Ezi-SERVO®

Closed Loop Stepping System

MINI

FASTECH

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FASTECH Co.,Ltd.

Table of Contents

※ Before operation ※

- Thank you for your purchasing Ezi-SERVO-MINI.
- Ezi-SERVO is an all-in-one Unit. For high-speed and high-precision drive of a stepping motor, Ezi-SERVO-MINI is an unique drive that adopts a new control scheme owing to an on-board high-performance 32bit digital signal processor.
- This manual describes handling, maintenance, repair, diagnosis and troubleshooting of Ezi-SERVO-MINI.
- Before operating Ezi-SERVO-MINI, thoroughly read this manual.
- After reading the manual, keep the manual near the Ezi-SERVO so that any user can read the manual whenever needed.

1. Precautions

◆ General Precautions

- Contents of this manual are subject to change without prior notice for functional improvement, change of specifications or user's better understanding.
  Thoroughly read the manual provided with the purchased Ezi-SERVO-MINI.

- When the manual is damaged or lost, please contact with Fastech's agents or our company at the address on the last page of the manual.

- Our company is not responsible for a product breakdown due to user's dismantling for the product, and such a breakdown is not guaranteed by the warranty.

◆ Put the Safety First

- Before installation, operation and repairing the Ezi-SERVO-MINI, thoroughly read the manual and fully understand the contents. Before operating the Ezi-SERVO please, understand the mechanical characteristics of the Ezi-SERVO and related safety information and precautions.

- This manual divides safety precautions into **Attention** and **Warning**.

⚠ **Attention** :	If user does not properly handle the product, the user may seriously or slightly injured and damages may occur in the machine.
⚠ **Warning** :	If user does not properly handle the product, a dangerous situation (such as an electric shock) may occur resulting in deaths or serious injuries.

- Although precaution is only a **Attention**, a serious result could be caused depending on the situation. Follow safety precautions.

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◆ Check the Product

⚠ **Attention**	Check the Product is damaged or parts are missing. Otherwise, the machine may get damaged or the user may get injured.

◆ Installation

⚠ **Attention**	Carefully move the Ezi-SERVO. Otherwise the Product may get damaged or User's foot may get injured by dropping the product. Use non-flammable materials such as metal in the place where the Ezi-SERVO is to be installed. Otherwise, a fire may occur. When installing several Ezi-SERVO in a sealed place, install a cooling fan to keep the ambient temperature of the Ezi-SERVO as 50℃ or lower. Otherwise, a fire or other kinds of accidents may occur due to overheating.
⚠ **Warning**	The process of Installation, Connection, Operation, Checking and Repairing should be done with qualified person. Otherwise, a fire or other kinds of accidents may occur.

◆ Connect Cables

⚠ **Attention**	Keep the rated range of Input Voltage for Ezi-SERVO. Otherwise, a fire or other kinds of accidents may occur. Cable connection should follow the wiring diagram. Otherwise, a fire or other kinds of accidents may occur.
⚠ **Warning**	Before connecting cables, check if input power is off. Otherwise, an electric shock or a fire may occur. The case of the Ezi-SERVO is insulated from the ground of the internal circuit by the condenser. Ground the Ezi-SERVO. Otherwise, an electric shock or a fire may occur.

◆ Operation

⚠ **Attention**	If a protection function(alarm) occurs, firstly remove its cause and then release(alarm reset) the protection function. If you are operating continuously without removing its cause, the machine may get damaged or the user may get injured. Do not make Motor Free and make input signal to ON during operation. Motor will stop and stop current will become zero. The machine may get damaged or the user may get injured. Make all input signals to OFF before supply input voltage to Ezi-SERVO. The machine may get damaged or the user may get injured by motor operation. All parameter values are set by default factory setting value. Change this value after reading this manual throughly. Otherwise, the machine may get damaged or other kinds of accidents may occur.

◆ Check and Repair

⚠ **Warning**	Stop supplying power to the main circuit and wait for a while before checking or repairing the Ezi-SERVO. Electricity remaining in the capacitor may cause danger. Do not change cabling while power is being supplied. Otherwise, the user may get injured or the product may get damaged. Do not reconstruct the Ezi-SERVO. Otherwise, an electric shock may occur or the reconstructed product can not get After-Service.

■ Part Numbering

Ezi-SERVO-MI-20S-A-□

Drive Series Type

Motor Flange Size
20 : 20mm
25 : 25mm
28 : 28mm
35 : 35mm
42 : 42mm

Motor Length
S : Single
M : Middle
L : Large
XL: Extra Large

Encoder Resolution
A : 10,000/Rev.
B : 20,000/Rev.
C : 32,000/Rev.
D : 16,000/Rev.
F : 4,000/Rev.

Motor Type
Blank : Standard
L : Low Vibration
H : High Speed

■ Combination List of Ezi-SERVO

| Unit Part Number	Motor Model Number	Drive Model Number
Ezi-SERVO-MI-20M-F	EzM-20M-F	EzS-PD-MI-20M-F
Ezi-SERVO-MI-20L-F	EzM-20L-F	EzS-PD-MI-20L-F
Ezi-SERVO-MI-25S-F-L	EzM-25S-F-L	EzS-PD-MI-25S-F
Ezi-SERVO-MI-25M-F-L	EzM-25M-F-L	EzS-PD-MI-25M-F
Ezi-SERVO-MI-25L-F-L	EzM-25L-F-L	EzS-PD-MI-25L-F
Ezi-SERVO-MI-28S-D	EzM-28S-D	EzS-PD-MI-28S-D
Ezi-SERVO-MI-28M-D	EzM-28M-D	EzS-PD-MI-28M-D
Ezi-SERVO-MI-28L-D	EzM-28L-D	EzS-PD-MI-28L-D
Ezi-SERVO-MI-35S-D	EzM-35S-D	EzS-PD-MI-35S-D
Ezi-SERVO-MI-35M-D	EzM-35M-D	EzS-PD-MI-35M-D
Ezi-SERVO-MI-35L-D	EzM-35L-D	EzS-PD-MI-35L-D
Ezi-SERVO-MI-35XL-D	EzM-35XL-D	EzS-PD-MI-35XL-D
Ezi-SERVO-MI-42S-A	EzM-42S-A	EzS-PD-MI-42S-A
Ezi-SERVO-MI-42S-B	EzM-42S-B	EzS-PD-MI-42S-B
Ezi-SERVO-MI-42S-C	EzM-42S-C	EzS-PD-MI-42S-C
Ezi-SERVO-MI-42M-A	EzM-42M-A	EzS-PD-MI-42M-A
Ezi-SERVO-MI-42M-B	EzM-42M-B	EzS-PD-MI-42M-B
Ezi-SERVO-MI-42M-C	EzM-42M-C	EzS-PD-MI-42M-C
Ezi-SERVO-MI-42L-A	EzM-42L-A	EzS-PD-MI-42L-A
Ezi-SERVO-MI-42L-B	EzM-42L-B	EzS-PD-MI-42L-B
Ezi-SERVO-MI-42L-C	EzM-42L-C	EzS-PD-MI-42L-C
Ezi-SERVO-MI-42XL-A	EzM-42XL-A	EzS-PD-MI-42XL-A
Ezi-SERVO-MI-42XL-B	EzM-42XL-B	EzS-PD-MI-42XL-B
Ezi-SERVO-MI-42XL-C	EzM-42XL-C	EzS-PD-MI-42XL-C

2. Main characteristics

1 Closed Loop System

Ezi-SERVO$^®$ is an innovative closed loop stepping motor and controller that utilizes a high-resolution motor mounted encoder to constantly monitor the motor shaft position. The encoder feedback feature allows the Ezi-SERVO$^®$ to update the current motor shaft position information every 25 micro seconds. This allows the Ezi-SERVO$^®$ drive to compensate for the loss of position, ensuring accurate positioning. For example, due to a sudden load change, a conventional stepper motor and drive could lose a step creating a positioning error and a great deal of cost to the end user!
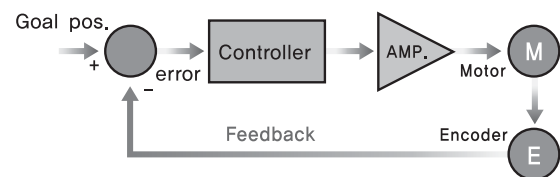
2 No Gain Tuning

Conventional servo systems, to ensure machine performance, smoothness, positional error and low servo noise, require the adjustment of its servo's gains as an initial crucial step. Even systems that employ auto-tuning require manual tweaking after the system is installed, especially if more that one axis are interdependent. Ezi-SERVO$^®$ employs the best characteristics of stepper and closed loop motion controls and algorithms to eliminate the need of tedious gain tuning required for conventional closed loop servo systems. This means that Ezi-SERVO$^®$ is optimized for the application and ready to work right out of the box! The Ezi-SERVO$^®$ system employs the unique characteristics of the closed loop stepping motor control, eliminating these cumbersome steps and giving the engineer a high performance servo system without wasting setup time. Ezi-SERVO$^®$ is especially well suited for low stiffness loads (for example, a belt and pulley system) that some-time require conventional servo systems to inertia match with the added expense and bulk of a gearbox. Ezi-SERVO$^®$ also performs exceptionally, even under heavy loads and high speeds!

Belt and Pulley System

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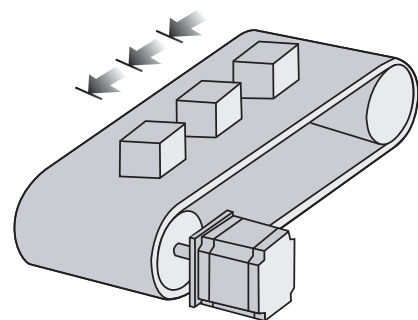
3 No Hunting

Traditional servo motor drives overshoot their position and try to correct by overshooting the opposite direction, especially in high gain applications. This is called null hunt and is especially prevalent in systems that the break away or static friction is significantly higher than the running friction. The cure is lowering the gain, which affects accuracy or using Ezi-SERVO® Motion Control System! Ezi-SERVO® utilizes the unique characteristics of stepping motors and locks itself into the desired target position, eliminating Null Hunt. This feature is especially useful in applications such as nanotech manufacturing, semiconductor fabrication, vision systems and ink jet printing in which system oscillation and vibration could be a problem.
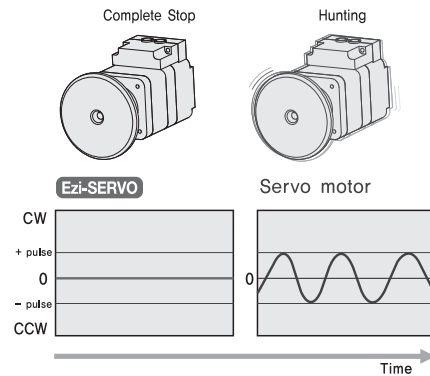
4 Smooth and Accurate

Ezi-SERVO® is a high-precision servo drive, using a high-resolution encoder with 32,000 pulses/revolution.
Unlike a conventional Microstep drive, the on-board high performance DSP(Digital Signal Processor) performs vector control and filtering, producing a smooth rotational control with minimum ripples.
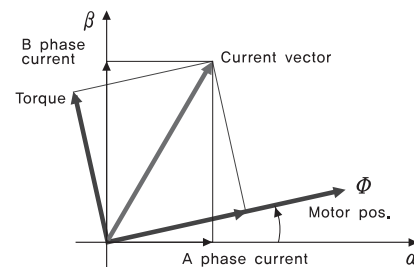
5 Fast Response

Similar to conventional stepping motors, Ezi-SERVO® instantly synchronizes with command pulses providing fast positional response.
Ezi-SERVO® is the optimum choice when zero-speed stability and rapid motions within a short distance are required. Traditional servo motor systems have a natural delay between the commanding input signals and the resultant motion because of the constant monitoring of the current position, necessitating in a waiting time until it settles, called settling time.
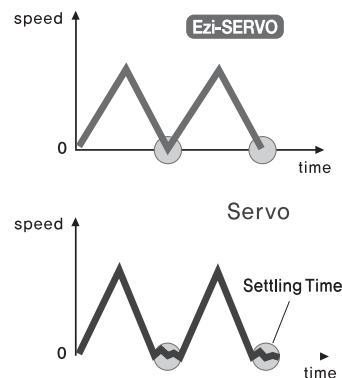
6 High Resolution

The unit of the position command can be divided precisely.
(Max. 32,000 pulses/revolution)

```
500
1000
1600
2000
3600
4000
5000
6400
7200
10000
16000
20000
32000
```
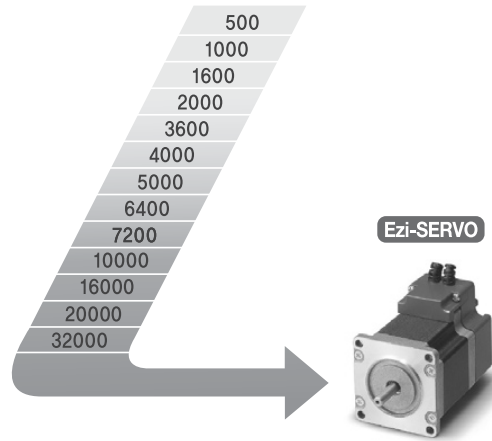
Ezi-SERVO

7 High Torque

Compared with common step motors and drives, Ezi–SERVO$^®$ motion control systems can maintain a high torque state over relatively long period of time. This means that Ezi–SERVO continuously operates without loss of position under 100% of the load. Unlike conventional microstep drives, Ezi–SERVO$^®$ exploits continuous high–torque operation during high–speed motion due to its innovative optimum current phase control.

torque

Ezi-SERVO
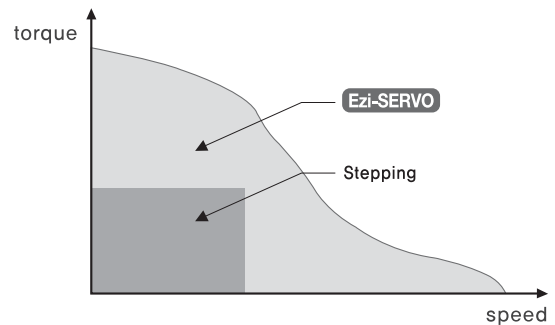
Stepping

speed

8 High Speed

The Ezi–SERVO$^®$ functions well at high speed without the loss of Synchronism or positioning error. Ezi–SERVO's ability of continuous monitoring of current position enables the stepping motor to generate high–torque, even under a 100% load condition.

speed

High Speed

time

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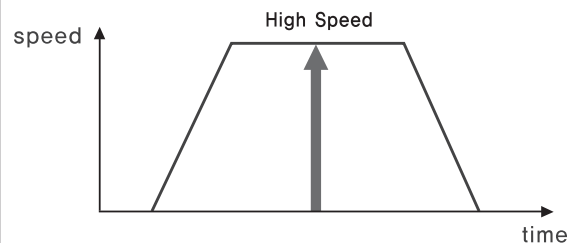
3. Drive Specification and Dimension

3.1 Drive Specification

| Motor Model	EzM-20 series	EzM-25 series	EzM-28 series	EzM-35 series	EzM-42 series
Driver Model	EzS-PD-MI-20 series	EzS-PD-MI-25 series	EzS-PD-MI-28 series	EzS-PD-MI-35 series	EzS-PD-MI-42 series
Input Voltage	24VDC ±10%				
Control Method	Closed loop control with 32bit DSP				
Current Consumption	Max : 500mA (Except motor current)				
Operating Condition — Ambient Temperature	In Use : 0~50℃ In Storage : -20~70℃				
Operating Condition — Humidity	In Use : 35~85%RH (Non-Condensing) In Storage : 10~90%RH (Non-Condensing)				
Operating Condition — Vib. Resist.	0.5G				
Function — Rotation Speed	0~3,000rpm				
Function — Resolution (P/R)	4,000/Rev. Encoder model : 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 4,000 10,000/Rev. Encoder model : 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 16,000/Rev. Encoder model : 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 16,000 20,000/Rev. Encoder model : 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 20,000 32,000/Rev. Encoder model : 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 32,000 (Selectable with Dip switch)				
Function — Max. Input Pulse Frequency	500KHz (Duty 50%)				
Function — Protection Functions	Over current, Over speed, Position tracking error, Over load, Over temperature, Over regenerated voltage, Motor connect error, Encoder connect error, Motor voltage error, Inposition error, System error, ROM error, Input voltage error, Position overflow error				
Function — LED Display	Power status, Alarm status, In-Position status, Servo On status				
Function — In-Position Selection	16 types (Selectable with Dip switch)				
Function — Position Gain Selection	16 types (Selectable with Dip switch)				
Function — Pulse Input Method	1-Pulse/2-Pulse (Selectable with DIP switch)				
Function — Rotational Direction	CW/CCW (Selectable with DIP switch)				
Function — Speed/Position Control Command	Pulse train input				
I/O Signal — Input Signal	Position command pulse, Servo On/Off, Alarm reset (Photocoupler input)				
I/O Signal — Output Signal	In-Position, Alarm (Photocoupler output) Encoder signal (A+, A-, B+, B-, Z+, Z-, 26C31 of Equivalent), (Line Driver output)				

3.2 Drive Dimension(mm)

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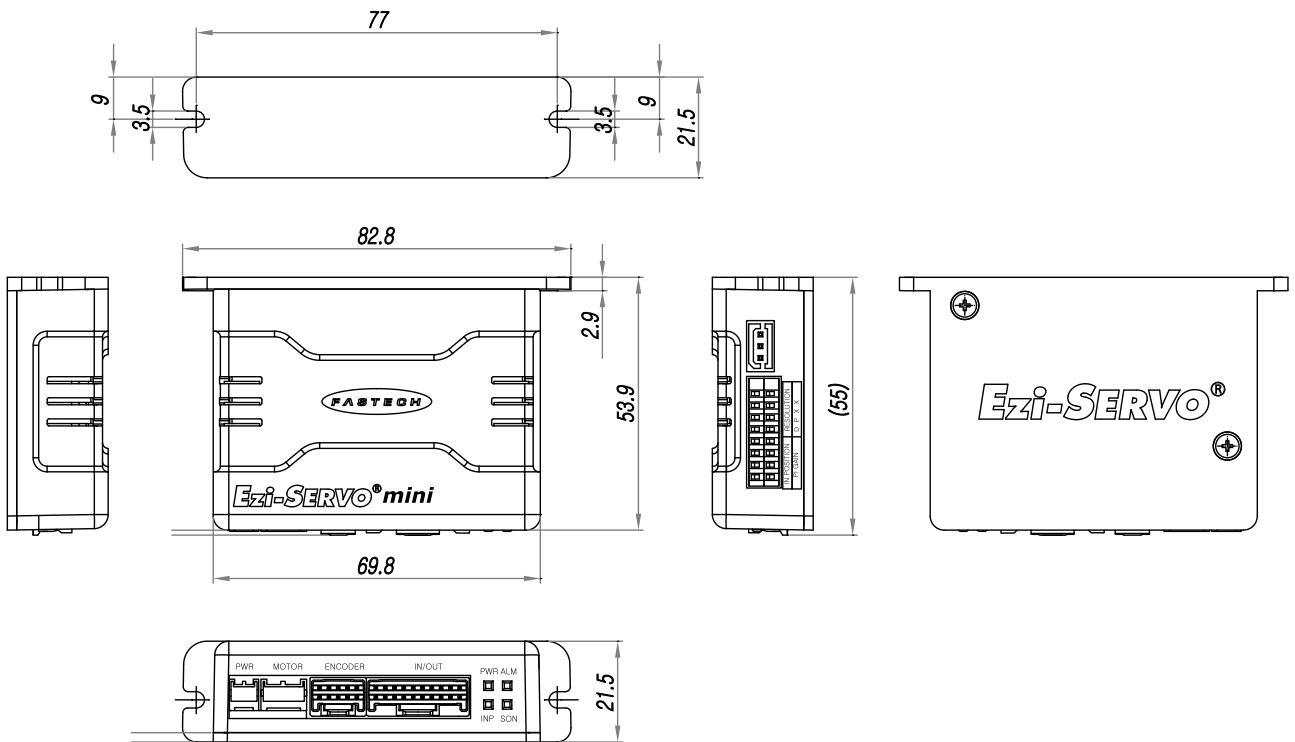
4. Motor specifications and Size

4.1 EzM-20 Series

4.1.1 Motor Specifications

M O D E L		UNIT	EzM-20M-F	EzM-20L-F
DRIVE METHOD		----	BI-POLAR	BI-POLAR
NUMBER OF PHASES		----	2	2
VOLTAGE		VDC	2.9	3.25
CURRENT per PHASE		A	0.5	0.5
RESISTANCE per PHASE		Ohm	5.8	6.5
INDUCTANCE per PHASE		mH	2.5	5
HOLDING TORQUE		N·m	0.018	0.035
ROTOR INERTIA		g·cm²	2.5	5
WEIGHTS		g	50	80
LENGTH (L)		mm	28	38
ALLOWABLE OVERHUNG LOAD	3mm	N	18	18
(DISTANCE FROM END OF SHAFT)	8mm		30	30
ALLOWABLE THRUST LOAD		N	Lower than motor weight	
INSULATION RESISTANCE		MOhm	100min. (at 500VDC)	
INSULATION CLASS		----	CLASS B (130℃)	
OPERATING TEMPERATURE		℃	0 to 55	

4.1.2 Motor Dimension(mm)
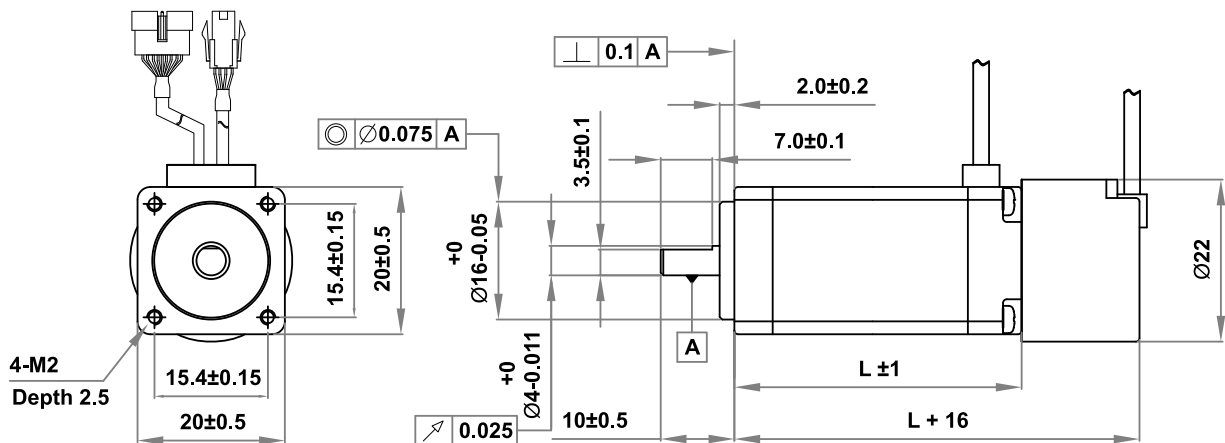
4.2 EzM-25 Series

4.2.1 Motor Specifications

Low Vibration

M O D E L		UNIT	EzM-25S-F-L	EzM-25M-F-L	EzM-25L-F-L
DRIVE METHOD		————	BI-POLAR	BI-POLAR	BI-POLAR
NUMBER OF PHASES		————	2	2	2
VOLTAGE		VDC	2.66	9.87	3.654
CURRENT per PHASE		A	0.7	0.21	0.63
RESISTANCE per PHASE		Ohm	3.8	47	5.8
INDUCTANCE per PHASE		mH	2.0	30	5.4
HOLDING TORQUE		N · m	0.033	0.049	0.062
ROTOR INERTIA		g · cm²	2	3	7
WEIGHTS		g	85	100	120
LENGTH (L)		mm	23.5	27.5	33
ALLOWABLE OVERHUNG LOAD	3mm	N	30	30	30
(DISTANCE FROM END OF SHAFT)	8mm		38	38	38
ALLOWABLE THRUST LOAD		N	Lower than motor weight		
INSULATION RESISTANCE		MOhm	100min. (at 500VDC)		
INSULATION CLASS		————	CLASS B (130℃)		
OPERATING TEMPERATURE		℃	0 to 55		

4.2.2 Motor Dimension(mm)

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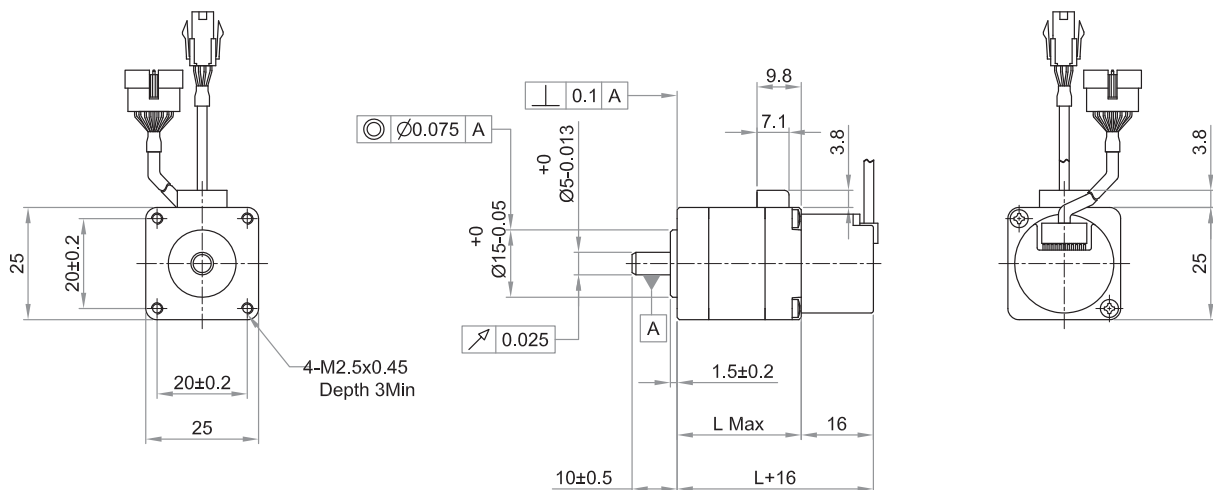
4.3 EzM-28 Series
4.3.1 Motor Specifications

M O D E L	UNIT	EzM-28S-D	EzM-28M-D	EzM-28L-D
DRIVE METHOD	----	BI-POLAR	BI-POLAR	BI-POLAR
NUMBER OF PHASES	----	2	2	2
VOLTAGE	VDC	3.04	3.04	3.42
CURRENT per PHASE	A	0.95	0.95	0.95
RESISTANCE per PHASE	Ohm	3.2	3.2	3.6
INDUCTANCE per PHASE	mH	2	5	5.8
HOLDING TORQUE	N·m	0.07	0.12	0.14
ROTOR INERTIA	g·cm²	9	13	18
WEIGHTS	g	110	140	200
LENGTH (L)	mm	32	45	52
ALLOWABLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT) 3mm	N	30	30	30
8mm		38	38	38
13mm		53	53	53
ALLOWABLE THRUST LOAD	N	Lower than motor weight		
INSULATION RESISTANCE	MOhm	100min. (at 500VDC)		
INSULATION CLASS	----	CLASS B (130℃)		
OPERATING TEMPERATURE	℃	0 to 55		

4.3.2 Motor Dimension (mm)
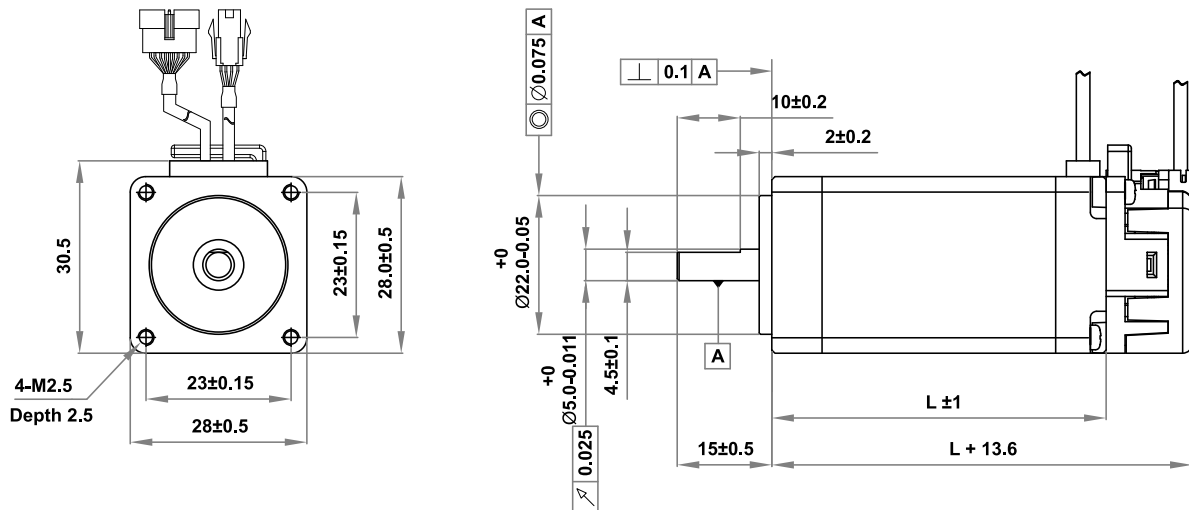
4.4 EzM-35 Series

4.4.1 Motor Specifications

M O D E L		UNIT	EzM-35S-D	EzM-35M-D	EzM-35L-D	EzM-35XL-D
DRIVE METHOD		----	BI-POLAR			
NUMBER OF PHASES		----	2			
VOLTAGE		VDC	2.28	2.88	4.59	5.39
CURRENT per PHASE		A	0.6	0.6	0.85	0.7
RESISTANCE per PHASE		Ohm	3.8	4.8	5.4	7.7
INDUCTANCE per PHASE		mH	3.2	6.1	6.5	8.4
HOLDING TORQUE		N · m	0.034	0.050	0.176	0.225
ROTOR INERTIA		g · cm²	5	8	11	32
WEIGHTS		g	165	180	260	360
LENGTH (L)		mm	22	26	38	53
ALLOWABLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	22	22	22	22
	8mm		26	26	26	26
	13mm		33	33	33	33
	18mm		46	46	46	46
ALLOWABLE THRUST LOAD		N	Lower than motor weight			
INSULATION RESISTANCE		MOhm	100min. (at 500VDC)			
INSULATION CLASS		----	CLASS B (130℃)			
OPERATING TEMPERATURE		℃	0 to 55			

4.4.2 Motor Dimension(mm) and Torque Characteristics

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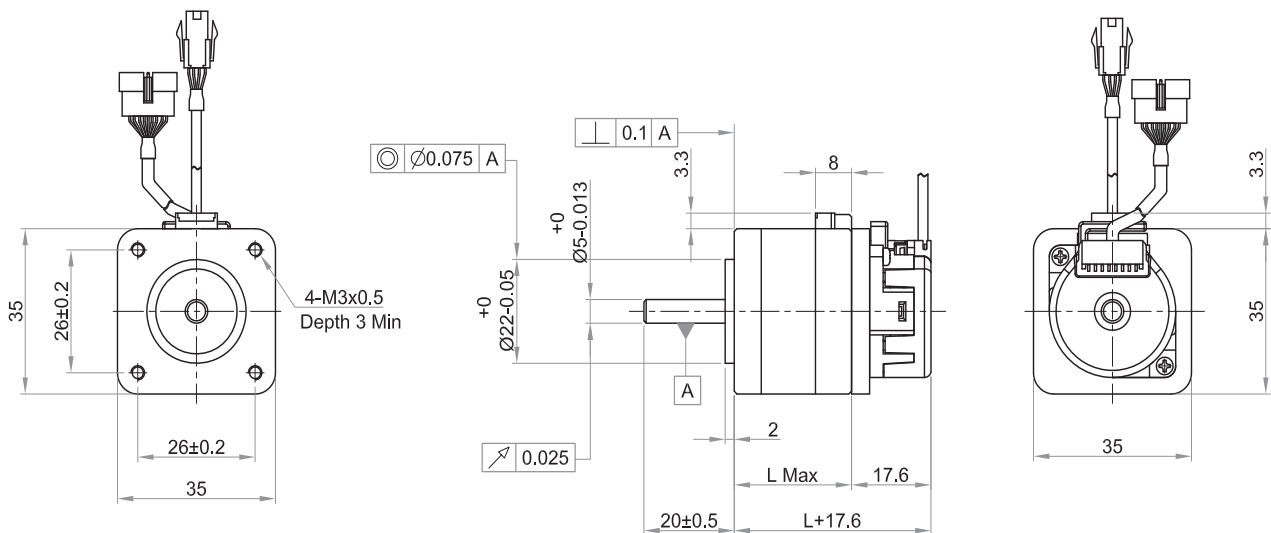
4.5 EzM-42 Series

4.5.1 Motor Specifications

M O D E L		UNIT	EzM-42S-A EzM-42S-B EzM-42S-C	EzM-42M-A EzM-42M-B EzM-42M-C	EzM-42L-A EzM-42L-B EzM-42L-C	EzM-42XL-A EzM-42XL-B EzM-42XL-C
DRIVE METHOD		-----	BI-POLAR	BI-POLAR	BI-POLAR	BI-POLAR
NUMBER OF PHASES		-----	2	2	2	2
VOLTAGE		VDC	3.36	4.32	4.56	7.2
CURRENT per PHASE		A	1.2	1.2	1.2	1.2
RESISTANCE per PHASE		Ohm	2.8	3.6	3.8	6
INDUCTANCE per PHASE		mH	2.5	7.2	8	15.6
HOLDING TORQUE		N·m	0.32	0.44	0.5	0.8
ROTOR INERTIA		g·cm²	35	54	77	114
WEIGHTS		g	220	280	350	500
LENGTH (L)		mm	33	39	47	59
ALLOWABLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	22	22	22	22
	8mm		26	26	26	26
	13mm		33	33	33	33
	18mm		46	46	46	46
ALLOWABLE THRUST LOAD		N	Lower than motor weight			
INSULATION RESISTANCE		MOhm	100min. (at 500VDC)			
INSULATION CLASS		----	CLASS B (130℃)			
OPERATING TEMPERATURE		℃	0 to 55			

4.5.2 Motor Dimension (mm)
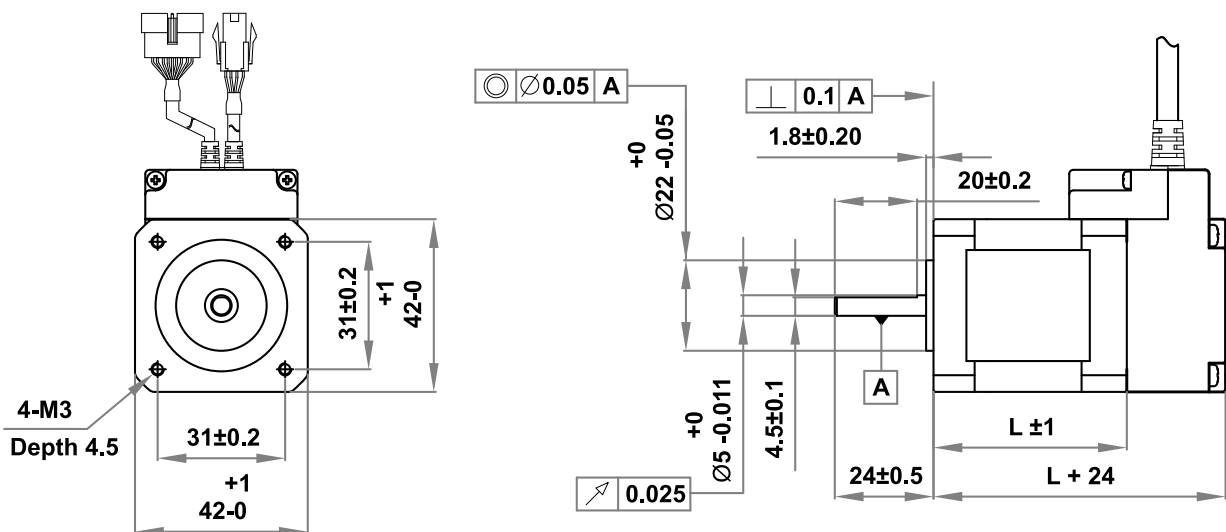
4.6 Motor Torque Characteristics

EzM-20 series

EzM-20L ——
EzM-20M ― ―

※Measured Condition
Motor Voltage = 24VDC
Motor Current = Rated Current(Refer to Motor Specification)
Drive = Ezi-SERVO-MINI

EzM-25 series

EzM-25L ——
EzM-25M ······
EzM-25S ― ―

※Measured Condition
Motor Voltage = 24VDC
Motor Current = Rated Current(Refer to Motor Specification)
Drive = Ezi-SERVO-MINI

EzM-28 series

EzM-28L ——
EzM-28M ― ―
EzM-28S ― ―

※Measured Condition
Motor Voltage = 24VDC
Motor Current = Rated Current(Refer to Motor Specification)
Drive = Ezi-SERVO-MINI

EzM-35 series

EzM-35XL ——
EzM-35L ― ―
EzM-35M ——
EzM-35S ······

※Measured Condition
Motor Voltage = 24VDC
Motor Current = Rated Current(Refer to Motor Specification)
Drive = Ezi-SERVO-MINI

EzM-42 series

EzM-42XL ——
EzM-42L ― ―
EzM-42M ― ―
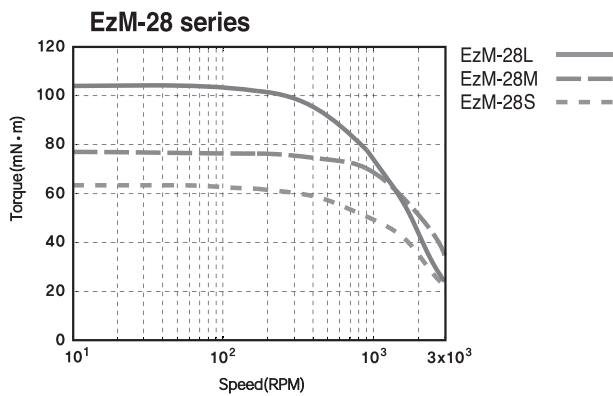EzM-42S ······

※Measured Condition
Motor Voltage = 24VDC
Motor Current = Rated Current(Refer to Motor Specification)
Drive = Ezi-SERVO-MINI

5.Installation and Cabling

5.1 Notes on Installation

1) Ezi-SERVO is designed for indoor use only.

2) The ambient temperature of the room should be 0℃~50℃.

3) If the temperature of the product case is higher than 50℃, radiate heat of the outside to cool down.

4) Do not install Ezi-SERVO under direct rays, near magnetic or radioactive objects.

5) If you set more than 2 drives, you must set over 20mm horizontally and over 50mm vertically as shown below.

5.2 Connection Diagram

Ezi-SERVO-MINI

Motor and Encoder

CN4
- 24VDC ±10% — 1
- GND — 2

Controller

CN1
- CW+(Pulse+) — 1
- CW-(Pulse-) — 2
- CCW+(Dir+) — 3
- CCW-(Dir-) — 4
- A+ — 5
- A- — 6
- B+ — 7
- B- — 8
- Z+ — 9
- Z- — 10
- Signal-GND — 18 Signal-GND
- Alarm — 11
- In-position — 12
- 24VDC GND — 19
- 24VDC — 20
- Servo On/Off — 13
- Alarm Reset — 14
- BRAKE+ — 16 24VDC
- BRAKE- — 17
- NC — 15
- FG

CN2
- A+ — 1
- A- — 2
- B+ — 3
- B- — 4
- Z+ — 5
- Z- — 6
- +5V — 7
- GND — 8
- FG — 9,10

Encoder E

CN3
- A — 4
- /A — 3
- B — 1
- /B — 2

Motor M

※) ⊠ Twisted Pair Shield Cable

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6. Setting and Operation

- Status Monitor LED
- InputOutput Connector (CN1)
- Encoder Connector (CN2)
- Motor Connector(CN3)
- Power Connector(CN4)

- In−Position Value Selection Switch
- Resolution Selection Switch
- Pulse input Selection Switch
- Rotational Direction Selection Switch
- Position Controller Gain Selection Switch

6.1 Status Monitor LED

6.1.1 Status LED Function and Condition

Status	Color	Function	Flash Condition
PWR	Green	Power input	Lights when power is On
INP	Yellow	Complete position motion	Lights ON when positioning error reaches within the preset pulse selected by Rotary switch
SON	Orange	Servo On/Off indication	Servo On : Lights On, Servo Off : Lights Off
ALM	Red	Alarm indication	Flash when protection function is activated (Identifiable which protection mode is activated by counting the LED flash times)

6.1.2 Protection functions and LED flash times

Times	Protection	Conditions
1	Over current	The current through power devices in inverter exceeds the limit value
2	Over speed	Motor speed exceed 3,000rpm
3	Position tracking error	Position error value is higher than 90° in motor run state
4	Over load	The motor is continuously operated more than 5 second under a load exceeding the max. torque
5	Over temperature	Inside temperature of drive exceeds 55℃
6	Over regeneratived voltage	Back-EMF is more high than limit value[1]
7	Motor connect error	The power is ON without connection of the motor cable to drive
8	Encoder connect error	Cable connection error with Encoder connector in drive
9	Motor voltage error	Motor voltage is out of limited value[2]
10	Inposition error	After operation is finished, a position error occurs
11	System error	Error occurs in drive system
12	ROM error	Error occurs in parameter storage device(ROM)
14	Input voltage error	Power source voltage is out of limited value[3]
15	Position overflow error	Position error value is higher than 90°in motor stop state

| 0.5 s | 2.0 s |

Alarm LED flash
(ex : Position tracking error)

Motor	EzM-20,EzM-25 EzM-28, EzM-35 EzM-42
[1] Over regeneratived voltage	70V
[2] Motor voltage error	20V
[3] Input voltage error	20~28V

6.2 Pulse Input Selection Switch

Indication	Switch Name	Functions
2P/1P	Selecting pulse input mode	Selectable 1-Pulse input mode or 2-Pulse input mode as Pulse input signal. ON : 1-Pulse mode OFF : 2-Pulse mode ※Default : 2-Pulse mode

	2-Pulse Mode	1-Pulse Mode
CW(Pulse) Pin		
CCW(Dir) Pin		
Rotational Direction	CW CCW	CW CCW

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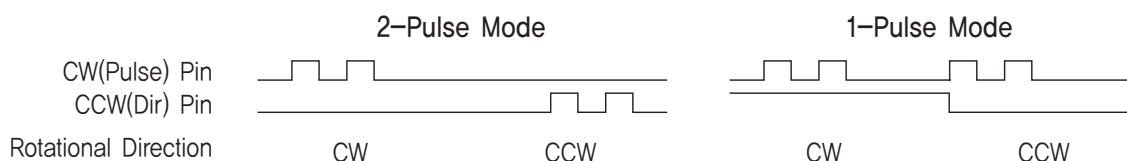
6.3 Rotational Direction Selection Switch

Indication	Switch Name	Functions
DIR	Switching Rotational Direction	Based on CW(+Dir signal) input to driver. ON : CCW(−Direction) OFF : CW(+Direction) ※Default : CW mode

Direction selection switch :
ON

CCW Dir.

Direction selection switch :
OFF

CW Dir.

6.4 Resolution Selection Switch

The number of pulse per revolution.

Position				Pulse/Rotation	Position				Pulse/Rotation
8	7	6	5		8	7	6	5	
ON	ON	ON	ON	4,000 or 16,000*1	OFF	ON	ON	ON	7,200
ON	ON	ON	OFF	500	OFF	ON	ON	OFF	10,000*2
ON	ON	OFF	ON	1,000	OFF	ON	OFF	ON	NC
ON	ON	OFF	OFF	1,600	OFF	ON	OFF	OFF	NC
ON	OFF	ON	ON	2,000	OFF	OFF	ON	ON	NC
ON	OFF	ON	OFF	3,600	OFF	OFF	ON	OFF	NC
ON	OFF	OFF	ON	5,000	OFF	OFF	OFF	ON	NC
ON	OFF	OFF	OFF	6,400	OFF	OFF	OFF	OFF	NC

*1 : Resolution value depend on encoder type.
(4000 or 16000)
*2 : Default = 10,000

Encoder Resolution	'ON ON ON ON' Position Resolution
4,000	4,000
10,000	500
16,000	16,000
20,000	20,000
32,000	32,000

6.5 Position Controller Gain Selection Switch

The purpose of the Position Controller is to correct motor position deviation after stopping caused by load and friction. Depending on the motor load, the user have to select position of the switch because the system to be stable and to correct the error as fast as possible.

-To turn the controller

1. Set the switch to '0' position
2. Start to rotate the switch until system becomes stable.
3. Rotate the switch +/- 1~2 position to reach better performance.

Indication				Time constant of integral part	Proportional Gain*1
4	3	2	1		
ON	ON	ON	ON	1	1
ON	ON	ON	OFF	1	2
ON	ON	OFF	ON	1	3
ON	ON	OFF	OFF	1	4*2
ON	OFF	ON	ON	1	5
ON	OFF	ON	OFF	1	6
ON	OFF	OFF	ON	2	1
ON	OFF	OFF	OFF	2	2
OFF	ON	ON	ON	2	3
OFF	ON	ON	OFF	2	4
OFF	ON	OFF	ON	2	5
OFF	ON	OFF	ON	3	1
OFF	OFF	ON	ON	3	2
OFF	OFF	ON	OFF	3	3
OFF	OFF	OFF	ON	3	4
OFF	OFF	OFF	OFF	3	5

*1 : Values in the columns are in relative units.
   They only show the parameter changes depending on the switch's position.
*2 : Default : 'ON ON OFF OFF'

6.6 In-Position Value Selection Switch(SW4)

To select the output condition of In-position signal. In-position output signal is generrated when the pulse number of position error is lower than selected In-position value set by this switch after positioning command executed.
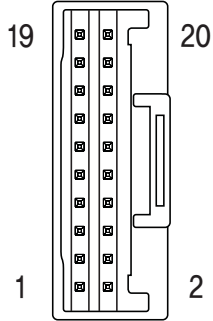
Indication				In-Position [Pulse] Fast Response	Indication				In-Position [Pulse] Fast Response
4	3	2	1		4	3	2	1	
ON	ON	ON	ON	0*1	OFF	ON	ON	ON	0
ON	ON	ON	OFF	1	OFF	ON	ON	OFF	1
ON	ON	OFF	ON	2	OFF	ON	OFF	ON	2
ON	ON	OFF	OFF	3	OFF	ON	OFF	OFF	3
ON	OFF	ON	ON	4	OFF	OFF	ON	ON	4
ON	OFF	ON	OFF	5	OFF	OFF	ON	OFF	5
ON	OFF	OFF	ON	6	OFF	OFF	OFF	ON	6
ON	OFF	OFF	OFF	7	OFF	OFF	OFF	OFF	7

*1 : Default : '0'

6.6.1 Setting method of Fast Response and Accurate Response
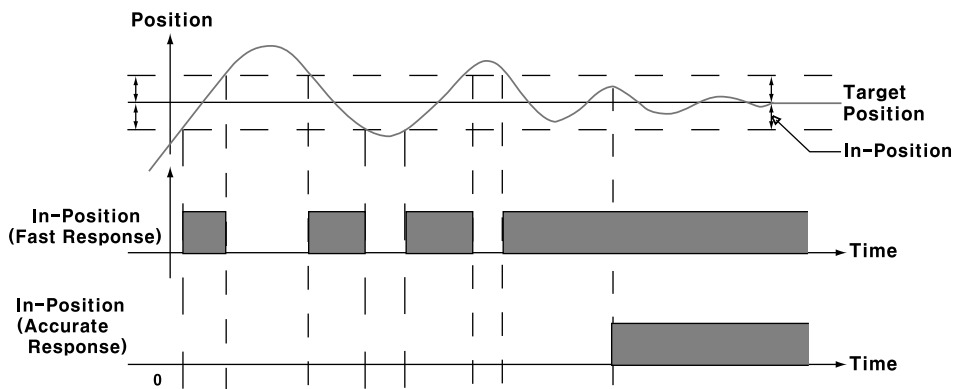
6.7 Input/Output signal(CN1)

Pin No.	Function	I/O Signal	Pin Layout
1	CW+(Pulse+)	Input	
2	CW−(Pulse−)	Input	
3	CCW+(Dir+)	Input	
4	CCW−(Dir−)	Input	
5	A+	Output	
6	A−	Output	
7	B+	Output	
8	B−	Output	
9	Z+	Output	
10	Z−	Output	
11	Alarm	Output	
12	In−Position	Output	
13	Servo On/Off	Input	
14	Alarm Reset	Input	
15	NC	————	
16	BRAKE+	Output	
17	BRAKE−	Output	
18	S−GND	Output	
19	24VDC GND	Input	
20	24VDC	Input	

Pin Layout:

19 ... 20

1 ... 2

※BRAKE function is Optional.

6.8 Encoder Connector(CN2)

Pin No.	Function	I/O Signal	Pin Layout
1	A+	Input	
2	A−	Input	
3	B+	Input	
4	B−	Input	
5	Z+	Input	
6	Z−	Input	
7	5VDC	Output	
8	5VDC GND	Output	
9	F. GND	————	
10	F. GND	————	

6.9 Motor Connector(CN3)

Pin No.	Function	Pin Layout
1	B Phase	
2	/B Phase	
3	/A Phase	
4	A Phase	

6.10 Power Connector(CN4)

Pin No.	Function	Pin Layout
1	Input Power : 24VDC ±10%	
2	Input Power : GND	

6.11 Run Current

There's no need to adjust because the run current is set with comparing to the kind of motor. But, the run current is 50% when motor is stopped.

7. System Configuration
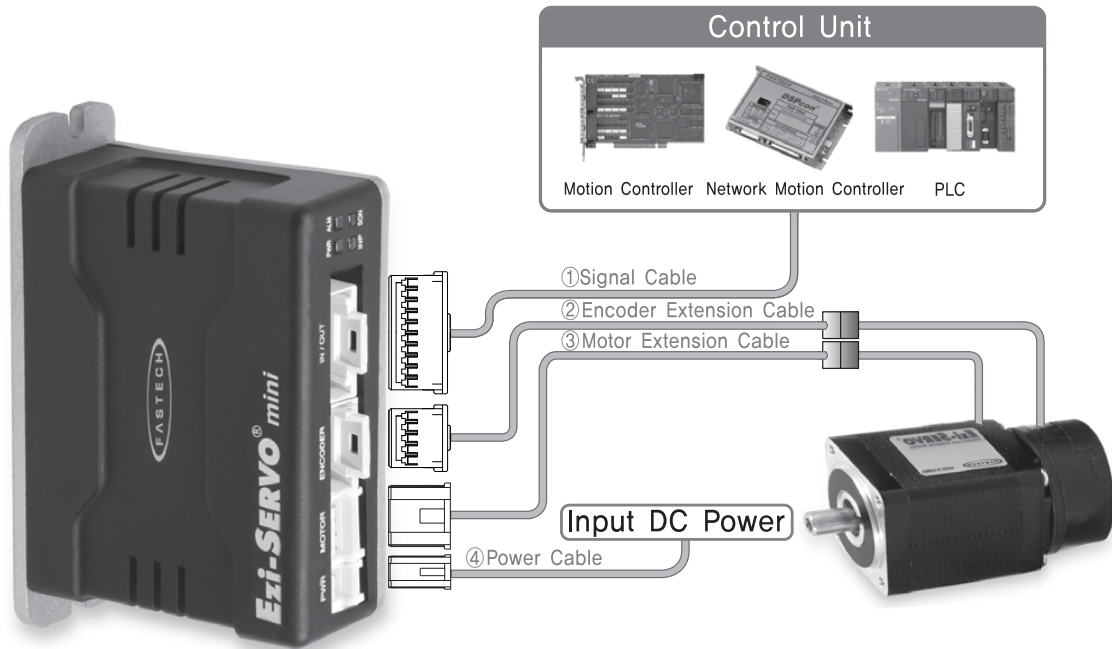
Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable
Standard Length	–	30cm	30cm	–
Max. Length	20m	20m	20m	2m

※Motor can not be directly connected to Drives so please use extension cable for connection. (Option)

7.1 Option

①Signal Cable

Available to connect between Control Unit and Ezi-SERVO-MINi.

Item	Length[m]	Remark
CSVI-S-□□□F	□□□	Normal Cable
CSVI-S-□□□M	□□□	Robot Cable

□is for Cable Length. The unit is 1m and Max. 20m length.

②Encoder Extension Cable

Available to extended connection between Encoder and Ezi-SERVMINI.

Item	Length[m]	Remark
CSVI-E-□□□F	□□□	Normal Cable
CSVI-E-□□□M	□□□	Robot Cable

□is for Cable Length. The unit is 1m and Max. 20m length.

③Motor Extension Cable

Available to extended connection between motor and Ezi-SERVO-MINI.

Item	Length[m]	Remark
CMNB-M-□□□F	□□□	Normal Cable
CMNB-M-□□□M	□□□	Robot Cable

□is for Cable Length. The unit is 1m and Max. 20m length.

④Power Cable

Available to connect between Power and Ezi-SERVO-MINI.

Item	Length[m]	Remark
CMNB-P-□□□F	□□□	Normal Cable
CMNB-P-□□□M	□□□	Robot Cable

□is for Cable Length. The unit is 1m and Max. 2m length.

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8. Control signal Input/Output Description

8.1 Input Signal

Input signals of the drive are all photocoupler inputs. The signal shows the status of internal photocouplers [ON:conduction], [OFF:Non-conduction], not displaying the voltage levels of the signal.

CW(Pin:1,2), CCW(Pin:3,4)

Alarm Reset(Pin:14)
Servo On/Off(Pin:13)
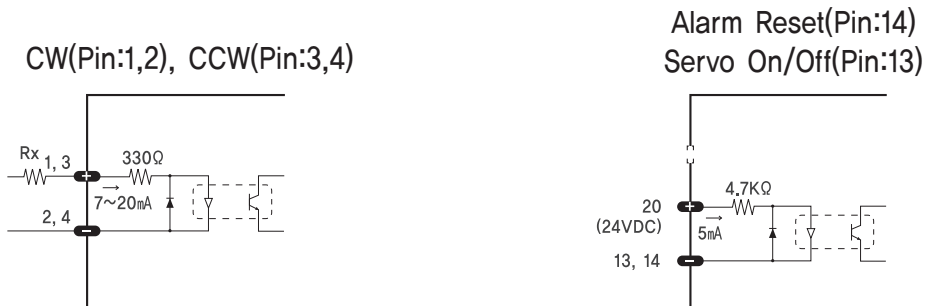
♦ **CW, CCW Input**

This signal can be used to receive a positioning pulse command from a user host motion controller. A user can select 1-pulse input mode or 2-pulse input mode (refer to switch No.1, SW1). The input schematic of CW, CCW is designed for 5V TTL level. When using 5V level as an input signal, the resistor Rx is not used and connect to the driver directly. When the level of input signal is more than 5V, Rx Resistor is required. If the resistor is absent, the drive will be damaged! In input signal level is 12V case, Rx value is 2.2kohm and in 24V case, 4.7kohm is suitable for Rx value.

♦ **Servo On/Off Input**

This input can be used only to adjust the position by manually moving the motor shaft from the load-side. By setting the signal [ON], the driver cuts off the power supply to the motor. Then, one can manually adjust output position. When setting the signal back to [OFF], the driver resumes the power supply to the motor and recovers the holding torque. When driving a motor, one needs to set the signal [OFF].
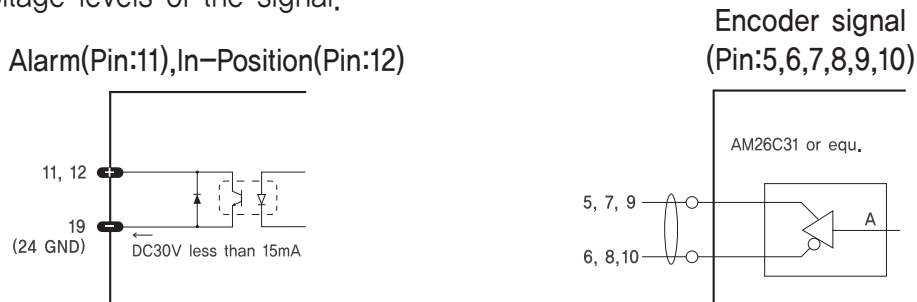
♦ **Alarm Reset Input**

When a protection mode has been activated, a signal to this alarm reset input cancels the Alarm output.
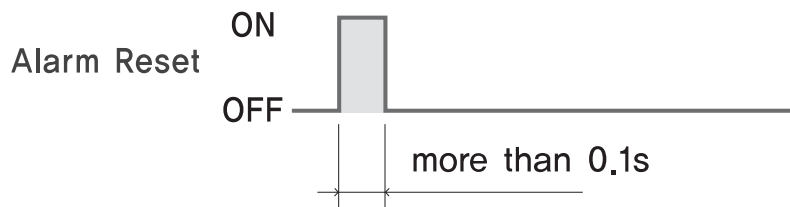
※By setting the alarm reset input signal [ON], cancel the Alarm output.
Before cancel the Alarm output, have to remove the source of Alarm.

8.2 Output Signal

Output signals from the driver are photocoupler outputs : Alarm, In-Position and the line driver outputs(encoder signal). In the case of photocoupler outputs, the signal indicates the status of internal photocouplers [ON:conduction], [OFF:Non-conduction], not displaying the voltage levels of the signal.

Alarm(Pin:11),In-Position(Pin:12)

Encoder signal (Pin:5,6,7,8,9,10)

11, 12

19
(24 GND)

DC30V less than 15mA

AM26C31 or equ.

5, 7, 9

6, 8,10

A

◆ Alarm Output

The Alarm output indicates [ON] when the driver is in a normal operation. If a protection mode has been activated, it goes [OFF]. A host controller needs to detect this signal and stop sending a motor driving command. When the driver detects an abnormal operation such as overload or overcurrent of the motor, it sets the Alarm output to [OFF], blinks the Alarm LED, disconnect the power to a motor and stop the motor simultaneously.

[Caution] Only at the Alarm output port, the photocoupler operation is in reverse. When the driver is in normal operation the Alarm output is [ON]. On the contrary when the driver is in abnormal operation that start protection mode, the Alarm output is [OFF].

◆ In-Position Output

In-Position signal is [ON] when positioning is completed. This signal is [ON] when the motor position error is within the value set by the switch SW4.

Motor speed

rot.   stop   rot.   stop

In-Pusition signal

ON

OFF
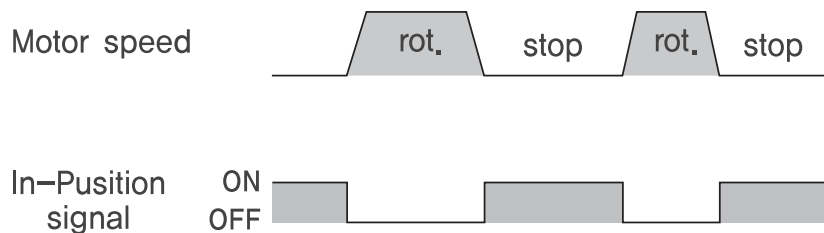
[Caution] In-Position signal is [ON] when low speed(under 50[pps]) Motioning even if The position command is not finished.
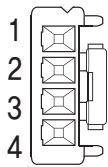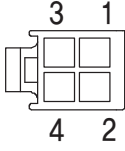
◆ Encoder Signal Output

The encoder signal is a line drive output. This can be used to confirm the stop position.

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Appendix

▪ Extension cable for Motor

For cable extension between Motor and Drive.

WIRING DIAGRAM

Drive Connector		Cabling	Motor Connector	
Pin Layout	Number		Number	Pin Layout
 1 2 3 4	1 2 3 4	----------	1 3 4 2	 3 1 4 2
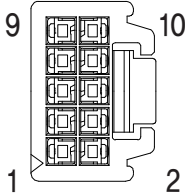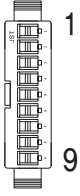
CONNECTOR

ITEM		Part Number	Maker
Drive Connector (CN3)	Housing	PAP-04V-S	JST
	Terminal	SPHD-001T-P0.5	JST
Motor Connector	Housing	5557-04R	MOLEX
	Terminal	5556T	MOLEX

■ Extension cable for Encoder

For cable extension between Encoder and Drive.

WIRING DIAGRAM

Drive Connector(CN2)		Cabling	Motor Connector	
Pin Layout	Number		Number	Pin Layout
	1		1	
	2		2	
	3		3	
	4		4	
	5		5	
	6		6	
	7		7	
	8		8	
	9		9	
	10			

CONNECTOR

ITEM		Part Number	Maker
Drive Connector(CN3)	Housing	501646-1000	MOLEX
	Terminal	501648-1000(AWG 26~28)	MOLEX
Motor Connector	Housing	SMP-09V-NC	JST
	Terminal	SHF-001T-0.8BS	JST

▪ Connector

Connector specifications for cabling to Ezi-SERVO.

ITEM		Part Number	Maker
Signal (CN1)	Housing	501646-2000	MOLEX
	Terminal	501648-1000(AWG 26~28)	MOLEX
	Connector	10120-3000VE	3M
	Backshell	10320-52AO-008	3M
Encoder (CN2)	Housing	501646-1000	MOLEX
	Terminal	501648-1000(AWG 26~28)	MOLEX
Encoder Side	Housing	SMP-09V-NC	JST
	Terminal	SHF-001T-0.8BS	JST
Motor (CN3)	Housing	PAP-04V-S	JST
	Terminal	SPHD-001T-P0.5	JST
Motor Side	Housing	5557-04R	MOLEX
	Terminal	5556T	MOLEX
Power (CN4)	Housing	PAP-02V-S	JST
	Terminal	SPHD-001T-P0.5	JST
	Housing	5557-02R	MOLEX
	Terminal	5556T	MOLEX

※These connectors are serviced together with Ezi-SERVO except when purchasing option cables.
※Above connector is the most suitable product for Ezi-SERVMINI. Another equivalent connector can be used.

Advantages over Open-loop Control Stepping Drive

1. Reliable positioning without loss of synchronism.

2. Holding stable position and automatically recovering to the original position even after experiencing positioning error due to a external force, such as mechanical vibration or vertical positioning holding.

3. Ezi-SERVO utilizes 100% full range of the rated motor torque, contrary to a conventional open-loop stepping drive that can use only up to 50% of the rated motor torque by considering loss of synchronism.

4. Capability to operate at high speed due to load-dependent current control, open-loop stepper drives use a constant current control at all speed range without considering load variations.

Advantages over servo motor controller

1. No gain tuning (Automatic adjustment of gain in response to a load change)

2. Maintain the stable holding position without fluctuation after completing positioning.

3. Fast positioning due to the independent control by on-board DSP.

4. Continuous operation during rapid short-stroke movement due to instantaneous positioning.

MEMO

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● Please note that the specifications are subject to change without
  notice due to product improvements.