

Stepping Motors

Controllers

Introduction
<i>QSTEP</i> AS AC Input
<i>QSTEP</i> ASC DC Input
5-Phase Microstep RK AC Input
2-Phase Full/Half UMK
5-Phase Microstep CRK
2-Phase Microstep RBK DC Input
2-Phase Microstep CMK
2-Phase PK/PV Without Encoder
2-Phase PK With Encoder
EMP400 Controllers
SG8030J
Accessories
Installation

EMP400 Series

SG8030J

Page

EMP400 Series	C-274
SG8030J	C-289

Overview of Controllers

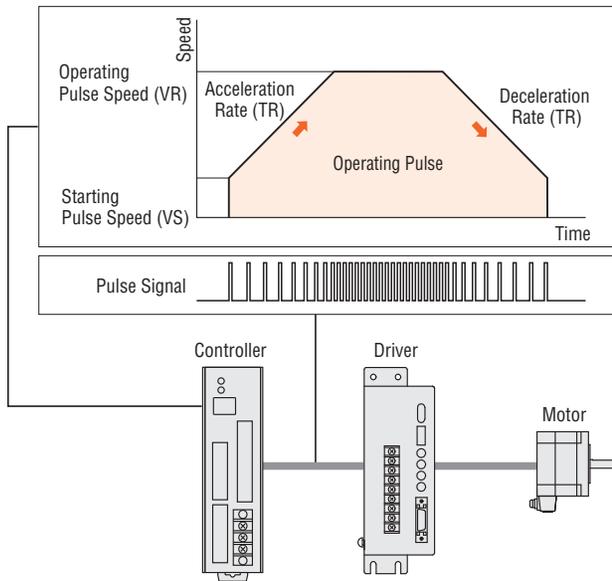
At Oriental Motor, a device that outputs pulse signals needed to operate a stepping motor is called a "Controller." Controllers let you make various settings to control your motor and also permit connection with a host programmable controller and sensors. Select a controller that best suits your system.

Features

Setting Positioning Operation Parameters

You can set desired positioning operation parameters (number of operation pulses, starting pulse speed, operating pulse speed, acceleration/deceleration rate, etc.).

Data Setting



Starting Pulse Speed (VS) [Hz]

The frequency at which output of pulse signals is started. The controller starts outputting pulse signals at the frequency specified by the starting pulse speed, and increases the frequency along the slope specified by the acceleration/deceleration rate.

Operating Pulse Speed (VR) [Hz]

The target pulse signal frequency. This frequency dictates the operating speed of the motor.

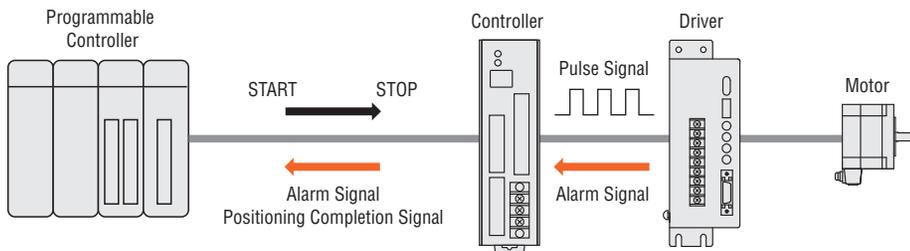
Acceleration/Deceleration Rate (TR) [msec/kHz]

The slope along which the pulse signal frequency is raised (acceleration) or lowered (deceleration). At Oriental motor, the time needed to raise (or lower) the frequency by 1 kHz is expressed in units of msec/kHz.

The specific method to set data varies from one product to another depending on, for example, whether a dedicated operator interface unit is used or a computer is used. For details, refer to the page explaining each product.

Operation System

When the equipment is to be operated automatically, provide a programmable controller to serve as the host of your controller.



The specifics vary depending on the product. For details, refer to the page explaining each product.

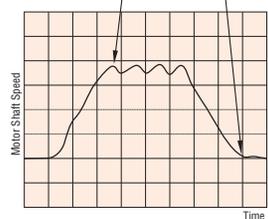
● **Jerk Limiting Control Function for Suppressing Vibration**

The "Jerk limiting control function" lets you suppress vibration that otherwise occurs when the motor is being driven or stopped. For example, this function is particularly useful when a belt pulley is used to drive the motor and you want the load to be moved with low vibration.

● **Measurement Conditions**

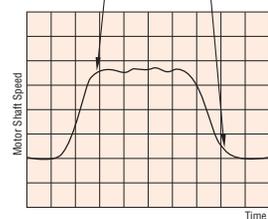
Mechanism: Belt drive
 Operation Mode: Positioning operation
 Load: 10 kg (22 lb.)

Vibration that occurs when the operation mode is switched from the acceleration/deceleration to constant speed manifests as vibration of the mechanism.



Linear Acceleration/Deceleration Pattern

By suppressing vibration that otherwise occurs when the operation mode is switched from acceleration/deceleration to constant speed, vibration of the mechanism is suppressed.



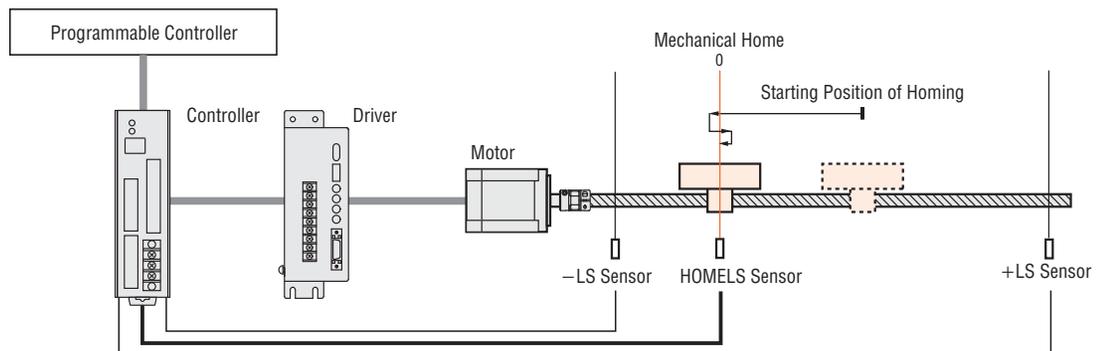
Jerk Acceleration/Deceleration Pattern

● These graphs are provided only as a reference. The actual effect of this function will vary depending on the mechanism of your equipment.

● **Offering Functions to Facilitate Motor Control**

◇ **Return to Mechanical Home Function**

To perform accurate positioning operation, the mechanical home that defines the reference point must be determined accurately. Oriental Motor's controllers are equipped with the "Automatic return to home function." All you need is to wire a home sensor, and you can utilize this home detection function right away.



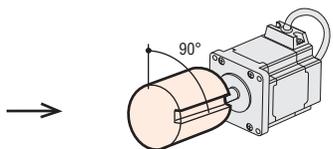
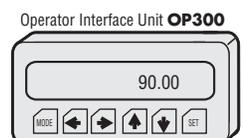
◇ **I/O Check Function**

You can check the connection (I/Os) with the programmable controller.

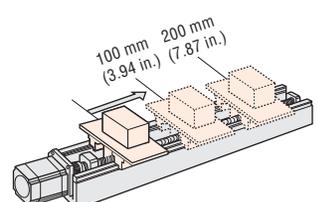
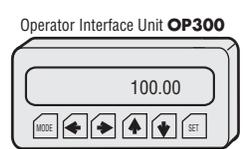
◇ **Travel Amount Setting in Multiple Units Such as mm**

You can set travel amounts in degrees and mm in addition to pulses.

• **Setting in degrees**



• **Setting in mm**



● The specifics vary depending on the product. For details, refer to the page explaining each product.

Introduction

QSTEP AS AC Input

QSTEP AS DC Input

5-Phase Microstep RK AC Input

2-Phase Full/Half UMK

5-Phase Microstep CMK DC Input

2-Phase Microstep RBK DC Input

2-Phase Microstep CMK

2-Phase PK/PV Without Encoder

2-Phase PK With Encoder

EM-P400 Controllers

5G8030J

Accessories

Installation

Types of Controller

Stored Program Controller

Pulse Oscillation

+

Sequence Function

+

I/O Control

These high-function controllers let you not only set motor positioning parameters and speeds, but also program various actions such as how the motor should operate according to the status of each general-purpose I/O and switching the output used to control an external device.

- Supporting conditional branching using general-purpose I/Os, wait processes using internal timers, and other operations based on sequence control.
- Single axis and dual axis types are available. The dual axis controller supports positioning operation based on linear interpolation.



EMP400 Series

Programmable Controller	Controller
Start ON	Return to Mechanical Home
	Stop 10 msec
	Positioning Operation 45°
	Positioning Operation 90°

- Sequence functions are provided, such as conditional branching and internal timer processing.

Stored Data Controller

Pulse Oscillation

- With these controllers, you can operate the motor with ease by issuing a start signal from the host controller, as long as the speed, travel amount and other conditions for motor operation have been set.
- Stored data controllers are available in two types: those operated in the data-select positioning mode and others operated in the sequential positioning mode.



SG8030J

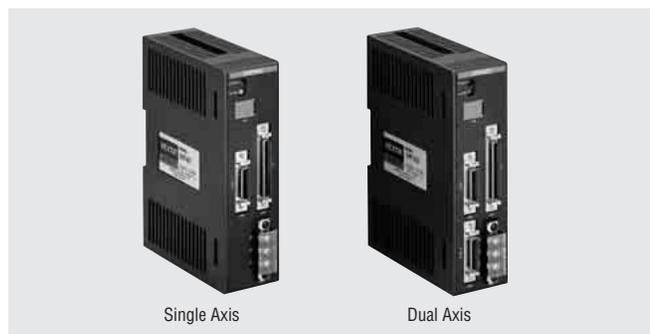
Programmable Controller	Controller
Return to Mechanical Home Start ON	Return to Mechanical Home
Stop 10 msec after operation complete	
Positioning Operation No. 1 Start ON	Positioning Operation 45°
Positioning Operation No. 2 Start ON	Positioning Operation 90°

Lineup

		Stored Program Controller	Stored Data Controller
		EMP400 Series	SG8030J
			
Program	Number of Programs	32	—
	Capacity	1000 commands	—
	Input Method	Command input via terminal program	—
	Number of Control Tasks	Main: 1, Sub: 0	—
Positioning Data	Number of Settings	—	4 steps Sequential positioning type Data-select positioning type
	Setting Mode	—	Set with touch pads on front panel
Oscillator Specifications	Number of Control Axes	Single axis, Dual axis	Single axis
	Pulse Output Mode	1-pulse output/2-pulse output mode	1-pulse output/2-pulse output mode
	Acceleration/Deceleration Pattern	Linear Jerk limiting control	Linear Jerk limiting control
Operation Pattern	Relative Positioning Operation	Available	Available
	Absolute Positioning Operation	Available	—
	Continuous Operation	Available	Available
	Return to Mechanical Home Operation	Available	Available
	Dual Axis Linear Interpolation Operation	Available	—
	Multistep Speed-Change Operation	Available	—
Features		<ul style="list-style-type: none"> • General-purpose inputs: 8 • General-purpose outputs: 6 • Carefully selected functions and commands to achieve motor operation with greater ease • Teaching function (when the accessory operator interface unit OP300 is used) • No special software • Program input using standard Windows® communication applications 	<ul style="list-style-type: none"> • Compact, simple and less wiring • Jerk limiting control function for load transfer applications with low vibration
General Specifications	Power Source	24 VDC	
	Dimensions	W 40 mm (1.57 in.) × D 100 mm (3.94 in.) × H 135 mm (5.31 in.)	W 48 mm (1.89 in.) × D 48 mm (1.89 in.) × H 83.7 mm (3.30 in.) (Except for the socket)
Page		C-274	C-289

RoHS RoHS-Compliant
 Stored Program Controller
EMP400 Series

● Additional Information ●
 Technical reference → Page F-1



Single Axis

Dual Axis

■ Features

● Allowing the Input of 32 Programs

The **EMP400** Series can store 32 different operation programs. You can select and execute a desired program or programs using an external input signal.

For example, you can create a dedicated program for each motion for selection/execution as necessary.

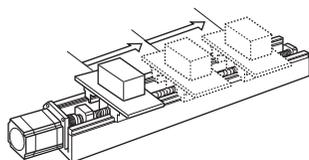
In addition to the 32 programs, you can input one program that runs automatically when the power is turned on.

A maximum of 1000 steps can be stored when all programs are combined together.

● Various Operation Patterns

◇ Repetitive Positioning

Simple movements like "repeating positioning operation for a specified number of times and then return to the home at the end" can be implemented effortlessly.



Example of Repetitive Positioning

◇ Stopping via Sensor Input

You can start an operation from a desired position using a general-purpose input and cause the motor to decelerate to a stop upon sensor detection.

◇ Linear Interpolation between Two Axes

Positioning operations involving two axes can be performed simultaneously via linear interpolation.

◇ Continuous Operation at Variable Speeds

You can change the speed to desired levels during continuous operation.

● Teaching Function

You can adjust the travel amount or monitor the current position via teaching, using an accessory **OP300** operator interface unit.

● No Need for Dedicated Software

Sequence programs are input from HyperTerminal, a standard Windows® communication application, so no dedicated software is necessary.

```

EMP400
Controller
Software Version *.*
Copyright 2000
ORIENTAL MOTOR CO., LTD.

0>edit 4
Seq 4
[1] PULSE2 2
[2] T2 30
[3] V2 1000
[4] VS2 500
[5] H2 +
[6] B2 1000
[7] INC2
[8] END

----->Select:Ax, Ix, or Dx(Alt/Ins/Del/Q=exit)
>>Command:
  
```

Functions

● Pulse Oscillation

Various operation patterns are provided standard from positioning and origin return to dual axis linear interpolation. All you need is to set the necessary parameters.

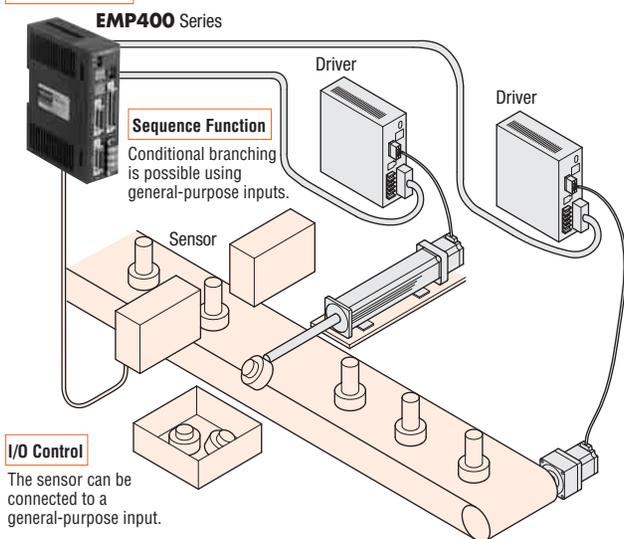
● Sequence Function

A series of operation patterns can be programmed using dedicated commands. 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.

Pulse Oscillation



● (RoHS) RoHS-Compliant

The **EMP400** Series conforms to the RoHS Directive that prohibits the use of six chemical substances including lead and cadmium.

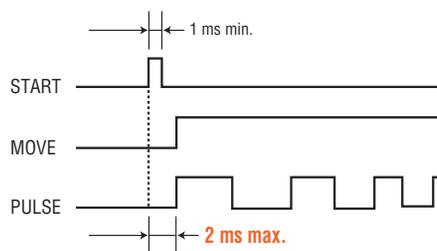
● Details of RoHS Directive → Page G-38

Pulse Oscillation

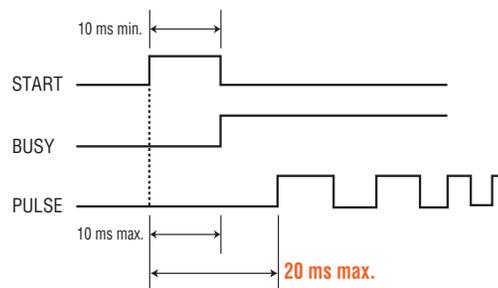
● Fast Response Time

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

Pulse Oscillating Time of EMP400 Series



Pulse Oscillating Time of Conventional Controller

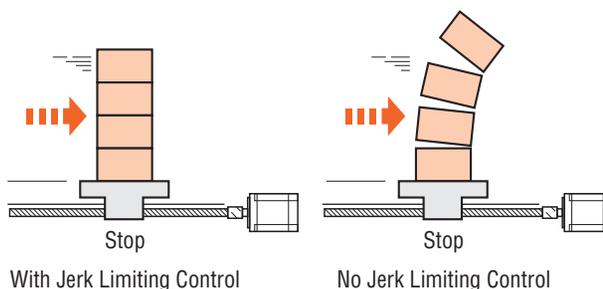
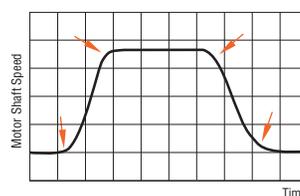


● High-Speed Positioning and Low Vibration

The jerk limiting 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 limiting 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.

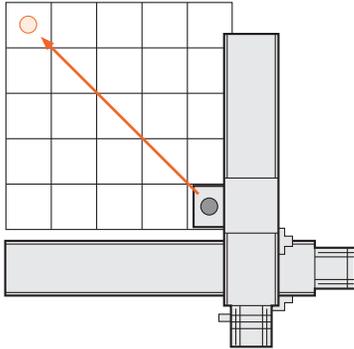


● Positioning Operation

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

● Linear Interpolation Operation

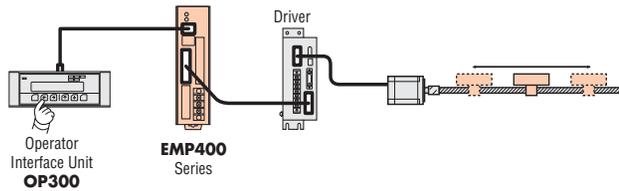
Two axes are controlled simultaneously, allowing direct movement to a target position.



● Teaching Function

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

EMP400 Series



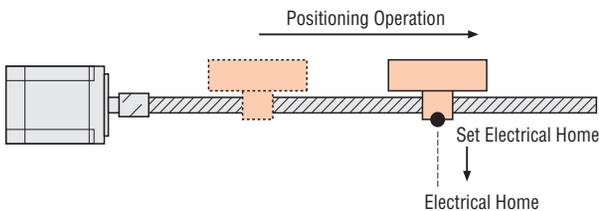
● Continuous Operation

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

● Set Soft Home (Clears the current position)

◇ Electrical Home

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



● Homing (Return to mechanical home operation)

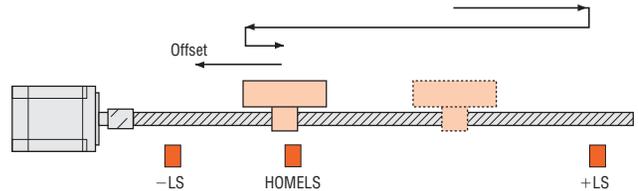
Ability to seek for a sensor representing a positioning reference point (home) is available.

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.

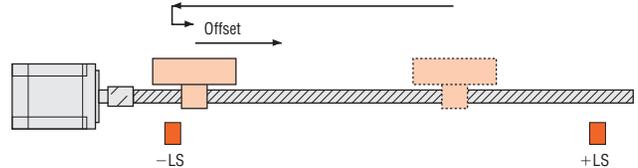
Since it's possible to specify the direction in which the home sensor is entered, backlash error doesn't occur in applications where positioning accuracy is critical.



◇ Constant-Speed Return (Two-sensor mode)

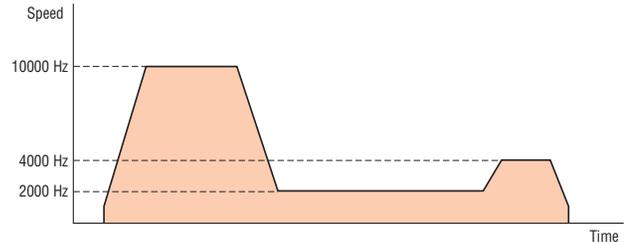
The mechanical unit returns home at a constant speed.

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



● Multistep Speed-Change Operation

Speed can be changed on the fly during continuous operation.

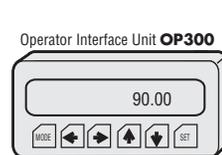


● A Choice of Acceleration/Deceleration Patterns

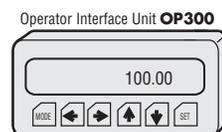
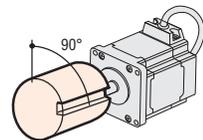
Each operation can be specified with a linear acceleration /deceleration pattern or jerk limiting control.

● Distance Options

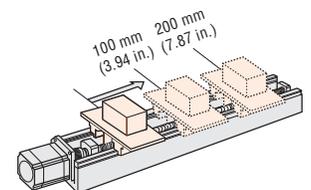
You can set travel amounts in degrees and mm in addition to pulses.



Setting in degrees



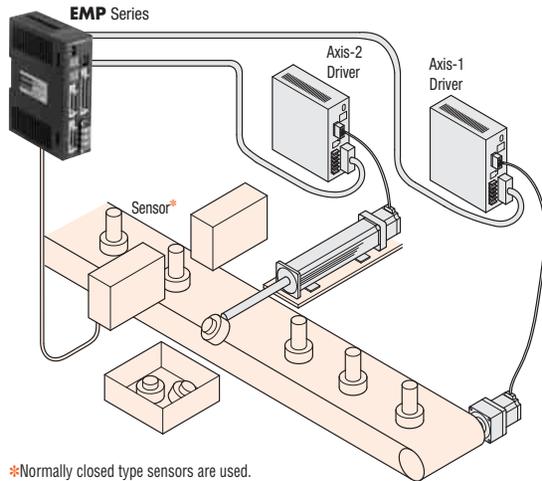
Setting in mm



Sequence Function

● Stopping via Sensor Input

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 general-purpose input 1.



*Normally closed type sensors are used.

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

```

Seq 1
[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 5000 Hz
[9] D2 +1000 ; Axis 2 (ejection)     Travel amount 1000 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

● Full Range of I/O

In addition to the signals for controlling the **EMP400** Series (e.g., start, external 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.

General-Purpose I/O

8 Inputs
6 Outputs

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

Motor Control I/O (Dedicated)

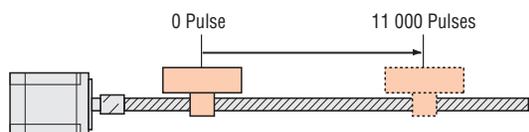
PULSE Output
CCR Output
ALARM Input
END Input
TIMING Input
+LS Input
-LS Input
HOMELS Input
SLIT Input
etc.

EMP400 Series 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.
Data Setting	S	Decelerate the motor to a stop.
	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 limiting time.
	T	Set the acceleration/deceleration rate.
Program Control	V	Set the operating speed.
	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.
Hardware Setting	ENDL	End the loop section.
	END	End the sequence program.
	IN	Wait for input.
	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.
Others	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.
	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

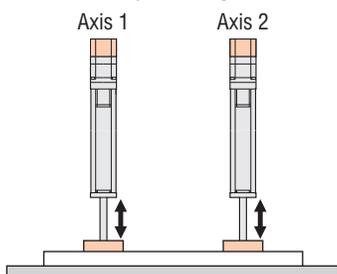
Sample. 1 Positioning operation



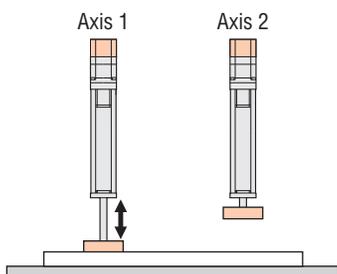
```
[1] VS1 500 ; Starting speed 500 Hz
[2] V1 1000 ; Operating speed 1000 Hz
[3] T1 30.0 ; Acceleration/deceleration rate 30.0 msec/kHz
[4] D1 +11000 ; Travel amount 11 000 pulses in CW direction
[5] INC1 ; Execute relative positioning operation
```

Sample. 2 Inputting multiple operation patterns

Simultaneous positioning of two axes



Axis 2 moves after axis 1 moves.

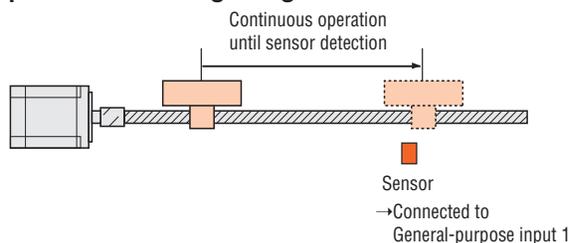


```
Seq 99 ; Hardware setting
[1] UNIT1 0.02,1 ; Axis 1 Change to travel amount mm
[2] UNIT2 0.02,1 ; Axis 2 Change to travel amount mm
```

```
Seq 1 ; Two axes execute at same time
[1] V1 1000 ; Axis 1 Operating speed 1000 Hz
[2] D1 +50 ; Axis 1 Travel amount 50 mm
[3] D2 +50 ; Axis 2 Travel amount 50 mm
[4] ABS1 ; 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] ABS1 ; Axes 1, 2 Execute absolute positioning operation
```

```
Seq 2 ; After axis 1 executes, axis 2 executes
[1] V1 1000 ; Axis 1 Operating speed 1000 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 2000 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
```

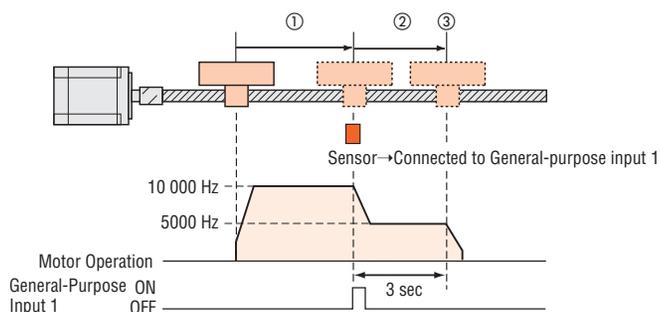
Sample. 3 Positioning using a sensor



```
[1] VS1 500 ; Starting speed 500 Hz
[2] V1 20000 ; Operating speed 20 000 Hz
[3] T1 30.0 ; Acceleration/deceleration rate 30.0 msec/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

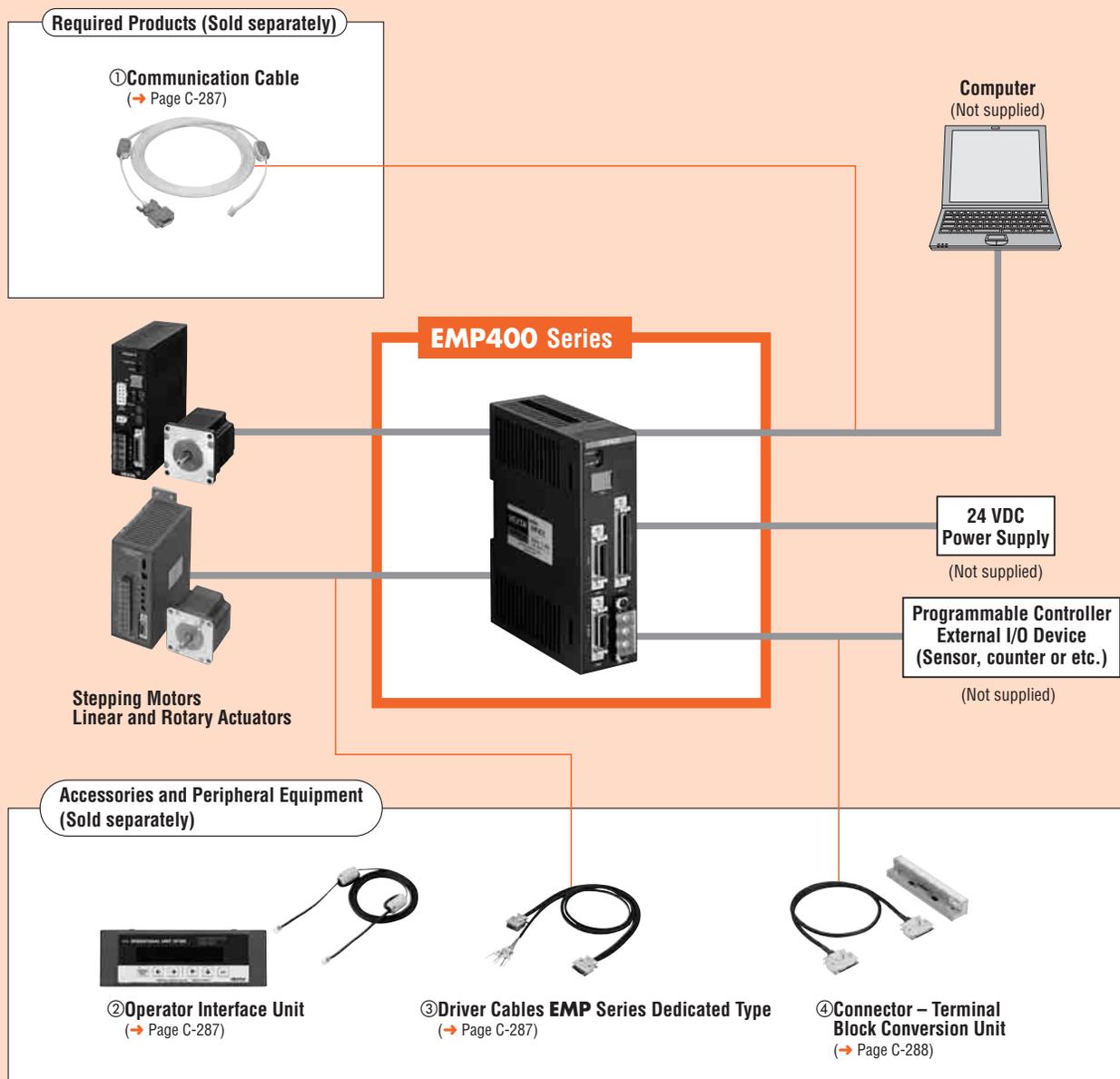
- ① Continuous operation at 10 000 Hz
- ② Decelerate to 5000 Hz upon sensor detection
- ③ Decelerate to a stop after three seconds



```
[1] VS1 500 ; Starting speed 500 Hz
[2] V1 10000 ; Operating speed 10 000 Hz
[3] T1 30.0 ; Acceleration/deceleration rate 30.0 msec/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 5000 Hz
[8] DELAY 3.0 ; Wait time 3 seconds
[9] S1 ; Decelerate to a stop
```

System Configuration

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



No.	Product Name	Overview	Page
①	Communication Cable	Cable for connecting the EMP400 Series and a PC [5 m (16.4 ft.)].	C-287
②	Operator Interface Unit	This unit lets you set, edit, monitor and operate various data at your fingertips. Comes with a 2 m (6.6 ft.) cable.	C-287
③	Driver Cables EMP Series Dedicated Type	Dedicated cable with connector for connecting the EMP400 Series and driver [1 m, 2 m (3.3 ft., 6.6 ft.)].	C-287
④	Connector – Terminal Block Conversion Unit	Set of terminal block and cable for connecting the EMP400 Series and host controller [1 m (3.3 ft.)].	C-288

● Example of System Configuration

(Sold separately)

EMP Series	Communication Cable	+	Operator Interface Unit	Driver Cable EMP Series Dedicated Type	Connector – Terminal Block Conversion Unit [1 m (3.3 ft.)]
EMP402-2	FC04W5		OP300	CC01EMP4	CC50T1

(Sold separately)

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

Product Number Code

EMP400 1 - 1

①

②

③

①	Series	EMP400 Series
②	Number of Axes	1: Single Axis 2: Dual Axis
③	Connector	1: Without Connectors 2: With Connectors

Product Line

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

The following items are included in each product.

Controller, Connector for Input/Output Signal*, Operating Manual
*Only for model with connectorsSpecifications **RoHS**

	Series	EMP400 Series
Program	Number of programs	32
	Capacity	1000 commands
	Input method	Command input via terminal program
	Number of control tasks	Main: 1 Sub: 0
Oscillator Specifications	Number of control axes	EMP401: Single axis, EMP402: Dual axis
	Pulse output mode	1-pulse output/2-pulse output mode
	Frequency	10 Hz~200 kHz (1 Hz increment) Pulse duty 50% (Fixed)
	Acceleration/deceleration rate	0.5~1000 msec/kHz (0.1 msec/kHz increments)
	Acceleration/deceleration pattern	Linear/jerk limiting control
Operation Pattern	Travel amount	Relative: -16 777 215~+16 777 215 pulses Absolute: -8 388 608~+8 388 607 pulses
	Relative positioning operation	Available
	Absolute positioning operation	Available
	Continuous operation	Available
	Return to mechanical home operation	Available
	Dual axis liner interpolation operation	Available
	Multistep speed-change operation	Available in continuous operation
Communication Specifications	Communication method	RS-232C based (3-wire)
	Transmission rate	9600 bps
Input/Output Signal Specifications	Inputs (START, E-STOP, etc.)	3 photocoupler inputs 24 VDC, Input resistance: 5.4 kΩ
	Outputs (MOVE, ALM, etc.)	4 open-collector outputs 24 VDC, 25 mA maximum 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 maximum each
	Driver and sensor inputs	7 photocoupler inputs/axis 12 VDC, Input resistance: 2.7 kΩ
	Driver outputs	3 open-collector outputs/axis 12 VDC, 20 mA maximum each
General Specifications	Power source	24 VDC±5%, Current consumption 0.45 A
	Dimensions	W 40 mm (1.57 in.) × H 135 mm (5.31 in.) × D 100 mm (3.94 in.)
	Mass	0.26 kg (0.57 lb.)
	Ambient temperature	0~+50°C (+32~+122°F) (non-freezing)
	Ambient humidity	20~85% (non-condensing)

Introduction

AC Input
5-Phase
Microstep
ASDC Input
5-Phase
Microstep
ASCAC Input
5-Phase
Microstep
RK2-Phase
Full/Half
UMK5-Phase
Microstep
CMKDC Input
2-Phase
Microstep
RBK2-Phase
Microstep
CMKWithout Encoder
2-Phase
PK/PVWith Encoder
2-Phase
PKEMP400
Controllers

5G8030J

Accessories

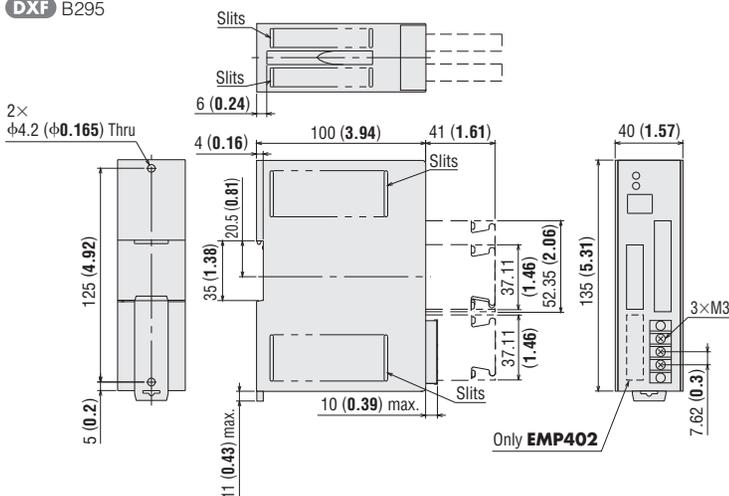
Installation

Dimensions Unit = mm (in.)

EMP400 Series

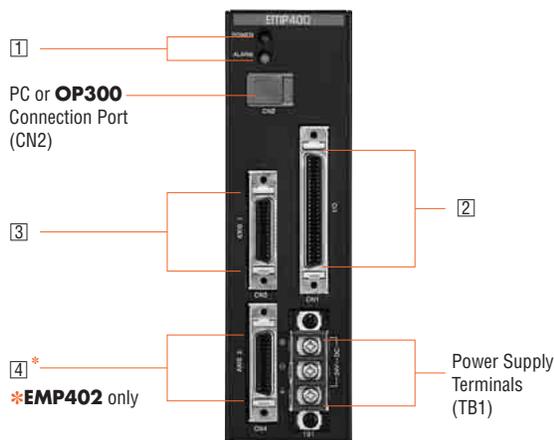
Mass: 0.26 kg (0.57 lb.)

DXF B295



Connection and Operation

Names and Functions of Controller Parts



1 LED Indicators

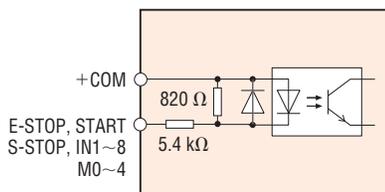
Indication	When Activated
POWER	Lights during 24 VDC input.
ALARM	Lights during alarm signal output.

2 CN1 I/O Signal Connector

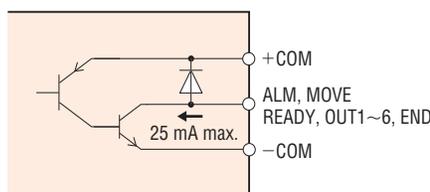
Pin No.	Signal Name	Description	Pin No.	Signal Name	Description
1	—	Not used	26	—	Not used
2	E-STOP input*	External stop	27	ALM output	Alarm
3	START input	Execute sequence	28	—	Not used
4	S-STOP input	Cease sequence execution	29	MOVE output	Output when outputting pulses
5	—	Not used	30	—	Not used
6	—	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 (+24 VDC)
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

*Connect to the ground [B contact (normally closed)] in normal operation. Use a half-pitch connector for connection.

Internal Input Circuit



Internal Output Circuit



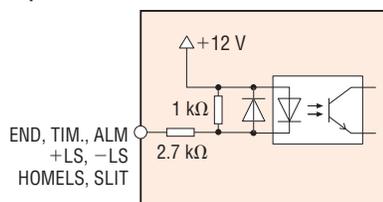
③ CN3 Axis-1 Driver/Sensor Connector

④ CN4 Axis-2 Driver/Sensor Connector

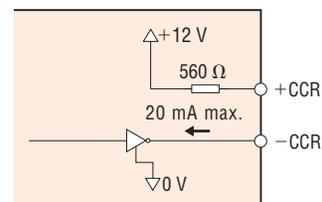
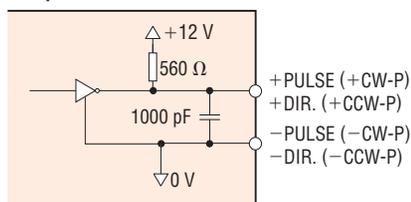
Pin No.	Signal Name	Description	Pin No.	Signal Name	Description
1	+PULSE output (+CW-P output)*	Pulse (CW pulse)*	14	-	Not used
2	-PULSE output (-CW-P output)*		15	-	Not used
3	+DIR. output (+CCW-P output)*	Rotation direction (CCW pulse)*	16	+CCR output	Counter-clear
4	-DIR. output (-CCW-P output)*		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 sensor	23	-	Not used
11	SLIT input	Slit sensor	24	-	Not used
12	+12 V output	Power supply for sensor (140 mA max.)	25	+5 V output	Power supply for timing signal (20 mA max.)
13	GND	GND for sensor	26	GND	GND for timing signal

*The signal names in parentheses are for 2-pulse output mode.

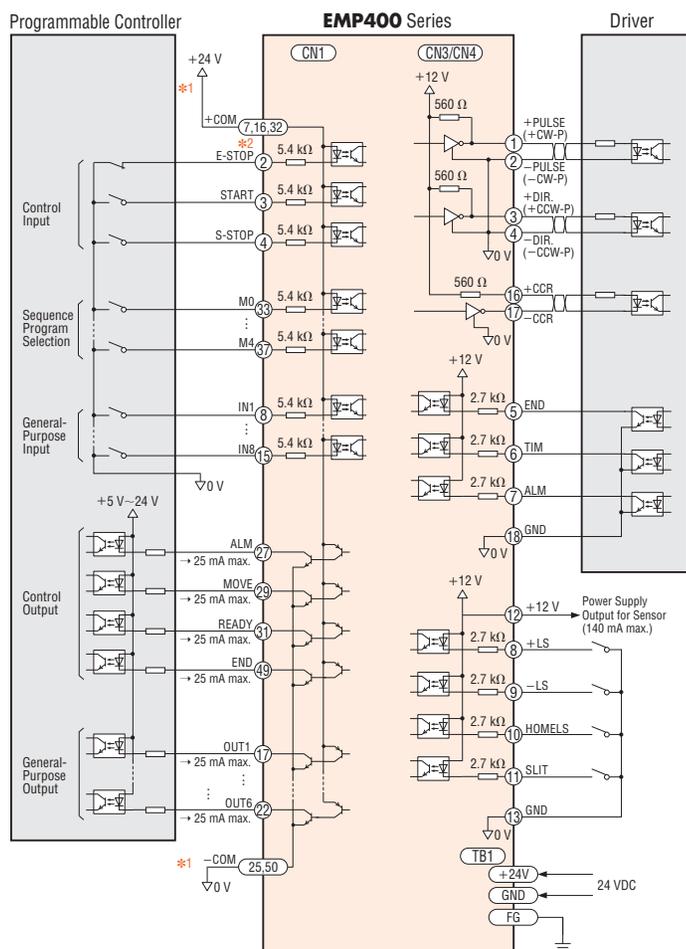
Input Circuit



Output Circuit



● Connection Diagram

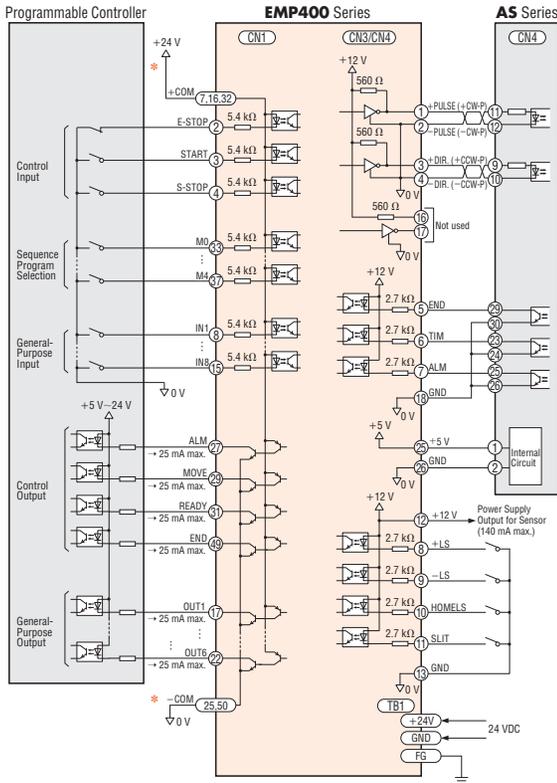


*1 When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power supply input.

*2 E-STOP: Connect to the ground [B contact (normally closed)] in normal operation.

● Connection Diagrams of Oriental Motor Products

AS Series

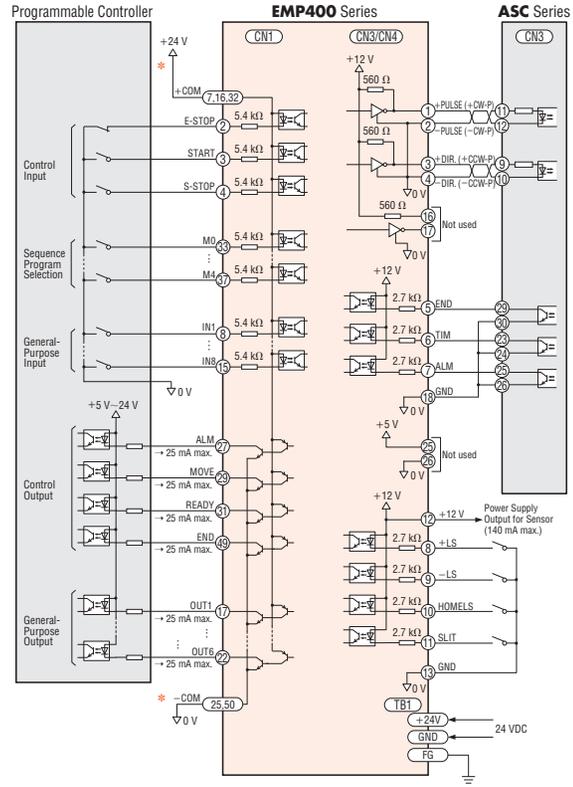


* When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power supply input.

Notes:

- Except for connection between **EMP400** Series and built-in controller driver.
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.

ASC Series

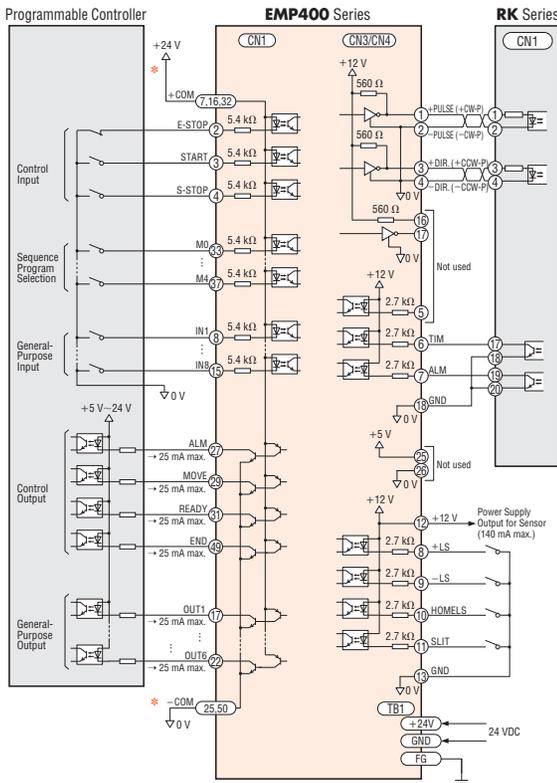


* When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power supply input.

Note:

- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.

RK Series

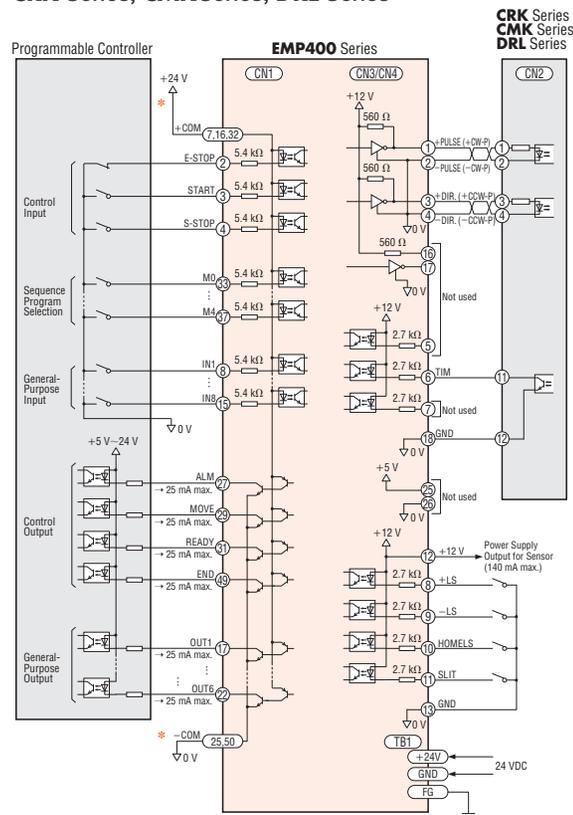


* When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power supply input.

Note:

- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.

CRK Series, CMK Series, DRL Series

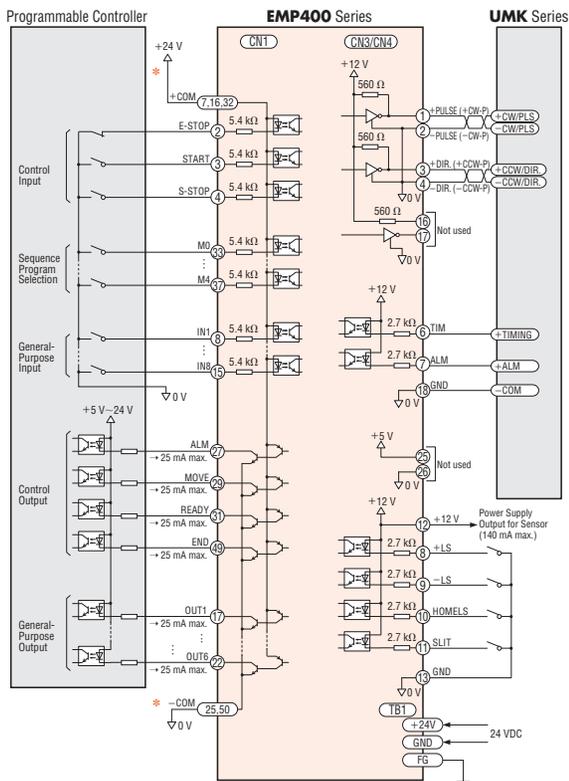


* When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power supply input.

Note:

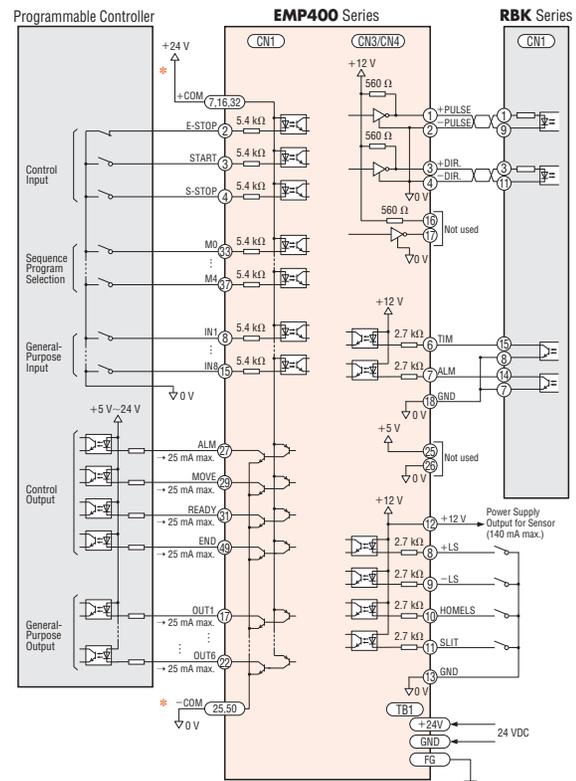
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.

UMK Series



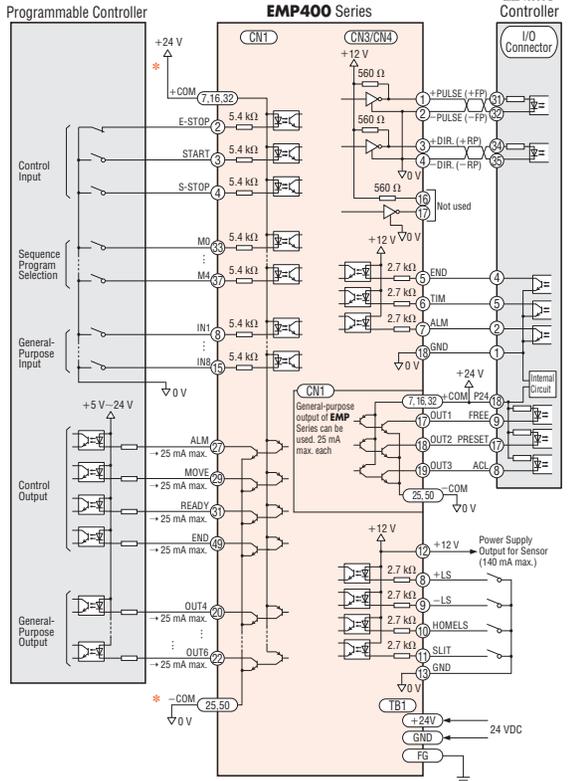
* When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power supply input.
Note:
 ● Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.

RBK Series



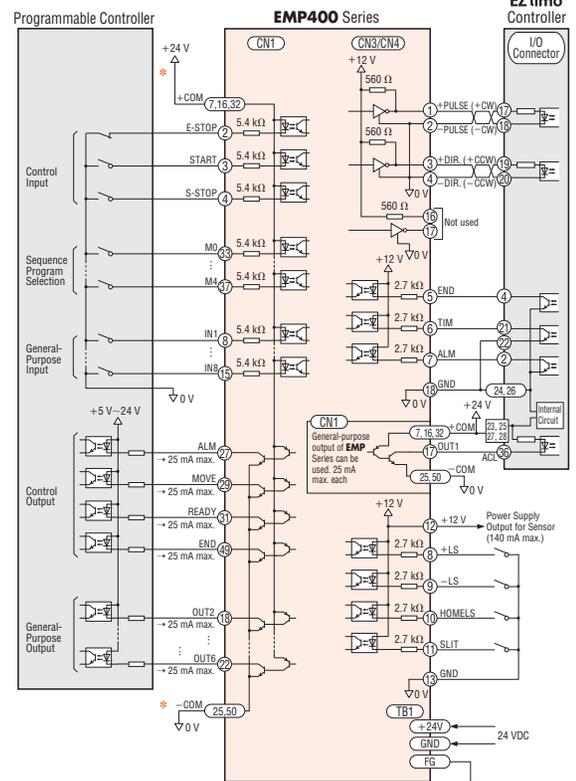
* When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power supply input.
Note:
 ● Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.

EZ limo EZSII Series



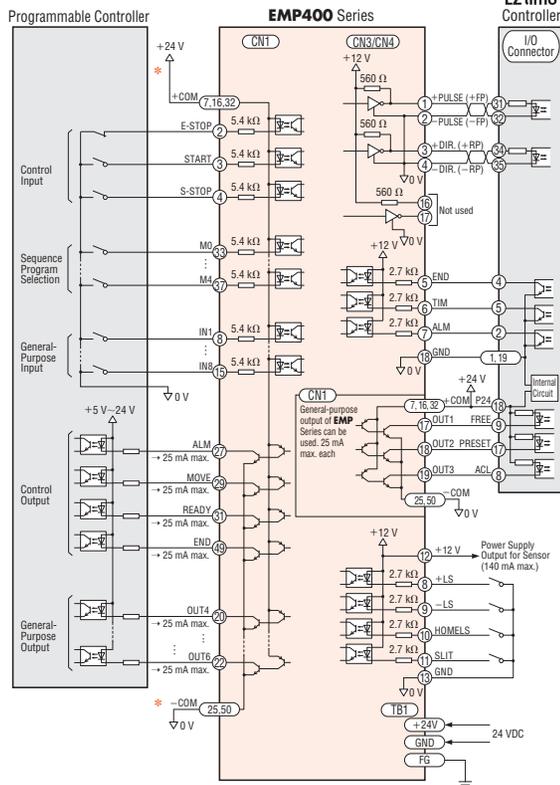
* When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power supply input.
Notes:
 ● Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.
 ● Supply 24 VDC to the power supply for input/output signals of the EZ limo controller. The signal will not activate without supplying 24 VDC.

EZ limo EZC Series



* When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power supply input.
Notes:
 ● Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.
 ● Supply 24 VDC to the power supply for input/output signals of the EZ limo controller. The signal will not activate without supplying 24 VDC.

EZ limo EZHC Series, EZHP Series

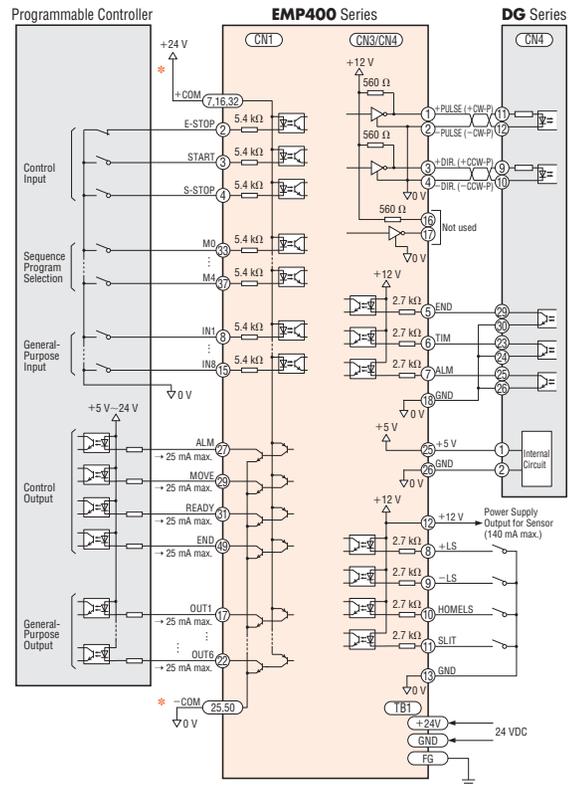


* When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power supply input.

Notes:

- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.
- Supply 24 VDC to the power source for input/output signals of the **EZ limo** controller. The signal will not activate without supplying 24 VDC.

DG Series (AC input)

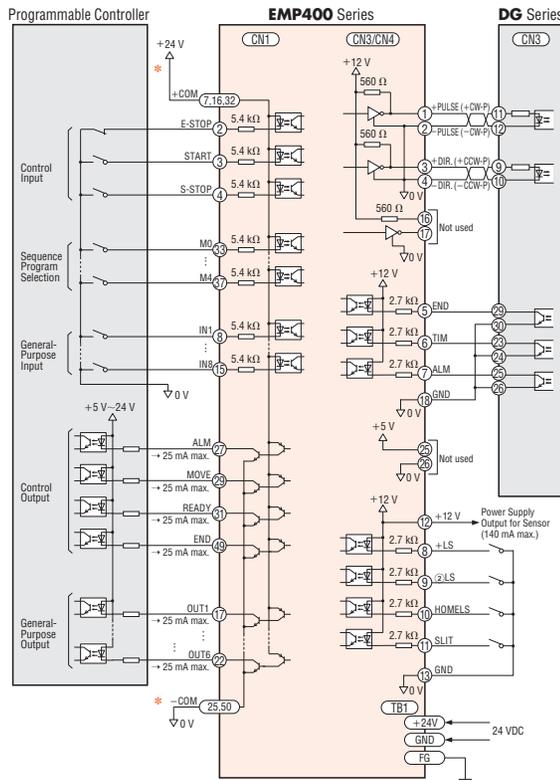


* When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power supply input.

Note:

- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.

DG Series (24 VDC input)



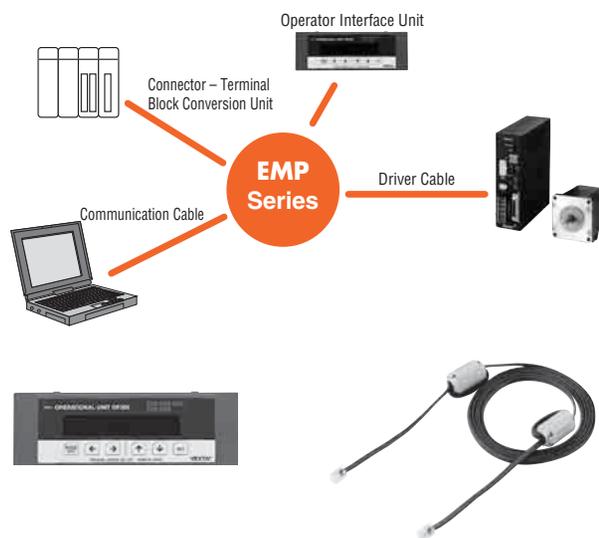
* When the I/O signals from CN1 are used, connect 24 VDC to the +COM and -COM input terminals separately from the power supply input.

Note:

- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.

Accessories (Sold separately)

We have a range of optional cables that achieve one-touch connection between the **EMP400** Series and peripherals, as well as an operator interface unit used for teaching operation.

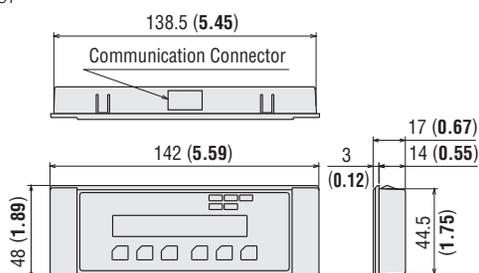


Operator Interface Unit **OP300** (RoHS)

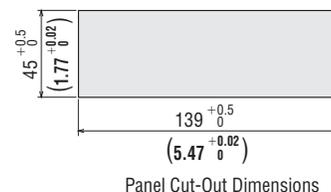
Set the travel amount via teaching or monitor the current position. The unit comes with a 2 m (6.6 ft.) cable for connection with the **EMP400** Series.

Dimensions Unit = mm (in.)

DXF B297



Panel Cut-Out



Communication Cable **FC04W5** (RoHS)

A 5 m (16.4 ft.) cable with a D-sub 9 connector one end for the RS-232C communications between the PC and the **EMP400** Series controller.



Driver Cables **EMP Series Dedicated Type**

This is a shielded cable equipped with, at one end of the cable, the half-pitch connector that snaps into the driver for stepping motors or motorized actuators. The other end of the cable is equipped with the connector for the **EMP** Series controller.

→ Pages C-300, D-189



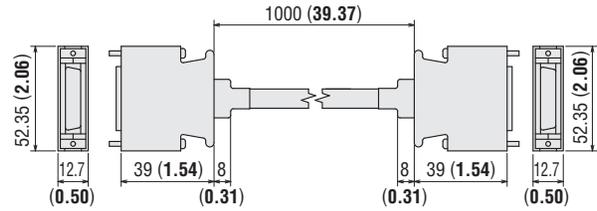
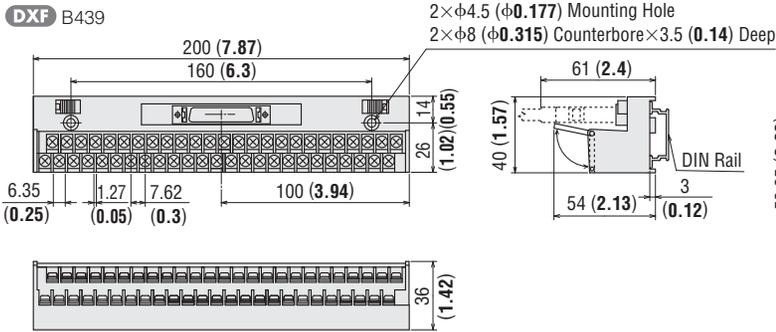
● Connector – Terminal Block Conversion Unit **CC50T1** (RoHS)

The **EMP** Series and programmable controller can be connected via a terminal block.

- With a signal name plate for easy, one-glance identification of driver signal name
- DIN rail mountable
- Cable length: 1 m (3.3 ft.)

◇ Dimensions Unit = mm (in.)

DXF B439



Terminal Block Pin Configuration

1	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
2	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

- Recommended Crimp Terminals
- Terminal screw size: M3
- Tightening torque: 1.2 N·m (170 oz-in)
- Applicable minimum lead wire: AWG22
- Round terminals are not available.

