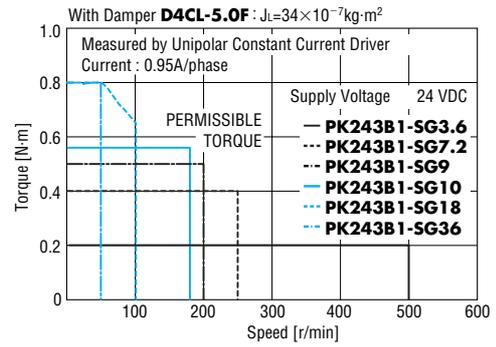
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

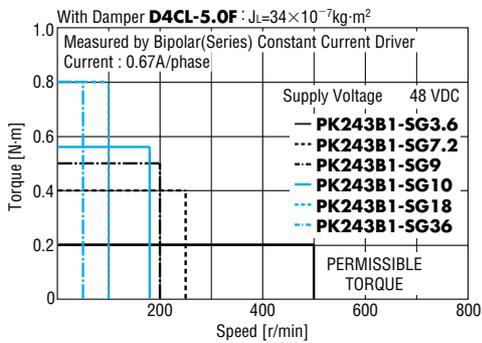
●PK243B1-SG□ Bipolar (Series) 24 VDC



●PK243B1-SG□ Unipolar



●PK243B1-SG□ Bipolar (Series) 48 VDC



□ **56.4 mm**

Step Angle 1.8°
Standard Type



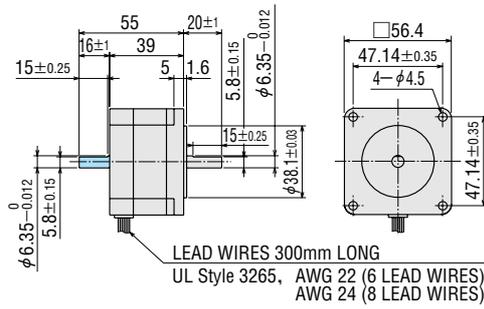
Specifications

Model	Connection Type	Holding Torque N·m	Current per Phase A/phase	Voltage V DC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J kg·m ²	Lead Wires (Pin)	Connection Diagram (see page 10)
PK264-01A PK264-01B	Bipolar (Series)	0.48	0.71	8.1	11.4	21.6	120×10 ⁻⁷	6	3
	Unipolar	0.39	1	5.7	5.7	5.4			2
PK264-02A PK264-02B	Bipolar (Series)	0.48	1.4	3.9	2.8	5.6	120×10 ⁻⁷	6	3
	Unipolar	0.39	2	2.8	1.4	1.4			2
PK264-03A PK264-03B	Bipolar (Series)	0.48	2.1	2.6	1.26	2.4	120×10 ⁻⁷	6	3
	Unipolar	0.39	3	1.9	0.63	0.6			2
PK264-E2.0A PK264-E2.0B	Bipolar (Parallel)	0.48	2.8	1.96	0.7	1.4	120×10 ⁻⁷	8	6
	Bipolar (Series)	0.48	1.4	3.9	2.8	5.6			5
	Unipolar	0.39	2	2.8	1.4	1.4			4
PK266-01A PK266-01B	Bipolar (Series)	1.17	0.71	11	14.8	40	300×10 ⁻⁷	6	3
	Unipolar	0.9	1	7.4	7.4	10			2
PK266-02A PK266-02B	Bipolar (Series)	1.17	1.4	5	3.6	10	300×10 ⁻⁷	6	3
	Unipolar	0.9	2	3.6	1.8	2.5			2
PK266-03A PK266-03B	Bipolar (Series)	1.17	2.1	3.2	1.5	4.4	300×10 ⁻⁷	6	3
	Unipolar	0.9	3	2.3	0.75	1.1			2
PK266-E2.0A PK266-E2.0B	Bipolar (Parallel)	1.17	2.8	2.52	0.9	2.5	300×10 ⁻⁷	8	6
	Bipolar (Series)	1.17	1.4	5	3.6	10			5
	Unipolar	0.9	2	3.6	1.8	2.5			4
PK268-01A PK268-01B	Bipolar (Series)	1.75	0.71	12	17.2	56	480×10 ⁻⁷	6	3
	Unipolar	1.35	1	8.6	8.6	14			2
PK268-02A PK268-02B	Bipolar (Series)	1.75	1.4	6.3	4.5	14.4	480×10 ⁻⁷	6	3
	Unipolar	1.35	2	4.5	2.25	3.6			2
PK268-03A PK268-03B	Bipolar (Series)	1.75	2.1	4.2	2	6.4	480×10 ⁻⁷	6	3
	Unipolar	1.35	3	3	1	1.6			2
PK268-E2.0A PK268-E2.0B	Bipolar (Parallel)	1.75	2.8	3.16	1.13	3.6	480×10 ⁻⁷	8	6
	Bipolar (Series)	1.75	1.4	6.3	4.5	14.4			5
	Unipolar	1.35	2	4.5	2.25	3.6			4

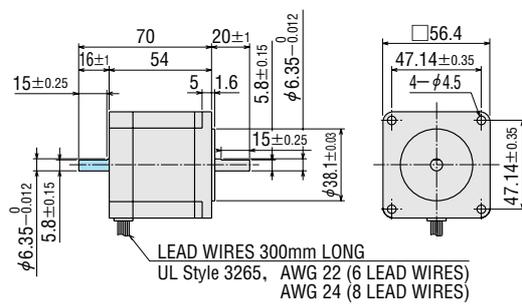
●Degree of Protection: IP30

■ **Dimensions unit: mm**

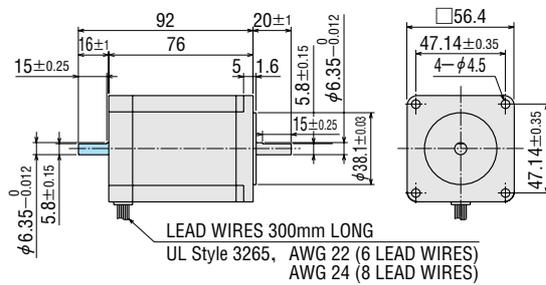
- **PK264-0□A, PK264-E2.0A** (Single Shaft) Mass 0.45 kg
- **PK264-0□B, PK264-E2.0B** (Double Shaft) Mass 0.45 kg



- **PK266-0□A, PK266-E2.0A** (Single Shaft) Mass 0.7 kg
- **PK266-0□B, PK266-E2.0B** (Double Shaft) Mass 0.7 kg



- **PK268-0□A, PK268-E2.0A** (Single Shaft) Mass 1 kg
- **PK268-0□B, PK268-E2.0B** (Double Shaft) Mass 1 kg

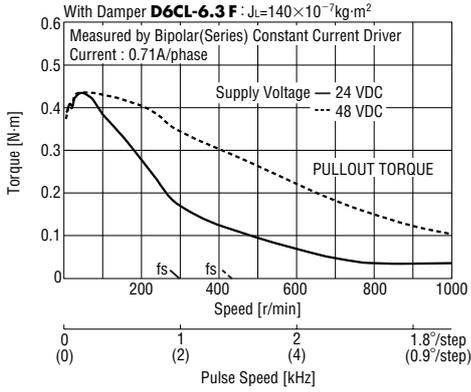


● These dimensions are for double shaft models. For single shaft, ignore the colored areas.

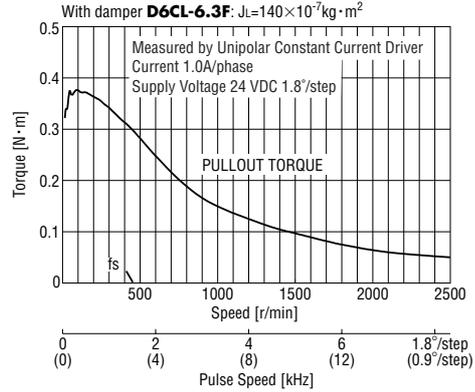
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

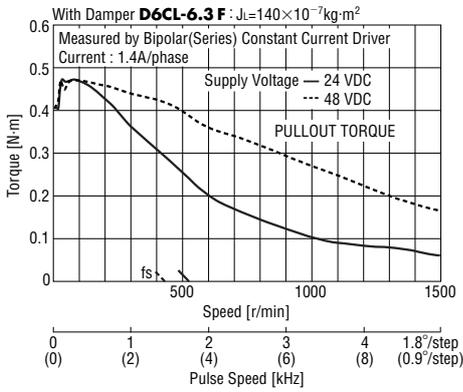
●PK264-01B Bipolar (Series)



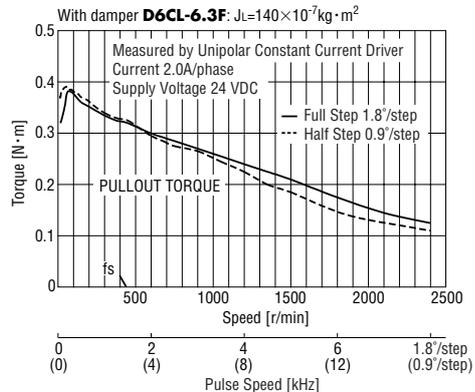
●PK264-01B Unipolar



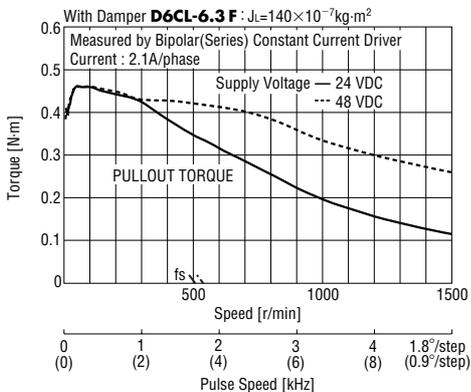
●PK264-02B Bipolar (Series)



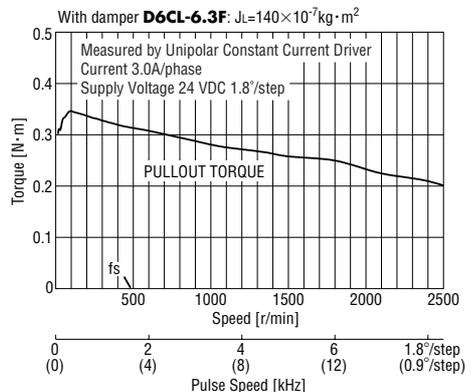
●PK264-02B Unipolar



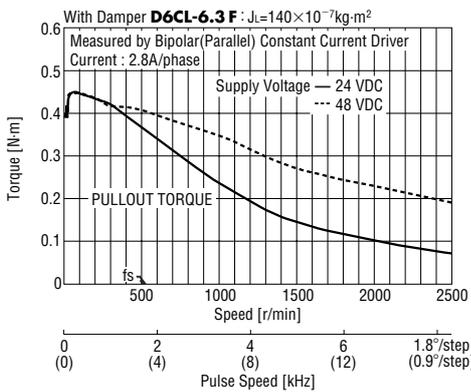
●PK264-03B Bipolar (Series)



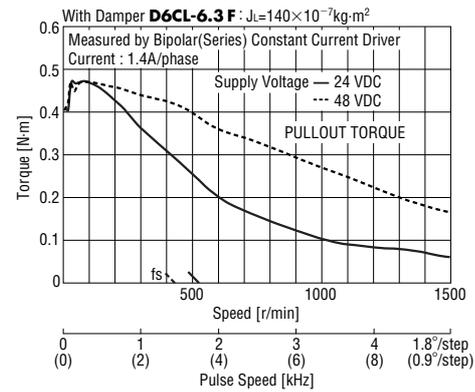
●PK264-03B Unipolar



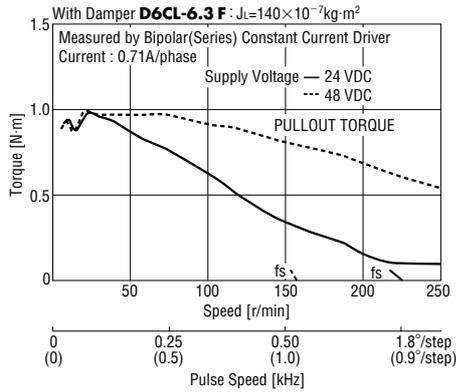
●PK264-E2.0B Bipolar (Parallel)



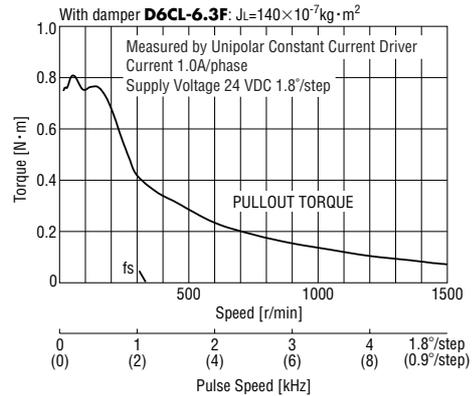
●PK264-E2.0B Bipolar (Series)



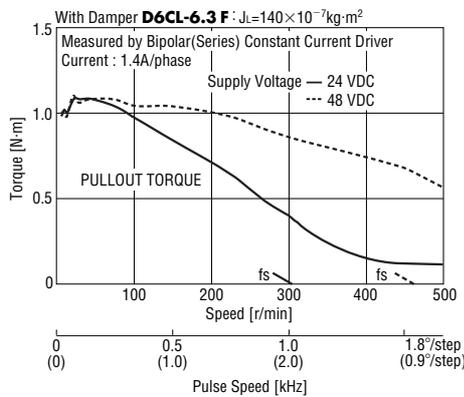
● **PK266-01B Bipolar (Series)**



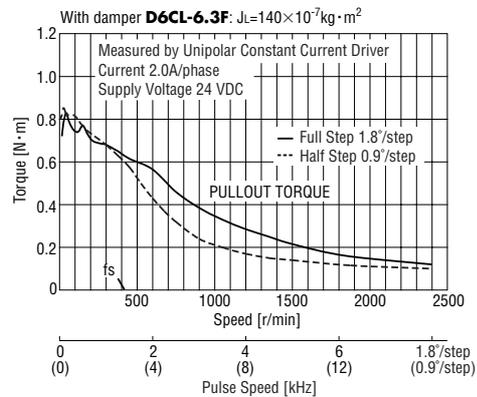
● **PK266-01B Unipolar**



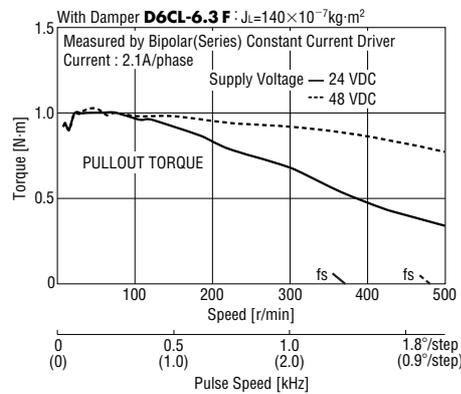
● **PK266-02B Bipolar (Series)**



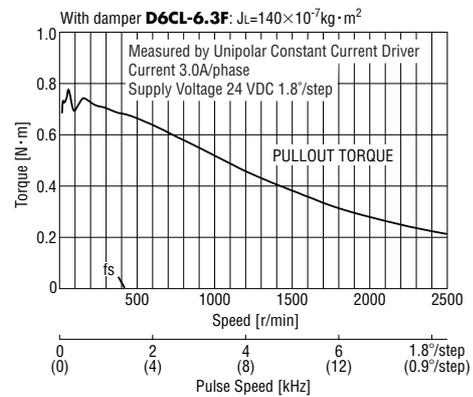
● **PK266-02B Unipolar**



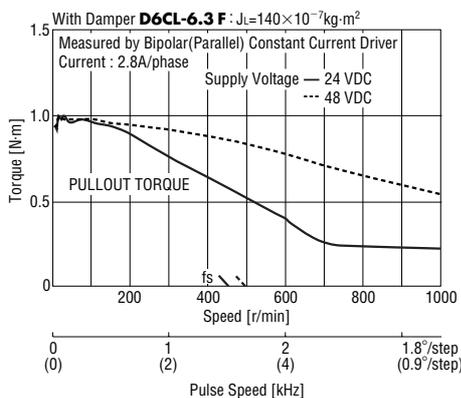
● **PK266-03B Bipolar (Series)**



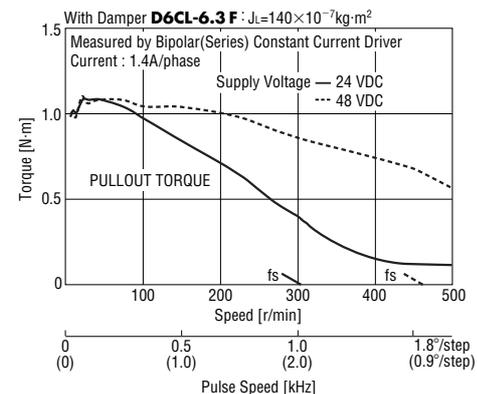
● **PK266-03B Unipolar**



● **PK266-E2.0B Bipolar (Parallel)**



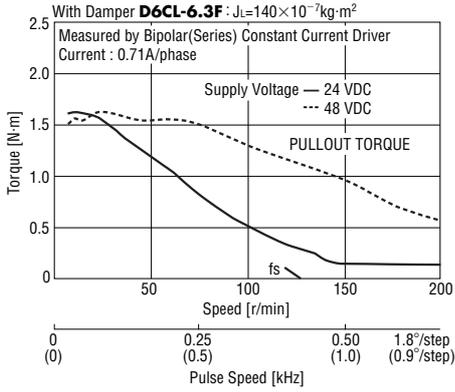
● **PK266-E2.0B Bipolar (Series)**



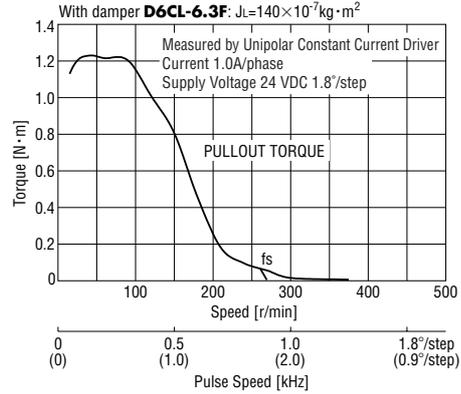
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

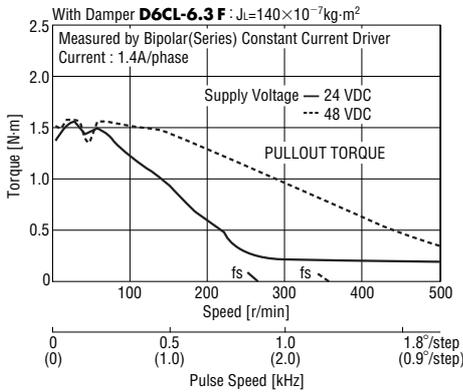
● **PK268-01B Bipolar (Series)**



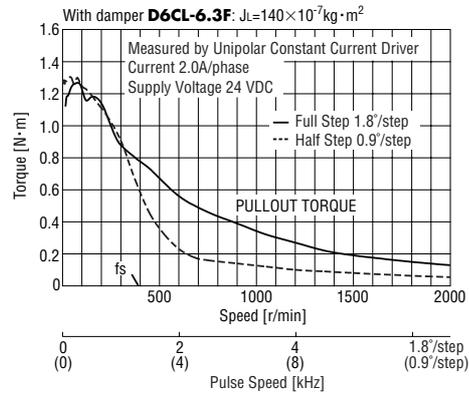
● **PK268-01B Unipolar**



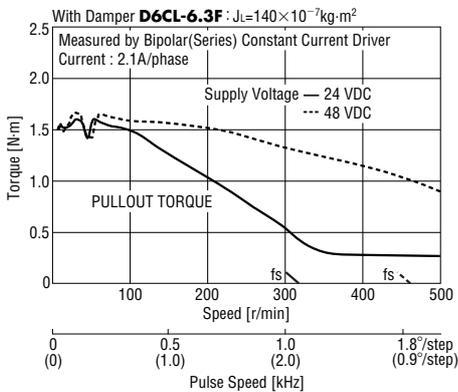
● **PK268-02B Bipolar (Series)**



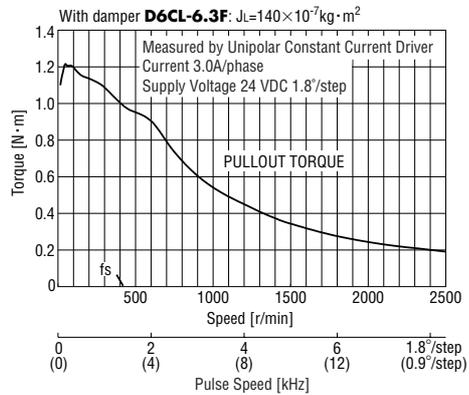
● **PK268-02B Unipolar**



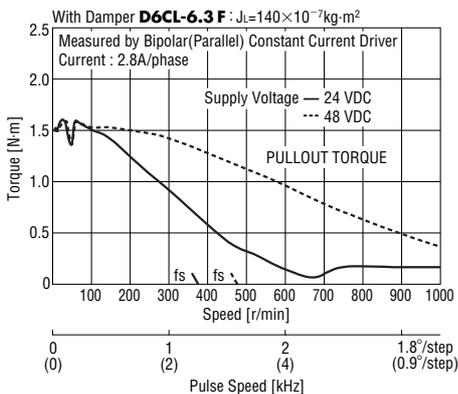
● **PK268-03B Bipolar (Series)**



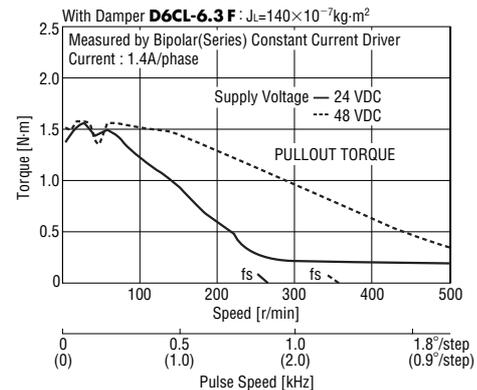
● **PK268-03B Unipolar**



● **PK268-E2.0B Bipolar (Parallel)**



● **PK268-E2.0B Bipolar (Series)**



□ **56.4 mm**

Step Angle 0.9°

M Type (High Resolution Type)



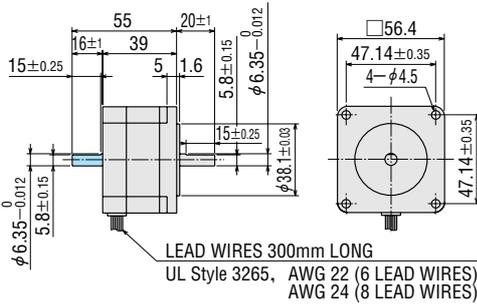
Specifications

Model Single Shaft Double Shaft	Connection Type	Holding Torque	Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J	Lead Wires (Pin)	Connection Diagram (see page 10)
		N·m	A/phase	V DC	Ω/phase	mH/phase	kg·m ²		
PK264M-01A PK264M-01B	Bipolar (Series)	0.48	0.71	8.1	11.4	26	120×10 ⁻⁷	6	3 2
	Unipolar	0.39	1	5.7	5.7	6.5			
PK264M-02A PK264M-02B	Bipolar (Series)	0.48	1.4	3.9	2.8	6.8	120×10 ⁻⁷	6	3 2
	Unipolar	0.39	2	2.8	1.4	1.7			
PK264M-03A PK264M-03B	Bipolar (Series)	0.48	2.1	2.6	1.26	3	120×10 ⁻⁷	6	3 2
	Unipolar	0.39	3	1.9	0.63	0.75			
PK264M-E2.0A PK264M-E2.0B	Bipolar (Parallel)	0.48	2.8	1.96	0.7	1.7	120×10 ⁻⁷	8	6 5 4
	Bipolar (Series)	0.48	1.4	3.9	2.8	6.8			
	Unipolar	0.39	2	2.8	1.4	1.7			
PK266M-01A PK266M-01B	Bipolar (Series)	1.17	0.71	11	14.8	50.8	300×10 ⁻⁷	6	3 2
	Unipolar	0.9	1	7.4	7.4	12.7			
PK266M-02A PK266M-02B	Bipolar (Series)	1.17	1.4	5	3.6	12.8	300×10 ⁻⁷	6	3 2
	Unipolar	0.9	2	3.6	1.8	3.2			
PK266M-03A PK266M-03B	Bipolar (Series)	1.17	2.1	3.2	1.5	5.8	300×10 ⁻⁷	6	3 2
	Unipolar	0.9	3	2.3	0.75	1.45			
PK266M-E2.0A PK266M-E2.0B	Bipolar (Parallel)	1.17	2.8	2.52	0.9	3.2	300×10 ⁻⁷	8	6 5 4
	Bipolar (Series)	1.17	1.4	5	3.6	12.8			
	Unipolar	0.9	2	3.6	1.8	3.2			
PK268M-01A PK268M-01B	Bipolar (Series)	1.75	0.71	12	17.2	77.6	480×10 ⁻⁷	6	3 2
	Unipolar	1.35	1	8.6	8.6	19.4			
PK268M-02A PK268M-02B	Bipolar (Series)	1.75	1.4	6.3	4.5	19.2	480×10 ⁻⁷	6	3 2
	Unipolar	1.35	2	4.5	2.25	4.8			
PK268M-03A PK268M-03B	Bipolar (Series)	1.75	2.1	4.2	2	8.4	480×10 ⁻⁷	6	3 2
	Unipolar	1.35	3	3	1	2.1			
PK268M-E2.0A PK268M-E2.0B	Bipolar (Parallel)	1.75	2.8	3.16	1.13	4.8	480×10 ⁻⁷	8	6 5 4
	Bipolar (Series)	1.75	1.4	6.3	4.5	19.2			
	Unipolar	1.35	2	4.5	2.25	4.8			

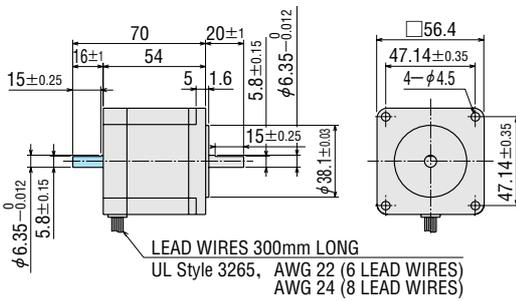
●Degree of Protection: IP30

■ **Dimensions unit: mm**

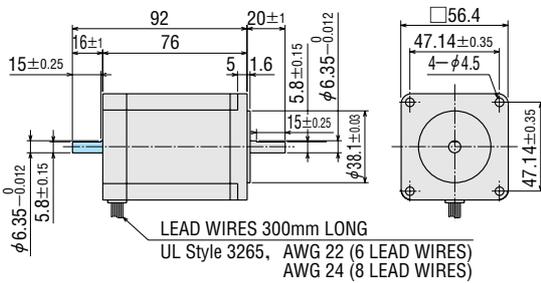
- **PK264M-0□A, PK264M-E2.0A** (Single Shaft) Mass 0.45 kg
- **PK264M-0□B, PK264M-E2.0B** (Double Shaft) Mass 0.45 kg



- **PK266M-0□A, PK266M-E2.0A** (Single Shaft) Mass 0.7 kg
- **PK266M-0□B, PK266M-E2.0B** (Double Shaft) Mass 0.7 kg



- **PK268M-0□A, PK268M-E2.0A** (Single Shaft) Mass 1 kg
- **PK268M-0□B, PK268M-E2.0B** (Double Shaft) Mass 1 kg

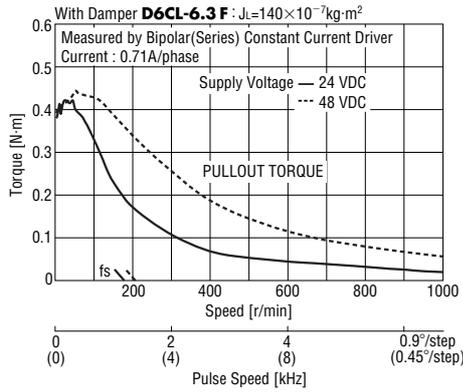


● These dimensions are for double shaft models. For single shaft, ignore the colored areas.

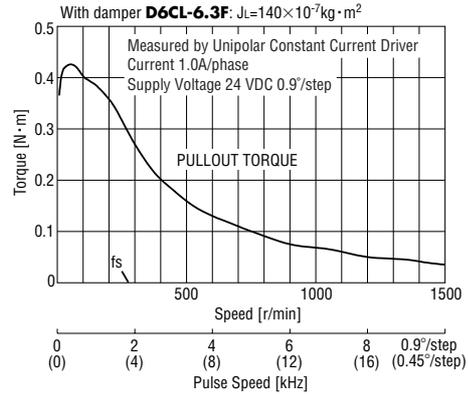
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

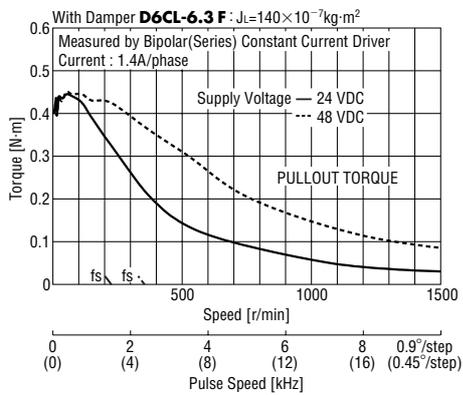
PK264M-01B Bipolar (Series)



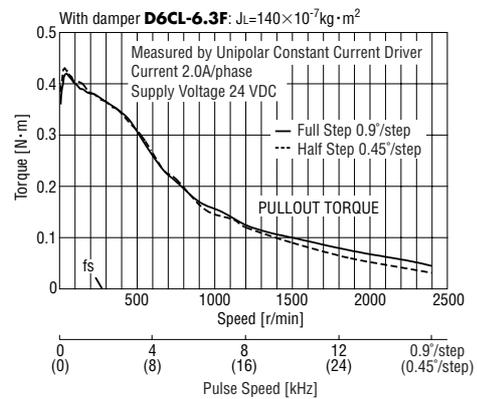
PK264M-01B Unipolar



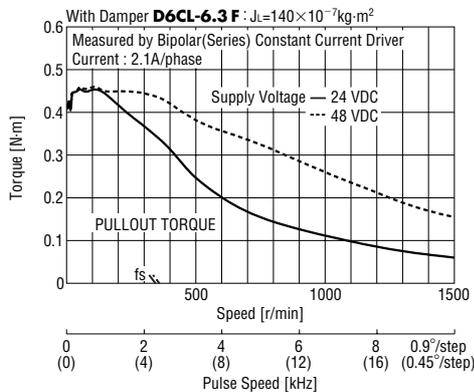
PK264M-02B Bipolar (Series)



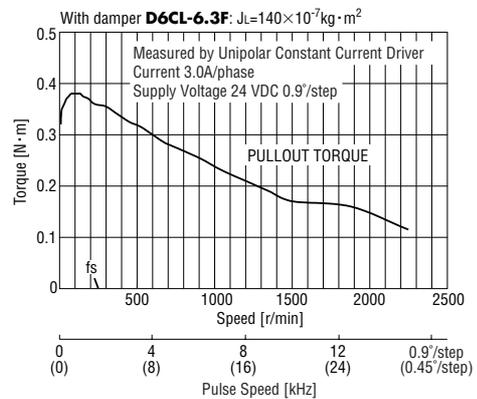
PK264M-02B Unipolar



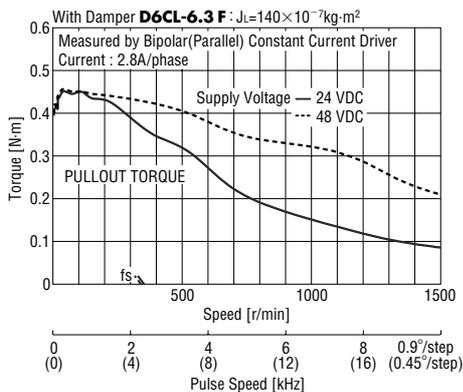
PK264M-03B Bipolar (Series)



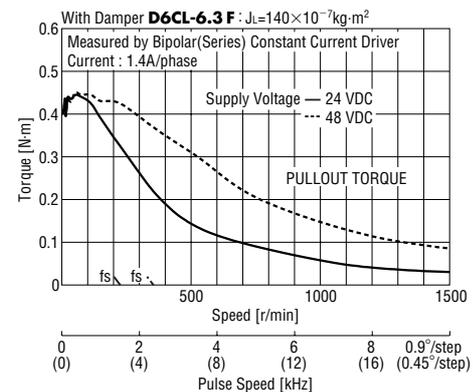
PK264M-03B Unipolar



PK264M-E2.0B Bipolar (Parallel)



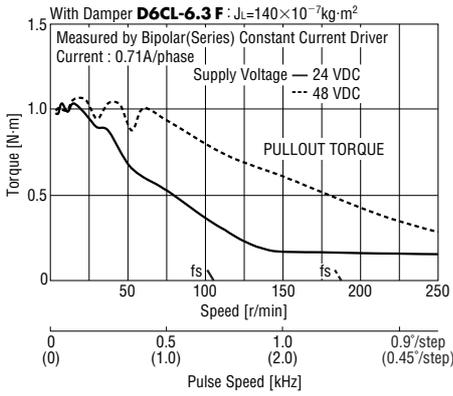
PK264M-E2.0B Bipolar (Series)



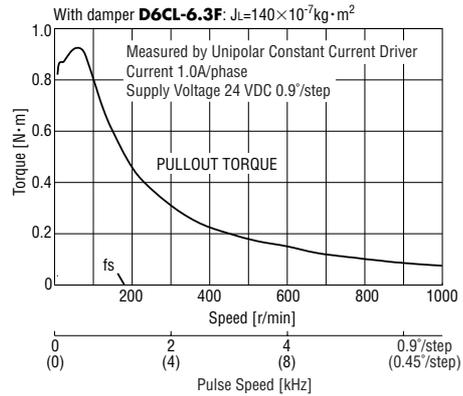
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

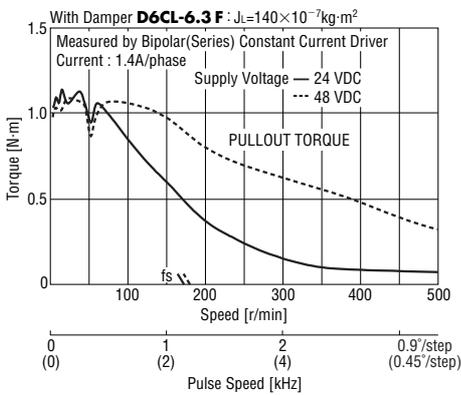
● **PK266M-01B Bipolar (Series)**



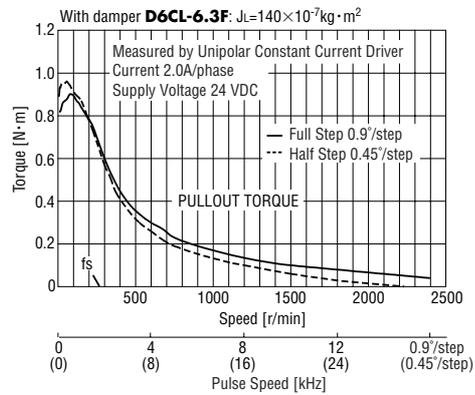
● **PK266M-01B Unipolar**



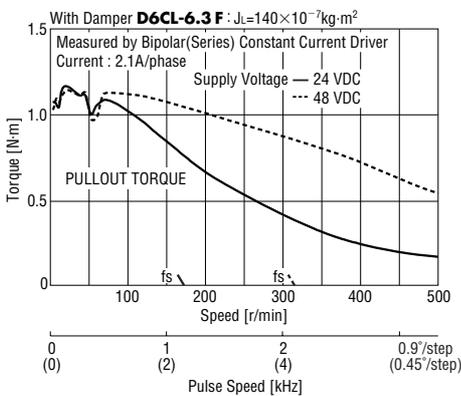
● **PK266M-02B Bipolar (Series)**



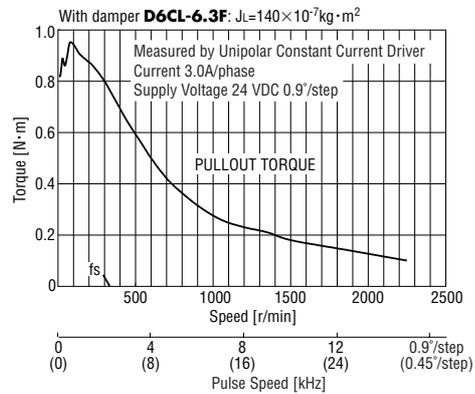
● **PK266M-02B Unipolar**



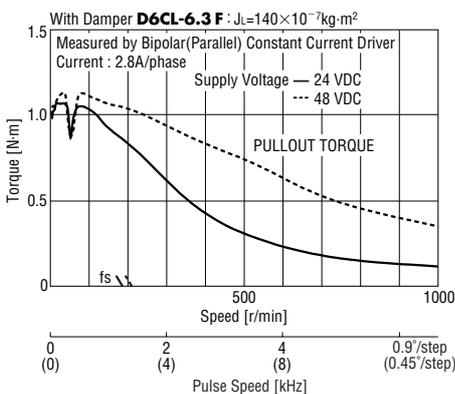
● **PK266M-03B Bipolar (Series)**



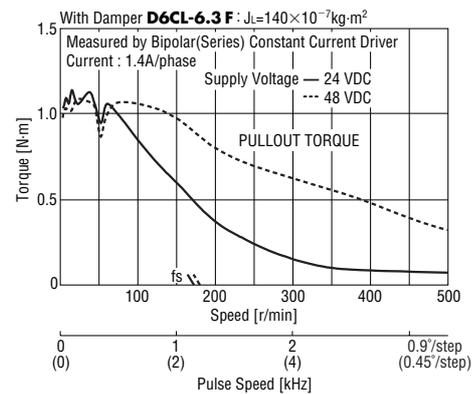
● **PK266M-03B Unipolar**



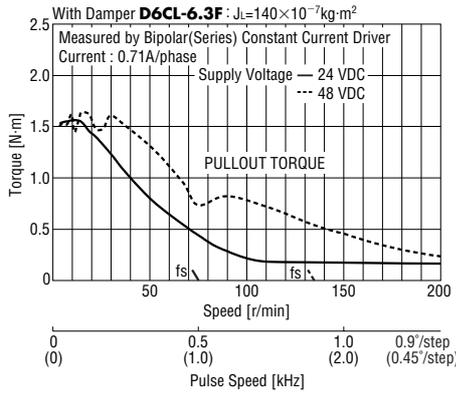
● **PK266M-E2.0B Bipolar (Parallel)**



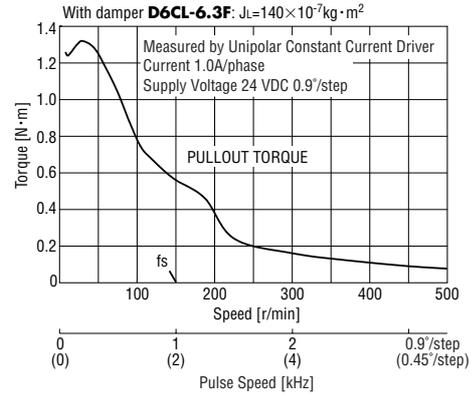
● **PK266M-E2.0B Bipolar (Series)**



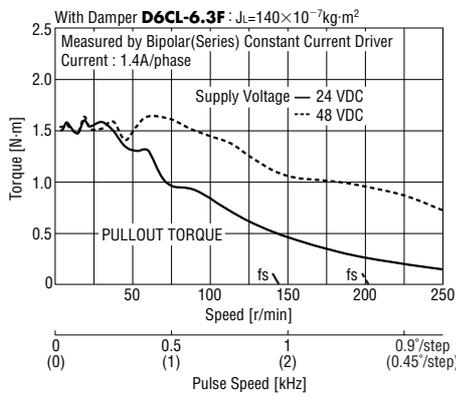
●PK268M-01B Bipolar (Series)



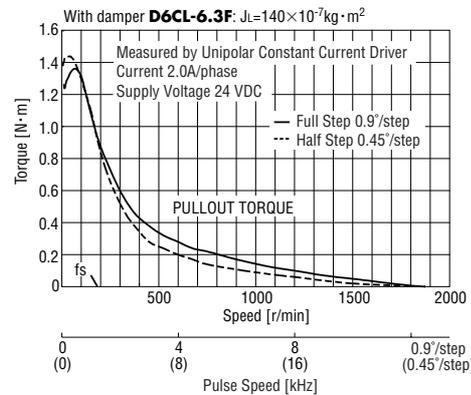
●PK268M-01B Unipolar



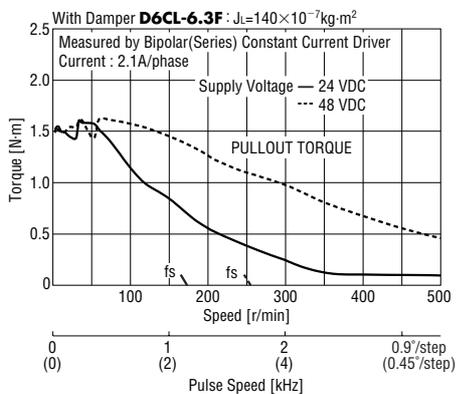
●PK268M-02B Bipolar (Series)



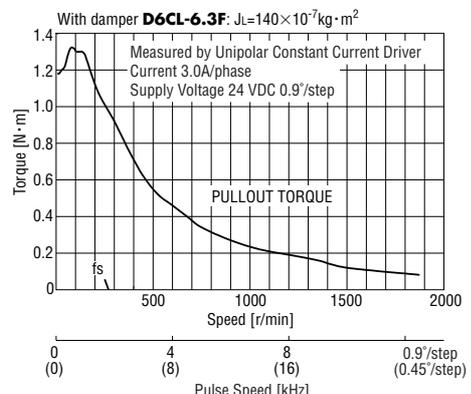
●PK268M-02B Unipolar



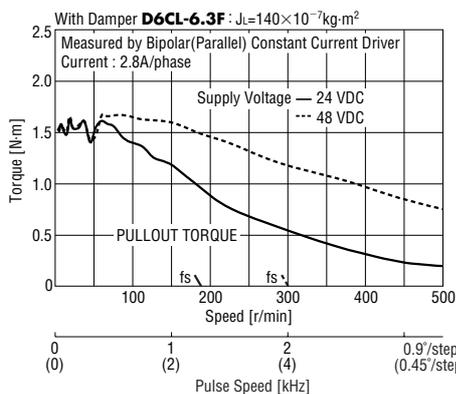
●PK268M-03B Bipolar (Series)



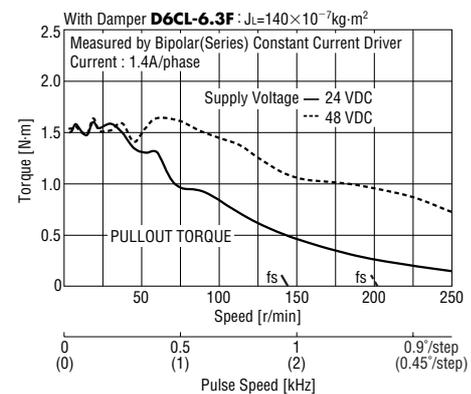
●PK268M-03B Unipolar



●PK268M-E2.0B Bipolar (Parallel)



●PK268M-E2.0B Bipolar (Series)



□ **60 mm**

SH Geared Type



Specifications

● **Motor Specifications**

Model Single Shaft Double Shaft	Connection Type	Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J	Lead Wires (Pin)	Connection Diagram (see page 10)
		A/phase	V DC	Ω/phase	mH/phase	kg·m ²		
PK264AE-SG □ PK264BE-SG □	Bipolar (Parallel)	2.8	1.96	0.7	1.4	120×10 ⁻⁷	8	6
	Bipolar (Series)	1.4	3.9	2.8	5.6			5
	Unipolar	2	2.8	1.4	1.4			4

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

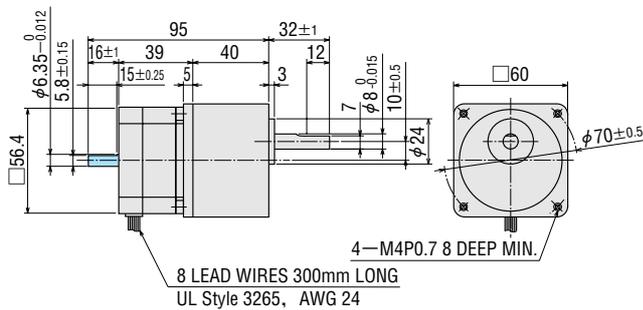
●Degree of Protection: IP30

● **Gearmotor Specifications**

Model Single Shaft Double Shaft	Gear Ratio	Holding Torque	Step Angle	Permissible Speed	Permissible Thrust Load	Permissible Overhung Load (at 10mm from shaft end)
		N·m				
PK264AE-SG3.6 PK264BE-SG3.6	1:3.6	1	0.5°	500	30	50
PK264AE-SG7.2 PK264BE-SG7.2	1:7.2	2	0.25°	250	30	50
PK264AE-SG9 PK264BE-SG9	1:9	2.5	0.2°	200	30	50
PK264AE-SG10 PK264BE-SG10	1:10	2.7	0.18°	180	30	50
PK264AE-SG18 PK264BE-SG18	1:18	3	0.1°	100	30	120
PK264AE-SG36 PK264BE-SG36	1:36	4	0.05°	50	30	120

■ **Dimensions unit: mm**

- PK264AE-SG**□ (Single Shaft) Mass 0.75 kg
- PK264BE-SG**□ (Double Shaft) Mass 0.75 kg



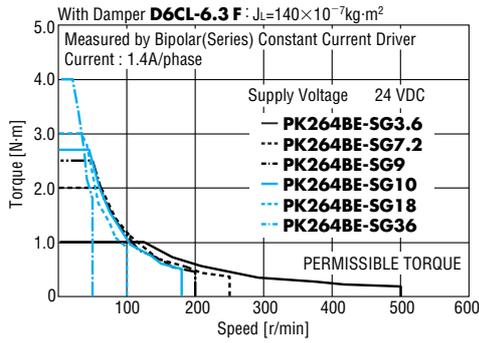
Mounting Screws (included)
M4 P0.7 15mm long: 4 pieces

●This dimension is for double shaft models. For single shaft, ignore the colored area.

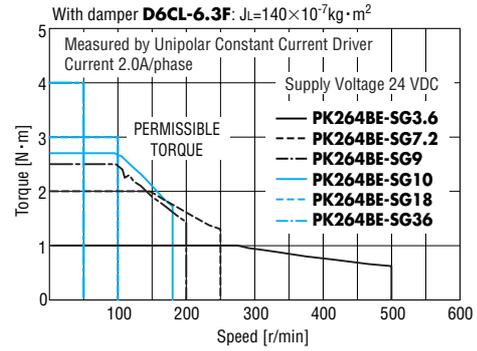
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

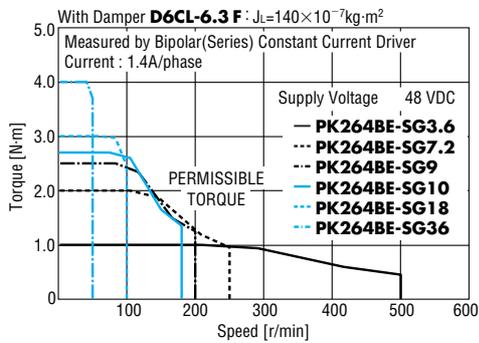
●PK264BE-SG Bipolar (Series) 24 VDC



●PK264BE-SG Unipolar



●PK264BE-SG Bipolar (Series) 48 VDC



□ **60 mm**

Step Angle 1.8°
J Type (High Inertia Capability)



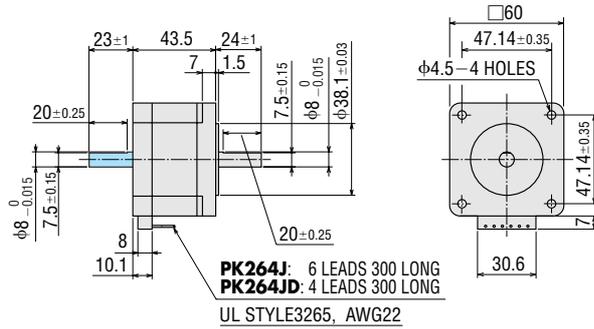
Specifications

Model Single Shaft Double Shaft	Connection Type	Holding Torque N·m	Current per Phase A/phase	Voltage V DC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J kg·m ²	Lead Wires (Pin)	Connection Diagram (see page 10)
PK264JDA PK264JDB	Bipolar	1.06	2.8	2.1	0.73	1.8	280×10 ⁻⁷	4	1
PK264JA PK264JB	Bipolar (Series)	1.06	1.4	4.1	2.92	7.2	280×10 ⁻⁷	6	3
	Unipolar	0.75	2	2.9	1.46	1.8			2
PK266JDA PK266JDB	Bipolar	1.75	2.8	2.8	1	3.05	450×10 ⁻⁷	4	1
PK266JA PK266JB	Bipolar (Series)	1.75	1.4	5.6	4	12.2	450×10 ⁻⁷	6	3
	Unipolar	1.35	2	4	2	3.05			2
PK267JDA PK267JDB	Bipolar	2.2	2.8	3.4	1.2	3.54	570×10 ⁻⁷	4	1
PK267JA PK267JB	Bipolar (Series)	2.2	1.4	6.7	4.8	14.2	570×10 ⁻⁷	6	3
	Unipolar	1.7	2	4.8	2.4	3.54			2
PK269JDA PK269JDB	Bipolar	3.1	2.8	4.2	1.49	5.7	900×10 ⁻⁷	4	1
PK269JA PK269JB	Bipolar (Series)	3.1	1.4	8.3	5.96	22.8	900×10 ⁻⁷	6	3
	Unipolar	2.2	2	6	2.98	5.7			2

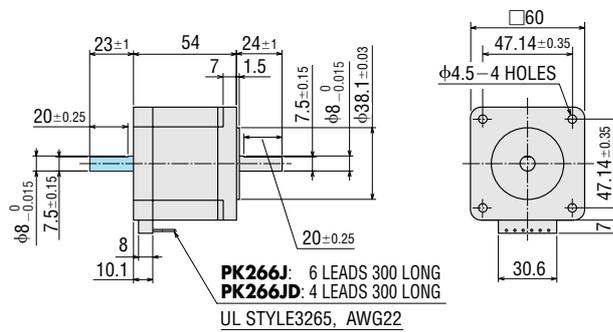
●Degree of Protection: IP30

■ Dimensions unit: mm

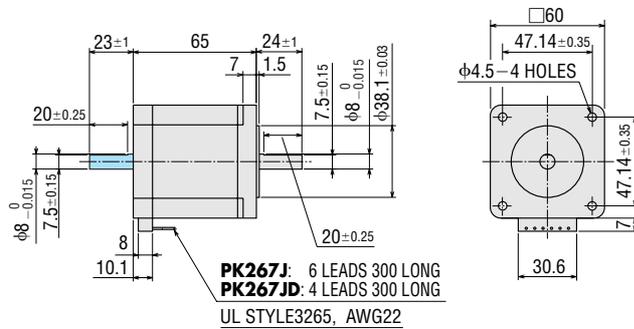
- **PK264JDA, PK264JA** (Single Shaft) Mass 0.6 kg
- **PK264JDB, PK264JB** (Double Shaft) Mass 0.6 kg



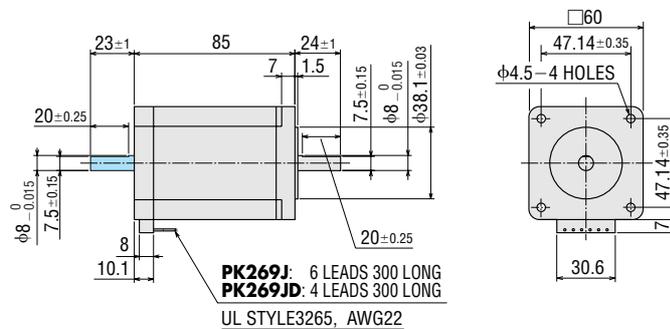
- **PK266JDA, PK266JA** (Single Shaft) Mass 0.83 kg
- **PK266JDB, PK266JB** (Double Shaft) Mass 0.83 kg



- **PK267JDA, PK267JA** (Single Shaft) Mass 1.02 kg
- **PK267JDB, PK267JB** (Double Shaft) Mass 1.02 kg



- **PK269JDA, PK269JA** (Single Shaft) Mass 1.43 kg
- **PK269JDB, PK269JB** (Double Shaft) Mass 1.43 kg

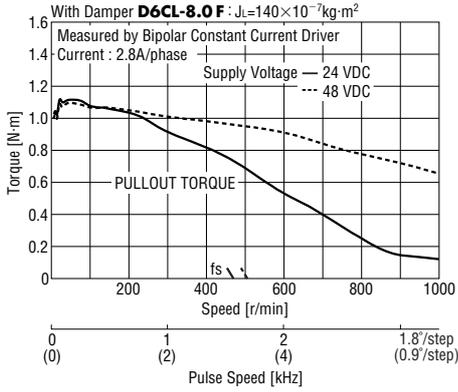


● These dimensions are for double shaft models. For single shaft, ignore the colored areas.

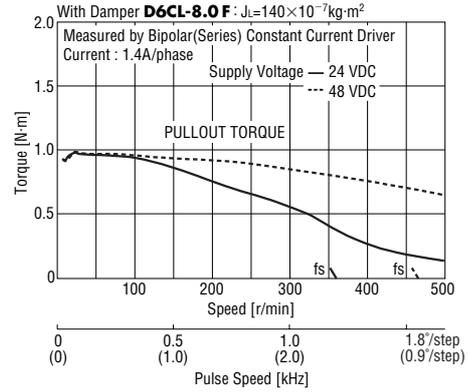
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

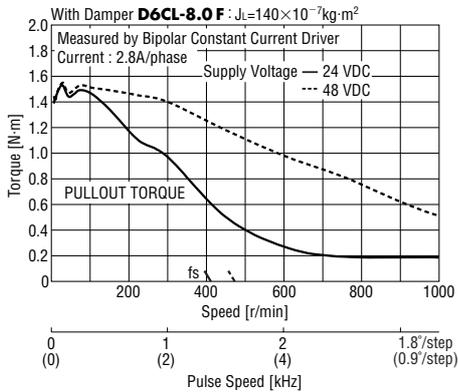
●PK264JDB Bipolar



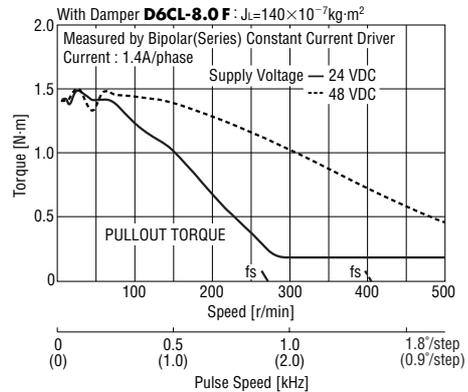
●PK264JB Bipolar (Series)



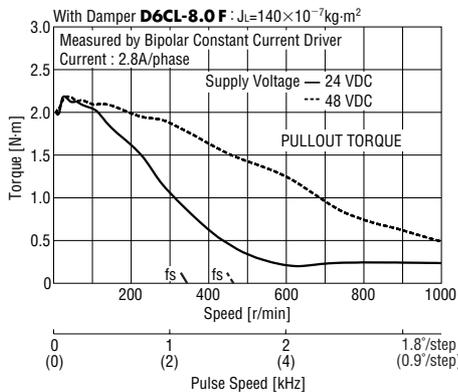
●PK266JDB Bipolar



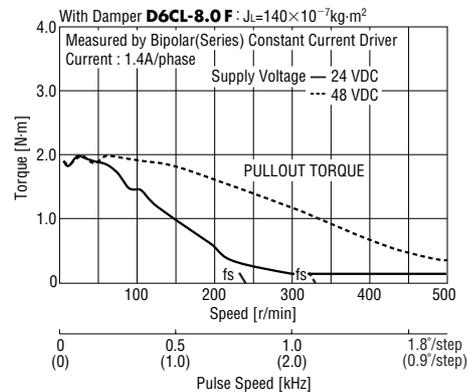
●PK266JB Bipolar (Series)



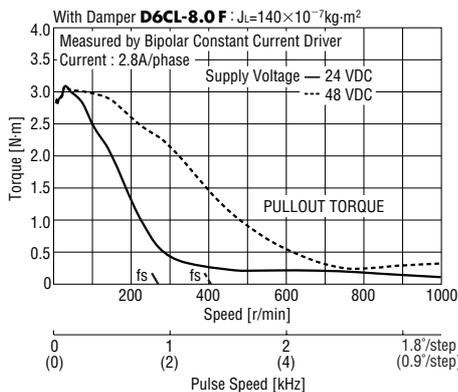
●PK267JDB Bipolar



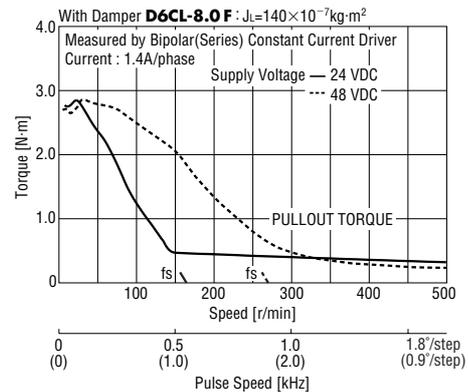
●PK267JB Bipolar (Series)



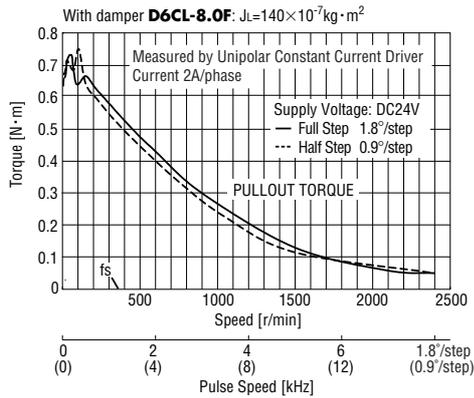
●PK269JDB Bipolar



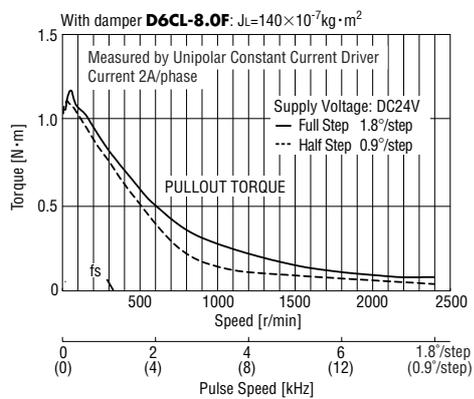
●PK269JB Bipolar (Series)



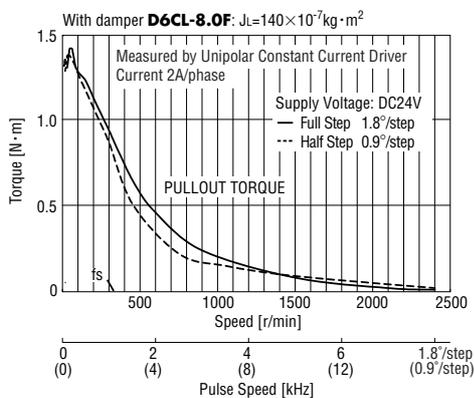
● **PK264JB** Unipolar



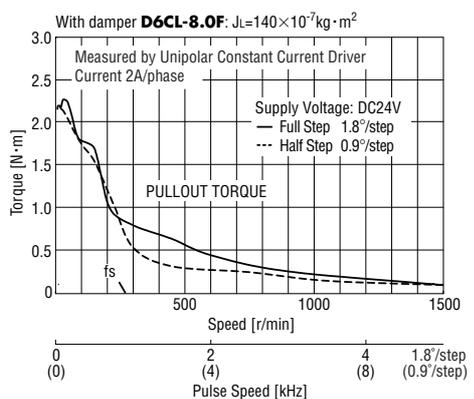
● **PK266JB** Unipolar



● **PK267JB** Unipolar

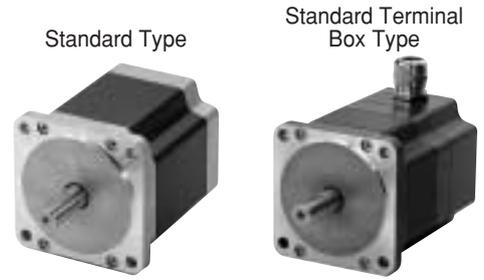


● **PK269JB** Unipolar



□ **85 mm**

Step Angle 1.8°
Standard Type
Standard Terminal Box Type



Specifications

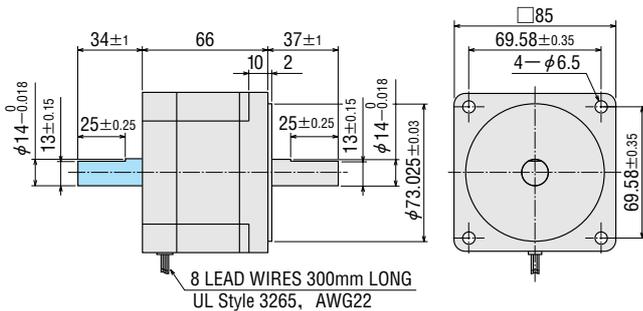
Model	Connection Type	Holding Torque N·m	Current per Phase A/phase	Voltage V DC	Resistance per Phase Ω/phase	Inductance mH/phase	Rotor Inertia J kg·m ²	Lead Wires (Pin)	Connection Diagram* (see page 10)		
PK296-E4.5A PK296-E4.5B PK296-E4.5T	Bipolar (Parallel) Bipolar (Series) Unipolar	3.1 3.1 2.2	6.3 3.18 4.5	1.4 2.8 2	0.24 0.96 0.48	1.5 6.0 1.5	1400×10 ⁻⁷	8	6 5 4		
PK299-E4.5A PK299-E4.5B PK299-E4.5T	Bipolar (Parallel) Bipolar (Series) Unipolar	6.2 6.2 4.4	6.3 3.18 4.5	1.9 3.9 2.8	0.33 1.32 0.66	2.5 10.0 2.5			2700×10 ⁻⁷	8	6 5 4
PK2913-E4.0A PK2913-E4.0B PK2913-E4.0T	Bipolar (Parallel) Bipolar (Series) Unipolar	9.3 9.3 6.6	5.6 2.8 4	2.6 5.3 3.8	0.49 1.94 0.97	4.2 16.8 4.2					4000×10 ⁻⁷

- Degree of Protection Standard type: IP30
Standard Terminal box type: IP65 (Except for mounting surface)

* See page 53 for the connection diagrams of terminal box type.

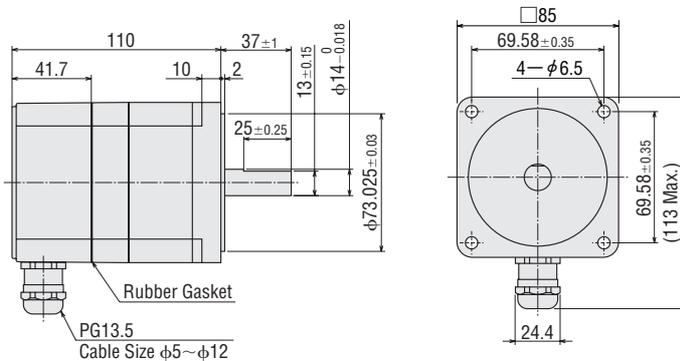
■ Dimensions unit: mm

- **PK296-E4.5A** (Single Shaft) Mass 1.7 kg
- **PK296-E4.5B** (Double Shaft) Mass 1.7 kg



- This dimension is for double shaft models.
For single shaft, ignore the colored area.

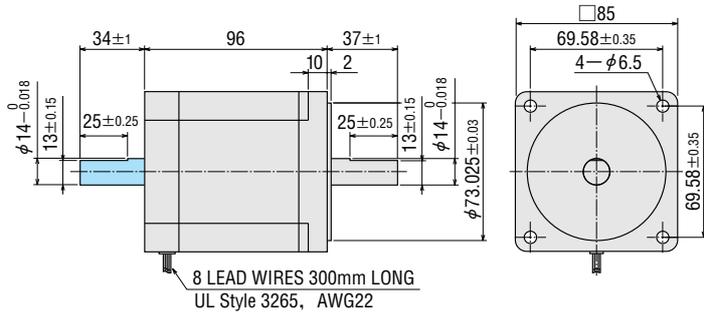
- **PK296-E4.5T** (Single Shaft) Mass 2.1 kg



■ Safety Standards and CE Marking

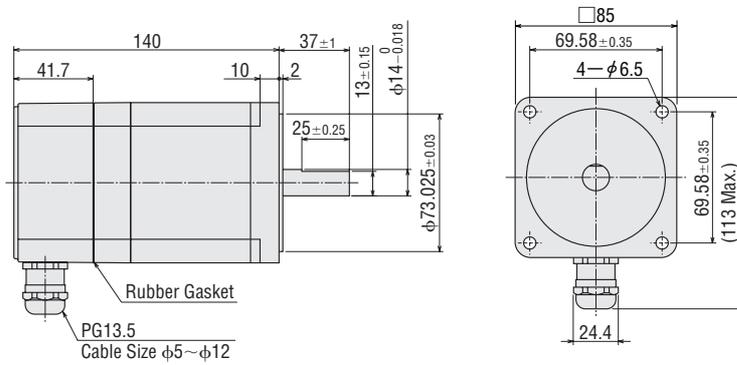
Standards	CE Marking
IEC60664-1 EN60034-1 EN60034-5	Low Voltage Directive (72/23/EEC)

- **PK299-E4.5A** (Single Shaft) Mass 2.8 kg
- **PK299-E4.5B** (Double Shaft) Mass 2.8 kg

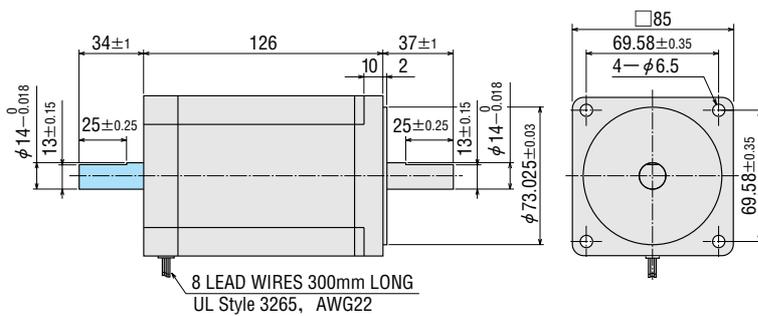


- This dimension is for double shaft models. For single shaft, ignore the colored area.

- **PK299-E4.5T** (Single Shaft) Mass 3.2 kg

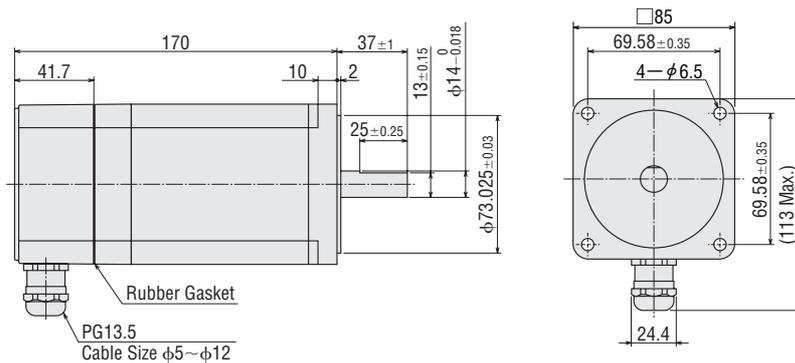


- **PK2913-E4.0A** (Single Shaft) Mass 3.8 kg
- **PK2913-E4.0B** (Double Shaft) Mass 3.8 kg



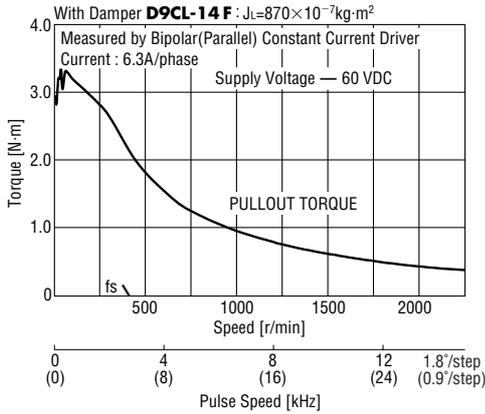
- This dimension is for double shaft models. For single shaft, ignore the colored area.

- **PK2913-E4.0T** (Single Shaft) Mass 4.3 kg

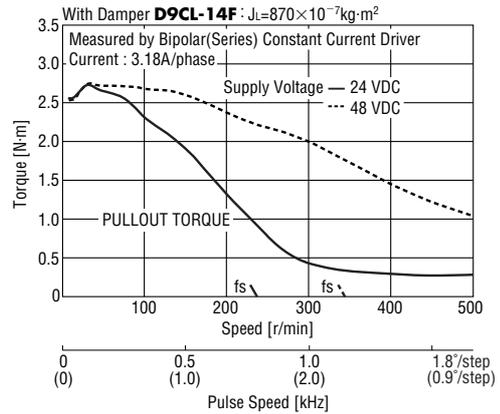


Speed-Torque Characteristics fs: Maximum Starting Pulse Rate

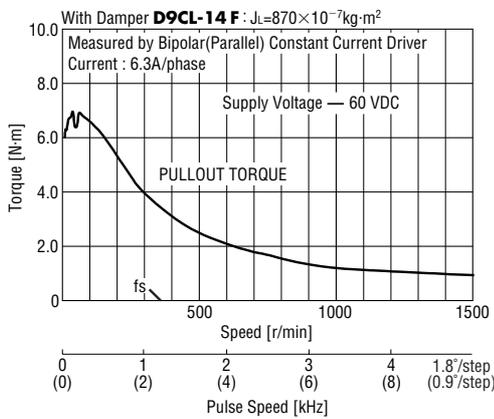
● **PK296-E4.5B, PK296-E4.5T** Bipolar (Parallel)



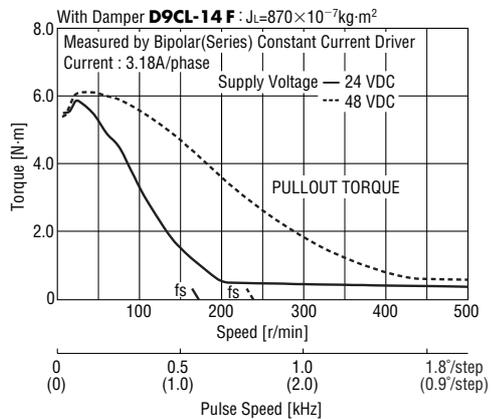
● **PK296-E4.5B, PK296-E4.5T** Bipolar (Series)



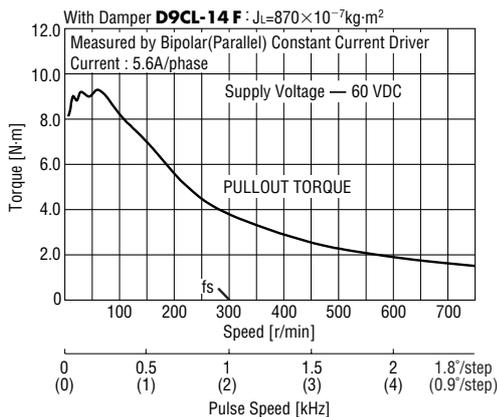
● **PK299-E4.5B, PK299-E4.5T** Bipolar (Parallel)



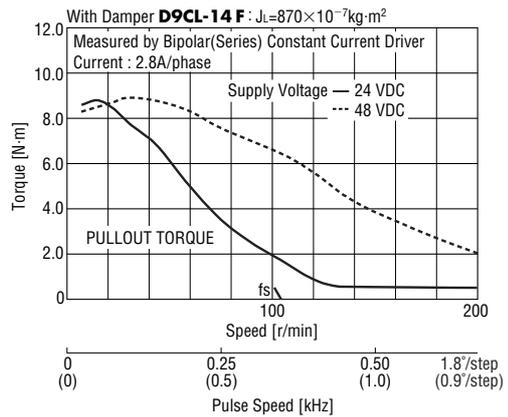
● **PK299-E4.5B, PK299-E4.5T** Bipolar (Series)



● **PK2913-E4.0B, PK2913-E4.0T** Bipolar (Parallel)



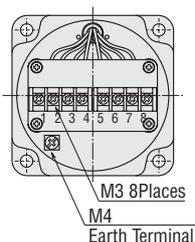
● **PK2913-E4.0B, PK2913-E4.0T** Bipolar (Series)



Terminal Box

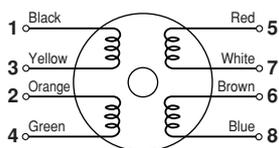
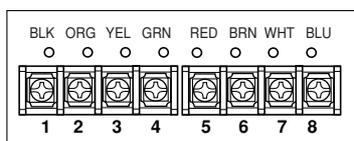
Terminal Box Layout

Remove cover for access to terminal board



Motor Wirings

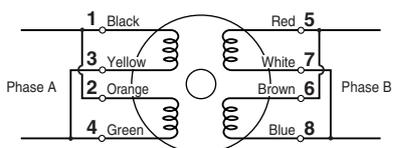
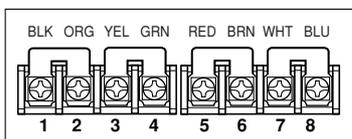
The figure below shows the relationship between each coil (phase) of the motor and the color of the corresponding leads. Use the supplied short bars to provide a connection of the desired method.



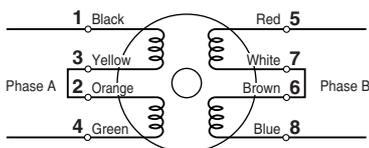
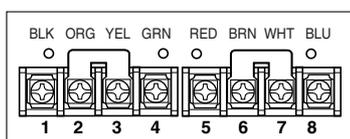
Wirings Connection Diagrams

Connect the supplies short bars (four pieces) as shown in the figure.

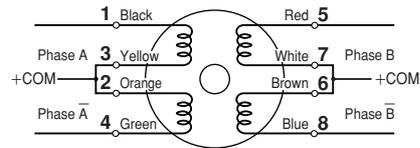
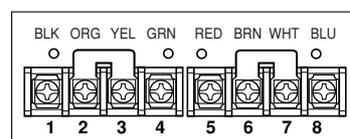
Bipolar (Parallel)



Bipolar (Series)



Unipolar



□ **90 mm**

SH Geared Type



Specifications

● **Motor Specifications**

Model Single Shaft Double Shaft	Connection Type	Current per Phase	Voltage	Resistance per Phase	Inductance	Rotor Inertia J	Lead Wires (Pin)	Connection Diagram (see page 10)
		A/phase	V DC	Ω/phase	mH/phase	kg·m ²		
PK296AE-SG □ PK296BE-SG □	Bipolar (Parallel)	4.2	1	0.24	1.5	1400×10 ⁻⁷	8	6
	Bipolar (Series)	2.1	2	0.96	6.0			5
	Unipolar	3	1.4	0.48	1.5			4

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

●Degree of Protection: IP30

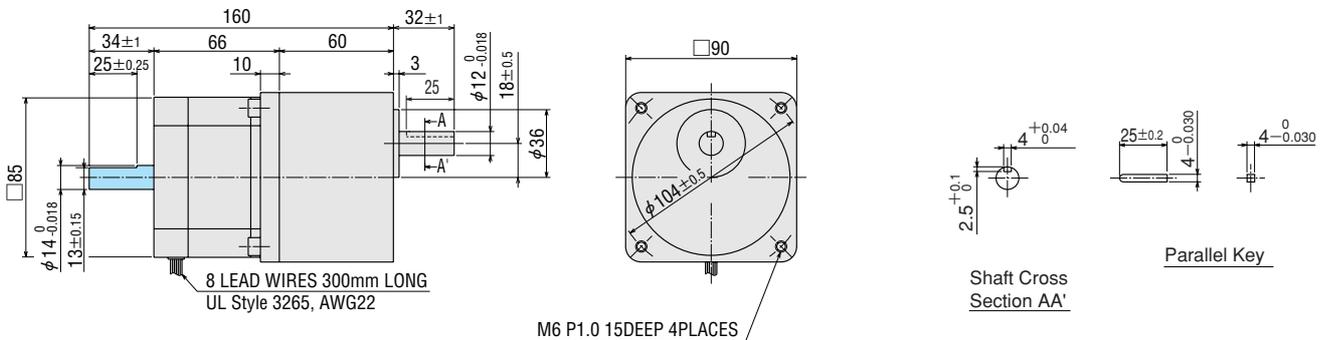
● **Gearmotor Specifications**

Model Single Shaft Double Shaft	Gear Ratio	Holding Torque N·m	Step Angle	Permissible Speed r/min	Permissible Thrust Load N	Permissible Overhung Load (at 10mm from shaft end) N
PK296AE-SG3.6 PK296BE-SG3.6	1:3.6	2.5	0.5°	500	100	300
PK296AE-SG7.2 PK296BE-SG7.2	1:7.2	5	0.25°	250	100	300
PK296AE-SG9 PK296BE-SG9	1:9	6.3	0.2°	200	100	300
PK296AE-SG10 PK296BE-SG10	1:10	7	0.18°	180	100	300
PK296AE-SG18 PK296BE-SG18	1:18	9	0.1°	100	100	300
PK296AE-SG36 PK296BE-SG36	1:36	12	0.05°	50	100	300

■ **Dimensions unit: mm**

●**PK296AE-SG**□ (Single Shaft) Mass 2.8 kg

●**PK296BE-SG**□ (Double Shaft) Mass 2.8 kg



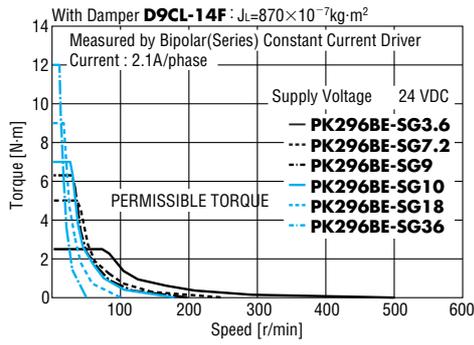
Mounting Screws (included)
M6 P1.0 18mm long: 4 pieces

●This dimension is for double shaft models. For single shaft, ignore the colored area.

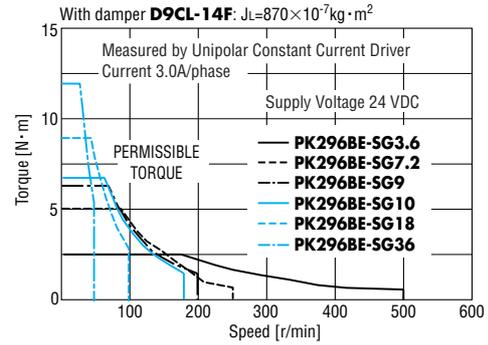
Speed-Torque Characteristics

fs: Maximum Starting Pulse Rate

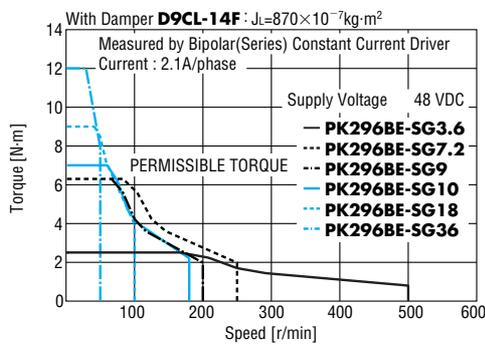
●PK296BE-SG □ Bipolar (Series) 24 VDC



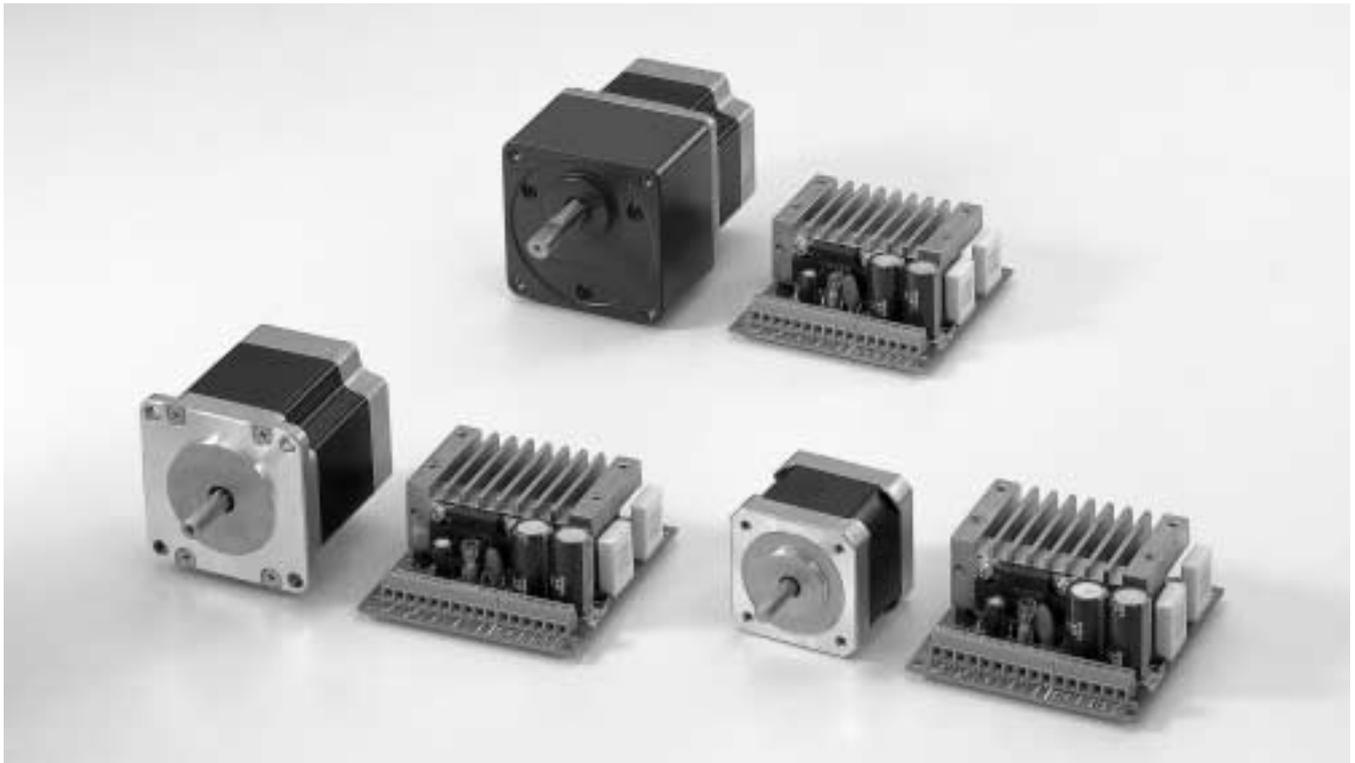
●PK296BE-SG □ Unipolar



●PK296BE-SG □ Bipolar (Series) 48 VDC



CSK Series



Product Specifications of CSK Series

Type	Model Name			Full Step Angle	Holding Torque N·m	Current per Phase A/phase	Page with Speed-torque Characteristics (Unipolar)
	Package Model	Motor Model	Driver Model				
Standard Type	CSK243-□T	PK243-01□	CSD2109-T	1.8°	0.16	0.95	P.23
	CSK244-□T	PK244-01□	CSD2112-T		0.26	1.2	P.24
	CSK245-□T	PK245-01□			0.32		P.25
	CSK264-□T	PK264-02□	CSD2120-T		0.39	2	P.36
	CSK266-□T	PK266-02□			0.9		P.37
	CSK268-□T	PK268-02□			1.35		P.38
High Resolution Type	CSK243M□T	PK243M-01□*	CSD2109-T	0.9°	0.16	0.95	P.29
	CSK244M□T	PK244M-01□*	CSD2112-T		0.26	1.2	P.30
	CSK245M□T	PK245M-01□*			0.32		P.31
	CSK264M□T	PK264M-02□*	CSD2120-T		0.39	2	P.41
	CSK266M□T	PK266M-02□*			0.9		P.42
	CSK268M□T	PK268M-02□*			1.35		P.43
SH Geared Type	CSK243□T-SG3.6	PK243□1-SG3.6	CSD2109-T	0.5°	0.2	0.95	P.33
	CSK243□T-SG7.2	PK243□1-SG7.2		0.25°	0.4		
	CSK243□T-SG9	PK243□1-SG9		0.2°	0.5		
	CSK243□T-SG10	PK243□1-SG10		0.18°	0.56		
	CSK243□T-SG18	PK243□1-SG18		0.1°	0.8		
	CSK243□T-SG36	PK243□1-SG36		0.05°	0.8		
	CSK264□T-SG3.6	PK264□2-SG3.6	CSD2120-T	0.5°	1	2	P.45
	CSK264□T-SG7.2	PK264□2-SG7.2		0.25°	2		
	CSK264□T-SG9	PK264□2-SG9		0.2°	2.5		
	CSK264□T-SG10	PK264□2-SG10		0.18°	2.7		
	CSK264□T-SG18	PK264□2-SG18		0.1°	3		
	CSK264□T-SG36	PK264□2-SG36		0.05°	4		

●Enter A (single shaft) or B (double shaft) in the box (□) within the model names.

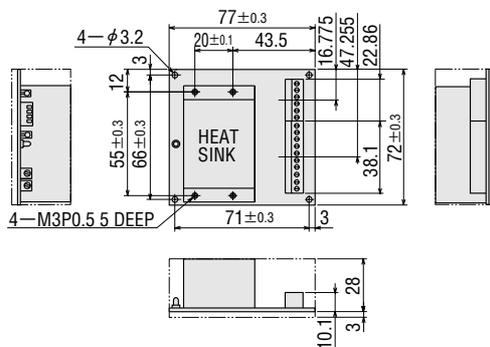
* The actual motor model names are changed for package model. The specifications and characteristics are not changed.

Driver Specifications

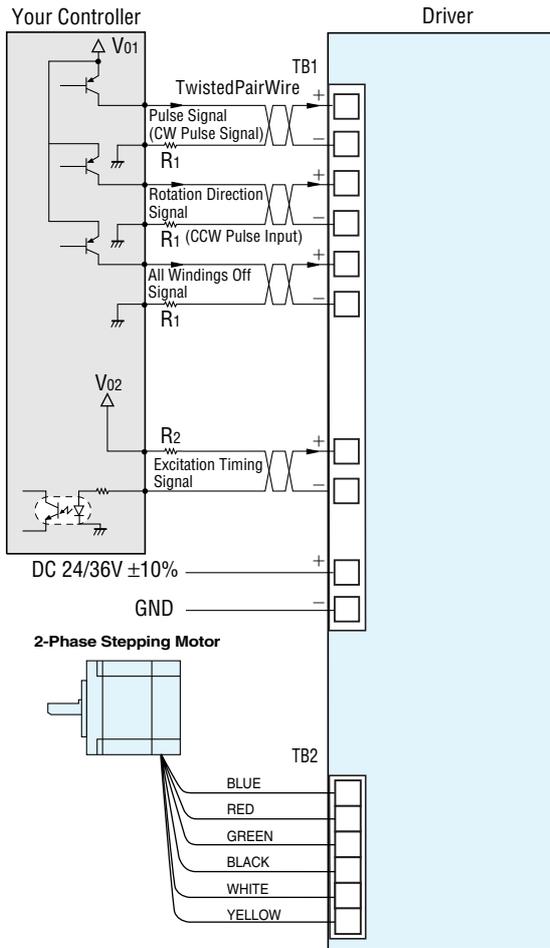
Driver Model	CSD2109-T	CSD2112-T	CSD2120-T
Power Source	DC 24V±10% 1.4A maximum DC 36V±10% 1.4A maximum	DC 24V±10% 1.6A maximum DC 36V±10% 1.6A maximum	DC 24V±10% 2.8A maximum DC 36V±10% 2.8A maximum
Output Current	A/phase 0.95	1.2	2
Excitation Mode	Full step: Standard Type: 1.8°/step (2 phase excitation), High Resolution Type: 0.9°/step (2 phase excitation) Half step: Standard Type: 0.9°/step (1-2 phase excitation), High Resolution Type: 0.45°/step (1-2 phase excitation)		
Input Signals	Input signal Circuit	Photocoupler Input, Input Resistance 220Ω, Input Current 20mA maximum Signal Voltage Photocoupler ON: +4~+5V, Photocoupler OFF: 0~+0.5V	
	·Pulse Signal (CW Pulse Signal)	Step Command Pulse Signal (CW Direction Command Pulse Signal at 2-pulse input mode) Pulse Width: 5μs minimum, Pulse Rise/Pulse Fall time: 2μs maximum Motor moves when the photocoupler state changes from ON to OFF.	
	·Rotation Direction Signal (CCW Pulse Signal)	Rotation Direction Command Pulse Signal Photocoupler ON: CW, Photocoupler OFF: CCW (CCW Direction Command Pulse Signal at 2-pulse input mode) Pulse Width: 5μs minimum, Pulse Rise/Pulse Fall Time: 2μs maximum Motor moves when the photocoupler state changes from ON to OFF.	
	·All Windings Off signal	When in the "Photocoupler ON" state the current to the motor is cut off and the motor shaft can be rotated naturally. When in the "Photocoupler OFF" state the current level set by the RUN potentiometer is supplied to the motor.	
Output Signals	Output Signal Circuit	Photocoupler, Open-Collector Output External use condition: 24V DC maximum, 10mA maximum	
	·Excitation Timing Signal	The signal is output every time the excitation sequence returns to the initial stage "0". (Photocoupler: ON) Full Step: Signal is output every 4 pulses, half Step: Signal is output every 8 pulses.	
Functions	Automatic Current Cutback, Pulse Input Mode Switch, Step Angle Switch, Power Supply Voltage Switch		
Driver Cooling Method	Natural Ventilation		
Mass	0.13	0.13	0.13
Ambient Temperature	0°C~+40°C		

Driver Dimensions unit: mm

Driver Model: CSD2109-T, CSD2112-T, CSD2120-T



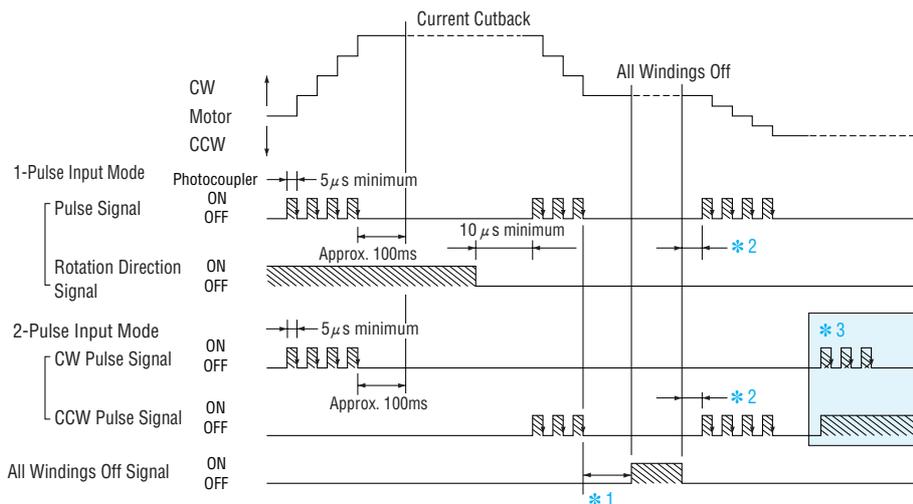
Wiring Diagram



Notes regarding wiring

1. Keep the voltage V_{01} and V_{02} between DC5V and DC24V. When V_{01} is equal to DC5V, the external resistances R_1 is not necessary. When V_{01} is above DC5V, connect R_1 to keep the current below 20mA. When the output current exceeds 10mA, connect the external resistances R_2 to keep the current below 10mA.
2. The transmission frequency will get lower as the pulse line becomes longer and therefore caution should be taken.
3. Use twisted-pair wire of 0.2mm² or thicker and 2m or less in length for the signal line.
4. The suitable wire size for the TB1 and TB2 connectors is between AWG22 and 24. Use wires rated at AWG20 (0.5mm²) for the power line.
5. Signal lines should be kept away at least 10cm from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.
6. If noise generated by the motor lead wire causes problem, try shielding of the motor lead wires with conductive tape or wire mesh.

Timing Chart



The photocopier diode lights in their shaded area.
The motor moves when the photocopier state changes from "ON" to "OFF" as indicated by arrow.

Response up to about 10 KHz with a pulse duty of 50%. When using it at higher speeds, narrow the pulse width.

*** 1:**
It is recommended to wait a period of time to allow the motor oscillations to end before inputting the "All Windings Off" signal. This time varies with the load inertia, the load torque and the starting pulse rate. Signal input must be stopped before the motor stops.

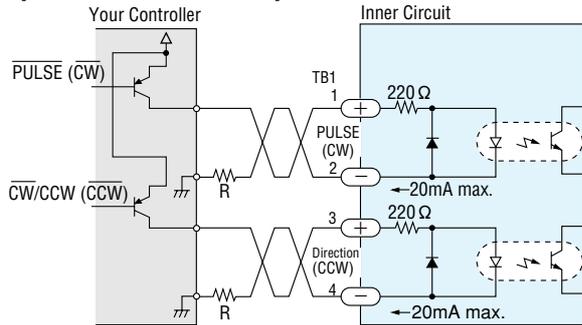
*** 2:**
Never input pulse signals immediately after switching the "All Windings Off" signal to the "photocopier OFF" state or the motor may lose synchronism. In general, an interval of 100ms (minimum) is required.

*** 3:**
At 2-pulse input mode, the motor will not operate properly when inputting a pulse signal while either the CW or CCW pulse is signal is already in the "photocopier ON" state.

■ Description of Input/Output Signals

1. Pulse (Pulse and Direction) Signal

■ Input Circuit and Sample Connection



The characters indicate signals under the 1-pulse input mode, while the characters in parenthesis indicate signals under the 2-pulse input mode. The external resistance R is not needed when V_0 is 5V. When the voltage exceeds 5V, connect the external resistance R to keep input current at 20mA or less.

1-pulse Input Mode

● Pulse Signal

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

The direction of the motor's rotation is determined by the following "Rotation Direction" signal.

● Rotation Direction Signal

The "Rotation Direction" signal is input.

A "photocoupler ON" signal input commands a clockwise direction rotation.

A "photocoupler OFF" signal input commands a counterclockwise direction rotation.

2-pulse Input Mode

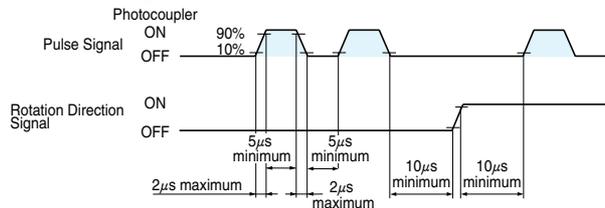
● CW Pulse Signal

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

● CCW Pulse Signal

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

■ Pulse Signal Characteristics



Shaded area indicates the radiation of the photocoupler diode. The motor starts at the trailing edge, shown by the arrow.

Pulse Signal Characteristics

1. The pulse voltage is 4 ~ 5V in the "photocoupler ON" state, and 0 ~ 0.5V in the "photocoupler OFF" state.
2. Input pulses for a pulse width is 5μs or more, the rise/ fall time is 2μs or less and pulse duty is 50% or less.
3. 10μs or more is the standard interval time for switching from CW to CCW. Note that the interval time greatly varies according to the motor and load inertia.

Pulse Signal Input Precautions

Be sure to set the signal in the "photocoupler OFF" state when the pulse signal is at rest.

Setting to the signal in the "photocoupler ON" state will not activate the "Automatic Current Cutback" function.

● 1-pulse Input Mode

Be sure to switch the direction of rotation with the "Pulse" signal in the "photocoupler OFF" state.

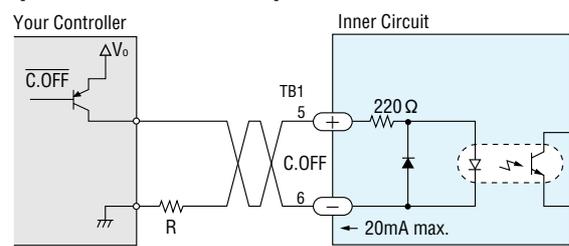
● 2-pulse Input Mode

Do not input CW pulses and CCW pulses at the same time.

When the "CW Pulse" signal or "CCW Pulse" signal is in the "photocoupler ON" state the input of pulses to the other will not rotate the motor normally.

2. C. OFF (All Windings Off) Signal

■ Input Circuit and Sample Connection

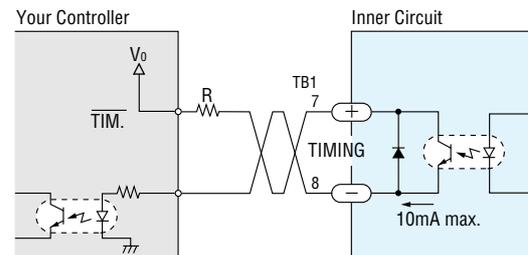


The external resistance R is not needed when V_0 is 5V. When the voltage exceeds 5V, connect the external resistance R to keep input current at 20mA or less.

1. If the "C.OFF" signal is in the "photocoupler ON" state the current does not flow through the motor and the motor shaft can be turned manually. This function can be used when the motor shaft needs external rotation or manual positioning. Be sure to set to the signal in the "photocoupler OFF" state when operating the motor. For regular use, no connections are necessary. The holding torque can be set in proportion to the motor stop current set by the STOP potentiometer.
2. Turning the "C.OFF" signal OFF does not change the excitation sequence (phase) of the motor. When the motor shaft is turned manually with C.OFF input, the shaft may turn $\pm 3.6^\circ$ from the shaft position when C.OFF is released.

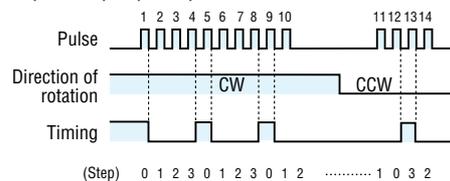
3. TIMING (Excitation Timing) Signal

■ Output Circuit and Sample Connection



Keep the voltage between 5V and 24V and current at 10mA or less.

- 1) The "Excitation Timing" (TIMING) signal indicates that the excitation of the motor is in the initial state (STEP 0). Use this signal to detect the home position accurately by matching the mechanical home position of the device and the excitation home position (STEP 0) of the motor.
- 2) The signal is output once each time the excitation sequence returns to (STEP 0) in synchronization with input pulses. The excitation sequence is designed to complete one cycle as the motor shaft rotates 7.2° . Output is as follows:
Full step: 1 output per 4 pulses
Half step: 1 output per 8 pulses



When used as indicated in the sample connection, the signal is in the "photocoupler ON" state at STEP 0.

Notes: When the power is turned ON, the excitation sequence is reset to STEP 0 and the timing lamp light up.

Motor Accessories

Motor Mounting Bracket



The mounting brackets are useful for maintaining proper alignment between the motor shaft and the load.

- The mounting bracket base is built with holes large enough to allow for alignment adjustment in the horizontal direction.
- Aluminum die cast construction

Model	Applicable Motor
PALOP	PK24□, PK24□P PK24□M
PAL2P-2	PK26□, PK26□J PK26□M
PAL4P-2	PK29□, PK29□T

Note: Mounting brackets are cannot be fitted to **SH** geared motors.

Clean Damper



Simply attaching the clean damper to the motor shaft will sharply reduce vibration at low speed and reduce settling time. The clean damper reduces vibration by mean of a silicon gel and wheel sealed in a heat-resistant plastic case, thus enabling it to be safety used in applications requiring a high degree of cleanliness.

Model	Applicable Motor
D4CL-5.0F	PK22□P, PK223P-SG PK23□P, PK24□ PK24□P, PK24□M PK243-SG
D6CL-6.3F	PK26□, PK26□M PK264-SG
D6CL-8.0F	PK26□J
D9CL-14F	PK29□, PK296-SG

Caution:

- The damper has hexagonal mounting screws in two locations. Make sure that both are securely tightened before operating the motor.
- The damper rotates at the same speed as the motor shaft and should therefore not be touched during operation.

Flexible Coupling



The slit-type coupling is ideal for joining the stepping motor's shaft of the mechanism being given.

Dedicated couplings are available for a range of motor torque.

- No Backlash
- Leaf spring formed by the slit absorbs skewing and end play
- High torsional rigidity, superior responsiveness
- Aluminum alloy construction

Model	Applicable Unit Model
MC12 Type	PK223P, PK224P PK225P
MC16 Type	PK243
MC20 Type	PK244, PK245 PK233P, PK235P
MC25 Type	PK244P, PK264
MC32 Type	PK266, PK268 PK264J
MC40 Type	PK296
MC50 Type	PK299, PK2913

※Please ask for details.

Note: Flexible couplings are cannot be attached to **SH** geared motor types.



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 subject to change without notice.
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