



# *α*STEP AS Series

## Additional Information

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

Introduction

		Motor & Driver Packages										2-Phase Stepping Motors		Controllers		Low-Speed Synchronous Motors	Accessories
AS	Closed Loop <i>α</i> STEP	ASC	ASC	RK	CRKII	CSK	PMC	UMK	CSK	PK/PV	PK	UI2120G	EMP401	EMP402	SG8030J	SMK	Before Using a Stepping Motor
	AC Input	DC Input	AC Input	DC Input	DC Input	DC Input	AC Input	DC Input	Encoder	with Encoder	with Indexer						
AS PLUS																	

## Closed Loop Stepping Motor and Driver Package

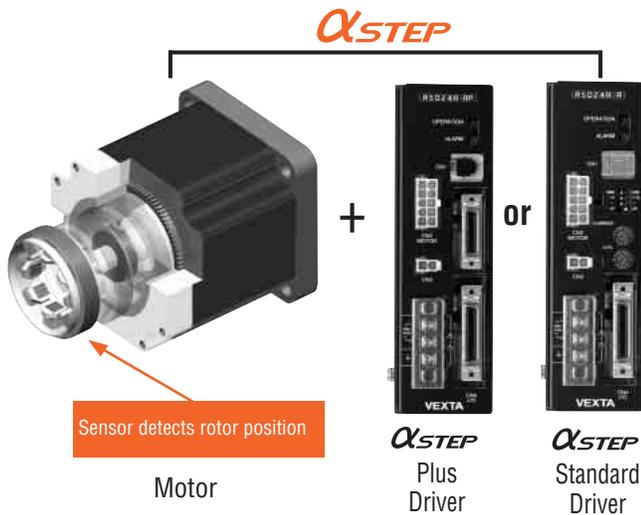
# $\alpha$ STEP AS Series

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

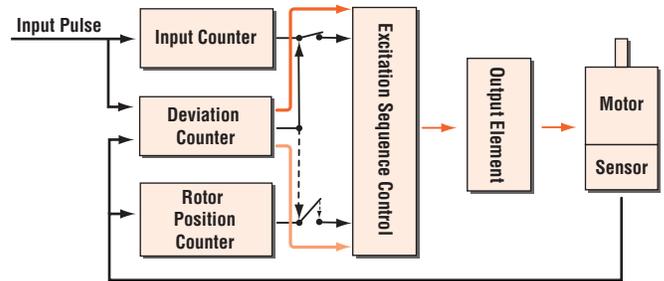
### Features

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

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



### $\alpha$ STEP Control Diagram



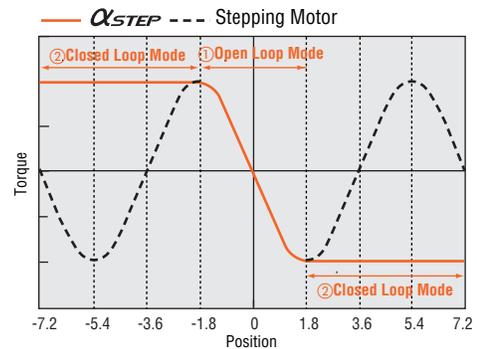
#### Normal (Positioning Deviation is less than $\pm 1.8^\circ$ )

Motor runs in open loop mode like a stepping motor.

#### If Motor Misssteps ( Positioning Deviation is greater than $\pm 1.8^\circ$ )

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

### $\alpha$ STEP Angle-Torque Characteristics

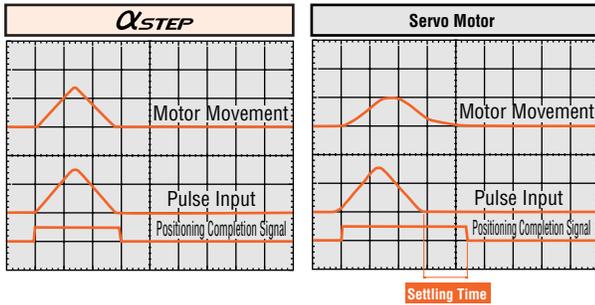


- If the positioning deviation is  $\pm 1.8^\circ$  or smaller, the motor runs in open loop mode like a stepping motor.
- If the positioning deviation is  $\pm 1.8^\circ$  or greater, the motor runs in closed loop mode and the position is corrected by exciting the motor windings to generate maximum torque based on the rotor position.

### ● High Response

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

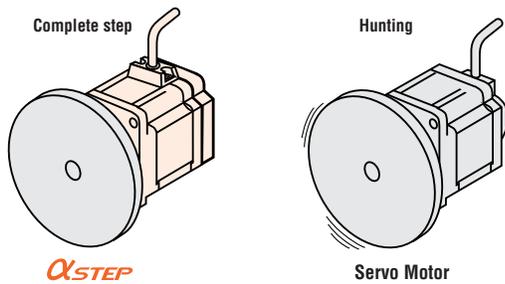
Measurement condition : Feed 1/5 rotation  
Load inertia 1.365 oz-in<sup>2</sup> ( $250 \times 10^{-7}$  kg·m<sup>2</sup>)



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

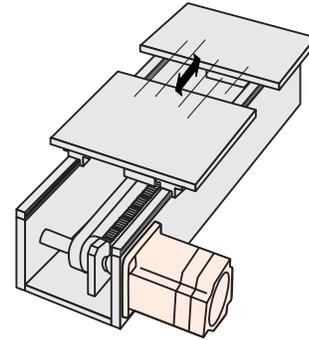
### ● No Hunting

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



### ● No Gain Tuning

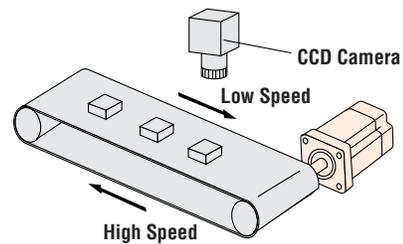
Gain tuning for a servo motor is critical, troublesome and time-consuming. Since the  $\alpha$ STEP operates like a stepping motor, there are no gain tuning requirements. Low rigidity applications, such as a belt and pulley system, are ideal for  $\alpha$ STEP.



### ● Low Vibration at Low Speed

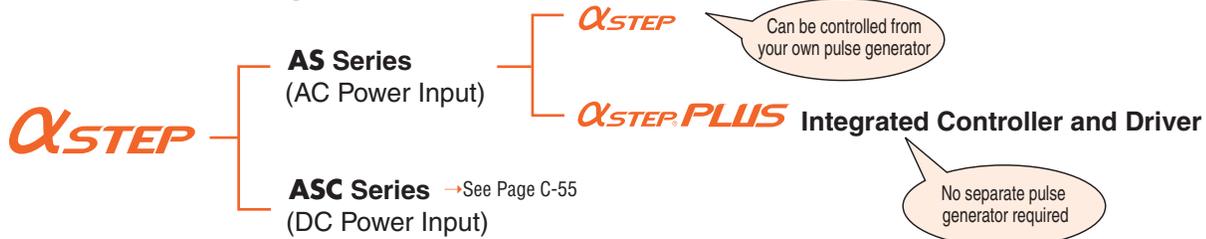
The driver employs advanced technology that produces smoothness comparable to a microstepping driver. Its vibration level is incredibly low, even when operating in the low speed range. When frequent changes from low (high) to high (low) speed operation are required, the use of the Resolution Select Function solves the problem.

$\alpha$ STEP provides resolution as low as 0.036° per step without any damping mechanism or other mechanical device. Even smoother operation is possible with geared models.



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

## AS Series Line-Up



### Standard

- Basic Model of  $\alpha$ STEP Motor and Driver System



### Tapered Hob (TH) Geared

- A wide variety of low gear ratios for high-speed operation
- Gear Ratios 3.6:1, 7.2:1, 10:1, 20:1, 30:1



### Planetary (PN) Geared

- High speed (low gear ratios), High positioning precision
- High permissible torque
- Centered output shaft
- Gear Ratios 5:1, 7.2:1, 10:1, 25:1, 36:1, 50:1



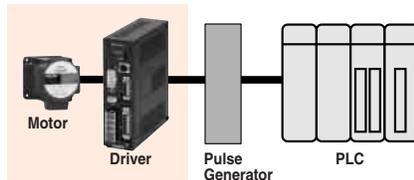
### Harmonic (HG) Geared

- High positioning precision
- High permissible/maximum torque
- Zero backlash
- High gear ratio, High resolution
- Centered output shaft
- Gear Ratios 50:1, 100:1

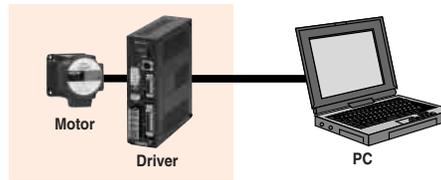
Step & Direction Input Type

or

Integrated Controller & Driver



Motor and driver are controlled with an external pulse generator.



No external pulse generator required.

## Product Line

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

● Electromagnetic brake models are also available.

**● Position Control**

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

**● Four Operation Modes**

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

**● General Inputs/Outputs**

- 8 Programmable Inputs
- 8 Programmable Outputs

**● Daisy Chain Capability**

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

**● Communication**

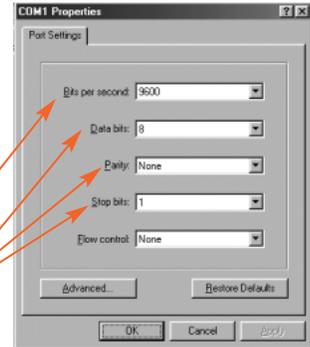
- ASCII based commands
- Conforms to RS-232C communication specifications
- Start-stop asynchronous transmission method
- Transmission speed: 9,600 bps
- Data length: 8 bits, 1 stop bit, no parity
- Protocol: TTY (CR+LF)
- Modular 4-pin connector

**● Program Memory**

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

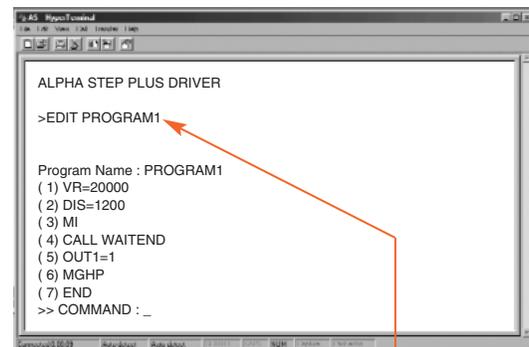
**● Built-in Functions**

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



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

**Example: "PROGRAM1"**

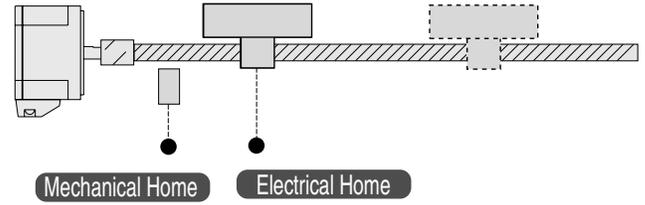
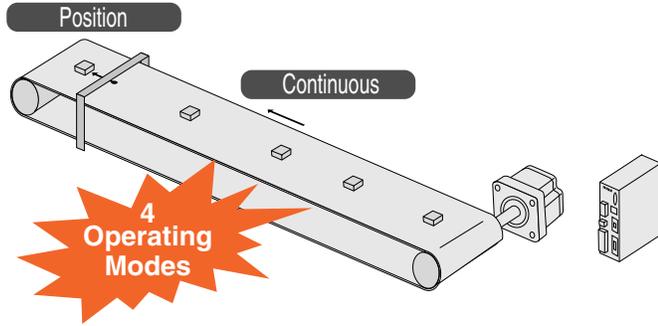


**PROGRAM1 Definition**

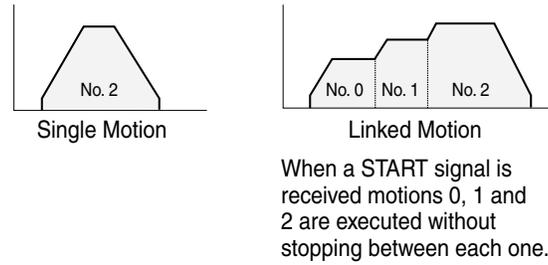
- Operating Speed: 20,000 Hz
- Move Distance: 1,200 pulses
- Call a subroutine that waits for the motor to stop before moving on to the next command
- Turn On Output #1
- Seek the Mechanical Home Position in the Positive Direction
- End of Program

## ■ $\alpha$ STEP Plus Features

### ● Operating Modes

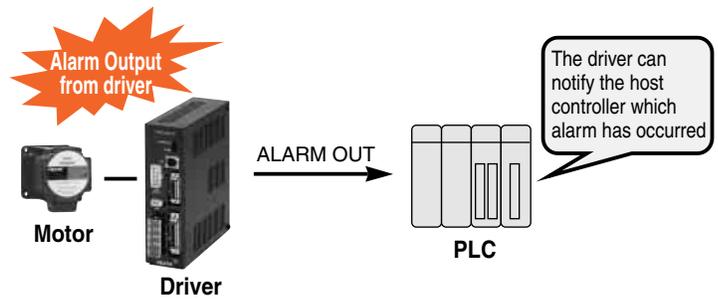


### ● Linked Motion Capability

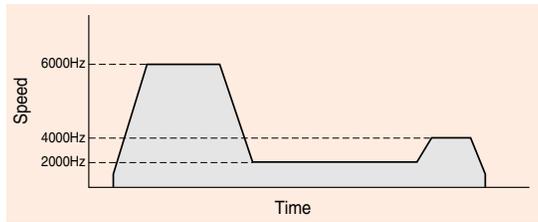


### ● Alarm Functions

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

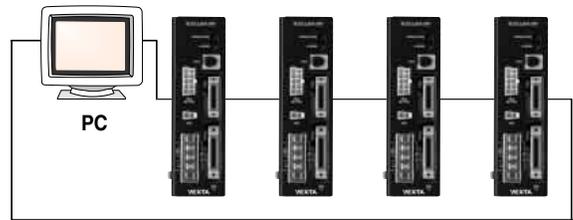


### ● Speed Change On The Fly



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

### ● Daisy Chain



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

## ■ Safety Standards and CE Marking

Model	Standards	Certification Body	File No.	CE Marking	
Motor	UL1004 UL2111 CSA C22.2 No.100*3 CSA C22.2 No.77*3	UL	E64199	Low Voltage Directives EMC Directives	
	EN60950 EN60034-1 EN60034-5				Conform to EN Standards
	Driver				UL508C *1 CSA C22.2 No.14
	EN60950 *2 EN50178	Conform to EN Standards			

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

**List of Motor and Driver Combinations** → Page C-53

**Details of Safety Standards** → Page G-2

• The EMC value changes according to the wiring and layout. Therefore, the final EMC level must be checked with the motor/driver incorporated in the user's equipment.

\*1 Maximum Ambient Temperature for UL

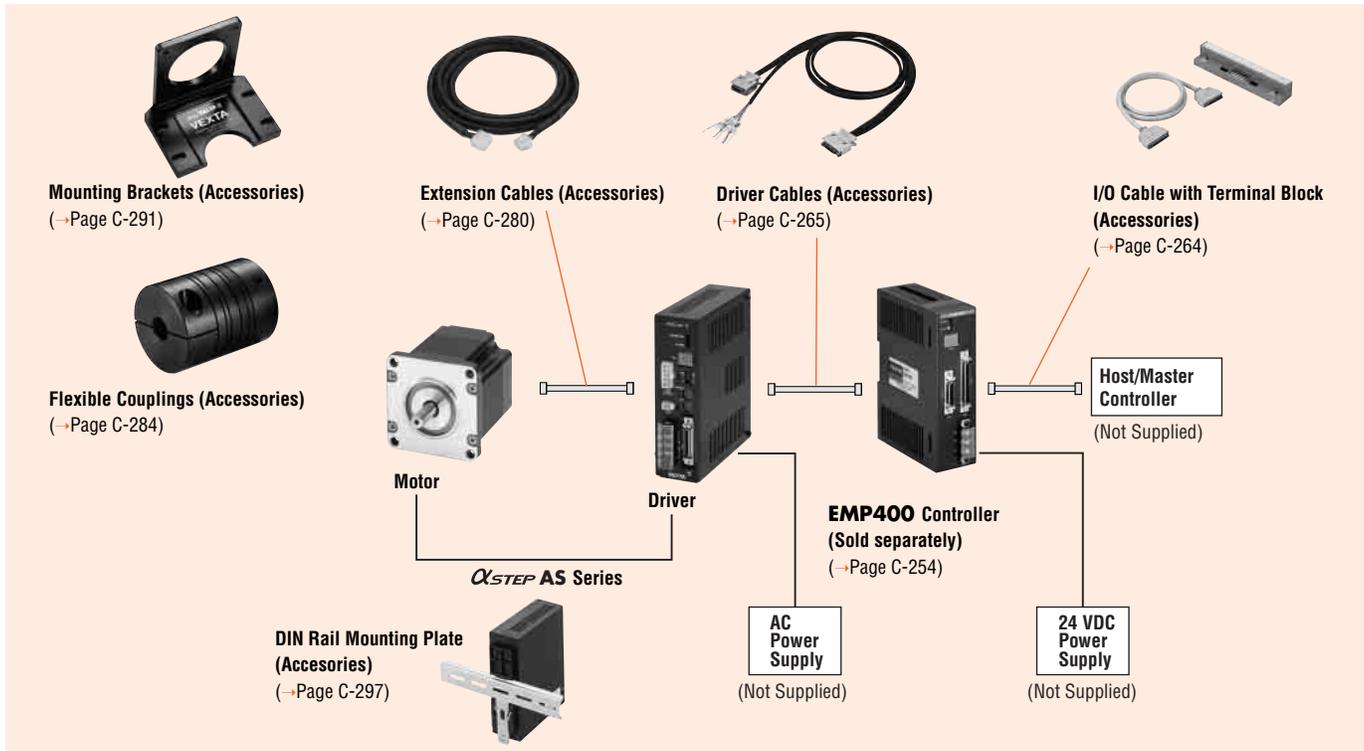
**AS:** 122°F (+50°C), **AS PLUS:** 104°F (+40°C)

\*2 EN60950 (Certified **AS** only)

\*3 Except for **AS46**□□ (Motor Frame Size 1.65 inch (42 mm)).

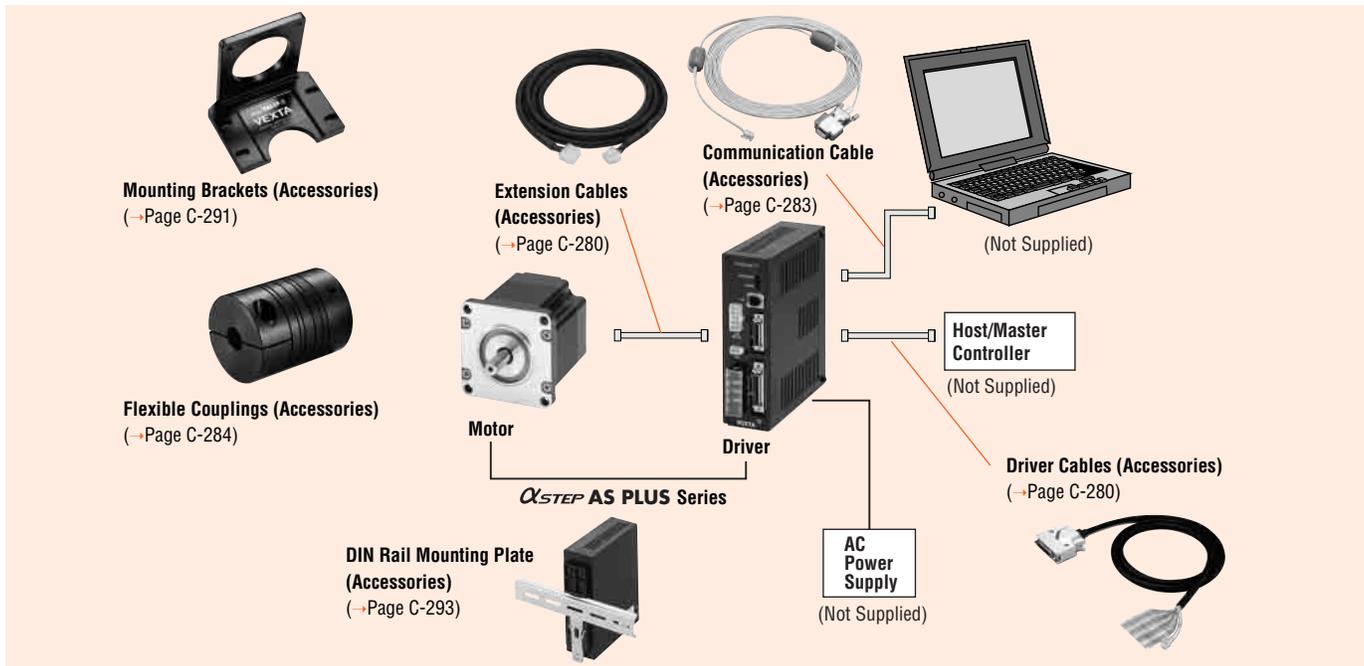
## System Configuration

### AS Series



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

### AS PLUS



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

## Extension Cables (For AS Series and AS PLUS Series)

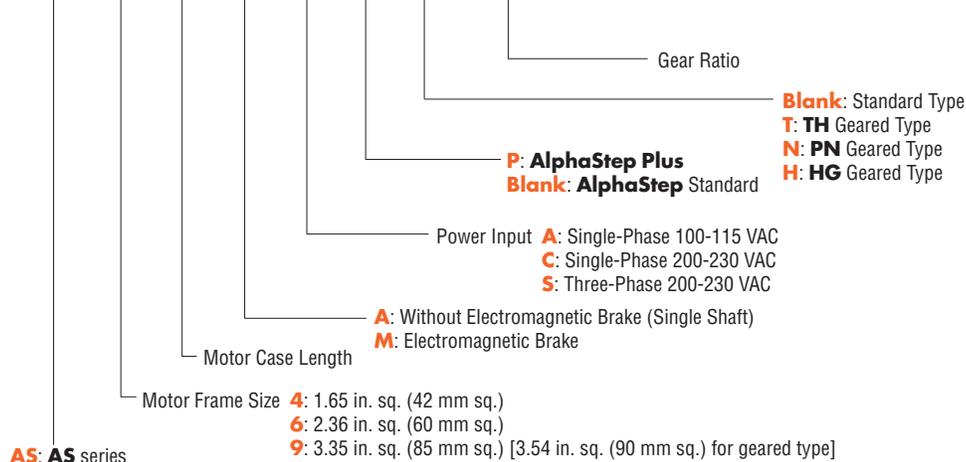
Extension cables are not included with  $\alpha$ STEP products. When using the  $\alpha$ STEP stepping motor and driver more than 1.31 feet (0.4 m) apart from each other, use an optional extension cable (sold separately).

#### Note:

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

## Product Number Code

# AS 6 6 A A P-T 3.6



## AS Product Lines

### AS Series

#### Standard Type

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

#### TH Geared Type

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



## ◆ TH Geared Type

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

## ◆ PN Geared Type

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

## ◆ HG Geared Type

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

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

## Specifications

\*Only the driver conforms to the CSA standard for **AS46** type motors.



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

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

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

\*3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking.

Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable. For motor frame size  1.65 in. ( 42 mm), use the standard type extension cable.

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

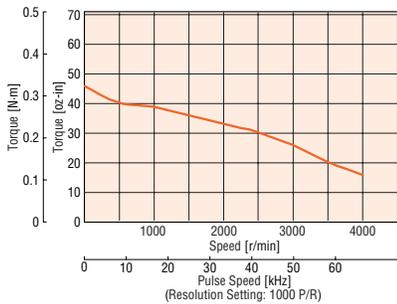
**AS PLUS:** The resolution can be set from 500 P/R to 10000 P/R by setting parameters.

How to Read Specifications Table → Page C-9

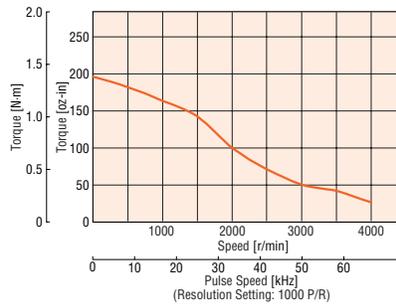
## Speed — Torque Characteristics

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

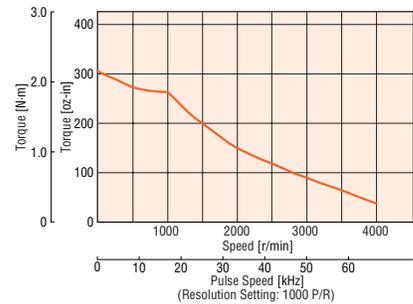
AS46□A, AS46□AP



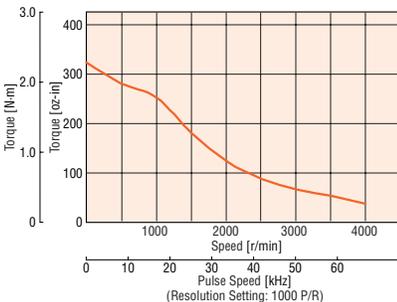
AS66□□, AS66□□P



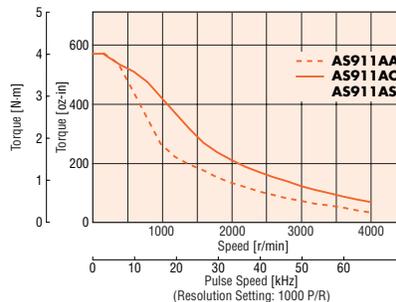
AS69□□, AS69□□P



AS98□□, AS98□□P



AS911A□, AS911A□P



### Notes:

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

# TH Geared Type

Motor Frame Size:  1.65 in. ( 42 mm)

## Specifications

\*Only the driver conforms to the CSA standard for **AS46** type motors.



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

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

\*3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking.

Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory standard type extension cable.

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

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

**How to Read Specifications Table**→Page C-9

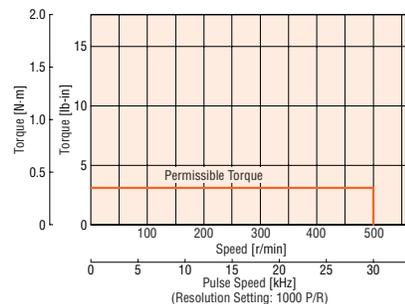
### Note:

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

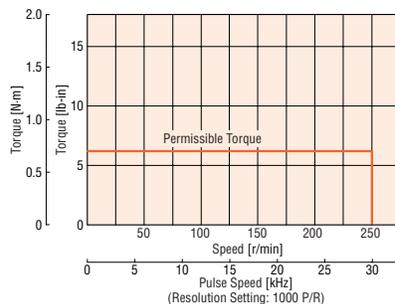
## Speed — Torque Characteristics

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

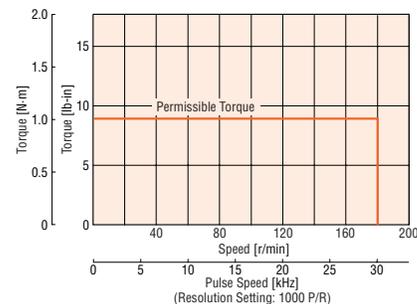
AS46□A-T3.6, AS46□AP-T3.6



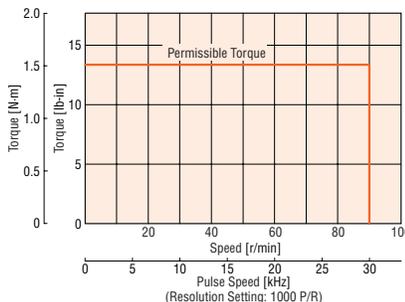
AS46□A-T7.2, AS46□AP-T7.2



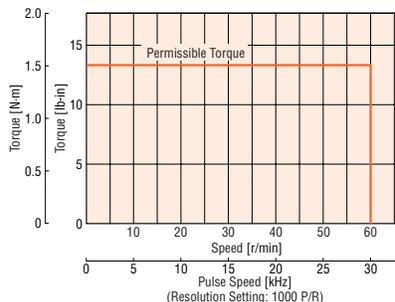
AS46□A-T10, AS46□AP-T10



AS46□A-T20, AS46□AP-T20



AS46□A-T30, AS46□AP-T30



### Notes:

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

# TH Geared Type

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



## Specifications

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

- \*1 The square box in the model number will contain one of the following letters to indicate the power supply voltage: **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC).
  - \*2 The values inside the brackets [ ] represents the specification for electromagnetic brake type.
  - \*3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable.
  - \*4 **AS** series: The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, 10000 P/R with the resolution select switch or resolution select switching signals. See page C-39 for details.
- AS PLUS:** The resolution can be set from 500 P/R to 10000 P/R by setting parameters.

How to Read Specifications Table → Page C-9

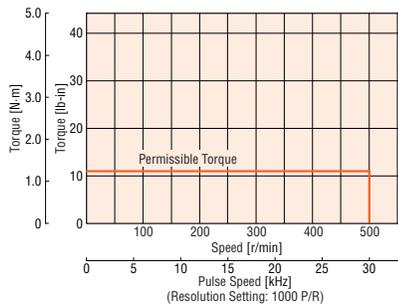
### Note:

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

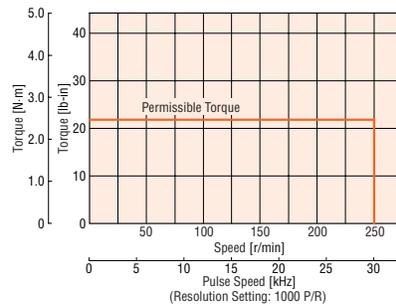
## Speed — Torque Characteristics

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

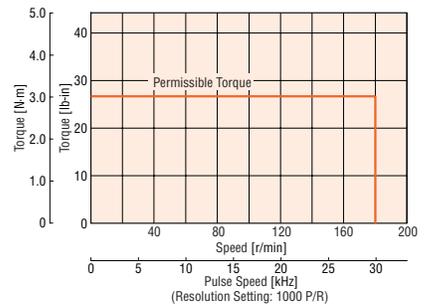
AS66□□-T3.6, AS66□□P-T3.6



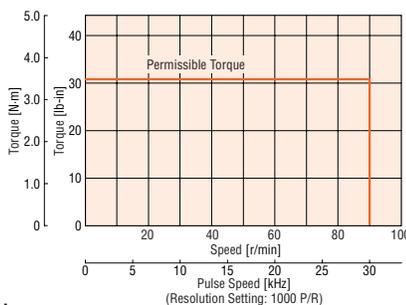
AS66□□-T7.2, AS66□□P-T7.2



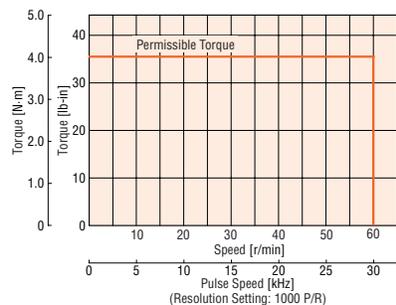
AS66□□-T10, AS66□□P-T10



AS66□□-T20, AS66□□P-T20



AS66□□-T30, AS66□□P-T30



### Notes:

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

# TH Geared Type

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



## Specifications

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

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

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

\*3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking.

Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable.

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

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

**How to Read Specifications Table**→Page C-9

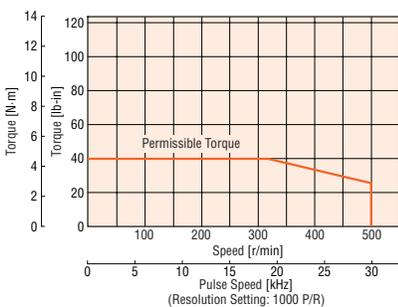
**Note:**

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

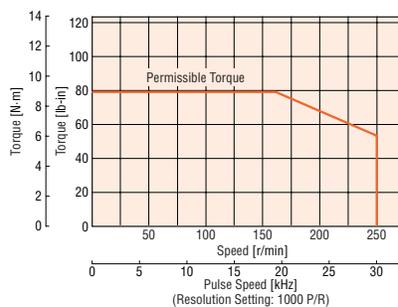
## Speed — Torque Characteristics

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

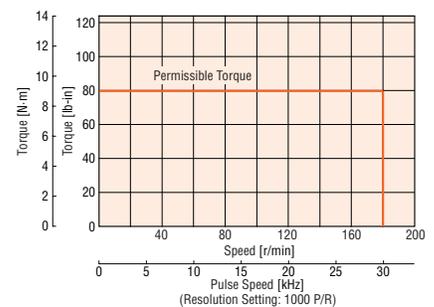
AS98□□-T3.6, AS98□□P-T3.6



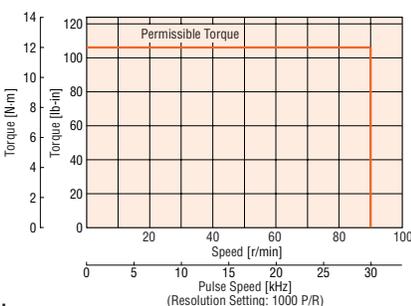
AS98□□-T7.2, AS98□□P-T7.2



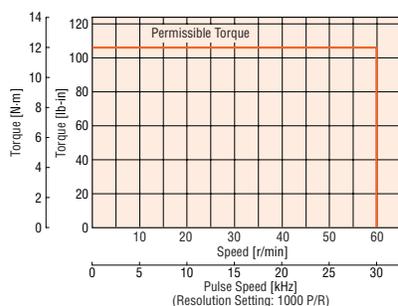
AS98□□-T10, AS98□□P-T10



AS98□□-T20, AS98□□P-T20



AS98□□-T30, AS98□□P-T30



**Notes:**

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

# PN Geared Type

Motor Frame Size:  1.65 in. ( 42 mm)

## Specifications

\*Only the driver conforms to the CSA standard for **AS46** type motors.



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

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

\*3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking.

Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory standard type extension cable.

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

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

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

How to Read Specifications Table → Page C-9

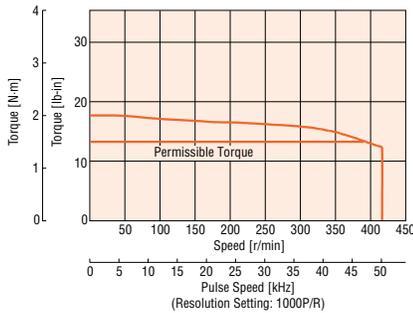
Note:

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

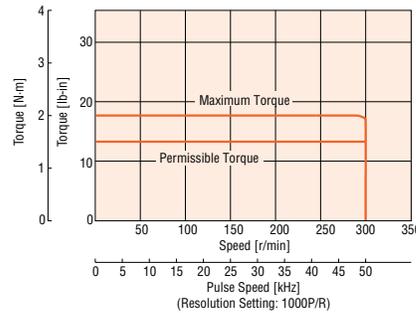
## Speed — Torque Characteristics

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

AS46□A-N7.2, AS46□AP-N7.2



AS46□A-N10, AS46□AP-N10



Notes:

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

Introduction

AS

AS PLUS

ASC

RK

CRK II

CSK

PMC

UMK

CSK

PK/PV

PK

UI2120G

EMP401

EMP402

SG8030J

SMK

Accessories

Before Using a Stepping Motor

2-Phase Stepping Motors

without Encoder

with Encoder

Driver with Indeter

Controllers

Low-Speed Synchronous Motors

Accessories

# PN Geared Type

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



## Specifications

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

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

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

\*3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking.

Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable.

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

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

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

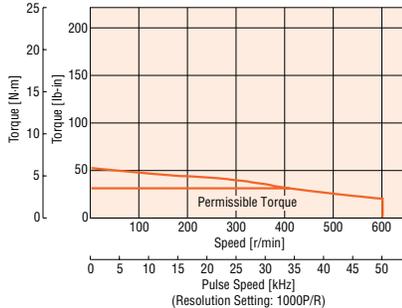
**How to Read Specifications Table**→Page C-9

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

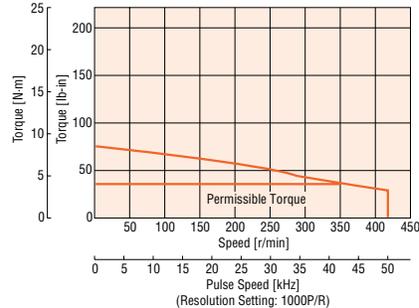
## Speed — Torque Characteristics

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

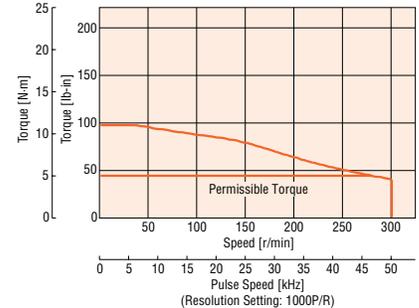
AS66□-N5, AS66□P-N5



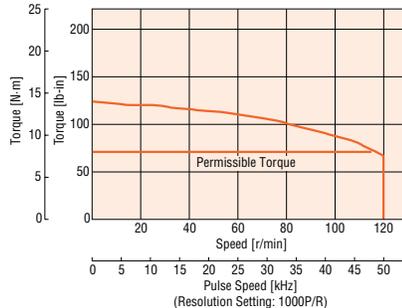
AS66□-N7.2, AS66□P-N7.2



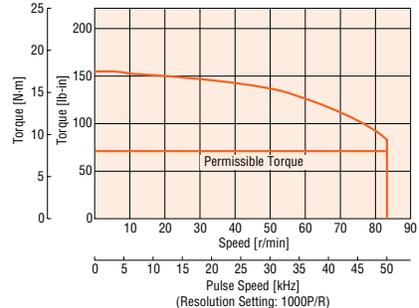
AS66□-N10, AS66□P-N10



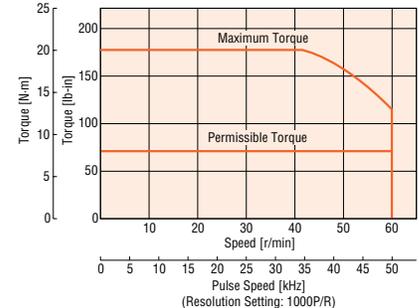
AS66□-N25, AS66□P-N25



AS66□-N36, AS66□P-N36



AS66□-N50, AS66□P-N50



### Notes:

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

# PN Geared Type

Motor Frame Size:  3.54 in. ( 90 mm)



## Specifications

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

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

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

\*3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking.

Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable.

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

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

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

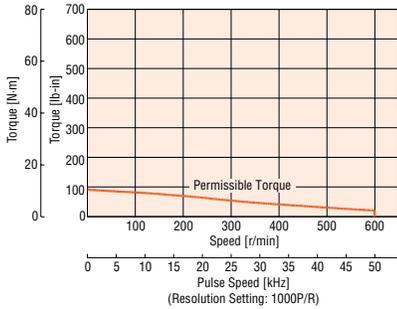
**How to Read Specifications Table** → Page C-9

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

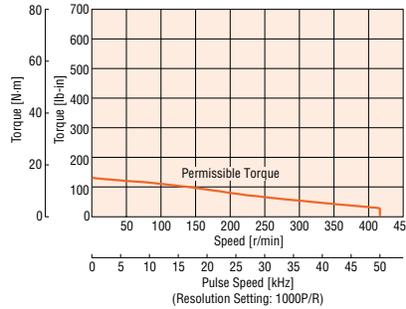
## Speed — Torque Characteristics

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

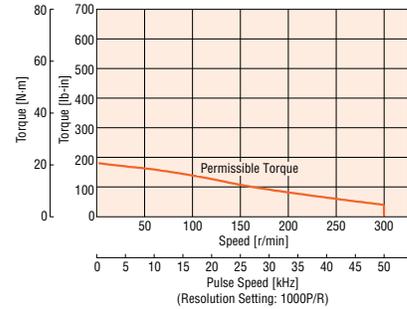
**AS98□-N5, AS98□-P-N5**



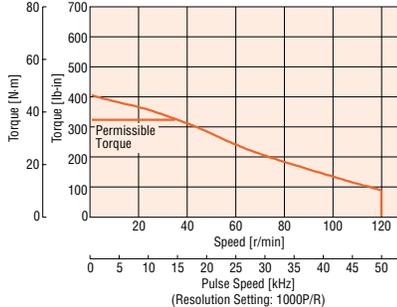
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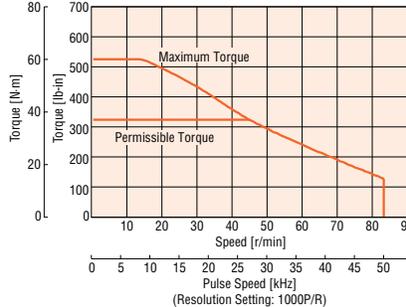
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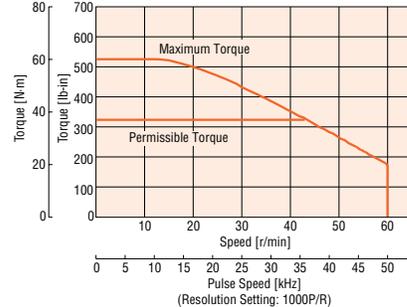
**AS98□-N25, AS98□-P-N25**



**AS98□-N36, AS98□-P-N36**



**AS98□-N50, AS98□-P-N50**



### Notes:

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

# HG Geared Type

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



## Specifications

\*Only the driver conforms to the CSA standard for AS46 type motors.

Model*1	AS		AS46AA2-H50	AS46AA2-H100	AS66A□2-H50	AS66A□2-H100	AS98A□-H50	AS98A□-H100	
	AS PLUS		AS46MA2-H50	AS46MA2-H100	AS66M□2-H50	AS66M□2-H100	AS98M□-H50	AS98M□-H100	
		W/O Electromagnetic Brake		AS46AAP2-H50	AS46AAP2-H100	AS66A□P2-H50	AS66A□P2-H100	AS98A□P-H50	AS98A□P-H100
		Electromagnetic Brake		AS46MAP2-H50	AS46MAP2-H100	AS66M□P2-H50	AS66M□P2-H100	AS98M□P-H50	AS98M□P-H100
Maximum Holding Torque	lb-in (N·m)		30 (3.5)	44 (5.0)	48 (5.5)	70 (8.0)	220 (25)	320 (37)	
Rotor Inertia*2 J	oz-in <sup>2</sup> (kg·m <sup>2</sup> )		0.46 (85×10 <sup>-7</sup> )	0.55 (100×10 <sup>-7</sup> )	2.4 (440×10 <sup>-7</sup> )	3.3 (599×10 <sup>-7</sup> )	8.8 (1600×10 <sup>-7</sup> )	9.6 (1759×10 <sup>-7</sup> )	
Permissible Speed Range	r/min		0~70	0~35	0~70	0~35	0~70	0~35	
Gear Ratio			50 : 1	100 : 1	50 : 1	100 : 1	50 : 1	100 : 1	
Resolution*4	1000 P/R		0.0072°/pulse	0.0036°/pulse	0.0072°/pulse	0.0036°/pulse	0.0072°/pulse	0.0036°/pulse	
Permissible Torque	lb-in (N·m)		30 (3.5)	44 (5.0)	48 (5.5)	70 (8.0)	220 (25)	320 (37)	
Maximum Torque	lb-in (N·m)		73 (8.3)	97 (11)	159 (18)	240 (28)	300 (35)	480 (55)	
Lost Motion (Load Torque)	arc min		Max. 1.5 (±0.16 N·m)	Max. 1.5 (±0.2 N·m)	Max. 0.7 (±0.28 N·m)	Max. 0.7 (±0.39 N·m)	Max. 1.5 (±1.2 N·m)	Max. 1.5 (±1.2 N·m)	
Power Source	Voltage-Frequency-Maximum Input Current		Single-Phase 100-115 VAC -15%~+10%-50/60 Hz 3.3 A		Single-Phase 100-115 VAC -15%~+10%-50/60 Hz 5 A Single-Phase 200-230 VAC -15%~+10%-50/60 Hz 3 A Three-Phase 200-230 VAC -15%~+10%-50/60 Hz 1.5 A		Single-Phase 100-115 VAC -15%~+10%-50/60 Hz 6 A Single-Phase 200-230 VAC -15%~+10%-50/60 Hz 3.5 A Three-Phase 200-230 VAC -15%~+10%-50/60 Hz 1.9 A		
Electromagnetic Brake*3	Type		Active when power is off						
	Power Supply Input		24 VDC±5%						
	Power Consumption		2 W		6 W		6 W		
	Excitation Current		0.08 A		0.25 A		0.25 A		
Weight*2	Static Friction Torque lb-in (N·m)		15.4 (1.75)	22 (2.5)	24 (2.75)	35 (4)	110 (12.5)	163 (18.5)	
	Motor lb. (kg)		1.5 (0.7) [1.8 (0.8)]		3.1 (1.4) [3.6 (1.65)]		8.6 (3.9) [9.5 (4.3)]		
Dimension No.	Driver		□10		□11		□12		
			AS=□13 AS PLUS=□14						

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

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

\*3 The electromagnetic brakes are for holding the position when the power is off. They can not be used for complicated braking.

Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brake, along with the accessory electromagnetic brake type extension cable.

For motor frame size □1.65 in. (□42 mm), use the standard type extension cable.

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

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

**How to Read Specifications Table** → Page C-9

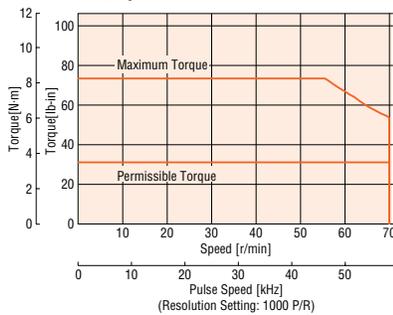
### Note:

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

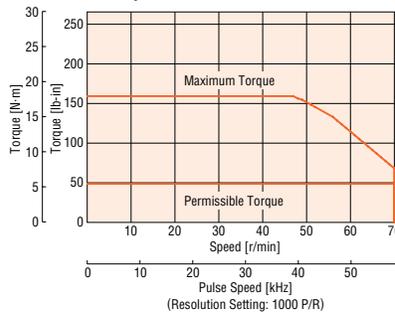
## Speed — Torque Characteristics

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

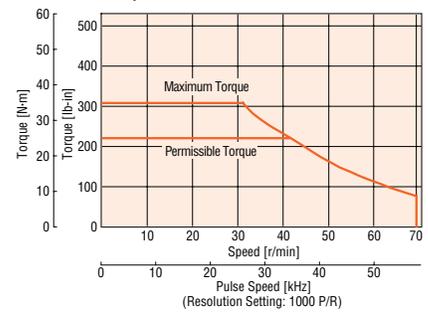
AS46□A2-H50, AS46□AP2-H50



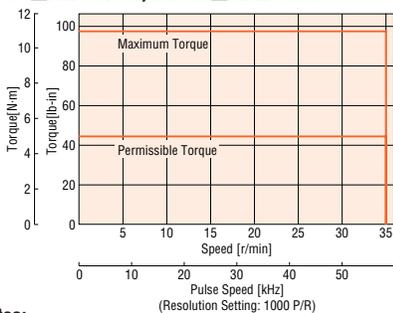
AS66□□2-H50, AS66□□P2-H50



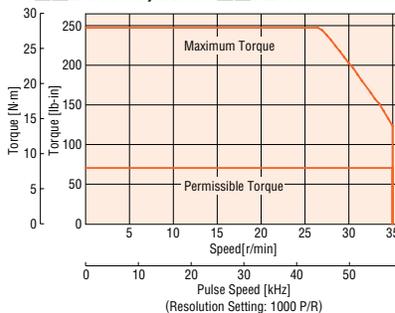
AS98□□-H50, AS98□□P-H50



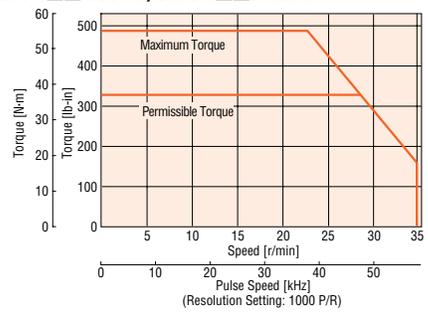
AS46□A2-H100, AS46□AP2-H100



AS66□□2-H100, AS66□□P2-H100



AS98□□-H100, AS98□□P-H100



### Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212°F(100°C). [Under 176°F(75°C) is required to comply with UL or CSA standards.]
- In order to prevent fatigue of the gear grease in the harmonic gear, keep the temperature of the gear case under 158°F (70°C).
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

## Common Specifications

### AS Series

Speed and Position Control Command	Pulse Train Input
Maximum Input Pulse Frequency	250 kHz (When the pulse duty is 50%)
Protective Functions	Overheat, Overload, Overvoltage, Speed Error, Overcurrent, OverSpeed, EEPROM Data Error, Sensor Error, System Error
Input Signals	Photocoupler Input (optically isolated), Equivalent Input Impedance : 220 Ω, Input Current 7~20 mA [Pulse Signal (Negative logic pulse input), Rotation Direction Signal, All Windings Off Signal, Alarm Clear Signal, Resolution Select Signal]
Output Signals	Photocoupler, Open-Collector Output, External use condition: 30 VDC maximum, 15 mA Maximum (Positioning Completion Signal, Alarm Signal, Excitation Timing Signal, ASG•BSG Signal) Line Driver Output: Equivalent of 26C31 (Timing Signal, ASG•BSG Signal)

### AS PLUS

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

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

## General Specifications

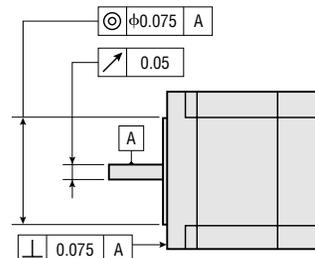
This is the value after rated operation at normal temperature and normal humidity.

		Motor	Driver
Insulation Class		Class B [266°F (130°C)] [UL/CSA: Recognized as class A 221°F(105°C)]	—
Insulation Resistance		100 MΩ minimum when measured by a 500 VDC megger between the following places: • Frame-Windings • Frame-Electromagnetic brake windings	100 MΩ minimum when measured by a 500 VDC megger between the following places: • Frame-Power supply input terminal • I/O-Power supply input terminal
Dielectric Strength		Sufficient to withstand the following for one minute: • Frame-Windings 1.5 kV (1.0 kV for <b>AS46</b> ) 50 Hz • Frame-Electromagnetic brake windings 1.0 kV 50 Hz	Sufficient to withstand the following for one minute: • Frame-Power supply input terminal 1.5 kV 50 Hz • I/O-Power supply input terminal 2.3 kV (3.0 kV for 200-230 VAC) 50 Hz: <b>AS</b> 1.8 kV 50 Hz: <b>AS PLUS</b>
Operating Environment (In Operation)	Ambient Temperature	0°C~+50°C (32°F~122°F), nonfreezing	<b>AS PLUS</b> : 0°C~+40°C (32°F~104°F) <b>AS</b> : 0°C~+50°C (32°F~122°F), nonfreezing
	Ambient Humidity	85% or less (noncondensing)	
	Atmosphere	No corrosive gases, dust, water or oil.	
Static Angle Error		±5 minutes	—
Shaft Runout		0.002 inch (0.05 mm) T.I.R.*	—
Concentricity		0.003 inch (0.075 mm) T.I.R.*	—
Perpendicularity		0.003 inch (0.075 mm) T.I.R.*	—

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

#### Note:

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



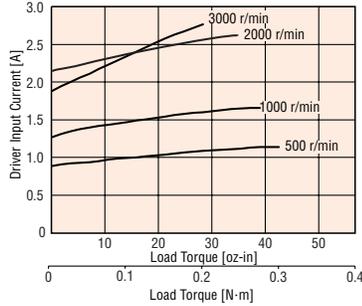
## Load Torque — Driver Input Current Characteristics

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

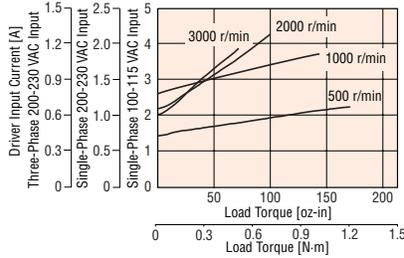
Motor shaft speed = Gear output shaft speed × Gear ratio [r/min]

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

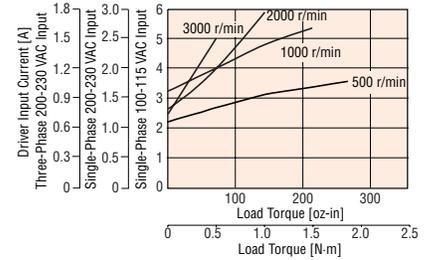
**AS46□A, AS46□AP**



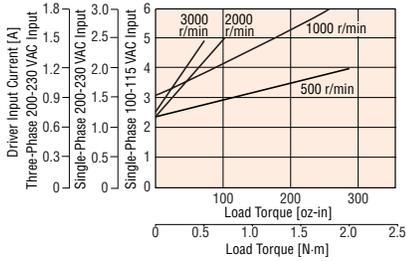
**AS66□□, AS66□□P**



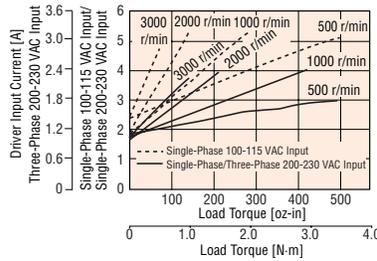
**AS69□□, AS69□□P**



**AS98□□, AS98□□P**



**AS911A□□, AS911A□□P**



## Permissible Overhung Load and Permissible Thrust Load

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

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

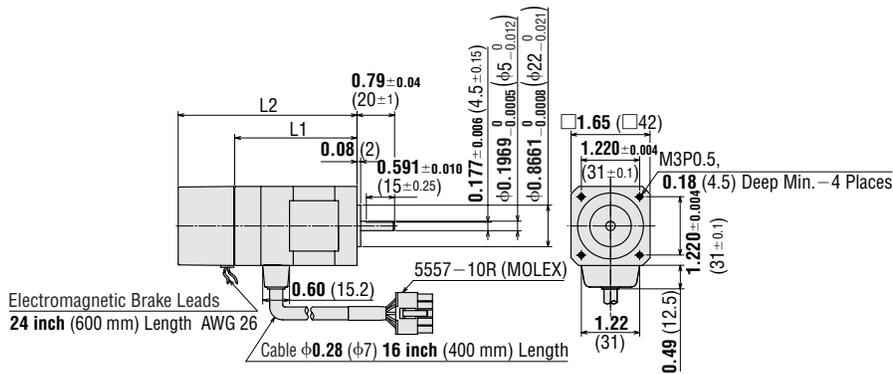
\* These values are common to the **AS** Series, the **AS PLUS** Series and all electromagnetic brake models.

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

### ● Motor

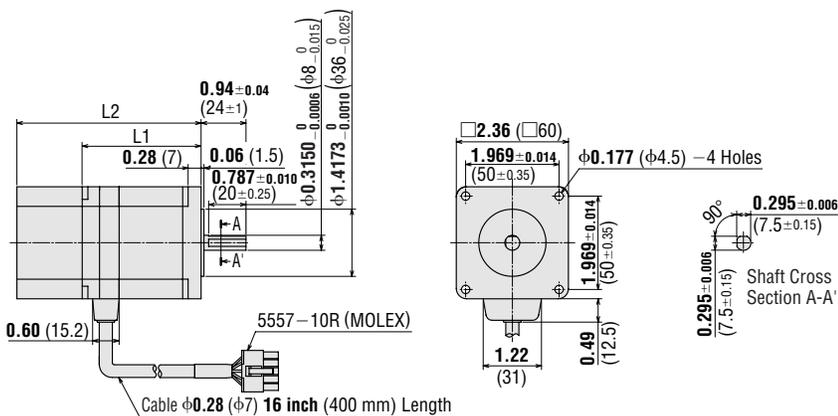
### ◆ Standard Type

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



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

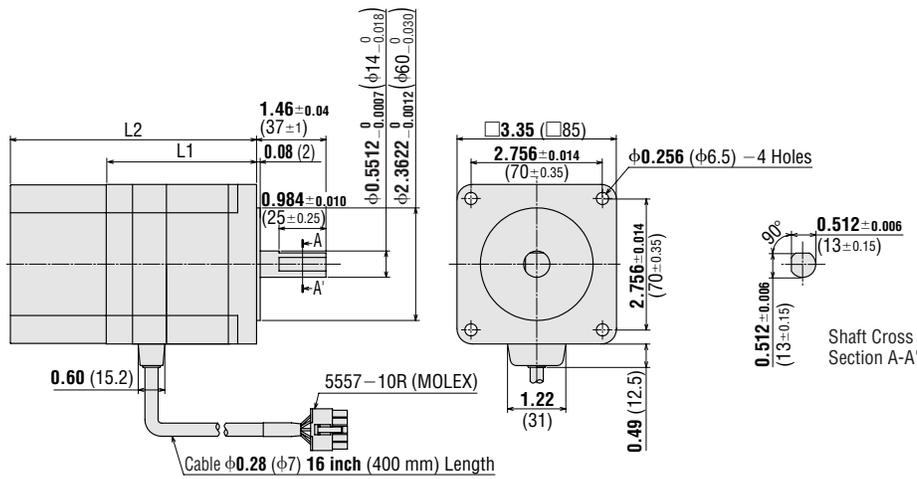
2 Motor Frame Size: □2.36 in. (□60 mm)



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

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

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

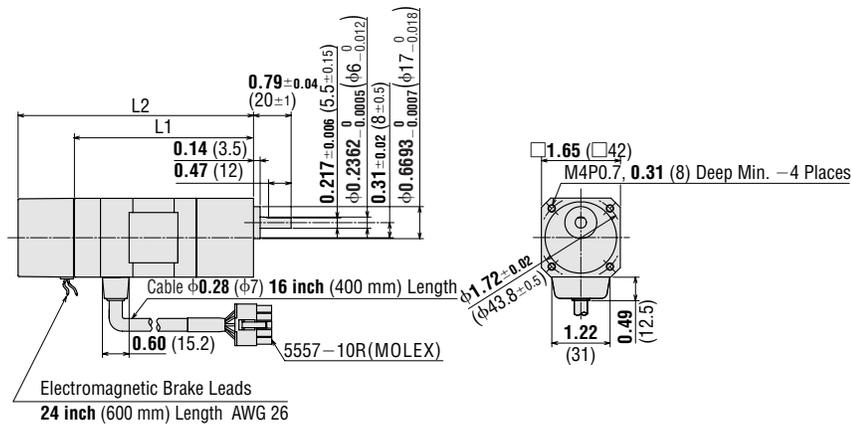


Model	Motor Model	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
<b>AS98A</b> □	ASM98A□	3.15 (80)	—	4.0 (1.8)	B196
<b>AS98A</b> □P					
<b>AS98M</b> □	ASM98M□	—	5.16 (131)	4.8 (2.2)	B235
<b>AS98M</b> □P					
<b>AS911A</b> □	ASM911A□	4.33 (110)	—	6.6 (3.0)	B264
<b>AS911A</b> □P					

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

### ◆ TH Geared Type

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



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

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

Introduction

AS AS PLUS

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PMC

UMK

CSK

PK/PV

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PK/PV

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UI2120G

EMP401

EMP402

SG8030J

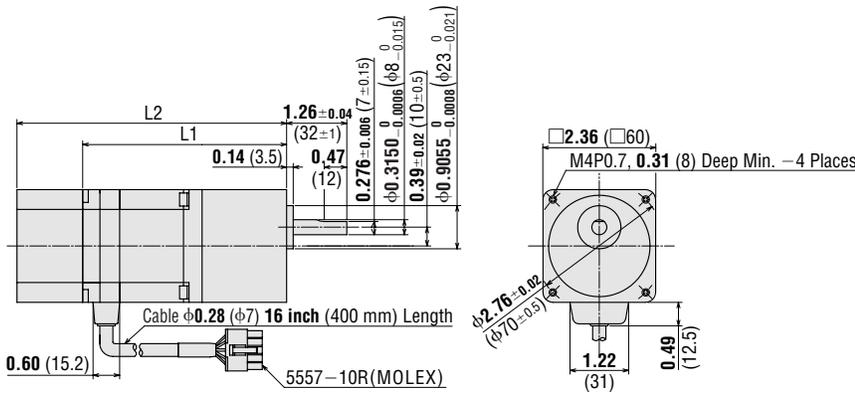
SMK

Accessories

Before Using a Stepping Motor

Before Using a Stepping Motor

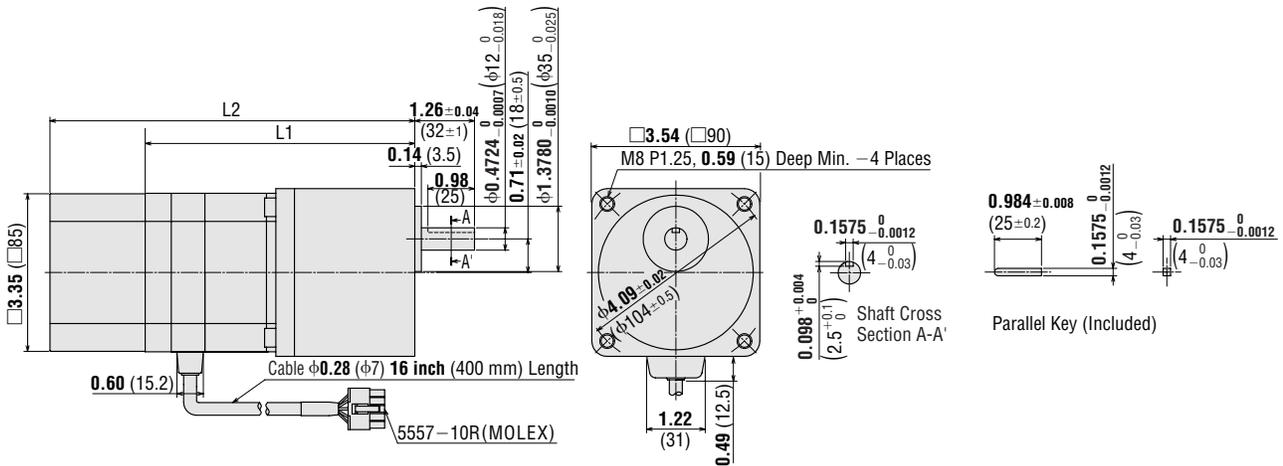
5 Motor Frame Size: □2.36 in. (□60 mm)



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

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

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

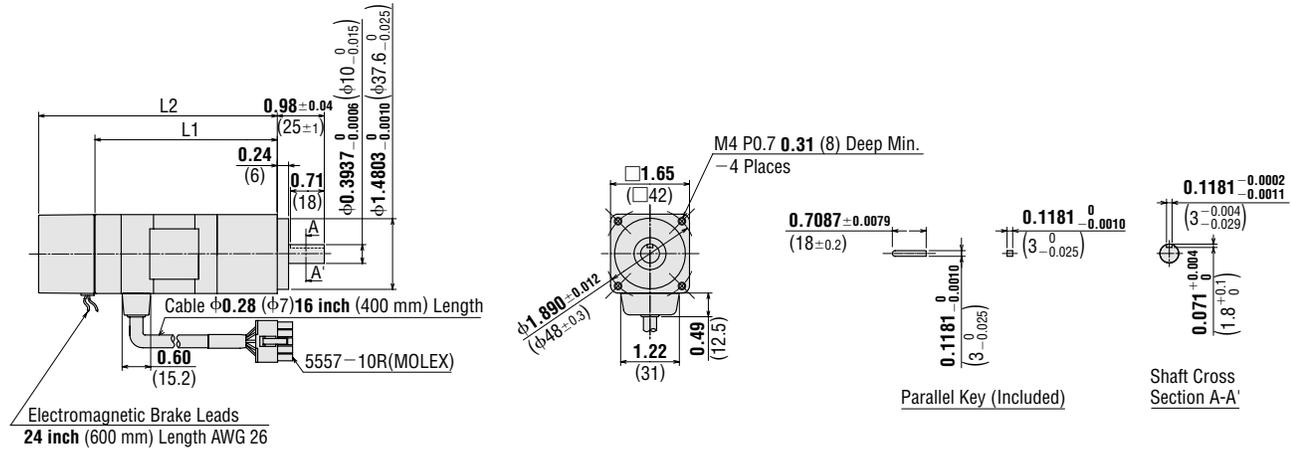


Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS98A□-T□	ASM98A□-T□	3.6, 7.2, 10, 20, 30	5.69 (144.5)	—	6.6 (3.0)	B203
AS98A□-P-T□						
AS98M□-T□	ASM98M□-T□	3.6, 7.2, 10, 20, 30	—	7.70 (195.5)	7.5 (3.4)	B236
AS98M□-P-T□						

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

## ◆ PN Geared Type

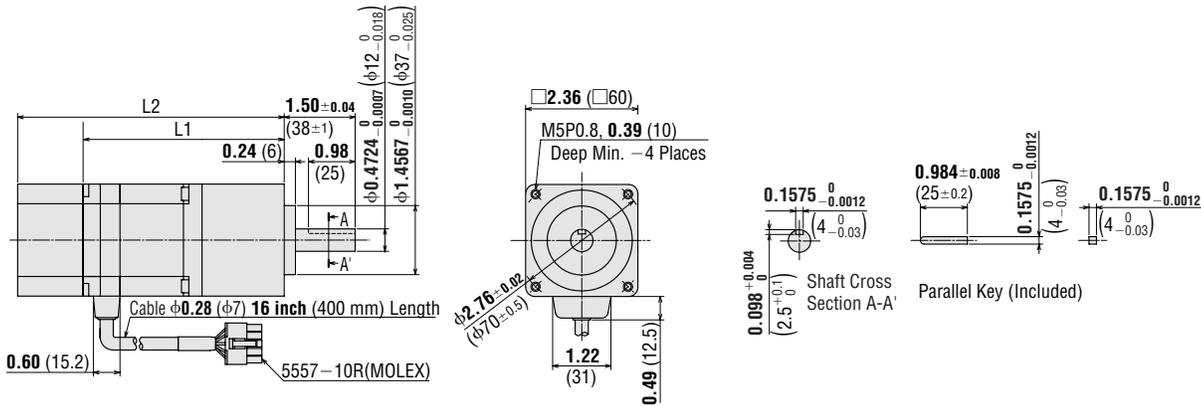
7 Motor Frame Size: □1.65 in. (□42 mm)



Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
<b>AS46AA-N</b> □	ASM46AA-N□	<b>7.2, 10</b>	3.81 (96.9)	—	1.6 (0.71)	B306
<b>AS46AP-N</b> □						
<b>AS46MA-N</b> □	ASM46MA-N□	<b>7.2, 10</b>	—	5.0 (126.9)	1.8 (0.81)	B307
<b>AS46MAP-N</b> □						

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

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



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

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

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

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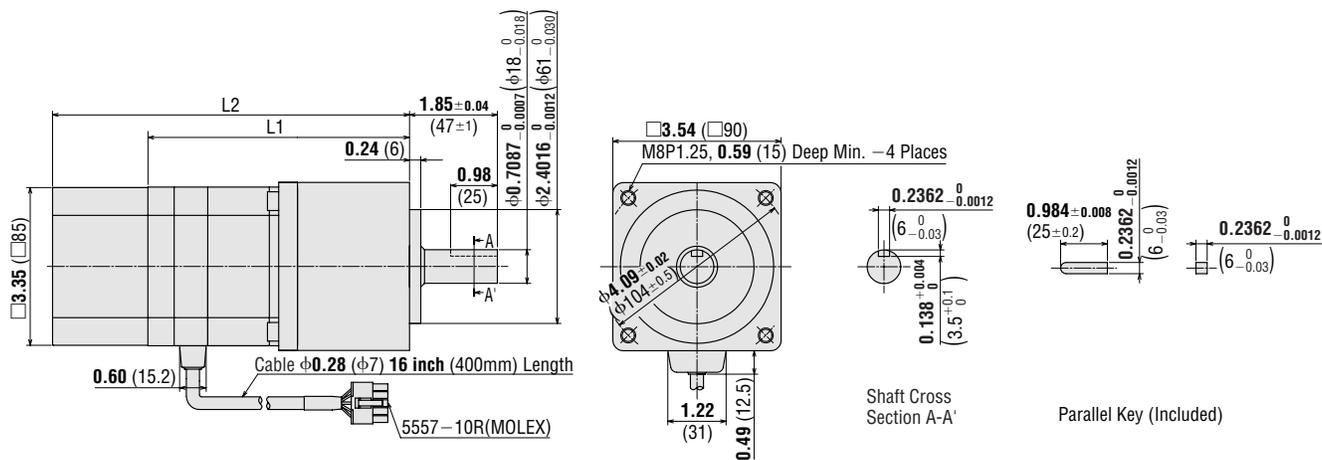
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9 Motor Frame Size: □3.54 in. (□90 mm)

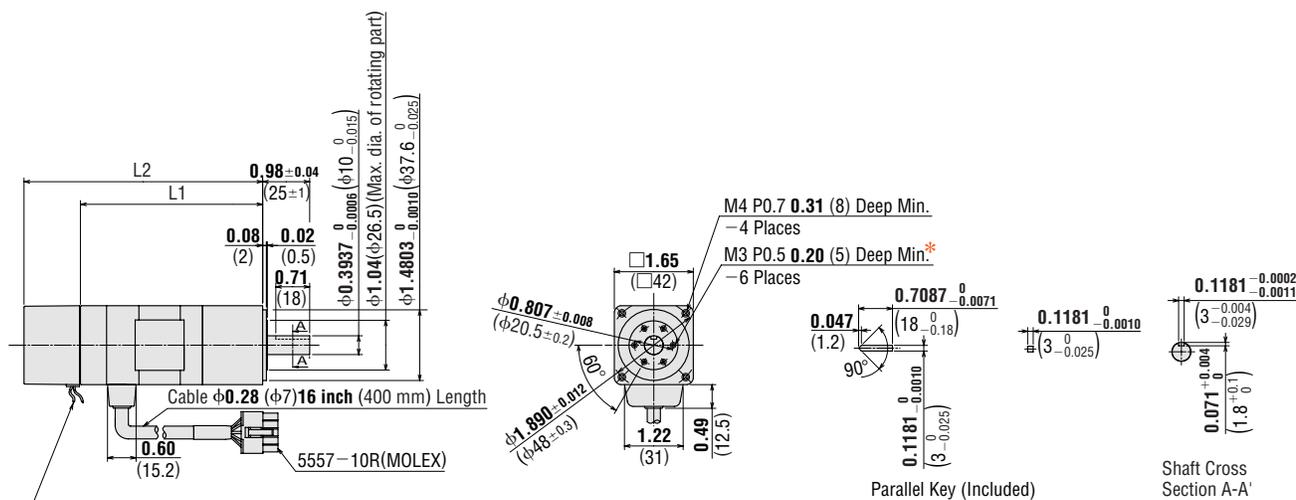


Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
AS98A□-N□	ASM98A□-N□	5, 7.2, 10	5.51 (140)	—	8.8 (4.0)	B230
AS98A□-P-N□						
AS98A□-N□	ASM98A□-N□	25, 36, 50	6.42 (163)	—	10 (4.7)	B231
AS98A□-P-N□						
AS98M□-N□	ASM98M□-N□	5, 7.2, 10	—	7.52 (191)	9.7 (4.4)	B239
AS98M□-P-N□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

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

◆ HG Geared Type

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



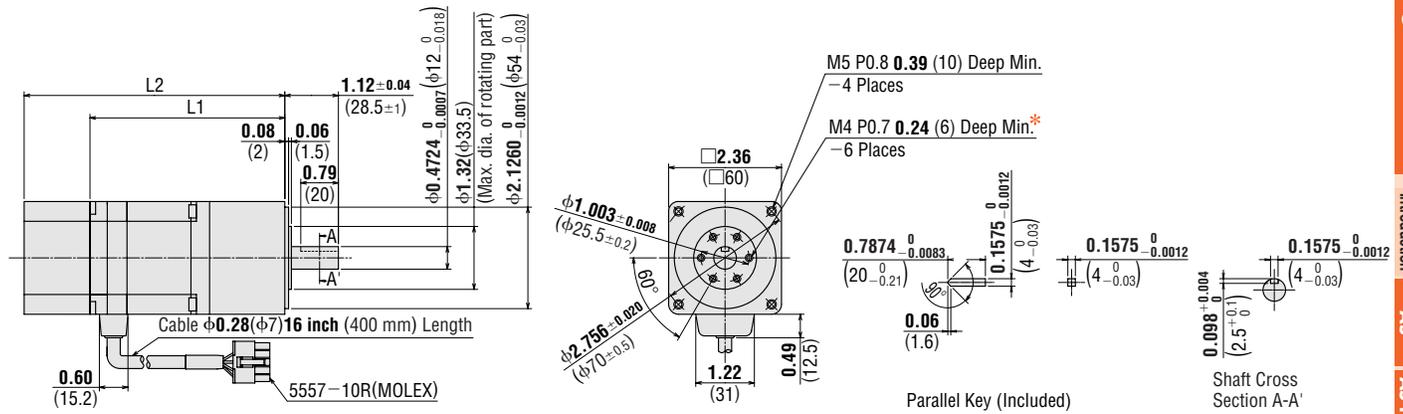
Electromagnetic Brake Leads  
24 inch (600 mm) Length AWG 26

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

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

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

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

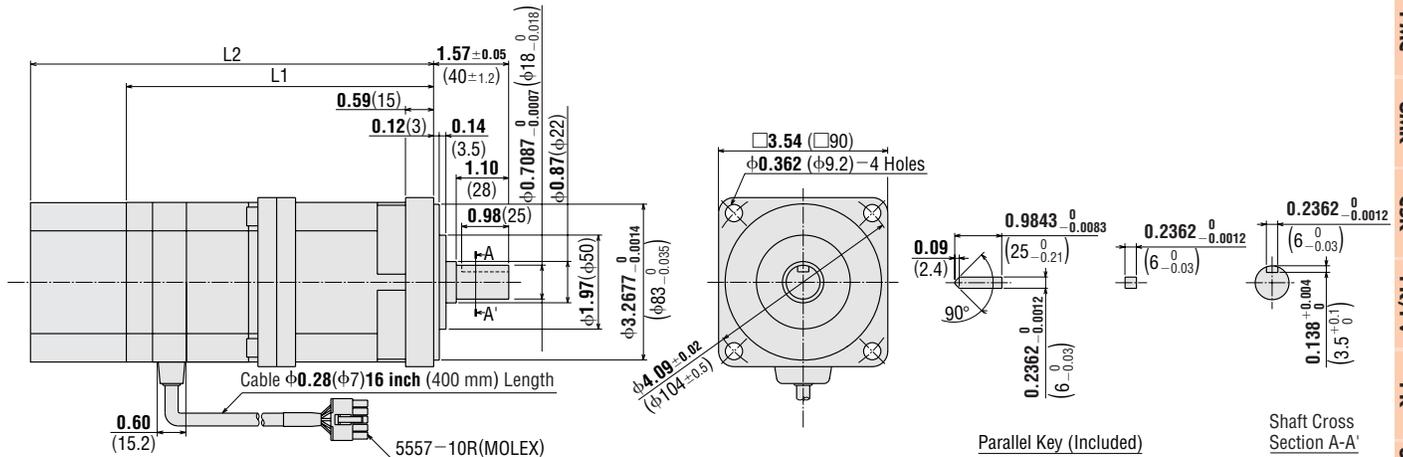


\* The position of the key slot on the output shaft [ $\phi 0.4724$  ( $\phi 12$ )] relative to the screw holes on a maximum diameter of  $\phi 1.32$  ( $\phi 33.5$ ) on the rotating part is arbitrary.

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

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

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



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

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

Introduction

AS

AS PLUS

ASC

RK

CRK II

CSK

PMC

UMK

PK/PV

PK

UI2120G

EMP401

EMP402

SG8030J

SMK

Accessories

Before Using a Stepping Motor

Controllers

Low-Speed Synchronous Motors

Accessories

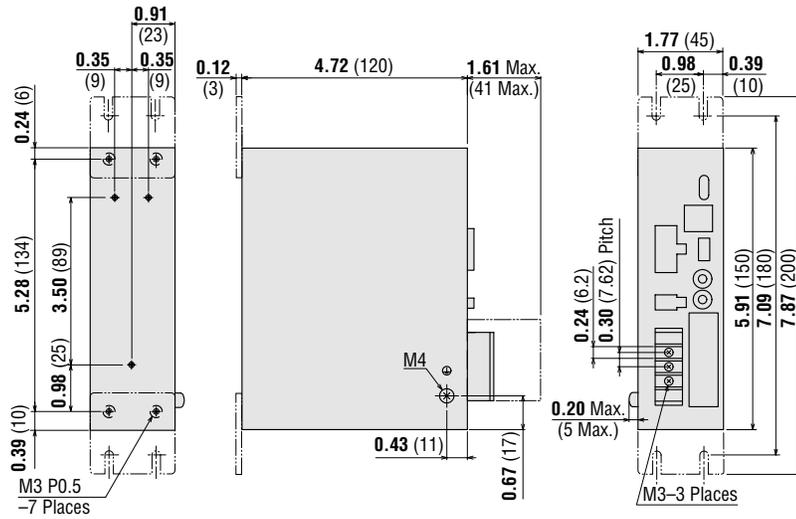
Before Using a Stepping Motor

## ● Driver

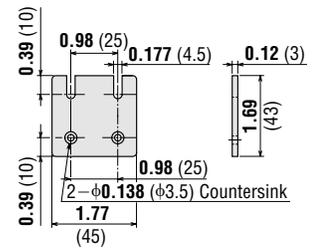
### 13 AS Series

Weight: 1.8 lb. (0.8 kg)

**DXF** B197



### ● Mounting Bracket (2 pieces, included)



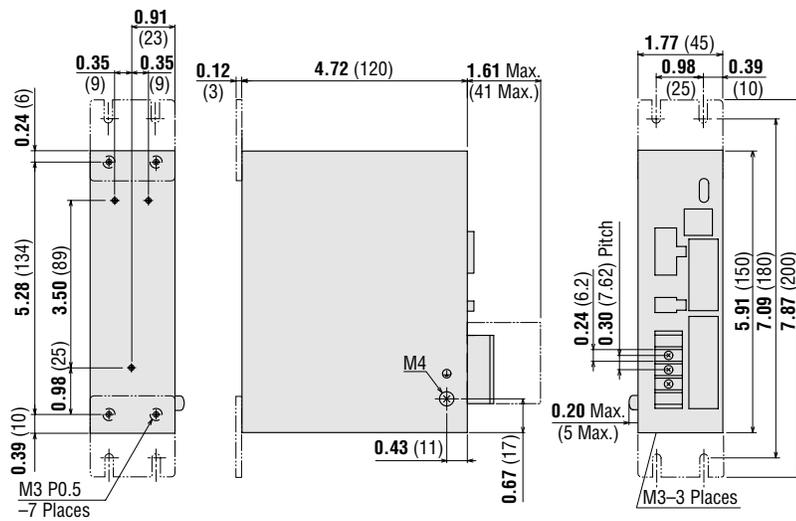
### ● I/O Connector (included)

Connector: 54306-3619 (MOLEX)  
Cover Assembly: 54331-0361 (MOLEX)

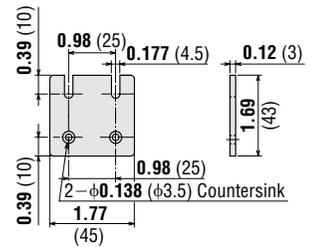
### 14 AS PLUS

Weight: 1.8 lb. (0.8 kg)

**DXF** B298



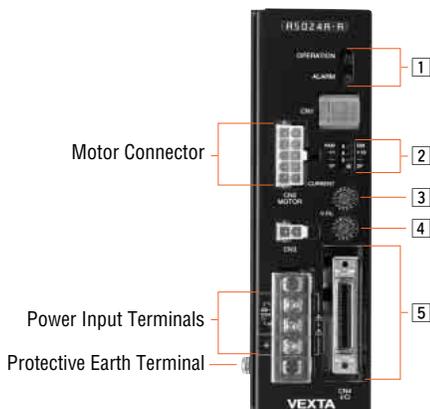
### ● Mounting Bracket (2 pieces, included)



### ● I/O Connector (included)

Connector (36 pin): 54306-3619 (MOLEX) for CN4  
Cover Assembly (36 pin): 54331-0361 (MOLEX) for CN4  
Connector (20 pin): 54306-2019 (MOLEX) for CN5  
Cover Assembly (20 pin): 54331-0201 (MOLEX) for CN5

## Connection and Operation AS Series



### 1 Signal Monitor Display

#### • LED Indicators

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

#### • Alarm

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

### 2 Function Switches

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

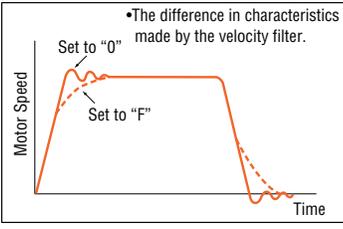
#### Note:

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

### 3 Current Adjustment Switch

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

### 4 Velocity Filter Adjustment Switch

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

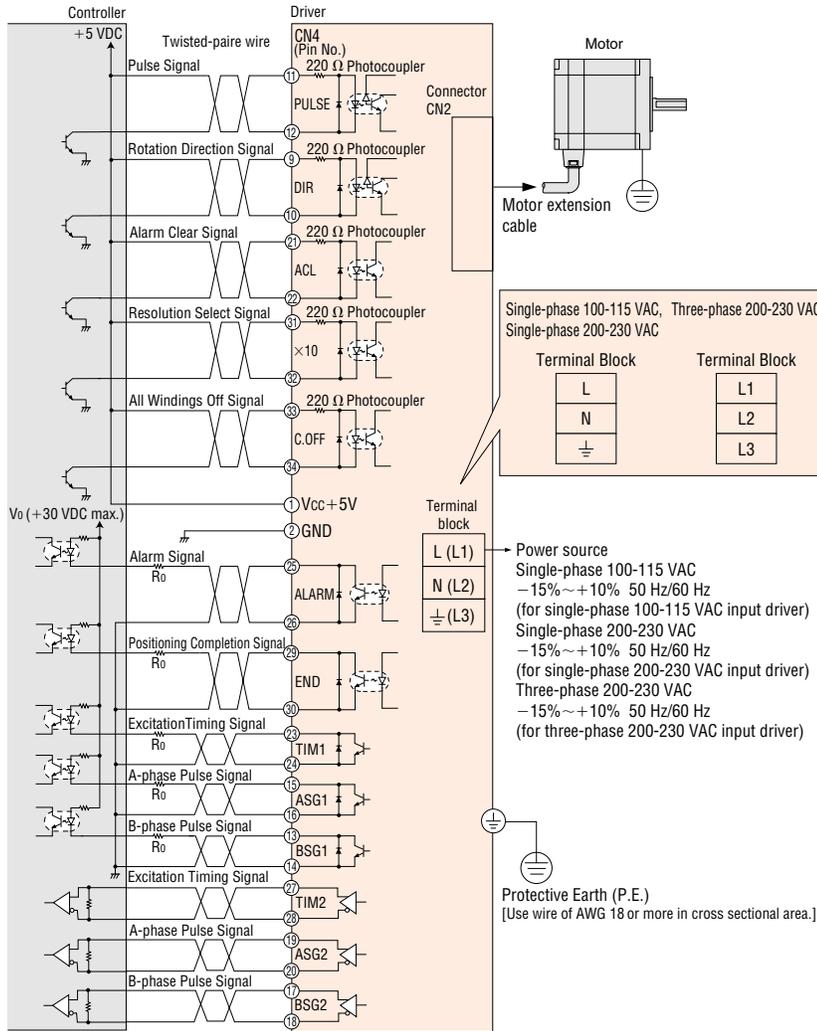
### 5 Input/Output Signals

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

\*1 Do not input 5 VDC and 24 VDC at the same time.

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

## ● Connection Diagrams AS Series

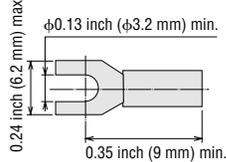
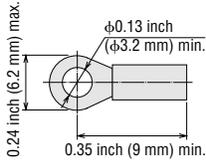


### Notes:

- $V_o$  and the current must be 30 VDC, 15 mA or less respectively. If the current exceeds 15 mA, connect external resistance  $R_o$ .
- Use a multi-core, twisted-pair shielded wire AWG 28 for the control input/output signal line (CN4), and keep wiring as short as possible [within 6.6 feet (2 m)].
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.
- When it is necessary to separate the motor and driver by more than 1.31 ft. (0.4 m), an optional extension cable or flexible cable must be used. Electromagnetic brake motor models (except motor frame size 1.65 inch (42 mm) must use an electromagnetic brake extension cable (sold separately). The frame size 1.65 inch (42 mm) models can use a standard extension cable even for electromagnetic brake motor models.
- Use a three-core cable for the power supply line with a conductor cross-sectional area of at least AWG 18. (single-phase 100-115 VAC, single-phase 200-230 VAC)
- Use a four-core cable for the power supply line with a conductor cross-sectional area of at least AWG 18. (three-phase 200-230 VAC)
- Keep the control input/output signal line at least 1 foot (300 mm) away from power lines (e.g. lines carrying large current, such as AC lines and motor lines). Also, do not run these lines through the same ducts or pipes as power lines.
- The customer must furnish the cables for power supply lines and control input/output signal lines.
- The driver must be properly grounded. The driver's Protective Earth terminal should be grounded to a common ground point, using a cable of AWG 18.
- When the "Timing Signal" or "Pulse Signal" is used, 5 VDC or 24 VDC power supply is necessary. Use either a 5 VDC or a 24 VDC power supply. Do not connect power to pins ① and ③ at the same time. See [5] Input/Output table on page C-39.

## ◆ Recommended Crimp Terminals

- Round shape terminals with insulator
- U shape terminals with insulator



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

## ◆ Connecting the Electromagnetic Brake to Power Supply

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

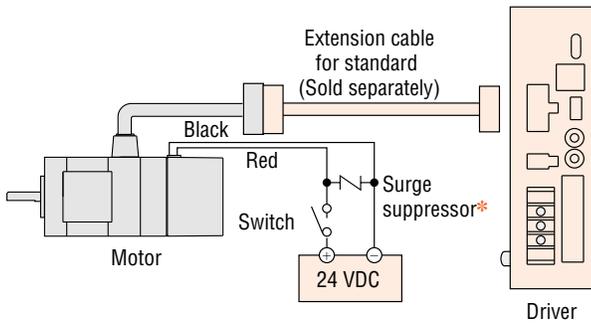
### Notes:

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

## Connection Method

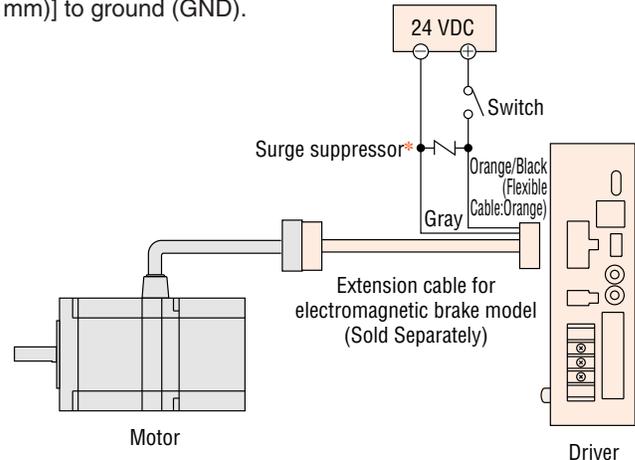
### AS46

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



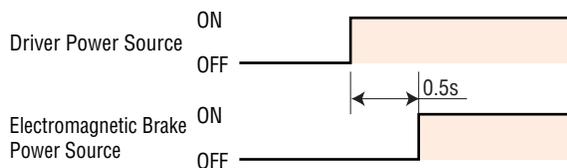
### AS66, AS69, AS98

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



## Timing Chart for Electromagnetic Brake Operation

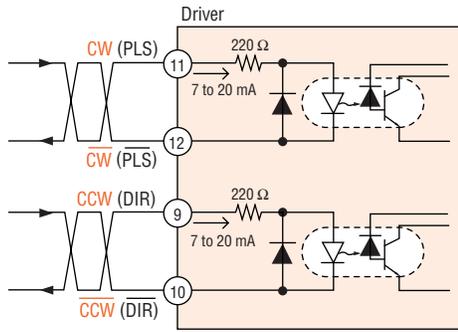
To release the electromagnetic brake, wait at least 0.5 seconds after turning on the driver power source. The load may fall down due to a loss of holding torque.



## ● Description of Input/Output Signals

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

#### ◆ Input Circuit and Sample Connection



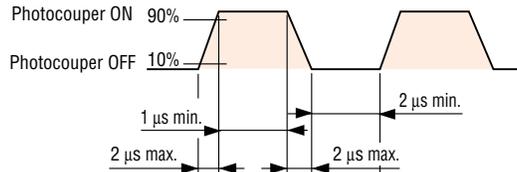
The letters indicate signals under the 2-pulse input mode, while the letters in parentheses indicate signals under the 1-pulse input mode. The factory setting is 2-pulse input mode.

#### Note:

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

#### ◆ Pulse Waveform Characteristics

##### (Photocopier state corresponding to the input pulse)



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

#### ◆ Pulse Input Mode

##### 1-Pulse Input Mode

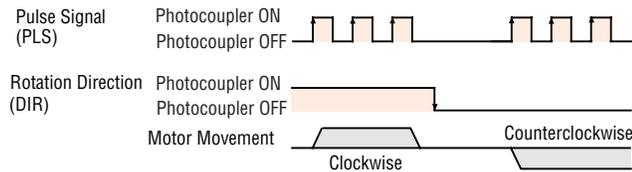
The 1-pulse input mode uses "Pulse" (PLS) and "Rotation Direction" (DIR) signals. CW is selected by inputting DIR signals at low level (with the input photocopier on), CCW by inputting at high level (with input photocopier off).

"Rotation Direction" signals

Photocopier "ON": Clockwise,

Photocopier "OFF": Counterclockwise

##### 1 Pulse Input Mode



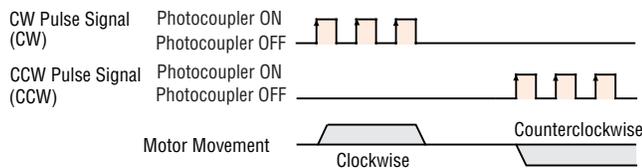
##### 2-pulse input mode

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

#### Note:

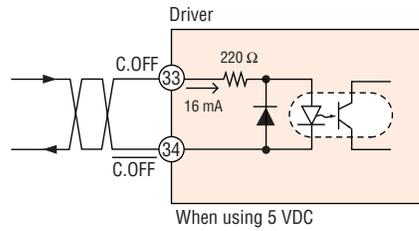
- The factory setting is 2-pulse input.

##### 2 Pulse Input Mode

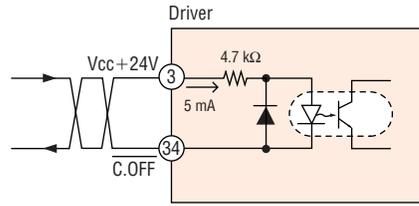


## All Windings Off (C.OFF) Input Signal

### ◆ Input Circuit and Sample Connection



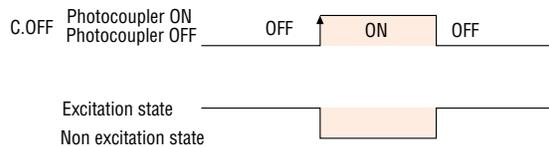
When using 5 VDC



When using 24 VDC

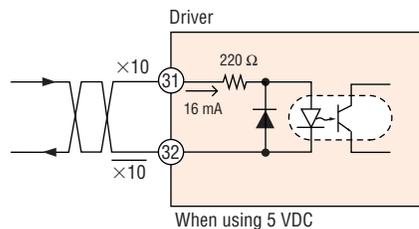
This controller power source offers a choice of either 5 VDC or 24 VDC.

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

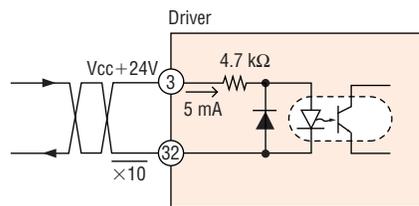


## Resolution Select (×10) Input Signal

### ◆ Input Circuit and Sample Connection



When using 5 VDC



When using 24 VDC

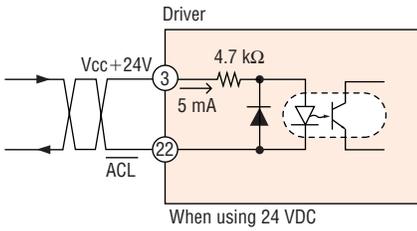
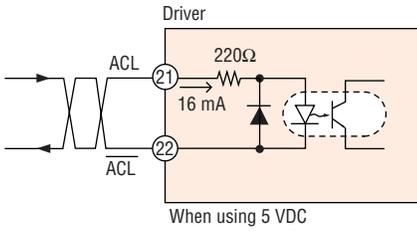
This controller power source offers a choice of either 5 VDC or 24 VDC. During input of this signal, the magnification of the resolution is ×10. It is only valid when the resolution select switch is set to ×1.

#### Note:

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

## Alarm Clear (ACL) Input Signal

### ◆ Input Circuit and Sample Connection



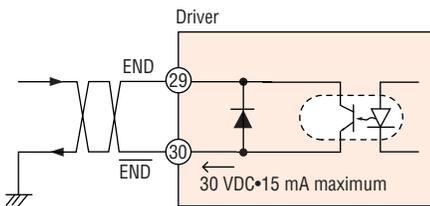
This controller power source offers a choice of either 5 VDC or 24 VDC. This signal is used when a protection circuit has been activated, for canceling the alarm without turning off power to the driver.

#### Note:

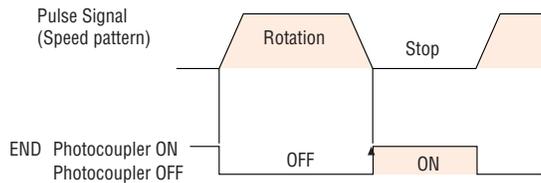
- The following alarm cannot be released. To cancel the alarm, first resolve the cause and check for safety, and then turn power on again.
  - Over Current ●EEPROM Data Error ●System Error

## Position Completion (END) Output Signal

### ◆ Output Circuit and Sample Connection



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

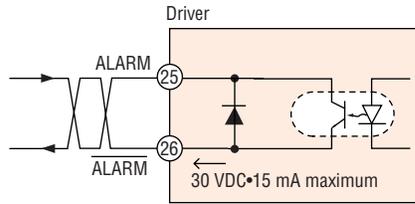


#### Note:

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

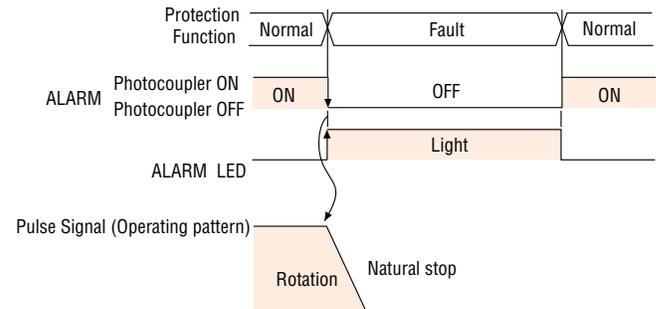
## Alarm (ALARM) Output Signal

### ◆ Output Circuit and Sample Connection



Circuits for use with 30 VDC, 15 mA maximum.

This signal indicates that one of the driver's protection circuits has been activated. When an abnormality such as an overload or over current is detected, the alarm signal is output, the ALARM indicator lights, and the motor stops (non-excitation state). To cancel the alarm, first resolve the cause and check for safety, and then input an Alarm-clear (ACL) signal or cycle power. Once power has been turned off, wait at least 10 seconds before turning it on again.



#### Note:

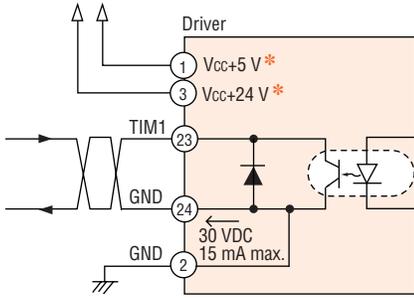
The alarm output uses positive logic (Normally Closed), all other outputs use negative logic (Normally Open).

## Excitation Timing (TIM.) Output Signal

### ◆ Output Circuit and Sample Connection

#### Open Collector Output (Current Source Type)

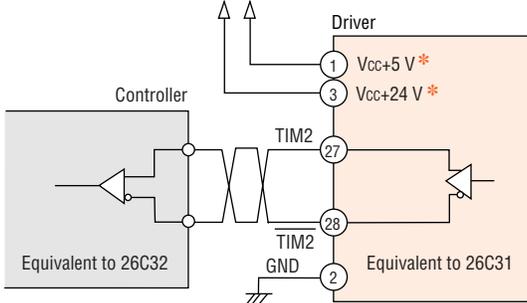
\*Power supply for timing output should be connected to either 5 VDC or 24 VDC.  
Do not input 5 VDC and 24 VDC at the same time.



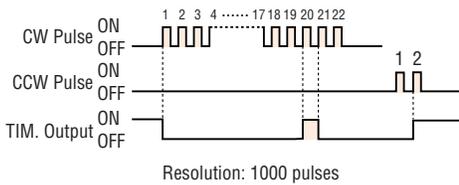
Circuits for use with 30 V, 15 mA maximum.

#### Line Driver Output

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



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



#### Notes:

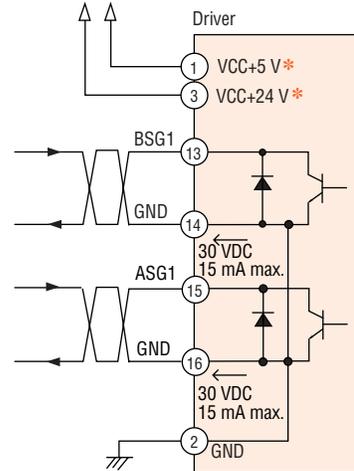
- A precise timing signal cannot be obtained when the speed of the pulse input frequency is over 500 Hz.
- When the Timing Signal Output is used, 5 VDC or 24 VDC power supply is necessary.

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

### ◆ Output Circuit and Sample Connection

#### Open Collector Output (Current Source Type)

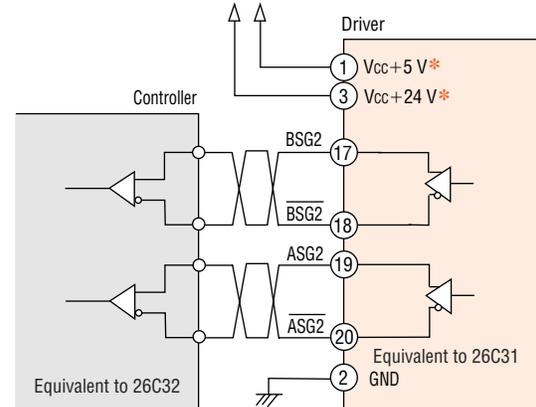
\*Power supply for quadrature output should be connected to either 5 VDC or 24 VDC.  
Do not input 5 VDC and 24 VDC at the same time.



Circuits for use with 30 V, 15 mA maximum.

#### Line Driver Output

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



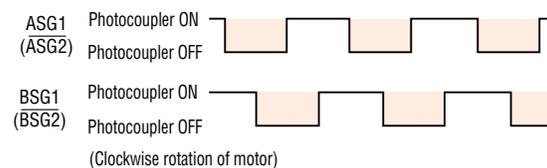
These signals are used when monitoring the motor position. The pulse resolution is the same as the motor resolution at the time of power-on.

[Example: Resolution select switch (1000 P/R)→Output pulse number for each motor revolution (1000).] The phase difference between A and B is 90° electrical.

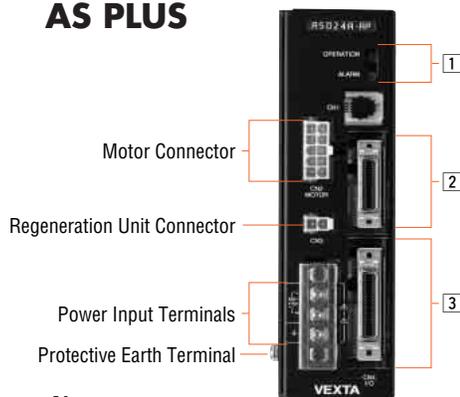
#### Notes:

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

### ◆ Pulse Waveform Characteristics



## Connection and Operation AS PLUS



### 1 Signal Monitor Display

#### • LED Indications

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

#### • Alarm

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

\* Possible – The Alarm can be cleared with the ALMCLR command or an ACL input.

Impossible – The AC power must be cycled to clear these alarms.

## 2 Limit Sensor Input Communication Signals (CN5)

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

## 3 I/O Signals (CN4)

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

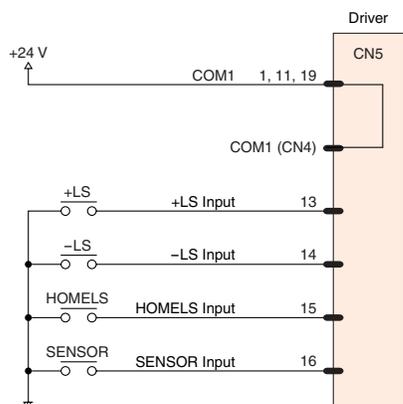
\*1: The following signals can be assigned arbitrarily via program settings. Additionally, the output logic of each signal can be switched. END output, RUN output, MOVE output, HOME-P output, TIM output, MBC output

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

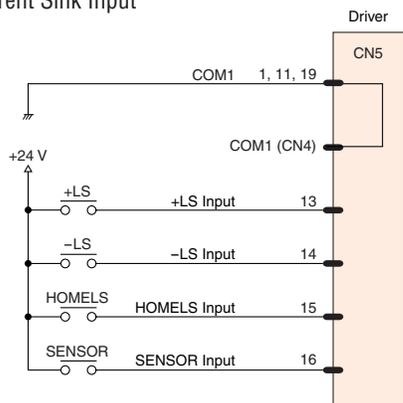


## ◆ Power Lines and Limit Sensors (CN5)

### • Current Source Input



### • Current Sink Input



## ◆ Wiring the signal cable

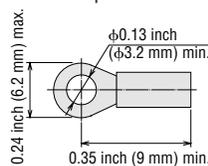
- Use input signals at  $24\text{ VDC} \pm 10\%$ .
- Use output signals at 30 VDC or below and at 4 to 8 mA.
- Use a shielded cable with a wire of a size ranging between AWG 24 and AWG 22 for the driver signal cable (I/O signals, limit sensors signals), and keep it as short as possible.
- Keep the control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

## ◆ Other wiring

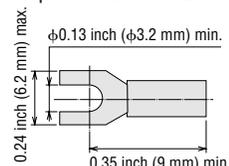
- When it is necessary to separate the motor and driver by more than 1.31 ft. (0.4 m), an optional extension cable or flexible cable must be used. Electromagnetic brake motor models (except motor frame size 1.65 inch (42 mm)) must use an electromagnetic brake extension cable (sold separately). The frame size 1.65 inch (42 mm) models can use a standard extension cable even for electromagnetic brake motor models.
- Use a three-core cable for the power supply line with a conductor cross-sectional area of at least AWG 18.
- The customer must furnish the cables for power supply lines and control input/output signal lines.
- The driver must be properly grounded. The driver's Protective Earth terminal should be grounded to a common ground point, using a cable of AWG 18.

## ◆ Recommended Crimp Terminals

Round shape terminals with insulator



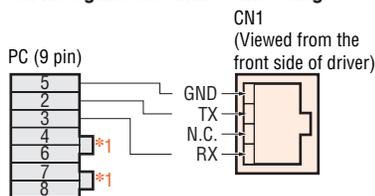
U shape terminals with insulator



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

## ◆ Connecting the Driver with a Personal Computer (CN1)

### • Pin Assignments and Connecting



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

### • Communication Specifications

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

### Notes:

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

## ◆ Connecting the Electromagnetic Brake to Power Supply

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

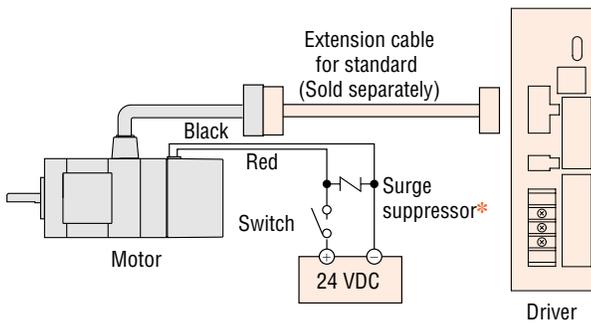
### Notes:

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

## Connection Method

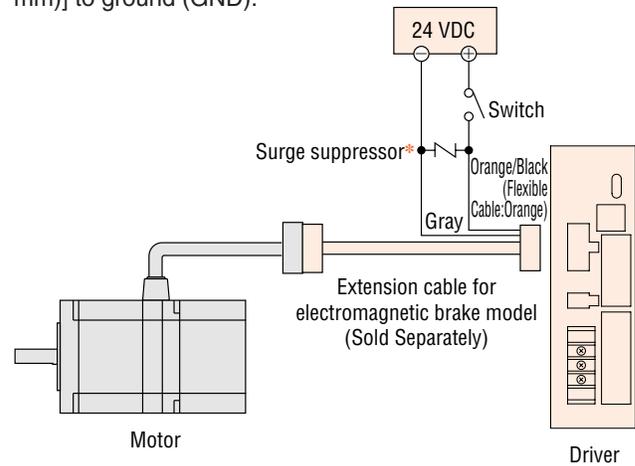
### AS46

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



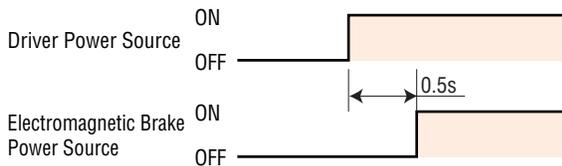
### AS66, AS69, AS98

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



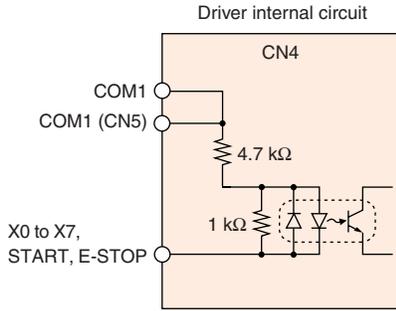
## Timing Chart for Electromagnetic Brake Operation

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



## ● Description of Input Signals (CN4)

### ◆ Input Circuit and Sample Connection



#### Note:

- Use input signals at 24 VDC $\pm$ 10%.

#### • P24 input, N24 input

These inputs are for the external power supply required for the RS-232C communication, ASG and BSG line driver outputs. Make sure to use a power supply of at least 24 VDC $\pm$ 10%, 0.05A.

If the same power supply is going to be used for the RS-232C, ASG, BSG and other external I/O, make sure to use a power supply of at least 24 VDC $\pm$ 10%, 0.2A.

#### • START input

This signal starts the program named "STARTUP".  
OFF $\rightarrow$ ON edge to start "STARTUP" program.

#### • E-STOP input

This signal is used to forcibly stop the operation.  
Set the stopping method using the ESTOPACT command.  
Additionally, the input logic can be changed using the ESTOPLV command. (The factory setting of this command is normally open.)  
OFF $\rightarrow$ ON edge to stop operation

#### • COM1 input

This is an external power-source terminal for input signals.  
This signal is internally connected to terminals COM1 of CN5.

#### • X0 to X7 inputs

The X0 through X7 inputs can be used as input ports for general signals. The status of each port can be read using an IN command or INx command.

The general signals assignable to the X0 through X7 inputs are listed below. Use a corresponding command to assign signal.

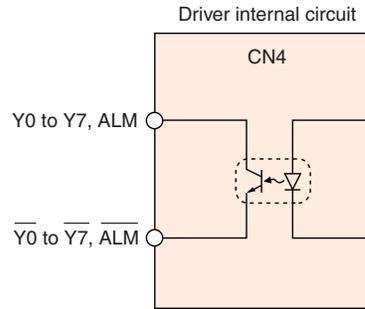
ACL input .....INACL command  
PAUSE input.....INPAUSE command  
MSTOP input.....INMSTOP command  
RESTART input.....INRESTART command

#### • ACL input

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

## ● Description of Output Signals (CN4)

### ◆ Output Circuit and Sample Connection



#### Note:

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

#### • Y0 to Y7 output

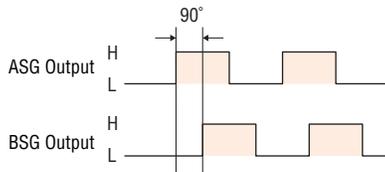
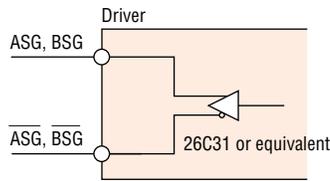
The Y0 through Y7 outputs can be used as output ports for general signals. The status of each port can be read using an OUT command or OUTx command.

The general signals assignable to the Y0 through Y7 outputs are listed below. Use the corresponding command to assign each signal.

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

## ASG, BSG Output

- Line driver output (26C31 or equivalent)



## ● ASG, BSG Line Driver Output

To monitor the motor position, connect these signals to a counter, etc.

The pulse resolution is the same as the motor resolution at the time of power-on.

The ASG output and BSG output have a phase difference of 90 degrees electrical.

Pulse output is subject to a maximum delay of 1 ms relative to the motor's motion. Use the ASG output and BSG output to check the stopping position.

## ● ALM Output

This signal is output when an alarm is generated by the driver's protective function.

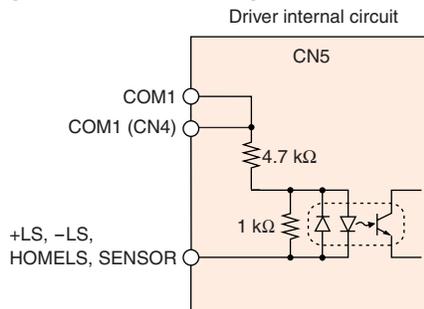
The reason for triggering of the protective function can be identified through the blink count of the alarm LED, or ALM command.

To reset the ALM output, remove the cause of the alarm and then perform one of the following procedures after ensuring safety:

- Assign INACL then turn the ACL input to ON.
- Enter an ALMCLR command.
- Turn off the AC power, wait at least 10 seconds, then turn it back on.

## ● Description of Limit Sensors (CN5)

### ◆ Input Circuit and Sample Connection



#### Note:

- Use input signals at 24 VDC  $\pm$  10%.

#### ● COM1 input

This is a power-source input terminal for limit-sensor signals. The power-source voltage must be 24 VDC  $\pm$  10%.

This signal is internally connected to terminals COM1 of CN4.

#### ● COM2 input

This is a power-source input terminal for limit-sensor signals.

Use it when sharing the input signal power source among two or more drivers.

#### ● +LS input, -LS input

These signals are input from +LS and -LS.

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

#### Continuous Operation and Positioning Operation

When a +LS or -LS is detected, the driver's protective function (over travel) is activated. As a result, the ALM output is turned OFF and the motor stops.

Set the stopping method using the OTACT command.

To pull out of +LS or -LS, cancel the protective function by inputting an ACL signal once or by using the ALMCLR command.

Then perform mechanical home seeking routine or operate the motor in the direction opposite that of the limit sensor during continuous operation.

#### Mechanical Home Seeking Routine

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

- **HOMELS input**

This signal is input from HOMELS.

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

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

- **SENSOR input**

This signal is input from SENSOR.

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

**Mechanical Home Seeking Routine**

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

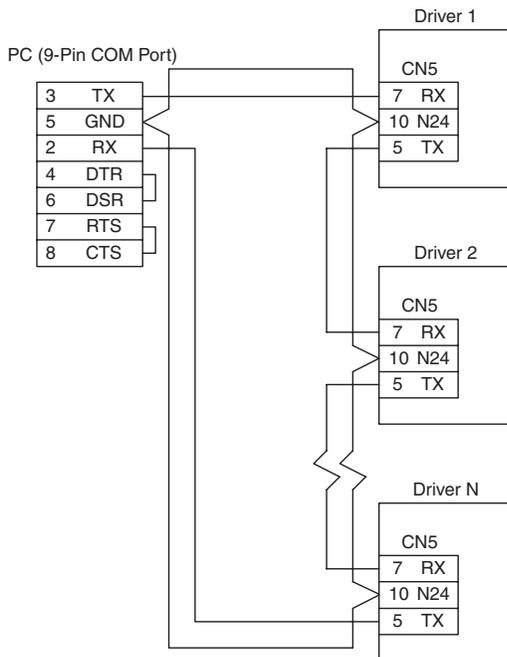
**Continuous Operation**

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

Set the stopping method using the SENSORACT command.

**Note:**

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



- **Description of Daisy-chain Connections**

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

- **TX, RX**

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

**Notes:**

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

## List of Motor and Driver Combinations

### Single-Phase 100-115 VAC

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

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

### Single-Phase 200-230 VAC

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

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

### ● Single-Phase 200-230 VAC

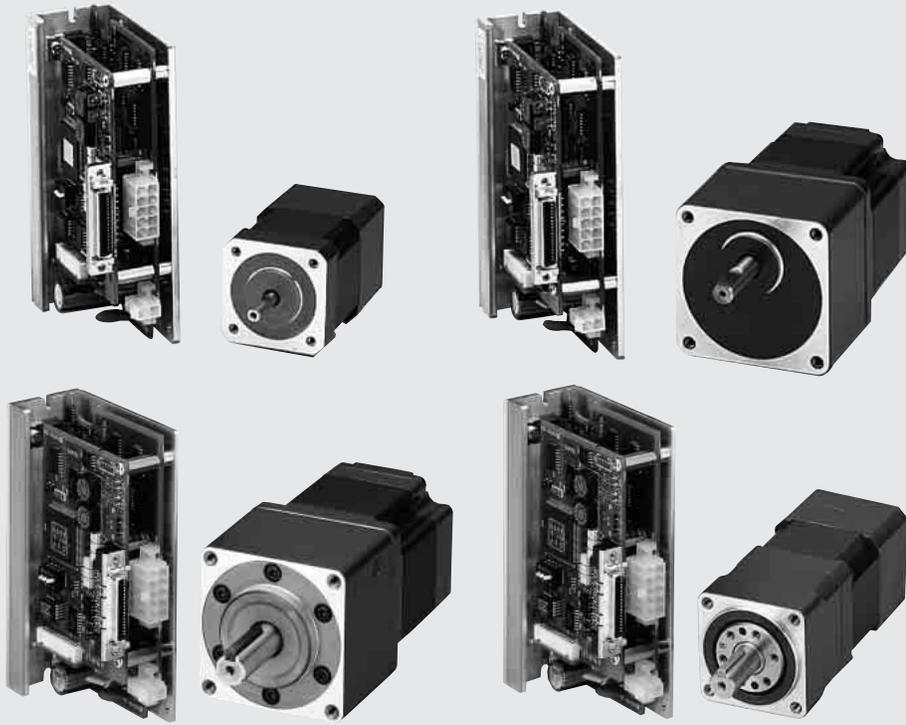
Type	AS			AS PLUS		
	Package Model	Motor Model	Driver Model	Package Model	Motor Model	Driver Model
TH Geared	AS66□C-T3.6	ASM66□C-T3.6	ASD12B-C	AS66□CP-T3.6	ASM66□C-T3.6	ASD12B-CP
	AS66□C-T7.2	ASM66□C-T7.2		AS66□CP-T7.2	ASM66□C-T7.2	
	AS66□C-T10	ASM66□C-T10	ASD12C-C	AS66□CP-T10	ASM66□C-T10	ASD12C-CP
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

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

### ● Three-Phase 200-230 VAC

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

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



# *α*STEP ASC Series

### Additional Information

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

Introduction

Motor & Driver Packages	
Closed Loop <i>α</i> STEP	5-Phase Full/Half
AC Input	DC Input
AS	AS PLUS
ASC	RK
	CRK II
	CSK
	PMC
	UMK
	CSK
	PK/PV
	PK
	UI2120G
	EMP401
	EMP402
	SG8030J
	SMK
	Accessories
	Before Using a Stepping Motor

## Closed Loop Stepping Motor and Driver Package

# $\alpha$ STEP ASC Series

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

### Features

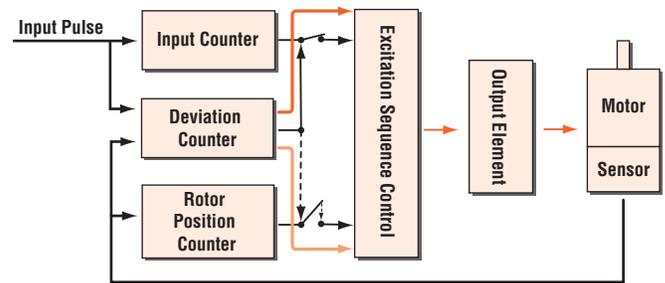
#### ● Closed loop control prevents loss of synchronism.

$\alpha$ STEP does not lose synchronism even when subjected to abrupt load fluctuation or acceleration.

A newly developed rotor position detection sensor constantly monitors the motor movement. If synchronism is about to be lost, closed loop control is used, so there is no need to worry about loss of steps.



#### ◆ $\alpha$ STEP Control Diagram

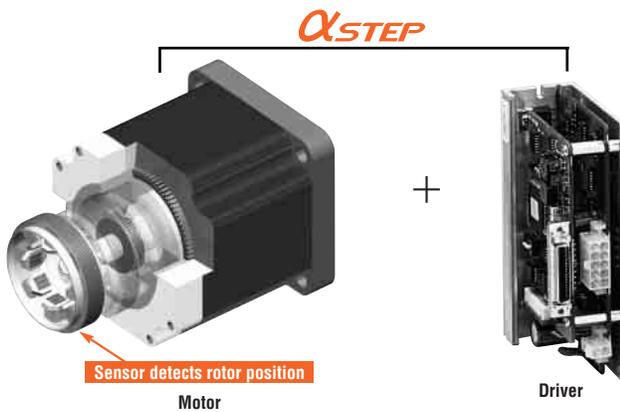


Normal (Positioning Deviation is less than  $\pm 1.8^\circ$ )

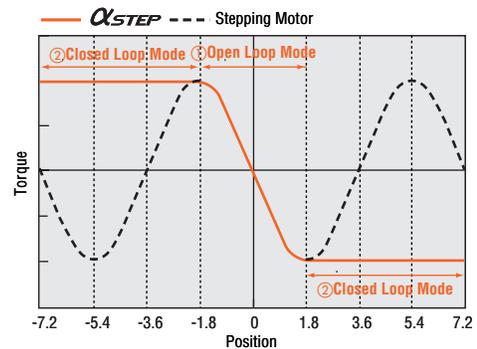
Motor runs in open loop mode like a stepping motor.

If Motor Misssteps (Positioning Deviation is greater than  $\pm 1.8^\circ$ )

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



#### ◆ $\alpha$ STEP Angle-Torque Characteristics



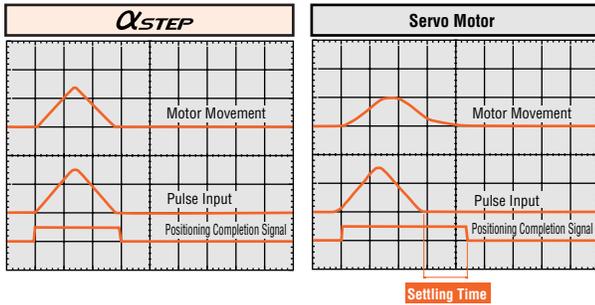
① If the positioning deviation is  $\pm 1.8^\circ$  or smaller, the motor runs in open loop mode like a stepping motor.

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

## ● High Response

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

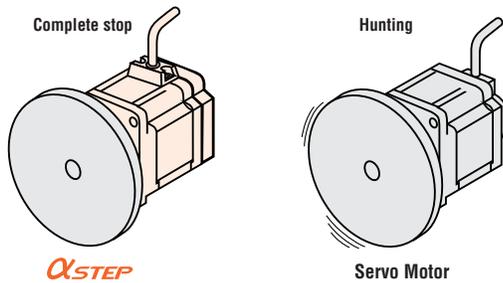
Measurement condition : Feed 1/5 rotation  
Load Inertia (J) = 1.37 oz-in<sup>2</sup> (250 × 10<sup>-7</sup> kg·m<sup>2</sup>)



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

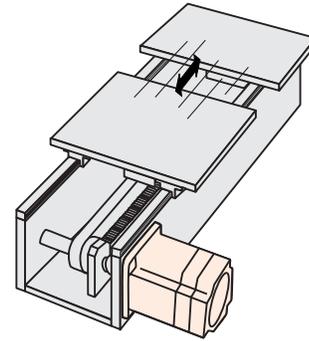
## ● No Hunting

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



## ● No Gain Tuning

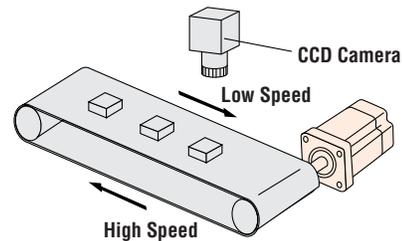
Gain tuning for servo motors is critical, troublesome and time-consuming. Since the  $\alpha$ STEP operates like a stepping motor, there are no gain tuning requirements. Low rigidity applications, such as belt and pulley, are ideal for  $\alpha$ STEP.



## ● Low Vibration at Low Speed

The driver employs advanced technology that produces smoothness comparable to a microstepping driver. Its vibration level is incredibly low, even when operating in the low speed range. When frequent changes from low (high) to high (low) speed operation are required, the use of the Resolution Select Function solves the problem.

$\alpha$ STEP provides resolution as low as 0.036° per step without any damping mechanism or other mechanical device. Even smoother operation is possible with geared models.



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

## ■ Safety Standards and CE Marking

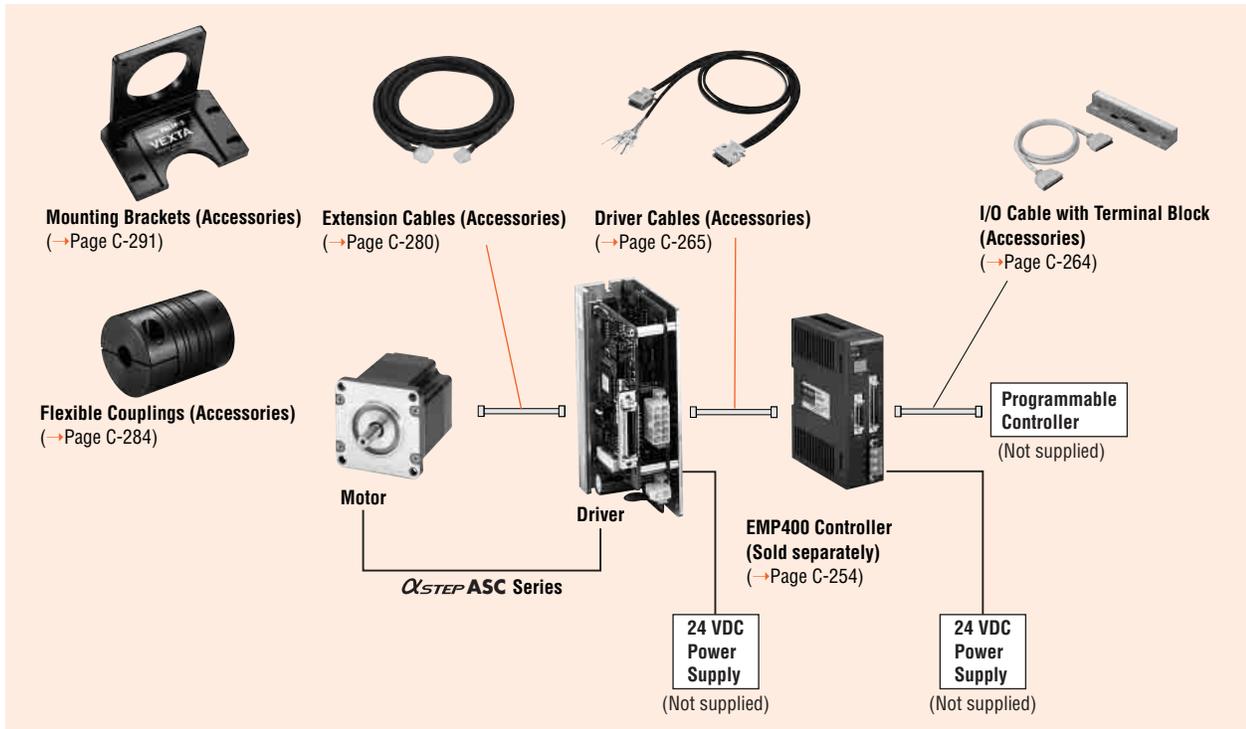
Model	Standards	Certification Body	Standards File No.	CE Marking
Motor	UL60950	UL	E208200	EMC Directives
	CSA C22.2 No.60950			
Driver	UL508C		E171462	
	CSA C22.2 No.14	E208200		
	UL60950			
	CSA C22.2 No.60950			

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

List of Motor and Driver Combinations → Page C-76

- Details of Safety Standards → Page G-2
- The EMC value changes according to the wiring and layout. Therefore, the final EMC level must be checked with the motor/driver incorporated in the user's equipment.

## System Configuration



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

## Extension Cables (For ASC Series)

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

### Note:

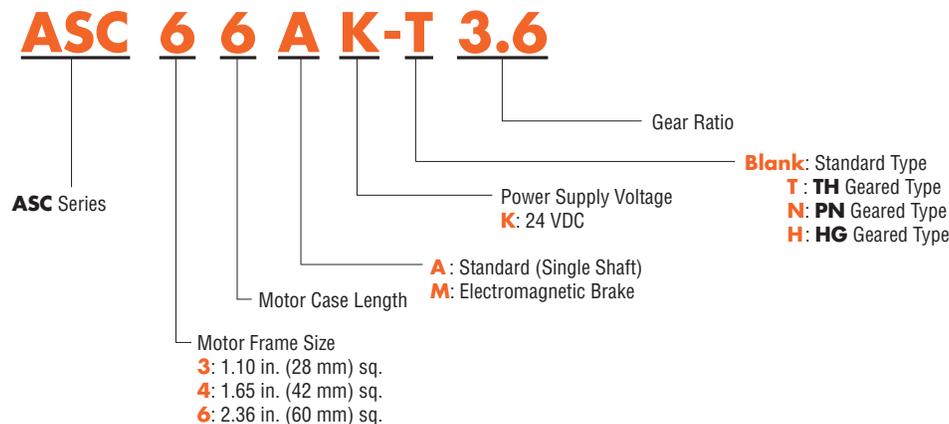
- Electromagnetic brake motor models [except motor frame size □1.65 in. (□42 mm)] must use an optional electromagnetic brake extension cable. The frame size □1.65 in. (□42 mm) models can use a standard extension cable even for electromagnetic brake motor models.

## Product Line

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

\* : Electromagnetic brake models not available.

## Product Number Code



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



## Specifications

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

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

\*2 The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals.

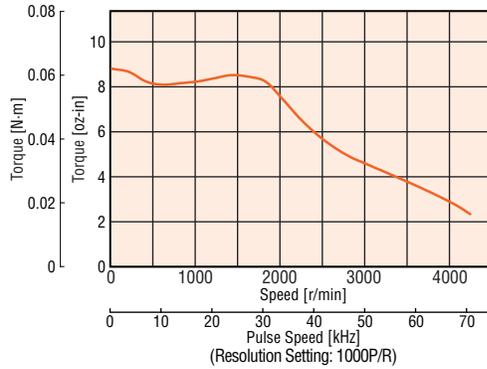
“Resolution Select” switch →Page C-72

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

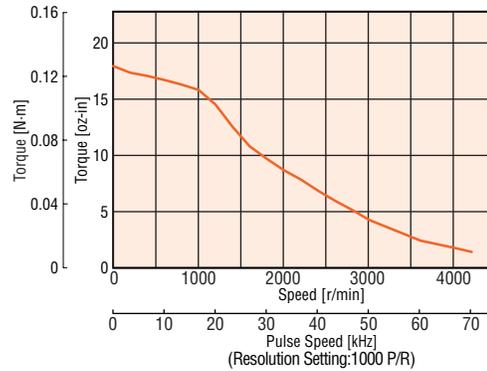
How to Read Specifications Table →Page C-9

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

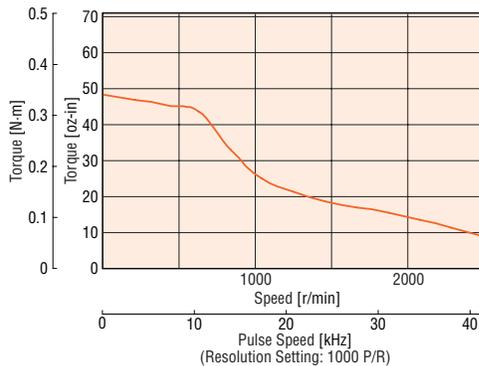
### ASC34AK



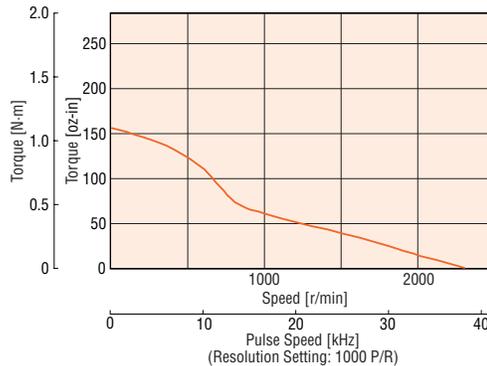
### ASC36AK



### ASC46□K



### ASC66□K



### Notes:

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

Introduction

AS

AS PLUS

ASC

RK

CRK II

CSK

PMC

UMK

CSK

PK/PV

PK

with Indeter

Driver

without Encoder

with Encoder

PK

UI2120G

EMP401

EMP402

SG8030J

SMK

Low-Speed Synchronous Motors

Accessories

Before Using a Stepping Motor

# TH Geared Type

Motor Frame Size:  1.65 in. ( 42 mm)



## Specifications

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

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

\*2 The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals.

“Resolution Select” switch →Page C-72

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

How to Read Specifications Table →Page C-9

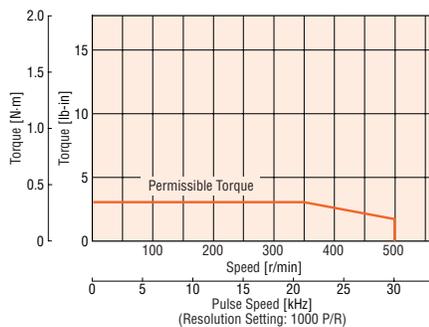
### Note:

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

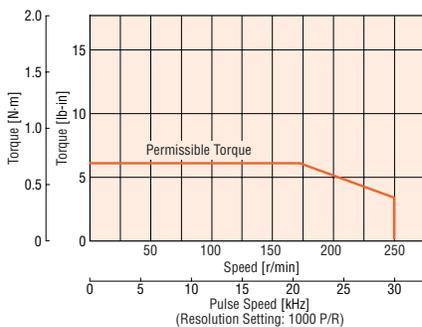
## Speed — Torque Characteristics

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

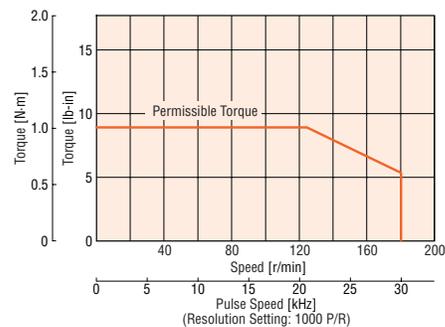
ASC46□K-T3.6



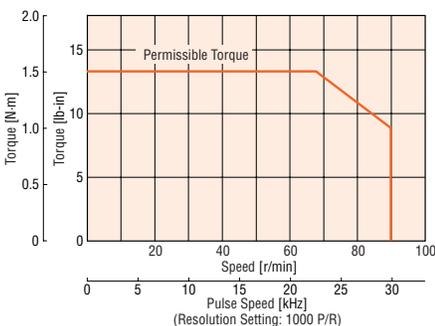
ASC46□K-T7.2



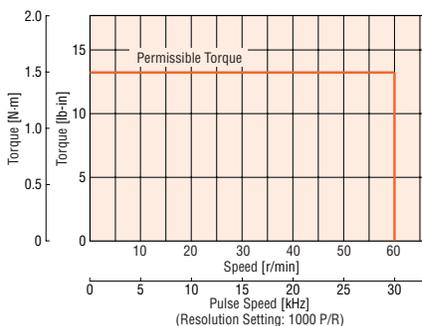
ASC46□K-T10



ASC46□K-T20



ASC46□K-T30



### Notes:

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

# TH Geared Type

Motor Frame Size:  2.36 in. ( 60 mm)



## Specifications

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

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

\*2 The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals.

“Resolution Select” switch →Page C-72

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

How to Read Specifications Table →Page C-9

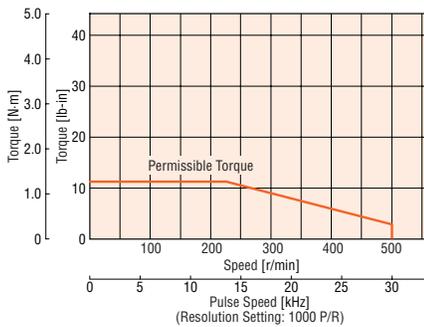
### Note:

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

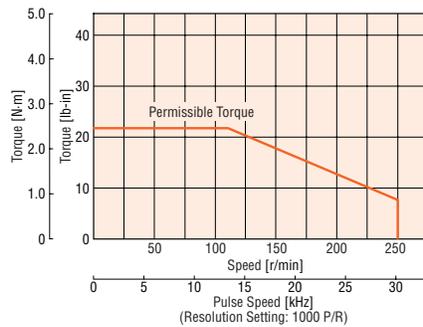
## Speed — Torque Characteristics

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

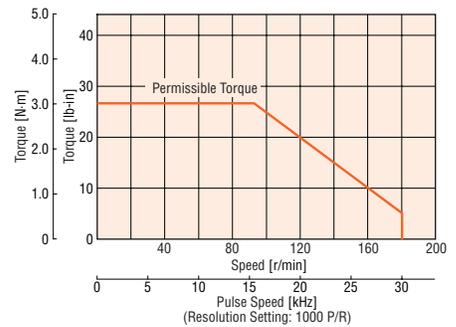
ASC66□K-T3.6



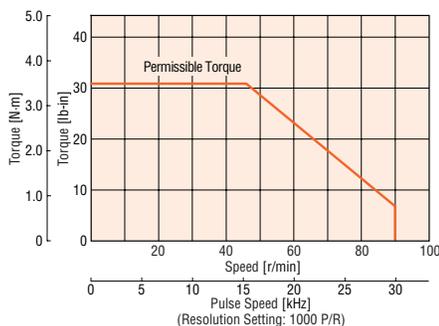
ASC66□K-T7.2



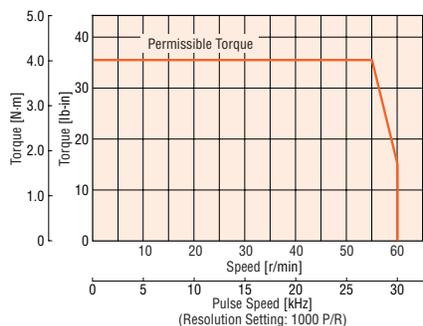
ASC66□K-T10



ASC66□K-T20



ASC66□K-T30



### Notes:

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

# PN Geared Type

Motor Frame Size:  1.65 in. ( 42 mm)



## Specifications How to Read Specifications Table → Page C-9

Model	w/o Electromagnetic Brake	<b>ASC46AK-N7.2</b>	<b>ASC46AK-N10</b>
	Electromagnetic Brake	<b>ASC46MK-N7.2</b>	<b>ASC46MK-N10</b>
Maximum Holding Torque	lb-in (N·m)	13.2 (1.5)	
Rotor Inertia*1 J	oz-in <sup>2</sup> (kg·m <sup>2</sup> )	0.37 (68×10 <sup>-7</sup> ) [0.454 (83×10 <sup>-7</sup> )]	
Backlash	arc min (degrees)	2 (0.034°)	
Angle Error	arc min (degrees)	6 (0.1°)	
Permissible Speed Range	r/min	0~333	0~240
Gear Ratio		7.2:1	10:1
Resolution*2	1000 P/R	0.05°/pulse	0.036°/pulse
Permissible Torque	lb-in (N·m)	13.2 (1.5)	
Maximum Torque*4	lb-in (N·m)	17.7 (2)	
Power Source	Voltage-Maximum Input Current	24 VDC±10% 1.7 A	
Electromagnetic Brake*3	Type	Active when power is off	
	Power Supply Input	24 VDC±5%	
	Power Consumption	2 W	
	Excitation Current	0.08 A	
Static Friction Torque	lb-in (N·m)	6.6 (0.75)	
Weight*1	Motor lb. (kg)	1.6 (0.71) [1.8 (0.81)]	
	Driver lb. (kg)	0.55 (0.25)	
Dimension No.	Motor	6	
	Driver	11	

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

\*2 The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals.

“Resolution Select” switch → Page C-72

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

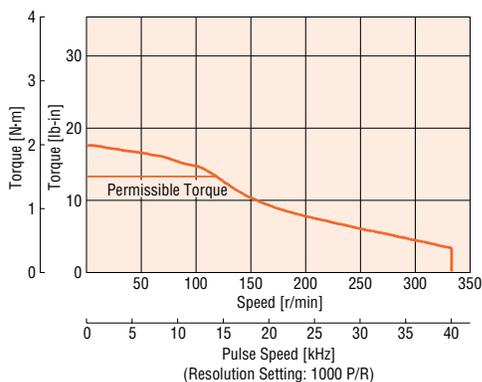
\*4 The value of Maximum Torque is for gear. For output torque for geared motor, refer to the Speed - Torque characteristics.

### Note:

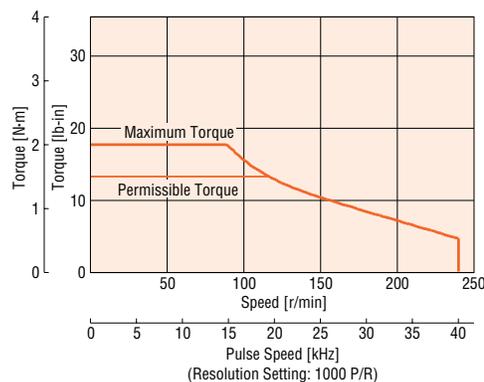
- Direction of rotation of the motor shaft and that of the gear output shaft is the same.

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

### ASC46□K-N7.2



### ASC46□K-N10



### Notes:

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

# PN Geared Type

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



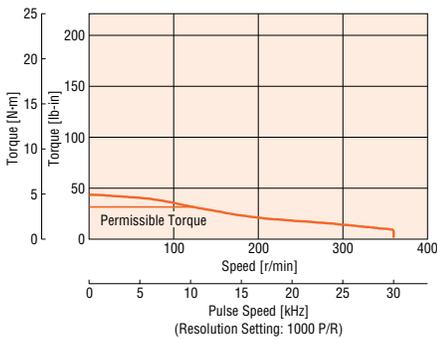
## Specifications How to Read Specifications Table →Page C-9

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

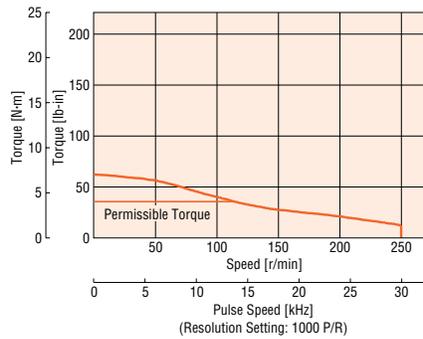
- \*1 The values inside the brackets [ ] represent the specification for the electromagnetic brake type.
  - \*2 The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals. **“Resolution Select” switch** →Page C-72
  - \*3 The electromagnetic brakes are for holding the position when the power is off. They cannot be used for complicated braking. Also, a separate 24 VDC ±5%, 0.3 A min. power supply is required for the electromagnetic brakes.
  - \*4 The value of Maximum Torque is for gear. For output torque for geared motor, refer to the Speed - Torque characteristics.
- Note:**
- Direction of rotation of the motor shaft and that of the gear output shaft is the same.

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

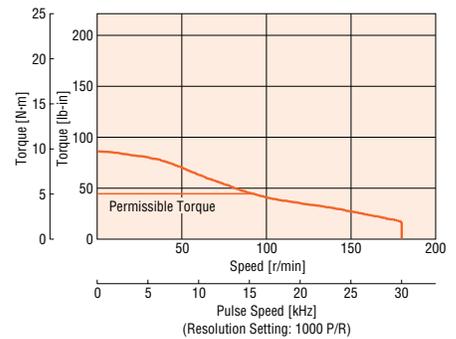
ASC66□K-N5



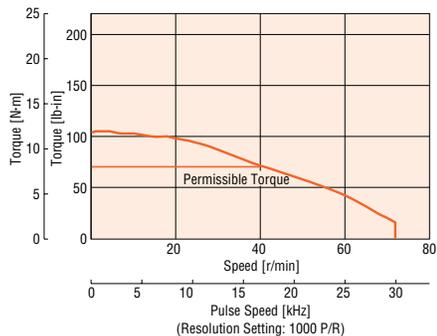
ASC66□K-N7.2



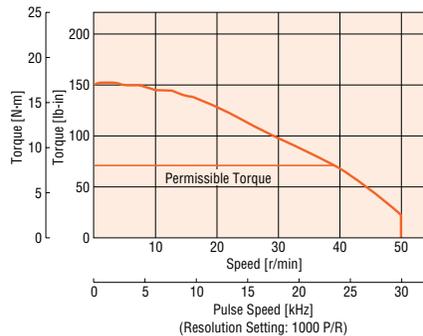
ASC66□K-N10



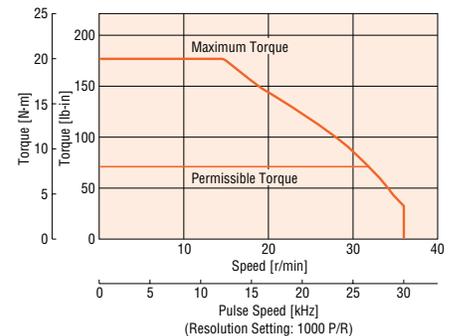
ASC66□K-N25



ASC66□K-N36



ASC66□K-N50



**Notes:**

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

# HG Geared Type

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



## Specifications

Model	w/o Electromagnetic Brake		ASC34AK-H50	ASC34AK-H100	ASC46AK-H50	ASC46AK-H100
	Electromagnetic Brake		—	—	ASC46MK-H50	ASC46MK-H100
Maximum Holding Torque	lb-in (N·m)		13.2 (1.5)	17.7 (2)	30 (3.5)	44 (5.0)
Rotor Inertia*1J	oz-in <sup>2</sup> (kg·m <sup>2</sup> )		0.077 (14×10 <sup>-7</sup> )		0.46 (85×10 <sup>-7</sup> ) [0.55 (100×10 <sup>-7</sup> )]	
Permissible Speed Range	r/min		0~70	0~35	0~48	0~24
Gear Ratio			50:1	100:1	50:1	100:1
Resolution*2	1000 P/R		0.0072°/ Pulse	0.0036°/ Pulse	0.0072°/ Pulse	0.0036°/ Pulse
Permissible Torque	lb-in (N·m)		13.2 (1.5)	17.7 (2)	30 (3.5)	44 (5.0)
Maximum Torque	lb-in (N·m)		17.7 (2)	24 (2.8)	73 (8.3)	97 (11)
Lost Motion (Load Torque)	arc min		Max. 3 (±0.06 N·m)	Max. 3 (±0.08 N·m)	Max. 1.5 (±0.16 N·m)	Max. 1.5 (±0.2 N·m)
Power Source	Voltage-Maximum Input Current		24 VDC±10% 1.0 A		24 VDC±10% 1.7 A	
	Type		—		Active when power is off	
Electromagnetic Brake*3	Power Supply Input		—		24 VDC±5%	
	Power Consumption		—		2 W	
	Excitation Current		—		0.08 A	
	Static Friction Torque lb-in (N·m)		—		15.4 (1.75)	22 (2.5)
Weight*1	Motor	lb. (kg)	0.55 (0.25)		1.5 (0.7) [1.8 (0.8)]	
	Driver	lb. (kg)	0.55 (0.25)			
Dimension No.	Motor		8		9	
	Driver		11			

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

\*2 The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals.

“Resolution Select” switch →Page C-72

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

How to Read Specifications Table →Page C-9

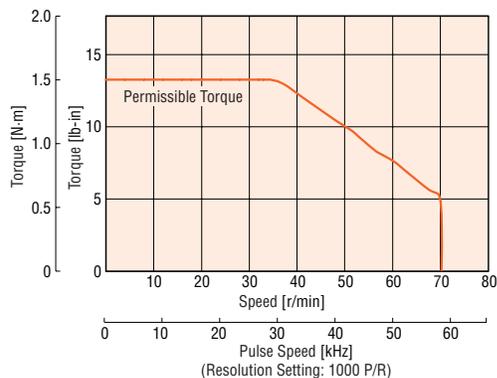
### Note:

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

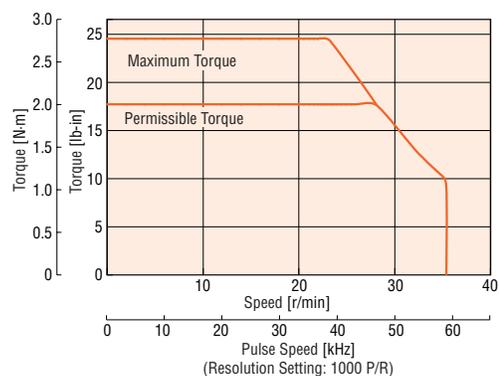
## Speed — Torque Characteristics

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

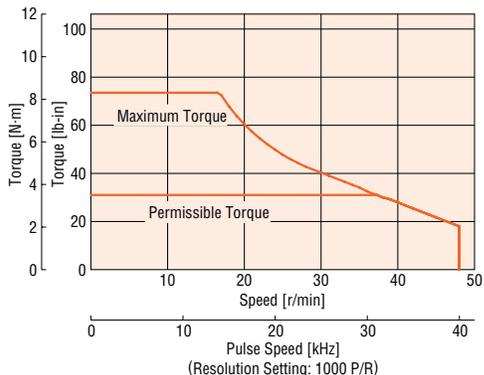
### ASC34AK-H50



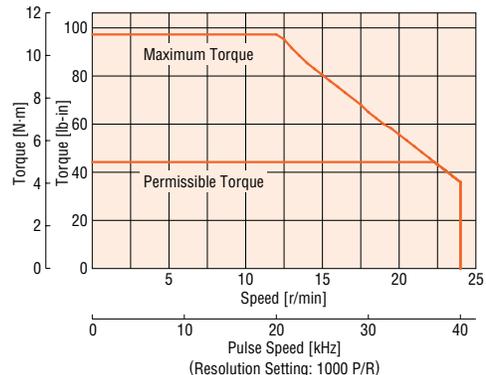
### ASC34AK-H100



### ASC46AK-H50



### ASC46AK-H100



### Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212°F (100°C). (Under 176°F (75°C) is required to comply with UL or CSA standards.)
- In order to prevent fatigue of the gear grease in the harmonic gear, keep the temperature of the gear case under 158°F (70°C).
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

# HG Geared Type

Motor Frame Size:  2.36 in. ( 60 mm)



## Specifications

Model	w/o Electromagnetic Brake		ASC66AK-H50		ASC66AK-H100	
	Electromagnetic Brake		ASC66MK-H50		ASC66MK-H100	
Maximum Holding Torque	lb-in (N·m)		48 (5.5)		70 (8.0)	
Rotor Inertia*1 J	oz-in <sup>2</sup> (kg·m <sup>2</sup> )		2.4 (440×10 <sup>-7</sup> ) [3.3 (599×10 <sup>-7</sup> )]			
Permissible Speed Range	r/min		0~36		0~18	
Gear Ratio			50:1		100:1	
Resolution*2	1000P/R		0.0072°/pulse		0.0036°/pulse	
Permissible Torque	lb-in (N·m)		48 (5.5)		70 (8.0)	
Maximum Torque	lb-in (N·m)		159 (18)		240 (28)	
Lost Motion (Load Torque)	arc min		Max. 0.7 (±0.28 N·m)		Max. 0.7 (±0.39 N·m)	
Power Source	Voltage-Maximum Input Current		24 VDC±10% 3.7 A			
Electromagnetic Brake*3	Type		Active when power is off			
	Power Supply Input		24 VDC±5%			
	Power Consumption		6 W			
	Excitation Current		0.25 A			
	Static Friction Torque	lb-in (N·m)	24 (2.75)		35 (4)	
Weight*1	Motor	lb. (kg)	3.1 (1.4) [3.6 (1.65)]			
	Driver	lb. (kg)	0.55 (0.25)			
Dimension No.	Motor		10			
	Driver		11			

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

\*2 The resolution can be set to any one of 500 P/R, 1000 P/R, 5000 P/R, or 10000 P/R with the resolution select switch or resolution select switching signals.

“Resolution Select” switch →Page C-72

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

How to Read Specifications Table →Page C-9

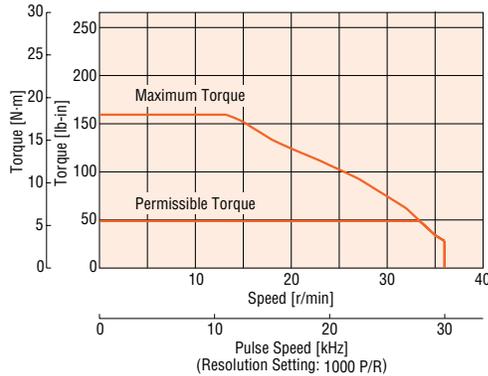
### Note:

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

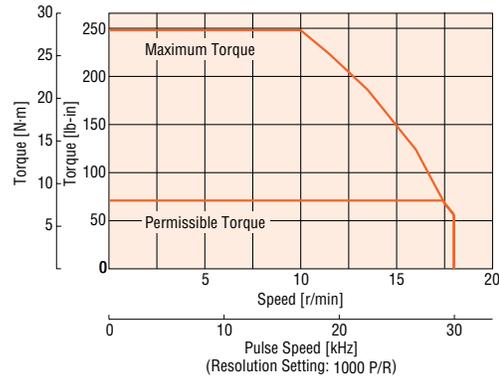
## Speed — Torque Characteristics

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

ASC66□K-H50



ASC66□K-H100



### Notes:

- Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212°F (100°C). (Under 176°F (75°C) is required to comply with UL or CSA standards.)
- In order to prevent fatigue of the gear grease in the harmonic gear, keep the temperature of the gear case under 158°F (70°C).
- When using the motor with the dedicated driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50%.

## Common Specifications

Maximum Input Pulse Frequency	250 kHz (When the pulse duty is 50%)
Speed • Positioning Control Command	Pulse Train Input
Protection Functions	When the protection functions are activated, an alarm signal is output and the motor stops automatically. Overload Protection, Overvoltage Protection, Speed Error Protection, Overspeed protection, EEPROM Data Error, Sensor Error, System Error
Input Signals	Photocoupler Input Input Resistance: 220 $\Omega$ Input Current 7~20 mA [Forward Pulse (Negative logic pulse input), Reverse Pulse (Negative logic pulse input), Current Off, Alarm Clear, Resolution Setting]
Output Signals	Photocoupler • Open Collector Output External equipment requirement Less than 30 VDC, 15 mA (Positioning Completion, Alarm, Timing) Transistor • Open Collector Output External equipment requirement Less than 30 VDC, 15 mA (Feedback Pulse A • B phase)

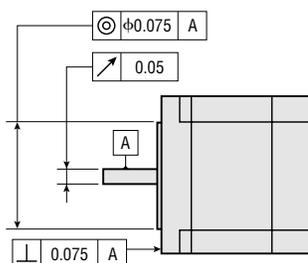
## General Specifications

		Motor	Driver
Insulation Class		Class B [266°F (130°C)] [UL/CSA: Recognized as class A 221°F (105°C )]	—
Insulation Resistance		100 M $\Omega$ minimum when measured by a 500 VDC megger between the following places · Frame-Motor and Sensor Windings	100 M $\Omega$ minimum when measured by a 500 VDC megger between the following places · Heat Sink-Power Supply Terminal
Dielectric Strength		Sufficient to withstand the following for one minute · Frame-Motor and Sensor Windings 0.5 kV 60 Hz	Sufficient to withstand the following for one minute · Heat Sink-Power Supply Terminal 0.5 kV 60 Hz
Operating Environment	Ambient Temperature	32°F~122°F (0°C~+50°C) (nonfreezing): Standard- <b>TH-PN</b> Geared Type 32°F~104°F (0°C~+40°C) (nonfreezing): <b>HG</b> Geared Type	+32°F~+104°F (0°C~+40°C) (nonfreezing)
	Ambient Humidity	85% or less (noncondensing)	
	Atmosphere	No corrosive gases, dust, water or oil.	
Static Angle Error		$\pm 5$ minutes	—
Shaft Runout		0.002 inch (0.05 mm) T.I.R.*	—
Concentricity		0.003 inch (0.075 mm) T.I.R.*	—
Perpendicularity		0.003 inch (0.075 mm) T.I.R.*	—

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

### Note:

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



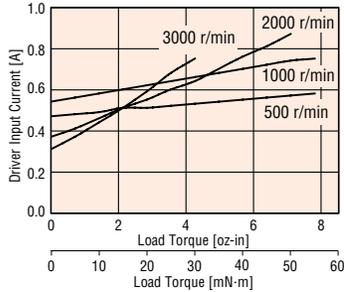
## Load Torque-Driver Input Current Characteristics

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

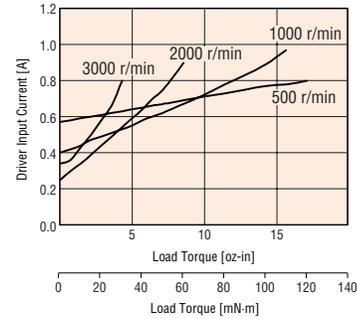
Motor shaft speed [r/min] = Gear output shaft speed × Gear ratio

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

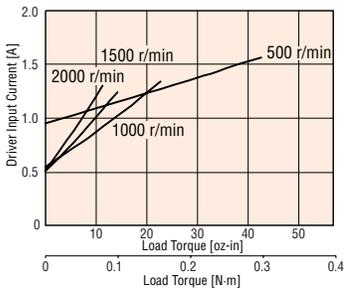
### ASC34AK



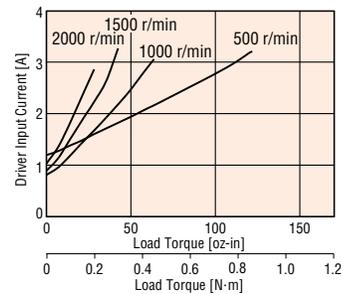
### ASC36AK



### ASC46□K



### ASC66□K



## Permissible Overhung Load and Permissible Thrust Load

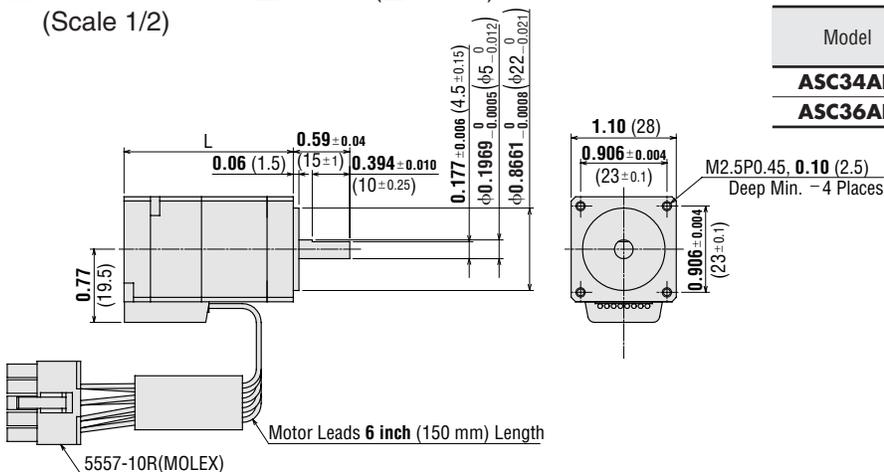
Unit = Upper values: lb./Lower values: N

Model	Overhung Load Distance from Shaft End [inch (mm)]					Thrust Load
	0	0.2 (5)	0.39 (10)	0.59 (15)	0.79 (20)	
ASC34AK	5.6	7.6	11.7	—	—	Keep thrust loads below the weight of the motor used.
ASC36AK	25	34	52	—	—	
ASC46□K	4.5	5.6	7.6	11.7	—	
	20	25	34	52	—	
ASC66□K	14.1	16.8	21	29	42	
	63	75	95	130	190	
ASC46□K-T3.6	2.2	3.1	4.5	6.7	—	3.3
ASC46□K-T7.2						
ASC46□K-T10						
ASC46□K-T20						
ASC46□K-T30	15	18	22	27	33	9
ASC66□K-T3.6						
ASC66□K-T7.2						
ASC66□K-T10						
ASC66□K-T20	70	80	100	120	150	40
ASC66□K-T30						
ASC46□K-N7.2						
ASC46□K-N10						
ASC66□K-N5	45	49	56	63	72	22
	200	220	250	280	320	
ASC66□K-N7.2	56	60	67	76	87	
ASC66□K-N10	250	270	300	340	390	
ASC66□K-N25	74	81	90	101	117	
ASC66□K-N36	330	360	400	450	520	
ASC66□K-N50	31	36	45	54	—	49
ASC34AK-H50						
ASC34AK-H100						
ASC46□K-H50						
ASC46□K-H100	180	220	270	360	510	220
ASC66□K-H50	72	83	99	123	162	101
ASC66□K-H100	320	370	440	550	720	450

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

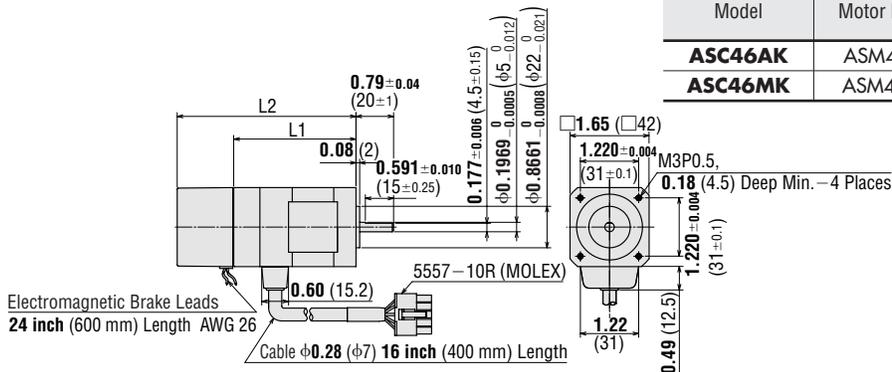
### Motor Standard Type

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



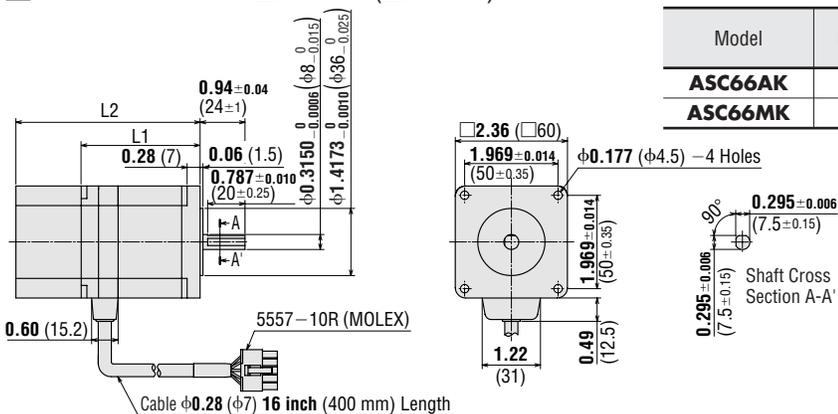
Model	Motor Model	L inch (mm)	Weight lb. (kg)	DXF
<b>ASC34AK</b>	ASM34AK	1.77 (45)	0.33 (0.15)	B274
<b>ASC36AK</b>	ASM36AK	2.56 (65)	0.48 (0.22)	B275

#### 2 Motor Frame Size □1.65 in. (□42 mm)



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

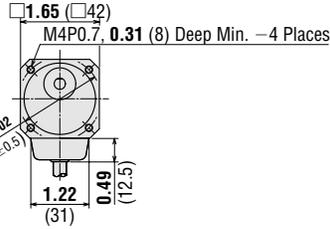
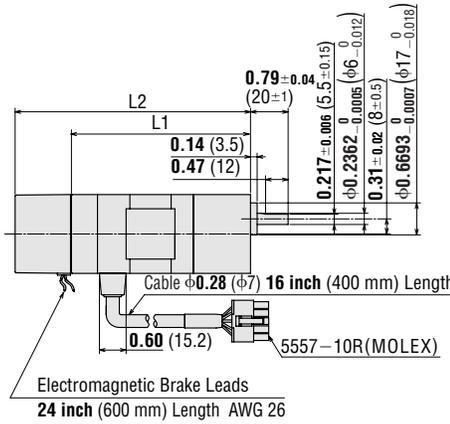
#### 3 Motor Frame Size □2.36 in. (□60 mm)



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

## ◆ TH Geared Type

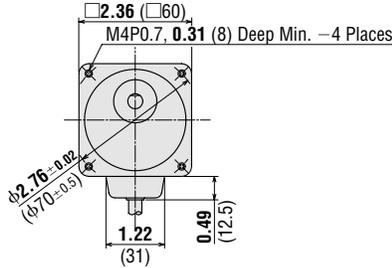
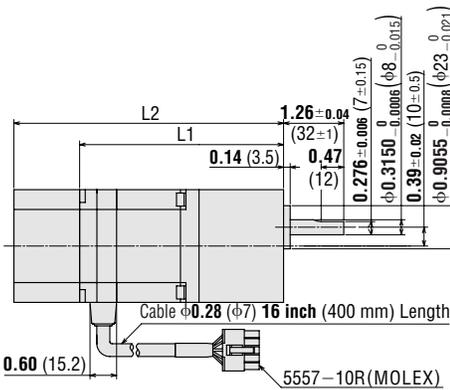
4 Motor Frame Size □1.65 in. (□42 mm)



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

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

5 Motor Frame Size □2.36 in. (□60 mm)

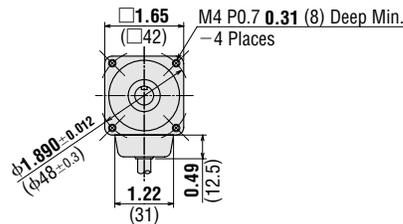
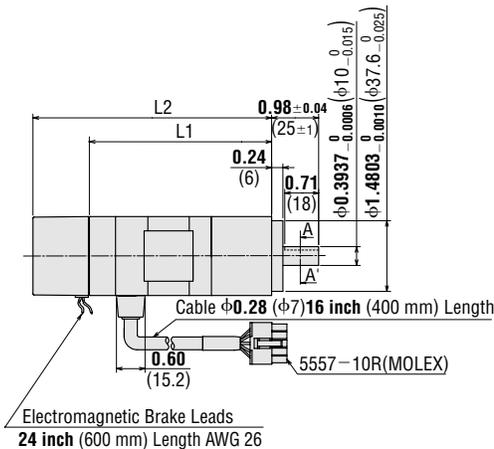


Model	Motor Model	Gear Ratio	L1 inch (mm)	L2 inch (mm)	Weight lb. (kg)	DXF
ASC66AK-T□	ASM66AK-T□	3.6, 7.2,	4.28 (108.6)	—	2.8 (1.25)	B201
ASC66MK-T□	ASM66MK-T□	10, 20, 30	—	5.65 (143.6)	3.3 (1.5)	B202

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

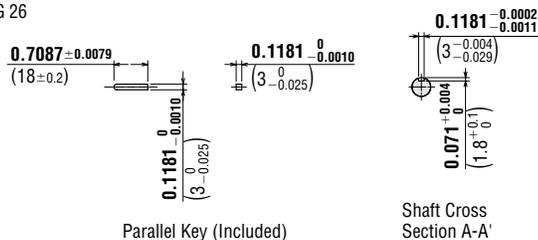
## ◆ PN Geared Type

6 Motor Frame Size □1.65 in. (□42 mm)



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

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



Introduction

AS

AS PLUS

ASC

RK

CRKII

CSK

PMC

UMK

CSK

PK/PV

PK

UI2120G

EMP401

EMP402

SG8030J

SMK

Accessories

Before Using a Stepping Motor

Controllers

Low-Speed Synchronous Motors

2-Phase Stepping Motors without Encoder

2-Phase Stepping Motors with Encoder

Driver with Indexer

Driver with Indexer

Driver with Indexer

Driver with Indexer

Driver with Indexer

Driver with Indexer

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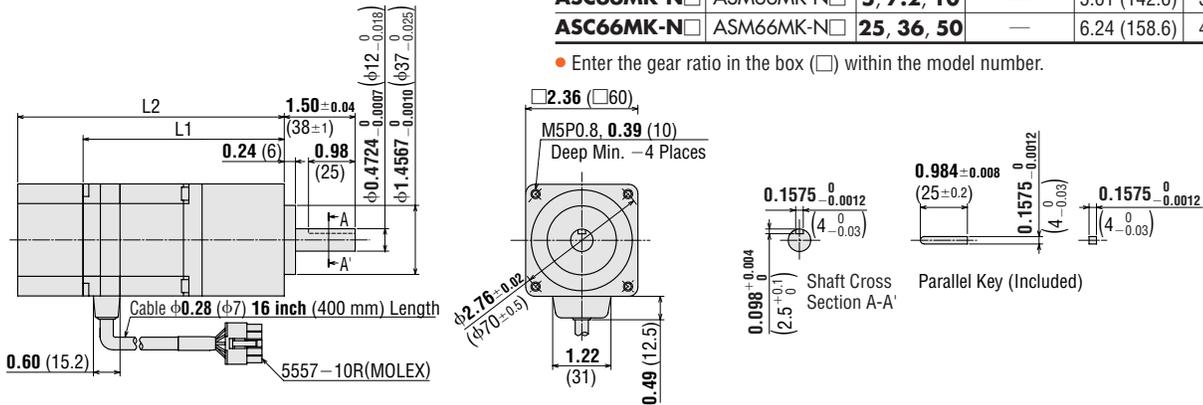
Driver with Indexer

Driver with Indexer

7 Motor Frame Size □2.36 in. (□60 mm)

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

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

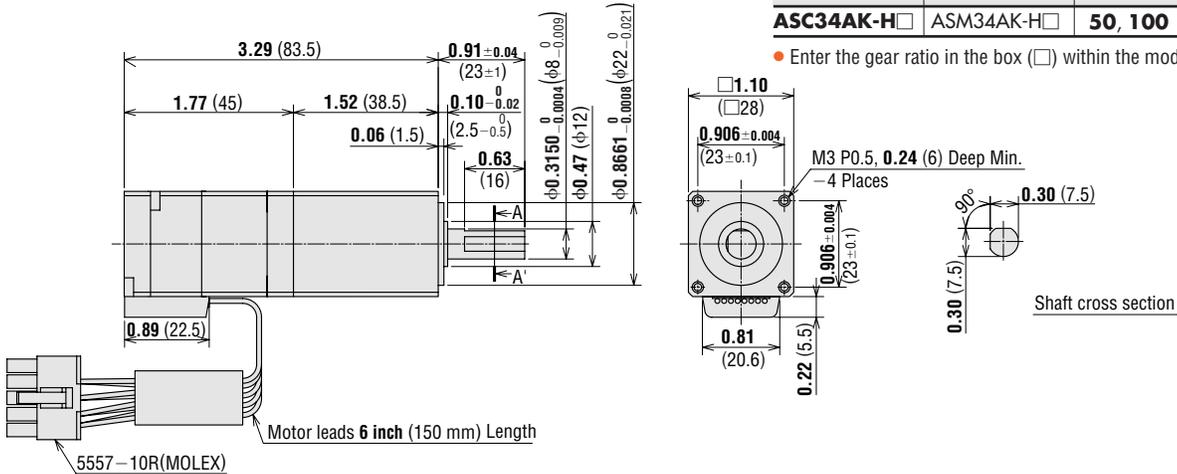


◆ HG Geared Type

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

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

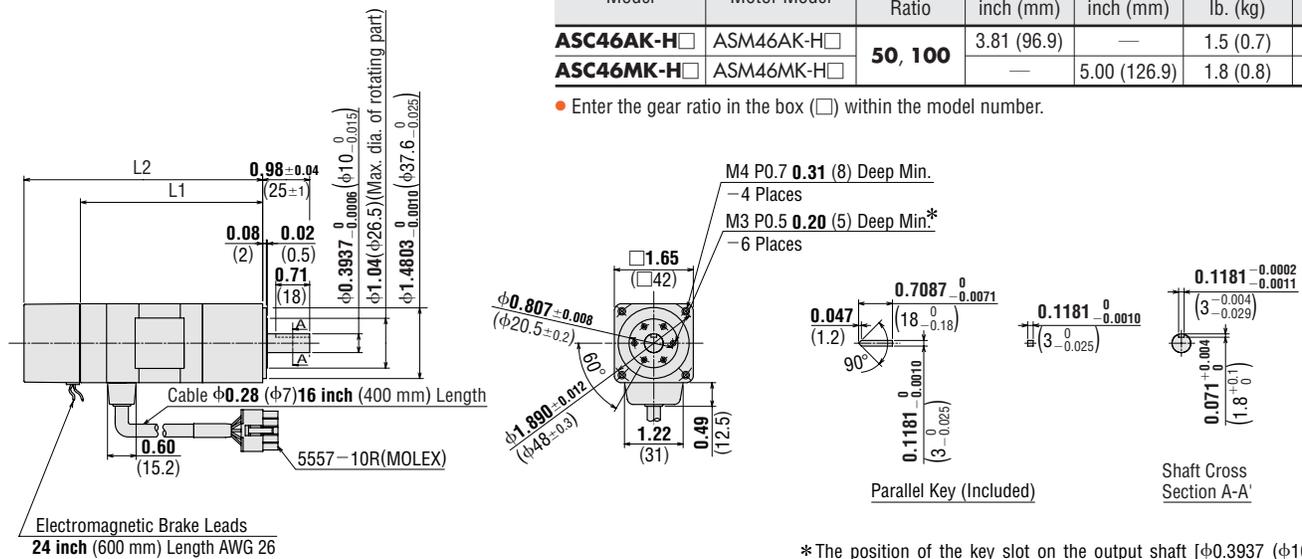
• Enter the gear ratio in the box (□) within the model number.



9 Motor Frame Size □1.65 in. (□42 mm)

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

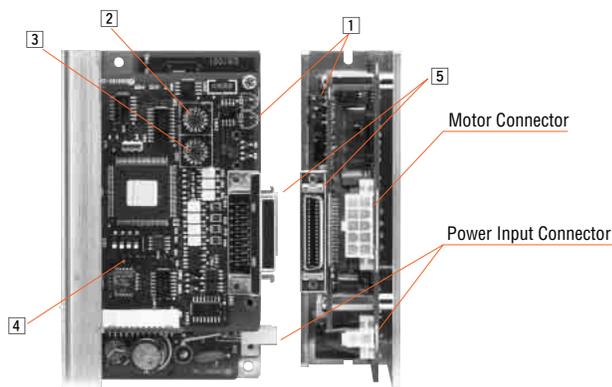
• Enter the gear ratio in the box (□) within the model number.



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



## Connection and Operation



### 1 Signal Monitor Display

#### • LED Indicators

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

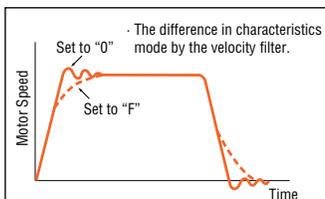
#### • Alarm

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

### 2 Current Adjustment Switch

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

### 3 Velocity Filter Adjustment Switch

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

### 4 Function Switches

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

#### Note:

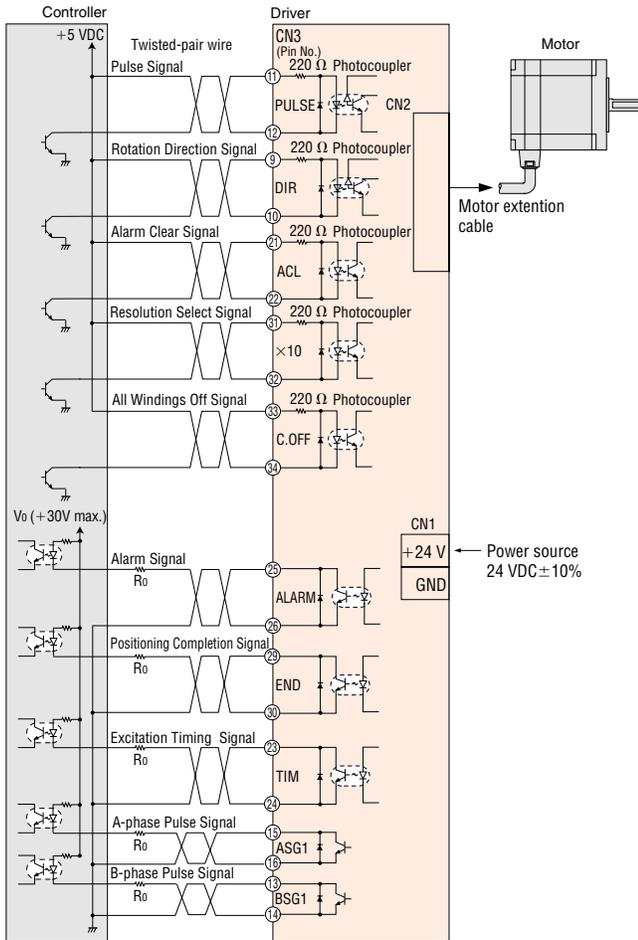
- Always turn the power off before switching resolution or pulse input, and turn it ON again after you have made the change.
- If the "Resolution Select" switch is set to "×10", it cannot control the resolution selected by the input terminals. It will always be "×10".

### 5 Input/Output Signals

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

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

## Connection Diagrams



### Notes:

- $V_o$  and the current must be 30 VDC, 15 mA or less respectively. If the current exceeds 15 mA, connect an external resistance  $R_o$ .
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.
- Use a multi-core, twisted-pair shielded wire AWG 28 for the control input/output signal line (CN3), and keep wiring as short as possible [within 6.6 feet (2 m)].
- When it is necessary to separate the motor and driver by more than 1.31 ft. (0.4 m), an optional extension cable or flexible cable must be used. Electromagnetic brake motor models (except motor frame size 1.65 inch (42 mm)), must use an electromagnetic brake extension cable (sold separately). The frame size 1.65 inch (42 mm) models can use a standard extension cable even for electromagnetic brake motor models.
- The range of wire for the power connector (CN1) is AWG 18~24. Use wire AWG 20 or thicker for the power line.
- Keep the control input/output signal line at least 1 foot (300 mm) away from power lines (e.g. lines carrying large current, such as AC lines and motor lines). Also, do not run these lines through the same ducts or pipes as power lines.
- Cables for power supply lines and control input/output signal lines are not supplied.
- Always use the accessory connector to connect the power connector.
- To install the pins, be sure to use the specified crimping tool made by Molex 57026-5000 (for UL1007) or 57027-5000 (for UL1015).

### ◆ Connecting the Electromagnetic Brake to Power Supply

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

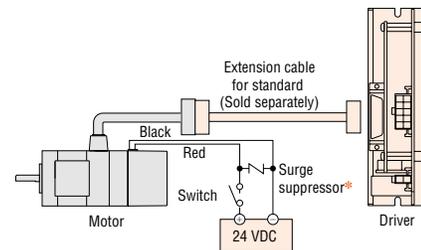
### Notes:

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

## Connection Method

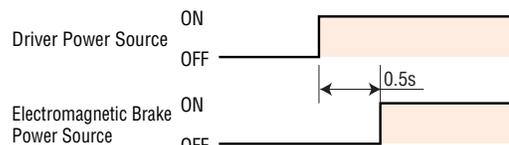
### ASC46

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



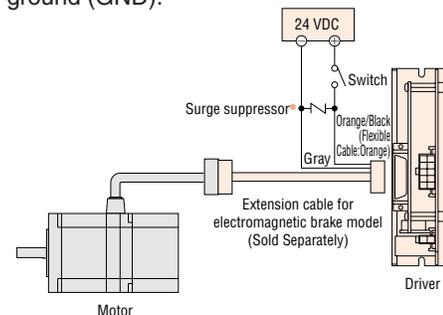
## Timing Chart for Electromagnetic Brake Operation

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



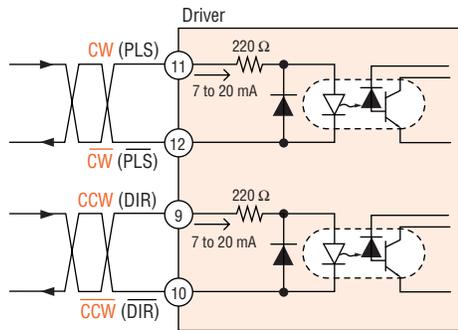
### ASC66

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



## ● Description of Input/Output Signals Pulse Input (CW) and Rotation Direction (CCW) Input Signal

### ◆ Input Circuit and Sample Connection



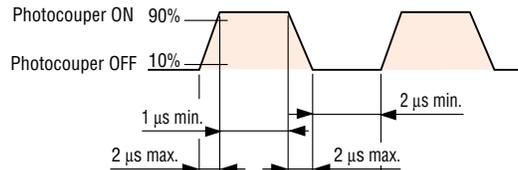
The letters indicate signals under the 2-pulse input mode, while the letters in parentheses indicate signals under the 1-pulse input mode.

#### Note:

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

### ◆ Pulse Waveform Characteristics

(Photocoupler state corresponding to the input pulse)



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

### ◆ Pulse Input Mode

#### 1-Pulse Input Mode

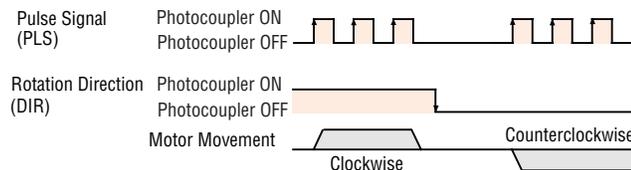
The 1-pulse input mode uses Pulse (PLS) and Rotation Direction (DIR) signals. CW is selected by inputting DIR signal at a low level (with the input photocoupler ON), CCW by inputting at high level (with input photocoupler OFF).

Rotation Direction signals

Photocoupler "ON": Clockwise,

Photocoupler "OFF": Counterclockwise

#### 1 Pulse Input Mode



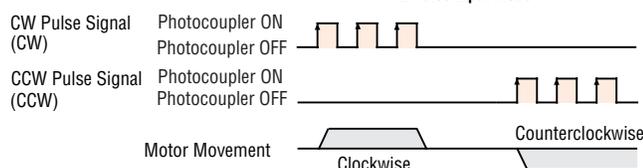
#### 2-pulse input mode

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

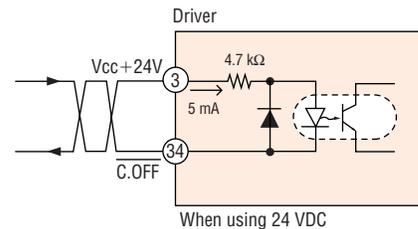
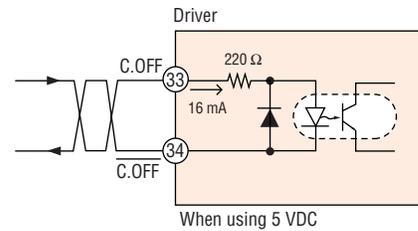
#### Note:

- The factory setting is 2-pulse input.

#### 2 Pulse Input Mode



## All Windings OFF (C.OFF) Input Signal ◆ Input Circuit and Sample Connection



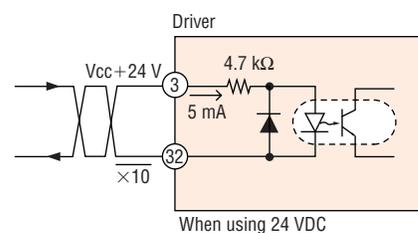
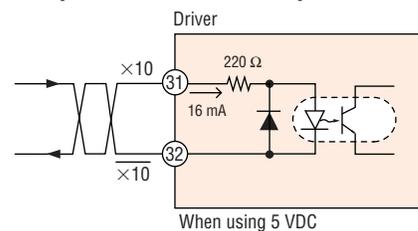
This controller power source offers a choice of either 5 VDC or 24 VDC.

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



## Resolution Select ( $\times 10$ ) Input Signal

### ◆ Input Circuit and Sample Connection



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

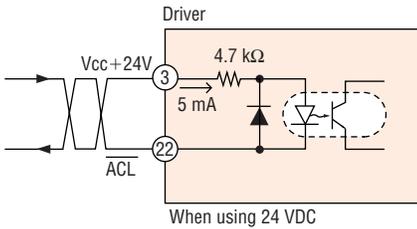
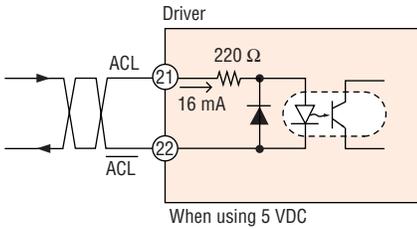
During input of this signal, the magnification of the resolution is  $\times 10$ . It is only valid when the resolution select switch is set to  $\times 1$ .

#### Note:

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

## Alarm Clear (ACL) Input Signal

### ◆ Input Circuit and Sample Connection



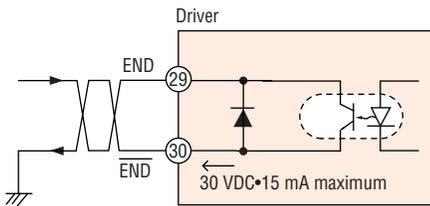
This controller power source offers a choice of either 5 VDC or 24 VDC. This signal is used for canceling the alarm without turning off power to the driver when a protection circuit has been activated.

#### Note:

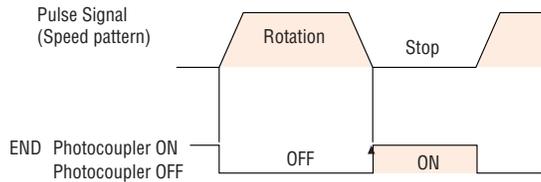
- The following alarm cannot be cleared. To cancel the alarm, first resolve the cause and check for safety, and then turn power on again.
  - Over Current
  - EEPROM Data Error
  - System Error

## Position Completion (END) Output Signal

### ◆ Output Circuit and Sample Connection



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

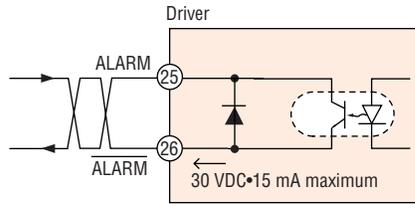


#### Note:

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

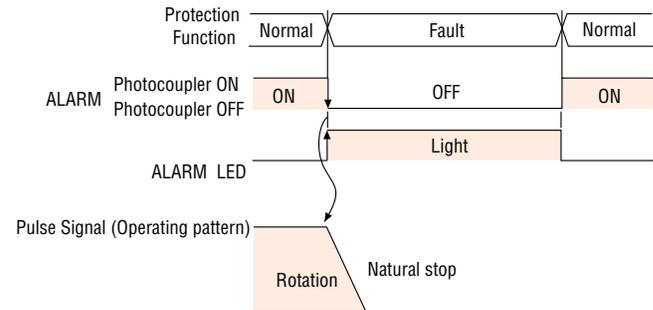
## Alarm (ALARM) Output Signal

### ◆ Output Circuit and Sample Connection



Circuits for use with 30 VDC, 15 mA maximum.

This signal indicates that one of the driver's protection circuits has been activated. When an abnormality such as an overload or over current is detected, the alarm signal is output, the ALARM indicator lights, and the motor stops (non-excitation state). To cancel the alarm, first resolve the cause and check for safety, and then input an Alarm Clear (ACL) signal or cycle power on. Once power has been turned off, wait at least 5 seconds before turning it on again.

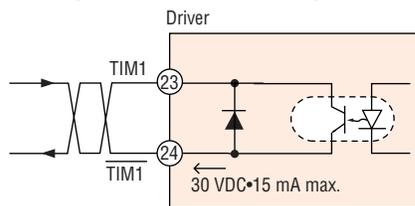


#### Note:

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

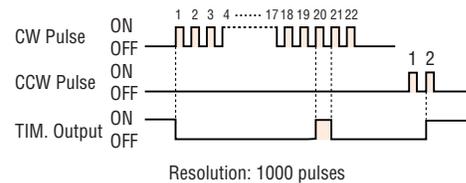
## Excitation Timing Signal (TIM.) Output Signal

### ◆ Output Circuit and Sample Connection



Circuits for use with 30 VDC, 15 mA maximum.

When the Excitation Timing signal is output, the photocopier turns ON. This signal can be used to detect the home position with greater precision. This signal is output 50 times per motor shaft revolution.

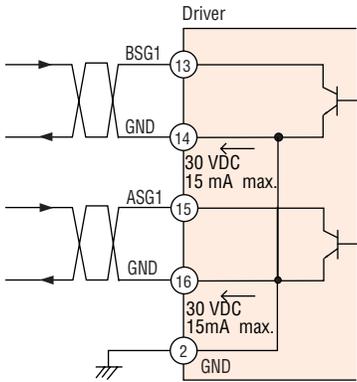


#### Note:

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

## Quadrature (ASG1/BSG1) Output Signal

### ◆ Output Circuit and Sample Connection

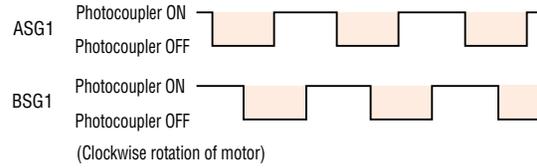


Circuits for use with 30 VDC, 15 mA maximum.  
 These signals are used when monitoring the motor position.  
 The pulse resolution is the same as the motor resolution at the time of power-on.  
 [Example: Resolution select switch (1000 P/R)→Output pulse number for each motor revolution (1000).] The phase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

### Notes:

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

### ◆ Pulse Waveform Characteristics



## ■ List of Motor and Driver Combinations

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

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