Motorized Actuators

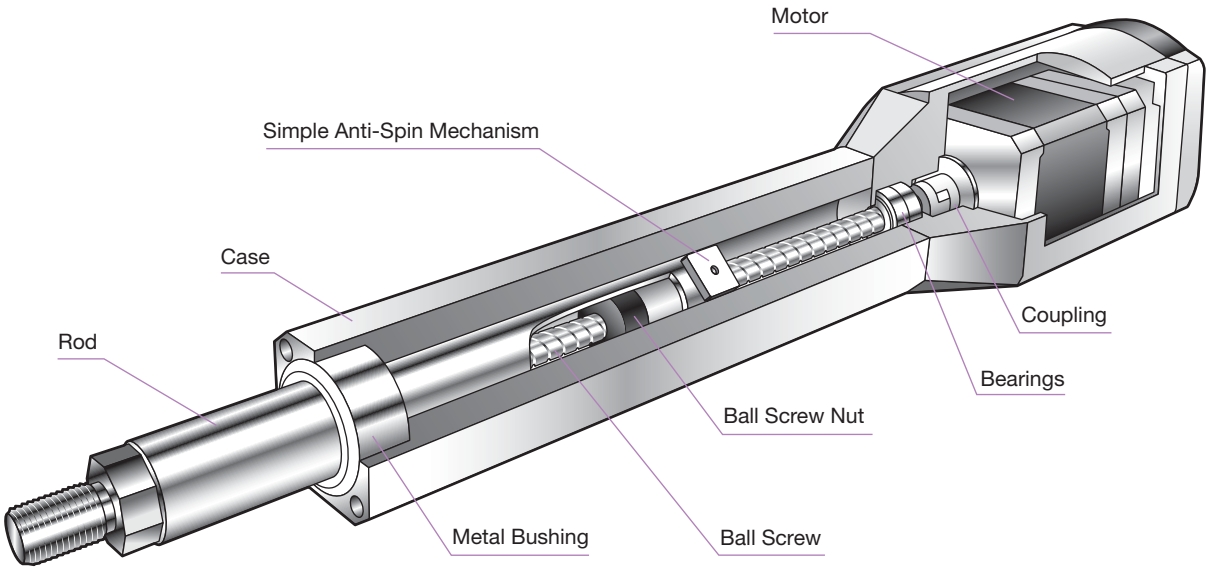
Motorized Cylinders

Features of Motorized Cylinders

Motorized cylinders are capable of driving a load linearly in a precise, accurate manner through the rotation of a ball screw controlled by a stepping motor. These cylinders incorporate features that add greater convenience to positioning operation, and are available in various product series and models.

Highly Accurate Positioning Operation

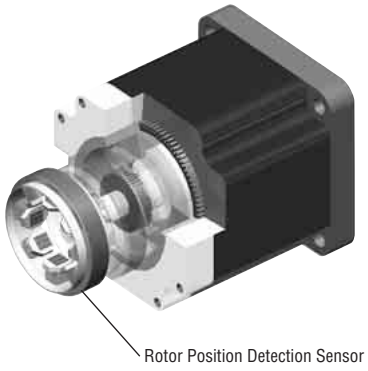
The ball screw is driven by a closed loop α_{STEP} stepping motor to position heavy loads with high accuracy. Integrating a motor with a linear motion mechanism, this type of actuator is ideal for applications where the load is pushed or pulled.



Adopting a Control Motor to Achieve Accurate, Multi-Functional Positioning

The motorized cylinders adopt an α_{STEP}. The α_{STEP} utilizes our unique closed loop control to maintain positioning operation even during abrupt load fluctuations and accelerations.

The controller features a variety of functions including the teaching function, push function, area output function and absolute function, thereby achieving a high-performance, high-functional motorized cylinder that is easy to use.

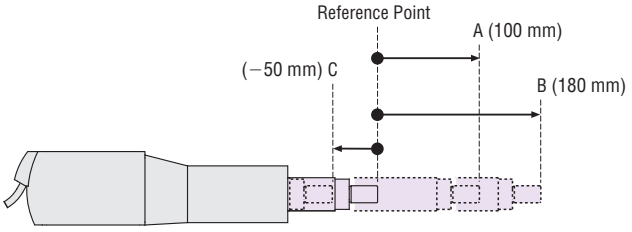


Offering Features That Add Greater Convenience to Positioning Function

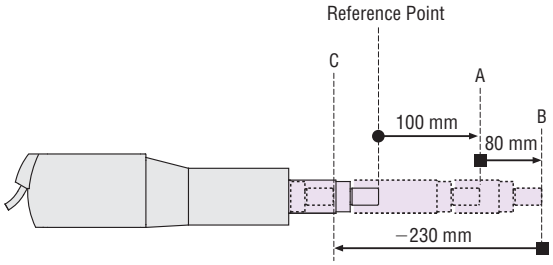
This controller is capable of controlling a cylinder, without tuning. It lets you use high-performance functions through simple operations.

Two Modes to Set Positioning Data Setting

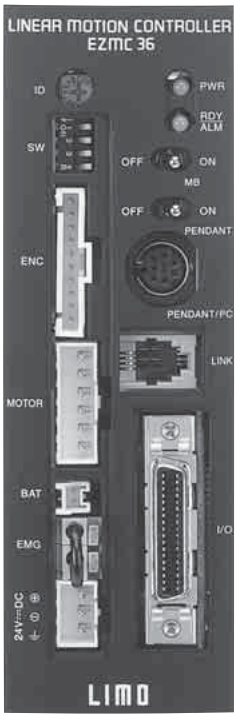
Data can be set in the absolute mode (absolute-position specification) or the incremental mode (incremental-position specification).



Absolute Mode:
The absolute position (distance) from the reference point is set.



Incremental Mode:
The position achieved by the motor after the last movement (= current position) is defined as the starting point for the next movement.



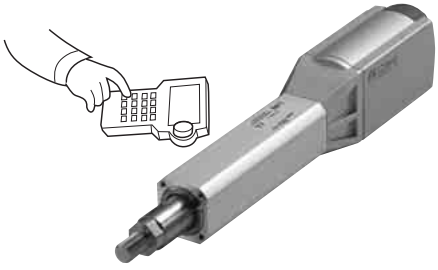
You can easily perform all tasks from data setting to actual operation by using our teaching pendant or data editing software.

●Teaching Pendant
(Sold separately)
EZT1

●Data Editing Software
(**EZC** Series only, sold separately)
EZED1

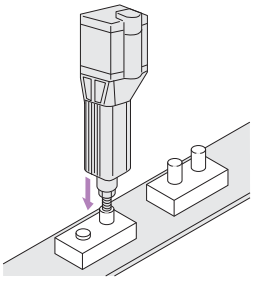
Teaching Function

You can directly move the rod to a desired position and store the position obtained, or use a teaching pendant to move the rod to a desired position and then store it.



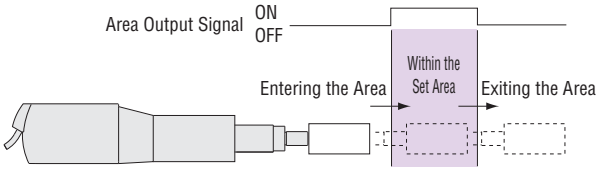
Push Function

The rod can be held steadily pushed against the load.



Area Output Signal

A signal is output when the cylinder rod enters a set area.



Linked Operation

By linking multiple sets of operation data, all you need is to input a start signal. You can then change the cylinder speed without physically stopping the cylinder.

Function for Automatic Control of an Electromagnetic Brake

The controller automatically controls the electromagnetic brake during operation and when stopping.

How to Read Specifications

Motorized Cylinders EZ limo EZC Series

Model	Incremental Type	EZC4-□CI			EZC4-□MCI			EZC6-□CI			EZC6-□MCI		
	Absolute Type	EZC4-□CA			EZC4-□MCA			EZC6-□CA			EZC6-□MCA		
Motor Type		Stepping Motor with Encoder											
Drive Method		Rolled Ball Screw											
Electromagnetic Brake		Not equipped			Equipped			Not equipped			Equipped		
Speed Range	mm/s	~100	~200	~300	~100	~200	~300	~100	~200	~300	~100	~200	~300
Max. Transportable Mass	kg Horizontal Direction ①	—											
	kg Vertical Direction ②	—			4.5	4	2	—			10	8	3
Max. Acceleration	m/s² Horizontal Direction ③	—											
	m/s² Vertical Direction ④	—			2			—			2		
Max. Thrust Force	N ⑤	45	40	23	45	40	23	100	94	35	100	94	35
Push Force	N ⑥	45 (Speed: 6 mm/s or less)						100 (Speed: 6 mm/s or less)					
Max. Holding Force	N Power ON ⑦	45						100					
	N Power OFF ⑧	—											
	N Electromagnetic Brake ⑨	—			45			—			100		
Repetitive Positioning Accuracy	mm ⑩	±0.02											
Resolution	mm ⑪	0.015											
Lead	mm ⑫	12											
Stroke	mm ⑬	50, 100, 200, 300											
Cylinder Mass [Stroke: Mass] Figure in the parentheses shows the mass of the model with electromagnetic brake.	kg	50: 1.6 (1.8) 200: 2.4 (2.6)			100: 1.9 (2.1) 300: 2.9 (3.1)			50: 3.2 (3.6) 200: 4.5 (4.9)			100: 3.6 (4.0) 300: 5.5 (5.9)		

①Maximum Transportable Mass (Horizontal direction)
In a horizontal direction, the value cannot be shown because it varies by frictional resistance of load supporting mechanism.

②Maximum Transportable Mass (Vertical direction)
Maximum mass that can be moved under rated conditions in the vertical direction.

③Maximum Acceleration (Horizontal direction)
Maximum acceleration rate allowed to move with the maximum transportable mass in the horizontal direction.
For motorized cylinder, the value cannot be shown.

④Maximum Acceleration (Vertical direction)
Maximum acceleration rate allowed to move with the maximum transportable mass in the vertical direction.

⑤Maximum Thrust Force
Maximum thrust force at constant speed with no load.

⑥Push Force
Maximum push force during a push operation in which a load is pressed continuously.

⑦Maximum Holding Force at Excitation
Maximum holding force with the power on.

⑧Maximum Holding Force at Non-Excitation
Maximum holding force with the power off.

⑨Maximum Holding Force (Electromagnetic brake)
Maximum holding force of the electromagnetic brake.

⑩Repetitive Positioning Accuracy
A value indicating the amount of error that generates when positioning is performed repeatedly to the same position in the same direction.

⑪Resolution
Distance the rod moves with one pulse input.

⑫Lead
Distance the rod moves linearly in one motor shaft rotation.

⑬Stroke
Maximum distance the load can be moved.

Glossary

Cylinder

Acceleration/Deceleration Rate

Acceleration rate indicates the change in speed per unit time. Acceleration rate is expressed in "m/s^2" when the international system of units (SI) is followed, or in the gravitational unit of "G" based on gravitational acceleration rate. The conversion formula is as follows:

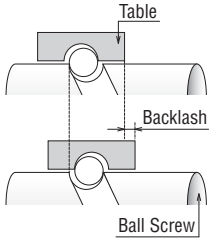
1 G ≒ 9.807 m/s^2

With Oriental Motor's controllers (except for linear motion controllers), acceleration rate is referred to as "acceleration/deceleration rate." The unit of acceleration/deceleration rate is ms/kHz. The conversion formula is as follows:

$$\text{Acceleration/deceleration rate [ms/kHz]} = \frac{\text{Resolution [mm]} \times 10^3}{\text{Acceleration rate [m/s}^2\text{]}}$$

Backlash

A play along the ball within the raceways of the ball screw and screw nut.



Life

The life of a cylinder is generally affected by the rolling fatigue life of its ball screw etc. When stress is applied repeatedly to the raceways and rolling elements of the ball, flaking (a phenomenon in which the metal surface turns into small scale-like pieces to separate from the base metal) occurs due to material fatigue caused by rolling fatigue. The rolling fatigue life refers to the time until the flaking occurs.
Since the life of each ball screw is varied, a rated life is calculated for each product based on its maximum ratings (maximum transportable mass, maximum speed, etc.) as a reference for calculating the product's life.
The life values specified for our products are not guaranteed. A reference traveling life of the **EZC4**/**EZHC4**/**EZHP4** models is 500 km and **EZC6**/**EZHC6**/**EZHP6** models is 3000 km.

Lost Motion

The difference between positions achieved by repeated positioning operations to the same positioning point performed in the positive and negative directions.

Operation Duty

The ratio of the time spent by the cylinder to perform one operation to the time during which it is stopped (= operating ratio of the motor).
Oriental Motor's cylinders should be used at an operation duty of not more than 50%. If the operation duty exceeds 50%, the motor surface temperature may rise to 100°C or above and the motor life will be reduced as a result.
If the ambient temperature remains at or below the maximum allowable ambient temperature specified for each product +40°C, the motor surface temperature should not exceed 100°C as long as the operation duty remains 50% or below. If the operation duty will exceed 50%, take appropriate measures to keep the motor surface temperature under 100°C.

Overhung Load

Overhung load is the load applied in a direction perpendicular to the output shaft (rod) of the cylinder. Do not apply an overhung load to **EZC**, **EZHC** and **EZHP** Series cylinders.

Repetitive Positioning Accuracy

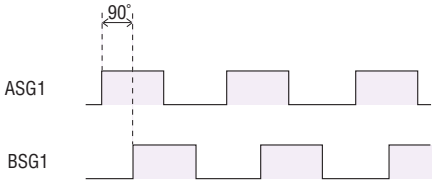
A value indicating the amount of error that generates when positioning is performed repeatedly to the same position in the same direction.

Linear Motion Controller

A-Phase/B-Phase Output

While the cylinder rod is moving, A-phase and B-phase pulses are output continuously.
•A-phase output: The rod position can be monitored by counting the number of output pulses.
•B-phase output: The B-phase output has a 90° phase difference compared with the A-phase output.

The traveling direction of the rod can be identified from the B-phase output level at the leading edge of the A-phase output pulse.



DIR.-A Pulse Input (2-pulse input)

ASG1 output: Pulses corresponding to cylinder operation are output.
BSG1 output: This output is used to identify the traveling direction of the rod. There is a 90° phase difference compared with the ASG1 output. The traveling direction of the rod can be identified from the BSG1 output level at the leading edge of the ASG1 output pulse.

●Controller Mode, Driver Mode

•Controller mode: A mode in which data stored in the controller is used to operate the cylinder.
•Driver mode: A mode in which pulse signals output from user's controller are used to operate the cylinder.

●Control Power Supply

This power supply is needed to use the controller's control functions such as data setting and operation execution. Always connect a control power supply.

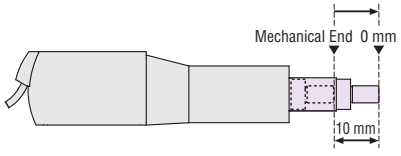
●HOMELS (Home sensor)

This sensor is used to determine the reference point in positioning operation. It is used during return to home operation in 3-sensor mode.

●Home Offset

A home offset is used to define the home (current position = 0 mm) at a position away by a certain distance from the position detected in return to home operation (mechanical end or ±LS or HOMELS position).
When a home offset is set, the cylinder will complete return to home operation and then automatically move to the home offset position before stopping.
This setting is useful when you wish to set the home at a position away from a mechanical end or when a sensor cannot be installed in the position you wish to set as the home.

(Example) Home offset = 10 mm
Return to home operation = Sensorless mode



A position 10 mm away from the mechanical end is set as the home.

●I/O Power Supply

This power supply is needed to use I/O signals such as START input and END output. Always connect an I/O power supply.

●+LS/−LS

These are limit sensors in the positive and negative directions. They are used to prevent the cylinder rod from exceeding the rod limit position.
When a +LS or −LS sensor signal is detected, the operation will stop and an alarm will generate. During return to home operation in 2-sensor mode, the position at which a +LS or −LS sensor signal is detected can be used as the home.

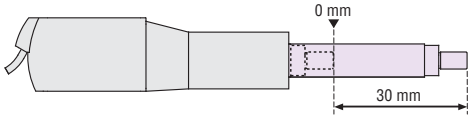
●Main Power Supply

This power supply is needed to drive the motor.

●Preset

A preset is used to change the predefined current position. You can enter a desired preset position.

(Example) When the preset position is set to 0 mm
①Stop the cylinder rod at the 30 mm position, and then turn the preset input ON.



②In each positioning operation performed after ①, the position achieved in ① is used as the 0 mm position.

●Return to Home Operation

An operation to confirm the home (current position = 0 mm) for positioning operation. Return to home operation is performed in one of the following three modes:
•Sensorless mode: The position at which the rod contacts a mechanical end of the cylinder is set as the home. Since no sensor is used, it is also called "sensorless return to home operation."
•2-sensor mode: A return to home operation that uses sensors. The position at which a +LS or −LS sensor signal is detected is set as the home. Which sensor is used as the home is set in the controller.
•3-sensor mode: Three sensors, namely +LS, −LS and HOMELS, are used. In this return to home operation, the position at which a HOMELS sensor signal is detected is set as the home.

●Sensor Power Supply

This power supply is needed when sensors such as ±LS and HOMELS are connected to the controller. Always connect a sensor power supply when sensors are used.

●Soft Limits

The traveling range corresponding to the stroke is predefined in the controller. The upper limit and lower limit of the traveling range set in the controller are referred to as "+ soft limit" and "− soft limit," respectively. If the cylinder rod is operated to a position beyond a soft limit, the rod will stop at the soft limit position and an alarm will generate.

●Software-Based Smooth Drive

A function to perform microstep drive automatically in accordance with operation commands based on input pulses. This function reduces noise and vibration during low speed operations such as return to home operation.

Safety and Standards

Category
A classification into five levels of B and 1 to 4 of the ability to maintain safe function should a safety control system fail.
[Refer to EN 954-1 (ISO 13849-1:1999) for details.]

Emergency Stop
A function to stop the machine with a single human action in order to avoid or reduce potential dangers to the man or damage to the machine or load in process.

In general, an emergency stop circuit is configured by combining mechanical parts such as relays and switches to cut off the power source (or cut off the motor power in the case of a cylinder). Stopping the motor while it is still excited, stopping the motor by controller's stopping function or stopping the motor using a software-operated device such as a programmable controller or personal computer can cause malfunction due to a programming error or noise. By cutting off the motor power by non-software means, an emergency stop can be actuated more reliably.
[Refer to EN 418 (ISO 13850) for details.]

Risk Assessment
A method to enable systematic assessment of potential dangers associated with the machine.
[Refer to EN 1050 (ISO 14121) for details.]

Estimate risks based on the usage of the machine or potential dangers associated with machine itself, and determine the necessary countermeasures. Use the risk assessment result to select the required emergency stop category and control system category.

Machines using the same cylinder may have different risk assessment results depending on the design, installation condition of safety covers over exterior surface and other conditions of each machine. You must conduct risk assessment of your specific machine to select appropriate categories.

Stop Category
Functions to stop a machine are classified into three categories as specified below:

Stop category 0: Stop the machine by directly cutting off the power to the machine's actuator. (In the case of a cylinder, the motor power is cut off.)
Stop category 1: A controlled stop where power is supplied to stop the machine's actuator, and then the power is cut off once the actuator has stopped. (This method is used in situations where suddenly cutting off the motor power may cause other dangers.)
Stop category 2: A controlled stop where power remains supplied to the machine's actuator. (In the case of a cylinder, the cylinder is stopped while the motor is still excited.)

An emergency stop must conform to stop category 0 or 1.
Which category should be selected is determined based on risk assessment of user's equipment.
[Refer to EN 60204-1 (IEC 60204-1) for details.]

Types and Features of Motorized Cylinders

EZC Series
With a 24 VDC input, the **EZC** Series offers high function and easy-to-use operation.

- Lead: 12 mm
- 24 VDC Input

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EZHC Series
Thanks to a ball screw with a lead pitch of 12 mm, the **EZHC** Series achieves a maximum speed of 600 mm/s.

- Lead: 12 mm
- Maximum Speed: 600 mm/s

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EZHP Series
The **EZHP** Series offers high function and high thrust force up to 400 N.

- Lead: 6 mm
- Maximum Thrust Force: 400 N

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Features of Motorized Cylinders
EZ limo EZC/EZHC/EZHP Series

Stylish design that would revolutionize the concept of esthetics in the Factory Automation environment – Easy & Stylish **EZ limo** is a linear-motion system that combines Oriental Motor's pledge to "ultimate user-friendliness," "utilization of the latest motor technology," "pursuit of mechanical design excellence" and "consideration for safety and the environment."

Space-Saving Cable Outlet Orientation
The cable outlet is facing downward, which contributes to the overall space savings by reducing the space needed to wire the cables.

Drive Method: THK's Ball Screw
(The QZ™ lubrication system provides a considerable duration of maintenance-free performance.)
- QZ™ lubrication system (THK): High-density fiber net supplies appropriate amounts of oil, thereby preventing oil waste and reducing environmental burden.

●Adopting a Closed Loop Control
The motor end houses a stepping motor with a rotor position detection sensor. When a condition presenting the possibility of a misstep is detected, the motor performs closed loop control, thereby ensuring stable operation.

●Prevention of Hunting When Stopping
Unlike conventional servomotors, the motor used in the **EZ limo** system is free from hunting.

●Low Vibration/Low Noise Even during Low Speed Operation
The **EZHC/EZHP** Series adopt software-based smooth drive control to suppress vibration and noise even during low speed operation, such as return to home operation.

●Offering a Wide Range of Utilities
Up to 63 positioning data can be set. The system provides a full range of utilities such as a teaching function, push function, area output function, selection of home detection modes and absolute type. **EZ limo** also supports external pulse input, which means you can combine your existing controller with the **EZ limo** system.

Easy Installation
Both the cylinder and controller can be installed easily.
Cylinder: The cylinder can be installed via the dedicated mounting holes.
Controller: The **EZC** Series controllers can be installed with mounting screws or using a DIN rail.
The **EZHC/EZHP** Series controllers come with dedicated mounting brackets.
●Installation ➜ Page D-121

Easy Connection
A connector provides a simple, one-touch connection to the controller.

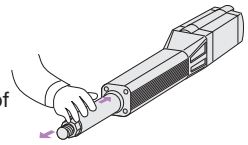
Combining all functions needed to operate a cylinder in positioning mode

●Teaching Function

You can move the rod to a desired position manually or by using the teaching pendant and store that position.

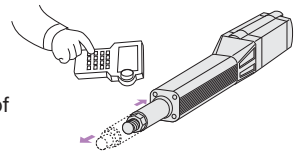
◇Direct Teaching

Turn off the excitation of the motor and move the rod manually to the target position, then store the data of that position as positioning data.



◇Remote Teaching

Use the keys on the teaching pendant to move the rod to the target position, then store the data of that position as positioning data.



●Choice of Incremental Type or Absolute Type

Choose the incremental type if you want to execute home detection each time the power is turned on. The absolute type would be your choice if you want to start operation from the current position rather than the home position, when the power is turned on. Even when the power is cut off, the absolute type follows the movement of the rod and backs up the movement.

◇Absolute Type

EZC Series

Two types of backup settings are available. Select the setting that best suits your application.

Standard backup — Provides a longer backup period.
Optional backup — Provides better speed-follow-up capability position.

EZHC/EZHP Series

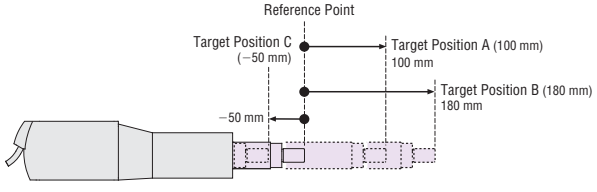
These models provide a long backup period of around 15 days (approx. 360 hours).

●Two Positioning Data Setting Modes

You can set positioning data in the absolute mode or incremental mode, depending on your preferred movement of the equipment.

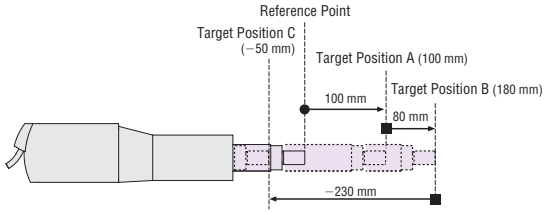
◇Absolute Mode (Absolute-position specification):

Each position is set as the absolute position with respect to the reference point. This is suitable when you want to move the work directly from an arbitrary position to a specified position.



◇Incremental Mode (Relative-position specification):

Each position is relative, being set as an amount of travel from the current position or another target position for the load.
This is suitable in a regular feed or other operation where the same pattern is used repeatedly.



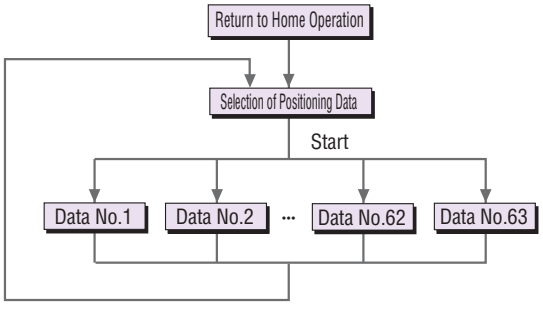
● Travel Amount Setting (Example)

Target Position	Travel Amount Setting	
	Absolute Mode	Incremental Mode
A	100	100
B	180	80
C	−50	−230

●Selective Positioning and Sequential Positioning Two Data Execution Modes

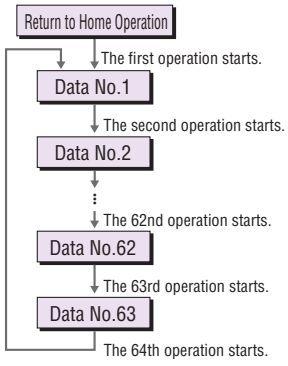
◇Selective Positioning Mode

The set data can be selected at random.



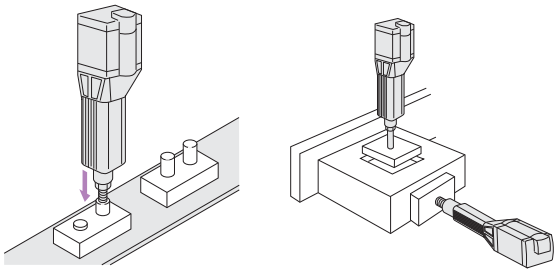
◇Sequential Positioning Mode

Positioning operation is performed sequentially from the desired data.



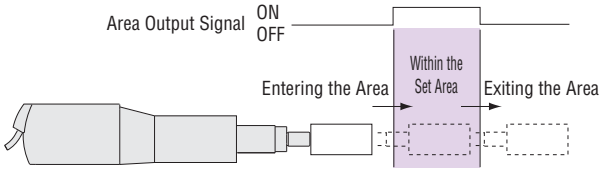
●Push Function

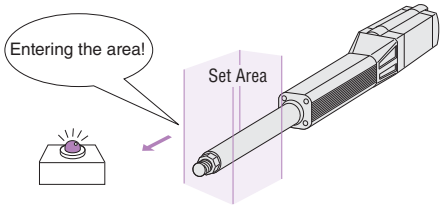
The rod can be held steadily pushed against the work or similar object, as with an air cylinder. The force used to push the load (push force) can be changed. The **EZHC/EZHP** Series allow setting of push width/force data for up to 63 desired points.



●Area Output Function

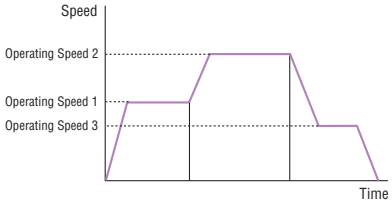
A signal is output when the cylinder rod enters a set range during operation.





●Linked Operation

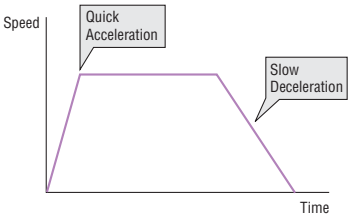
Up to 63 operation data (for **EZC** Series) or 4 operation data (for **EZHC/EZHP** Series) can be linked, thereby allowing the cylinder rod to change speeds without stopping.



•Data with the same operation direction can be linked.

●Separate Acceleration and Deceleration Settings

Acceleration and deceleration can be set separately for each positioning data. This feature is useful in a quick acceleration/slow deceleration operation where the motor rises quickly and then decelerates slowly to a stop. (The opposite pattern – slow acceleration/quick deceleration – is also supported.)



EZC Series:
63 points each for acceleration and deceleration (Can be set for each data)
EZHC/EZHP Series:
1 point each for acceleration and deceleration (Common to all data)

●Choice of Two Return to Home Methods

◇Sensorless Return to Home

Return to home is performed without the use of home sensor. The home position can be adjusted.

◇Return to Home Using Sensors

Return to home is performed using home sensors. The sensors are available as accessories (sold separately).

●Sensor set ➜ Page D-117

Note:

●No space is available inside the actuator for installing the sensors. Use the sensors by installing them externally to the actuator.

●Operation Using External Pulse Input

The **EZ limo** can be combined with your existing controller to serve as a driver controlling the cylinder by pulse input.

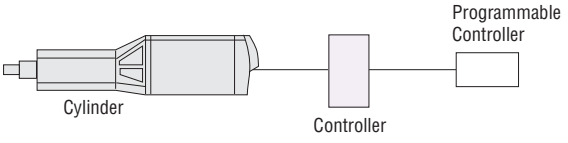
	Controller Mode	Driver Mode
Push Function	●	×
Teaching Function	●	×
Monitoring Function	●	×
Pause Function	●*1	×
Area Output Function	●	×
Absolute System	●	●*2
Sensorless Return to Home	●	×

●: Available ×: Not available

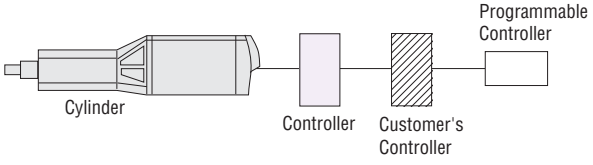
Notes:

●Certain functions cannot be used in the driver mode.
●Provide HOME, +LS and −LS sensors (accessories) and connect them to the controller you want to use.
*1 Only for **EZC** Series
*2 Only for **EZHC/EZHP** Series

●Normal System Configuration Controller Mode



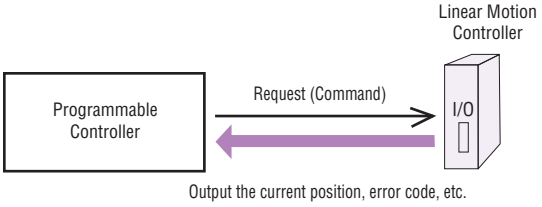
●When Combined with the Customer's Controller Driver Mode



Controller **EMP** Series (pulse generator) required for the operation in the driver mode is available. Controller **EMP400** Series ➜ Page C-274

●Output of Current Position and Error Code (**EZHC/EZHP** Series only)

The current position, error code and certain other data can be output to an external device.



●Simple Unit Setting

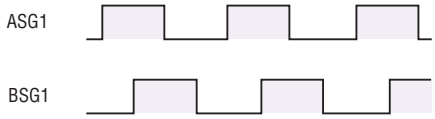
Travel amount, operating speed and acceleration/deceleration can be set directly as mm, mm/s and m/s^2 values, respectively. There is no need for pulse conversion, which allows for more efficient operation of a linear-motion product.

●Continuous Operation via External Signal (**EZHC/EZHP** Series only)

Continuous operation can be performed while an external signal (FWD, RVS) is ON. This mode is ideal when you want to move the load via external control without using the teaching pendant.

●Rod Position Monitor (**EZHC/EZHP** Series only)

A counter or similar device can be connected to monitor the position of the cylinder rod using A-phase/B-phase pulse signal outputs.



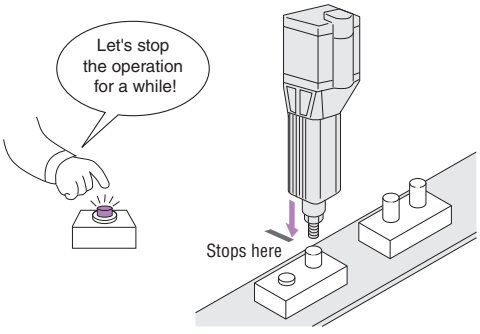
(When the cylinder rod is moving to the counter-motor side.)

Notes:

- The phase difference between A and B is 90° in electrical angle.
- The pulse output accuracy is within ±0.01 mm.
- Pulse output is subject to a maximum delay of 1 msec with respect to the actual movement of the cylinder rod. Use this function to check the stop position.

●Pause Function (**EZC** Series only)

The cylinder can be stopped temporarily during operation, using an external signal. When the pause input signal (PAUSE) is turned ON, the cylinder decelerates to a stop. When the START signal is turned ON again after the signal is turned OFF, the cylinder resumes operation from the position at which it had stopped.



●Pleasant, User-Friendly Operation

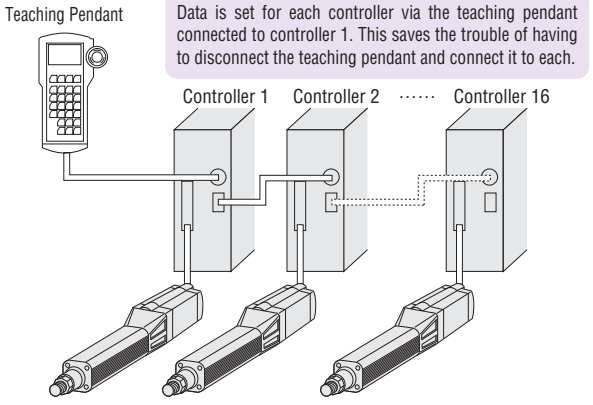
An accessory teaching pendant facilitates data setting and operation.

The LCD monitor is easy to see, and the user-friendly controls ensure pleasant, trouble-free operation. The teaching pendant can be used with different models.

LCD Monitor

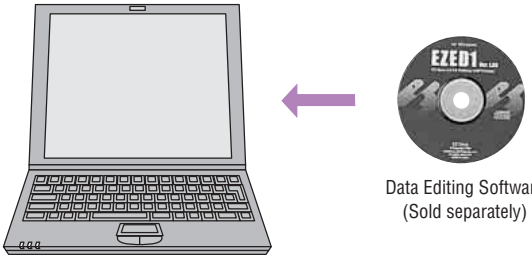
●Connection of Multiple Axes

A maximum of 16 controllers can be connected, with data set separately for each of the controllers. There is no need to connect the teaching pendant to each of the controllers.

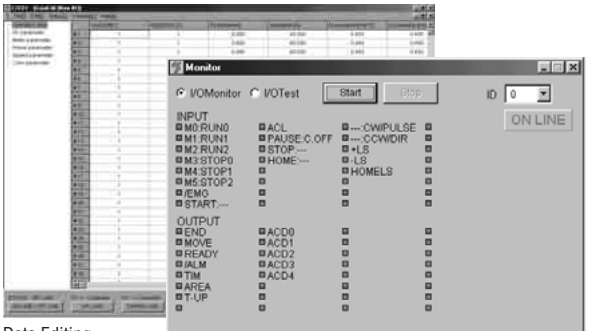


●Easy Data Editing (**EZC** Series only)

You can set and edit various data on a personal computer (PC) using accessory data editing software. The software comes with a PC interface cable (5 m) used to connect the controller and PC. The software also provides various monitoring functions.



Data Editing Software (Sold separately)



Data Editing

Monitoring

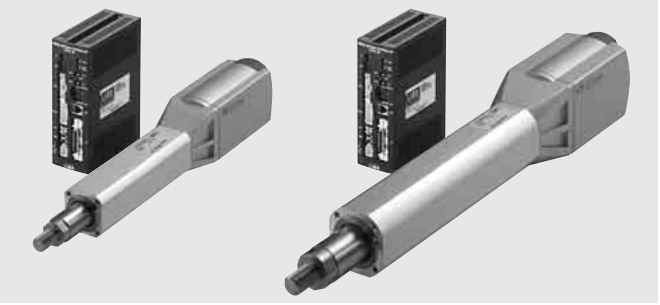
Motorized Cylinders

EZ limo EZC Series

●Additional Information●
Technical reference ➜ Page F-1
Safety standards ➜ Page G-2

CE

●List of safety standard approved products (Model, Standards, File No., Certification Body)
➜ Page G-11



Features

●Adopting a Closed Loop Control

The motor end houses a stepping motor with a rotor position detection sensor. When a condition presenting the possibility of a misstep is detected, the motor performs closed loop control, thereby ensuring stable operation.

●Prevention of Hunting When Stopping

Unlike conventional servomotors, the motor used in the **EZ limo** system is free from hunting.

●Long-Term Maintenance-Free

The drive method uses THK's ball screw, which employs the QZ™ lubrication system. These mechanisms give the system a considerable duration of maintenance-free performance.

●QZ™ lubrication system (THK): High-density fiber net supplies appropriate amounts of oil, thereby preventing oil waste and reducing environmental burden.

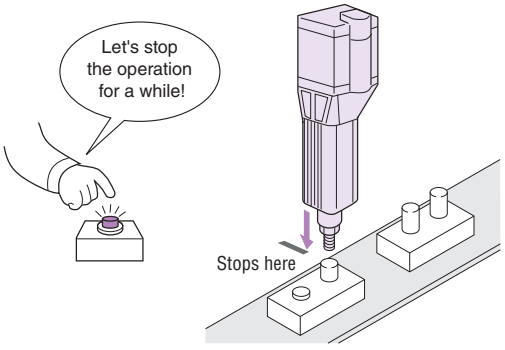
●Space-Saving Cable Outlet Orientation

The cable outlet is facing downward, which contributes to the overall space savings by reducing the space needed to wire the cables.

The cable outlet is facing downward.

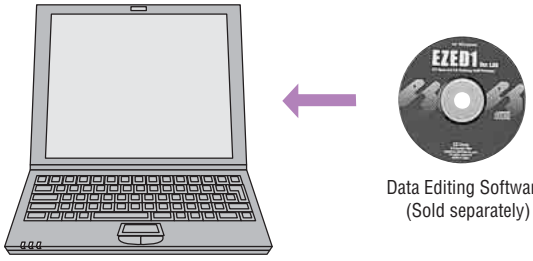
●Pause Function

The cylinder can be stopped temporarily during operation, using an external signal. When the pause input signal (PAUSE) is turned ON, the cylinder decelerates to a stop. When the START signal is turned ON again after the signal is turned OFF, the cylinder resumes operation from the position at which it had stopped.



●Easy Data Editing

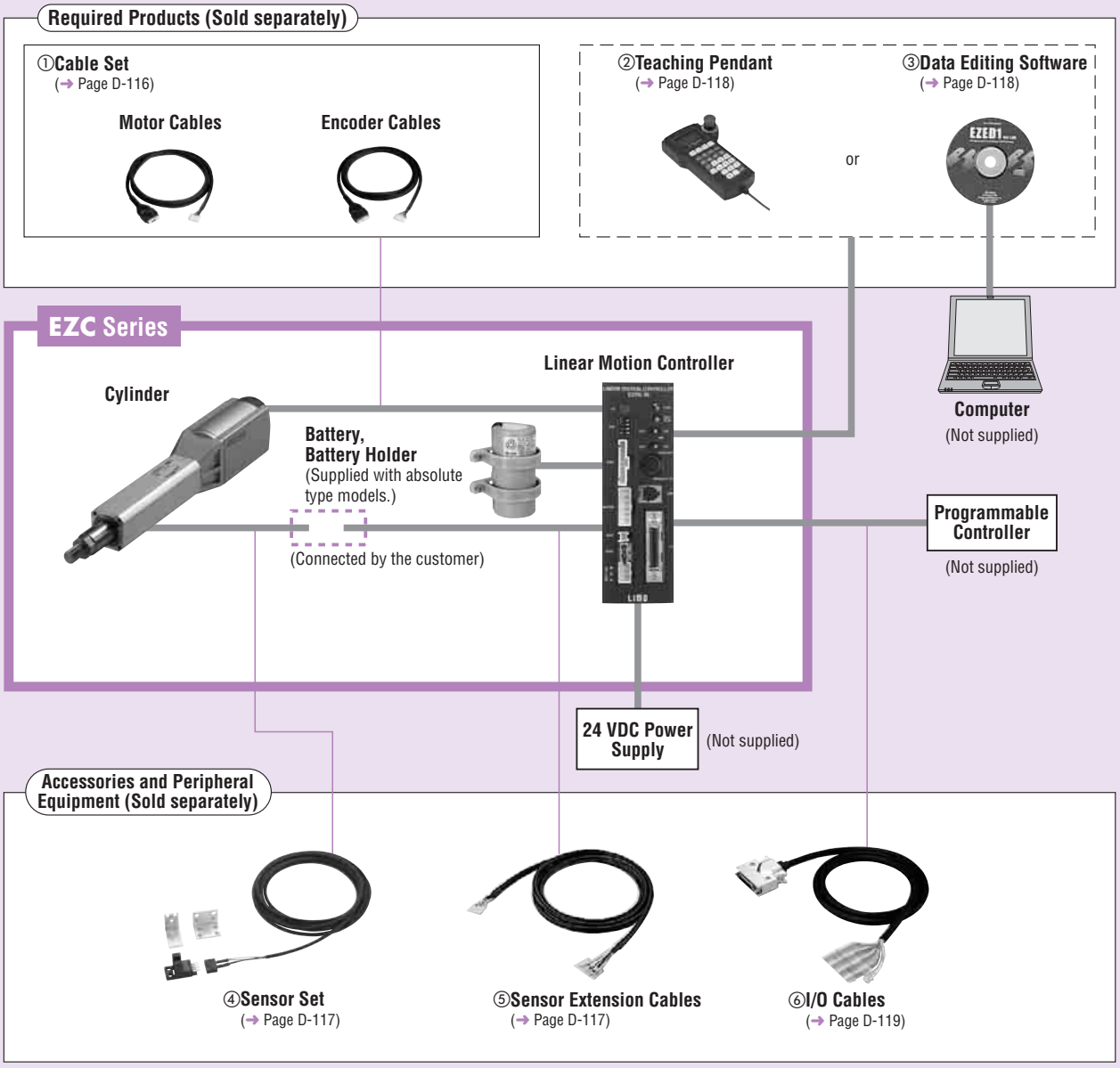
You can set and edit various data on a personal computer (PC) using accessory data editing software. The software comes with a PC interface cable (5 m) used to connect the controller and PC. The software also provides various monitoring functions.



Data Editing Software
(Sold separately)

System Configuration

Controller Mode



No.	Product Name	Overview	Page
①	Cable Set	Cable for extending the wiring distance between the cylinder and linear motion controller (2 to 10 m). Each set consists of a motor cable and an encoder cable.	D-116
②	Teaching Pendant	This pendant (**EZT1**) lets you set and operate various data at your fingertips. Cable length 5 m.	D-118
③	Data Editing Software	This software (**EZED1**) lets you set and edit various data on a computer. Comes with a dedicated communication cable (5 m).	D-118
④	Sensor Set	Three sets of sensors, mounting brackets and cables with connector (2 m), as well as a shielding plate.	D-117
⑤	Sensor Extension Cables	Cable used for connection between the linear motion controller and the sensor (2 m).	D-117
⑥	I/O Cables	Cable used for connection between the linear motion controller and the host controller (1 m, 2 m).	D-119

●Example of System Configuration

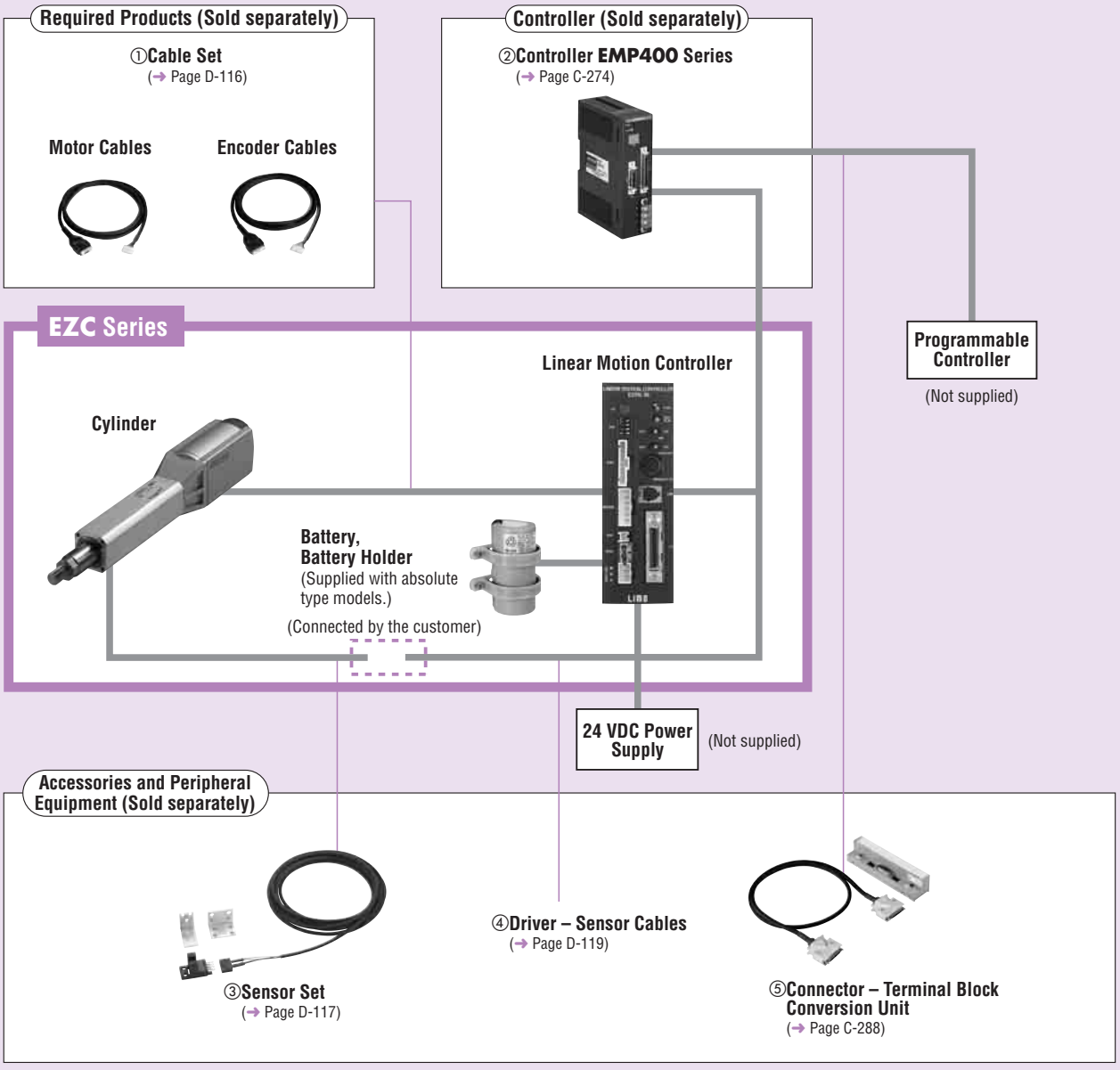
(Sold separately)				(Sold separately)		
EZC Series	Cable Set※1 (2 m)	Teaching Pendant	+	I/O Cable (1 m)	Sensor Extension Cable※2 (2 m)	Sensor Set※2 (2 m)
EZC4-05CA	CC02EZ1	EZT1		CC36D1-1	CC02EZ1-S	PAES-S

※1 Motor cable and encoder cable are available separately. ➜ Page D-116
※2 Not required if return to home operation is performed without sensors.

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

●Driver Mode

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



No.	Product Name	Overview	Page
①	Cable Set	Cable for extending the wiring distance between the cylinder and linear motion controller (2 to 10 m). Each set consists of a motor cable and an encoder cable.	D-116
②	Controller	This controller gives commands needed to drive the cylinder.	C-274
③	Sensor Set	Three sets of sensors, sensor mounting brackets and cables with connector (2 m), as well as a shielding plate.	D-117
④	Driver – Sensor Cables	Cable for connecting the linear motion controller and the **EMP** Series controller (0.5 m).	D-119
⑤	Connector – Terminal Block Conversion Unit	Set of terminal block and cable for connecting the **EMP** Series controller and the host controller (1 m).	C-288

●Example of System Configuration

(Sold separately)			(Sold separately)			
EZC Series	Cable Set* (2 m)	+	Controller	Driver – Sensor Cable (0.5 m)	Sensor Set (2 m)	Connector – Terminal Block Conversion Unit (1 m)
EZC4-05CA	CC02EZ1		EMP401-1	CC005EZ4-EMPD	PAES-S	CC50T1

*Motor cable and encoder cable are available separately. ➜ Page D-116

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

Product Number Code

EZC 4 - 10 M C I

① ② ③ ④ ⑤ ⑥

①	Series	**EZC**: **EZC** Series
②	Cylinder Size	
③	Stroke	**05**: 50 mm **10**: 100 mm **20**: 200 mm **30**: 300 mm
④	Electromagnetic Brake	Blank: Without Electromagnetic Brake **M**: With Electromagnetic Brake
⑤	With Controller	
⑥	Type	**I**: Incremental Type **A**: Absolute Type

Product Line

●Incremental Type

◇Without Electromagnetic Brake

Stroke	Model	Model
50 mm	**EZC4-05CI**	**EZC6-05CI**
100 mm	**EZC4-10CI**	**EZC6-10CI**
200 mm	**EZC4-20CI**	**EZC6-20CI**
300 mm	**EZC4-30CI**	**EZC6-30CI**

◇With Electromagnetic Brake

Stroke	Model	Model
50 mm	**EZC4-05MCI**	**EZC6-05MCI**
100 mm	**EZC4-10MCI**	**EZC6-10MCI**
200 mm	**EZC4-20MCI**	**EZC6-20MCI**
300 mm	**EZC4-30MCI**	**EZC6-30MCI**

●Absolute Type

◇Without Electromagnetic Brake

Stroke	Model	Model
50 mm	**EZC4-05CA**	**EZC6-05CA**
100 mm	**EZC4-10CA**	**EZC6-10CA**
200 mm	**EZC4-20CA**	**EZC6-20CA**
300 mm	**EZC4-30CA**	**EZC6-30CA**

◇With Electromagnetic Brake

Stroke	Model	Model
50 mm	**EZC4-05MCA**	**EZC6-05MCA**
100 mm	**EZC4-10MCA**	**EZC6-10MCA**
200 mm	**EZC4-20MCA**	**EZC6-20MCA**
300 mm	**EZC4-30MCA**	**EZC6-30MCA**

The following items are included in each product.
Cylinder, Linear Motion Controller, Operating Manual, Hexagonal Nut, I/O Connector, Power Supply Cable, Battery*, Battery Holder*
*Only for absolute type

Specifications

Cylinder Specifications

Model		EZC4-□CI			EZC4-□MCI			EZC6-□CI			EZC6-□MCI		
	Absolute Type	EZC4-□CA			EZC4-□MCA			EZC6-□CA			EZC6-□MCA		
Motor Type		Stepping Motor with Encoder											
Drive Method		Rolled Ball Screw											
Electromagnetic Brake		Not equipped			Equipped			Not equipped			Equipped		
Speed Range	mm/s	~100	~200	~300	~100	~200	~300	~100	~200	~300	~100	~200	~300
Max. Transportable Mass	kg Horizontal Direction*	–						–					
	Vertical Direction	–			4.5	4	2	–			10	8	3
Max. Acceleration	m/s² Horizontal Direction	–						–					
	Vertical Direction	–			2			–			2		
Max. Thrust Force	N	45	40	23	45	40	23	100	94	35	100	94	35
Push Force	N	45 (Speed: 6 mm/s or less)						100 (Speed: 6 mm/s or less)					
Max. Holding Force	N Power ON	45						100					
	Power OFF	–											
	Electromagnetic Brake	–			45			–			100		
Repetitive Positioning Accuracy	mm	±0.02											
Resolution	mm	0.015											
Lead	mm	12											
Stroke	mm	50, 100, 200, 300											
Cylinder Mass [Stroke: Mass] Figure in the parentheses shows the mass of the model with electromagnetic brake.	kg	50: 1.6 (1.8) 100: 1.9 (2.1) 200: 2.4 (2.6) 300: 2.9 (3.1)						50: 3.2 (3.6) 100: 3.6 (4.0) 200: 4.5 (4.9) 300: 5.5 (5.9)					

● Enter the stroke length in the box (□) within the model name.

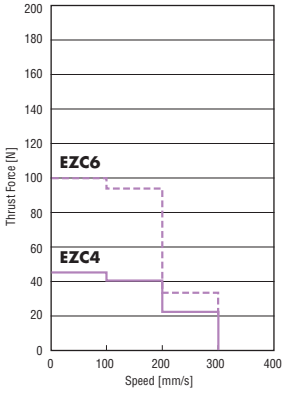
* In a horizontal direction, the value cannot be shown because it varies by frictional resistance of the load supporting mechanism. Always provide an external anti-spin mechanism, such as a guide.

Installation ➜ Page D-121

How to read specifications ➜ Page D-70

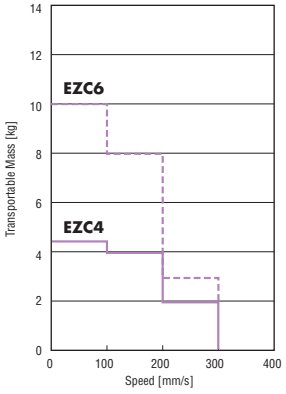
●Correlation Diagram of Speed and Thrust Force

◇Horizontal Direction/Vertical Direction



●Correlation Diagram of Speed and Transportable Mass

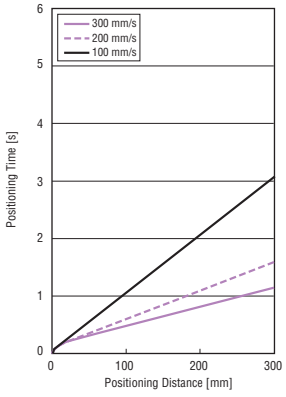
◇Vertical Direction



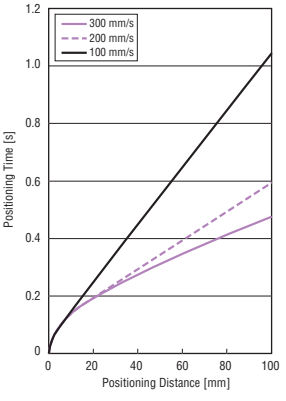
●Positioning Distance – Positioning Time

The positioning time (reference value) can be checked from the positioning distance.
The graphs below represent the characteristics when operated at maximum acceleration and maximum speed.

◇Horizontal Direction/Vertical Direction



Enlargement of Positioning Distance under 100 mm

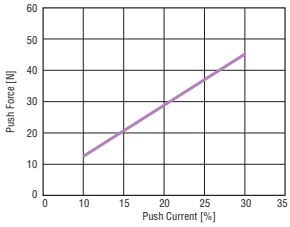


● The starting speed should be 6 mm/s or less.

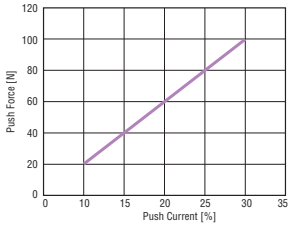
●Push Force

Push force can be set through "Push current setting" in a parameter mode.

◇EZC4



◇EZC6



Notes:

● The above value is a reference, not guaranteed.

● When the cylinder is used in a vertical direction, an external force calculated by multiplying the mass of the load by the rate of gravitational acceleration is applied. Therefore, the cylinder push force must be set so as to accommodate this external force. Measure the push force using an actual load, and set an appropriate push current.

●Specifications of Linear Motion Controller

◇Controller Mode

Model		EZMC36I/EZMC36A
Type		Stored data type
Number of Control Axes		1 axis
Power Supply Input	Voltage	24 VDC±10%
	Current	4.0 A (Controller only: 3.5 A)*
Positioning Data	Setting Mode	Absolute mode (absolute-position specification), Incremental mode (relative-position specification)
	Number	63
	Setting Method	Data is set using the accessory teaching pendant (**EZT1**) or accessory data editing software (**EZED1**). (stored in EEPROM)
Positioning Control	Mode	Sequential positioning, Selective positioning
	Travel Amount Setting Range	−9999.990～+9999.990 mm (value set in units of 0.015 mm)
	Starting Speed Setting Range	0.015～250.000 mm/s (value set in units of 0.015 mm/s)
	Operating Speed Setting Range	0.015～300.000 mm/s (value set in units of 0.015 mm/s)
	Acceleration/Deceleration Rate Setting Range	0.015～150.000 m/s^2 (value set in units of 0.015 m/s^2)
Control Modes		・External input mode (EXT): In this mode, operation by external signal, command position, I/O condition and alarm condition can be monitored. ・Program mode (PRG): In this mode, operation data can be created, changed or cleared. ・Parameter mode (PAR): In this mode, operation parameters and function setting parameters can be set or changed. ・Test mode (TST): In this mode, manual operation and I/O check can be performed.
Operation Modes		Positioning operation, Return to home operation, Linked operation (a maximum of 63 data), Push-motion operation
Input Signals	Input Mode	24 VDC Photocoupler insulation input, Input resistance: 4.7 kΩ
	START	Start the positioning operation.
	STOP	Stop the positioning operation and the return to home operation.
	HOME	Start the return to home operation.
	PAUSE	Pause the operation. (Operation data will be retained.)
	M0～M5	Select the step No.
	ACL	Cancel the protective function currently active.
Output Signals	Output Mode	Transistor output linked to photocoupler 24 VDC, 25 mA or less
	READY	This signal is output when the controller is able to accept operation signals.
	ALM	This signal is output when a protective function has been activated.
	END	This signal is output when a positioning operation or return to home operation has completed.
	MOVE	This signal is output when the cylinder is moving.
	AREA	This output notifies that the moving part of the cylinder is staying inside a specified area.
	T-UP	Output when the push-motion operation has ended.
	ALM0～ALM4	An applicable LED blink count is output when a protective function has been activated.
Protective Functions		Excessive position deviation, Overcurrent protection, Overvoltage protection, Overheat protection, Overload, Motor overheat protection, Motor communication error, Overspeed, Nonvolatile memory error, Sensor error, etc.
Indicators (LED)		Power supply, Status
Cooling Method		Natural ventilation
Mass		0.43 kg

*Take into account safety margin of +0.2 A for the teaching pendant, and/or +0.3 A for the electromagnetic brake type.

◇Driver Mode

Model		EZMC36I/EZMC36A
Power Supply Input	Voltage	24 VDC±10%
	Current	4.0 A (Controller only: 3.5 A)*
Maximum Response Frequency		20 kHz (When the pulse duty is 50%)
Input Signals	Input Mode	5 VDC Photocoupler insulation input, Input resistance: 220 Ω (CW Pulse, CCW Pulse) 24 VDC Photocoupler insulation input, Input resistance: 4.7 kΩ (ACL, RUN0～RUN2, STOP0～STOP2, C.OFF)
	CW Pulse	Operation command pulse input (The operation command pulse input in counter-motor direction in the 2-pulse input mode) Pulse width: 2 μs minimum, Pulse rise/fall: 2 μs maximum (Negative logic pulse input)
	CCW Pulse	Direction of movement input (The operation command pulse input in motor direction in the 2-pulse input mode) Pulse width: 2 μs minimum, Pulse rise/fall: 2 μs maximum (Negative logic pulse input)
	ACL	Cancel the protective function currently active.
	RUN0～RUN2	The three-bit input is used to set the motor's operating current as a percentage of the output current.
	STOP0～STOP2	The three-bit input is used to set the motor's standstill current as a percentage of the output current.
	C.OFF	The current flow to the motor is cut off.
Output Signals	Output Mode	Transistor output linked to photocoupler (The TIM. signal uses a photocoupler output.) 24 VDC, 25 mA or less
	TIM.	Signal is output when the excitation sequence is at step "0." A TIM. signal is output each time the rod moves by 0.24 mm.
	ALM	This signal is output when a protective function has been activated.
	END	This signal is output when a positioning operation or return to home operation has completed.
	ALM0～ALM4	An applicable LED blink count is output when a protective function has been activated.
Protective Functions		Excessive position deviation, Overcurrent protection, Overvoltage protection, Overheat protection, Overload, Motor overheat protection, Motor communication error, Overspeed, Nonvolatile memory error, Sensor error, etc.
Indicators (LED)		Power supply, Status
Cooling Method		Natural ventilation
Mass		0.43 kg

*Take into account safety margin of +0.2 A for the teaching pendant, and/or +0.3 A for the electromagnetic brake type.

General Specifications

This is the value after rated operation under normal ambient temperature and humidity

Item	Motor	Linear Motion Controller
Insulation Resistance	100 MΩ or more when 500 VDC megger is applied between the following places: · Windings – Case · Case – Windings of electromagnetic brake (Only for electromagnetic brake type)	100 MΩ or more when 500 VDC megger is applied between the following places: · FG – Power supply terminal · FG – Signal I/O terminal
Dielectric Strength	Sufficient to withstand the following for 1 minute: **EZC4** · Windings – Case 0.5 kVAC 50 Hz · Case – Windings of electromagnetic brake (Only for electromagnetic brake type) 0.5 kVAC 50 Hz **EZC6** · Windings – Case 1.0 kVAC 50 Hz · Case – Windings of electromagnetic brake (Only for electromagnetic brake type) 1.0 kVAC 50 Hz	Sufficient to withstand the following for 1 minute: · FG – Power supply terminal 0.5 kVAC 50 Hz · FG – Signal I/O terminal 0.5 kVAC 50 Hz
Ambient Temperature	0～+40°C (non-freezing)	
Ambient Humidity	85% or less (non-condensing)	

Note:

● Do not measure insulation resistance or perform the dielectric strength test while the cylinder and linear motion controller are connected.

Battery Specifications (For the absolute type only)

Model	PAEZ-BT
Battery Type	Cylindrical sealed nickel-cadmium storage cell
Nominal Voltage	1.2 V
Rated Capacity	10000 mAh
Mass	430 g
Life	Approx. 4 years※1
Charge Time	48 hours※1
Data Retention Period※1※2	Standard backup: Approx. 96 hours Optional backup: Approx. 70 hours
Ambient Temperature	0～+40˚C (non-freezing)
Ambient Humidity	20～85% (non-condensing)

※1 At an ambient temperature of 20˚C

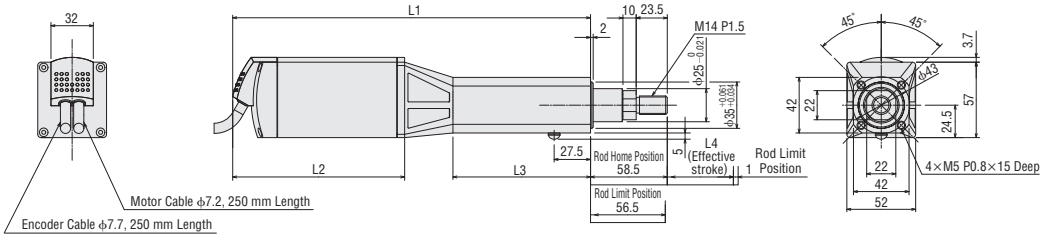
※2 After the power is cut off with the battery fully charged.

Dimensions Unit = mm

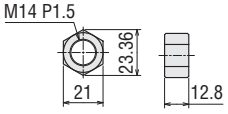
●Cylinder

◇EZC4

Cylinder Model	L1	L2	L3	L4	DXF
EZC4-05	270.5	130	104	50	D396
EZC4-05M	300.5	160			D397
EZC4-10	320.5	130	154	100	D398
EZC4-10M	350.5	160			D399
EZC4-20	420.5	130	254	200	D400
EZC4-20M	450.5	160			D401
EZC4-30	520.5	130	354	300	D402
EZC4-30M	550.5	160			D403

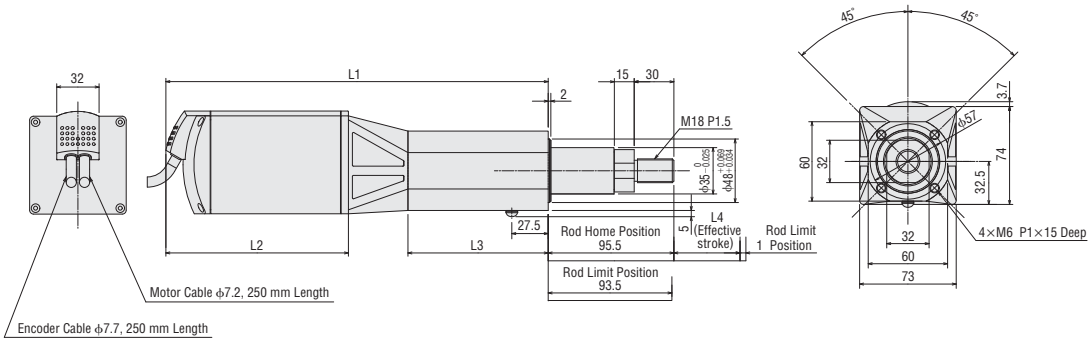


● Nut (1 piece, included)

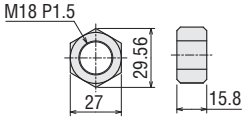


◇EZC6

Cylinder Model	L1	L2	L3	L4	DXF
EZC6-05	289	138	106	50	D404
EZC6-05M	324	173			D405
EZC6-10	339	138	156	100	D406
EZC6-10M	374	173			D407
EZC6-20	439	138	256	200	D408
EZC6-20M	474	173			D409
EZC6-30	539	138	356	300	D410
EZC6-30M	574	173			D411

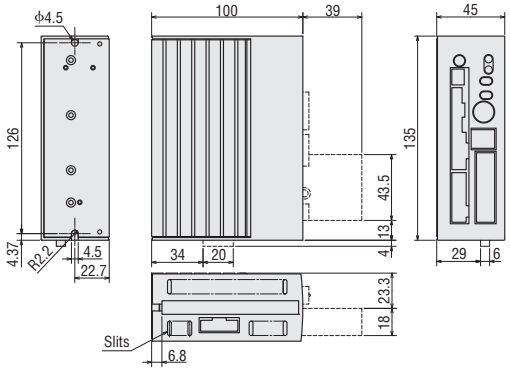


● Nut (1 piece, included)



● Linear Motion Controller

EZMC36I, EZMC36A
Mass: 0.43 kg
DXF D412

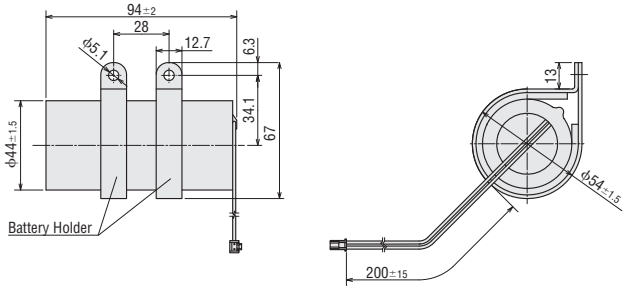


● Control I/O Connector (Included)
Case: 54331-1361 (MOLEX)
Connector: 54306-3619 (MOLEX)

Power Supply Cable 600 mm (Included)

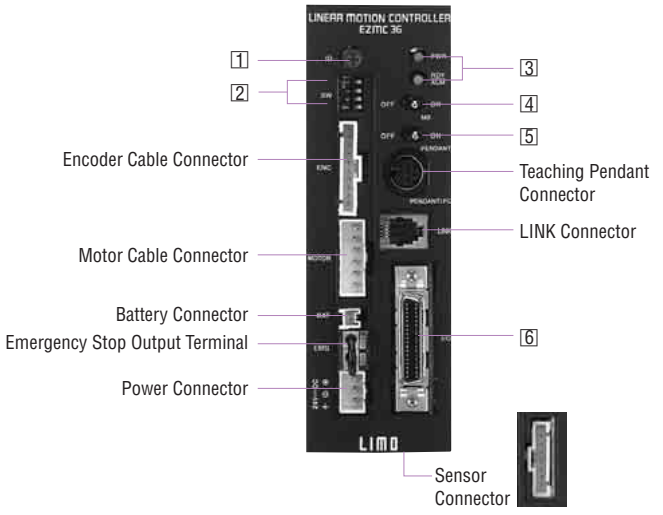
Name	Conductor
+24V	AWG20
GND	AWG20
FG	AWG18

● Battery
(Supplied with absolute type. Battery holder provided.)
Mass: 0.43 kg
DXF D486



Connection and Operation

Names and Functions of Linear Motion Controller Parts

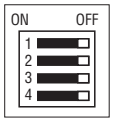


1 Axis-Number Setting Switch

Indication	Function
ID	Set controller axis number

2 Operation-Mode Select Switches

Indication	Function
1	Not used
2	
3	Set pulse input mode (in driver mode) ON: 1-pulse input mode OFF: 2-pulse input mode
4	Switch modes ON: Driver mode OFF: Controller mode



●The area in white indicates the switch position.

●All switches are set to OFF at the time of shipment.

3 LED Indicators

Indication	Color	Function
PWR	Green	Power ON indication
RDY/ALM	Green/Red	Status indication

4 Electromagnetic Brake-Release Switch

Indication	Function
MB	Forcibly switch electromagnetic brake operation modes ON: Actuation OFF: Release

●This switch becomes effective only when a protective function is activated.

5 Teaching Pendant Switch

Indication	Function
PENDANT	Enable/disable the teaching pendant ON: Enable the teaching pendant OFF: Disable the teaching pendant (The emergency stop button on the teaching pendant is also disabled.)

6 I/O Connector

◇Controller Mode

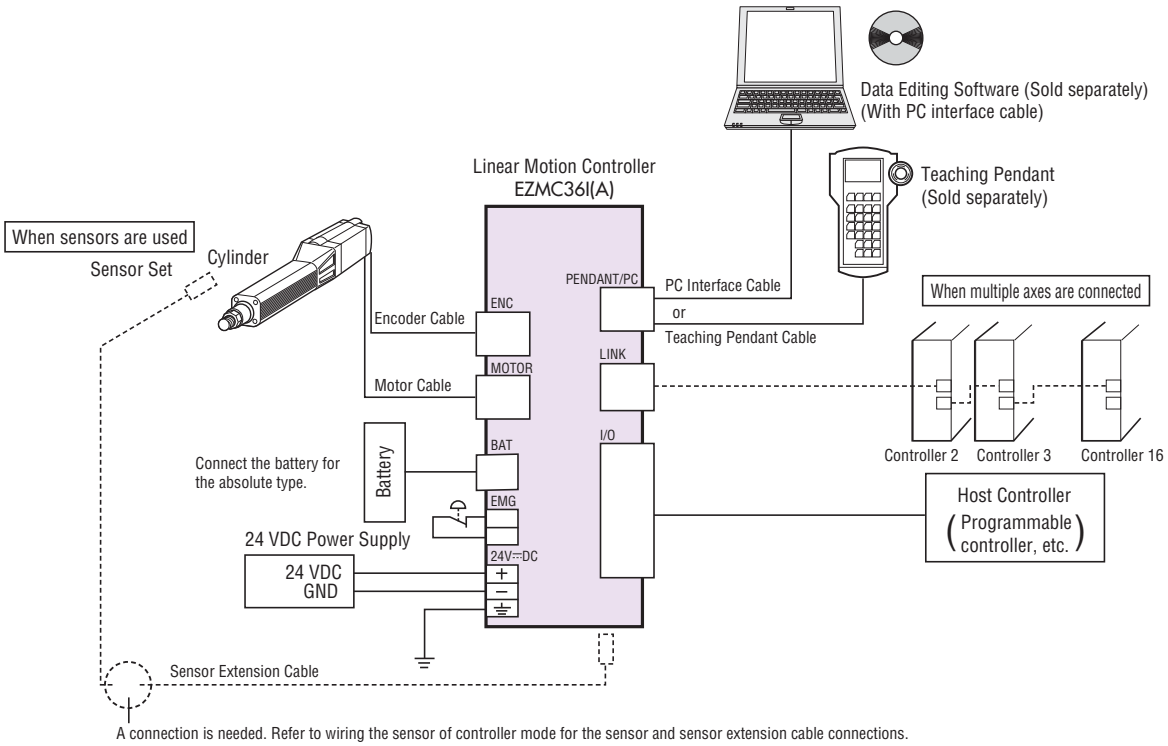
Indication	Input/Output	Pin No.	Signal Name	Function
I/O	Input	23	+COM	Power supply for output signal +24 VDC
		25		
		27	COM	Power supply for input signal +24 VDC
		28		
		24	−COM	Power supply for output signal GND
		26		
	Output	1	READY	Turn ON when the START input can be received.
		2	ALM	Turn ON while the controller is operating normally and turn OFF when the alarm generates.
		4	END	Turn ON when the operation has ended.
		5	MOVE	Turn ON during operation.
		9	AREA	Turn ON when positioning is performed inside the set area or while the set area is being passed.
		10	T-UP	Turn ON during push-motion operation.
		31	ALM0	Alarm information is output in a five-bit code.
		32	ALM1	
		33	ALM2	
		34	ALM3	
		35	ALM4	
	Input	36	ACL	Clear an alarm.
		11	M0	M0～M5 input signals are combined to select a positioning point. (If all signals are OFF, the sequential positioning mode will be selected.)
		12	M1	
		13	M2	
		14	M3	
		15	M4	
		16	M5	
		3	STOP	Stop the operation.
		6	START	Start the positioning operation.
		7	PAUSE	Stop the operation temporarily.
		8	HOME	Perform return to home operation.

◇Driver Mode

Indication	Input/Output	Pin No.	Signal Name	Function
I/O	Input	23	+COM	Power supply for output signal +24 VDC
		25		
		27	COM	Power supply for input signal +24 VDC
		28		
		24	−COM	Power supply for output signal GND
		26		
	Output	2	ALM	Turn ON while the controller is operating normally and turn OFF when the alarm generates.
		4	END	Turn ON when the operation has ended.
		31	ALM0	Alarm information is output in a five-bit code.
		32	ALM1	
		33	ALM2	
		34	ALM3	
		35	ALM4	
		21	TIM.+	Indicate that the motor is at the beginning of its excitation sequence (step "0"). This signal is output in sync with the input pulse: the signal is output once whenever the excitation sequence returns to step 0. (The excitation sequence completes one cycle when the cylinder rod has moved by 0.24 mm.)
		22	TIM.−	
	Input	36	ACL	Clear an alarm.
		11	RUN0	RUN0～RUN2 input signals are combined to set the motor operating current.
		12	RUN1	
		13	RUN2	
		14	STOP0	STOP0～STOP2 input signals are combined to set the motor standstill current.
		15	STOP1	
		16	STOP2	
		17	CW+	Move the cylinder rod to the counter-motor side.
		18	CW−	
		19	CCW+	Move the cylinder rod to the motor side.
		20	CCW−	
		7	C.OFF	When this signal is ON, the current flow to the motor is cut off and the holding force generated by motor torque is lost. Turning this signal from ON to OFF does not change the motor's excitation sequence.

Features D-78 / System Configuration D-79 / Product Line D-81

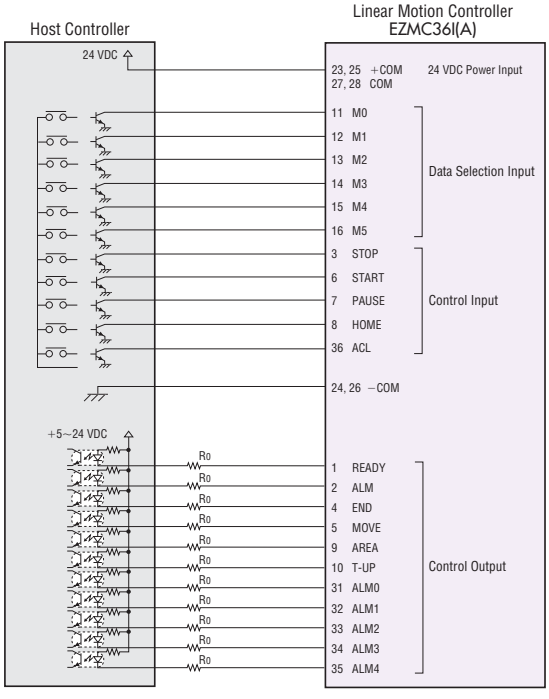
●Connection Diagram



A connection is needed. Refer to wiring the sensor of controller mode for the sensor and sensor extension cable connections.

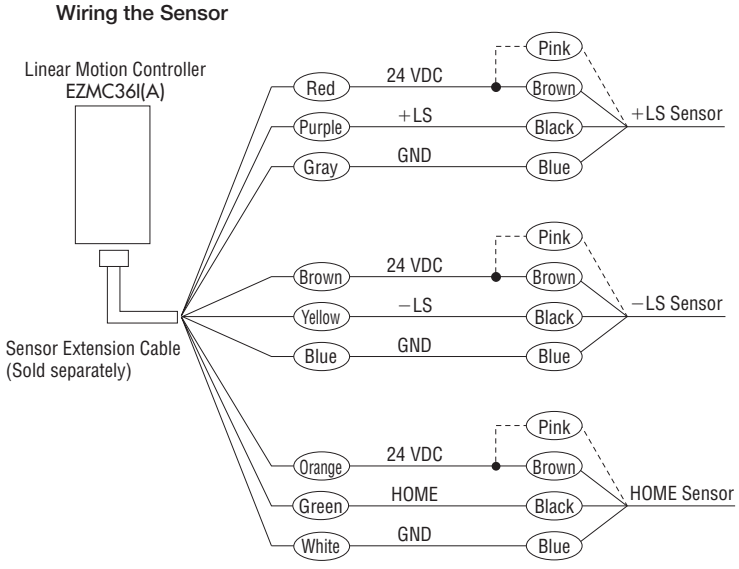
●Connection to Host Controller

◇Controller Mode



●Refer to page D-88 for the conditions of external resistor Ro.

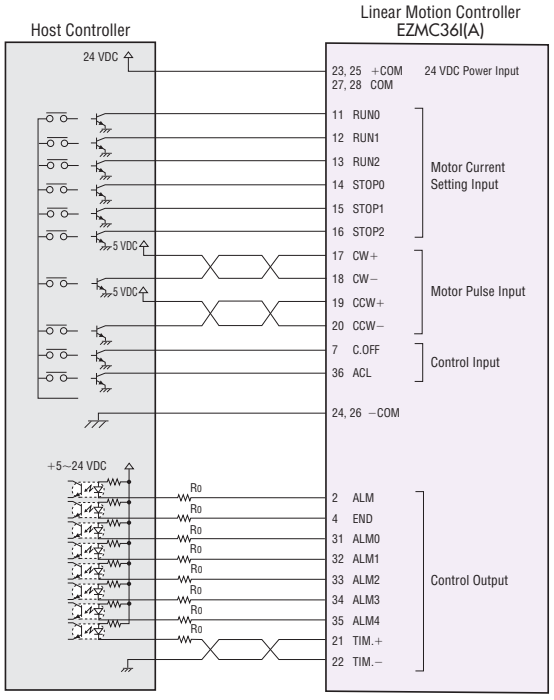
Wiring the Sensor



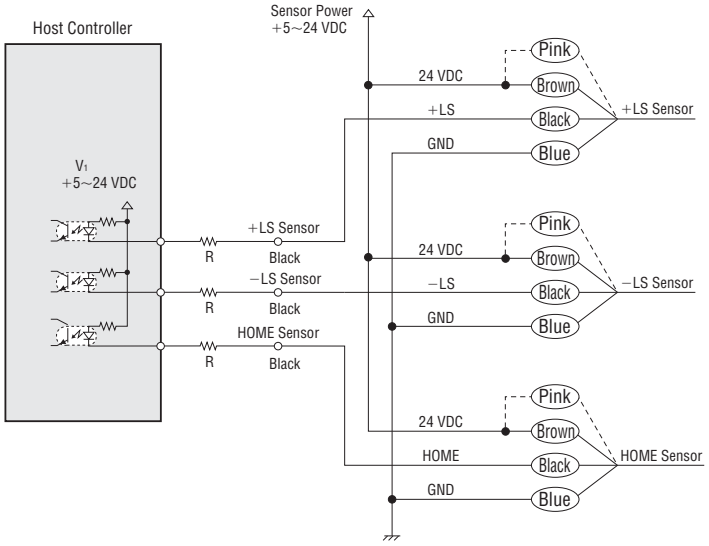
●The 24 VDC output from the controller is used to drive the sensors. Do not use it as a power supply for any item other than the sensors.

●Connect the pink lead to the brown lead when the sensor logic is N.C. (normally closed). The pink lead is not connected when the sensor logic is N.O. (normally open).

◇Driver Mode



Wiring the Sensor



- V_1 must be between 5 VDC and 24 VDC. The current must be 100 mA or less. If the current exceeds 100 mA, connect an external resistor R.
- Connect the pink lead to the brown lead when the sensor logic is N.C. (normally closed). The pink lead is not connected when the sensor logic is N.O. (normally open).

◇Power Supply

- Use a 24 VDC power supply with a capacity of 4.0 A or more.
- If the power capacity is insufficient, motor output may drop, which may cause the cylinder to malfunction (due to lack of thrust force).

◇Power Supply to +COM

- Use a power supply with a capacity of 24 VDC, 100 mA or more.

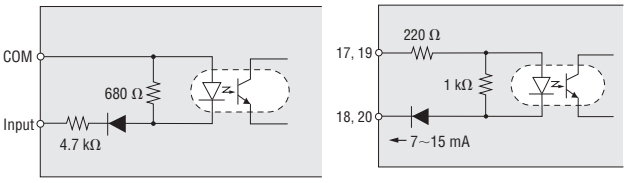
◇Output Signal Connection

- Output signal voltage must be between 5 VDC and 24 VDC. The current must be 25 mA or less. If the current exceeds 25 mA, connect an external resistor R_0.

◇Notes on Wiring

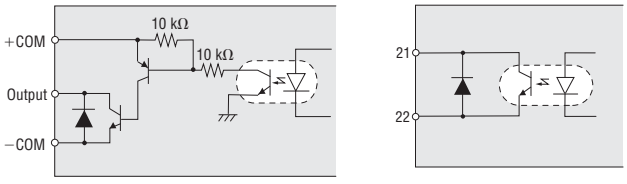
- Wire the control I/O signal lines over as short a distance as possible, using a shielded cable (AWG28 or thicker).
- When it is necessary to have a connection more than 250 mm between cylinder and linear motion controller, the accessory motor cable and encoder cable must be used.
- Wire the control I/O signal lines by providing a minimum distance of 300 mm from the power lines (large-current circuits such as the power supply line and motor line). Do not wire the control I/O signal lines with the power lines in the same duct or bundle them together.

Input Circuit



●Controller Mode Pin No.		●Driver Mode Pin No.		●Driver Mode Pin No.	
36	ACL	36	ACL	17	CW+
11~16	M0~M5	11~13	RUN0~RUN2	18	CW−
3	STOP	14~16	STOP0~STOP2	19	CCW+
6	START	7	C.OFF	20	CCW−
7	PAUSE				
8	HOME				

Output Circuit



●Controller Mode Pin No.		●Driver Mode Pin No.		●Driver Mode Pin No.	
1	READY	2	ALM	21	TIM.+
2	ALM	4	END	22	TIM.−
4	END	31~35	ALM0~ALM4		
5	MOVE				
9	AREA				
10	T-UP				
31~35	ALM0~ALM4				

●Description of Input/Output Signals

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

Input (output) "ON" indicates that the current is sent into the photocoupler (transistor) inside the linear motion controller. Input (output) "OFF" indicates that the current is not sent into the photocoupler (transistor) inside the linear motion controller.

Photocoupler OFF ON

◇Controller Mode

START Input Signal

When a START signal is input following selection of positioning operation data, operation corresponding to the selected positioning operation data will start.

STOP Input Signal

This input is used to stop the moving cylinder.
The input logic for STOP signal as well as stopping pattern can be changed via the teaching pendant.

HOME Input Signal

When a HOME signal is input, the cylinder will start return to home operation.

PAUSE Input Signal

This input is used to pause the moving cylinder. (Operation data will be retained.) To resume the operation, switch the PAUSE signal to OFF and then turn the START signal ON.

M0～M5 Input Signals

Operation data to be used in positioning operation can be selected by a combination of ON/OFF settings of the six signals from M0 to M5.

M5	M4	M3	M2	M1	M0	Data to be selected
OFF	OFF	OFF	OFF	OFF	OFF	Sequential positioning operation
OFF	OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	OFF	ON	OFF	2
⋮	⋮	⋮	⋮	⋮	⋮	⋮
ON	ON	ON	ON	OFF	ON	61
ON	ON	ON	ON	ON	OFF	62
ON	ON	ON	ON	ON	ON	63

ACL Input Signal

This input reverts to the normal ON condition the ALM signal that has been turned OFF following an activation of the controller's protective function.

READY Output Signal

This output notifies whether or not the controller is able to accept cylinder operation commands. When the READY signal is ON, the controller accepts the inputs of the M0 to M5 signals, START signal and HOME signal.

MOVE Output Signal

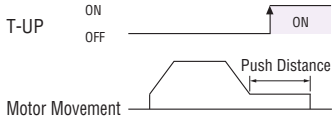
This output indicates that the cylinder is in operating condition and turns ON when the cylinder is moving.

AREA Output Signal

This output notifies that the moving part of the cylinder is inside a specified area (between the upper and lower limits) and turns ON when the moving part of the cylinder is inside this area. A desired area can be set via the teaching pendant. This signal is output at all time regardless of whether the cylinder is moving or stopped.

T-UP Output Signal

This output notifies that a push-motion operation has completed. The T-UP output turns ON when the load is pressed against the cylinder within the push distance.

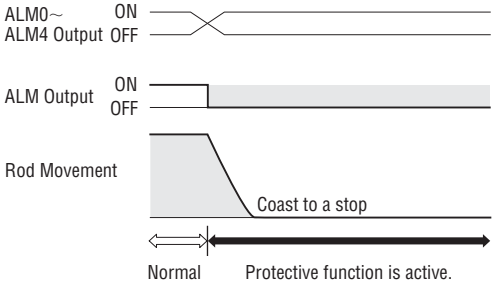


END Output Signal

This output notifies that the positioning operation or return to home operation of the cylinder has completed. This signal is output when the rod is stopped after completion of an applicable operation.

ALM Output Signal

This output notifies that the controller's protective function has been activated. The ALM output remains ON while the controller is operating normally, and turns OFF when a protective function has been activated. When an ALM signal is output, an applicable ALM code (ALM0 to ALM4) will also be output.



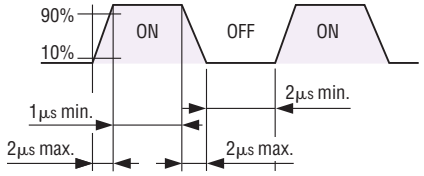
ALM0～ALM4 Output Signals

These signals are output when an ALM signal is output to notify, as an LED blink count, the protective function that has triggered the ALM output.

◇Driver Mode

PLS (CW), DIR (CCW) Input Signals

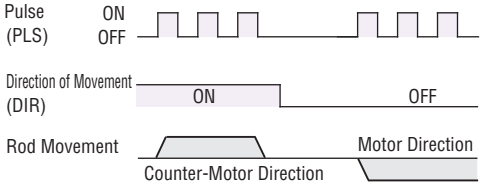
Pulse Waveform Characteristics



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

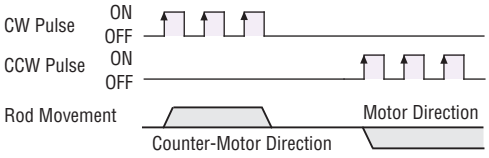
•1-Pulse Input Mode

- The 1-pulse input mode uses “Pulse” (PLS) and “Direction of Movement” (DIR) signals.
- When DIR signals are ON, the cylinder rod moves to counter-motor side.
- When DIR signals are OFF, the cylinder rod moves to motor side.



•2-Pulse Input Mode

- When CW pulses are input, the cylinder rod moves to counter-motor side.
- When CCW pulses are input, the cylinder rod moves to motor side.



RUN0～RUN2 Input Signals

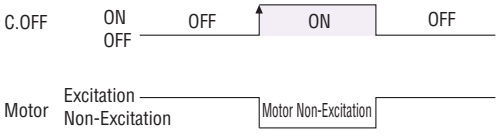
These inputs are used to set the motor's operating current. The internal setting of operating current can be changed via the teaching pendant. Input these signals externally to reduce the operating current when an ample cylinder thrust is available and you want to reduce the vibration during operation or suppress heat generation from the motor. However, since the thrust force and holding force will decrease roughly in proportion to the operating current, pay attention not to set the current excessively low.

STOP0～STOP2 Input Signals

These inputs are used to set the motor's standstill current. The internal setting of standstill current can be changed via the teaching pendant. Input these signals externally to reduce the standstill current when an ample cylinder thrust is available and you want to suppress heat generation from the motor. However, since the thrust force and holding force will decrease or starting characteristics will drop roughly in proportion to the standstill current, pay attention not to set the current excessively low.

C.OFF Input Signal

Turning the C.OFF input ON will cut off the output current to the motor. (The motor will no longer generate a holding force on the cylinder.)
To operate the cylinder, turn the C.OFF input OFF.

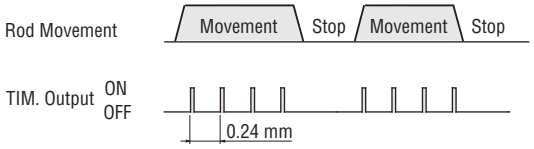


ACL Input Signal

This input reverts to the normal ON condition the ALM signal that has been turned OFF following an activation of the controller's protective function.

TIM. Output Signal

This output turns ON when a "Timing" signal is output. A TIM. signal is output each time the rod moves by 0.24 mm.

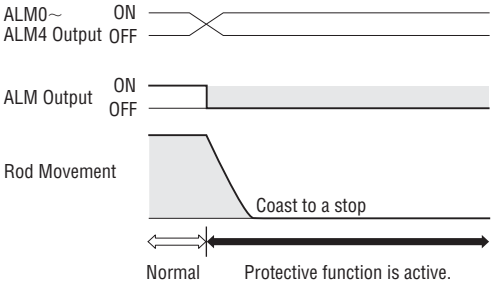


END Output Signal

This output notifies that the positioning operation or return to home operation of the cylinder has completed. This signal is output when the rod is stopped after completion of an applicable operation.

ALM Output Signal

This output notifies that the controller's protective function has been activated. The ALM output remains ON while the controller is operating normally, and turns OFF when a protective function has been activated. When an ALM signal is output, an applicable ALM code (ALM0 to ALM4) will also be output.



ALM0～ALM4 Output Signals

These signals are output when an ALM signal is output to notify, as an LED blink count, the protective function that has triggered the ALM output.

List of Cylinder and Controller Combinations

Model names for cylinder and linear motion controller combinations are shown below.

Type	Electromagnetic Brake	Model	Cylinder Model	Linear Motion Controller Model
Incremental Type	Not equipped	**EZC4-□CI**	EZC4-□	EZMC36I
	Equipped	**EZC4-□MCI**	EZC4-□M	
Absolute Type	Not equipped	**EZC4-□CA**	EZC4-□	EZMC36A
	Equipped	**EZC4-□MCA**	EZC4-□M	
Incremental Type	Not equipped	**EZC6-□CI**	EZC6-□	EZMC36I
	Equipped	**EZC6-□MCI**	EZC6-□M	
Absolute Type	Not equipped	**EZC6-□CA**	EZC6-□	EZMC36A
	Equipped	**EZC6-□MCA**	EZC6-□M	

● Enter the stroke length in the box (□) within the model name.

Motorized Cylinders

EZ limo EZHC Series

●Additional Information●
Technical reference ➜ Page F-1
Safety standards ➜ Page G-2

CE

●List of safety standard approved products (Model, Standards, File No., Certification Body)
➜ Page G-11

Features

●Adopting a Closed Loop Control

The motor end houses a stepping motor with a rotor position detection sensor. When a condition presenting the possibility of a misstep is detected, the motor performs closed loop control, thereby ensuring stable operation.

●Prevention of Hunting When Stopping

Unlike conventional servomotors, the motor used in the **EZ limo** system is free from hunting.

●Low Vibration/Low Noise Even during Low Speed Operation

The **EZHC** Series adopts software-based smooth drive control to suppress vibration and noise even during low speed operation, such as return to home operation.

●Long-Term Maintenance-Free

The drive method uses THK's ball screw, which employs the QZ™ lubrication system. These mechanisms give the system a considerable duration of maintenance-free performance.

● QZ™ lubrication system (THK): High-density fiber net supplies appropriate amounts of oil, thereby preventing oil waste and reducing environmental burden.

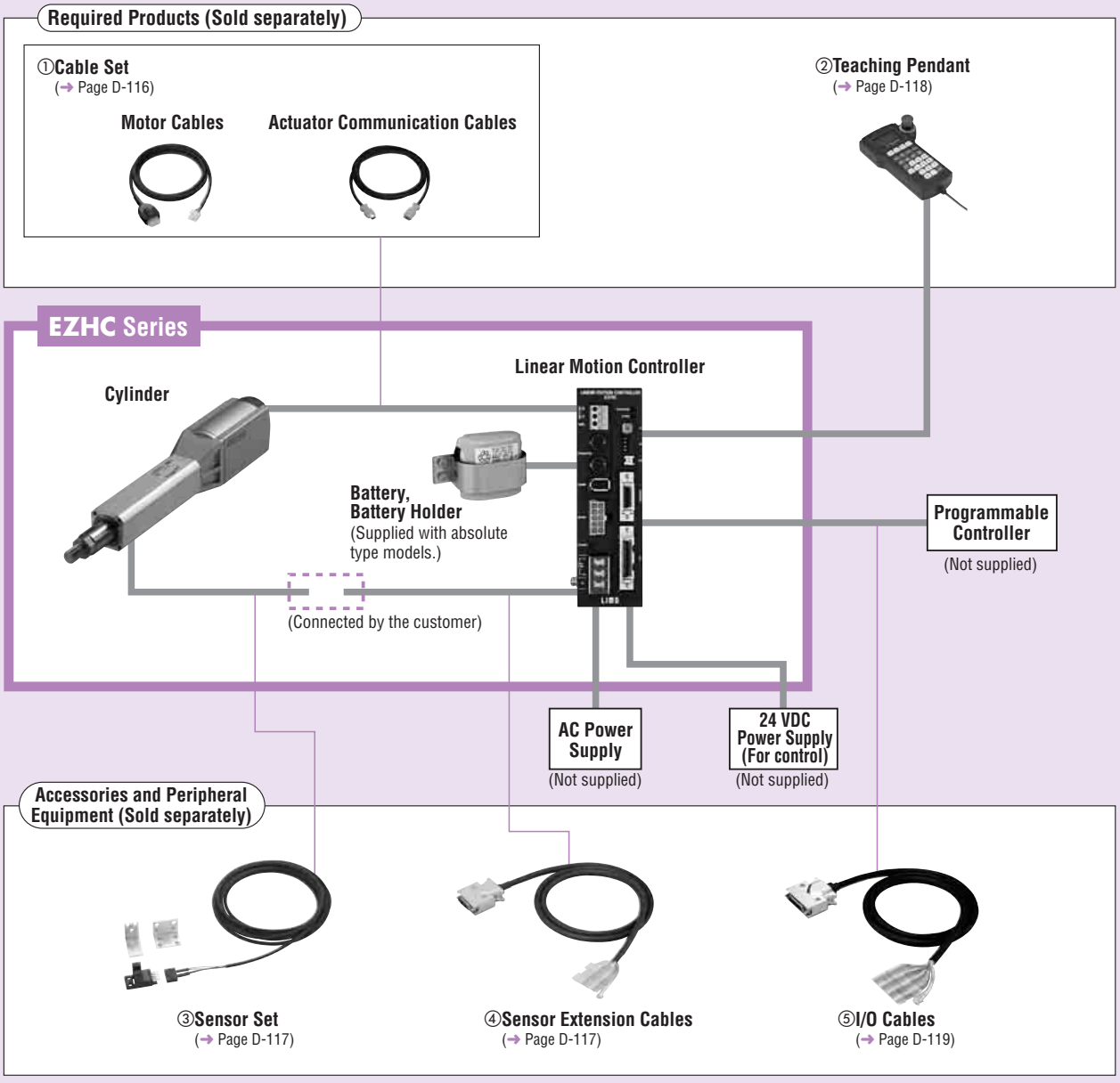
●Space-Saving Cable Outlet Orientation

The cable outlet is facing downward, which contributes to the overall space savings by reducing the space needed to wire the cables.

The cable outlet is facing downward.

System Configuration

Controller Mode



No.	Product Name	Overview	Page
①	Cable Set	Cable for extending the wiring distance between the cylinder and linear motion controller (2 to 10 m). Each set consists of a motor cable and an actuator communication cable.	D-116
②	Teaching Pendant	This pendant (**EZT1**) lets you set and operate various data at your fingertips. Cable length 5 m.	D-118
③	Sensor Set	Three sets of sensors, mounting brackets and cables with connector (2 m), as well as a shielding plate.	D-117
④	Sensor Extension Cables	Cable used for connection between the linear motion controller and the sensor (1 m, 2 m).	D-117
⑤	I/O Cables	Cable used for connection between the linear motion controller and the host controller (1 m, 2 m).	D-119

Example of System Configuration

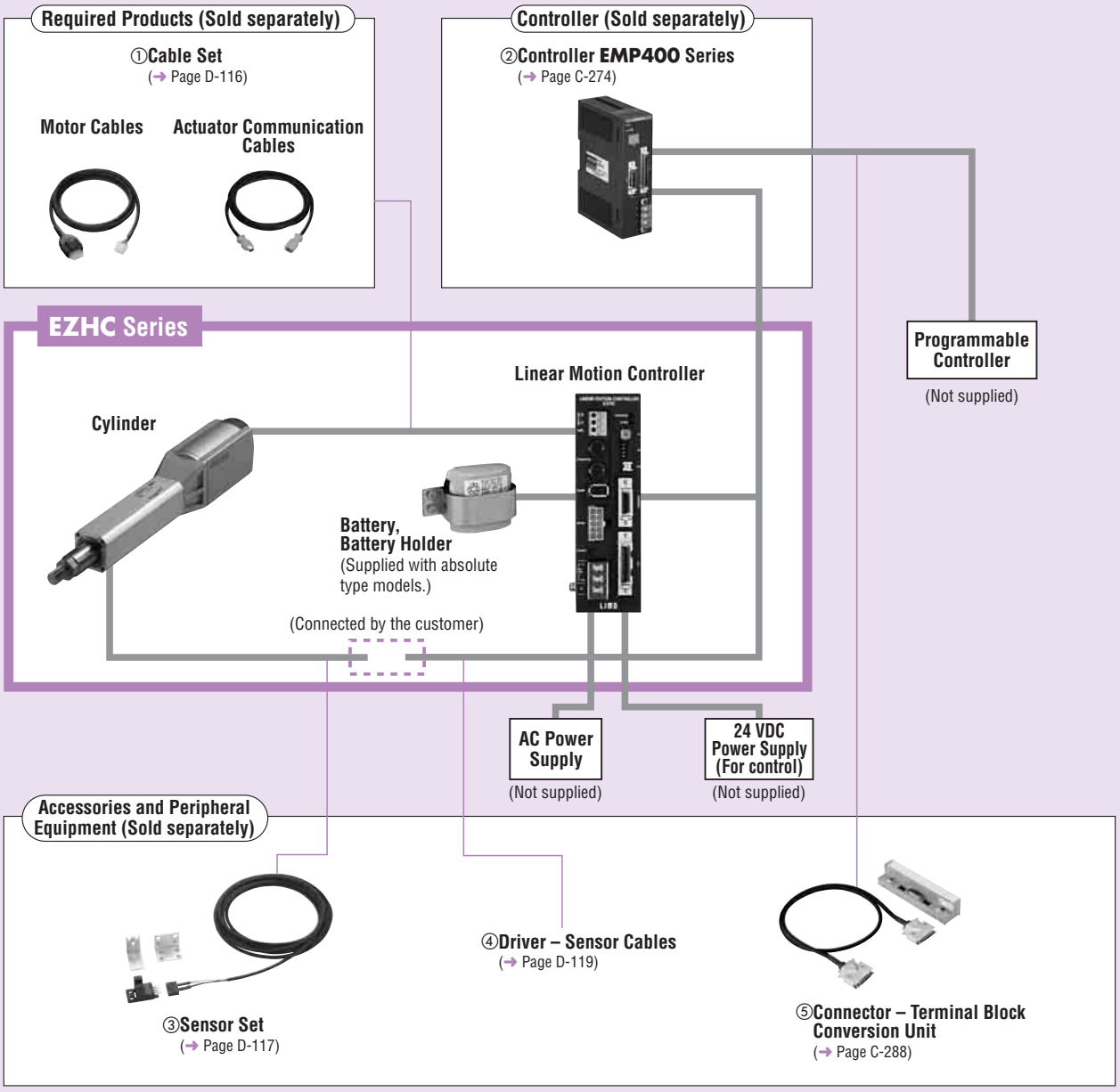
(Sold separately)				(Sold separately)		
EZHC Series	Cable Set*1 (2 m)	Teaching Pendant	+	I/O Cable (1 m)	Sensor Extension Cable*2 (2 m)	Sensor Set*2 (2 m)
EZHC4A-05A	CC02EZ2	EZT1		CC36D1-1	CC20D2-1	PAES-S

*1 Motor cable and actuator communication cable are available separately. ➔ Page D-116
*2 Not required if return to home operation is performed without sensors.

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

●Driver Mode

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



No.	Product Name	Overview	Page
①	Cable Set	Cable for extending the wiring distance between the cylinder and linear motion controller (2 to 10 m). Each set consists of a motor cable and an actuator communication cable.	D-116
②	Controller	This controller gives commands needed to drive the cylinder.	C-274
③	Sensor Set	Three sets of sensors, sensor mounting brackets and cables with connector (2 m), as well as a shielding plate.	D-117
④	Driver – Sensor Cables	Cable for connecting the linear motion controller and the **EMP** Series controller (0.5 m).	D-119
⑤	Connector – Terminal Block Conversion Unit	Set of terminal block and cable for connecting the **EMP** Series controller and the host controller (1 m).	C-288

●Example of System Configuration

(Sold separately)			(Sold separately)			
EZHC Series	Cable Set* (2 m)	+	Controller	Driver – Sensor Cable (0.5 m)	Sensor Set (2 m)	Connector – Terminal Block Conversion Unit (1 m)
EZHC4A-05A	CC02EZ2		EMP401-1	CC005EZ6-EMPD	PAES-S	CC50T1

✻ Motor cable and actuator communication cable are available separately. ➜ Page D-116

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

Product Number Code

EZHC 4 A - 10 M I

① ② ③ ④ ⑤ ⑥

①	Series	**EZHC**: **EZHC** Series
②	Cylinder Size	
③	Power Supply Input	**A**: Single-Phase 100-115 VAC **C**: Single-Phase 200-230 VAC
④	Stroke	**05**: 50 mm **10**: 100 mm **20**: 200 mm **30**: 300 mm
⑤	Electromagnetic Brake	Blank: Without Electromagnetic Brake **M**: With Electromagnetic Brake
⑥	Type	**I**: Incremental Type **A**: Absolute Type

Product Line

●Incremental Type

◇Without Electromagnetic Brake

Stroke	Single-Phase 100-115 VAC		Single-Phase 200-230 VAC
	Model	Model	Model
50 mm	**EZHC4A-05I**	**EZHC6A-05I**	**EZHC6C-05I**
100 mm	**EZHC4A-10I**	**EZHC6A-10I**	**EZHC6C-10I**
200 mm	**EZHC4A-20I**	**EZHC6A-20I**	**EZHC6C-20I**
300 mm	**EZHC4A-30I**	**EZHC6A-30I**	**EZHC6C-30I**

◇With Electromagnetic Brake

Stroke	Single-Phase 100-115 VAC		Single-Phase 200-230 VAC
	Model	Model	Model
50 mm	**EZHC4A-05MI**	**EZHC6A-05MI**	**EZHC6C-05MI**
100 mm	**EZHC4A-10MI**	**EZHC6A-10MI**	**EZHC6C-10MI**
200 mm	**EZHC4A-20MI**	**EZHC6A-20MI**	**EZHC6C-20MI**
300 mm	**EZHC4A-30MI**	**EZHC6A-30MI**	**EZHC6C-30MI**

●Absolute Type

◇Without Electromagnetic Brake

Stroke	Single-Phase 100-115 VAC		Single-Phase 200-230 VAC
	Model	Model	Model
50 mm	**EZHC4A-05A**	**EZHC6A-05A**	**EZHC6C-05A**
100 mm	**EZHC4A-10A**	**EZHC6A-10A**	**EZHC6C-10A**
200 mm	**EZHC4A-20A**	**EZHC6A-20A**	**EZHC6C-20A**
300 mm	**EZHC4A-30A**	**EZHC6A-30A**	**EZHC6C-30A**

◇With Electromagnetic Brake

Stroke	Single-Phase 100-115 VAC		Single-Phase 200-230 VAC
	Model	Model	Model
50 mm	**EZHC4A-05MA**	**EZHC6A-05MA**	**EZHC6C-05MA**
100 mm	**EZHC4A-10MA**	**EZHC6A-10MA**	**EZHC6C-10MA**
200 mm	**EZHC4A-20MA**	**EZHC6A-20MA**	**EZHC6C-20MA**
300 mm	**EZHC4A-30MA**	**EZHC6A-30MA**	**EZHC6C-30MA**

The following items are included in each product.

Cylinder, Linear Motion Controller, Operating Manual, Mounting Bracket for Controller, Hexagonal Nut, User I/O Connector, Sensor I/O Connector, Battery*, Battery Holder*

*Only for absolute Type

Specifications

Cylinder Specifications

Model	Incremental Type	EZHC4A-□I		EZHC4A-□MI		EZHC6A-□I, EZHC6C-□I		EZHC6A-□MI, EZHC6C-□MI	
	Absolute Type	EZHC4A-□A		EZHC4A-□MA		EZHC6A-□A, EZHC6C-□A		EZHC6A-□MA, EZHC6C-□MA	
Motor Type		Stepping Motor with Built-In Rotor-Position Sensor							
Drive Method		Rolled Ball Screw							
Electromagnetic Brake		Not equipped		Equipped		Not equipped		Equipped	
Speed Range	mm/s	~400	~600	~400	~600	~400	~600	~400	~600
Max. Transportable Mass	kg Horizontal Direction*	–				–			
	kg Vertical Direction	–		6.5	4.5	–		15	6
Max. Acceleration	m/s² Horizontal Direction	–				–			
	m/s² Vertical Direction	–		2.5		–		2.5	
Max. Thrust Force	N	65	55	65	55	200	73	200	73
Push Force	N	65 (Speed: 6 mm/s or less)				200 (Speed: 6 mm/s or less)			
Max. Holding Force	N Power ON	65				200			
	N Power OFF	–							
	N Electromagnetic Brake	–		65		–		200	
Repetitive Positioning Accuracy	mm	±0.02							
Resolution	mm	0.01							
Lead	mm	12							
Stroke	mm	50, 100, 200, 300							
Cylinder Mass [Stroke: Mass] Figure in the parentheses shows the mass of the model with electromagnetic brake.	kg	50: 1.7 (1.9) 100: 2.0 (2.2) 200: 2.5 (2.7) 300: 3.0 (3.2)				50: 3.3 (3.7) 100: 3.7 (4.1) 200: 4.6 (5.0) 300: 5.6 (6.0)			

● Enter the stroke length in the box (□) within the model name.

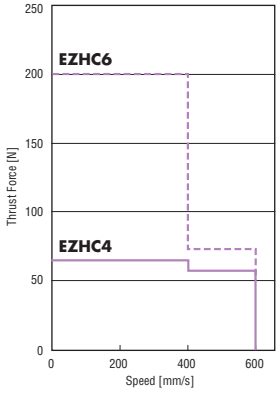
* In a horizontal direction, the value cannot be shown because it varies by frictional resistance of the load supporting mechanism. Always provide an external anti-spin mechanism, such as a guide.

Installation ➜ Page D-121

How to read specifications ➜ Page D-70

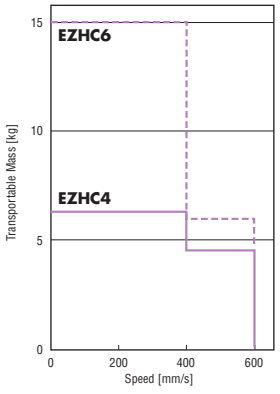
Correlation Diagram of Speed and Thrust Force

◇Horizontal Direction/Vertical Direction



Correlation Diagram of Speed and Transportable Mass

◇Vertical Direction

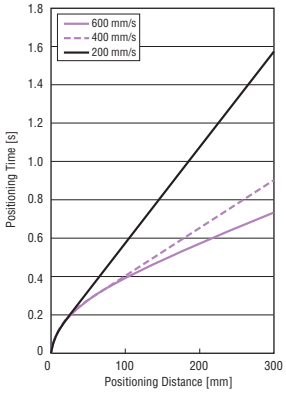


Positioning Distance – Positioning Time

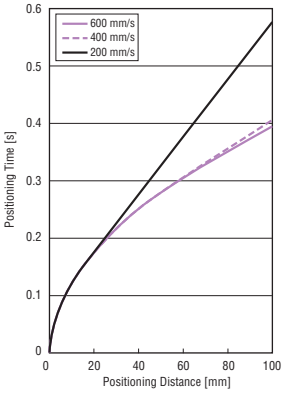
The positioning time (reference value) can be checked from the positioning distance.

The graphs below represent the characteristics when operated at maximum acceleration and maximum speed.

◇Horizontal Direction/Vertical Direction



Enlargement of Positioning Distance under 100 mm

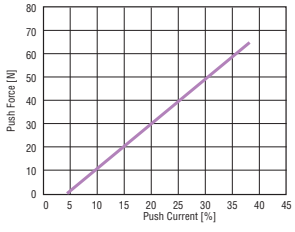


● The starting speed should be 6 mm/s or less.

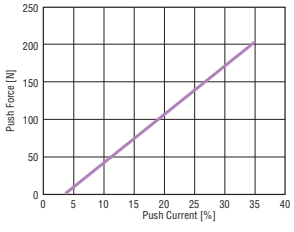
Push Force

Push force can be set through "Push current setting" in a program mode.

◇EZHC4



◇EZHC6



Notes:

● The above value is a reference, not guaranteed.

● When the cylinder is used in a vertical direction, an external force calculated by multiplying the mass of the load by the rate of gravitational acceleration is applied. Therefore, the cylinder push force must be set so as to accommodate this external force. Measure the push force using an actual load, and set an appropriate push current.

Features D-92 / System Configuration D-93 / Product Line D-95

●Specifications of Linear Motion Controller

◇Controller Mode

Model			EZMC13I-A/EZMC13A-A	EZMC24I-A/EZMC24A-A	EZMC12I-C/EZMC12A-C
Type			Stored data type		
Number of Control Axes			1 axis		
Power Supply Input	Control Power		24 VDC±10% 1.0 A (Controller only: 0.5 A)*		
	Main Power	Voltage	Single-Phase 100-115 VAC −15%, +10%		Single-Phase 200-230 VAC −15%, +10%
		Frequency	50/60 Hz		
		Current	3.3 A	5.0 A	3.0 A
Positioning Data	Setting Mode		Absolute mode (absolute-position specification), Incremental mode (relative-position specification)		
	Number		63		
	Setting Method		Data is set using the accessory teaching pendant (**EZT1**). (Stored in EEPROM)		
Positioning Control	Mode		Sequential positioning, Selective positioning		
	Travel Amount Setting Range		−83886.08～+83886.07 mm (value set in units of 0.01 mm)		
	Starting Speed Setting Range		0.01～250.00 mm/s (value set in units of 0.01 mm/s)		
	Operating Speed Setting Range		0.01～600.00 mm/s (value set in units of 0.01 mm/s)		
	Acceleration/Deceleration Rate Setting Range		0.01～100.00 m/s² (value set in units of 0.01 m/s²)		
Control Modes			· External input mode (EXT): In this mode, operation by external signal, command position, I/O condition and alarm condition can be monitored. · Program mode (PRG): In this mode, operation data can be created, changed or cleared. · Parameter mode (PAR): In this mode, operation parameters and function setting parameters can be set or changed. · Test mode (TST): In this mode, manual operation and I/O check can be performed.		
Operation Modes			Positioning operation, Return to home operation, Linked operation (a maximum of 4 data), Push-motion operation, Continuous operation		
Input Signals	Input Mode		24 VDC Photocoupler insulation input, Input resistance: 4.7 kΩ (START, STOP, HOME/PRESET, FREE, M0～M5, REQ, ACL/CK) 5 VDC Photocoupler insulation input, Input resistance: 180 Ω or 24 VDC Photocoupler insulation input, Input resistance: 2.7 kΩ (FWD, RVS)		
	START		Start the positioning operation.		
	STOP		Stop the positioning operation and the return to home operation.		
	HOME/PRESET		HOME: Start the return to home operation. PRESET: Preset the current position.		
	FREE		Stop motor excitation and release the electromagnetic brake.		
	M0～M5		Select the step No.		
	REQ		Request the current position output.		
	FWD		Move the cylinder rod to the counter-motor side.		
	RVS		Move the cylinder rod to the motor side.		
	ACL/CK		ACL: Cancel the protective function currently active. CK: Used when the current position is output.		
Output Signals	Output Mode		Transistor output linked to photocoupler (24 VDC, 15 mA or less), Line driver output		
	ALM		This signal is output when a protective function has been activated.		
	END/OUTR		END: Turn ON when the positioning operation or return to home operation has ended. OUTR: Turn ON when current position output is ready.		
	MOVE		This signal is output when the cylinder is moving.		
	AREA/OUT0		AREA: This output notifies that the moving part of the cylinder is staying inside a specified area. OUT0: Output current position.		
	T-UP/OUT1		T-UP: Output when the push-motion operation has ended. OUT1: Output current position.		
	ASG1, BSG1		Output the position of the cylinder rod via pulse signal. (Open-collector output)		
	ASG2, BSG2		Output the position of the cylinder rod via pulse signal. (Line driver output)		
Protective Functions			Excessive position deviation, Overcurrent protection, Overvoltage protection, Overheat protection, Overload, Motor overheat protection, Sensor error, Overspeed, Nonvolatile memory error, etc.		
Indicators (LED)			Control power supply, Alarm		
Cooling Method			Natural ventilation		
Mass			0.8 kg		

*Take into account safety margin of +0.2 A for the teaching pendant, and/or +0.3 A for the electromagnetic brake type.

◇Driver Mode

Model			EZMC13I-A/EZMC13A-A	EZMC24I-A/EZMC24A-A	EZMC12I-C/EZMC12A-C
Power Supply Input	Control Power		24 VDC ±10% 1.0 A (Controller only: 0.5 A)*		
	Main Power	Voltage	Single-Phase 100-115 VAC −15%, +10%		Single-Phase 200-230 VAC −15%, +10%
		Frequency	50/60 Hz		
		Current	3.3 A	5.0 A	3.0 A
Maximum Response Frequency			80 kHz (When the pulse duty is 50%)		
Input Signals	Input Mode		5 VDC Photocoupler insulation input, Input resistance: 180 Ω or 24 VDC Photocoupler insulation input, Input resistance: 2.7 kΩ (FP, RP) 24 VDC Photocoupler insulation input, Input resistance: 4.7 kΩ (ACL/CK, FREE, C.OFF, PRESET, REQ)		
	FP		Operation command pulse input (The operation command pulse input in counter-motor direction in the 2-pulse input mode.) Pulse width: 2 μs minimum, Pulse rise/fall: 2 μs maximum (Negative logic pulse input)		
	RP		Direction of movement input (The operation command pulse input in motor direction in the 2-pulse input mode.) Pulse width: 2 μs minimum, Pulse rise/fall: 2 μs maximum (Negative logic pulse input)		
	ACL/CK		ACL: Cancel the protective function currently active. CK: Used when the current position is output.		
	FREE		Stop motor excitation and release the electromagnetic brake.		
	C.OFF		The current flow to the motor is cut off.		
	PRESET		Preset the current position.		
	REQ		Request the current position output.		
Output Signals	Output Mode		Transistor output linked to photocoupler (24 VDC, 15 mA or less), Line driver output		
	TIM./OUT0		TIM.: Signal is output when the excitation sequence is at step "0." A TIM. signal is output each time the rod moves by 0.24 mm. OUT0: Output current position.		
	OUT1		Output current position.		
	ALM		This signal is output when a protective function has been activated.		
	END/OUTR		END: Turn ON when the positioning operation or return to home operation has ended. OUTR: Turn ON when current position output is ready.		
	ASG1, BSG1		Output the position of the cylinder rod via pulse signal. (Open-collector output)		
	ASG2, BSG2		Output the position of the cylinder rod via pulse signal. (Line driver output)		
Protective Functions			Excessive position deviation, Overcurrent protection, Overvoltage protection, Overheat protection, Overload, Motor overheat protection, Overspeed, Nonvolatile memory error, Sensor error, etc.		
Indicators (LED)			Control power supply, Alarm		
Cooling Method			Natural ventilation		
Mass			0.8 kg		

*Take into account safety margin of +0.2 A for the teaching pendant, and/or +0.3 A for the electromagnetic brake type.

General Specifications

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

Item	Motor	Linear Motion Controller
Insulation Resistance	100 MΩ or more when 500 VDC megger is applied between the following places: · Motor/Sensor windings – Case · Case – Windings of electromagnetic brake (Only for electromagnetic brake type)	100 MΩ or more when 500 VDC megger is applied between the following places: · Signal I/O, Control power supply, PE – Main power supply terminal · Signal I/O, Control power supply, PE – Motor output terminal · Signal I/O, Control power supply, PE – Battery input terminal
Dielectric Strength	Sufficient to withstand the following for 1 minute: **EZHC4** · Motor/Sensor windings – Case 1.0 kVAC 50 Hz · Case – Windings of electromagnetic brake (Only for electromagnetic brake type) 1.0 kVAC 50 Hz **EZHC6** · Motor/Sensor windings – Case 1.5 kVAC 50 Hz · Case – Windings of electromagnetic brake (Only for electromagnetic brake type) 1.0 kVAC 50 Hz	Sufficient to withstand the following for 1 minute: · Signal I/O, Control power supply – Main power supply terminal 1.8 kVAC · Signal I/O, Control power supply – Motor output terminal 1.8 kVAC · Signal I/O, Control power supply – Battery input terminal 1.8 kVAC · PE – Main power supply terminal 1.5 kVAC · PE – Motor output terminal 1.5 kVAC · PE – Battery input terminal 1.5 kVAC
Ambient Temperature	0～+40℃ (non-freezing)	
Ambient Humidity	85% or less (non-condensing)	

Note:

● Do not measure insulation resistance or perform the dielectric strength test while the cylinder and linear motion controller are connected.

Battery Specifications (For the absolute type only)

Model	PAEZ-BT2
Battery Type	Cylindrical sealed nickel-cadmium storage cell
Nominal Voltage	2.4 V
Rated Capacity	2000 mAh
Mass	180 g
Life	Approx. 4 years※1
Charge Time	48 hours※1
Data Retention Period	Approx. 360 hours (15 days)※1※2
Ambient Temperature	0～+40℃ (non-freezing)
Ambient Humidity	20～85% (non-condensing)

※1 At an ambient temperature of 20℃

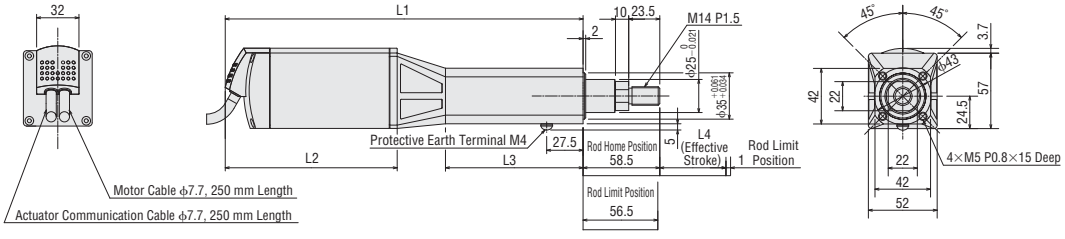
※2 After the power is cut off with the battery fully charged.

Dimensions Unit = mm

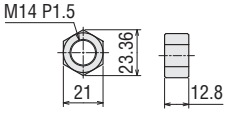
● Cylinder

◇**EZHC4**

Cylinder Model	L1	L2	L3	L4	DXF
EZHC4A-05	270.5	130	104	50	D396
EZHC4A-05M	300.5	160			D397
EZHC4A-10	320.5	130	154	100	D398
EZHC4A-10M	350.5	160			D399
EZHC4A-20	420.5	130	254	200	D400
EZHC4A-20M	450.5	160			D401
EZHC4A-30	520.5	130	354	300	D402
EZHC4A-30M	550.5	160			D403



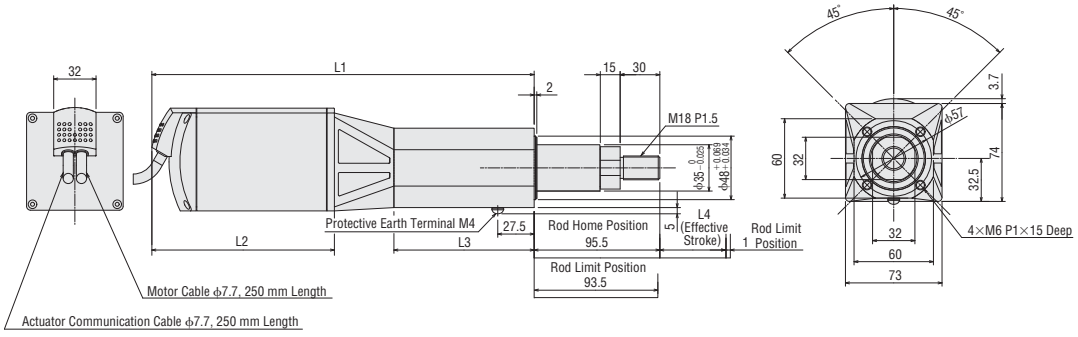
● Nut (1 piece, included)



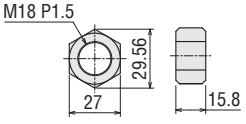
◇EZHC6

Cylinder Model	L1	L2	L3	L4	DXF
EZHC6□-05	289	138	106	50	D404
EZHC6□-05M	324	173			D405
EZHC6□-10	339	138	156	100	D406
EZHC6□-10M	374	173			D407
EZHC6□-20	439	138	256	200	D408
EZHC6□-20M	474	173			D409
EZHC6□-30	539	138	356	300	D410
EZHC6□-30M	574	173			D411

● Enter the power supply voltage A or C in the box (□) within the model name.

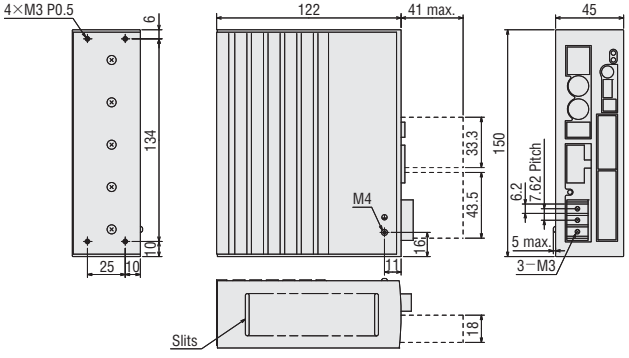


● Nut (1 piece, included)

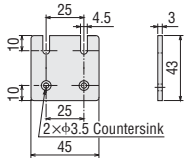


●Linear Motion Controller

EZMC13I-A, EZMC24I-A, EZMC12I-C
EZMC13A-A, EZMC24A-A, EZMC12A-C
Mass: 0.8 kg
DXF D487



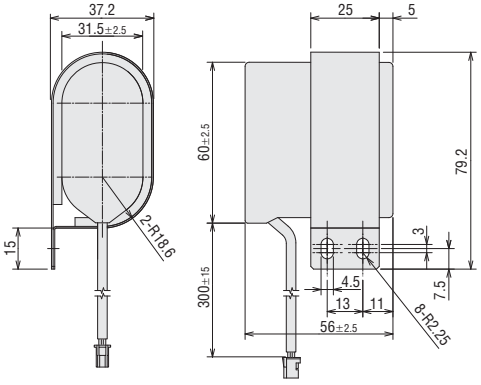
● Mounting Bracket
(2 pieces, included)



● Control I/O Connector (Included)
Case: 54331-1361 (MOLEX)
Connector: 54306-3619 (MOLEX)

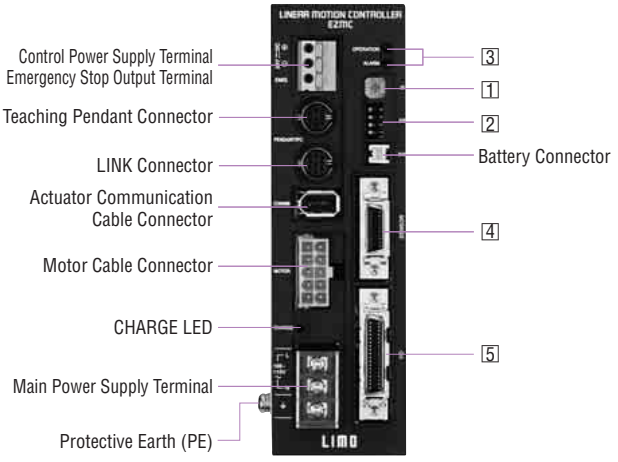
● Sensor I/O Connector (Included)
Case: 54331-1201 (MOLEX)
Connector: 54306-2019 (MOLEX)

● Battery
(Supplied with absolute type. Battery holder provided.)
Mass: 0.18 kg
DXF D488



Connection and Operation

Names and Functions of Linear Motion Controller Parts

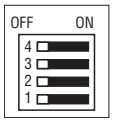


1 Axis-Number Setting Switch

Indication	Function
ID	Set controller axis number

2 Operation-Mode Select Switches

Indication	Function
4	Not used
3	
2	Set pulse input mode (in driver mode) ON: 1-pulse input mode OFF: 2-pulse input mode
1	Switch modes ON: Driver mode OFF: Controller mode



● The area in white indicates the switch position.

● All switches are set to OFF at the time of shipment.

3 LED Indicators

Indication	Color	Function
OPERATION	Green	Control power supply indication
ALARM	Red	Alarm indication

4 Sensor I/O Connector

Indication	Input/ Output	Pin No.	Signal Name	Function
SENSOR	Output	1	P24	Power supply for sensor +24 VDC
		11		
		19		
		2	N24	Power supply for sensor GND
		12		
		20		
	Input	13	+LS	+LS (counter-motor side) limit sensor
		14	−LS	−LS (motor side) limit sensor
		15	HOMELS	Mechanical home sensor

5 I/O Connector

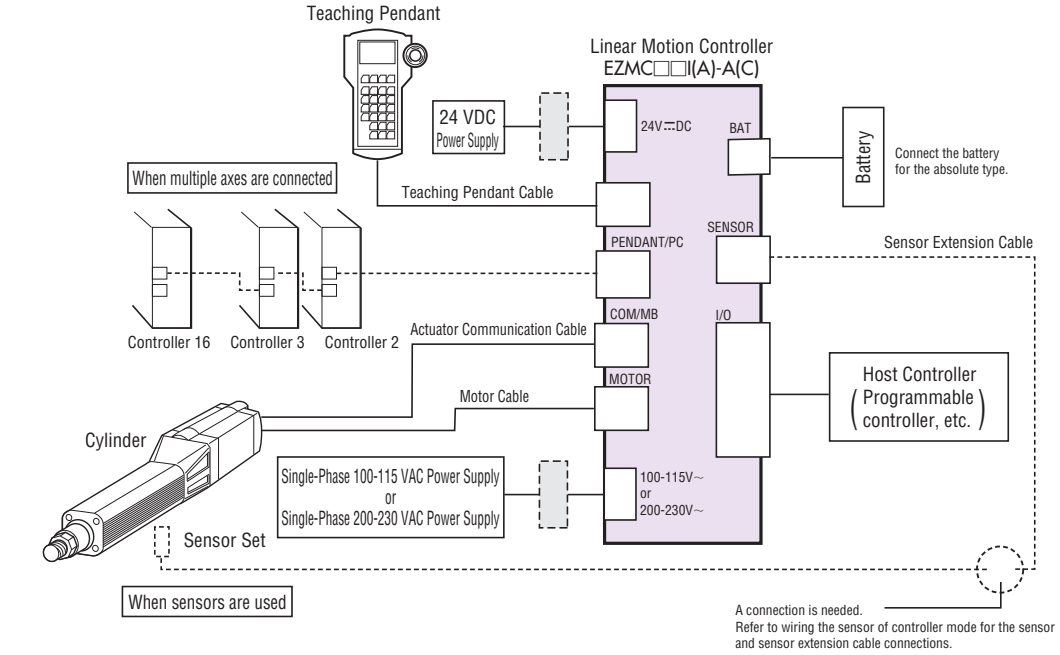
◇Controller Mode

Indication	Input/ Output	Pin No.	Signal Name	Function
I/O	Input	18	P24	Power supply for I/O signal +24 VDC
		1	N24	Power supply for I/O signal GND
		19		
	Output	2	ALM	Turn ON while the controller is operating normally and turn OFF when the alarm generates.
		3	MOVE	Turn ON during operation.
		4	END/OUTR	END: Turn ON when the operation has ended. OUTR: Turn ON when current position output is ready.
		5	AREA/OUT0	AREA: Turn ON when the load has moved to a position inside the specified range or while passing the specified range. OUT0: Output the current position.
		6	T-UP/OUT1	T-UP: Turn ON during push-motion operation. OUT1: Output the current position.
		20	ASG1 (oc)	Output the position of the cylinder rod via pulse signal. (Open-collector output)
		21	BSG1 (oc)	
		22	ASG2 (dif)	Output the position of the cylinder rod via pulse signal. (Line driver output)
		23	$\overline{\text{ASG2}}$ (dif)	
		24	BSG2 (dif)	
		25	$\overline{\text{BSG2}}$ (dif)	
	Input	7	START	Start the positioning operation.
		8	ACL/CK	ACL: Clear an alarm. CK: Used when the current position is output.
		9	FREE	Stop motor excitation and release the electromagnetic brake.
		10	STOP	Stop the operation.
		11	M0	M0～M5 input signals are combined to select a positioning point. (If all signals are OFF, the sequential positioning mode will be selected.)
		12	M1	
		13	M2	
		14	M3	
		15	M4	
		16	M5	
		17	HOME/ PRESET	HOME: Start the return to home operation. PRESET: Preset the current position.
		30	REQ	Request the current position output.
		31	FWD+	Move the cylinder rod to the counter-motor side. (Continuous operation input)
		32	FWD−	
		33	P24-FWD	
		34	RVS+	Move the cylinder rod to the motor side. (Continuous operation input)
		35	RVS−	
		36	P24-RVS	

◇Driver Mode

Indication	Input/ Output	Pin No.	Signal Name	Function
I/O	Input	18	P24	Power supply for I/O signal +24 VDC
		1	N24	Power supply for I/O signal GND
		19		
	Output	2	ALM	Turn ON while the controller is operating normally and turn OFF when the alarm generates.
		4	END/OUTR	END: Turn ON when the operation has ended. OUTR: Turn ON when current position output is ready.
		5	TIM./OUT0	TIM.: Indicate that the motor is at the beginning of its excitation sequence (step "0."). This signal is output in sync with the input pulse: the signal is output once whenever the excitation sequence returns to step "0." (The excitation sequence completes one cycle when the cylinder rod has moved by 0.24 mm*.) *EZHP4/EZHP6: 0.12 mm OUT0: Output the current position.
		6	OUT1	Output the current position.
		20	ASG1 (oc)	Output the position of the cylinder rod via pulse signal. (Open-collector output)
		21	BSG1 (oc)	
		22	ASG2 (dif)	Output the position of the cylinder rod via pulse signal. (Line driver output)
		23	$\overline{\text{ASG2}}$ (dif)	
		24	BSG2 (dif)	
		25	$\overline{\text{BSG2}}$ (dif)	
	Input	8	ACL/CK	ACL: Clear an alarm. CK: Used when the current position is output.
		9	FREE	Stop motor excitation and release the electromagnetic brake.
		10	C.OFF	When this signal is ON, the current flow to the motor is cut off and the holding force generated by motor torque is lost. Turning this signal from ON to OFF does not change the motor's excitation sequence.
		17	PRESET	Preset the current position.
		30	REQ	Request the current position output.
		31	FP+	Move the cylinder rod to the counter-motor side. (Pulse input)
		32	FP−	
		33	P24-FP	
		34	RP+	Move the cylinder rod to the motor side. (Pulse input)
		35	RP−	
		36	P24-RP	

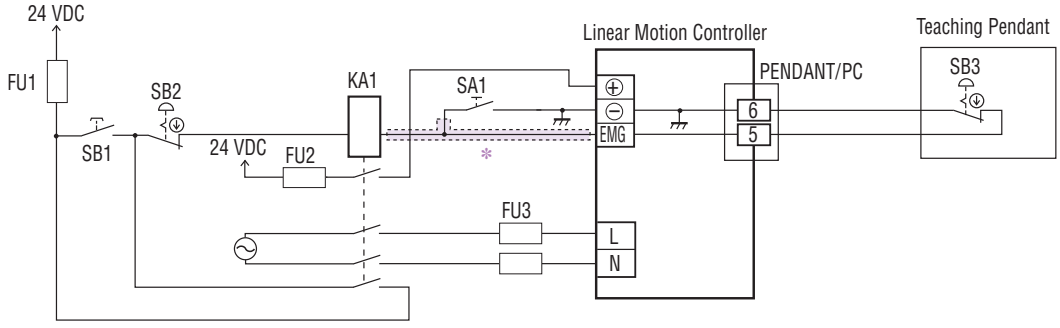
●Connection Diagram



For the section indicated by broken line, refer to the following "Emergency stop circuit."

●Emergency Stop Circuit (Connection example of power system and emergency stop system)

A connection example of controller power system and emergency stop system is given below, which conforms to Category 1 under the EN 954-1 safety standard and Stop Category 0 under the EN 60204-1 safety standard.



- FU1: Ground-fault protection fuse (500 mA)
- FU2: Ground-fault protection fuse (1A)
- FU1, FU2, KA1 and SB2 should use EN certified products.
- Relay (KA1) ratings: 24 VDC, 30 mA
- Refer to "**EZHS**/**EZHC**/**EZHP** Series controller user manual" for examples of connecting multiple controllers using controller link cables.
- ✻: Provide ground-fault protection in the section indicated by broken line, such as wiring the cables in duct.

◇Power Supply

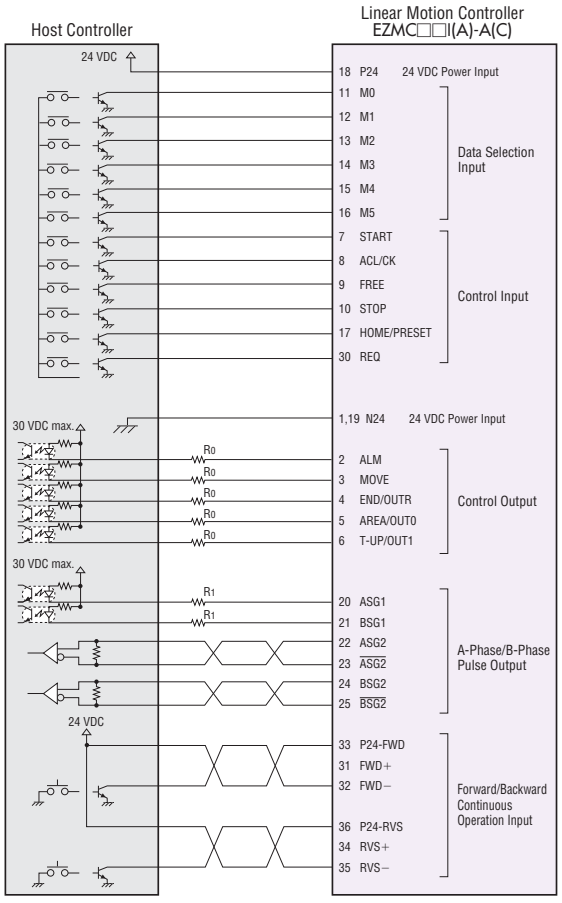
- Two types of power supply, main power and control power, are required. Both power supplies must at least have the specified capacity. Specifications of linear motion controller ➜ Page D-97
- If the power capacity is insufficient, motor output may drop, which may cause the cylinder to malfunction (due to lack of thrust force).

◇Notes on Wiring

- Wire the control I/O signal lines over as short a distance as possible, using a shielded cable (AWG28 or thicker).
- When it is necessary to have a connection more than 250 mm between cylinder and linear motion controller, the accessory motor cable and actuator communication cable must be used.
- Wire the control I/O signal lines by providing a minimum distance of 300 mm from the power lines (large-current circuits such as the power supply line and motor line). Do not wire the control I/O signal lines with the power lines in the same duct or bundle them together.

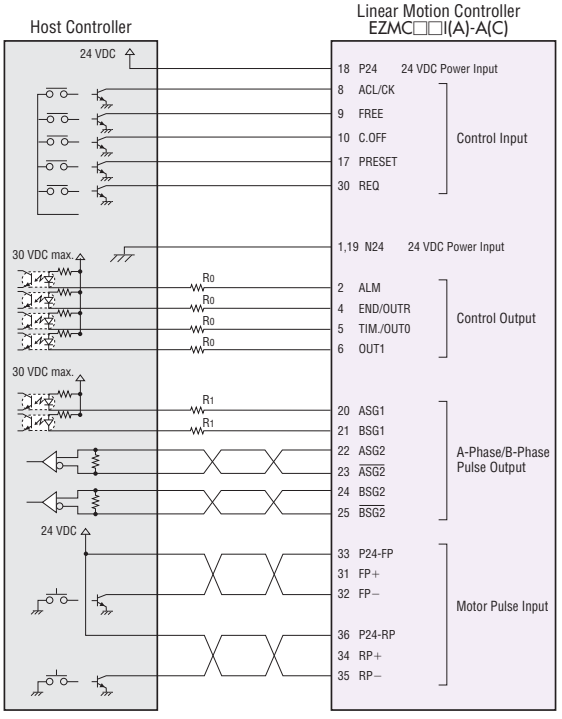
●Connection to Host Controller

◇Controller Mode



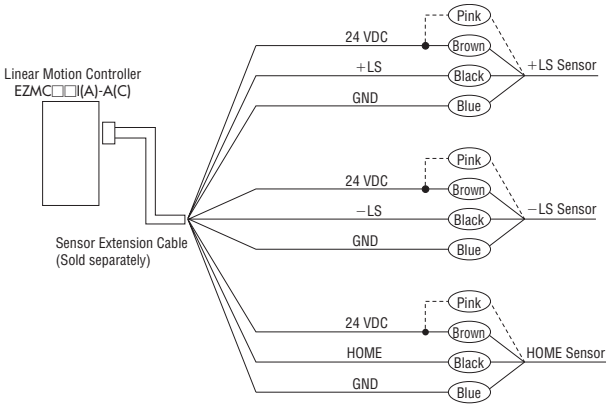
● Refer to page D-104 for the conditions of external resistors R_0 and R_1.

◇Driver Mode



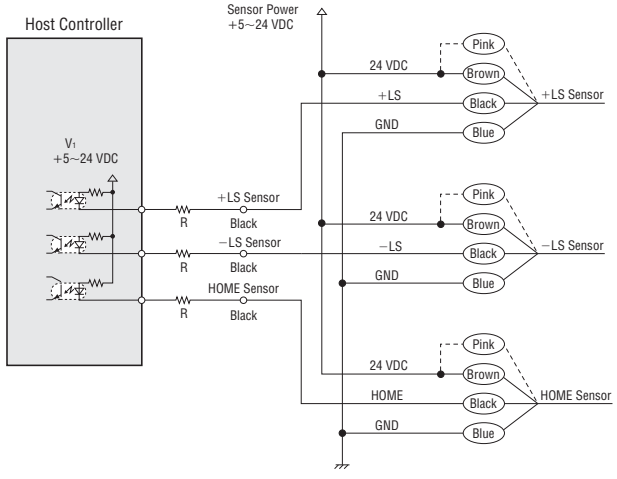
● Refer to page D-104 for the conditions of external resistors R_0 and R_1.

Wiring the Sensor



● The 24 VDC output from the linear motion controller is used to drive the sensors. Do not use it as a power supply for any item other than the sensors.
● Connect the pink lead to the brown lead when the sensor logic is N.C. (normally closed). The pink lead is not connected when the sensor logic is N.O. (normally open).

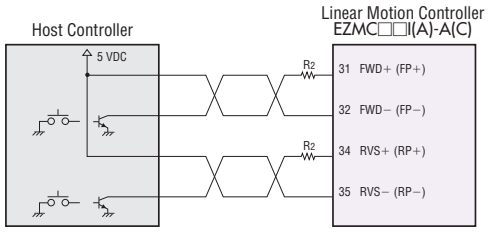
Wiring the Sensor



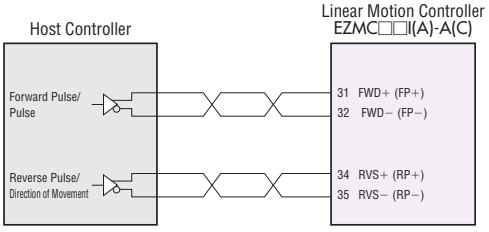
● V_1 must be between 5 VDC and 24 VDC. The current must be 100 mA or less. If the current exceeds 100 mA, connect an external resistor R.
● Connect the pink lead to the brown lead when the sensor logic is N.C. (normally closed). The pink lead is not connected when the sensor logic is N.O. (normally open).

◇FWD (FP), RVS (RP) Signal

When 5 VDC open-collector output signal is used

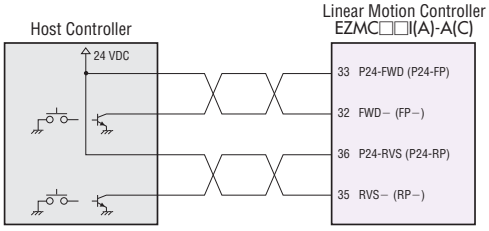


When line driver output is used



- When the output signal is 5 VDC, the external resistor R_2 is not required. If the output signal exceeds 5 VDC, connect an external resistor R_2 to keep the input current between 7 to 20 mA.

When 24 VDC open-collector output signal is used



◇Input Circuit 1 Connection

- The power supply for P24 must have a capacity of 24 VDC, 200 mA or more.
- When connecting each sensor to a sensor connector and supplying sensor power from the P24 terminal of the sensor connector, use a DC power supply capable of supplying 200 mA as specified above plus the current consumed by each sensor. (When the accessory sensor set **PAES-S** is used, the current capacity must be increased by 35 mA per sensor.)
- The 24 VDC supplied to the P24 terminal of the I/O connector is output to the P24 terminal of the sensor connector as pass-through output.

◇Input Circuit 2 Connection

The photocoupler diode in the input circuit can receive 7 to 20 mA of current.

- When a 24 VDC power supply is used, connect 24 VDC to ㉝ and ㊱ and then connect to ㉜ and ㉟, respectively.
- When a 5 VDC power supply is used, connect 5 VDC to ㉛ and ㉞ and then connect to ㉜ and ㉟, respectively.
- If a pulse generator of line driver output is used, connect the +side of line driver output to ㉛ and ㉞, and the −side of line driver output to ㉜ and ㉟, respectively. (Refer to the connection diagram above.)

◇Output Circuit 1 Connection

The load connected to the open-collector output terminal of output circuit 1 should be 30 VDC, 10 mA or less. If the current capacity of the load exceeds 10 mA, connect an external resistor R_0*.

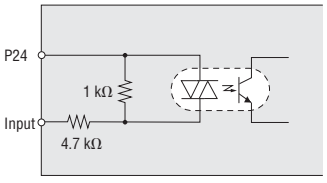
◇Output Circuit 2 Connection

The load connected to the open-collector output terminal of output circuit 2 should be 30 VDC, 15 mA or less. If the current capacity of the load exceeds 15 mA, connect an external resistor R_1*.

*Refer to page D-103 for the connection positions of external resistor.

Input Circuit

Input Circuit 1



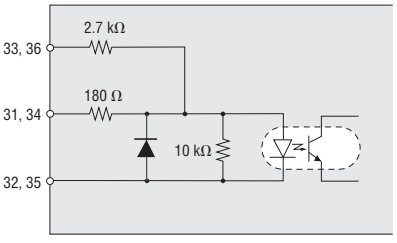
●Controller Mode

Pin No.	
⑦	START
⑧	ACL/CK
⑨	FREE
⑩	STOP
⑪～⑯	M0～M5
⑰	HOME/PRESET
㉚	REQ

●Driver Mode

Pin No.	
⑧	ACL/CK
⑨	FREE
⑩	C.OFF
⑰	PRESET
㉚	REQ

Input Circuit 2



●Controller Mode

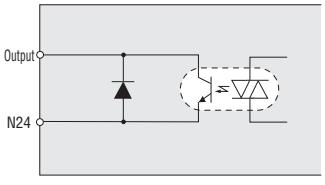
Pin No.	
㉛	FWD+
㉜	FWD−
㉝	P24-FWD
㉞	RVS+
㉟	RVS−
㊱	P24-RVS

●Driver Mode

Pin No.	
㉛	FP+
㉜	FP−
㉝	P24-FP
㉞	RP+
㉟	RP−
㊱	P24-RP

Output Circuit

Output Circuit 1



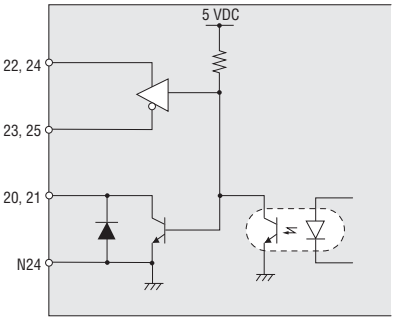
●Controller Mode

Pin No.	
②	ALM
③	MOVE
④	END/OUTR
⑤	AREA/OUT0
⑥	T-UP/OUT1

●Driver Mode

Pin No.	
②	ALM
④	END/OUTR
⑤	TIM./OUT0
⑥	OUT1

Output Circuit 2



●Common to Controller Mode and Driver Mode

Pin No.		
⑳	ASG1	A-Phase Pulse Output (Open-collector output)
㉑	BSG1	B-Phase Pulse Output (Open-collector output)
㉒	ASG2	A-Phase Pulse Output (Line driver output +)
㉓	$\overline{\text{ASG2}}$	A-Phase Pulse Output (Line driver output −)
㉔	BSG2	B-Phase Pulse Output (Line driver output +)
㉕	$\overline{\text{BSG2}}$	B-Phase Pulse Output (Line driver output −)

●Description of Input/Output Signals

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

Input (output) "ON" indicates that the current is sent into the photocoupler (transistor) inside the linear motion controller. Input (output) "OFF" indicates that the current is not sent into the photocoupler (transistor) inside the linear motion controller.

Photocoupler OFF ON

◇Controller Mode

START Input Signal

When a START signal is input following selection of positioning operation data, operation corresponding to the selected positioning operation data will start.

STOP Input Signal

This input is used to stop the moving cylinder.
The input logic for STOP signal as well as stopping pattern can be changed via the teaching pendant.

HOME Input Signal

When a HOME signal is input, the cylinder will start return to home operation.

M0～M5 Input Signals

Operation data to be used in positioning operation can be selected by a combination of ON/OFF settings of the six signals from M0 to M5.

M5	M4	M3	M2	M1	M0	Data to be selected
OFF	OFF	OFF	OFF	OFF	OFF	Sequential positioning operation
OFF	OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	OFF	ON	OFF	2
⋮	⋮	⋮	⋮	⋮	⋮	⋮
ON	ON	ON	ON	ON	ON	63

ACL Input Signal

This input reverts to the normal ON condition the ALM signal that has been turned OFF following an activation of the controller's protective function.

FREE Input Signal

This input is used to actuate or release the electromagnetic brake. Turning the FREE input ON will release the electromagnetic brake. (The holding force applied to the cylinder will also be lost.)

PRESET Input Signal

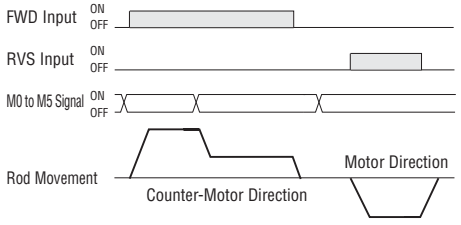
Turning the PRESET signal ON will preset the current position. A desired position can be preset. This signal can be switched with the HOME signal on the teaching pendant.

REQ Input Signal

This input indicates that a current position output request can be accepted from the host controller. The current position data can be transferred when the REQ signal is ON.
This signal is used in combination with the OUTR, OUT0 and OUT1 signal outputs.

FWD, RVS Input Signals

These inputs are used for continuous operation in the forward or reverse direction.
When FWD is input, the cylinder rod will move to the counter-motor side. When RVS is input, the cylinder rod will move to the motor side. As for the operating speed, the positioning operating speed set in the selected operation number (M0 to M5) will be applied.



MOVE Output Signal

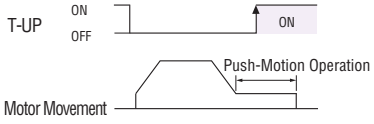
This output indicates that the cylinder is in operating condition and turns ON when the cylinder is moving.

AREA Output Signal

This output notifies that the moving part of the cylinder is inside a specified area (between the upper and lower limits) and turns ON when the moving part of the cylinder is inside this area. A desired area can be set via the teaching pendant. This signal is output at all time regardless of whether the cylinder is moving or stopped.

T-UP Output Signal

This output notifies that a push-motion operation has completed. The T-UP output turns ON when the load is pressed against the cylinder within the push distance.

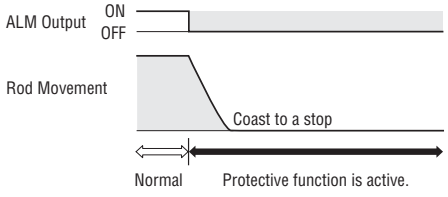


END Output Signal

This output notifies that the positioning operation or return to home operation of the cylinder has completed. This signal is output when the rod is stopped after completion of an applicable operation.

ALM Output Signal

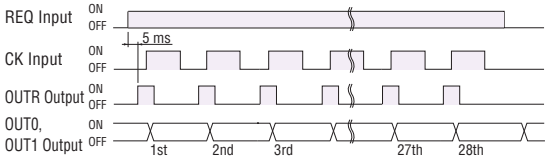
This output notifies that the controller's protective function has been activated. The ALM output remains ON while the controller is operating normally, and turns OFF when a protective function has been activated.



OUTR, OUT0, OUT1 Output Signals

These outputs are used to output the current position data as recognized by the controller. The OUTR signal indicates that the controller is ready to transmit data, while the OUT0 and OUT1 signals output the current position data to the host controller. These signals are used in combination with the REQ signal input.

Image of current position output



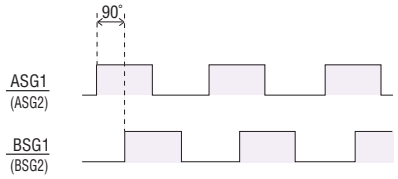
ASG1/BSG1, ASG2/BSG2 Output Signals

A counter or similar device can be connected to monitor the position of the cylinder rod.

Notes:

- The pulse output accuracy is within ±0.01 mm.
- The pulse output is subject to a maximum delay of 1 msec with respect to the actual movement of the cylinder rod. Use this function to check the stop position.
- Output is allowed up to the maximum operating speed of each series. When the counter function is to be used, provide a frequency counter that can count frequencies of at least twice the applicable maximum speed.
  Maximum speed: 600 mm/s (60 kHz) for the **EZHC** Series, 300 mm/s (60 kHz) for the **EZHP** Series
- When line driver output is used, connect a terminal resistor of 150 Ω between the line receiver inputs.
- When open-collector output is used, keep the cable length to 2 m or less. In the open-collector output mode, the output waveform will fluctuate depending on the load condition. Therefore, check the operation beforehand with the equipment you plan to combine the actuator with.

Pulse Output Waveform



When the cylinder rod is moving to the counter-motor side

ASG1 output: Pulses corresponding to the cylinder operation are output.

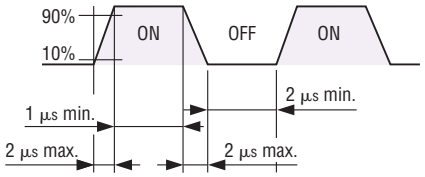
BSG1 output: This output is used to determine the direction of movement of the rod. A phase difference of 90° (electrical angle) exists with respect to the ASG1 output. The direction of movement of the rod can be determined from the BSG1 output level at the rise of the ASG1 output.

◇Driver Mode

FP, RP Input Signals

These signals are used to input forward/reverse pulses. Make sure the pulse train of the user controller will be input.

Pulse Waveform Characteristics

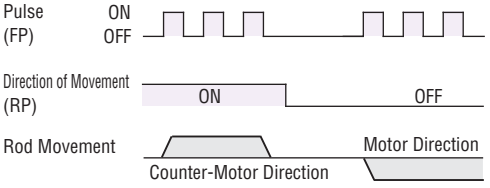


- For pulse signals, input pulse waveforms like those in the figure above.

•1-Pulse Input Mode

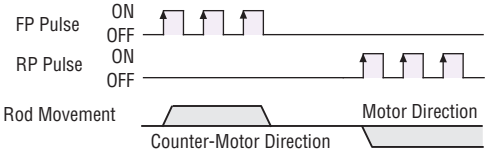
The 1-pulse input mode uses "Pulse" (FP) and "Direction of Movement" (RP) signals.

- When RP signals are ON, the cylinder rod moves to counter-motor side.
- When RP signals are OFF, the cylinder rod moves to motor side.



•2-Pulse Input Mode

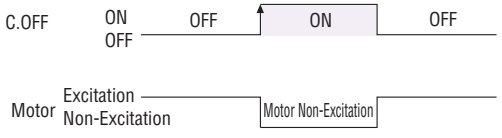
- When FP pulses are input, the cylinder rod moves to counter-motor side.
- When RP pulses are input, the cylinder rod moves to motor side.



C.OFF Input Signal

Turning the C.OFF input ON will cut off the output current to the motor. (The motor will no longer generate a holding force on the cylinder.)

To operate the cylinder, turn the C.OFF input OFF.



ACL Input Signal

This input reverts to the normal ON condition the ALM signal that has been turned OFF following an activation of the controller's protective function.

FREE Input Signal

This input is used to actuate or release the electromagnetic brake. Turning the FREE input ON will release the electromagnetic brake. (The holding force applied to the cylinder will also be lost.)

PRESET Input Signal

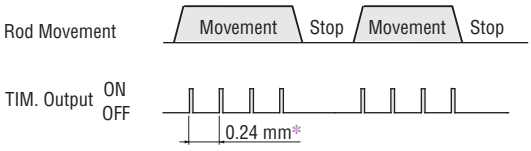
Turning the PRESET signal ON will preset the current position. A desired position can be preset via the teaching pendant.

REQ Input Signal

This input indicates that a current position output request can be accepted from the host controller. The current position data can be transferred when the REQ signal is ON.
This signal is used in combination with the OUTR, OUT0 and OUT1 signal outputs.

TIM. Output Signal

This output turns ON when a "Timing" signal is output. A TIM. signal is output each time the rod moves by 0.24 mm*.



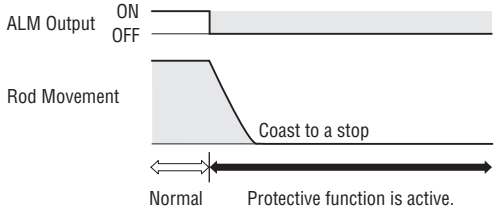
*__EZHP4/EZHP6__: 0.12 mm

END Output Signal

This output notifies that the positioning operation or return to home operation of the cylinder has completed. This signal is output when the rod is stopped after completion of an applicable operation.

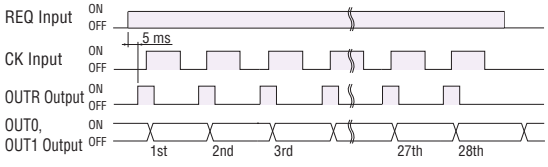
ALM Output Signal

This output notifies that the controller's protective function has been activated. The ALM output remains ON while the controller is operating normally, and turns OFF when a protective function has been activated.



OUTR, OUT0, OUT1 Output Signals

These outputs are used to output the current position data as recognized by the controller. The OUTR signal indicates that the controller is ready to transmit data, while the OUT0 and OUT1 signals output the current position data to the host controller. These signals are used in combination with the REQ signal input.



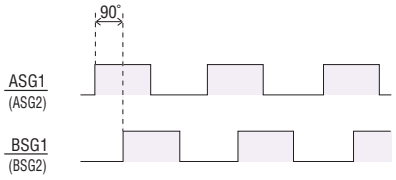
ASG1/BSG1, ASG2/BSG2 Output Signals

A counter or similar device can be connected to monitor the position of the cylinder rod.

Notes:

- The pulse output accuracy is within ±0.01 mm.
- The pulse output is subject to a maximum delay of 1 msec with respect to the actual movement of the cylinder rod. Use this function to check the stop position.
- Output is allowed up to the maximum operating speed of each series. When the counter function is to be used, provide a frequency counter that can count frequencies of at least twice the applicable maximum speed.
  Maximum speed: 600 mm/s (60 kHz) for the **EZHC** Series, 300 mm/s (60 kHz) for the **EZHP** Series
- When line driver output is used, connect a terminal resistor of 150 Ω between the line receiver inputs.
- When open-collector output is used, keep the cable length to 2 m or less. In the open-collector output mode, the output waveform will fluctuate depending on the load condition. Therefore, check the operation beforehand with the equipment you plan to combine the actuator with.

Pulse Output Waveform



When the cylinder rod is moving to the counter-motor side

ASG1 output: Pulses corresponding to the cylinder operation are output.

BSG1 output: This output is used to determine the direction of movement of the rod. A phase difference of 90° (electrical angle) exists with respect to the ASG1 output. The direction of movement of the rod can be determined from the BSG1 output level at the rise of the ASG1 output.

List of Cylinder and Controller Combinations

Model names for cylinder and linear motion controller combinations are shown below.

Type	Electromagnetic Brake	Model	Cylinder Model	Linear Motion Controller Model
Incremental Type	Not equipped	**EZHC4A-□I**	EZHC4A-□	EZMC13I-A
	Equipped	**EZHC4A-□MI**	EZHC4A-□M	
Absolute Type	Not equipped	**EZHC4A-□A**	EZHC4A-□	EZMC13A-A
	Equipped	**EZHC4A-□MA**	EZHC4A-□M	
Incremental Type	Not equipped	**EZHC6A-□I**	EZHC6A-□	EZMC24I-A
		EZHC6C-□I	EZHC6C-□	EZMC12I-C
	Equipped	**EZHC6A-□MI**	EZHC6A-□M	EZMC24I-A
		EZHC6C-□MI	EZHC6C-□M	EZMC12I-C
Absolute Type	Not equipped	**EZHC6A-□A**	EZHC6A-□	EZMC24A-A
		EZHC6C-□A	EZHC6C-□	EZMC12A-C
	Equipped	**EZHC6A-□MA**	EZHC6A-□M	EZMC24A-A
		EZHC6C-□MA	EZHC6C-□M	EZMC12A-C

● Enter the stroke length in the box (□) within the model name.

Motorized Cylinders

EZ limo EZHP Series

●Additional Information●
Technical reference ➜ Page F-1
Safety standards ➜ Page G-2

CE

●List of safety standard approved products (Model, Standards, File No., Certification Body) ➜ Page G-11

Features

●Adopting a Closed Loop Control

The motor end houses a stepping motor with a rotor position detection sensor. When a condition presenting the possibility of a misstep is detected, the motor performs closed loop control, thereby ensuring stable operation.

●Prevention of Hunting When Stopping

Unlike conventional servomotors, the motor used in the **EZ limo** system is free from hunting.

●Low Vibration/Low Noise Even during Low Speed Operation

The **EZHP** Series adopts software-based smooth drive control to suppress vibration and noise even during low speed operation, such as return to home operation.

●Long-Term Maintenance-Free

The drive method uses THK's ball screw, which employs the QZ™ lubrication system. These mechanisms give the system a considerable duration of maintenance-free performance.

●QZ™ lubrication system (THK): High-density fiber net supplies appropriate amounts of oil, thereby preventing oil waste and reducing environmental burden.

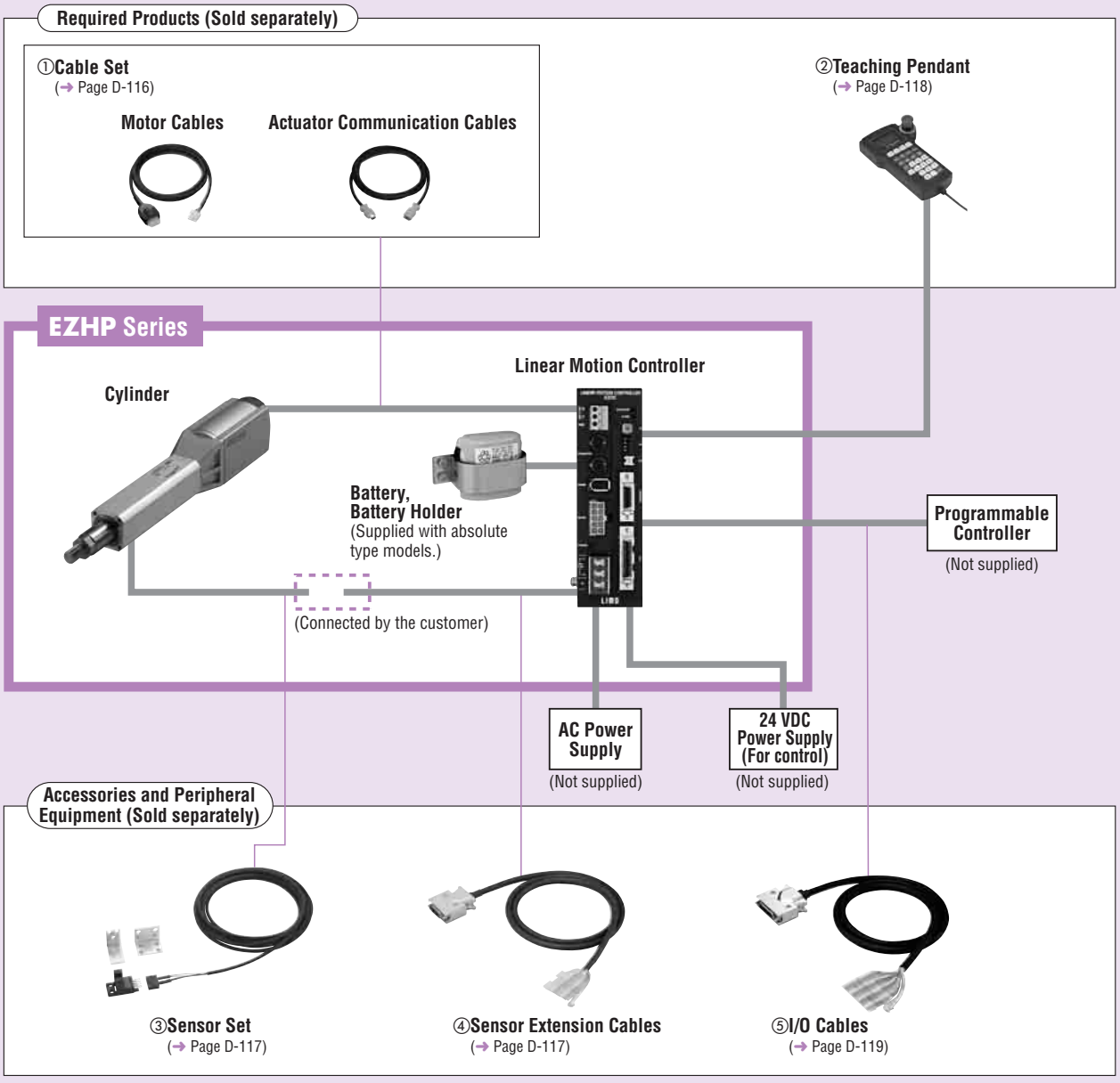
●Space-Saving Cable Outlet Orientation

The cable outlet is facing downward, which contributes to the overall space savings by reducing the space needed to wire the cables.

The cable outlet is facing downward.

System Configuration

Controller Mode



No.	Product Name	Overview	Page
①	Cable Set	Cable for extending the wiring distance between the cylinder and linear motion controller (2 to 10 m). Each set consists of a motor cable and an actuator communication cable.	D-116
②	Teaching Pendant	This pendant (**EZT1**) lets you set and operate various data at your fingertips. Cable length 5 m.	D-118
③	Sensor Set	Three sets of sensors, sensor mounting brackets and cables with connector (2 m), as well as a shielding plate.	D-117
④	Sensor Extension Cables	Cable used for connection between the linear motion controller and the sensor (1 m, 2 m).	D-117
⑤	I/O Cables	Cable used for connection between the linear motion controller and the host controller (1 m, 2 m).	D-119

●Example of System Configuration

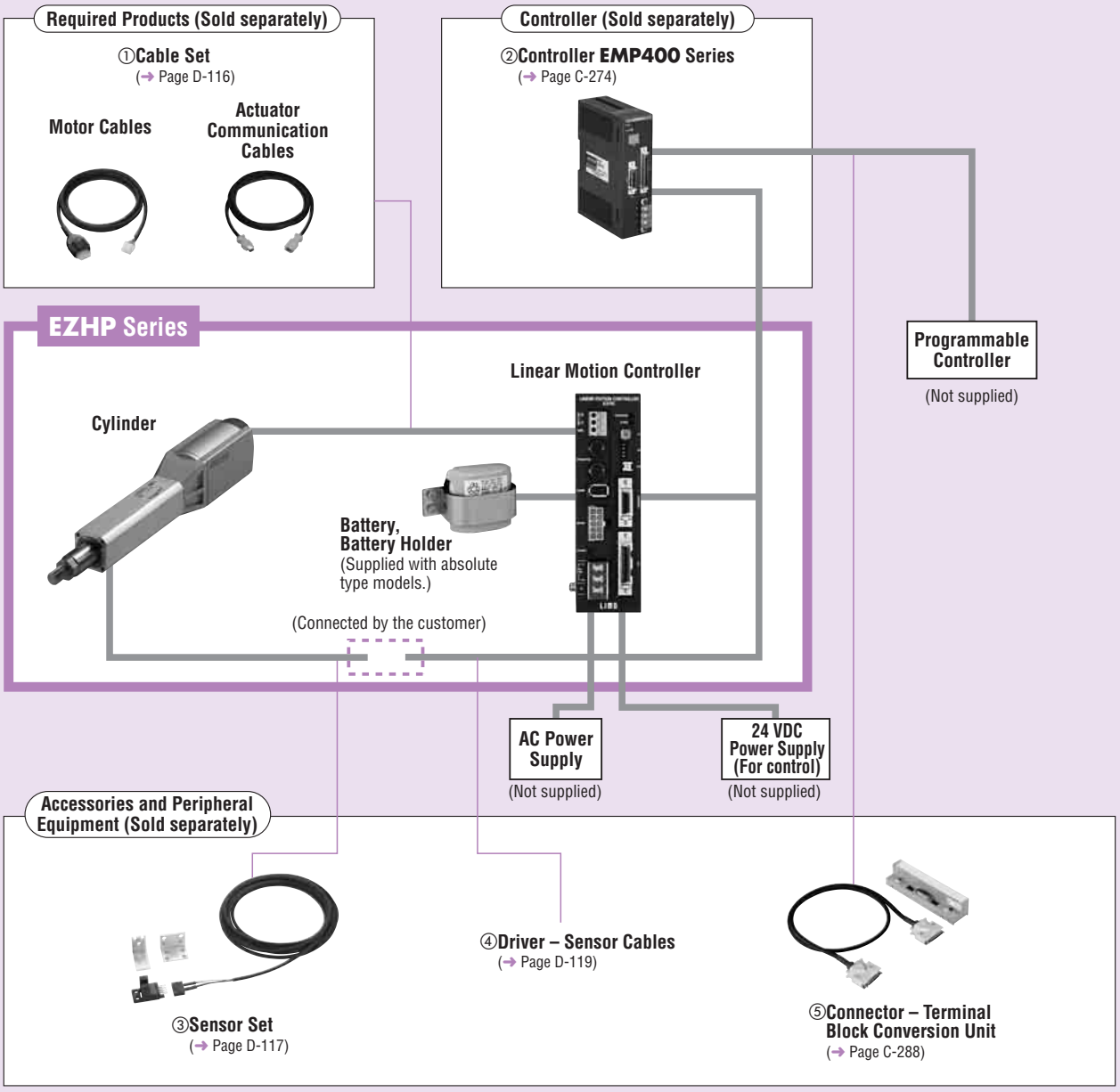
	(Sold separately)			(Sold separately)		
EZHP Series	Cable Set*1 (2 m)	Teaching Pendant	+	I/O Cable (1 m)	Sensor Extension Cable*2 (2 m)	Sensor Set*2 (2 m)
EZHP4A-05A	CC02EZ2	EZT1		CC36D1-1	CC20D2-1	PAES-S

*1 Motor cable and actuator communication cable are available separately. ➜ Page D-116
*2 Not required if return to home operation is performed without sensors.

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

●Driver Mode

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



No.	Product Name	Overview	Page
①	Cable Set	Cable for extending the wiring distance between the cylinder and linear motion controller (2 to 10 m). Each set consists of a motor cable and an actuator communication cable.	D-116
②	Controller	This controller gives commands needed to drive the cylinder.	C-274
③	Sensor Set	Three sets of sensors, sensor mounting brackets and cables with connector (2 m), as well as a shielding plate.	D-117
④	Driver – Sensor Cables	Cable for connecting the linear motion controller and the **EMP** Series controller (0.5 m).	D-119
⑤	Connector – Terminal Block Conversion Unit	Set of terminal block and cable for connecting the **EMP** Series controller and the host controller (1 m).	C-288

●Example of System Configuration

(Sold separately)			(Sold separately)			
EZHP Series	Cable Set* (2 m)	+	Controller	Driver – Sensor Cable (0.5 m)	Sensor Set (2 m)	Connector – Terminal Block Conversion Unit (1 m)
EZHP4A-05A	CC02EZ2		EMP401-1	CC005EZ6-EMPD	PAES-S	CC50T1

✻ Motor cable and actuator communication cable are available separately. ➔ Page D-116

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

Product Number Code

EZHP 4 A - 10 M I

① ② ③ ④ ⑤ ⑥

①	Series	**EZHP**: **EZHP** Series
②	Cylinder Size	
③	Power Supply Input	**A**: Single-Phase 100-115 VAC **C**: Single-Phase 200-230 VAC
④	Stroke	**05**: 50 mm **10**: 100 mm **20**: 200 mm **30**: 300 mm
⑤	Electromagnetic Brake	Blank: Without Electromagnetic Brake **M**: With Electromagnetic Brake
⑥	Type	**I**: Incremental Type **A**: Absolute Type

Product Line

●Incremental Type

◇Without Electromagnetic Brake

Stroke	Single-Phase 100-115 VAC		Single-Phase 200-230 VAC
	Model	Model	Model
50 mm	**EZHP4A-05I**	**EZHP6A-05I**	**EZHP6C-05I**
100 mm	**EZHP4A-10I**	**EZHP6A-10I**	**EZHP6C-10I**
200 mm	**EZHP4A-20I**	**EZHP6A-20I**	**EZHP6C-20I**
300 mm	**EZHP4A-30I**	**EZHP6A-30I**	**EZHP6C-30I**

◇With Electromagnetic Brake

Stroke	Single-Phase 100-115 VAC		Single-Phase 200-230 VAC
	Model	Model	Model
50 mm	**EZHP4A-05MI**	**EZHP6A-05MI**	**EZHP6C-05MI**
100 mm	**EZHP4A-10MI**	**EZHP6A-10MI**	**EZHP6C-10MI**
200 mm	**EZHP4A-20MI**	**EZHP6A-20MI**	**EZHP6C-20MI**
300 mm	**EZHP4A-30MI**	**EZHP6A-30MI**	**EZHP6C-30MI**

●Absolute Type

◇Without Electromagnetic Brake

Stroke	Single-Phase 100-115 VAC		Single-Phase 200-230 VAC
	Model	Model	Model
50 mm	**EZHP4A-05A**	**EZHP6A-05A**	**EZHP6C-05A**
100 mm	**EZHP4A-10A**	**EZHP6A-10A**	**EZHP6C-10A**
200 mm	**EZHP4A-20A**	**EZHP6A-20A**	**EZHP6C-20A**
300 mm	**EZHP4A-30A**	**EZHP6A-30A**	**EZHP6C-30A**

◇With Electromagnetic Brake

Stroke	Single-Phase 100-115 VAC		Single-Phase 200-230 VAC
	Model	Model	Model
50 mm	**EZHP4A-05MA**	**EZHP6A-05MA**	**EZHP6C-05MA**
100 mm	**EZHP4A-10MA**	**EZHP6A-10MA**	**EZHP6C-10MA**
200 mm	**EZHP4A-20MA**	**EZHP6A-20MA**	**EZHP6C-20MA**
300 mm	**EZHP4A-30MA**	**EZHP6A-30MA**	**EZHP6C-30MA**

The following items are included in each product.

Cylinder, Linear Motion Controller, Operating Manual, Mounting Bracket for Controller, Hexagonal Nut, User I/O Connector, Sensor I/O Connector, Battery*, Battery Holder*

*Only for absolute type

Specifications

Cylinder Specifications

Model	Incremental Type	EZHP4A-□I		EZHP4A-□MI		EZHP6A-□I, EZHP6C-□I		EZHP6A-□MI, EZHP6C-□MI	
	Absolute Type	EZHP4A-□A		EZHP4A-□MA		EZHP6A-□A, EZHP6C-□A		EZHP6A-□MA, EZHP6C-□MA	
Motor Type		Stepping Motor with Built-In Rotor-Position Sensor							
Drive Method		Rolled Ball Screw							
Electromagnetic Brake		Not equipped		Equipped		Not equipped		Equipped	
Speed Range	mm/s	~200	~300	~200	~300	~200	~300	~200	~300
Max. Transportable Mass	kg Horizontal Direction*	–				–			
	kg Vertical Direction	–		14	9	–		30	12
Max. Acceleration	m/s² Horizontal Direction	–				–			
	m/s² Vertical Direction	–		2.5		–		2.5	
Max. Thrust Force	N	140	110	140	110	400	147	400	147
Push Force	N	140 (Speed: 6 mm/s or less)				400 (Speed: 6 mm/s or less)			
Max. Holding Force	N Power ON	140				400			
	N Power OFF	–				–			
	N Electromagnetic Brake	–		140		–		400	
Repetitive Positioning Accuracy	mm	±0.02							
Resolution	mm	0.01							
Lead	mm	6							
Stroke	mm	50, 100, 200, 300							
Cylinder Mass [Stroke: Mass] Figure in the parentheses shows the mass of the model with electromagnetic brake.	kg	50: 1.7 (1.9) 100: 2.0 (2.2) 200: 2.5 (2.7) 300: 3.0 (3.2)				50: 3.3 (3.7) 100: 3.7 (4.1) 200: 4.6 (5.0) 300: 5.6 (6.0)			

● Enter the stroke length in the box (□) within the model name.

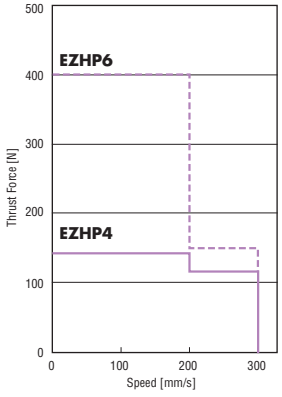
* In a horizontal direction, the value cannot be shown because it varies by frictional resistance of the load supporting mechanism. Always provide an external anti-spin mechanism, such as a guide.

Installation ➜ Page D-121

How to read specifications ➜ Page D-70

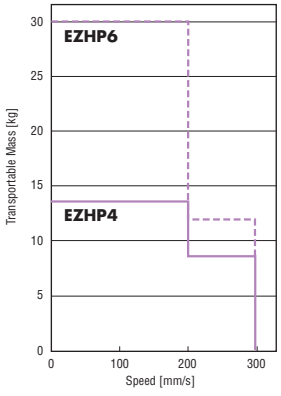
Correlation Diagram of Speed and Thrust Force

◇Horizontal Direction/Vertical Direction



Correlation Diagram of Speed and Transportable Mass

◇Vertical Direction

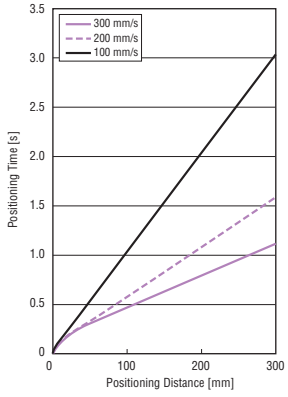


Positioning Distance – Positioning Time

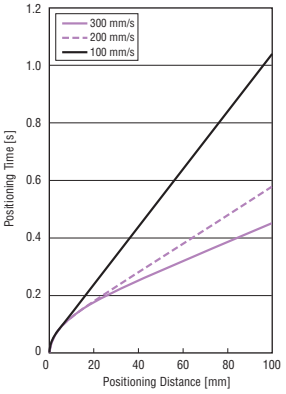
The positioning time (reference value) can be checked from the positioning distance.

The graphs below represent the characteristics when operated at maximum acceleration and maximum speed.

◇Horizontal Direction/Vertical Direction



Enlargement of Positioning Distance under 100 mm

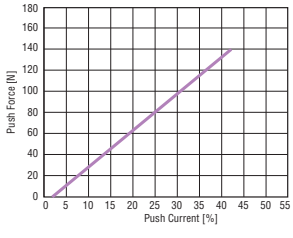


● The starting speed should be 3 mm/s or less.

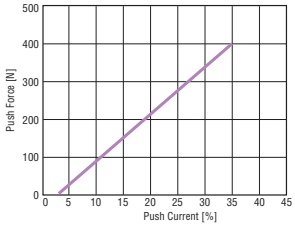
Push Force

Push force can be set through "Push current setting" in a program mode.

◇EZHP4



◇EZHP6



Notes:

● The above value is a reference, not guaranteed.

● When the cylinder is used in a vertical direction, an external force calculated by multiplying the mass of the load by the rate of gravitational acceleration is applied. Therefore, the cylinder push force must be set so as to accommodate this external force. Measure the push force using an actual load, and set an appropriate push current.

Features D-108 / System Configuration D-109 / Product Line D-111

●Specifications of Linear Motion Controller

◇Controller Mode

Model			EZMC13I-A/EZMC13A-A	EZMC24I-A/EZMC24A-A	EZMC12I-C/EZMC12A-C
Type			Stored data type		
Number of Control Axes			1 axis		
Power Supply Input	Control Power		24 VDC±10%　1.0 A (Controller only: 0.5 A)*		
	Main Power	Voltage	Single-Phase 100-115 VAC −15%, +10%		Single-Phase 200-230 VAC −15%, +10%
		Frequency	50/60 Hz		
		Current	3.3 A	5.0 A	3.0 A
Positioning Data	Setting Mode		Absolute mode (absolute-position specification), Incremental mode (relative-position specification)		
	Number		63		
	Setting Method		Data is set using the accessory teaching pendant (**EZT1**). (Stored in EEPROM)		
Positioning Control	Mode		Sequential positioning, Selective positioning		
	Travel Amount Setting Range		−83886.08～+83886.07 mm (value set in units of 0.01 mm)		
	Starting Speed Setting Range		0.01～250.00 mm/s (value set in units of 0.01 mm/s)		
	Operating Speed Setting Range		0.01～300.00 mm/s (value set in units of 0.01 mm/s)		
	Acceleration/Deceleration Rate Setting Range		0.01～100.00 m/s² (value set in units of 0.01 m/s²)		
Control Modes			· External input mode (EXT): In this mode, operation by external signal, command position, I/O condition and alarm condition can be monitored. · Program mode (PRG): In this mode, operation data can be created, changed or cleared. · Parameter mode (PAR): In this mode, operation parameters and function setting parameters can be set or changed. · Test mode (TST): In this mode, manual operation and I/O check can be performed.		
Operation Modes			Positioning operation, Return to home operation, Linked operation (a maximum of 4 data), Push-motion operation, Continuous operation		
Input Signals	Input Mode		24 VDC Photocoupler insulation input, Input resistance: 4.7 kΩ (START, STOP, HOME/PRESET, FREE, M0～M5, REQ, ACL/CK) 5 VDC Photocoupler insulation input, Input resistance: 180 Ω or 24 VDC Photocoupler insulation input, Input resistance: 2.7 kΩ (FWD, RVS)		
	START		Start the positioning operation.		
	STOP		Stop the positioning operation and the return to home operation.		
	HOME/PRESET		HOME: Start the return to home operation. PRESET: Preset the current position.		
	FREE		Stop motor excitation and release the electromagnetic brake.		
	M0～M5		Select the step No.		
	REQ		Request the current position output.		
	FWD		Move the cylinder rod to the counter-motor side.		
	RVS		Move the cylinder rod to the motor side.		
	ACL/CK		ACL: Cancel the protective function currently active. CK: Used when the current position is output.		
Output Signals	Output Mode		Transistor output linked to photocoupler (24 VDC, 15 mA or less), Line driver output		
	ALM		This signal is output when a protective function has been activated.		
	END/OUTR		END: Turn ON when the positioning operation or return to home operation has ended. OUTR: Turn ON when current position output is ready.		
	MOVE		This signal is output when the cylinder is moving.		
	AREA/OUT0		AREA: This output notifies that the moving part of the cylinder is staying inside a specified area. OUT0: Output current position.		
	T-UP/OUT1		T-UP: Output when the push-motion operation has ended. OUT1: Output current position.		
	ASG1, BSG1		Output the position of the cylinder rod via pulse signal. (Open-collector output)		
	ASG2, BSG2		Output the position of the cylinder rod via pulse signal. (Line driver output)		
Protective Functions			Excessive position deviation, Overcurrent protection, Overvoltage protection, Overheat protection, Overload, Motor overheat protection, Sensor error, Overspeed, Nonvolatile memory error, etc.		
Indicators (LED)			Control power supply, Alarm		
Cooling Method			Natural ventilation		
Mass			0.8 kg		

*Take into account safety margin of +0.2 A for the teaching pendant, and/or +0.3 A for the electromagnetic brake type.

◇Driver Mode

Model			EZMC13I-A/EZMC13A-A	EZMC24I-A/EZMC24A-A	EZMC12I-C/EZMC12A-C
Power Supply Input	Control Power		24 VDC ±10%　1.0 A (Controller only: 0.5 A)*		
	Main Power	Voltage	Single-Phase 100-115 VAC −15%, +10%		Single-Phase 200-230 VAC −15%, +10%
		Frequency	50/60 Hz		
		Current	3.3 A	5.0 A	3.0 A
Maximum Response Frequency			80 kHz (When the pulse duty is 50%)		
Input Signals	Input Mode		5 VDC Photocoupler insulation input, Input resistance: 180 Ω or 24 VDC Photocoupler insulation input, Input resistance: 2.7 kΩ (FP, RP) 24 VDC Photocoupler insulation input, Input resistance: 4.7 kΩ (ACL/CK, FREE, C.OFF, PRESET, REQ)		
	FP		Operation command pulse input (The operation command pulse input in counter-motor direction in the 2-pulse input mode) Pulse width: 2 μs minimum, Pulse rise/fall: 2 μs maximum (Negative logic pulse input)		
	RP		Direction of movement input (The operation command pulse input in motor direction in the 2-pulse input mode) Pulse width: 2 μs minimum, Pulse rise/fall: 2 μs maximum (Negative logic pulse input)		
	ACL/CK		ACL: Cancel the protective function currently active. CK: Used when the current position is output.		
	FREE		Stop motor excitation and release the electromagnetic brake.		
	C.OFF		The current flow to the motor is cut off.		
	PRESET		Preset the current position.		
	REQ		Request the current position output.		
Output Signals	Output Mode		Transistor output linked to photocoupler (24 VDC, 15 mA or less), Line driver output		
	TIM./OUT0		TIM.: Signal is output when the excitation sequence is at step "0." (A TIM. signal is output each time the rod moves by 0.12 mm.) OUT0: Output current position.		
	OUT1		Output current position.		
	ALM		This signal is output when a protective function has been activated.		
	END/OUTR		END: Turn ON when the positioning operation or return to home operation has ended. OUTR: Turn ON when current position output is ready.		
	ASG1, BSG1		Output the position of the cylinder rod via pulse signal. (Open-collector output)		
	ASG2, BSG2		Output the position of the cylinder rod via pulse signal. (Line driver output)		
Protective Functions			Excessive position deviation, Overcurrent protection, Overvoltage protection, Overheat protection, Overload, Motor overheat protection, Sensor error, Overspeed, Nonvolatile memory error, etc.		
Indicators (LED)			Control power supply, Alarm		
Cooling Method			Natural ventilation		
Mass			0.8 kg		

*Take into account safety margin of +0.2 A for the teaching pendant, and/or +0.3 A for the electromagnetic brake type.

General Specifications

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

Item	Motor	Linear Motion Controller
Insulation Resistance	100 MΩ or more when 500 VDC megger is applied between the following places: · Motor/Sensor windings – Case · Case – Windings of electromagnetic brake (Only for electromagnetic brake type)	100 MΩ or more when 500 VDC megger is applied between the following places: · Signal I/O, Control power supply, PE – Main power supply terminal · Signal I/O, Control power supply, PE – Motor output terminal · Signal I/O, Control power supply, PE – Battery input terminal
Dielectric Strength	Sufficient to withstand the following for 1 minute: **EZHP4** · Motor/Sensor windings – Case 1.0 kVAC 50 Hz · Case – Windings of electromagnetic brake (Only for electromagnetic brake type) 1.0 kVAC 50 Hz **EZHP6** · Motor/Sensor windings – Case 1.5 kVAC 50 Hz · Case – Windings of electromagnetic brake (Only for electromagnetic brake type) 1.0 kVAC 50 Hz	Sufficient to withstand the following for 1 minute: · Signal I/O, Control power supply – Main power supply terminal 1.8 kVAC · Signal I/O, Control power supply – Motor output terminal 1.8 kVAC · Signal I/O, Control power supply – Battery input terminal 1.8 kVAC · PE – Main power supply terminal 1.5 kVAC · PE – Motor output terminal 1.5 kVAC · PE – Battery input terminal 1.5 kVAC
Ambient Temperature	0～+40°C (non-freezing)	
Ambient Humidity	85% or less (non-condensing)	

Note:

● Do not measure insulation resistance or perform the dielectric strength test while the cylinder and linear motion controller are connected.

Battery Specifications (For the absolute type only)

Model	PAEZ-BT2
Battery Type	Cylindrical sealed nickel-cadmium storage cell
Nominal Voltage	2.4 V
Rated Capacity	2000 mAh
Mass	180 g
Life	Approx. 4 years※1
Charge Time	48 hours※1
Data Retention Period	Approx. 360 hours (15 days)※1※2
Ambient Temperature	0～+40˚C (non-freezing)
Ambient Humidity	20～85% (non-condensing)

※1 At an ambient temperature of 20˚C

※2 After the power is cut off with the battery fully charged.

List of Cylinder and Controller Combinations

Model names for cylinder and linear motion controller combinations are shown below.

Type	Electromagnetic Brake	Model	Cylinder Model	Linear Motion Controller Model
Incremental Type	Not equipped	**EZHP4A-□I**	EZHP4A-□	EZMC13I-A
	Equipped	**EZHP4A-□MI**	EZHP4A-□M	
Absolute Type	Not equipped	**EZHP4A-□A**	EZHP4A-□	EZMC13A-A
	Equipped	**EZHP4A-□MA**	EZHP4A-□M	
Incremental Type	Not equipped	**EZHP6A-□I**	EZHP6A-□	EZMC24I-A
		EZHP6C-□I	EZHP6C-□	EZMC12I-C
	Equipped	**EZHP6A-□MI**	EZHP6A-□M	EZMC24I-A
		EZHP6C-□MI	EZHP6C-□M	EZMC12I-C
Absolute Type	Not equipped	**EZHP6A-□A**	EZHP6A-□	EZMC24A-A
		EZHP6C-□A	EZHP6C-□	EZMC12A-C
	Equipped	**EZHP6A-□MA**	EZHP6A-□M	EZMC24A-A
		EZHP6C-□MA	EZHP6C-□M	EZMC12A-C

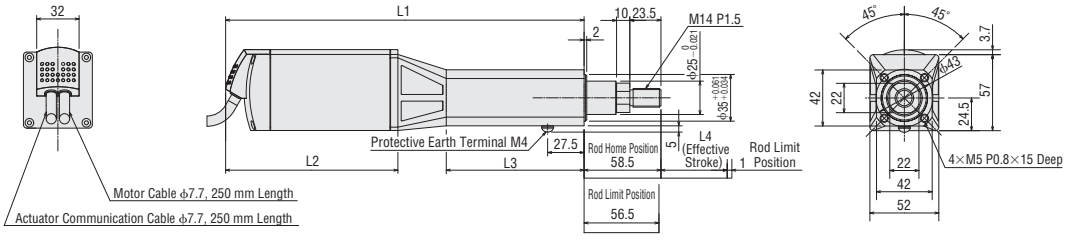
● Enter the stroke length in the box (□) within the model name.

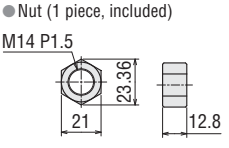
Dimensions Unit = mm

● Cylinder

◇**EZHP4**

Cylinder Model	L1	L2	L3	L4	DXF
EZHP4A-05	270.5	130	104	50	D396
EZHP4A-05M	300.5	160			D397
EZHP4A-10	320.5	130	154	100	D398
EZHP4A-10M	350.5	160			D399
EZHP4A-20	420.5	130	254	200	D400
EZHP4A-20M	450.5	160			D401
EZHP4A-30	520.5	130	354	300	D402
EZHP4A-30M	550.5	160			D403

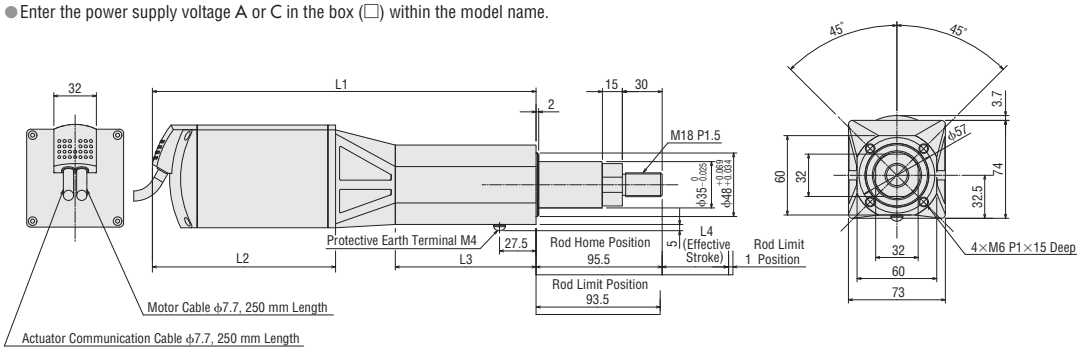




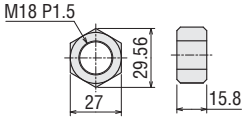
◇EZHP6

Cylinder Model	L1	L2	L3	L4	DXF
EZHP6□-05	289	138	106	50	D404
EZHP6□-05M	324	173			D405
EZHP6□-10	339	138	156	100	D406
EZHP6□-10M	374	173			D407
EZHP6□-20	439	138	256	200	D408
EZHP6□-20M	474	173			D409
EZHP6□-30	539	138	356	300	D410
EZHP6□-30M	574	173			D411

● Enter the power supply voltage A or C in the box (□) within the model name.

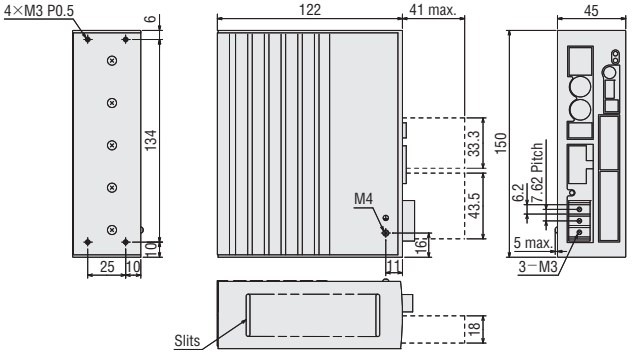


● Nut (1 piece, included)

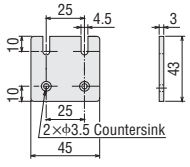


● Linear Motion Controller

EZMC13I-A, EZMC24I-A, EZMC12I-C
EZMC13A-A, EZMC24A-A, EZMC12A-C
Mass: 0.8 kg
DXF D487



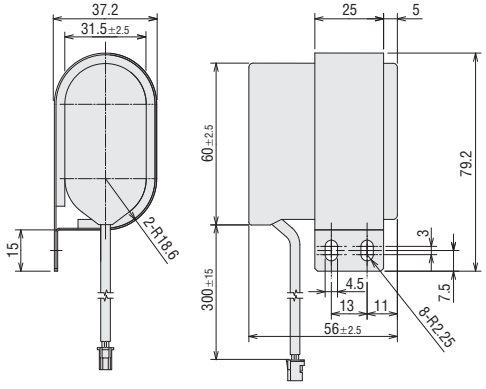
● Mounting Bracket
(2 pieces, included)



● Control I/O Connector (Included)
Case: 54331-1361 (MOLEX)
Connector: 54306-3619 (MOLEX)

● Sensor I/O Connector (Included)
Case: 54331-1201 (MOLEX)
Connector: 54306-2019 (MOLEX)

● Battery
(Supplied with absolute type. Battery holder provided.)
Mass: 0.18 kg
DXF D488



■Connection and Operation

Common to **EZHC** Series. Refer to page D-100.