



# Controllers for Stepping Motors

Introduction	Motor & Driver Packages															2-Phase Stepping Motors			Driver with Indexer		Controllers			Low-Speed Synchronous Motors		Before Using a Stepping Motor
	Closed Loop		5-Phase Microstep		5-Phase Full/Half		2-Phase Full/Half		without Encoder		with Encoder															
	AC Input		DC Input		DC Input		AC Input		DC Input		Encoder		Encoder													
	AS	AS PLUS	ASC	RK	CFK II	CSK	PMC	UMK	CSK	PK/PV	PK	U12120G	EMP401	5C8800	5C8800E	5G8030J	SMK	Accessories								

## Additional Information

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

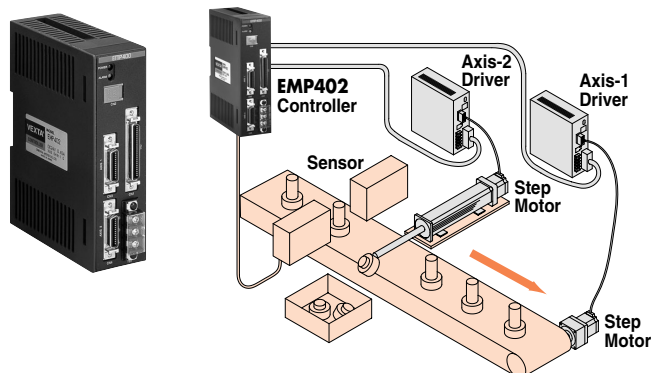
<b>EMP400 Series</b> .....	C-254
<b>SC8800/SC8800E</b> .....	C-266
<b>SG8030J</b> .....	C-270

# Controllers for Stepping Motors

## EMP400 Series

### Page C-254

- Coordinated 2-axis moves via linear interpolation operation
- Step pulse rate up to 200 kHz
- General I/O: 8 inputs and 6 outputs
- Optional **OP300** operator interface unit available
- Ability to change velocity "on the fly"
- Also available as a single axis controller

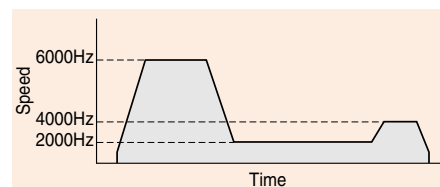


## SC8800

### SC8800E

### Page C-266

- Encoder feedback
- Stand-alone single axis operation
- Select programs using a programmable controller
- Step pulse rate up to 800 kHz
- General I/O: 4 inputs and 2 outputs
- Daisy chain up to 35 axes



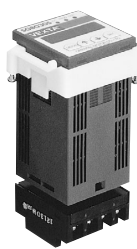
## SG8030J

### Page C-270

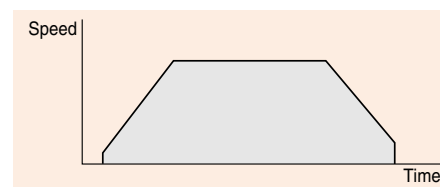
- Compact and simple controller
- Sequence control of four positioning operations
- Selective control of four positions
- Select operating modes using a programmable controller
- Step pulse rate up to 200 kHz



DIN Rail-Mount Model  
**SG8030J-D**

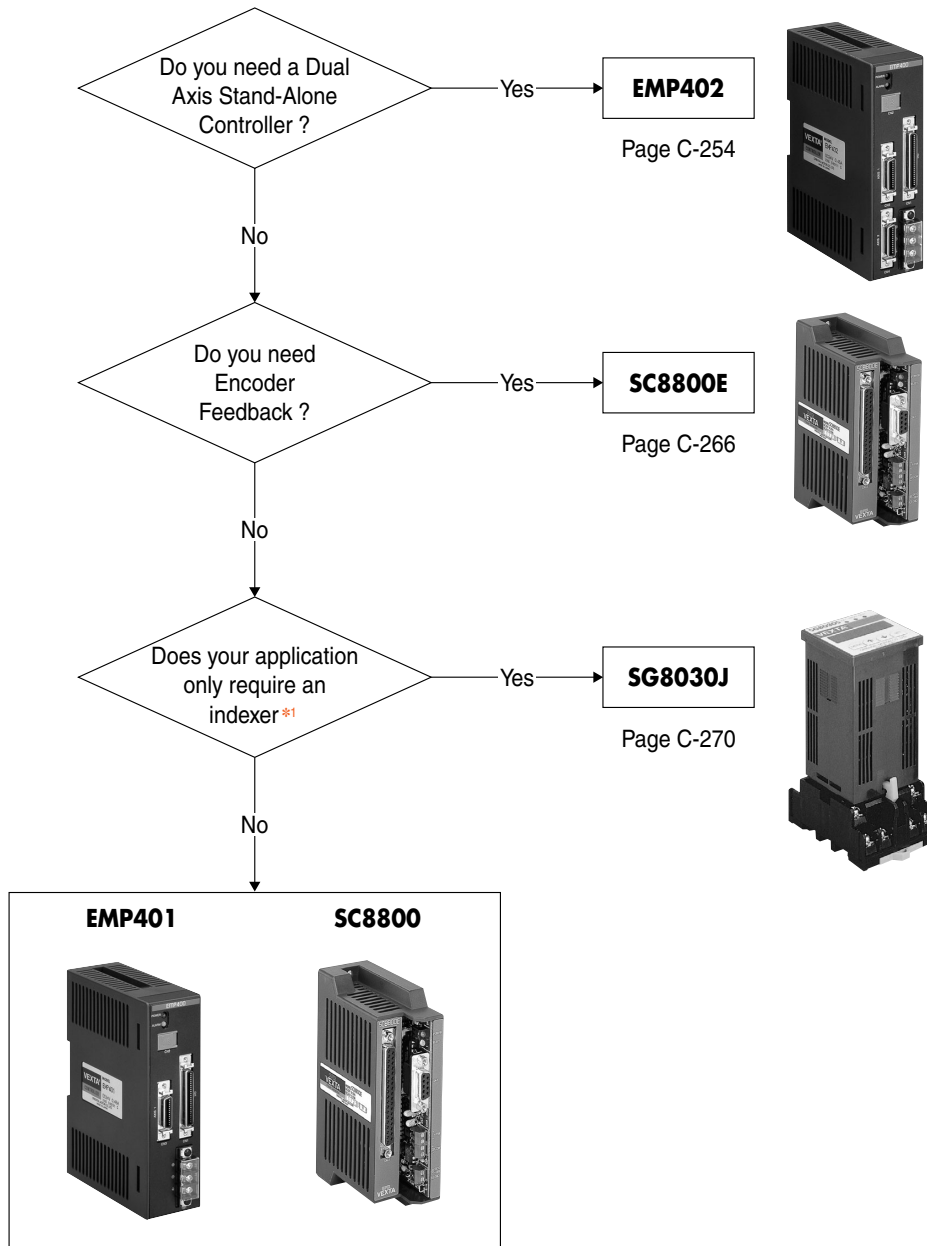


Panel-Mount Model  
**SG8030J-U**



## Controller Selection Guide

Based on the needs of your application, determine the controller which best fits your needs.



\*1 An Indexer is a device that provides step and direction output pulses, but does not have general (programmable) inputs or outputs.

## Controller Comparison

	Dual Axis Motion Control	Serial Communication Port (RS232C)	Daisy Chain *2	Math Function	Encoder Feedback Connection	Sequences	Startup Program *3	Homing Function	Maximum Pulse Frequency	Inputs	Outputs
<b>EMP402</b>	YES	YES	NO	NO	NO	33 (1000 commands max.)	YES	YES	200 kHz	8 General + 22 Dedicated	6 General + 10 Dedicated
<b>EMP401</b>	NO	YES	NO	NO	NO	33 (1000 commands max.)	YES	YES	200 kHz	8 General + 15 Dedicated	6 General + 7 Dedicated
<b>SC8800E</b>	NO	YES	35 Devices	YES	YES	50 or 8 Kb of memory	YES	YES	800 kHz	4 General + 9 Dedicated	2 General + 4 Dedicated
<b>SC8800</b>	NO	YES	35 Devices	YES	NO	50 or 8 Kb of memory	YES	YES	800 kHz	4 General + 6 Dedicated	2 General + 4 Dedicated
<b>SG8030J</b>	NO	NO	NO	NO	NO	1 Sequence or 4 Data Positions	NO	YES	200 kHz	6 Dedicated	3 Dedicated

\*2 Multiple controllers connected to one host communication port.

\*3 A startup program executes when the controller is powered on. The **SG8030J** uses a START input to execute a sequence.

## Programmable Motion Controller EMP400 Series

The **EMP400** Series controllers allow easy programming using simple commands. The dual axis model provides coordinated moves via linear interpolation.

Various motion profiles can be achieved by using up to 32 sequence programs. 1 program can be dedicated as a STARTUP program.

### Features

#### Pulse Oscillation

Various operation commands are provided for positioning operation, return-to-home operation and dual axis linear interpolation functions. The operator only needs to set the parameters.

#### Sequence Function

A series of operation patterns can be programmed using dedicated commands. This is an ideal function for distributed system control.

#### I/O Control

General-purpose I/O signals are provided in addition to dedicated I/Os such as pulse output and limit-sensor input. Synchronization with peripherals is also possible.

### Function

#### Pulse Oscillation

##### ● Fast Response Time

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

##### ● High-Speed Positioning & Low Vibration

The jerk-limit control function allows you to set a shorter acceleration/deceleration time compared with the use of linear acceleration/deceleration patterns. This reduces the overall positioning time.

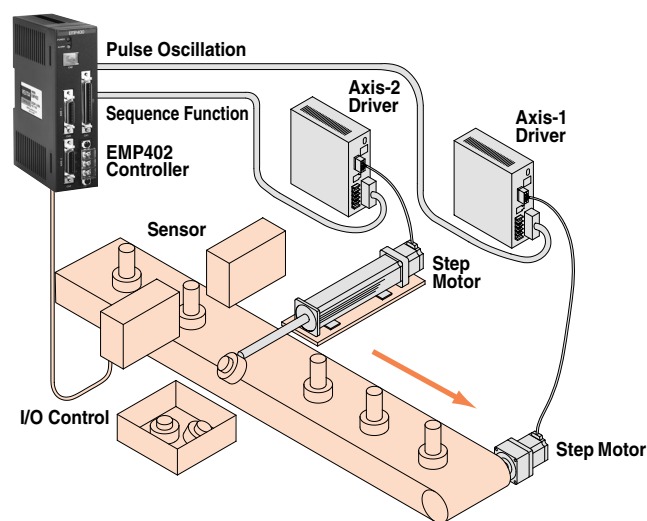
#### What is jerk-limit control?

This term refers to the acceleration/deceleration patterns used to ensure the smoothness of speed change at the start of operation or when the machine enters a constant-speed mode from an acceleration mode. Since speed change becomes more smooth, vibration is reduced.

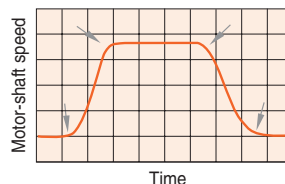


Single axis model: **EMP401**

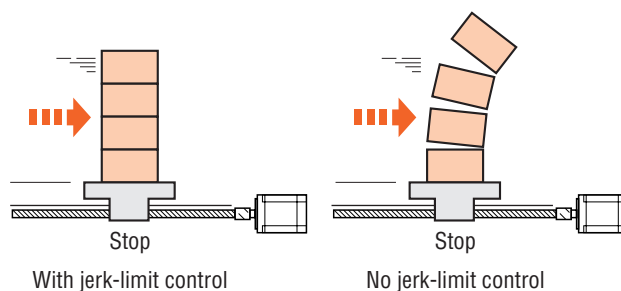
Dual axis model: **EMP402**



Motor Velocity Profile



Effect of Type on Positioning Time

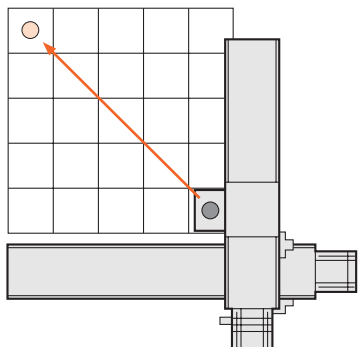


## ● Positioning Operation

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

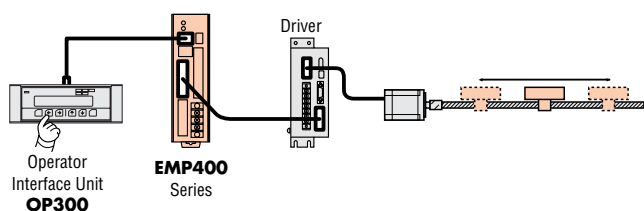
## ● Linear Interpolation Operation

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



## ● Teaching Function

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

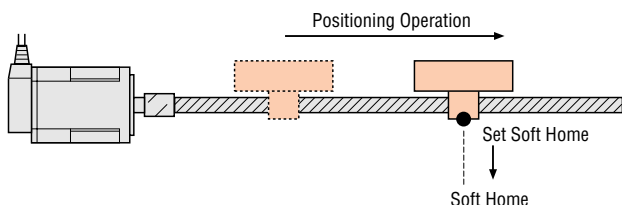


## ● Continuous Operation

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

## ● Set Soft Home (Clears the current position)

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



## ● Homing

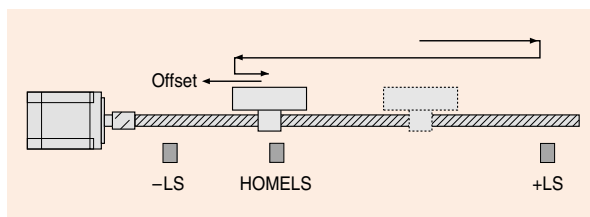
Ability to seek for a sensor representing a positioning reference point (home) is available.

Also available is the ability to set an offset from the home position.

### High-speed return (three-sensor mode)

Using a predetermined sequence, the mechanical unit returns home at high speed from any position with three sensors monitoring the current position.

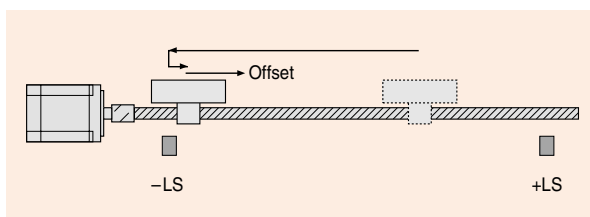
Since it's possible to specify the direction in which the home sensor is entered, backlash error doesn't occur in applications where positioning accuracy is critical.



### Constant-speed return (two-sensor mode)

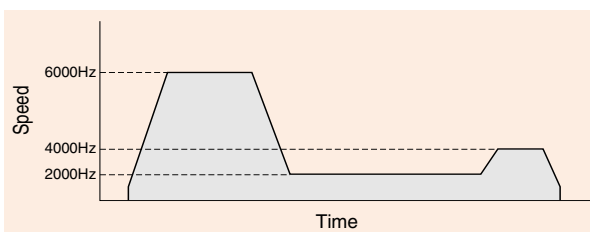
The mechanical unit returns home at a constant speed.

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



## ● Speed Change on the Fly

Speed can be changed on the fly during continuous operation.

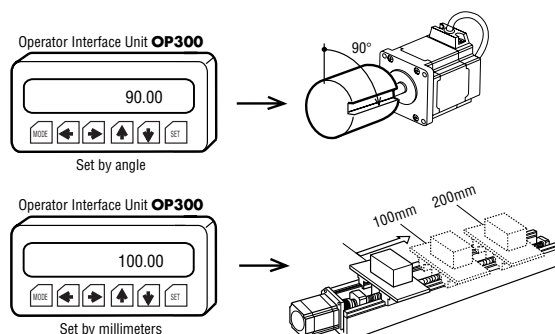


## ● A Choice of Acceleration/Deceleration Patterns

Each operation can be programmed using linear patterns or jerk-limit control.

## ● Distance Options

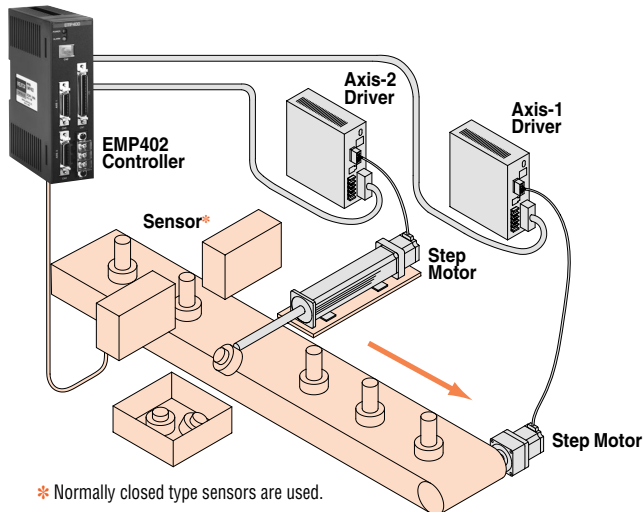
Set travel amount using various scaling units such as pulses, millimeters, or degrees.



Introduction	AS	AS PLUS	ASC	RK	CFK II	CSK	PMC	UMK	CSK	PK/PV	PK	UI2120G	EMP401	EMP402	SC8800	SC8800E	SG8030J	SMK	Accessories	Before Using a Stepping Motor
	Closed Loop Qstep	5-Phase Microstep	5-Phase Full/Half	2-Phase Full/Half	2-Phase Full/Half	without Encoder	with Encoder	Driver	Controller	Low-Speed Synchronous Motors										

## Sequence Function

Connect a motor for transferring products to axis 1, another motor for ejecting nonconforming products to axis 2, and a sensor for detecting the height of transferred products to one of the general-purpose inputs.



## Application Description

- ① Transfer products via an index move of 30,000 pulses (axis 1).
- ② Detect the height of the product using the sensor (general-purpose input 1).
- ③ Return to ① if the detection result is acceptable.
- ④ If the detection result is not acceptable, perform an index move of 30,000 pulses and eject the nonconforming product (axis 2). Return to ② and perform acceptability judgment for the next product.

## Sample Code for Application Example

```

[ 1] V1 10000 ; Axis 1 (transfer)      Operating speed 10 kHz
[ 2] D1 +30000 ; Axis 1 (transfer)     Travel amount 30,000 pulses
①→[ 3] INC1   ; Axis 1 (transfer)     Incremental positioning operation
[ 4] DELAY 0.5 ; Wait for 0.5 sec.
②③→[ 5] CJMP 1,0,3 ; Acceptability judgment (general-purpose input 1 = sensor)
                                ; OFF = Go to step [3] if OK
                                ; ON = Go to next step if NG
④→[ 6] INC1   ; Axis 1 (transfer)     Incremental positioning operation
[ 7] DELAY 0.5 ; Wait for 0.5 sec.
[ 8] V2 5000   ; Axis 2 (ejection)     Operating speed 5,000 Hz
[ 9] D2 +1000  ; Axis 2 (ejection)     Travel amount 1,000 pulses
[10] ABS2     ; Axis 2 (ejection)     Absolute positioning operation
[11] D2 0     ; Axis 2 (ejection)     Travel amount 0 pulse
[12] ABS2     ; Axis 2 (ejection)     Absolute positioning operation
[13] JMP 5    ; Jump to step [5]

```

## I/O Control

In addition to the signals for controlling the **EMP400** series (e.g., start, emergency stop, ready), a full range of other signals are available, including those necessary for motor control (e.g., pulse, alarm, limit sensor, home sensor) and general-purpose I/Os.

### Control I/O (Dedicated)

START Input  
E-STOP Input  
READY Output  
MOVE Output  
END Output  
etc.

### Motor Control I/O (Dedicated)

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

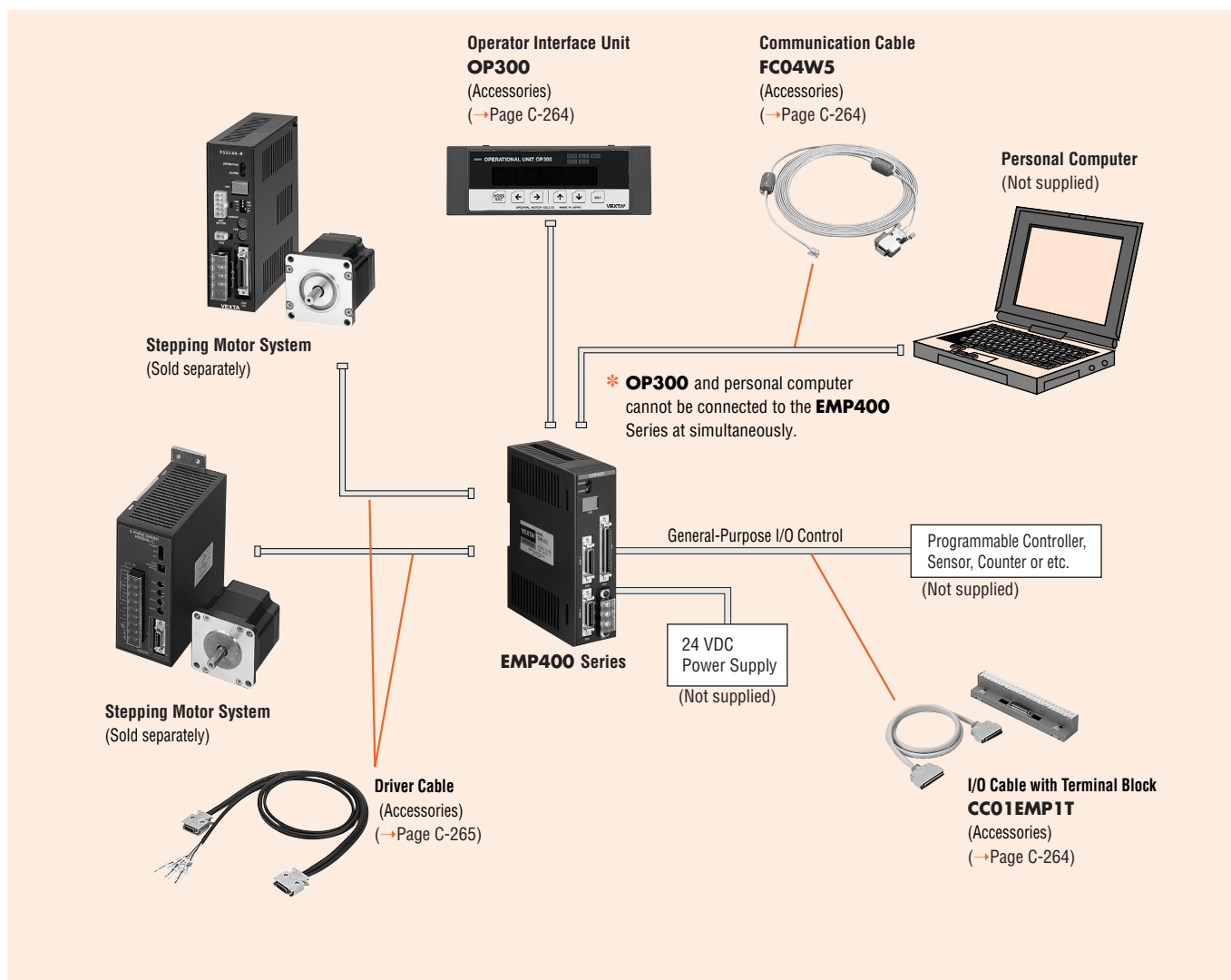
### General Purpose I/O

8 inputs  
6 outputs

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



## System Configuration



## Product Number Code

**EMP40 1 - 1**

EMP400 Series

Number of axes  
1: Single axis  
2: Dual axis

Connector  
1: Without connectors  
2: With connectors

## Product Line

Type	Number of Axes	Connector
EMP401-1	Single axis	Without connectors
EMP401-2		With connectors
EMP402-1	Dual axis	Without connectors
EMP402-2		With connectors

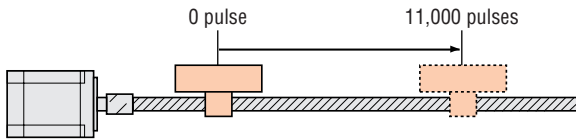
## Command List

Command		Description
Motor control	ABS	Perform the positioning operation with the absolute position specified.
	INC	Perform the positioning operation with the relative position specified.
	MHOME	Perform the return to mechanical home operation.
	SCAN	Perform continuous operation.
	RESET	Reset the software.
	RTNCR	Set the current position to 0 (clear).
	RUN	Execute the sequence program.
	S	Decelerate the motor to a stop.
Data setting	D	Set the travel amount and positioning data.
	DOWEL	Set the operating intervals (dwell time).
	H	Set the direction of rotation.
	OFS	Set the offset travel amount.
	RAMP	Set the acceleration/deceleration pattern and jerk limit time.
	T	Set the acceleration/deceleration rate.
	V	Set the operating speed.
Program control	VS	Set the starting speed.
	CJMP	Jump to a specified step when a given condition is satisfied.
	JMP	Jump to a specified step.
	DELAY	Set the delay time.
	MU	Set parallel processing.
	LOOP	Set the loop.
	ENDL	End the loop section.
	END	End the sequence program.
	IN	Wait for input.
Hardware setting	OUT	Control the general-purpose output.
	ACTL	Switch the logic setting for the sensor and alarm.
	EEN	Set the use of END input.
	ETIME	Set the END output time.
	ID	Perform the initial setting for a linear motion product.
	PULSE	Set the pulse-output mode.
	SEN	Set the home-detection mode.
	TIM	Set the use of TIM input and SLIT input.
Others	UNIT	Set the unit for travel amount.
	EDIT	Edit the sequence program.
	DEL	Delete the sequence program.
	DWNLD	Download the sequence program.
	UPLD	Upload the sequence program.
	R	Check the system conditions.



## Sample Programs

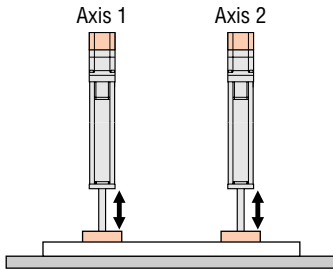
### Sample. 1 Positioning operation



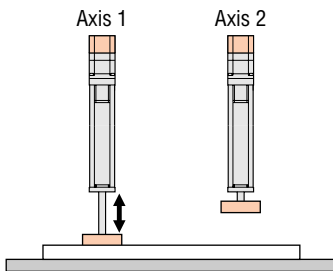
[1] VS1 500 ; Starting speed 500 Hz  
 [2] V1 1000 ; Operating speed 1,000 Hz  
 [3] T1 30.0 ; Acceleration/deceleration rate 30.0 ms/kHz  
 [4] D1 +11000 ; Travel amount 11,000 pulses  
 [5] INC1 ; Execute relative positioning operation

### Sample. 2 Inputting multiple operation patterns

Simultaneous positioning of two axes



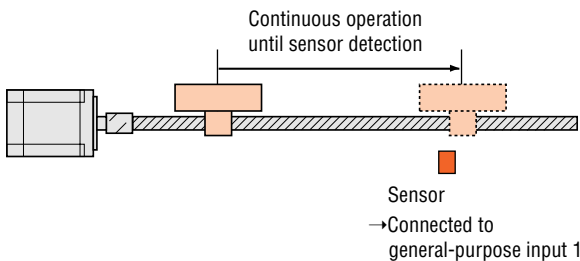
Axis 2 moves after axis 1 moves.



Seq 99 ; Hardware Setting  
 [1] UNIT1 0.02,1 ; Axis 1 Change to travel amount mm  
 [2] UNIT2 0.02,1 ; Axis 2 Change to travel amount mm  
 Seq 1 ; 2 axis execute at same time  
 [1] V1 1000 ; Axis 1 Operating speed 1,000 Hz  
 [2] D1 +50 ; Axis 1 Travel amount 50 mm  
 [3] D2 +50 ; Axis 2 Travel amount 50 mm  
 [4] ABSC ; Axes 1, 2 Execute absolute positioning operation  
 [5] DELAY 1.0 ; Pause at 1-second internal timer  
 [6] D1 0 ; Axis 1 Travel amount 0 mm  
 [7] D2 0 ; Axis 2 Travel amount 0 mm  
 [8] ABSC ; Axes 1, 2 Execute absolute positioning operation

Seq 2 ; After axis 1 executes, axis 2 executes  
 [1] V1 1000 ; Axis 1 Operating speed 1,000 Hz  
 [2] D1 +50 ; Axis 1 Travel amount 50 mm  
 [3] ABS1 ; Axis 1 Execute absolute positioning operation  
 [4] D1 0 ; Axis 1 Travel amount 0 mm  
 [5] ABS1 ; Axis 1 Execute absolute positioning operation  
 [6] V2 2000 ; Axis 2 Operating speed 2,000 Hz  
 [7] D2 +50 ; Axis 2 Travel amount 50 mm  
 [8] ABS2 ; Axis 2 Execute absolute positioning operation  
 [9] D2 0 ; Axis 2 Travel amount 0 mm  
 [10] ABS2 ; Axis 2 Execute absolute positioning operation

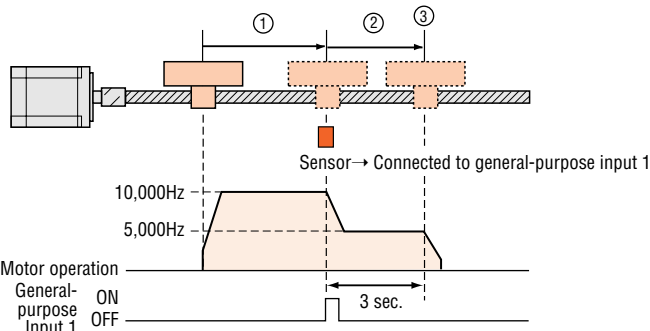
### Sample. 3 Positioning using a sensor



[1] VS1 500 ; Starting speed 500 Hz  
 [2] V1 20000 ; Operating speed 20,000 Hz  
 [3] T1 30.0 ; Acceleration/deceleration rate 30.0 ms/kHz  
 [4] H1 + ; Direction of rotation + (CW direction)  
 [5] SCAN1 ; Start continuous operation  
 [6] IN 1,1 ; General-purpose input 1 Waiting for ON  
 [7] S1 ; Decelerate to a stop

### Sample. 4 Multistep speed-change operation

- ① Continuous operation at 10,000 Hz
- ② Decelerate to 5,000 Hz upon sensor detection
- ③ Decelerate to a stop after three seconds



[1] VS1 500 ; Starting speed 500 Hz  
 [2] V1 10000 ; Operating speed 10,000 Hz  
 [3] T1 30.0 ; Acceleration/deceleration rate 30.0 ms/kHz  
 [4] H1 + ; Direction of rotation + (CW direction)  
 [5] SCAN1 ; Start continuous operation  
 [6] IN 1,1 ; General-purpose input 1 Waiting for ON  
 [7] V1 5000 ; Decelerate to 5,000 Hz  
 [8] DELAY 3.0 ; Wait time 3 seconds  
 [9] S1 ; Decelerate to a stop

## ■ Specifications

Program	Number of programs	32			
	Capacity	1,000 commands			
	Input method	Command input via terminal program			
Oscillator Specifications	Number of control axes	<b>EMP401</b> : Single axis · <b>EMP402</b> : Dual axis			
	Pulse output mode	1- or 2-pulse output mode			
	Frequency	10 to 200 kHz (1-Hz increment) Pulse duty 50% (Fixed)			
	Acceleration/deceleration rate	0.5 to 1,000 ms/kHz (0.1 - ms/kHz increments)			
	Acceleration/deceleration pattern	Linear/jerk-limit control			
Operation Pattern	Travel amount	Incremental: -16,777,215~+16,777,215 pulse Absolute: -8,388,608~+8,388,607 pulse			
		Incremental Operation	Absolute Operation	Mechanical Home Seeking	Continuous Operation
	Linear acceleration/deceleration	✓	✓	✓	✓
	Jerk-limit control	✓	✓	✓	✓
	Dual axis linear interpolation operation	✓	✓	×	×
Communication Specifications	Speed change on the fly	×	×	×	✓
	Communication method	RS-232C based (3-wire)			
	Parameters	Baud rate fixed at 9,600, 8 data bits, 1 stop bit, no parity			
Input/Output Signal Specifications	Inputs (START, E-STOP, S-STOP)	3 photocoupler inputs 24 VDC, Input resistance 5.4 kΩ			
	Outputs (MOVE, ALM, READY, END)	4 open-collector outputs 24 VDC, 25 mA Max. each			
	General-purpose inputs	8 photocoupler inputs 24 VDC, Input resistance 5.4 kΩ			
	General-purpose outputs	6 open-collector outputs 24 VDC, 25 mA Max. each			
	Driver and sensor inputs	7 ( <b>EMP401</b> ) / 14 ( <b>EMP402</b> ) photocoupler inputs 12 VDC, input resistance 2.7 kΩ			
	Driver outputs	3 ( <b>EMP401</b> ) / 6 ( <b>EMP402</b> ) open-collector outputs 12 VDC, 20 mA Max. each			
General Specifications	Power requirement	24 VDC ±5%, Current Consumption 0.45 A			
	Dimensions	W 1.57 in. (40 mm) × H 5.31 in. (135 mm) × D 3.94 in. (100 mm)			
	Weight	0.57 lb. (0.26 kg)			
	Ambient temperature	32°F~122°F (0°C~+50°C) (nonfreezing)			
	Ambient humidity	20% ~ 85% (noncondensing)			

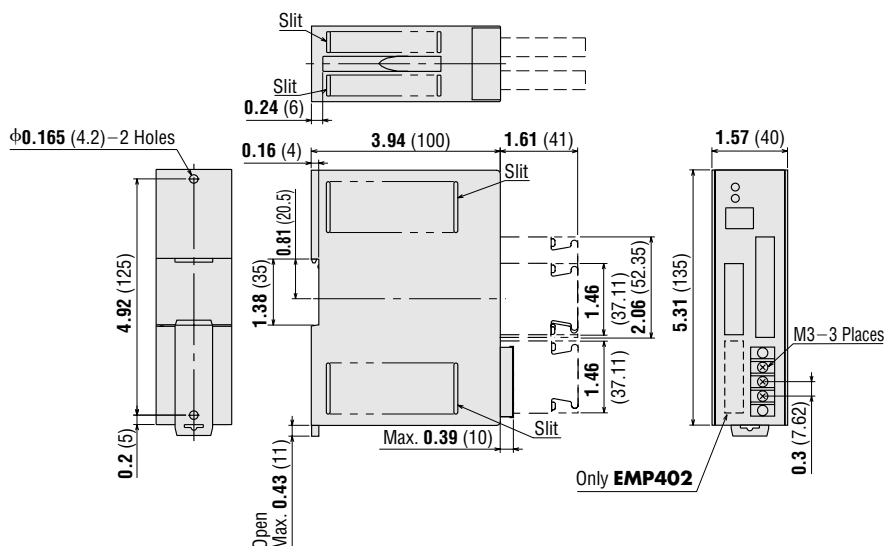
✓ : Available    ✕ : Not Available

## ■ Dimensions

Scale 1/4, Unit = **inch** (mm)

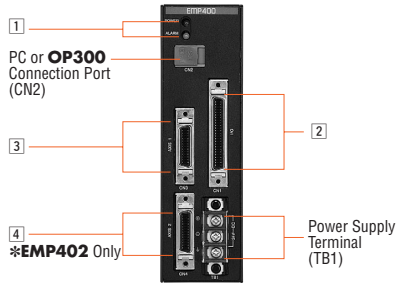
Weight: 0.57 lb. (0.26 kg)

DXF B295



## Connection and Operation

### Connector Layout



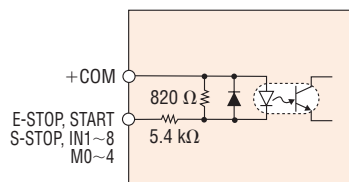
### 1 LED Monitor Display

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

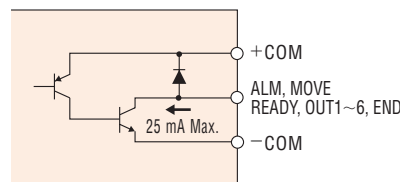
### 2 CN1 I/O Signal Connector

Pin No.	Signal	Description	Pin No.	Signal	Description
1	—	Not used	26	—	Not used
2	E-STOP Input	Emergency Stop	27	ALM Output	Alarm
3	START Input	Execute Sequence Program	28	—	Not used
4	S-STOP Input	Cease Sequence Execution	29	MOVE Output	Outputting Pulses
5	—	Not used	30	—	Not used
6	—	Not used	31	READY Output	Ready to accept START input
7	+COM Input	I/O Power Supply (+24 VDC)	32	+COM Input	I/O Power Supply (+24V)
8	IN1 Input	General Inputs	33	M0 Input	Sequence Number Selection
9	IN2 Input		34	M1 Input	
10	IN3 Input		35	M2 Input	
11	IN4 Input		36	M3 Input	
12	IN5 Input		37	M4 Input	
13	IN6 Input		38	—	Not used
14	IN7 Input		39	—	Not used
15	IN8 Input		40	—	Not used
16	+COM Input	I/O Power Supply (+24 VDC)	41	—	Not used
17	OUT1 Output	General Outputs	42	—	Not used
18	OUT2 Output		43	—	Not used
19	OUT3 Output		44	—	Not used
20	OUT4 Output		45	—	Not used
21	OUT5 Output		46	—	Not used
22	OUT6 Output		47	—	Not used
23	—	Not used	48	—	Not used
24	—	Not used	49	END Output	End Signal
25	—COM Input	GND for I/O	50	—COM Input	GND for I/O

Internal Input Circuit



Internal Output Circuit



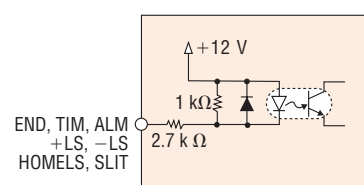
### 3 CN3 Axis-1 Driver Connector

### 4 CN4 Axis-2 Driver Connector

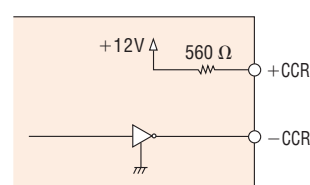
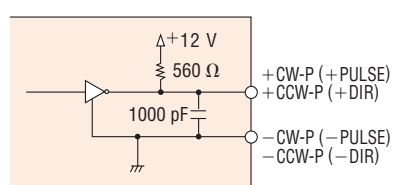
Pin No.	Signal	Description	Pin No.	Signal	Description
1	+CW-P output (+PULSE output) *	CW pulse (pulse) *	14	—	Not used
2	−CW-P output (−PULSE output) *		15	—	Not used
3	+CCW-P output (+DIR output) *	CCW pulse (Direction of rotation) *	16	+CCR output	Counter-clear
4	−CCW-P output (−DIR output) *		17	−CCR output	
5	END input	END signal from driver	18	GND	GND signal from driver
6	TIM input	Timing signal from driver	19	—	Not used
7	ALM input	Alarm signal from driver	20	—	Not used
8	+LS input	CW limit sensor	21	—	Not used
9	−LS input	CCW limit sensor	22	—	Not used
10	HOMELS input	Home limit sensor	23	—	Not used
11	SLIT input	Slit sensor	24	—	Not used
12	+12 V output	Power source for sensor (140 mA max.)	25	+5 V output	Power source for timing signal (20 mA max.)
13	GND	GND for sensor	26	GND	GND for timing signal

\* The values in parentheses are for 1-pulse output mode. The other values are for 2-pulse output mode.

#### Internal Input Circuit



#### Internal Output Circuit

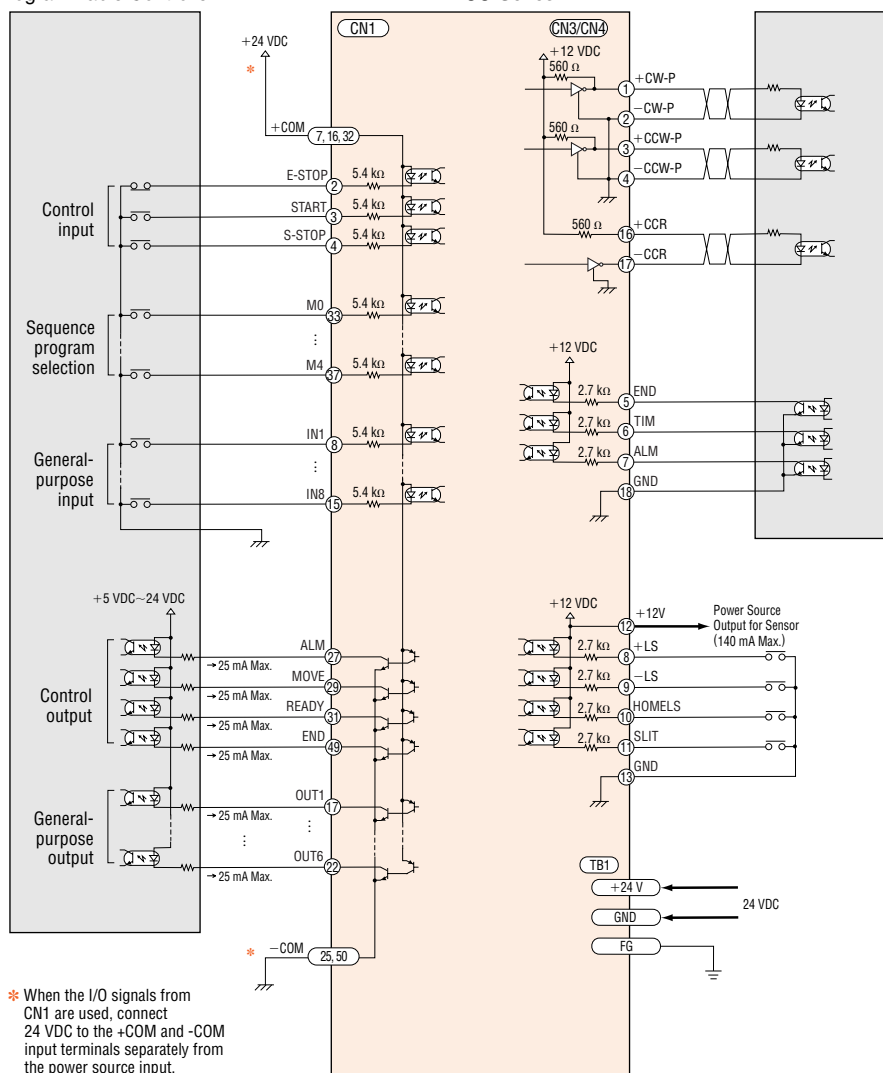


## Connection Diagrams

### Programmable Controller

### EMP400 Series

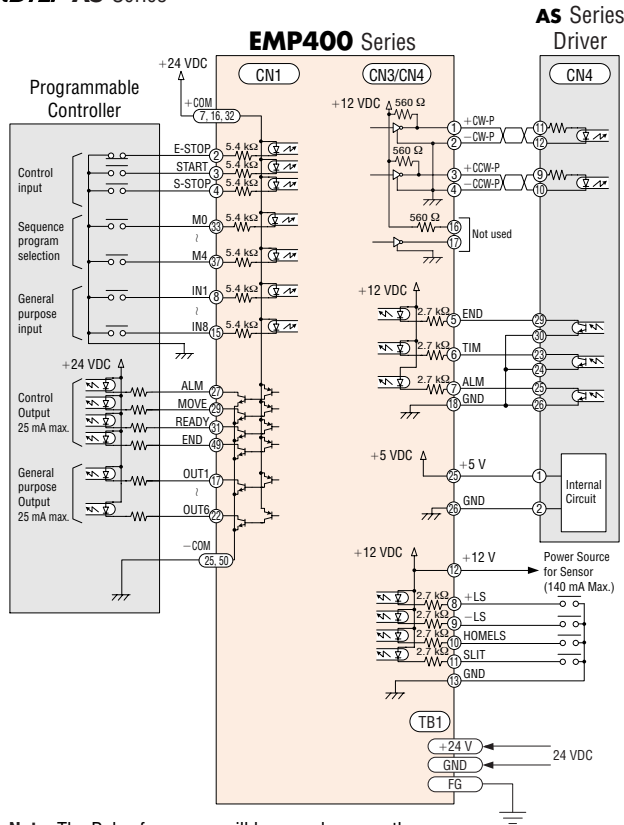
### Driver



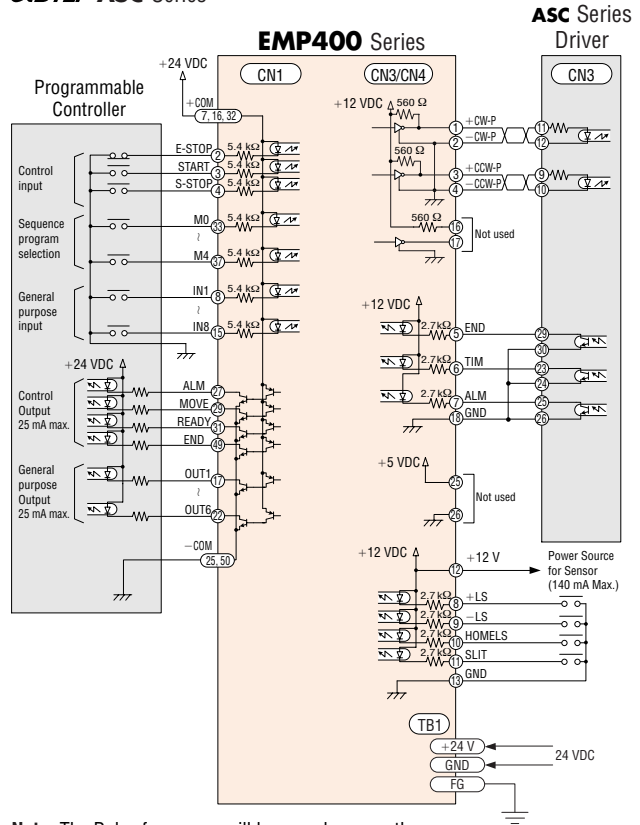
\* When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power source input.

## Connection Diagrams

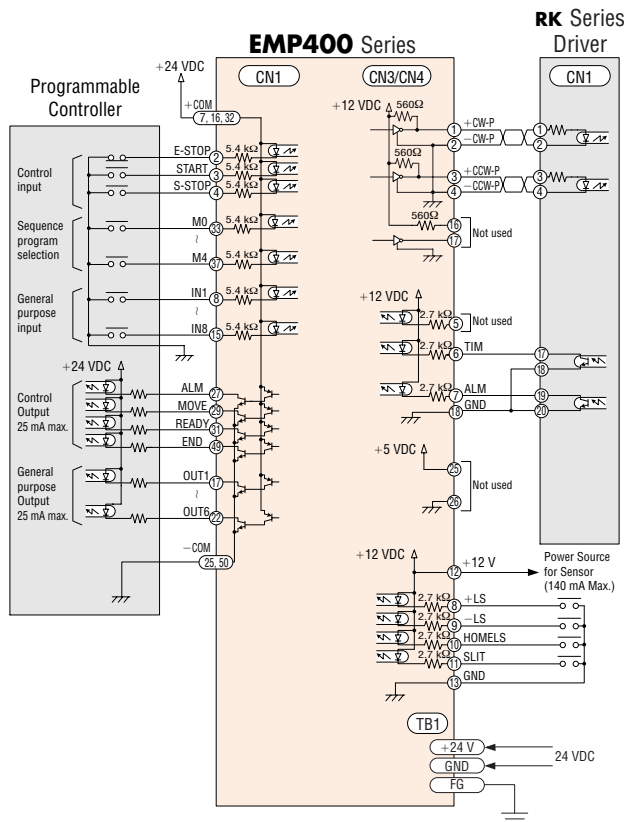
### αSTEP AS Series



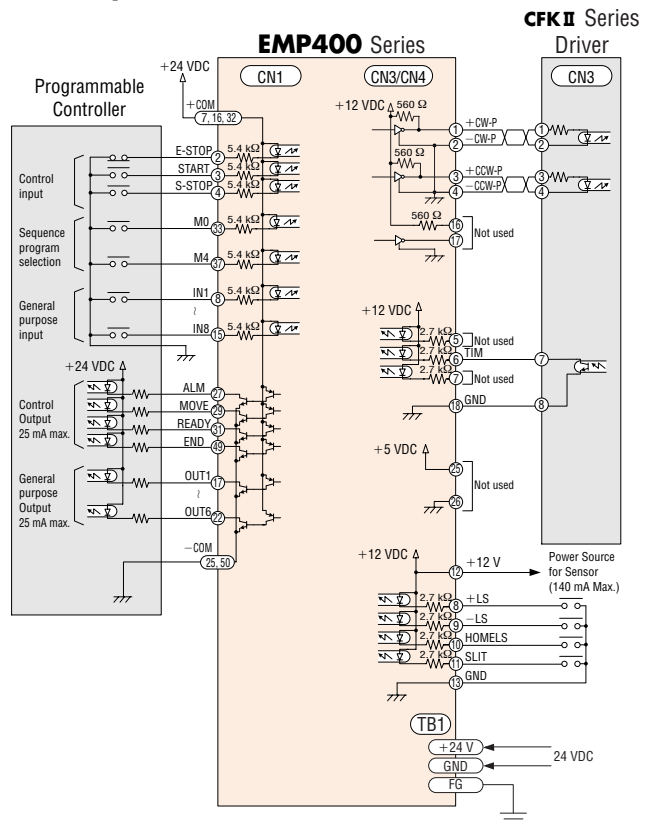
### αSTEP ASC Series



### RK Series



### Nano Step CFK II Series



## Accessories (sold separately)

### Operator Interface Unit



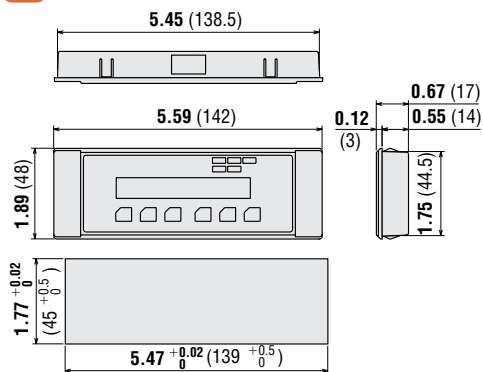
Model: **OP300**

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

\* A personal computer cannot be connected while the **OP300** is connected.

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

DXF B297



Panel Cut-out Dimensions

### I/O Cable with Terminal Block



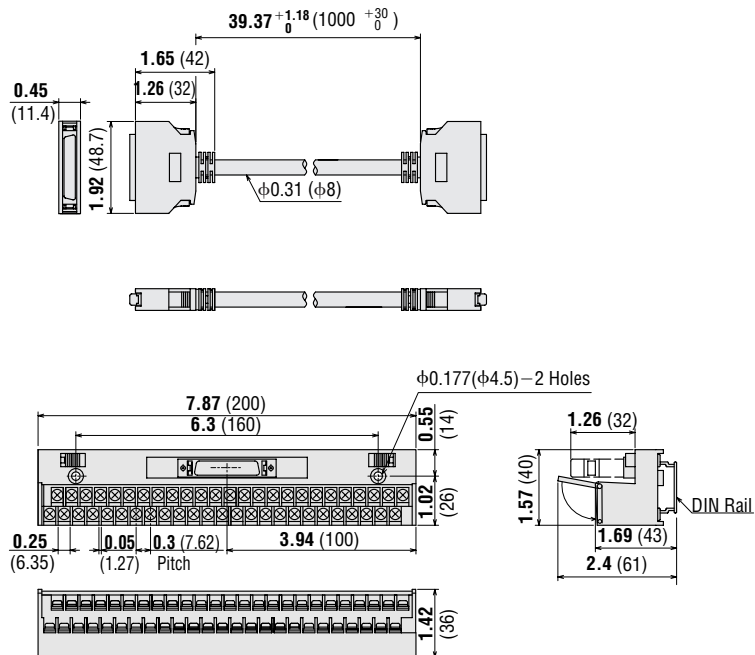
Model: **CC01EMP1T**

The **EMP400** Series, programmable controller, and I/O signals can all be connected via a terminal block.

Cable length: 3.3 ft. (1 m)

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

DXF B300



Terminal block pin configuration

26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

### Communication Cable



Model: **FC04W5**

Input programs from a PC

Use this 16.4 ft. (5 m) communication cable to connect the **EMP400** Series to a PC. (DSUB9F to RJ 11 cable)

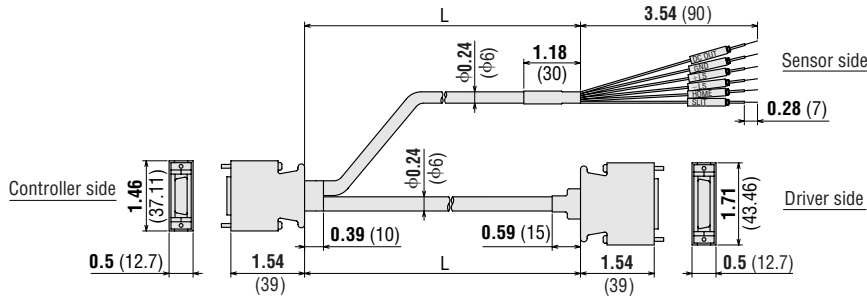
## ● Driver Cables



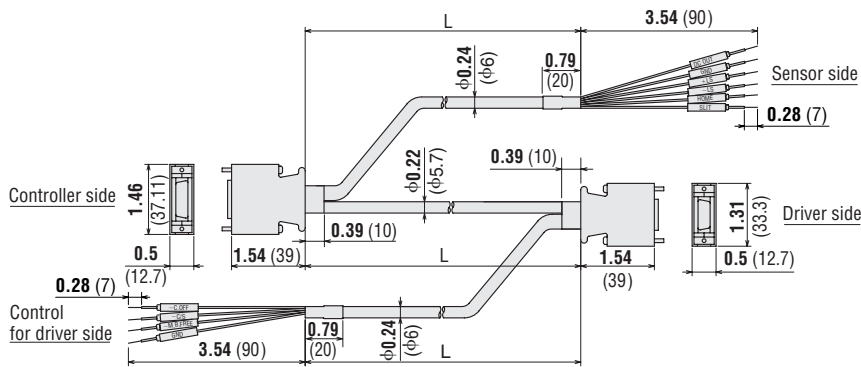
Model	Length (L)	Applicable Product	Connector Number
<b>CC01EMP4</b>	3.3 ft. (1 m)	<b>AS, ASC Series</b>	CN3 & CN4
<b>CC02EMP4</b>	6.6 ft. (2 m)	<b>AS, ASC Series</b>	
<b>CC01EMP5</b>	3.3 ft. (1 m)	<b>RK Series</b>	
<b>CC02EMP5</b>	6.6 ft. (2 m)	<b>RK Series</b>	

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

### ● CC□□EMP4



### ● CC□□EMP5



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AS PLUS

ASC

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CFK II

CSK

PMC

UMK

CSK

PK/PV

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SC8800

SG8030J

SMK

Accessories

Before Using

a Stepping

Motor

Motor &amp; Driver Packages

5-Phase Full/Half

2-Phase Full/Half

without Encoder

with Encoder

with Indexer

Controllers

Low-Speed Synchronous Motors

Accessories

Before Using a Stepping Motor



## RS232C-Compatible Controller SC8800/SC8800E for Stepping Motor Systems

The **SC8800** and **SC8800E** controllers can be programmed from a computer or ASCII terminal via a standard RS-232C port.



### Features

#### Easy-to-Use

- The instruction set software is built into the controller. There is no need for set-up diskettes.
- Can be pre-programmed prior to installation.
- An easy-to-learn instruction set allows for complete system operation.
- End-of-travel and home positions can be easily determined by the three dedicated limit switch inputs.
- Operates on 10 to 28 VDC so the controller can be powered by a standard power supply.

#### Programming Options

- Can be controlled or programmed directly from a computer or ASCII terminal via a standard RS-232C port.
- Can be controlled by industry-standard programmable logic controllers so it can run off any already existing PLC.
- Linear, S-curve and parabolic acceleration/deceleration profiles are available.

#### Flexible I/O

- There are four programmable inputs and two programmable outputs to give the controller the ability to control other functions within the machine. All inputs and outputs are optically isolated.
- Step and direction signal outputs are industry standard TTL level signals in either 1-pulse or 2-pulse modes so the **SC8800** and the **SC8800E** can be used with any industry-standard stepping motor and driver package.
- All I/Os can be driven by an external DC power supply of 5 to 24 VDC.

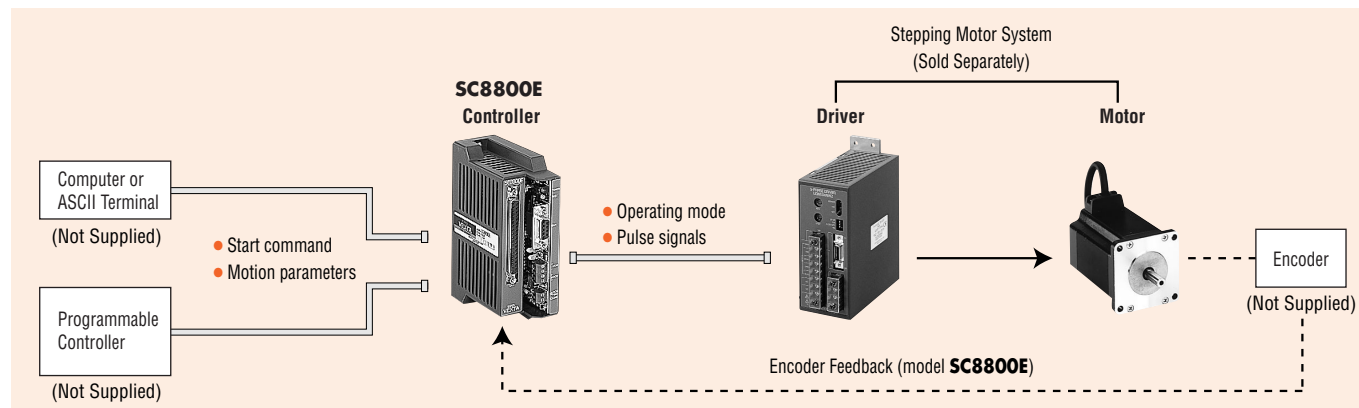
#### Encoder Feedback Capabilities (Model SC8800E)

- Nearly every known feedback device can be recognized since the controller can use two or three channels in either single-ended or differential modes.

#### Daisy-Chain Capabilities

- Up to 35 different axes can be controlled from one computer or ASCII terminal by daisy-chaining up to 35 **SC8800** or **SC8800E** controllers together.
- Available with an optional encoder input for position verification (model **SC8800E**).

### System Configuration



## Specifications

Parameter			Value
Input Power			10~28 VDC, 3.0 watts max.
Performance	Stepping Accuracy		±0 steps from preset total
	Velocity Accuracy		±0.05% of preset rate
	Velocity Repeatability		±0.01% of max. rate
	Position Range		0 to ±999,999,999 steps, when DSCALE is active
	Velocity Range		1 to 800,000 steps/sec
	Acceleration Rate		0.001 to 10 sec
Motion Types	Absolute		Move to specified internal counter position
	Index		Move specified distance
	Continuous		Move at specified speed until commanded to stop
	Go Home		Move to Home limit switch
	Move Time		Move specified distance in specified time
Sequence Execution	Via RS-232C		Sequence may be executed from RS-232C interface with the RUN command
	Via Power-up Auto Run		Execute any sequence, 0~15 upon power-up
	Via Programmable Input		Sequences may be selected using an external device
Programming Language			Simple, high-level programming language
Non-Volatile Memory	Sequence Length		8k or up to available remaining memory
	Number of Programs		50 max. or up to available memory
Inputs	Command Interface	Type	RS-232C serial type, 3-wire implementation (Tx, Rx, Gnd)
		Parameters	Baud rate fixed at 9600, 8 data bits, 1 stop bit, no parity
		Configuration	35 units max. can be controlled via a single port in the daisy-chain configuration
	CW, CCW and Home Limits		+5 to +30 VDC, Optically Isolated
	Programmable Inputs		Four to be used for machine interaction and/or sequence selection, +5 to +30 VDC, Optically Isolated
	TIM		Phase zero indicator, +5 to +30 VDC, Optically Isolated
Outputs	Encoder		Model <b>SC8800E</b> accepts 2 or 3 channel, 2-phase quadrature incremental encoders with differential or single ended outputs, 5 VDC TTL compatible, 400 kHz (quadrature), max.
	Step and Direction		TTL, High: 4~5 VDC, Low: 0~0.5 VDC, Pulse width: 0.5 ms min., Rise/Fall time: 0.2 ms max.
	Programmable		Two, Open collector, 1~24 VDC, 80 mA max.
Mechanical	Status		Fault & Busy, Open collector, 1~24 VDC, 80 mA max.
	Dimensions		L 3.35 in. (85 mm) × W 1.57 in. (40 mm) × H 4.72 in. (120 mm)
	I/O Connectors		Combination of fixed screw terminal and D-type
Environmental	Cooling Method		Natural Ventilation
	Ambient Temperature Range		32°F~122°F (0°C~+50°C)
	Humidity		20~85% (noncondensing)
Weight			0.68 lb. (0.31 kg)

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SC8800E

SG8030J

SMK

Accessories

Before Using a Stepping Motor

Motor &amp; Driver Packages

5-Phase Microstep

5-Phase Full/Half

2-Phase Full/Half

without Encoder

with Encoder

Driver

with Indexer

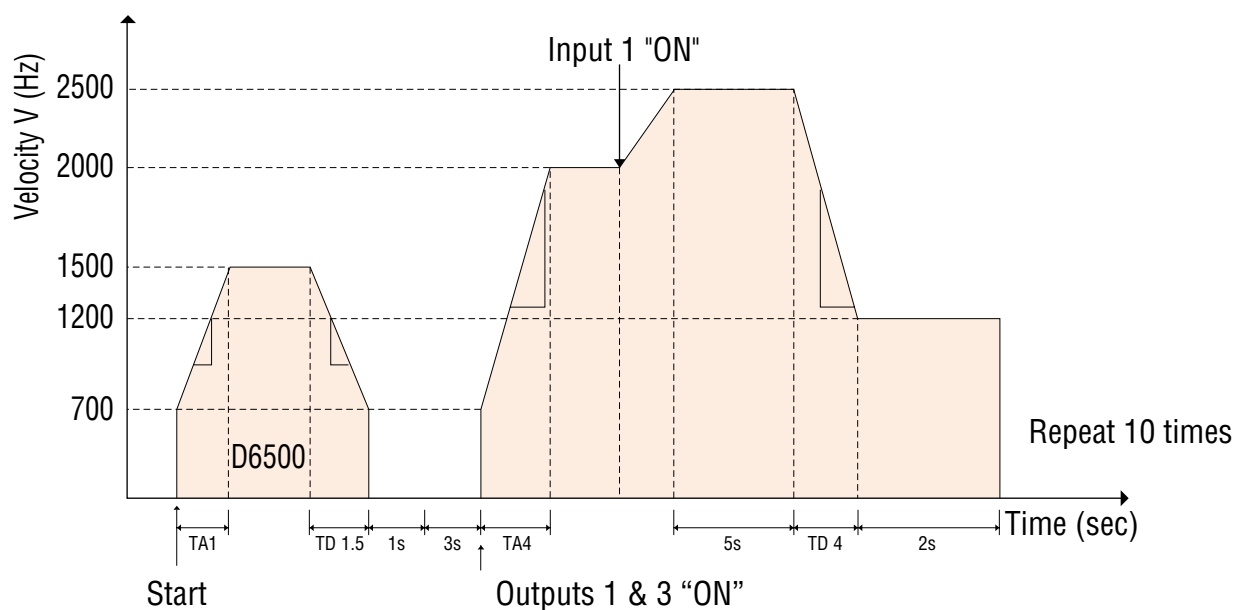
Controllers

Low-Speed Synchronous Motors

Accessories

Before Using a Stepping Motor

## Programming Example



The two moves shown above can be executed with the following program commands :

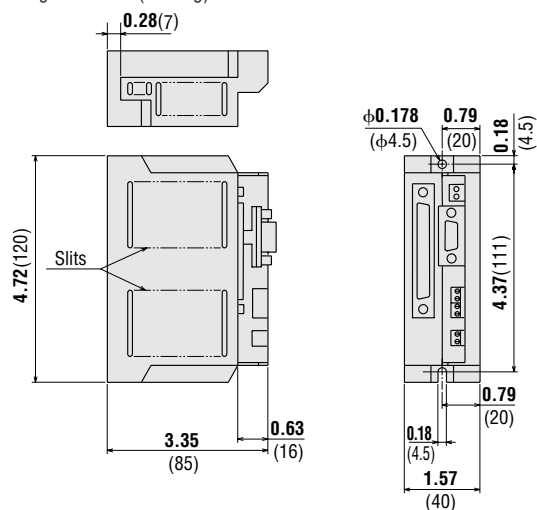
Commands	Description
1 LOOP 10	Loop this program 10 times
2 SAS Push START to begin	Echo message to screen
3 VS700; V1500	Set start and run velocities for the first move
4 TA1; TD1.5	Set Accel time to 1 sec & Decel time to 1.5 sec
<b>When start signal is input, program begins</b>	
5 PC0; EC0	Set position and encoder counters to zero
6 H+	Set direction to CW
7 D6500	Set distance to 6500 steps
8 MI	Execute the Index move
9 DELAY1	Delay 1 second
10 IF (CPI=0)	If encoder position is incorrect,
11 THEN JMP1	Then, restart program
12 ELSE DELAY3	Else Delay 3 seconds.
13 OUT=101	Turn on Outputs 1 and 3
14 V2000	Set velocity to 2000 steps/sec
15 T4	Set Accel & Decel time to 4 sec. for second move
16 WHILE (IN1=0)	While Input #1 is off,
17 MC	Move continuously
18 ENDW	End the while loop
19 V2500; MC	Change speed to 2500 steps/sec
20 DELAY5	Delay 5 seconds
21 V1200	Change speed to 1200 step/sec
22 DELAY2	Delay 2 seconds
23 STOP	Stop moving
24 ENDL	Return to beginning of loop

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

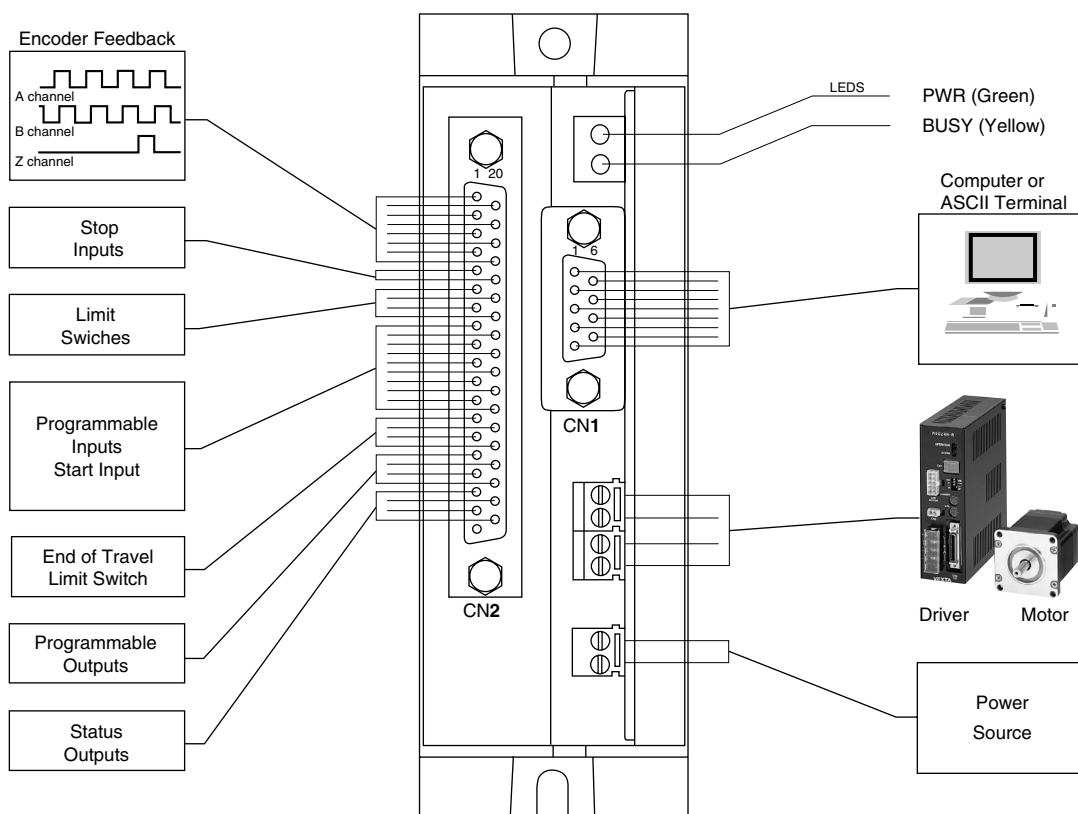
**SC8800**

**SC8800E**

Weight: 0.68 lb. (0.31 kg)



## ■ System Layout

[illegible]

## Stepping Motor Controller

# SG8030J

The **SG8030J** is a compact controller that switches between two control methods according to the application: sequential positioning and data selection positioning.

With sequential positioning mode, up to four positioning control operations can be executed in the pre-determined sequence by simply inputting the start command from a programmable controller. In data selection positioning mode, positioning is controlled by selecting one of four sets of pre-registered positioning data and inputting the start command from a programmable controller.

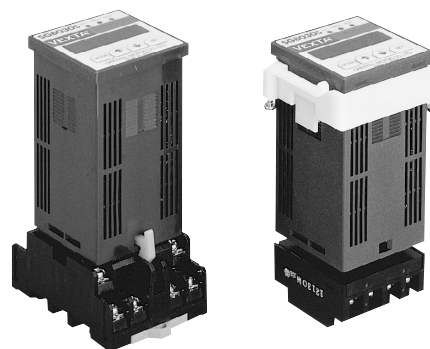
### Features

#### High Performance, Compact Size

With dimensions of 1.89 in.×1.89 in.×3.3 in. (48 mm×48 mm×84 mm), the **SG8030J** is the smallest Oriental Motor controller. They come in DIN-rail-mount and panel mount versions.

#### High-Speed Positioning & Low Vibration

The jerk-limit control function allows you to set a shorter acceleration/deceleration time compared with the use of linear acceleration/deceleration patterns. This reduces the overall positioning time.



DIN Rail Mounting Model

Recessed Mounting Model

#### Switch Control Methods Easily

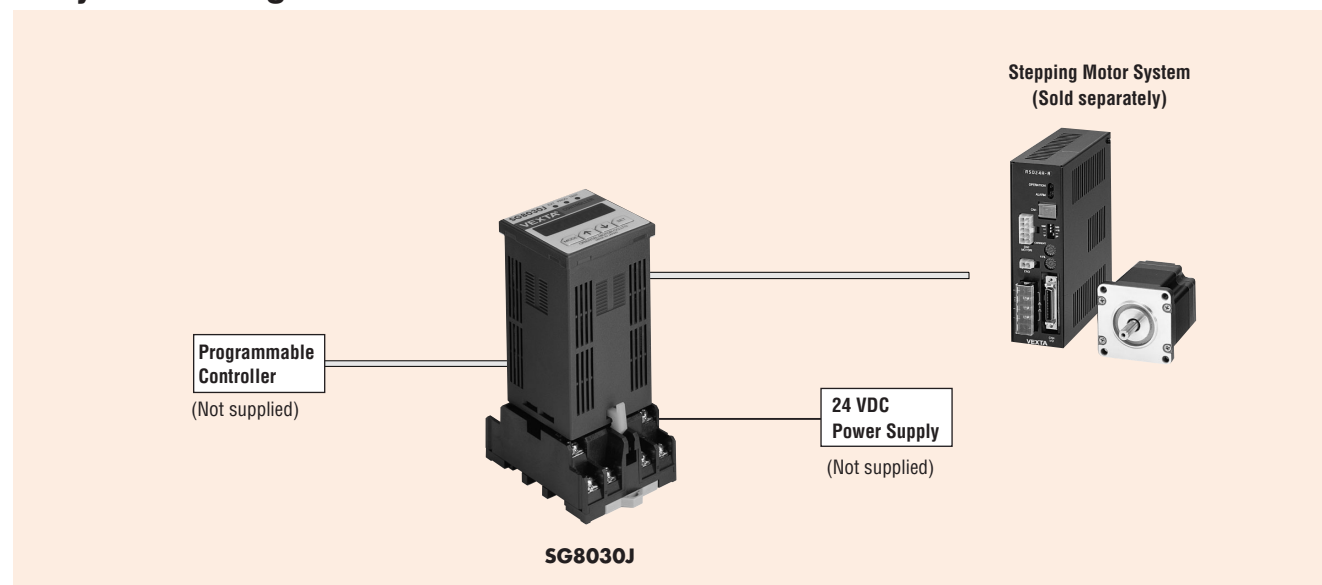
Switch control between sequential positioning and data selection positioning.

#### Functions

The **SG8030J** offers commonly used functions including:

- Control modes: External, program, test
- Operating modes: Positioning, return to mechanical home, continuous operation

### System Configuration



Type	Model
DIN Rail Mounting Model	<b>SG8030J-D</b>
Recessed Mounting Model	<b>SG8030J-U</b>

Model		SG8030J-D SG8030J-U
Number of Control Axes		1 Axis
Number of Settings		4 Profiles
Positioning Data	Setting Mode	Set with touch key on front panel (stored in EEPROM)
	Setting Method	Incremental Mode (point to point)
	Mode	Sequential-Step Positioning Step-Select Positioning
Positioning Control	Move Distance Setting Range	Incremental 1~99999 Pulses
	Starting Pulse Speed Setting Range (VS)	100 Hz~10 kHz (100 Hz Units)
	Operating Pulse Speed Setting Range (VR)	100 Hz~200 kHz (100 Hz Units)
	Acceleration/Deceleration Rate Setting Range (TR)	1~100 ms/kHz (28 rate")
Pulse Output Mode		1-Pulse Output/2-Pulse Output Mode select possible
Operation Modes		Positioning Operation (INDEX Operation) Return to Mechanical Home Operation (HOME Operation) Continuous Operation (SCAN Operation) JOG Operation * Test mode only
Control Modes		External Input Mode (EXT) Program Mode (PROG) Test Mode (TEST)
Mechanical Home Return Function		Sensor detection of home through designation of mechanical home detection direction of rotation
Input Signals		24 VDC Photocoupler Input, Input Resistance 4.7 kΩ
Output Signals		Transistor Output Linked to Photocoupler 24VDC 25 mA maximum
Power Supply Input		24 VDC±5% Current Consumption 0.1 A
Ambient Temperature		32°F~104°F (0°C~+40°C) (Nonfreezing)
Ambient Humidity		20%~85% (Noncondensing)

1. 2. 4. 5. 6. 8. 10. 12. 14. 15. 16. 18. 20. 22. 24. 25. 26. 28. 30. 35. 40. 45. 50. 60. 70. 80. 90. 100

[illegible]

Technical drawing of the Recessed Mounting Adapter showing front and side views with dimensions.

**Panel thickness range** **0.04~0.16 (1~4)**

**Recessed Mounting Adapter**

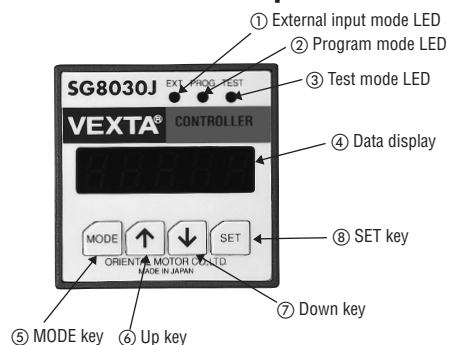
**Rear Connection Socket**

**Dimensions:**

- Front View:
  - Width: **2.28 (58)**
  - Height: **1.89 (48)**
- Side View:
  - Adapter Thickness: **0.22 (5.5)**
  - Adapter Length: **4.17MAX. (106max.)**

$1.77^{+0.02}_0$   
(45 $^{+0.5}_0$ )

## Connection and Operation



|   |   |
|---|---|
| ① | EXT (LED): Lights up when external input is selected. |
| ② | PROG (LED): Lights up when program mode is selected.  |
| ③ | TEST (LED): Lights up when test mode is selected.     |
| ④ | Data display: Shows operation and setting status.     |
| ⑤ | MODE key  |
| ⑥ | ↑ key   |
| ⑦ | ↓ key   |
| ⑧ | SET key   |

### Connection Socket Signal Table

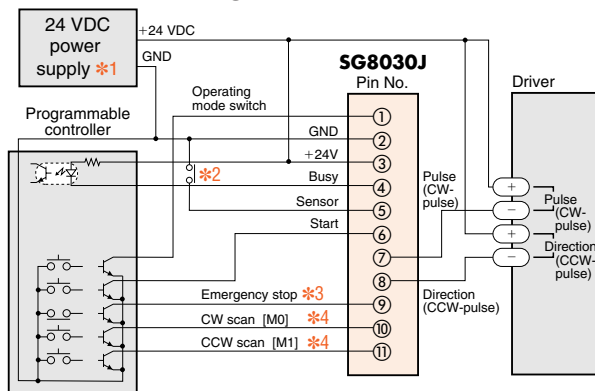
| Pin No. | Signal Designation              | I/O    | Function  |
|---------|---------------------------------|--------|---|
| 1       | Operation Mode Input            | Input  | S: Switching Positioning/Home Detection Operation<br>D: Switching Positioning/Home Detection Operation and Continuous Operation |
| 2       | GND                             | Input  | 24 VDC Power Supply   |
| 3       | +24 VDC                         | Input  |   |
| 4       | Busy                            | Output | Output during Pulse Oscillation   |
| 5       | Sensor                          | Input  | Mechanical Home Detection Sensor  |
| 6       | Start                           | Input  | Start Signal  |
| 7       | CW Pulse/Pulse                  | Output | CW Pulse (2-pulse input mode)/Pulse (1-pulse input mode)  |
| 8       | CCW Pulse/Rotation Direction    | Output | CCW Pulse (2-pulse input mode)/Rotation Direction (1-pulse input mode)  |
| 9       | Emergency Stop                  | Input  | Stop all operations (including busy output)   |
| 10      | S: CW Scan<br>D: M0 [CW Scan]   | Input  | S: CW Continuous Operation<br>D: Data Select Signal [CW Continuous Operation]   |
| 11      | S: CCW Scan<br>D: M1 [CCW Scan] | Input  | S: CCW Continuous Operation<br>D: Data Select Signal [CCW Continuous Operation]   |

Indications in brackets [ ] apply to state when mode switching signal was input.

\* Only pins 1, 10, 11 differ for sequential positioning and selection positioning.

"S" in the table indicates sequential positioning and "D" indicates selection positioning.

### Connection Diagram



\*1 The pulse output section uses a constant-current circuit, so no external resistor is required.

Connect +5 V power directly to the driver + terminals and connect the 24 VDC and 5 VDC GND terminals to each other.

\*2 Use a 24 VDC home sensor.

\*3 This should be normally closed during normal operation.

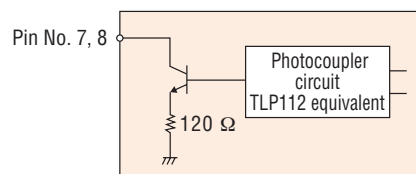
When not using the emergency stop input signal, always connect to the +24 VDC terminal.

The "E.STOP" message is displayed when the power supply turns off.

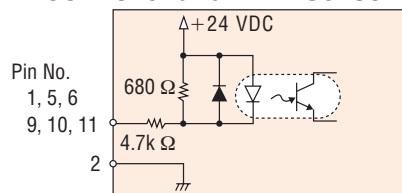
\*4 The names in brackets [ ] are for data selection positioning type.

## Description of Input/Output Signals

### Output Signals to Driver



### Input Signals from Programmable Controller and Limit Sensor



### Output Signals to Programmable Controller

