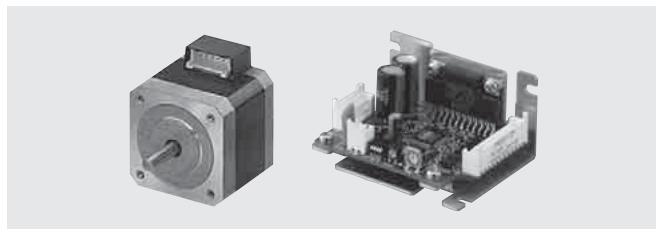


# RoHS Compliant 2-Phase Stepping Motor and Driver Package CMK Series

● Additional Information ●  
Technical reference → Page F-1

The **CMK** Series is a motor and driver package consisting of a 2-phase stepping motor and 24 VDC input microstep driver, allowing for a reduction in the size of your equipment and in vibration.



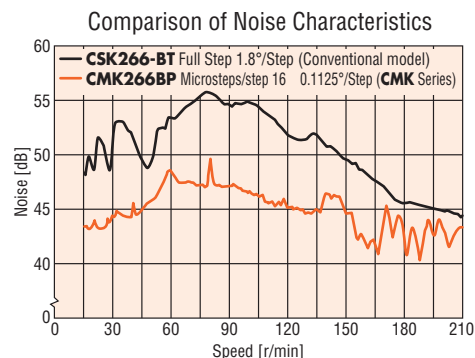
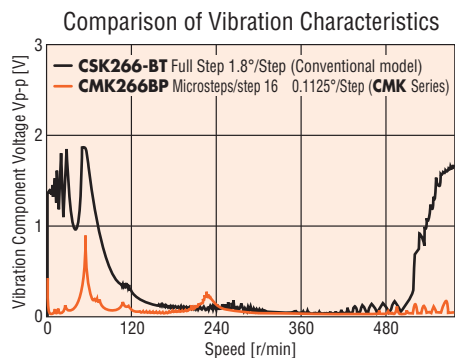
## Features

### ● Achieving Low Vibration and Noise in a Microstep Drive

The newly designed DC board-level microstepping driver is compact and lightweight. The 2-phase stepping motor's basic step angle (1.8°/step) is divided by a maximum of 16 resolutions (0.1125°/step) without the use of a reduction mechanism or other mechanical elements, which contributes to the reduction in noise and vibration of your equipment.

Microsteps/Step	Resolution	Step Angle
1	200	1.8°
2	400	0.9°
4	800	0.45°
8	1600	0.225°
16	3200	0.1125°

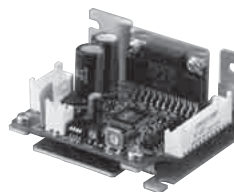
(At basic step angle 1.8°/step)



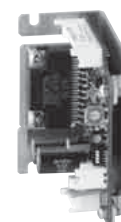
### ● Full Range of Driver Functions

- Five preset step angles
- Operating current can easily be set with a digital switch
- 1-pulse/2-pulse input mode switching
- Power LED
- Connector with lock (by MOLEX)

### ◇ Easy-to-Install Heat Sink Shape



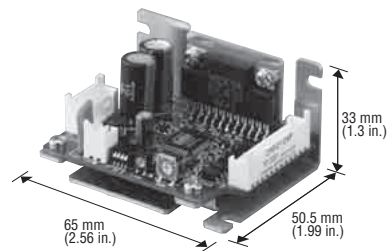
Horizontal Installation



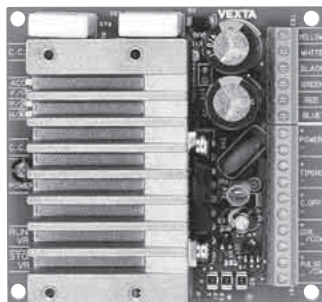
Vertical Installation

● One of the Smallest Microstep Drivers in the Industry

The **CMK** Series driver is one of the smallest, lightest microstep driver in the industry. The driver is 62% lighter and has 41% less install area (based on horizontal installation) compared to our conventional model. This product contributes to downsizing of your equipment.



Mass: 130 g (0.29 lb.)



Conventional Model (CSD2120-T)

Mass: 50 g (0.11 lb.)



New Product (CMD21□□P)

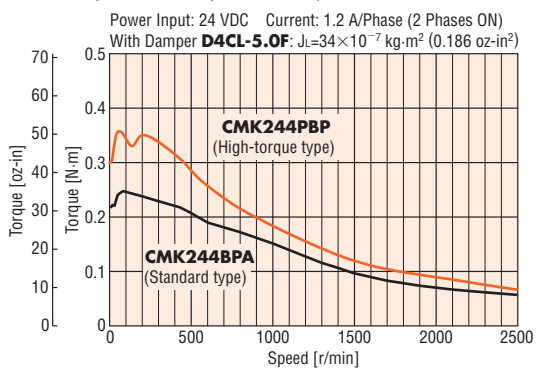
Comparison with a conventional driver

- ◇ Mass: **62%** less
- ◇ Install area: **41%** less (based on horizontal installation)
- ◇ Volume: **41%** less [the conventional driver includes a 5 mm (0.2 in.) spacer for installation.]

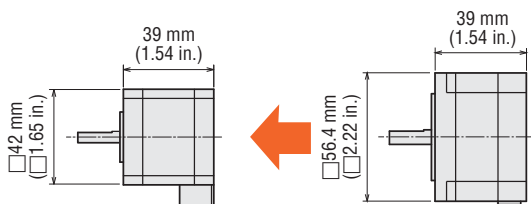
● High-Torque Type

The high-torque type adopts new technology and design. The motor produces approximately 50% higher torque than a conventional stepping motor of the same size.

Comparison of Speed – Torque Characteristics



Providing torque equivalent to a motor of the next larger frame size, the high-torque type allows for a reduction in the size of your equipment.



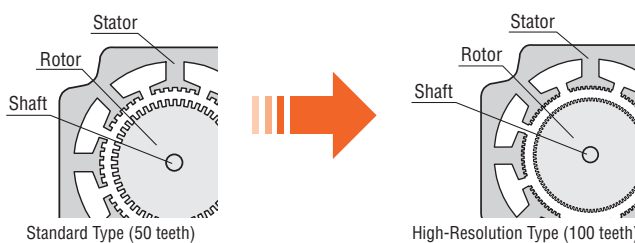
High-Torque Type	Type	Standard Type
<b>CMK244PAP</b>	Model	<b>CMK264AP</b>
0.39 N·m (55 oz-in)	Maximum Holding Torque	0.36 N·m (51 oz-in)

The high-torque type is connected using a connector – a connection method everyone is familiar with.

- Desired cable length and type can be selected.
- Maintenance becomes easy.
- Motor lead wire/connector assembly [0.6 m (2 ft.)] is included with motor and driver package.

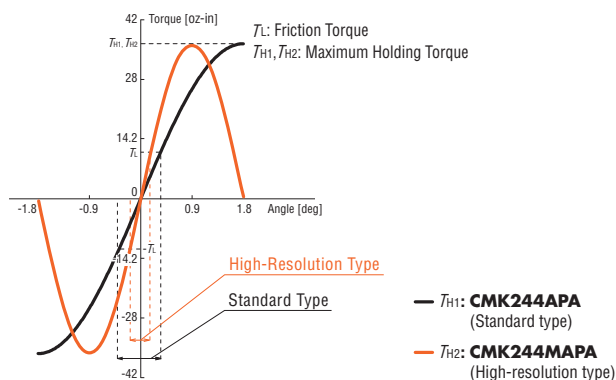
● High-Resolution Type

The basic step angle is 0.9°, which is half that of the standard type. 400 steps per rotation is possible. This motor achieves high resolution, low vibration and improved stopping accuracy.



The small basic step angle allows the torque to increase sharply while minimizing the negative effect of friction load.

Comparison of Angle – Torque Characteristics



● **RoHS** RoHS-Compliant




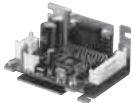








The **CMK** Series conforms to the RoHS Directive that prohibits the use of six chemical substances including lead and cadmium.

● Details of RoHS Directive → Page G-38

- Introduction
- AC Input **QSTEP AS**
- DC Input **QSTEP ASC**
- 5-Phase Microstep **RK** AC Input
- 2-Phase Full/Half **UMK** AC Input
- 5-Phase Microstep **CMK** DC Input
- 2-Phase Microstep **RBK** DC Input
- 2-Phase Microstep **CMK** DC Input
- 2-Phase PK/PV Without Encoder
- 2-Phase PK With Encoder
- EMP400 Controllers
- SG8030U Controllers
- Accessories
- Installation

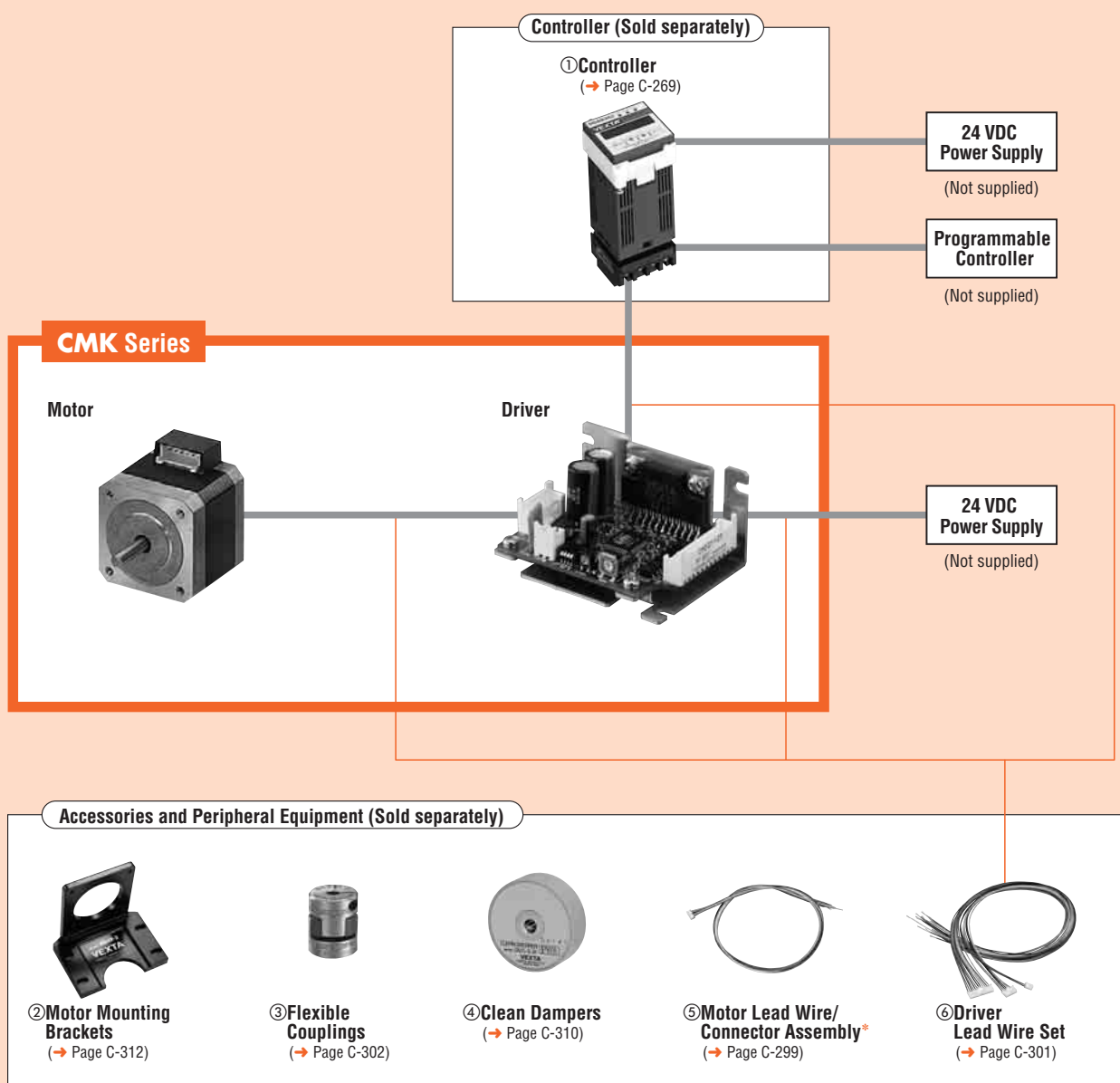
### ● Wide Variety

The **CMK** Series motor and driver package comes in five frame sizes of 28 to 60 mm (1.10 to 2.36 in.) as well as four motor types.

Type	Features	□28 mm (□1.10 in.)	□35 mm (□1.38 in.)	□42 mm (□1.65 in.)	□50 mm (□1.97 in.)	□56.4/60 mm (□2.22/2.36 in.)	Driver
High-Torque Type	A high-torque motor has higher torque of approx. 1.5 times compared with the conventional standard type motor.						
High-Resolution Type	A high-resolution type offers higher positioning accuracy with the basic step angle set to 0.9°/step, which is just half the basic step angle of the standard type motor.						
Standard Type	The basic model offering a good balance of torque and low vibration/noise characteristics.						
<b>SH</b> Geared Type	These geared types are effective for inertia reduction, increasing torque, higher resolution and suppressing vibration. Six gear ratios are available.						

## System Configuration

An example of a system configuration with the **SG8030J** controller.



\*Motor lead wire/connector assembly of 0.6 m (2 ft.) is included with the connector-coupled motor and driver package.

No.	Product Name	Overview	Page
①	Controller	This controller outputs pulse commands that determine the rotation amount and rotating speed.	C-269
②	Motor Mounting Brackets	Dedicated mounting bracket for the motor.	C-312
③	Flexible Couplings	Coupling that connects the motor shaft to the driven shaft.	C-302
④	Clean Dampers	Dedicated damper for suppressing stepping motor vibration.	C-310
⑤	Motor Lead Wire/Connector Assembly	Lead wire with a connector crimped for connector-coupled motors [0.6 m, 1 m (2 ft., 3.3 ft.)].	C-299
⑥	Driver Lead Wire Set	Cables for connecting the driver and motor, DC power supply or host controller [0.6 m (2 ft.)] ( <b>LCS01CMK2</b> ).	C-301

### ● Example of System Configuration

(Sold separately)

<b>CMK Series</b>	+	<b>Controller</b>	<b>Motor Mounting Bracket</b>	<b>Flexible Coupling</b>	<b>Clean Damper</b>	<b>Driver Lead Wire Set [0.6 m (2 ft.)]</b>
<b>CMK244BPB</b>		<b>SG8030J-U</b>	<b>PALOPA</b>	<b>MCS140506</b>	<b>D4CL-5.0F</b>	<b>LCS01CMK2</b>

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

## Product Number Code

- High-Torque Type, High-Resolution Type, Standard Type

# CMK 2 4 3 M A P A

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

- SH Geared Type

# CMK 2 6 4 A P A - SG 10

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

## Product Line

- High-Torque Type

Model (Single shaft)	Model (Double shaft)
<b>CMK223PAP</b>	<b>CMK223PBP</b>
<b>CMK224PAP</b>	<b>CMK224PBP</b>
<b>CMK225PAP</b>	<b>CMK225PBP</b>
<b>CMK233PAP</b>	<b>CMK233PBP</b>
<b>CMK235PAP</b>	<b>CMK235PBP</b>
<b>CMK244PAP</b>	<b>CMK244PBP</b>
<b>CMK246PAP</b>	<b>CMK246PBP</b>

The following items are included in each product.

Motor, Driver, Driver Connector, Motor Lead Wire/Connector Assembly, Operating Manual

- High-Resolution Type

Model (Single shaft)	Model (Double shaft)
<b>CMK243MAPA</b>	<b>CMK243MBPA</b>
<b>CMK244MAPA</b>	<b>CMK244MBPA</b>
<b>CMK245MAPA</b>	<b>CMK245MBPA</b>
<b>CMK264MAP</b>	<b>CMK264MBP</b>
<b>CMK266MAP</b>	<b>CMK266MBP</b>
<b>CMK268MAP</b>	<b>CMK268MBP</b>

The following items are included in each product.

Motor, Driver, Driver Connector, Operating Manual

- Standard Type

Model (Single shaft)	Model (Double shaft)
<b>CMK243APA</b>	<b>CMK243BPA</b>
<b>CMK244APA</b>	<b>CMK244BPA</b>
<b>CMK245APA</b>	<b>CMK245BPA</b>
<b>CMK256AP</b>	<b>CMK256BP</b>
<b>CMK258AP</b>	<b>CMK258BP</b>
<b>CMK264AP</b>	<b>CMK264BP</b>
<b>CMK266AP</b>	<b>CMK266BP</b>
<b>CMK268AP</b>	<b>CMK268BP</b>

The following items are included in each product.

Motor, Driver, Driver Connector, Operating Manual

① Series	<b>CMK: CMK Series</b>		
②	<b>2: 2-Phase</b>		
③ Motor Frame Size	<b>2: 28 mm (1.10 in.)</b>	<b>3: 35 mm (1.38 in.)</b>	<b>4: 42 mm (1.65 in.)</b> <b>5: 50 mm (1.97 in.)</b>
④ Motor Case Length	<b>6: 56.4 mm (2.22 in.)</b>		
⑤ Motor Type	<b>P: High-Torque Type</b> <b>M: High-Resolution Type</b> Blank: Standard Type		
⑥ Shaft Type	<b>A: Single Shaft</b> <b>B: Double Shaft</b>		
⑦ Signal I/O Mode of Driver	<b>P: Photocoupler</b>		
⑧ U.S.A. Version			

① Series	<b>CMK: CMK Series</b>		
②	<b>2: 2-Phase</b>		
③ Motor Frame Size	<b>2: 28 mm (1.10 in.)</b>	<b>4: 42 mm (1.65 in.)</b>	<b>6: 60 mm (2.36 in.)</b>
④ Motor Case Length			
⑤ Shaft Type	<b>A: Single Shaft</b> <b>B: Double Shaft</b>		
⑥ Signal I/O Mode of Driver	<b>P: Photocoupler</b>		
⑦ U.S.A. Version			
⑧ Gearhead Type	<b>SG: SH Geared Type</b>		
⑨ Gear Ratio			

- SH Geared Type

Model (Single shaft)	Model (Double shaft)
<b>CMK223AP-SG7.2</b>	<b>CMK223BP-SG7.2</b>
<b>CMK223AP-SG9</b>	<b>CMK223BP-SG9</b>
<b>CMK223AP-SG10</b>	<b>CMK223BP-SG10</b>
<b>CMK223AP-SG18</b>	<b>CMK223BP-SG18</b>
<b>CMK223AP-SG36</b>	<b>CMK223BP-SG36</b>
<b>CMK243APA-SG3.6</b>	<b>CMK243BPA-SG3.6</b>
<b>CMK243APA-SG7.2</b>	<b>CMK243BPA-SG7.2</b>
<b>CMK243APA-SG9</b>	<b>CMK243BPA-SG9</b>
<b>CMK243APA-SG10</b>	<b>CMK243BPA-SG10</b>
<b>CMK243APA-SG18</b>	<b>CMK243BPA-SG18</b>
<b>CMK243APA-SG36</b>	<b>CMK243BPA-SG36</b>
<b>CMK264APA-SG3.6</b>	<b>CMK264BPA-SG3.6</b>
<b>CMK264APA-SG7.2</b>	<b>CMK264BPA-SG7.2</b>
<b>CMK264APA-SG9</b>	<b>CMK264BPA-SG9</b>
<b>CMK264APA-SG10</b>	<b>CMK264BPA-SG10</b>
<b>CMK264APA-SG18</b>	<b>CMK264BPA-SG18</b>
<b>CMK264APA-SG36</b>	<b>CMK264BPA-SG36</b>

The following items are included in each product.

Motor, Driver, Driver Connector, Motor Lead Wire/Connector Assembly\*, Mounting Screws for Motor, Operating Manual  
\*Only for connector-coupled motor

# High-Torque Type Motor Frame Size 28 mm (1.10 in.)

## Specifications RoHS

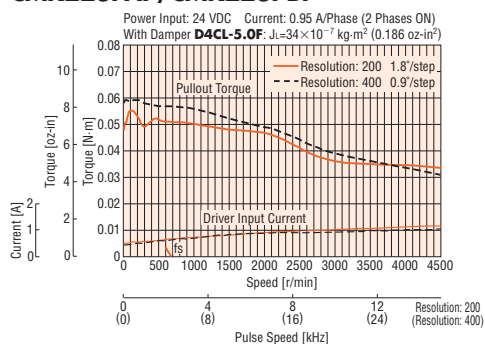
Model	Single Shaft	<b>CMK223PAP*</b>	<b>CMK224PAP*</b>	<b>CMK225PAP*</b>
	Double Shaft	<b>CMK223PBP*</b>	<b>CMK224PBP*</b>	<b>CMK225PBP*</b>
Maximum Holding Torque	N·m (oz-in)	0.05 (7.1)	0.075 (10.6)	0.09 (12.7)
Rotor Inertia J	kg·m <sup>2</sup> (oz-in <sup>2</sup> )	9×10 <sup>-7</sup> (0.049)	12×10 <sup>-7</sup> (0.066)	18×10 <sup>-7</sup> (0.098)
Rated Current	A/Phase	0.95		
Basic Step Angle		1.8°		
Power Source		24 VDC±10% 1.5 A		
Excitation Mode		Microstep		
Mass	Motor	kg (lb.)	0.11 (0.24)	0.14 (0.31)
	Driver	kg (lb.)	0.05 (0.11)	
Dimension No.	Motor		<span style="border: 1px solid black; padding: 1px;">1</span>	
	Driver		<span style="border: 1px solid black; padding: 1px;">10</span>	

How to read specifications table → Page C-11

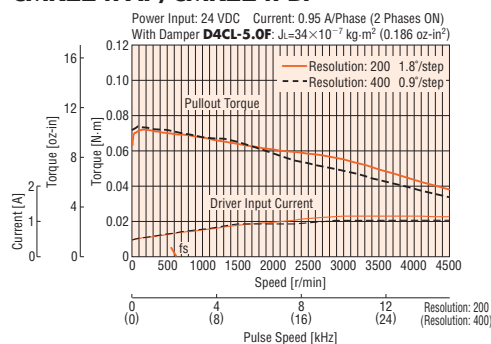
\* Motor lead wire/connector assembly [0.6 m (2 ft.)] is included with the connector-coupled motor and driver package.

## Speed – Torque Characteristics How to read speed – torque characteristics → Page C-12

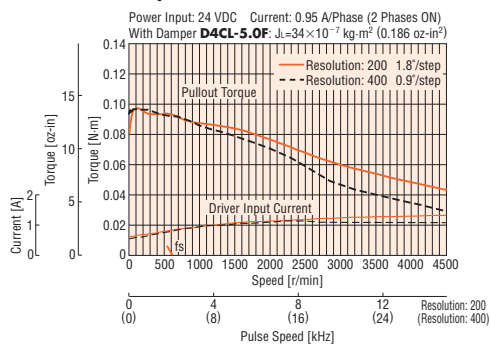
### CMK223PAP/CMK223PBP



### CMK224PAP/CMK224PBP



### CMK225PAP/CMK225PBP



- The pulse input circuit responds to approximately 100 kHz with a pulse duty of 50%.

#### Notes:

- Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 100°C (212°F).
- The driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 40%.

Introduction

QSTEP  
ASQSTEP  
ASC5-Phase  
Microstep  
RK2-Phase  
Full/Half  
UMK5-Phase  
Microstep  
CMK2-Phase  
Microstep  
RKM2-Phase  
Microstep  
CMK2-Phase  
PK/PV  
Without Encoder2-Phase  
PK  
With Encoder

EMP400

SG8030J

Accessories

Installation

# High-Torque Type Motor Frame Size 35 mm (1.38 in.), 42 mm (1.65 in.)

## Specifications RoHS

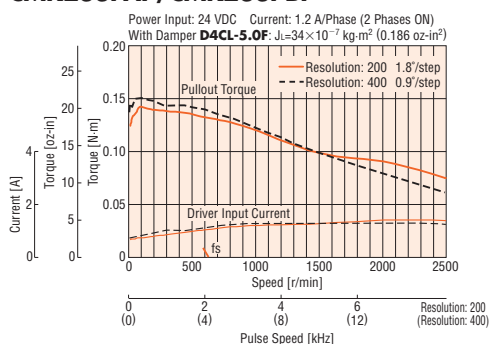
Model	Single Shaft	<b>CMK233PAP*</b>	<b>CMK235PAP*</b>	<b>CMK244PAP*</b>	<b>CMK246PAP*</b>
	Double Shaft	<b>CMK233PBP*</b>	<b>CMK235PBP*</b>	<b>CMK244PBP*</b>	<b>CMK246PBP*</b>
Maximum Holding Torque	N·m (oz-in)	0.16 (22)	0.3 (42)	0.39 (55)	0.75 (106)
Rotor Inertia J	kg·m <sup>2</sup> (oz-in <sup>2</sup> )	24×10 <sup>-7</sup> (0.131)	50×10 <sup>-7</sup> (0.27)	57×10 <sup>-7</sup> (0.31)	114×10 <sup>-7</sup> (0.62)
Rated Current	A/Phase	1.2			
Basic Step Angle		1.8°			
Power Source		24 VDC±10% 1.7 A			
Excitation Mode		Microstep			
Mass	Motor kg (lb.)	0.18 (0.4)	0.285 (0.63)	0.3 (0.66)	0.5 (1.1)
	Driver kg (lb.)	0.05 (0.11)			
Dimension No.	Motor	②		③	
	Driver	⑩			

How to read specifications table → Page C-11

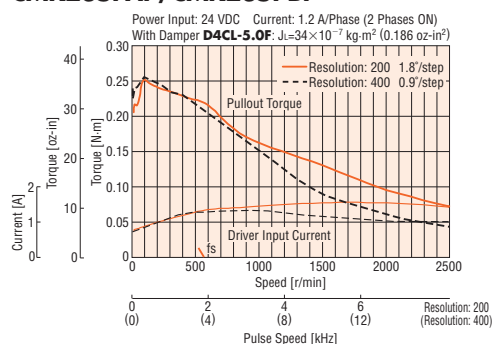
\* Motor lead wire/connector assembly [0.6 m (2 ft.)] is included with the connector-coupled motor and driver package.

## Speed – Torque Characteristics How to read speed – torque characteristics → Page C-12

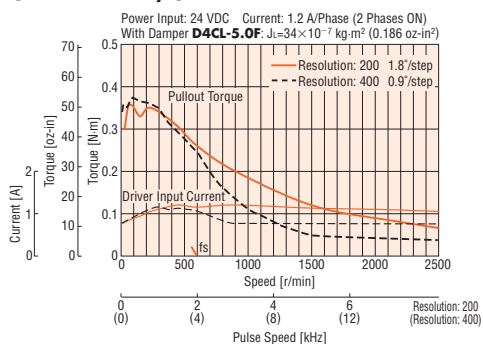
### CMK233PAP/CMK233PBP



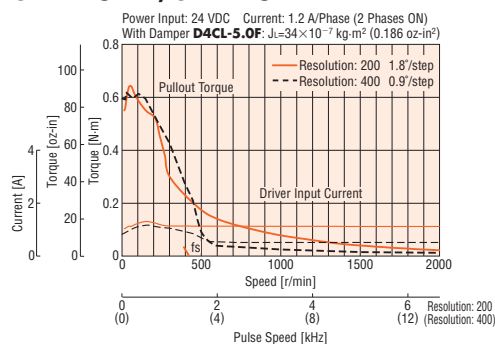
### CMK235PAP/CMK235PBP



### CMK244PAP/CMK244PBP



### CMK246PAP/CMK246PBP



● The pulse input circuit responds to approximately 100 kHz with a pulse duty of 50%.

#### Notes:

- Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 100°C (212°F).
- The driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 40%.

# High-Resolution Type Motor Frame Size 42 mm (1.65 in.), 56.4 mm (2.22 in.)

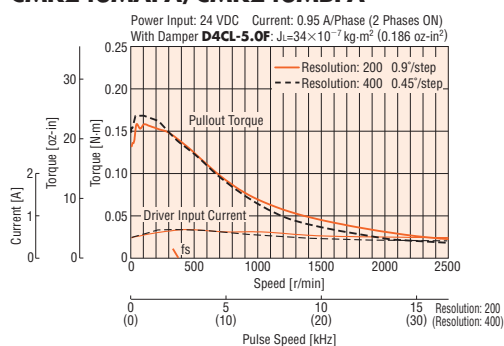
## Specifications (RoHS)

Model	Single Shaft	CMK243MAPA	CMK244MAPA	CMK245MAPA	CMK264MAP	CMK266MAP	CMK268MAP	
	Double Shaft	CMK243MBPA	CMK244MBPA	CMK245MBPA	CMK264MBP	CMK266MBP	CMK268MBP	
Maximum Holding Torque	N·m (oz·in)	0.16 (22)	0.26 (36)	0.32 (45)	0.37 (52)	0.9 (127)	1.35 (191)	
Rotor Inertia J	kg·m <sup>2</sup> (oz·in <sup>2</sup> )	35×10 <sup>-7</sup> (0.191)	54×10 <sup>-7</sup> (0.3)	68×10 <sup>-7</sup> (0.37)	120×10 <sup>-7</sup> (0.66)	300×10 <sup>-7</sup> (1.64)	480×10 <sup>-7</sup> (2.6)	
Rated Current	A/Phase	0.95	1.2			2		
Basic Step Angle		0.9°						
Power Source		24 VDC±10% 1.5 A	24 VDC±10% 1.7 A		24 VDC±10% 2.9 A			
Excitation Mode		Microstep						
Mass	Motor	kg (lb.)	0.24 (0.53)	0.3 (0.66)	0.37 (0.81)	0.45 (0.99)	0.7 (1.54)	1 (2.2)
	Driver	kg (lb.)	0.05 (0.11)					
Dimension No.	Motor	[4]						
	Driver	[10]						

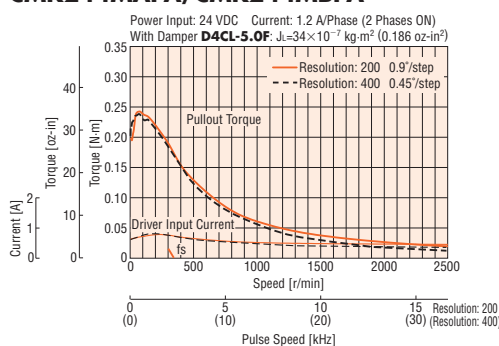
How to read specifications table → Page C-11

## Speed – Torque Characteristics How to read speed – torque characteristics → Page C-12

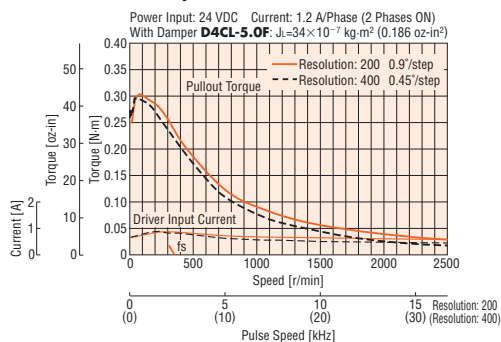
### CMK243MAPA/CMK243MBPA



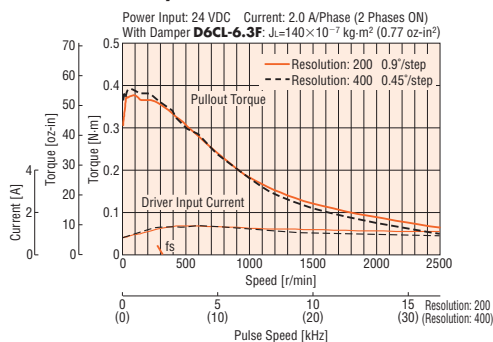
### CMK244MAPA/CMK244MBPA



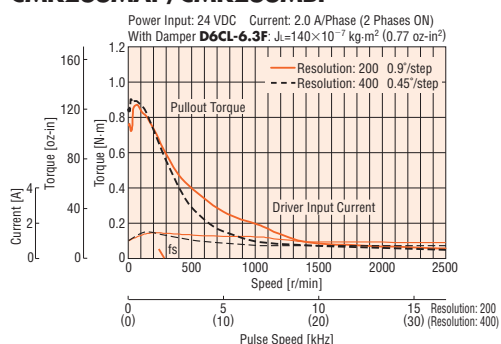
### CMK245MAPA/CMK245MBPA



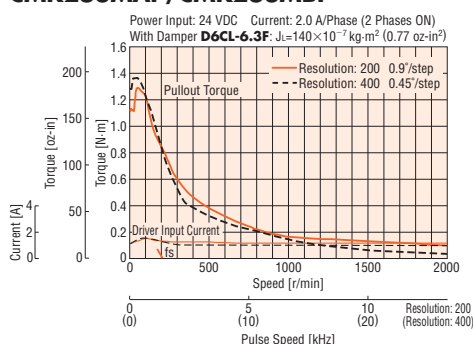
### CMK264MAP/CMK264MBP



### CMK266MAP/CMK266MBP



### CMK268MAP/CMK268MBP



- The pulse input circuit responds to approximately 100 kHz with a pulse duty of 50%.

#### Notes:

- Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 100°C (212°F).
- The driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 40%.

# Standard Type Motor Frame Size 42 mm (1.65 in.), 50 mm (1.97 in.)

## Specifications (RoHS)

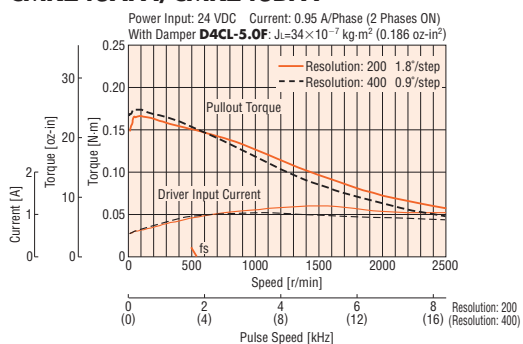
Model	Single Shaft	<b>CMK243APA</b>	<b>CMK244APA</b>	<b>CMK245APA</b>	<b>CMK256AP</b>	<b>CMK258AP</b>	
	Double Shaft	<b>CMK243BPA</b>	<b>CMK244BPA</b>	<b>CMK245BPA</b>	<b>CMK256BP</b>	<b>CMK258BP</b>	
Maximum Holding Torque	N·m (oz·in)	0.16 (22)	0.26 (36)	0.32 (45)	0.56 (79)	1.2 (170)	
Rotor Inertia J	kg·m <sup>2</sup> (oz·in <sup>2</sup> )	35×10 <sup>-7</sup> (0.191)	54×10 <sup>-7</sup> (0.3)	68×10 <sup>-7</sup> (0.37)	230×10 <sup>-7</sup> (1.26)	420×10 <sup>-7</sup> (2.3)	
Rated Current	A/Phase	0.95	1.2		2		
Basic Step Angle		1.8°					
Power Source		24 VDC±10% 1.5 A	24 VDC±10% 1.7 A		24 VDC±10% 2.9 A		
Excitation Mode		Microstep					
Mass	Motor	kg (lb.)	0.21 (0.46)	0.27 (0.59)	0.35 (0.77)	0.53 (1.17)	0.89 (1.96)
	Driver	kg (lb.)	0.05 (0.11)				
Dimension No.	Motor	[4]			[5]		
	Driver	[10]					

How to read specifications table → Page C-11

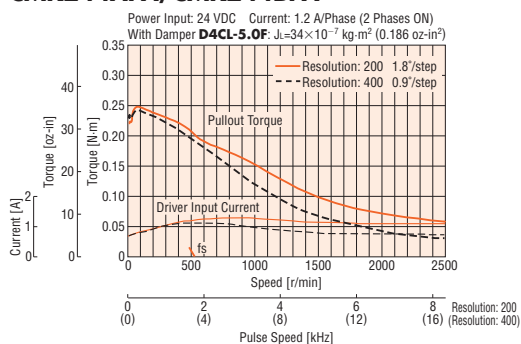
## Speed – Torque Characteristics

How to read speed – torque characteristics → Page C-12

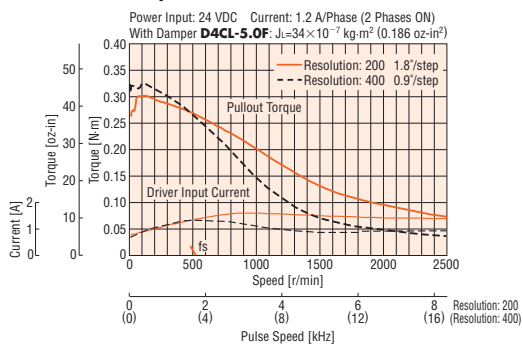
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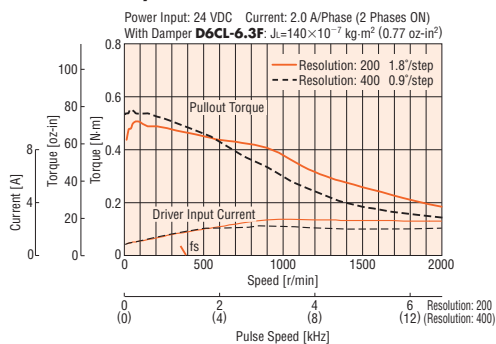
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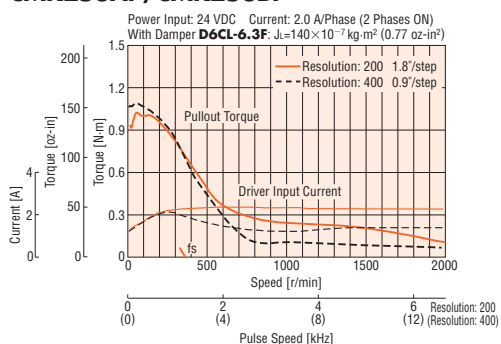
### CMK245APA/CMK245BPA



### CMK256AP/CMK256BP



### CMK258AP/CMK258BP



● The pulse input circuit responds to approximately 100 kHz with a pulse duty of 50%.

#### Notes:

- Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 100°C (212°F).
- The driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 40%.

# Standard Type Motor Frame Size 56.4 mm (2.22 in.)

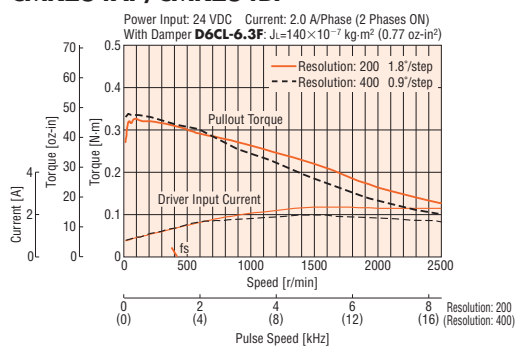
## Specifications (RoHS)

Model	Single Shaft	<b>CMK264AP</b>	<b>CMK266AP</b>	<b>CMK268AP</b>
	Double Shaft	<b>CMK264BP</b>	<b>CMK266BP</b>	<b>CMK268BP</b>
Maximum Holding Torque	N·m (oz·in)	0.36 (51)	0.82 (116)	1.35 (191)
Rotor Inertia J	kg·m <sup>2</sup> (oz·in <sup>2</sup> )	120×10 <sup>-7</sup> (0.66)	300×10 <sup>-7</sup> (1.64)	480×10 <sup>-7</sup> (2.6)
Rated Current	A/Phase	2		
Basic Step Angle		1.8°		
Power Source		24 VDC ± 10% 2.9 A		
Excitation Mode		Microstep		
Mass	Motor	kg (lb.)	0.45 (0.99)	0.7 (1.54)
	Driver	kg (lb.)	0.05 (0.11)	
Dimension No.	Motor		6	
	Driver		10	

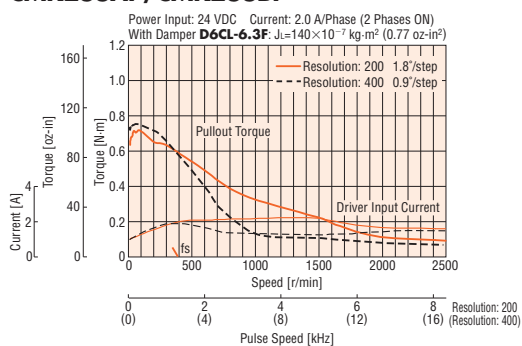
How to read specifications table → Page C-11

## Speed – Torque Characteristics How to read speed – torque characteristics → Page C-12

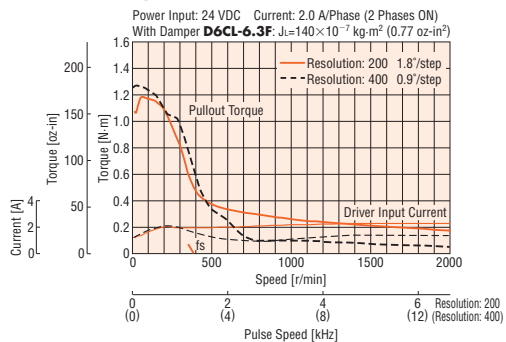
### CMK264AP/CMK264BP



### CMK266AP/CMK266BP



### CMK268AP/CMK268BP



- The pulse input circuit responds to approximately 100 kHz with a pulse duty of 50%.

#### Notes:

- Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 100°C (212°F).
- The driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 40%.

Introduction

QSTEP  
ASQSTEP  
ASC5-Phase  
Microstep  
RK2-Phase  
Full/Half  
UMK5-Phase  
Microstep  
CMK2-Phase  
Microstep  
RBM2-Phase  
Microstep  
CMK2-Phase  
PK/PV  
Without Encoder2-Phase  
PK  
With EncoderEMP400  
Controllers

SG8030J

Accessories

Installation

# SH Geared Type Motor Frame Size 28 mm (1.10 in.)

## Specifications (RoHS)

Model	Single Shaft	CMK223AP-SG7.2*	CMK223AP-SG9*	CMK223AP-SG10*	CMK223AP-SG18*	CMK223AP-SG36*	
	Double Shaft	CMK223BP-SG7.2*	CMK223BP-SG9*	CMK223BP-SG10*	CMK223BP-SG18*	CMK223BP-SG36*	
Maximum Holding Torque	N·m (oz·in)	0.3 (42)				0.4 (56)	
Rotor Inertia J	kg·m <sup>2</sup> (oz·in <sup>2</sup> )	9×10 <sup>-7</sup> (0.049)					
Rated Current	A/Phase	0.95					
Basic Step Angle		0.25°	0.2°	0.18°	0.1°	0.05°	
Gear Ratio		7.2:1	9:1	10:1	18:1	36:1	
Permissible Torque	N·m (oz·in)	0.3 (42)				0.4 (56)	
Permissible Speed Range	r/min	0~250	0~200	0~180	0~100	0~50	
Power Source		24 VDC±10% 1.5 A					
Excitation Mode		Microstep					
Mass	Motor	kg (lb.)					0.16 (0.35)
	Driver	kg (lb.)					0.05 (0.11)
Dimension No.	Motor						7
	Driver						10

How to read specifications table → Page C-11

\* Motor lead wire/connector assembly [0.6 m (2 ft.)] is included with the connector-coupled motor and driver package.

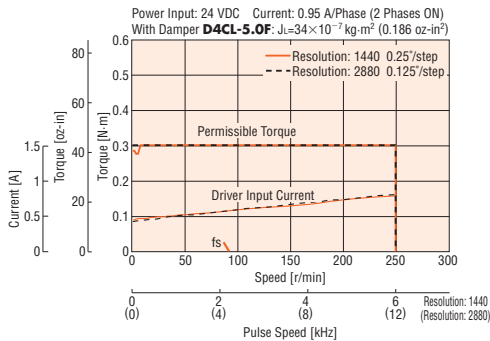
### Notes:

- Backlash value is approximately 1 to 2°.
- Direction of rotation of the motor and that of the gear output shaft are the same for gear ratios 7.2:1 and 36:1. It is the opposite for 9:1, 10:1 and 18:1 gear ratios.

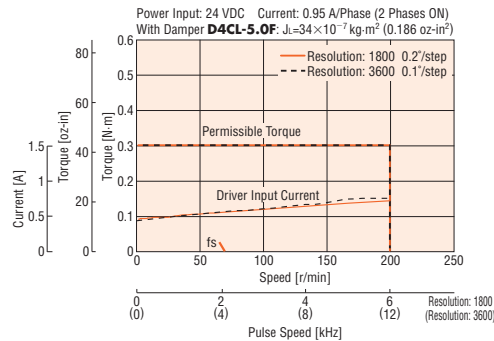
## Speed – Torque Characteristics

How to read speed – torque characteristics → Page C-12

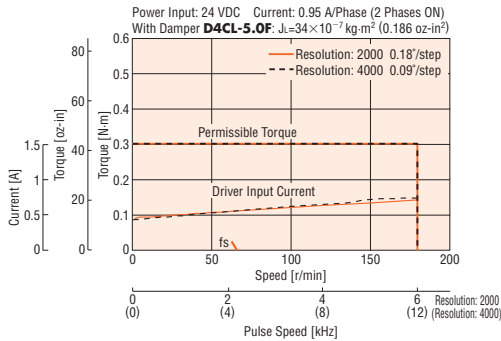
### CMK223AP-SG7.2/CMK223BP-SG7.2



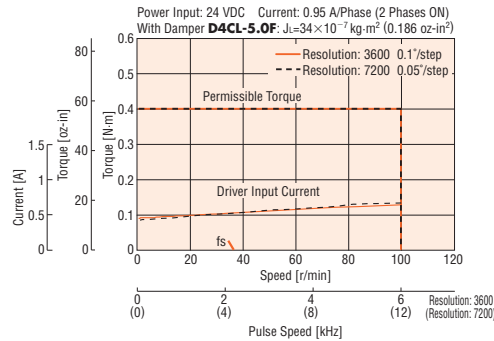
### CMK223AP-SG9/CMK223BP-SG9



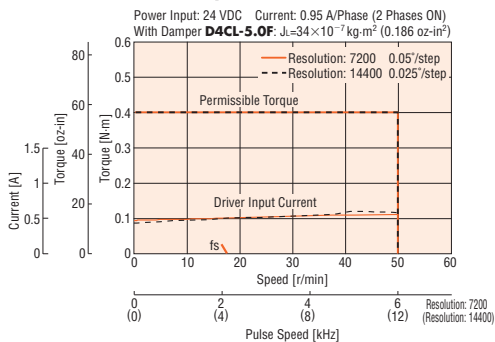
### CMK223AP-SG10/CMK223BP-SG10



### CMK223AP-SG18/CMK223BP-SG18



### CMK223AP-SG36/CMK223BP-SG36



- The pulse input circuit responds to approximately 100 kHz with a pulse duty of 50%.

### Notes:

- Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 100°C (212°F).
- The driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 40%.

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

## Specifications (RoHS)

Model	Single Shaft	CMK243APA-SG3.6	CMK243APA-SG7.2	CMK243APA-SG9	CMK243APA-SG10	CMK243APA-SG18	CMK243APA-SG36
	Double Shaft	CMK243BPA-SG3.6	CMK243BPA-SG7.2	CMK243BPA-SG9	CMK243BPA-SG10	CMK243BPA-SG18	CMK243BPA-SG36
Maximum Holding Torque	N·m (lb-in)	0.2 (1.77)	0.4 (3.5)	0.5 (4.4)	0.56 (4.9)	0.8 (7)	
Rotor Inertia J	kg·m <sup>2</sup> (oz-in <sup>2</sup> )	35×10 <sup>-7</sup> (0.191)					
Rated Current	A/Phase	0.95					
Basic Step Angle		0.5°	0.25°	0.2°	0.18°	0.1°	0.05°
Gear Ratio		3.6:1	7.2:1	9:1	10:1	18:1	36:1
Permissible Torque	N·m (lb-in)	0.2 (1.77)	0.4 (3.5)	0.5 (4.4)	0.56 (4.9)	0.8 (7)	
Permissible Speed Range	r/min	0~500	0~250	0~200	0~180	0~100	0~50
Power Source		24 VDC±10% 1.5 A					
Excitation Mode		Microstep					
Mass	Motor	kg (lb.)					
	Driver	0.35 (0.77)					
Dimension No.	Motor	8					
	Driver	10					

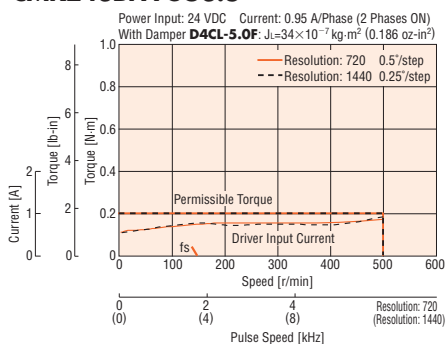
How to read specifications table → Page C-11

### Notes:

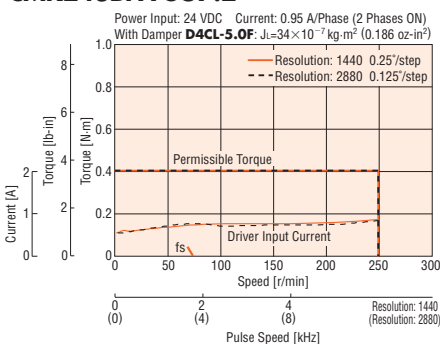
- Backlash value is approximately 1 to 2°.
- Direction of rotation of the motor and that of the gear output shaft are the same for gear ratios 3.6:1, 7.2:1, 9:1 and 10:1. It is the opposite for 18:1 and 36:1 gear ratios.

## Speed – Torque Characteristics How to read speed – torque characteristics → Page C-12

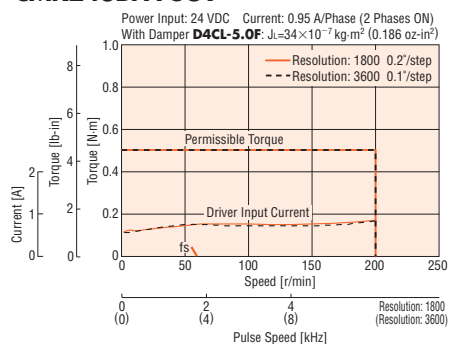
### CMK243APA-SG3.6/ CMK243BPA-SG3.6



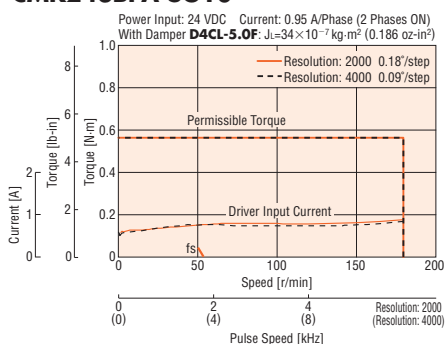
### CMK243APA-SG7.2/ CMK243BPA-SG7.2



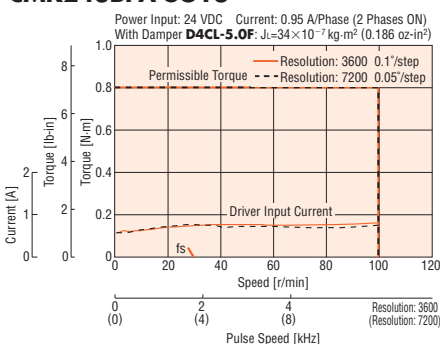
### CMK243APA-SG9/ CMK243BPA-SG9



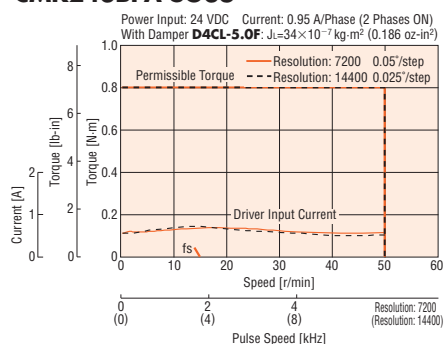
### CMK243APA-SG10/ CMK243BPA-SG10



### CMK243APA-SG18/ CMK243BPA-SG18



### CMK243APA-SG36/ CMK243BPA-SG36



- The pulse input circuit responds to approximately 100 kHz with a pulse duty of 50%.

### Notes:

- Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 100°C (212°F).
- The driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 40%.

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

## Specifications (RoHS)

Model	Single Shaft	CMK264APA-SG3.6	CMK264APA-SG7.2	CMK264APA-SG9	CMK264APA-SG10	CMK264APA-SG18	CMK264APA-SG36
	Double Shaft	CMK264BPA-SG3.6	CMK264BPA-SG7.2	CMK264BPA-SG9	CMK264BPA-SG10	CMK264BPA-SG18	CMK264BPA-SG36
Maximum Holding Torque	N·m (lb-in)	1 (8.8)	2 (17.7)	2.5 (22)	2.7 (23)	3 (26)	4 (35)
Rotor Inertia J	kg·m <sup>2</sup> (oz-in <sup>2</sup> )	120 × 10 <sup>-7</sup> (0.66)					
Rated Current	A/Phase	2					
Basic Step Angle		0.5°	0.25°	0.2°	0.18°	0.1°	0.05°
Gear Ratio		3.6:1	7.2:1	9:1	10:1	18:1	36:1
Permissible Torque	N·m (lb-in)	1 (8.8)	2 (17.7)	2.5 (22)	2.7 (23)	3 (26)	4 (35)
Permissible Speed Range	r/min	0~500	0~250	0~200	0~180	0~100	0~50
Power Source		24 VDC ± 10% 2.9 A					
Excitation Mode		Microstep					
Mass	Motor	kg (lb.)					0.75 (1.65)
	Driver	kg (lb.)					0.05 (0.11)
Dimension No.	Motor	9					
	Driver	10					

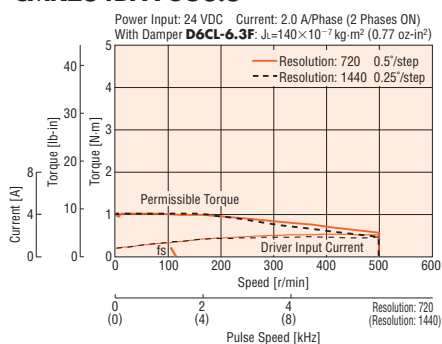
How to read specifications table → Page C-11

### Notes:

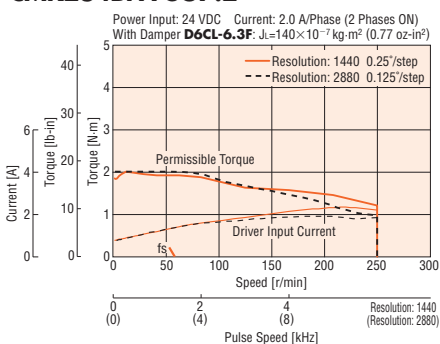
- Backlash value is approximately 1 to 2°.
- Direction of rotation of the motor and that of the gear output shaft are the same for gear ratios 3.6:1, 7.2:1, 9:1 and 10:1. It is the opposite for 18:1 and 36:1 gear ratios.

## Speed – Torque Characteristics How to read speed – torque characteristics → Page C-12

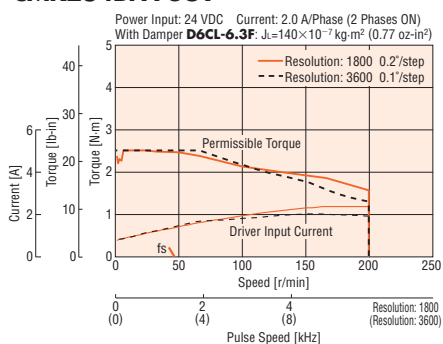
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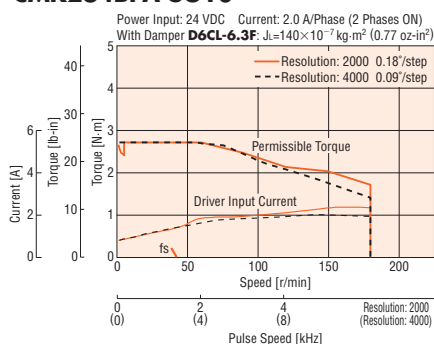
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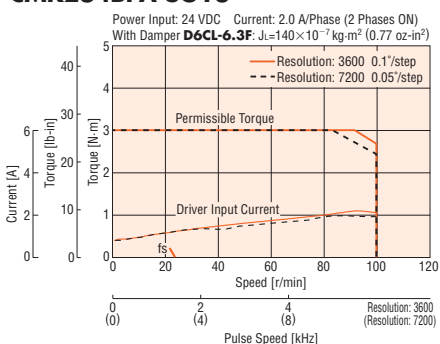
### CMK264APA-SG9/ CMK264BPA-SG9



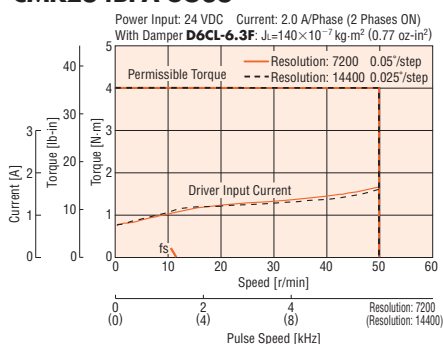
### CMK264APA-SG10/ CMK264BPA-SG10



### CMK264APA-SG18/ CMK264BPA-SG18



### CMK264APA-SG36/ CMK264BPA-SG36



- The pulse input circuit responds to approximately 100 kHz with a pulse duty of 50%.

### Notes:

- Pay attention to heat dissipation from motor as there will be a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 100°C (212°F).
- The driver's automatic current cutback function at motor standstill reduces maximum holding torque by approximately 40%.

## Driver Specifications

Input Signals	Input Mode	Photocoupler input Pulse (CW pulse) signal, Rotation direction (CCW pulse) signal: Input resistance 200 Ω, Input current 5~20 mA Photocoupler ON: +3~5.25 V, Photocoupler OFF: 0~+1 V (Voltage between terminals) All windings off signal, Step angle select signal, Automatic current cutback release signal: Input resistance 3.3 kΩ, Input current 1 mA (5 VDC)/8 mA (24 VDC) Photocoupler ON: +4.5~26.4 V, Photocoupler OFF: 0~+1 V (Voltage between terminals)
	Pulse Signal (CW Pulse Signal)	Operation command pulse signal (CW direction operation command pulse signal when in 2-pulse input mode), Negative logic pulse input Pulse width: 5 μs minimum, Pulse rise/fall: 2 μs maximum, Pulse duty: 50% and below Motor moves one step when the pulse input is switched from ON to OFF. Maximum input pulse frequency: 100 kHz (When the pulse duty is 50%)
	Rotation Direction Signal (CCW Pulse Signal)	Rotation direction signal, Photocoupler ON: CW, Photocoupler OFF: CCW (CCW direction operation command pulse signal when in 2-pulse input mode, Negative logic pulse input) Pulse width: 5 μs minimum, Pulse rise/fall: 2 μs maximum, Pulse duty: 50% and below Motor moves one step when the pulse input is switched from photocoupler ON to OFF Maximum input pulse frequency: 100 kHz (When the pulse duty is 50%)
	All Windings Off Signal	When in the "photocoupler ON" state, the output current to the motor is cut off and the motor shaft can be rotated manually. When in the "photocoupler OFF" state, the current is supplied to the motor.
	Step Angle Select Signal	When in the "photocoupler ON" state, the motor operates at the basic step angle regardless of the settings of the step angle setting switches. When in the "photocoupler OFF" state, the motor operates at the step angle set by the step angle setting switches.
	Automatic Current Cutback Release Signal	When in the "photocoupler ON" state, the automatic current cutback function will not be activated even after the motor stops. When in the "photocoupler OFF" state, the automatic current cutback function will be activated after the motor stops (after approx. 100 msec).
Output Signal	Output Mode	Photocoupler, Open-collector output External use condition: 24 VDC maximum, 10 mA maximum
	Excitation Timing Signal	The signal is output every time the excitation sequence returns to the initial stage "0." (Photocoupler: ON) •High-torque type, standard type 1.8°/step [Microsteps/step: 1 (Resolution: 200)]: Signal is output every 4 pulses 0.45°/step [Microsteps/step: 4 (Resolution: 800)]: Signal is output every 16 pulses •High-resolution type 0.9°/step [Microsteps/step: 1 (Resolution: 400)]: Signal is output every 4 pulses 0.225°/step [Microsteps/step: 4 (Resolution: 1600)]: Signal is output every 16 pulses •SH geared type (gear ratio 18:1) 0.1°/step [Microsteps/step: 1 (Resolution: 3600)]: Signal is output every 4 pulses 0.025°/step [Microsteps/step: 4 (Resolution: 14400)]: Signal is output every 16 pulses
Functions		Automatic current cutback, Step angle select, Pulse input mode switch, All windings off, Excitation timing
Cooling Method		Natural ventilation

## General Specifications

Item	Motor	Driver
Insulation Class	Class B [130°C (266°F)]	—
Insulation Resistance	100 MΩ or more when 500 VDC megger is applied between the windings and the case under normal ambient temperature and humidity.	—
Dielectric Strength	Sufficient to withstand 1.0 kVAC at 50 Hz or 60 Hz applied between the windings and the case for 1 minute under normal ambient temperature and humidity. [0.5 kVAC for models with frame size 42 mm (1.65 in.) or smaller]	—
Operating Environment	Ambient Temperature	−10~+50°C (+14~+122°F) (non-freezing)
	Ambient Humidity	85% or less (non-condensing)
	Atmosphere	No corrosive gases, dust, water or oil
Temperature Rise	Temperature rise of windings is 80°C (144°F) or less measured by the resistance change method. (at rated voltage, at standstill, two phases energized)	—
Stop Position Accuracy*1	±3 arc minutes (±0.05°)	—
Shaft Runout	0.05 mm (0.002 in.) T.I.R.*4	—
Radial Play*2	0.025 mm (0.001 in.) maximum of 5 N (1.12 lb.)	—
Axial Play*3	0.075 mm (0.003 in.) maximum of 10 N (2.2 lb.)	—
Concentricity	0.075 mm (0.003 in.) T.I.R.*4	—
Perpendicularity	0.075 mm (0.003 in.) T.I.R.*4	—

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

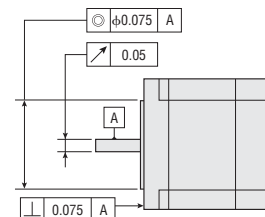
\*2 Radial Play: Displacement in shaft position in the radial direction, when a 5 N (1.12 lb.) load is applied in the vertical direction to the tip of the motor's shaft.

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

\*4 T.I.R. (Total Indicator Reading): The total dial gauge reading when the measurement section is rotated one revolution centered on the reference axis center.

### Note:

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



## Permissible Overhung Load and Permissible Thrust Load

Unit = N (lb.)

Type	Model	Permissible Overhung Load					Permissible Thrust Load
		Distance from Shaft End					
		0 mm (0 in.)	5 mm (0.2 in.)	10 mm (0.39 in.)	15 mm (0.59 in.)	20 mm (0.79 in.)	
High-Torque Type	CMK223P□P CMK224P□P CMK225P□P	25 (5.6)	34 (7.6)	52 (11.7)	—	—	The permissible thrust load shall be no greater than the motor mass.
	CMK233P□P CMK235P□P	20 (4.5)	25 (5.6)	34 (7.6)	52 (11.7)	—	
	CMK244P□P CMK246P□P	20 (4.5)	25 (5.6)	34 (7.6)	52 (11.7)	—	
High-Resolution Type	CMK243M□PA CMK244M□PA CMK245M□PA	20 (4.5)	25 (5.6)	34 (7.6)	52 (11.7)	—	
	CMK264M□P CMK266M□P CMK268M□P	54 (12.1)	67 (15)	89 (20)	130 (29)	—	
	CMK243□PA CMK244□PA CMK245□PA	20 (4.5)	25 (5.6)	34 (7.6)	52 (11.7)	—	
Standard Type	CMK256□P CMK258□P	54 (12.1)	67 (15)	89 (20)	130 (29)	—	
	CMK264□P CMK266□P CMK268□P	54 (12.1)	67 (15)	89 (20)	130 (29)	—	
	CMK223□P-SG7.2 CMK223□P-SG9 CMK223□P-SG10 CMK223□P-SG18 CMK223□P-SG36	15 (3.3)	17 (3.8)	20 (4.5)	23 (5.1)	—	
SH Geared Type	CMK243□PA-SG3.6 CMK243□PA-SG7.2 CMK243□PA-SG9 CMK243□PA-SG10 CMK243□PA-SG18 CMK243□PA-SG36	10 (2.2)	15 (3.3)	20 (4.5)	30 (6.7)	—	15 (3.3)
	CMK264□PA-SG3.6 CMK264□PA-SG7.2 CMK264□PA-SG9 CMK264□PA-SG10	30 (6.7)	40 (9)	50 (11.2)	60 (13.5)	70 (15.7)	30 (6.7)
	CMK264□PA-SG18 CMK264□PA-SG36	80 (18)	100 (22)	120 (27)	140 (31)	160 (36)	

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

## Dimensions Unit = mm (in.)

### Motor

#### High-Torque Type

1 □28 mm (□1.10 in.)

Model	Motor Model	L1	L2	Mass kg (lb.)	DXF
<b>CMK223PAP</b>	PK223PA	32	—	0.11 (0.24)	B326
<b>CMK223PBP</b>	PK223PB	(1.26)	42 (1.65)		
<b>CMK224PAP</b>	PK224PA	40	—	0.14 (0.31)	B327
<b>CMK224PBP</b>	PK224PB	(1.57)	50 (1.97)		
<b>CMK225PAP</b>	PK225PA	51.5	—	0.2 (0.44)	B328
<b>CMK225PBP</b>	PK225PB	(2.03)	61.5 (2.42)		

Motor lead wire/connector assembly of 0.6 m (2 ft.) is included with the package. UL Style 3265, AWG24

If you are purchasing only a motor for maintenance purpose, etc., motor lead wire/connector assembly and connector will not be supplied. They must be purchased separately.

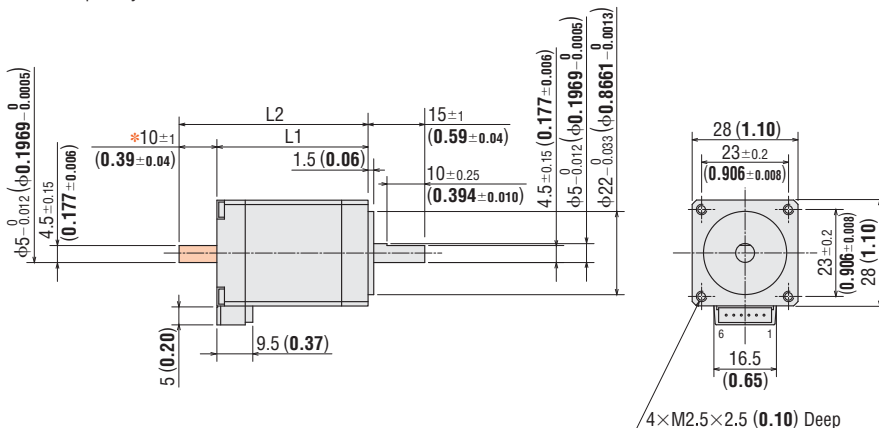
→ Page C-299

#### Applicable Connector

Connector housing: 51065-0600 (MOLEX)

Contact: 50212-8100 (MOLEX)

Crimp tool: 57176-5000 (MOLEX)



\*The length of machining on the double shaft model is  $10 \pm 0.25$  (0.394 ± 0.010).

2 □35 mm (□1.38 in.)

Model	Motor Model	L1	L2	Mass kg (lb.)	DXF
<b>CMK233PAP</b>	PK233PA	37	—	0.18 (0.4)	B329
<b>CMK233PBP</b>	PK233PB	(1.46)	52 (2.05)		
<b>CMK235PAP</b>	PK235PA	52	—	0.285 (0.63)	B330
<b>CMK235PBP</b>	PK235PB	(2.05)	67 (2.64)		

Motor lead wire/connector assembly of 0.6 m (2 ft.) is included with the package. UL Style 3265, AWG24

If you are purchasing only a motor for maintenance purpose, etc., motor lead wire/connector assembly and connector will not be supplied. They must be purchased separately.

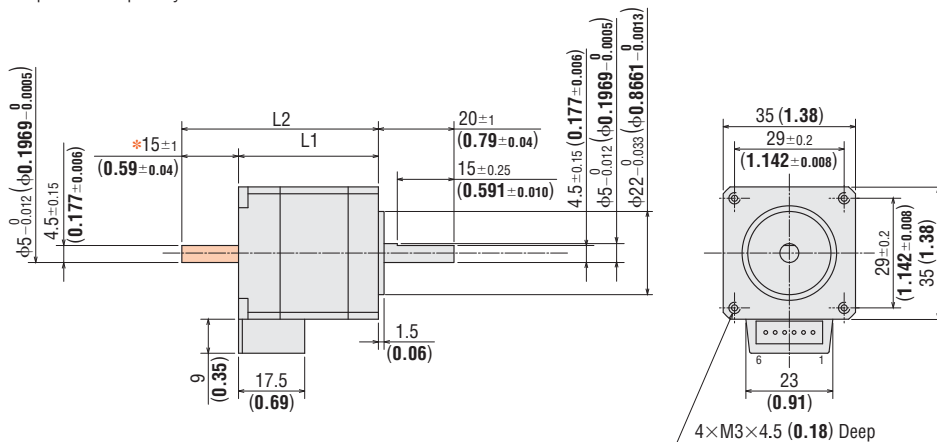
→ Page C-299

#### Applicable Connector

Connector housing: 51103-0600 (MOLEX)

Contact: 50351-8100 (MOLEX)

Crimp tool: 57295-5000 (MOLEX)



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

● These dimensions are for the double shaft models. For the single shaft models, ignore the orange ( ) areas.

### ③ □42 mm (□1.65 in.)

Model	Motor Model	L1	L2	Mass kg (lb.)	DXF
<b>CMK244PAP</b>	PK244PA	39	—	0.3	B331
<b>CMK244PBP</b>	PK244PB	(1.54)	54 (2.13)	(0.66)	
<b>CMK246PAP</b>	PK246PA	59	—	0.5	B332
<b>CMK246PBP</b>	PK246PB	(2.32)	74 (2.91)	(1.1)	

Motor lead wire/connector assembly of 0.6 m (2 ft.) is included with the package. UL Style 3265, AWG24

If you are purchasing only a motor for maintenance purpose, etc., motor lead wire/connector assembly and connector will not be supplied. They must be purchased separately.

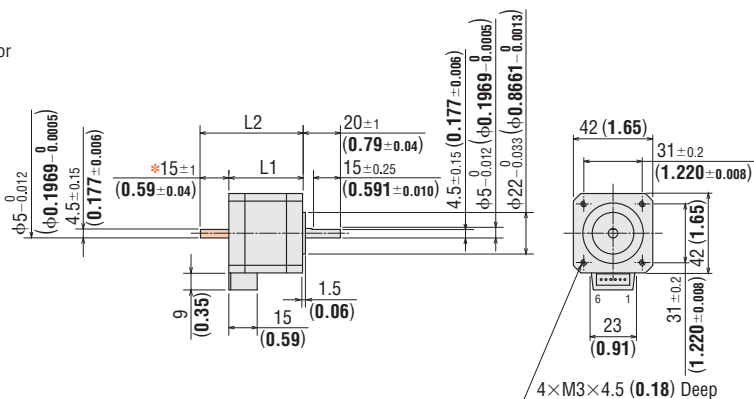
→ Page C-299

● Applicable Connector

Connector housing: 51103-0600 (MOLEX)

Contact: 50351-8100 (MOLEX)

Crimp tool: 57295-5000 (MOLEX)

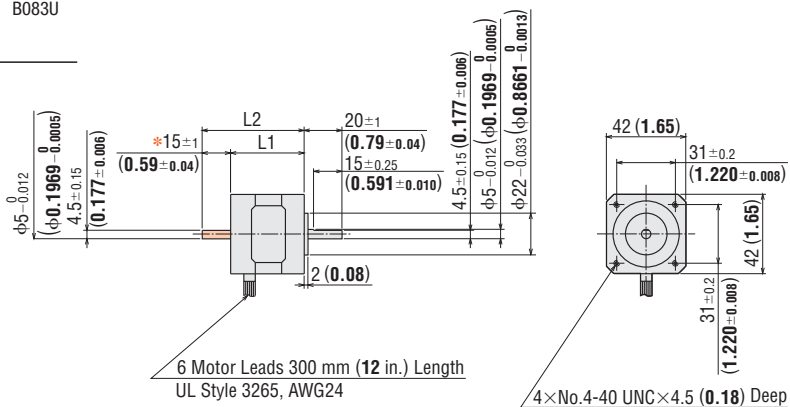


\*The length of machining on the double shaft model is  $15_{\pm 0.25}$  (0.591 ± 0.010).

### ◇ High-Resolution Type, Standard Type

#### ④ □42 mm (□1.65 in.)

Model	Motor Model	L1	L2	Mass kg (lb.)	DXF
<b>CMK243APA</b>	PK243-01AA	33 (1.3)	—	0.21 (0.46)	B081U
<b>CMK243MAPA</b>	PK243MAA		—	0.24 (0.53)	
<b>CMK243BPA</b>	PK243-01BA		48 (1.89)	0.21 (0.46)	
<b>CMK243MBPA</b>	PK243MBA	39 (1.54)	—	0.27 (0.59)	B082U
<b>CMK244APA</b>	PK244-01AA		—	0.3 (0.66)	
<b>CMK244MAPA</b>	PK244MAA		54 (2.13)	0.27 (0.59)	
<b>CMK244BPA</b>	PK244-01BA	47 (1.85)	—	0.35 (0.77)	B083U
<b>CMK244MBPA</b>	PK244MBA		—	0.3 (0.66)	
<b>CMK245APA</b>	PK245-01AA		—	0.37 (0.81)	
<b>CMK245MAPA</b>	PK245MAA	62 (2.44)	—	0.35 (0.77)	B083U
<b>CMK245BPA</b>	PK245-01BA		—	0.37 (0.81)	
<b>CMK245MBPA</b>	PK245MBA	—	—	0.37 (0.81)	



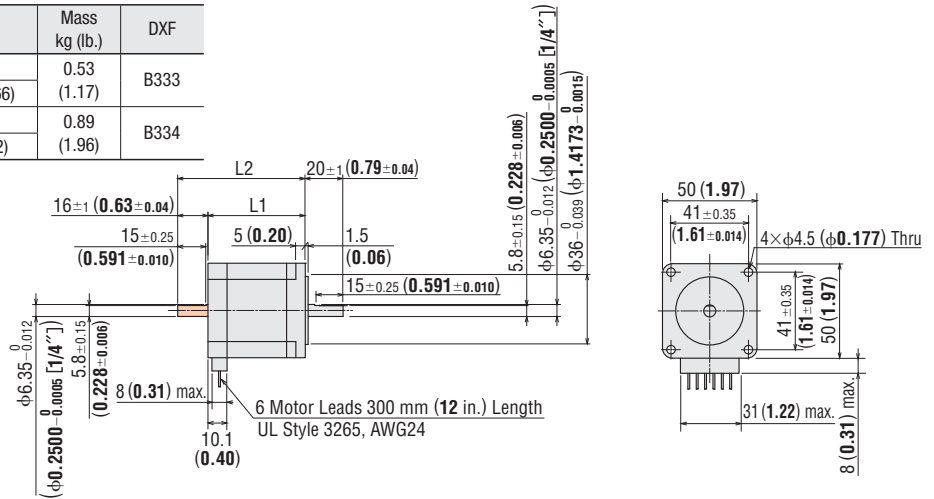
\*The length of machining on the double shaft model is  $15_{\pm 0.25}$  (0.591 ± 0.010).

● These dimensions are for the double shaft models. For the single shaft models, ignore the orange ( ) areas.

◇ Standard Type

⑤ □ 50 mm (□ 1.97 in.)

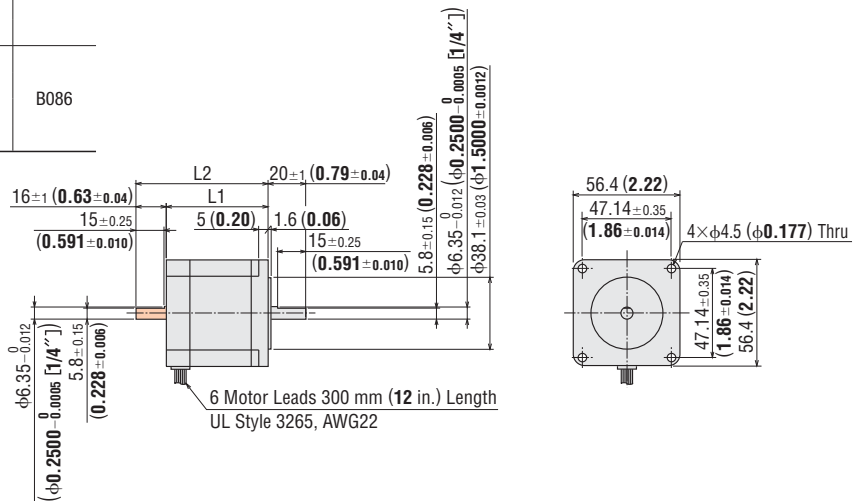
Model	Motor Model	L1	L2	Mass kg (lb.)	DXF
<b>CMK256AP</b>	PK256-02A	51.5	—	0.53	B333
<b>CMK256BP</b>	PK256-02B	(2.03)	67.5 (2.66)	(1.17)	
<b>CMK258AP</b>	PK258-02A	81	—	0.89	B334
<b>CMK258BP</b>	PK258-02B	(3.19)	97 (3.82)	(1.96)	



◇ High-Resolution Type, Standard Type

⑥ □ 56.4 mm (□ 2.22 in.)

Model	Motor Model	L1	L2	Mass kg (lb.)	DXF
<b>CMK264AP</b>	PK264-02A	39 (1.54)	—	0.45 (0.99)	B084
<b>CMK264MAP</b>	PK264MA				
<b>CMK264BP</b>	PK264-02B		55 (2.17)		
<b>CMK264MBP</b>	PK264MB	54 (2.13)	—	0.7 (1.54)	B085
<b>CMK266AP</b>	PK266-02A				
<b>CMK266MAP</b>	PK266MA		70 (2.76)		
<b>CMK266MBP</b>	PK266MB	76 (2.99)	—	1.0 (2.2)	B086
<b>CMK268AP</b>	PK268-02A				
<b>CMK268MAP</b>	PK268MA		92 (3.62)		
<b>CMK268MBP</b>	PK268MB				



● These dimensions are for the double shaft models. For the single shaft models, ignore the orange ( ) areas.

### ◇ SH Geared Type

#### 7 □ 28 mm (□ 1.10 in.)

Model	Motor Model	Gear Ratio	Mass kg (lb.)	DXF
<b>CMK223AP-SG</b> □	PK223PA-SG □	<b>7.2, 9, 10, 18, 36</b>	0.16 (0.35)	B335
<b>CMK223BP-SG</b> □	PK223PB-SG □			

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

Motor lead wire/connector assembly of 0.6 m (2 ft.) is included with the package. UL Style 3265, AWG24

If you are purchasing only a motor for maintenance purpose, etc., motor lead wire/connector assembly and connector will not be supplied. They must be purchased separately.

→ Page C-299

● Screws (Included)

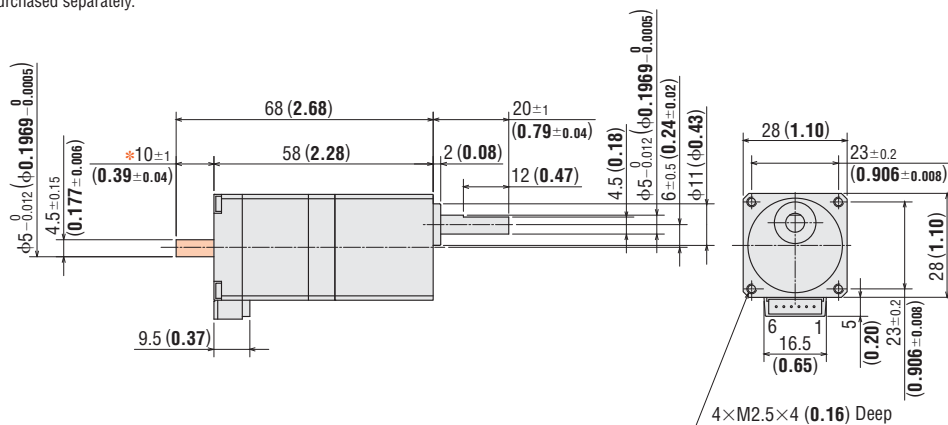
M2.5 Length 8 mm (0.31 in.) ... 4 pieces

● Applicable Connector

Connector housing: 51065-0600 (MOLEX)

Contact: 50212-8100 (MOLEX)

Crimp tool: 57176-5000 (MOLEX)



\*The length of machining on the double shaft model is 10±0.25 (0.394±0.010).

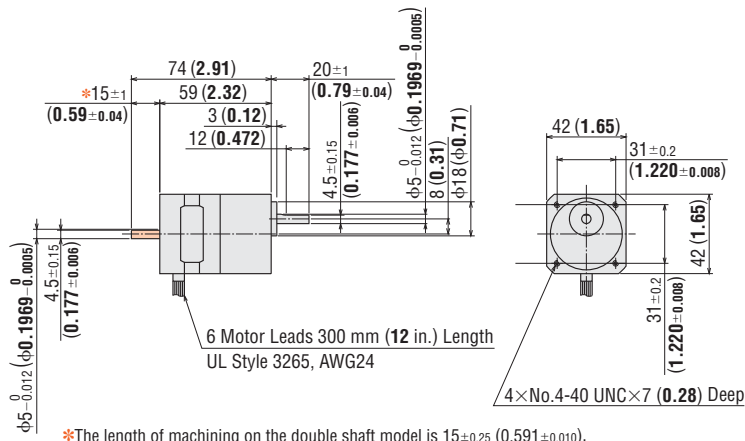
#### 8 □ 42 mm (□ 1.65 in.)

Model	Motor Model	Gear Ratio	Mass kg (lb.)	DXF
<b>CMK243APA-SG</b> □	PK243A1A-SG □	<b>3.6, 7.2, 9, 10, 18, 36</b>	0.35 (0.77)	B091U
<b>CMK243BPA-SG</b> □	PK243B1A-SG □			

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

● Screws (Included)

No.4-40 UNC Length 10 mm (0.39 in.) ... 4 pieces



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

● These dimensions are for the double shaft models. For the single shaft models, ignore the orange (■) areas.

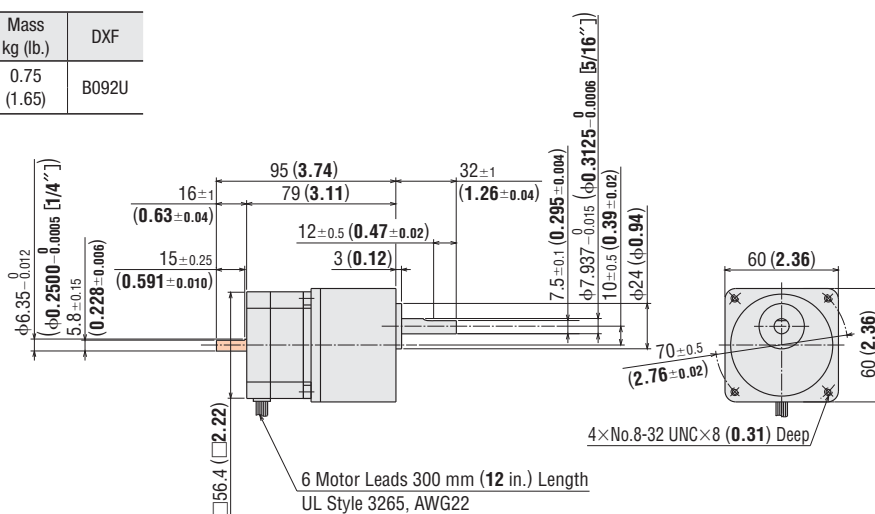
9 □ 60 mm (□ 2.36 in.)

Model	Motor Model	Gear Ratio	Mass kg (lb.)	DXF
<b>CMK264APA-SG</b> □	PK264A2A-SG □	<b>3.6, 7.2, 9, 10,</b>	0.75	B092U
<b>CMK264BPA-SG</b> □	PK264B2A-SG □	<b>18, 36</b>	(1.65)	

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

● Screws (Included)

No.8-32 UNC Length 15.8 mm (0.62 in.) ... 4 pieces



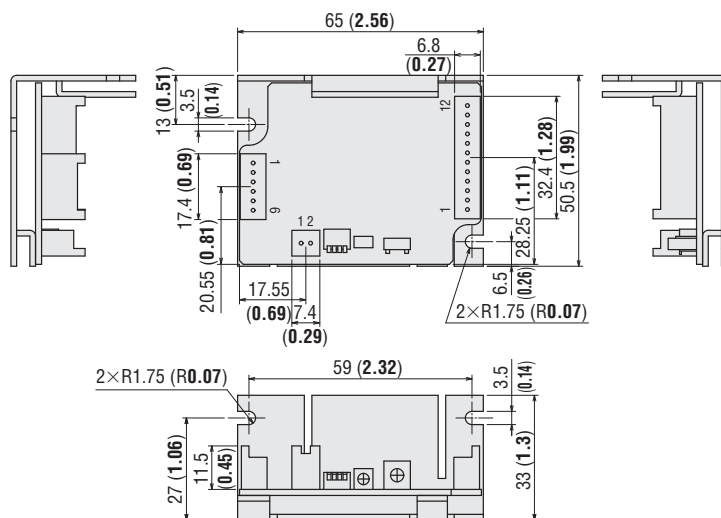
● These dimensions are for the double shaft models. For the single shaft models, ignore the orange (■) areas.

● Driver

10 CMD2109P, CMD2112P, CMD2120P

Mass: 0.05 kg (0.11 lb.)

DXF B441



● Connector Housing (Included)

51103-0200 (MOLEX)

51103-1200 (MOLEX)

51103-0600 (MOLEX)

● Contact (Included)

50351-8100 (MOLEX)

Note:

● Use the included connector for power supply, signal and motor. When assembling the connectors, use the hand-operated crimp tool [57295-5000 (MOLEX)]. The crimp tool is not included with the package. It must be purchased separately.

Driver lead wire set crimped with connector is available (sold separately). → Page C-301

Introduction

AC Input

DC Input

5-Phase Microstep

AC Input

2-Phase Full/Half

UMK

5-Phase Microstep

DC Input

2-Phase Microstep

CMK

2-Phase Microstep

Without Encoder

2-Phase PK/PV

With Encoder

2-Phase PK

Controllers

EMP400

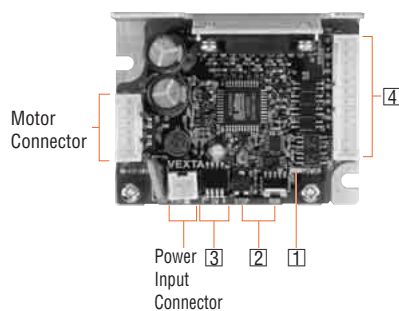
SG8030J

Accessories

Installation

## Connection and Operation

### Names and Functions of Driver Parts



#### 1 Power Input Display

Color	Function	When Activated
Green	Power supply indication	Lights when power is on.

#### 2 Current Adjustment Switches

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

#### 3 Function Select Switches

Indication	Switch Name	Function
1	Pulse input mode switch	Switches between 1-pulse input and 2-pulse input.
2, 3, 4	Step angle setting switch	These switches can be set to the desired resolution from the five resolution levels.

### Step Angle Setting Switches

SW-2	SW-3	SW-4	Microsteps/Step	Resolution	Step Angle
OFF	OFF	OFF	1	200	1.8°
OFF	OFF	ON	2	400	0.9°
OFF	ON	OFF	4	800	0.45°
OFF	ON	ON	8	1600	0.225°
ON	OFF	OFF	16	3200	0.1125°

#### Notes:

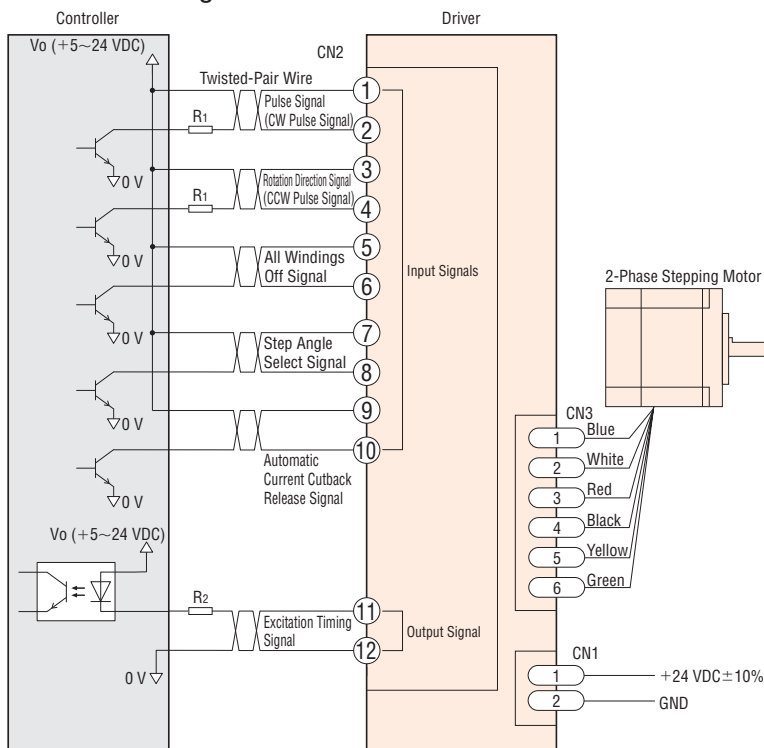
- Use of any setting other than the combinations listed in the table will automatically set the microstep to "1" and the motor will operate at the basic step angle.
- The step angle is calculated by dividing the basic step angle by the number of microsteps. The above figures are based on a basic step angle of 1.8°.
- With the high-resolution type, the basic step angle and resolution are 0.9° and 400 (microsteps/step 1) respectively.
- If you are using a geared type, the step angle divided by the gear ratio becomes the actual step angle.
- The step angle set with the step angle setting switches will become effective when the "Step Angle Select" (CS) signal input is OFF.
- Do not change the "Step Angle Select" (CS) signal input or step angle setting switches while the motor is operating. It may cause the motor to misstep and stop. Change the step angle setting switches, when the "Step Angle Select" (CS) signal input is OFF and the "Excitation Timing" (TIM) signal output is ON.

#### 4 Input/Output Signals

Indication	Input/Output	Pin No.	Signal Name	Function
CN2	Input	1	Pulse signal (CW pulse signal)	Operation command pulse signal (The motor will rotate in the CW direction when in 2-pulse input mode.)
		2		
		3	Rotation direction signal (CCW pulse signal)	Rotation direction signal (Photocoupler ON: CW, Photocoupler OFF: CCW (The motor will rotate in the CCW direction when in 2-pulse input mode.)
		4		
		5	All windings off signal	Cuts the output current to the motor and allows the motor shafts to be rotated manually.
		6		
		7	Step angle select signal	The motor will operate at the basic step angle regardless of the settings of the step angle setting switches.
		8		
		9	Automatic current cutback release signal	This signal is used to disable the automatic current cutback function.
		10		
Output		11	Excitation timing signal	Outputs signals when the excitation sequence is at STEP "0."
		12		

Description of input/output signals → Page C-201

● Connection Diagram



◇ Input Signal Connection

● Pulse (CW) Signal, Rotation Direction (CCW) Signal  
 Signals can be connected directly when 5 VDC is supplied. If the signals are used at a voltage exceeding 5 VDC, be sure to provide an external resistor to prevent the current exceeding 20 mA from flowing. Internal components will be damaged if a voltage exceeding 5 VDC is supplied directly without using an external resistor.  
 Example: If the voltage is 24 VDC, connect a resistor ( $R_1$ ) of 1.5 to 2.2 k $\Omega$  and 0.5 W or more.  
 ● All Windings Off Signal, Step Angle Select Signal, Automatic Current Cutback Release Signal  
 Signals can be connected directly when 5 to 24 VDC is supplied.

◇ Output Signal Connection

Use the output signal at 24 VDC or less and 10 mA or less. If these specifications are exceeded, the internal components may get damaged. Check the specification of the connected equipment. When the current is above 10 mA, connect an external resistor  $R_2$ .

◇ Power Supply

Use a power supply that can supply sufficient input current. When power supply capacity is insufficient, a decrease in motor output can cause the following malfunctions:  
 ● Motor does not rotate properly at high-speed  
 ● Slow motor startup and stopping

◇ Notes on Wiring

- Use twisted-pair wires of AWG24~22 and keep wiring as short as possible [within 2 m (6.6 ft.)].
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases. Technical reference → Page F-54
- Use wires of AWG22 or thicker for power supply lines. When assembling the connector, use the hand-operated crimp tool or the crimped driver lead wire set (sold separately). The crimp tool is not provided with the package. It must be purchased separately.
- Provide a minimum distance of 2 cm (0.79 in.) between the signal lines and power lines (AC lines, motor lines and other large-current circuits). Do not run the signal lines in the same duct as power lines or bundle them with power lines.
- If noise generated by the motor lead wires causes a problem, insert ferrite cores in the motor lead wire.
- Incorrect connection of DC power input will lead to driver damage. Make sure that the polarity is correct before turning power on.

● Description of Input/Output Signals

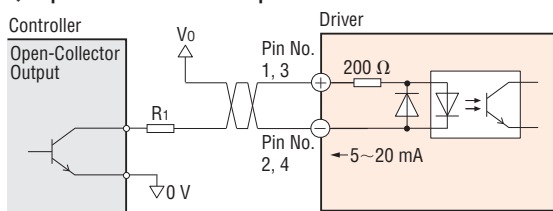
Indication of Input/Output Signal "ON"/"OFF"

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

Photocoupler OFF ON

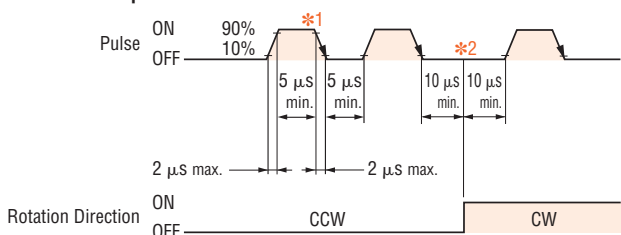
Pulse (CW) and Rotation Direction (CCW) Input Signal

◇ Input Circuit and Sample Connection

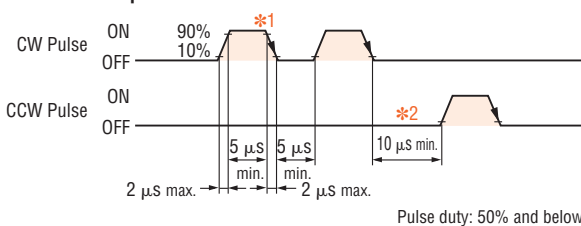


◇ Pulse Waveform Characteristics

● 1-Pulse Input Mode



● 2-Pulse Input Mode



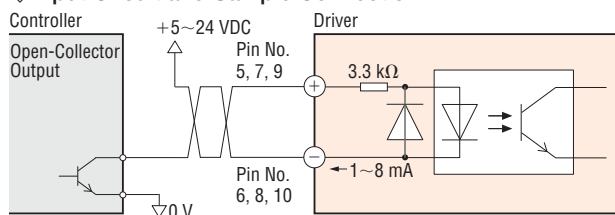
- \*1 The shaded area indicates that the photocoupler diode is ON. The motor moves when the photocoupler state changes from ON to OFF.
- \*2 The minimum interval time when changing rotation direction is 10  $\mu$ s. This value varies greatly depending on the motor type and load inertia.

◇ Pulse Signal Characteristics

- Keep the pulse signal at the "photocoupler OFF" state when no pulses are being input.
- In 1-pulse input mode, leave the pulse signal at rest ("photocoupler OFF") when changing rotation directions.
- In 2-pulse input mode, do not input a CW pulse and CCW pulse simultaneously.

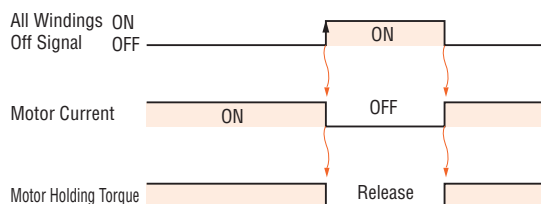
### All Windings Off (AWO) Input Signal Step Angle Select (CS) Input Signal Automatic Current Cutback Release (ACDOFF) Input Signal

#### ◇ Input Circuit and Sample Connection



#### ◇ All Windings Off (AWO) Input Signal

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



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

- Switching the "All Windings Off" (AWO) signal from "photocoupler ON" to "photocoupler OFF" does not alter the excitation sequence.

When the motor shaft is manually adjusted with the "All Windings Off" signal input, the shaft will shift up to  $\pm 3.6^\circ$  (geared type:  $\pm 3.6^\circ/\text{gear ratio}$ ) from the position set after the "All Windings Off" signal is released.

#### ◇ Step Angle Select (CS) Input Signal

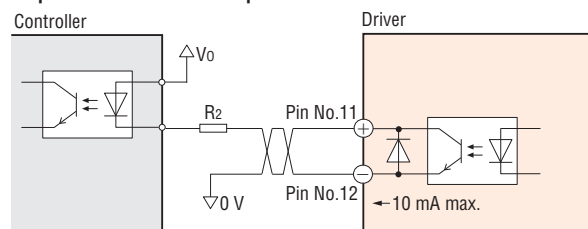
- When this signal input is "ON," the motor will operate at the basic step angle regardless of the settings of the step angle setting switches. When the signal input is "OFF," the motor will operate at the step angle set with the step angle setting switches.
- To change the step angle, do so when the "Excitation Timing" signal output is "ON" and the motor is at standstill.

#### ◇ Automatic Current Cutback Release (ACDOFF) Input Signal

- When this signal is in the "photocoupler ON" state, the automatic current cutback function is disabled. When this signal is in the "photocoupler OFF" state, the automatic current cutback function will be activated after the motor stops (after approx. 100 msec).
- The photocoupler must be "OFF" when the motor is operating.

### Excitation Timing (TIM) Output Signal

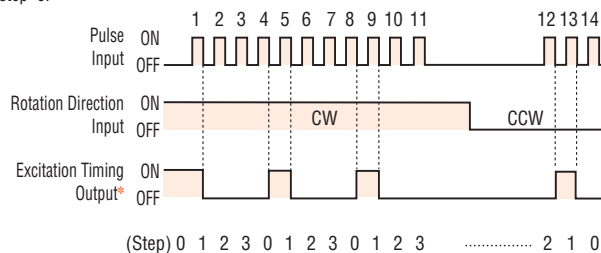
#### ◇ Output Circuit and Sample Connection



- The "Excitation Timing" signal is output to indicate when the motor excitation is in the initial stage (step "0" at power up).
- The "Excitation Timing" signal is output simultaneously with a pulse input each time the excitation sequence returns to step "0." The excitation sequence will complete one cycle for every  $7.2^\circ$  ( $3.6^\circ$  for high-resolution type) rotation of the motor output shaft.  
Microsteps/step 1: Signal is output once every 4 pulses.  
Microsteps/step 4: Signal is output once every 16 pulses.

#### Timing chart at $1.8^\circ/\text{step}$ (Microsteps/step 1)

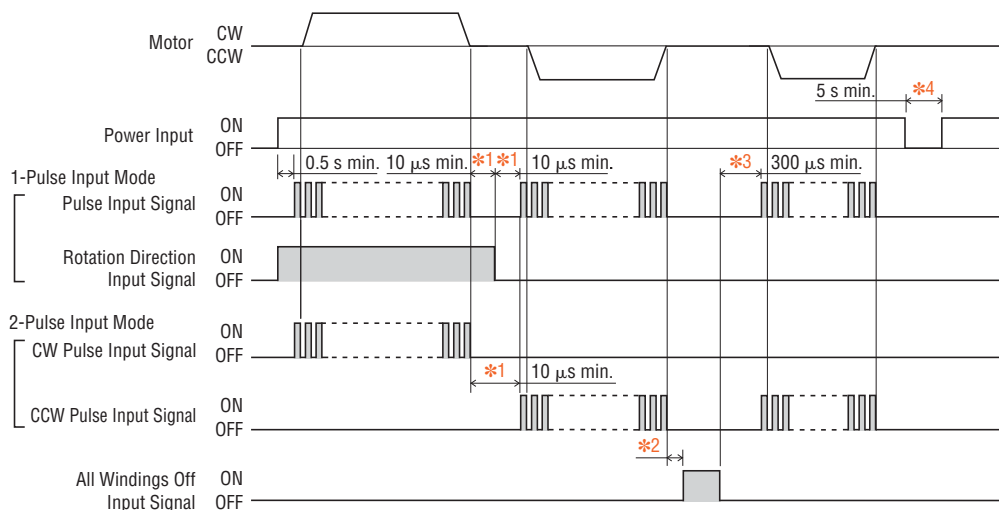
\*When connected as shown in the sample connection, the signal will be "photocoupler ON" at step "0."



#### Notes:

- When power is turned ON, the excitation sequence is reset to step "0" and the "Excitation Timing" signal is output.
- When operating the motor using the "Excitation Timing" signal output, make sure the motor output shaft stops at an integral multiple of  $7.2^\circ$  ( $3.6^\circ$  for high-resolution type).

## ● Timing Chart



The  section indicates that the photocoupler diode is emitting light.

- \*1 The minimum switching time to change direction (1-pulse input mode), and switching time to change CW, CCW pulse (2-pulse input mode) 10  $\mu$ s is shown as a response time of circuit. The motor may need more time than that.
- \*2 Depends on load inertia, load torque and starting frequency.
- \*3 Never input a pulse signal immediately after switching the "All Windings Off" signal to "photocoupler OFF." The motor may not start.
- \*4 Wait at least 5 seconds before turning on the power again.

## List of Motor and Driver Combinations

Model names for motor and driver combinations are shown below.

Type	Model	Motor Model	Driver Model	
High-Torque Type	<b>CMK223PAP</b>	PK223PA*	CMD2109P	
	<b>CMK223PBP</b>	PK223PB*		
	<b>CMK224PAP</b>	PK224PA*		
	<b>CMK224PBP</b>	PK224PB*		
	<b>CMK225PAP</b>	PK225PA*		
	<b>CMK225PBP</b>	PK225PB*		
	High-Resolution Type	<b>CMK233PAP</b>	PK233PA*	CMD2112P
		<b>CMK233PBP</b>	PK233PB*	
		<b>CMK235PAP</b>	PK235PA*	
		<b>CMK235PBP</b>	PK235PB*	
		<b>CMK244PAP</b>	PK244PA*	
		<b>CMK244PBP</b>	PK244PB*	
		<b>CMK246PAP</b>	PK246PA*	
		<b>CMK246PBP</b>	PK246PB*	
Standard Type	<b>CMK243MAPA</b>	PK243MAA	CMD2109P	
	<b>CMK243MBPA</b>	PK243MBA		
	<b>CMK244MAPA</b>	PK244MAA	CMD2112P	
	<b>CMK244MBPA</b>	PK244MBA		
	<b>CMK245MAPA</b>	PK245MAA	CMD2120P	
	<b>CMK245MBPA</b>	PK245MBA		
	<b>CMK264MAP</b>	PK264MA	CMD2120P	
	<b>CMK264MBP</b>	PK264MB		
	<b>CMK266MAP</b>	PK266MA		
	<b>CMK266MBP</b>	PK266MB		
Standard Type	<b>CMK243APA</b>	PK243-01AA	CMD2109P	
	<b>CMK243BPA</b>	PK243-01BA		
	<b>CMK244APA</b>	PK244-01AA	CMD2112P	
	<b>CMK244BPA</b>	PK244-01BA		
	<b>CMK245APA</b>	PK245-01AA		
	<b>CMK245BPA</b>	PK245-01BA		
	<b>CMK256AP</b>	PK256-02A	CMD2120P	
	<b>CMK256BP</b>	PK256-02B		
	<b>CMK258AP</b>	PK258-02A		
	<b>CMK258BP</b>	PK258-02B		
<b>CMK264AP</b>	PK264-02A			
<b>CMK264BP</b>	PK264-02B			
<b>CMK266AP</b>	PK266-02A	CMD2120P		
<b>CMK266BP</b>	PK266-02B			
<b>CMK268AP</b>	PK268-02A			
<b>CMK268BP</b>	PK268-02B			

Type	Model	Motor Model	Driver Model
SH Geared Type	<b>CMK223AP-SG7.2</b>	PK223PA-SG7.2*	CMD2109P
	<b>CMK223BP-SG7.2</b>	PK223PB-SG7.2*	
	<b>CMK223AP-SG9</b>	PK223PA-SG9*	
	<b>CMK223BP-SG9</b>	PK223PB-SG9*	
	<b>CMK223AP-SG10</b>	PK223PA-SG10*	
	<b>CMK223BP-SG10</b>	PK223PB-SG10*	
	<b>CMK223AP-SG18</b>	PK223PA-SG18*	
	<b>CMK223BP-SG18</b>	PK223PB-SG18*	
	<b>CMK223AP-SG36</b>	PK223PA-SG36*	
	<b>CMK223BP-SG36</b>	PK223PB-SG36*	
	<b>CMK243APA-SG3.6</b>	PK243A1A-SG3.6	
	<b>CMK243BPA-SG3.6</b>	PK243B1A-SG3.6	
	<b>CMK243APA-SG7.2</b>	PK243A1A-SG7.2	
	<b>CMK243BPA-SG7.2</b>	PK243B1A-SG7.2	
	<b>CMK243APA-SG9</b>	PK243A1A-SG9	
	<b>CMK243BPA-SG9</b>	PK243B1A-SG9	
	<b>CMK243APA-SG10</b>	PK243A1A-SG10	
	<b>CMK243BPA-SG10</b>	PK243B1A-SG10	
	<b>CMK243APA-SG18</b>	PK243A1A-SG18	
	<b>CMK243BPA-SG18</b>	PK243B1A-SG18	
<b>CMK243APA-SG36</b>	PK243A1A-SG36		
<b>CMK243BPA-SG36</b>	PK243B1A-SG36		
SH Geared Type	<b>CMK264APA-SG3.6</b>	PK264A2A-SG3.6	CMD2120P
	<b>CMK264BPA-SG3.6</b>	PK264B2A-SG3.6	
	<b>CMK264APA-SG7.2</b>	PK264A2A-SG7.2	
	<b>CMK264BPA-SG7.2</b>	PK264B2A-SG7.2	
	<b>CMK264APA-SG9</b>	PK264A2A-SG9	
	<b>CMK264BPA-SG9</b>	PK264B2A-SG9	
	<b>CMK264APA-SG10</b>	PK264A2A-SG10	
	<b>CMK264BPA-SG10</b>	PK264B2A-SG10	
	<b>CMK264APA-SG18</b>	PK264A2A-SG18	
	<b>CMK264BPA-SG18</b>	PK264B2A-SG18	
<b>CMK264APA-SG36</b>	PK264A2A-SG36		
<b>CMK264BPA-SG36</b>	PK264B2A-SG36		

- \* If you are purchasing only a motor for maintenance purpose, etc., motor lead wire/connector assembly will not be supplied. They must be purchased separately. They are available as accessories. Motor lead wire/connector assembly → Page C-299

