

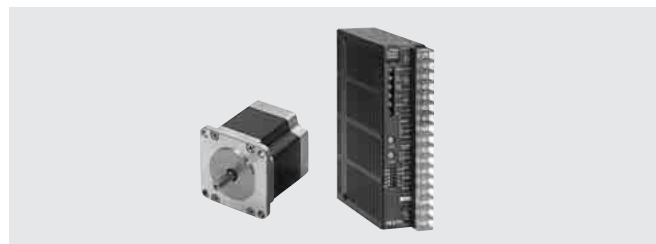
RoHS RoHS-Compliant

2-Phase Stepping Motor and Driver Package

UMK Series

● Additional Information ●
Technical reference → Page F-1

The **UMK** Series is a 2-phase stepping motor (resolution: 200 per rotation) with easy-handling AC input driver package. It provides enhanced high-speed characteristics compared with motor packages combined with a DC input driver.

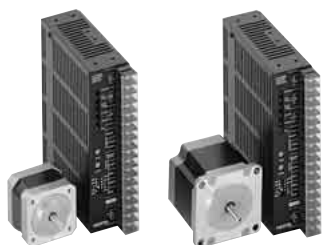


Features

● Selectable from Six Types of Motors

The product line now has two frame sizes [□42 mm (□1.65 in.), □56.4 mm (2.22 in.)]. Three kinds of output torque are available for each size.

(If lower vibration and lower noise are required, 5-phase stepping motors are recommended.)



□42 mm (□1.65 in.)

□56.4 mm (□2.22 in.)

Product Number Code

UMK 2 6 6 M A A

① ② ③ ④ ⑤ ⑥ ⑦

Product Line

● Standard Type

Model (Single shaft)	Model (Double shaft)
UMK243AA	UMK243BA
UMK244AA	UMK244BA
UMK245AA	UMK245BA
UMK264AA	UMK264BA
UMK266AA	UMK266BA
UMK268AA	UMK268BA

● Compact Driver

The **UMK** Series driver offers high output of 0.95 to 2 A/phase in a compact body of 35 mm×100 mm×135 mm (1.38 in.×3.94 in.×5.31 in.) based on surface mount technology and optimized heat design.

● A Full Range of Functions

The **UMK** Series has a range of built-in functions such as automatic current cutoff, pulse input mode switching, step angle select and overheat output logic switching. All these functions can be controlled using the front panel switches and monitored by LEDs. The series also comes with a timing output that facilitates mechanical homing.

● **RoHS** RoHS-Compliant

The **UMK** 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

① Series	UMK: UMK Series
② 2: 2-Phase	
③ Motor Frame Size	4: 42 mm (1.65 in.) 6: 56.4 mm (2.22 in.)
④ Motor Case Length	
⑤ Motor Type	Blank: Standard Type M: High-Resolution Type
⑥ Motor Shaft Type	A: Single Shaft B: Double Shaft
⑦ U.S.A. Version	

● High-Resolution Type

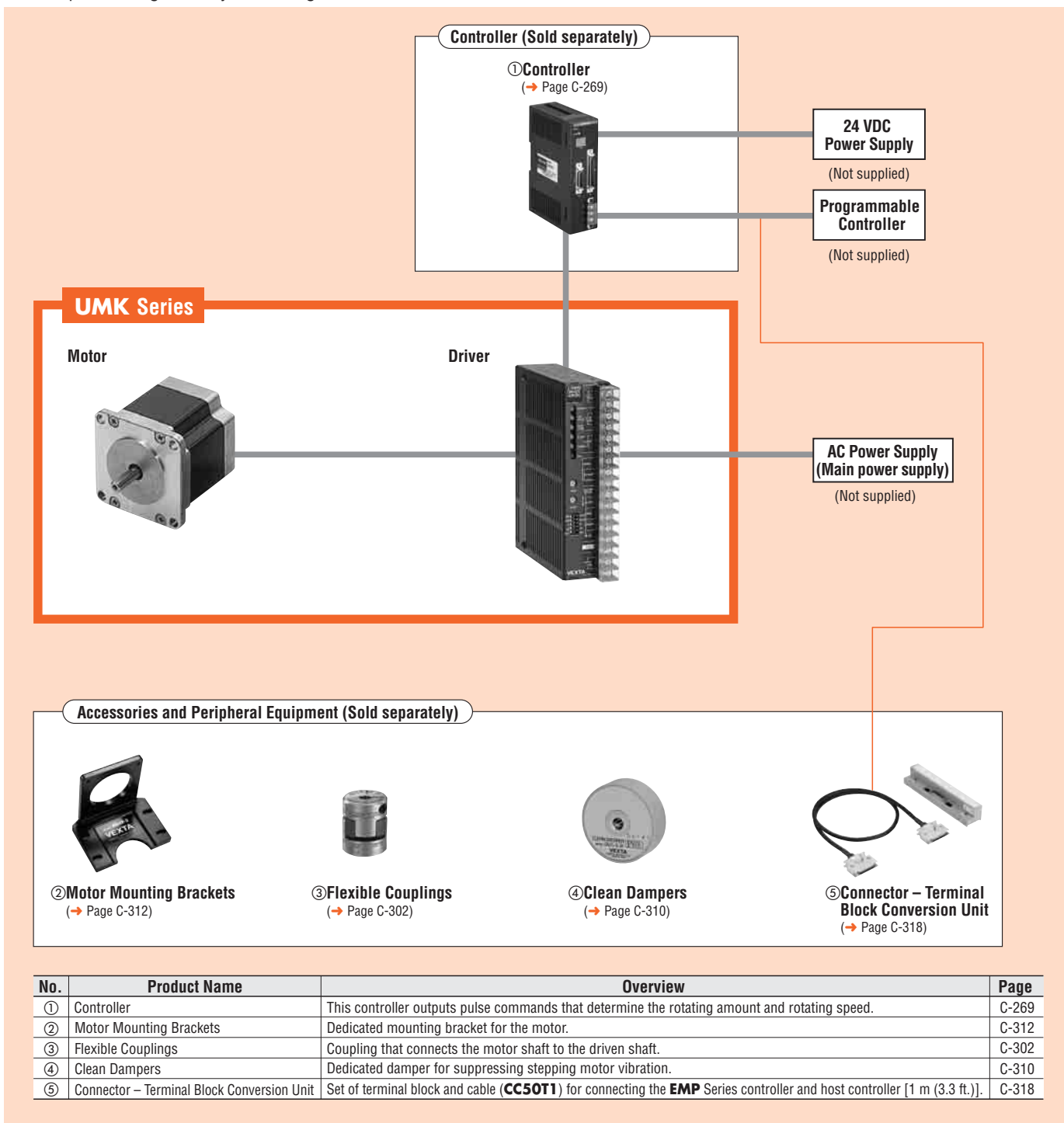
Model (Single shaft)	Model (Double shaft)
UMK243MAA	UMK243MBA
UMK244MAA	UMK244MBA
UMK245MAA	UMK245MBA
UMK264MAA	UMK264MBA
UMK266MAA	UMK266MBA
UMK268MAA	UMK268MBA

The following items are included in each product.

Motor, Driver, Mounting Bracket for Driver (with screws), Operating Manual

System Configuration

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



● Example of System Configuration

(Sold separately)

UMK Series	+	Controller	Motor Mounting Bracket	Flexible Coupling	Clean Damper	Connector – Terminal Block Conversion Unit [1 m (3.3 ft.)]
UMK266BA		EMP401-1	PAL2P-2	MCS2006F04	D6CL-6.3F	CC50T1

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

Standard Type Motor Frame Size 42 mm (1.65 in.), 56.4 mm (2.22 in.)

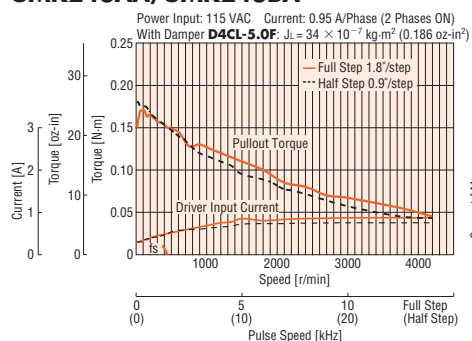
Specifications RoHS

Model	Single Shaft	UMK243AA	UMK244AA	UMK245AA	UMK264AA	UMK266AA	UMK268AA
	Double Shaft	UMK243BA	UMK244BA	UMK245BA	UMK264BA	UMK266BA	UMK268BA
Maximum Holding Torque	N·m (oz·in)	0.16 (22)	0.26 (36)	0.32 (45)	0.39 (55)	0.9 (127)	1.35 (191)
Rotor Inertia J	kg·m ² (oz·in ²)	35×10^{-7} (0.191)	54×10^{-7} (0.3)	68×10^{-7} (0.37)	120×10^{-7} (0.66)	300×10^{-7} (1.64)	480×10^{-7} (2.6)
Rated Current	A/Phase	0.95	1.2		2		
Basic Step Angle	1.8°						
Power Source	Single-Phase 115 VAC ±15% 60 Hz or Single-Phase 100 VAC ±15% 50/60 Hz						
Excitation Mode	1 A						
	1.4 A						
Mass	2.2 A						
	Full Step: 1.8°/step Half Step: 0.9°/step						
Dimension No.	Motor	kg (lb.)	0.21 (0.46)	0.27 (0.59)	0.35 (0.77)	0.45 (0.99)	0.7 (1.5)
	Driver	kg (lb.)	0.47 (1)				
Dimension No.	Motor	[1]			[2]		
	Driver	[1]			[3]		

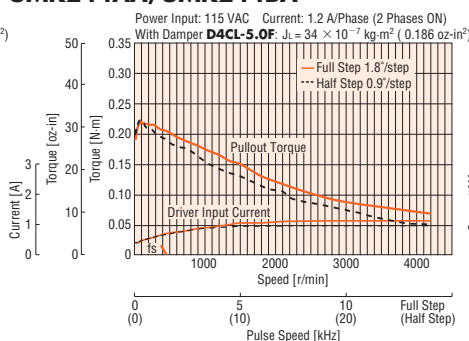
How to read specifications table → Page C-11

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

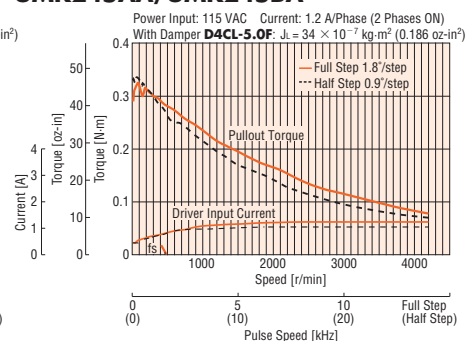
UMK243AA/UMK243BA



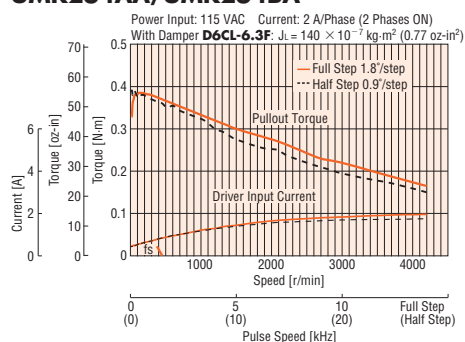
UMK244AA/UMK244BA



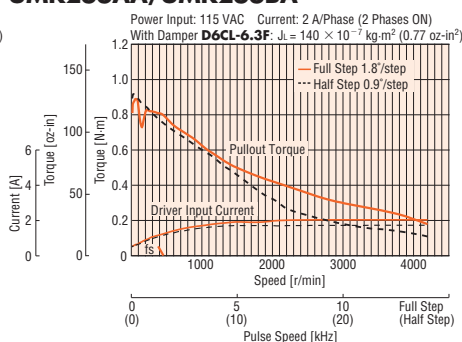
UMK245AA/UMK245BA



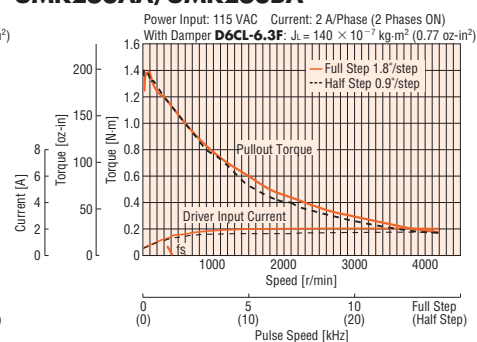
UMK264AA/UMK264BA



UMK266AA/UMK266BA



UMK268AA/UMK268BA



- The pulse input circuit responds up to approximately 20 kHz with a pulse duty of 50%.

Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 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.)

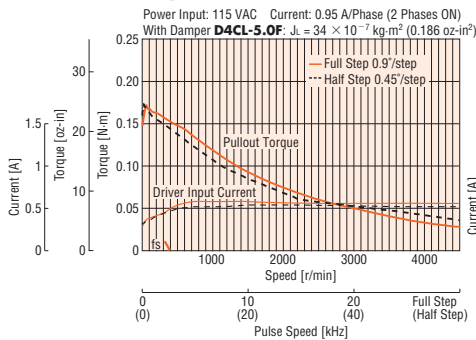
Specifications (RoHS)

Model	Single Shaft	UMK243MAA	UMK244MAA	UMK245MAA	UMK264MAA	UMK266MAA	UMK268MAA
	Double Shaft	UMK243MBA	UMK244MBA	UMK245MBA	UMK264MBA	UMK266MBA	UMK268MBA
Maximum Holding Torque	N·m (oz·in)	0.16 (22)	0.26 (36)	0.32 (45)	0.39 (55)	0.9 (127)	1.35 (191)
Rotor Inertia J	kg·m ² (oz·in ²)	35×10 ⁻⁷ (0.191)	54×10 ⁻⁷ (0.3)	68×10 ⁻⁷ (0.37)	120×10 ⁻⁷ (0.66)	300×10 ⁻⁷ (1.64)	480×10 ⁻⁷ (2.6)
Rated Current	A/Phase	0.95	1.2		2		
Basic Step Angle	0.9°						
Power Source	Single-Phase 115 VAC±15% 60 Hz or Single-Phase 100 VAC ±15% 50/60 Hz						
Excitation Mode	Full Step: 0.9°/step Half Step: 0.45°/step						
Mass	Motor	kg (lb.)	0.24 (0.53)	0.3 (0.66)	0.37 (0.81)	0.45 (0.99)	0.7 (1.5)
	Driver	kg (lb.)	0.47 (1)				
Dimension No.	Motor	[1]				[2]	
	Driver					[3]	

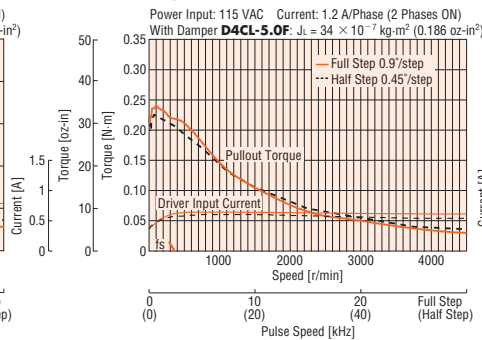
How to read specifications table → Page C-11

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

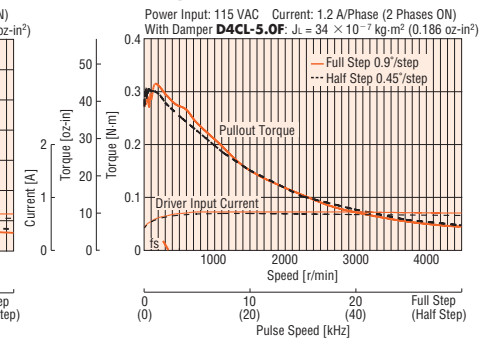
UMK243MAA/UMK243MBA



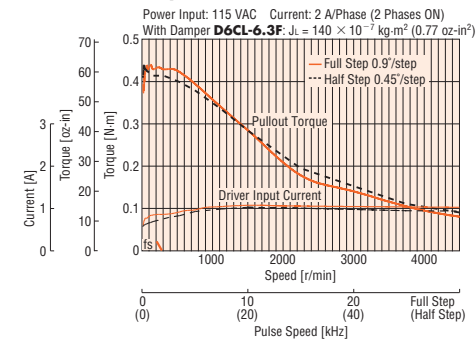
UMK244MAA/UMK244MBA



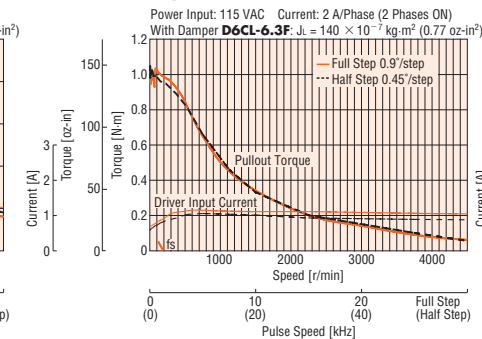
UMK245MAA/UMK245MBA



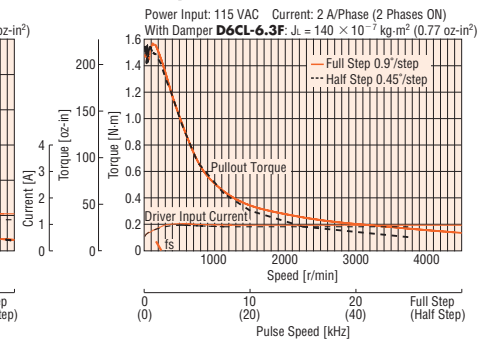
UMK264MAA/UMK264MBA



UMK266MAA/UMK266MBA



UMK268MAA/UMK268MBA



- The pulse input circuit responds up to approximately 20 kHz with a pulse duty of 50%.

Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 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, Input resistance: 220 Ω, Input current: 7~20 mA Photocoupler ON: +4.5~5 V, Photocoupler OFF: 0~+1 V (Voltage between terminals)
	Pulse Signal (CW Pulse Signal)	Operation command pulse signal (CW direction operation command pulse signal when in 2-pulse input mode), Negative logic pulse input Pulse width: 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: 20 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: 20 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.
Output Signals	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) Full step: Signal is output every 4 pulses, Half step: Signal is output every 8 pulses
	Overheat Signal	The signal is output when the temperature of the driver heat sink rises above approximately 90°C (194°F). (Photocoupler: ON or OFF, automatic return available) The motor current is cut off automatically if the automatic current off function is ON. The output logic of the photocoupler is based on the setting of the overheat output logic switch.
Functions	Automatic current cutback, Automatic current Off, Pulse mode input switch, Step angle select, Overheat output logic switch	
Indicators (LED)	Power supply input, CW/PLS input, CCW/DIR input, All windings off input, Excitation timing output, Overheat output	
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.	100 MΩ or more when 500 VDC megger is applied between the following places under normal ambient temperature and humidity: • Case — Power input terminal • Case — Signal I/O terminal • Power input terminal — Signal I/O terminal
Insulation Strength	Sufficient to withstand 1.0 kVAC (0.5 kVAC for UMK24 □ and UMK24M □ types) at 50 Hz or 60 Hz applied between the windings and the case for 1 minute under normal ambient temperature and humidity.	Sufficient to withstand the following for 1 minute under normal ambient temperature and humidity: • Case — Power input terminal 1.0 kVAC 50 Hz or 60 Hz • Case — Signal I/O terminal 1.0 kVAC 50 Hz or 60 Hz • Power input terminal — Signal I/O terminal 1.0 kVAC 50 Hz or 60 Hz
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 the 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.)

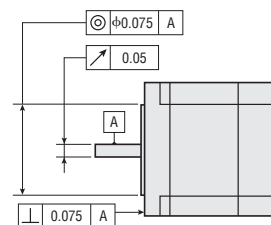
*2 Radial Play: Displacement in shaft position in the radial direction, when a 5 N (1.12 lb.) load is applied in the vertical direction to the tip of the motor's shaft.

*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 a 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.)

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.)	
UMK243 □A, UMK243 □MA UMK244 □A, UMK244 □MA UMK245 □A, UMK245 □MA	20 (4.5)	25 (5.6)	34 (7.6)	52 (11.7)	–	The permissible thrust load shall be no greater than the motor mass.
UMK264 □A, UMK264 □MA UMK266 □A, UMK266 □MA UMK268 □A, UMK268 □MA	54 (12.1)	67 (15)	89 (20)	130 (29)	–	

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

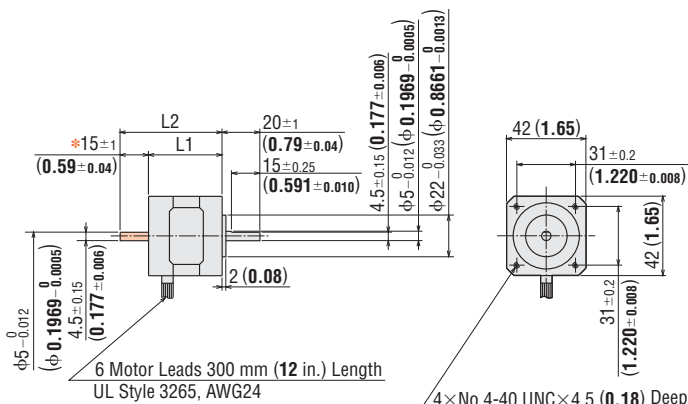
Dimensions Unit = mm (in.)

Motor

◇ Standard Type, High-Resolution Type

1 □ 42 mm (□ 1.65 in.)

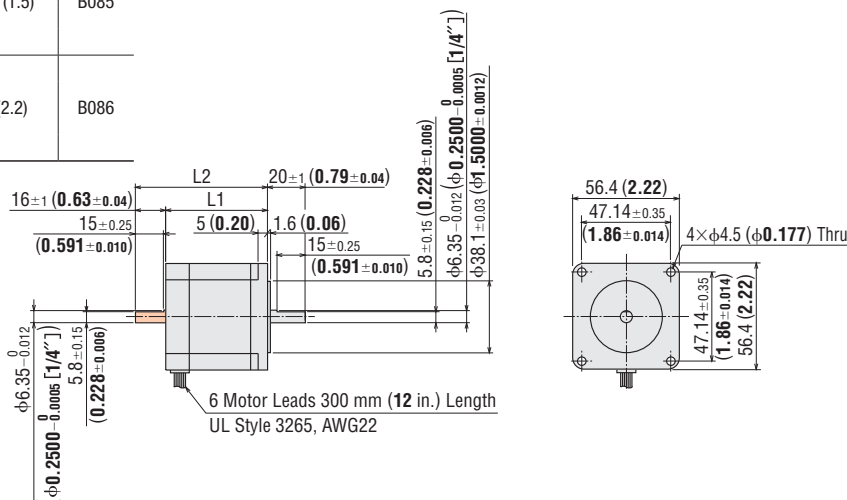
Model	Motor Model	L1	L2	Mass kg (lb.)	DXF
UMK243AA	PK243-01AA	33 (1.3)	–	0.21 (0.46)	B081U
UMK243MAA	PK243MAA			0.24 (0.53)	
UMK243BA	PK243-01BA			0.21 (0.46)	
UMK243MBA	PK243MBA			0.24 (0.53)	
UMK244AA	PK244-01AA	39 (1.54)	–	0.27 (0.59)	B082U
UMK244MAA	PK244MAA			0.3 (0.66)	
UMK244BA	PK244-01BA			0.27 (0.59)	
UMK244MBA	PK244MBA			0.3 (0.66)	
UMK245AA	PK245-01AA	47 (1.85)	–	0.35 (0.77)	B083U
UMK245MAA	PK245MAA			0.37 (0.81)	
UMK245BA	PK245-01BA			0.35 (0.77)	
UMK245MBA	PK245MBA			0.37 (0.81)	



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

2 □ 56.4 mm (□ 2.22 in.)

Model	Motor Model	L1	L2	Mass kg (lb.)	DXF
UMK264AA	PK264-02A	39 (1.54)	–	0.45 (0.99)	B084
UMK264MAA	PK264MA				
UMK264BA	PK264-02B				
UMK264MBA	PK264MB				
UMK266AA	PK266-02A	54 (2.13)	–	0.7 (1.5)	B085
UMK266MAA	PK266MA				
UMK266BA	PK266-02B				
UMK266MBA	PK266MB				
UMK268AA	PK268-02A	76 (2.99)	–	1 (2.2)	B086
UMK268MAA	PK268MA				
UMK268BA	PK268-02B				
UMK268MBA	PK268MB				



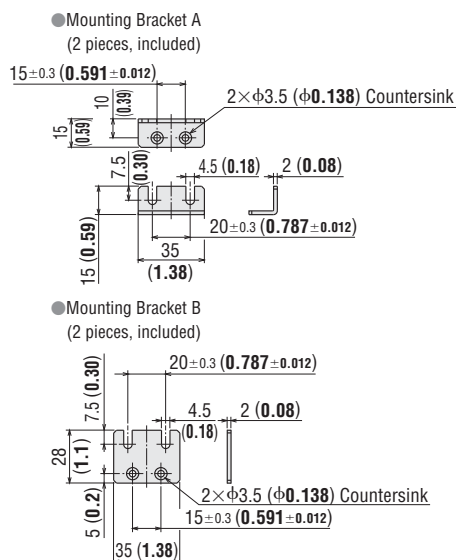
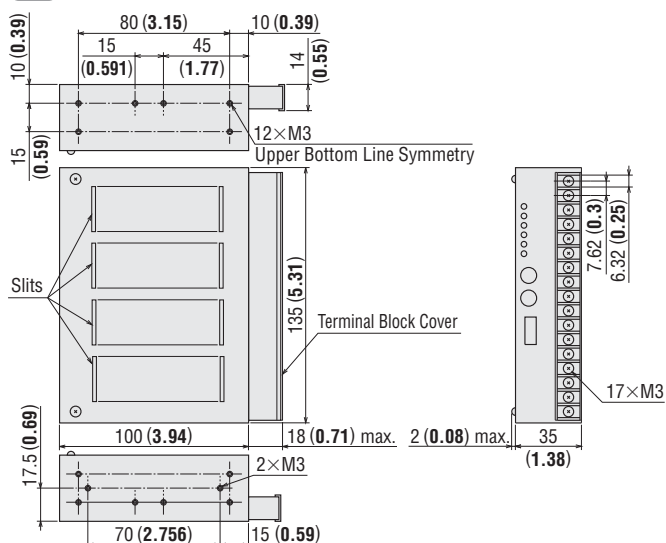
These dimensions are for the double shaft models. For the single shaft models, ignore the orange areas.

● Driver

UDK2109A, UDK2112A, UDK2120A

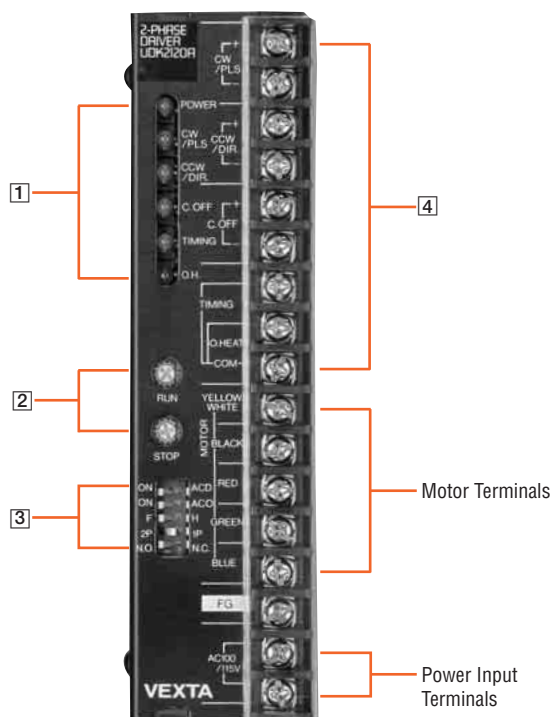
Mass: 0.47 kg (1 lb.)

DXF B087



■ Connection and Operation

● Names and Functions of Driver Parts



1 Signal Monitor Displays

Indication	Color	Function
POWER	Green	Power input display
CW/PLS	Green	Pulse/CW pulse input display
CCW/DIR.	Green	Rotation direction/CCW pulse input display
C.OFF	Green	All windings off input display
TIMING	Green	Excitation timing output display
O.H.	Red	Overheat output display

2 Current Adjustment Switches

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

3 Function Select Switches

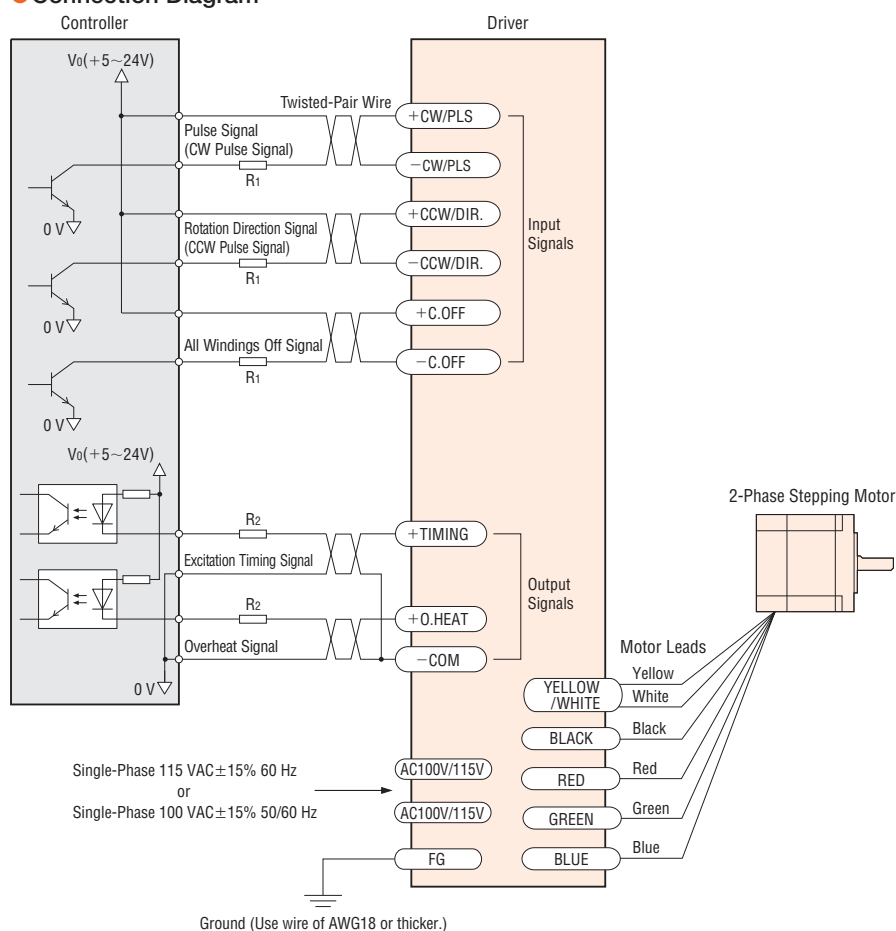
Indication	Switch Name	Function
ON/ACD	Automatic current cutback function switch	Automatically decreases output current to motor at motor standstill.
ON/ACO	Automatic current off function switch	When the temperature of the driver heat sink rises above 90°C (194°F), this function automatically switches the motor current off. The function can be set and released with this switch.
F/H	Step angle select switch	Switches the motor's step angle. Standard type F: 1.8°/step, H: 0.9°/step High-resolution type F: 0.9°/step, H: 0.45°/step
2P/1P	Pulse input mode switch	Switches between 1-pulse input and 2-pulse input.
N.O./N.C.	Overheat output logic switch	Select overheat alarm logic. N.O.: Normally open N.C.: Normally closed Use according to your equipment.

4 Input/Output Signals

Input/Output	Signal Name	Function
Input	CW pulse signal (Pulse signal)	Operation command pulse signal (The motor will rotate in the CW direction when in 2-pulse input mode.)
	CCW pulse signal (Rotation direction signal)	Rotation direction signal. Photocoupler OFF: CCW; Photocoupler ON: CW (The motor will rotate in the CCW direction when in 2-pulse input mode.)
	All windings off signal	Cuts the output current to the motor and allows the motor shafts to be rotated by external force.
Output	Excitation timing signal	Outputs signals when the excitation sequence is at STEP "0."
	Overheat signal	When the temperature of the driver heat sink rises above 90°C (194°F), this signal will be output.

Description of input/output signals → Page C-130

● Connection Diagram



◇ Input Signal Connection

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 (R₁) of 1.5 to 2.2 kΩ and 0.5 W or more.

◇ Output Signal Connection

Use output signals at 24 VDC or less and 10 mA or less.

If these specifications are exceeded, the internal components may be damaged.

Check the specification of the connected equipment.

When the current is above 10 mA, connect an external resistor R₂.

◇ Power Supply

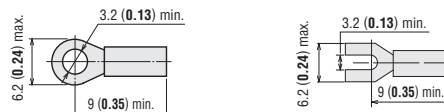
Use a power supply that can supply sufficient input current. When power supply capacity is insufficient, a decrease in motor output can cause the following malfunctions:

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

◇ Notes on Wiring

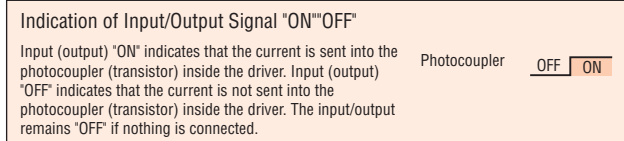
- Use twisted-pair wires of AWG24 or thicker and keep wiring as short as possible [within 2 m (6.6 ft.)].
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases. Technical reference → Page F-54
- Use wires of AWG20 or thicker for motor line (when extended) and power supply lines, and use wire of AWG18 or thicker for protective earth line.
- To ground the driver and controller, lead the ground conductor from the protective earth terminal and connect the ground conductor to provide a common ground point.
- Provide a minimum distance of 10 cm (3.9 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.

◇ Recommended Crimp Terminals Unit = mm (in.)



- Crimp terminals are not provided with the products. They must be purchased separately.

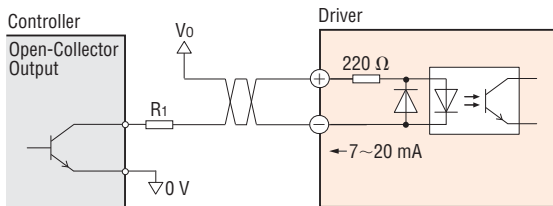
● Description of Input/Output Signals



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

All Windings Off (C.OFF) Input Signal

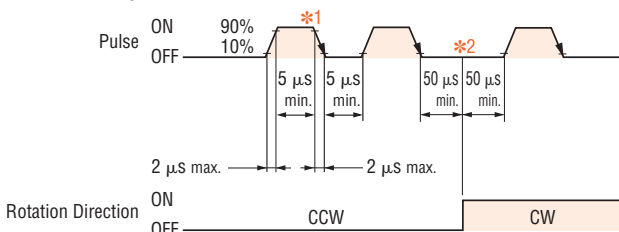
◇ Input Circuit and Sample Connection



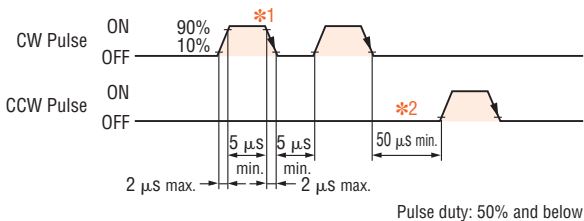
◇ Pulse (CW) and Rotation Direction (CCW) Input Signal

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.

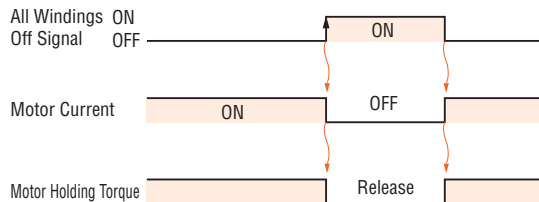
*2 The minimum interval time when changing rotation directions is 50 μs. This value varies greatly depending on the motor type and load inertia.

◇ 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 (C.OFF) Input Signal

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



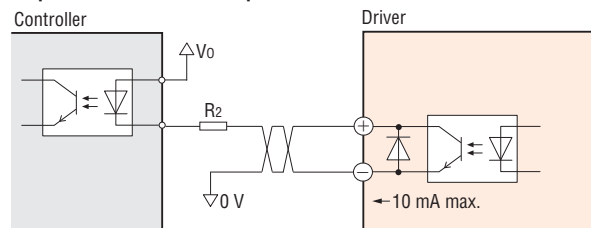
The shaded area indicates that the motor provides holding torque in proportion to standstill current set by STOP switch.

- Switching the "All Windings Off" (C.OFF) signal from "photocoupler ON" to "photocoupler OFF" does not alter the excitation sequence. When the motor shaft is manually adjusted with the "All Windings Off" signal input, the shaft will shift up to $\pm 3.6^\circ$ from the position set after the "All Windings Off" signal is released.

Excitation Timing (TIMING) Output Signal

Overheat (O.HEAT) Output Signal

◇ Output Circuit and Sample Connection



◇ Excitation Timing (TIMING) Output Signal

- The "Excitation Timing" signal is output when the motor excitation is in the initial stage (step "0").
- The "Excitation Timing" signal is output simultaneously with a pulse input each time the excitation sequence returns to step "0." The excitation sequence will complete one cycle for every 7.2° rotation of the motor output shaft.

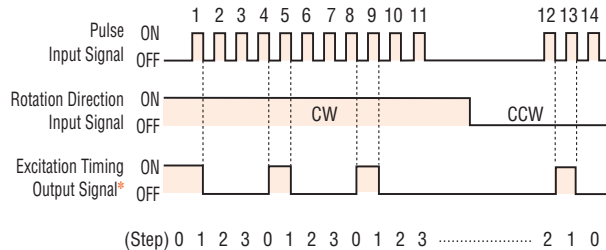
Full step: Signal is output once every 4 pulses.

Half step: Signal is output once every 8 pulses.

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

Timing chart at 1.8°/step (full step)

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



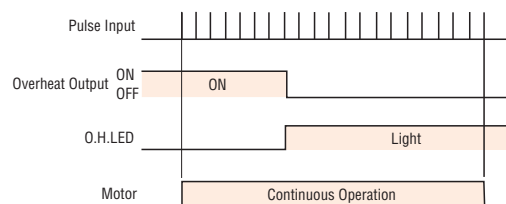
Note:

- When power is turned on, the excitation sequence is reset to step "0" and the "Excitation Timing" signal will be output.

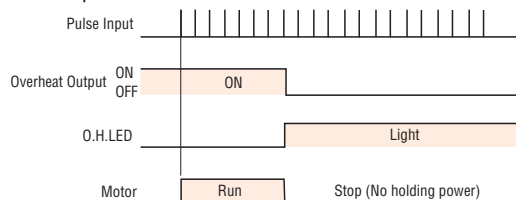
◇ Overheat (O.HEAT) Output Signal

- The "Overheat" signal is output to protect the driver from heat damage if the internal temperature of the driver heat sink rises above 90°C (194°F). The O.H. LED lights on the front panel when the "Overheat" signal is output.
- When used as shown in the sample connection with the overheat output logic switch set to "N.O.", the signal becomes "photocoupler ON." (Switch to "N.C." to set to the "photocoupler OFF.")
- You can select whether to stop the motor or continue the operation when an "Overheat" signal is output.
- If the automatic current off function switch is set to ACO position, output current is cut off to stop the motor when the "Overheat" signal is output.

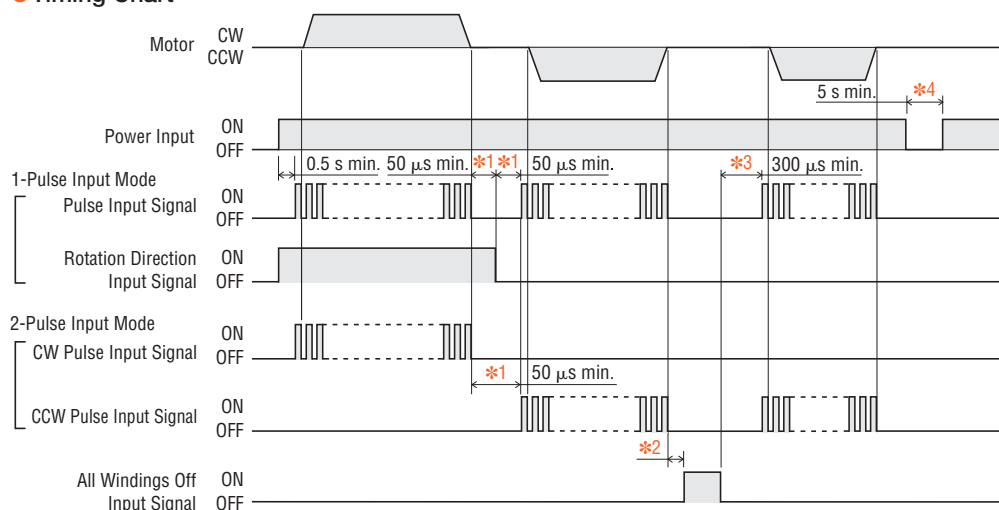
- If the automatic current off function switch is set to "OFF" position, the motor continues operation when the "Overheat" signal is output.



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



● Timing Chart



- *1 The minimum switching time to change direction (1-pulse input mode), and switching time to change CW, CCW pulse (2-pulse input mode) 50 μs 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 the "photocoupler OFF" state. The motor may not start.
- *4 Wait at least five 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
Standard	UMK243□A	PK243-01□A	UDK2109A
	UMK244□A	PK244-01□A	UDK2112A
	UMK245□A	PK245-01□A	
	UMK264□A	PK264-02□	UDK2120A
	UMK266□A	PK266-02□	
	UMK268□A	PK268-02□	
High-Resolution	UMK243M□A	PK243M□A	UDK2109A
	UMK244M□A	PK244M□A	UDK2112A
	UMK245M□A	PK245M□A	
	UMK264M□A	PK264M□	UDK2120A
	UMK266M□A	PK266M□	
	UMK268M□A	PK268M□	

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

