

Ezi-SERVO[®]

Closed Loop Stepping System

- Miniaturized Compact Size
- Closed Loop System
- No Gain Tuning
- No Hunting
- High Resolution
- Fast Response

MINI



CE

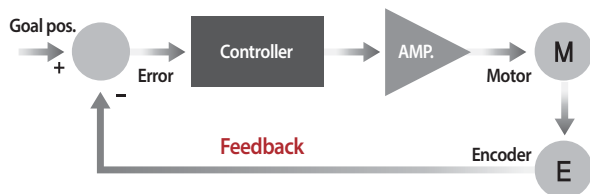


Fast, Accurate, Smooth Motion

Features

1. Closed Loop System

Ezi-SERVO MINI 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 MINI to update the current motor shaft position information every 25 micro seconds. This allows the Ezi-SERVO MINI 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!



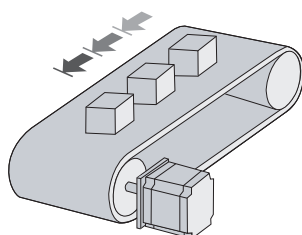
2. No Gain Tuning

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 autotuning require manual tweaking after the system is installed, especially if more than one axis are interdependent.

Ezi-SERVO MINI 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 MINI is optimized for the application and ready to work right out of the box! The Ezi-SERVO MINI 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 MINI is especially well suited for low stiffness loads (For example, a belt and pulley system) that sometime require conventional servo systems to inertia match with the added expense and bulk of a gearbox.

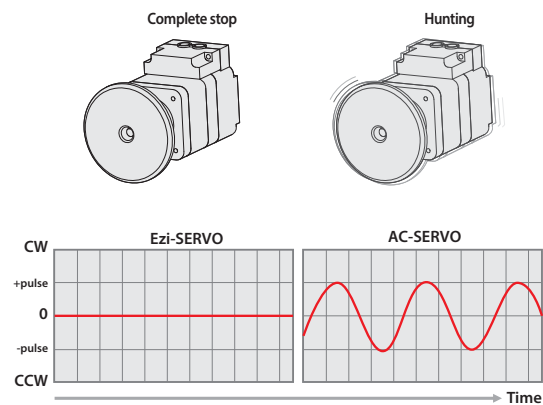
Ezi-SERVO MINI also performs exceptionally, even under heavy loads and high speeds!



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 MINI Motion Control System! Ezi-SERVO MINI 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. Fast Response

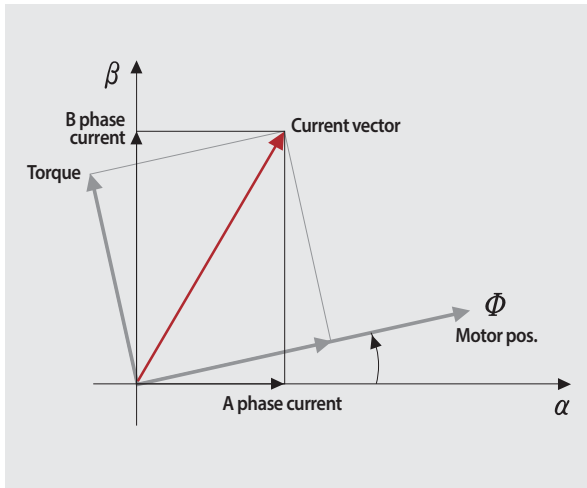
Similar to conventional stepping motors, Ezi-SERVO MINI instantly synchronizes with command pulses providing fast positional response. Ezi-SERVO MINI is the optimum choice when zero-speed stability and rapid motions within a short distance are required. Traditional servo motor systems have a natural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



5. Smooth and Accurate

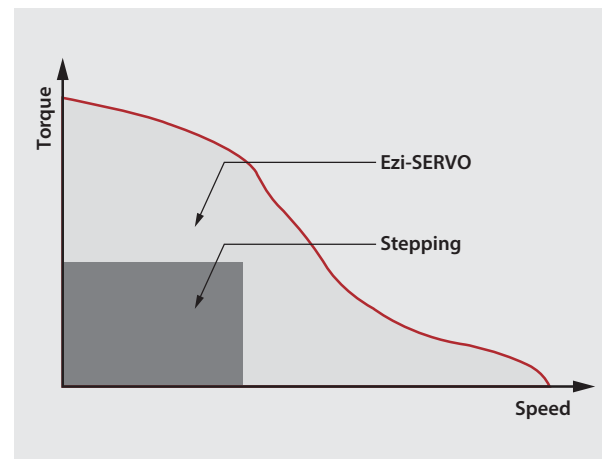
Ezi-SERVO MINI is a high-precision servo drive, using a high-resolution encoder with 32,000[ppr].

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.



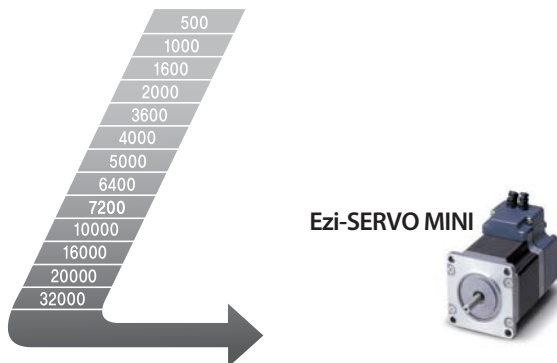
7. High Torque

Compared with common step motors and drives, Ezi-SERVO MINI 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 MINI exploits continuous high-torque operation during high-speed motion due to its innovative optimum current phase control.



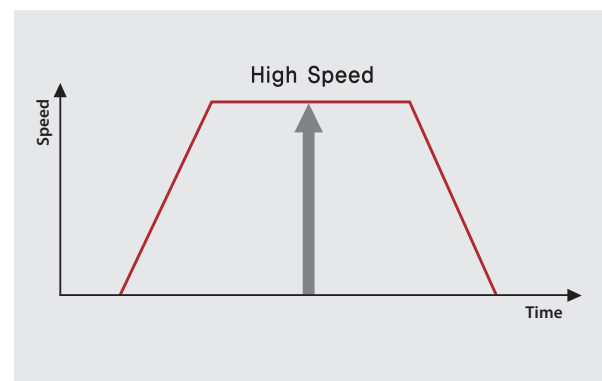
6. High Resolution

The unit of the position command can be divided precisely.
(Max. 32,000[ppr])



8. High Speed

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



Part Numbering Method

Ezi-SERVO-MI-20M-F-BK-PN05-□



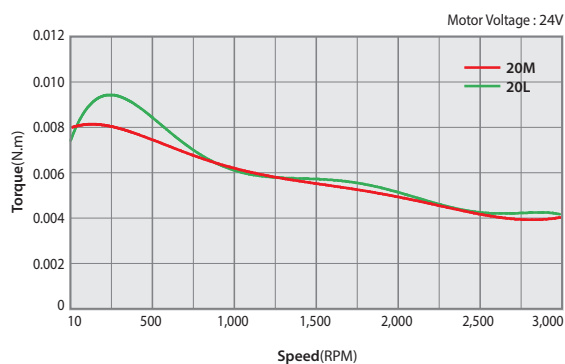
Motor, Drive Combination

UNIT No.	MOTOR No.	DRIVE No.
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-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-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-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

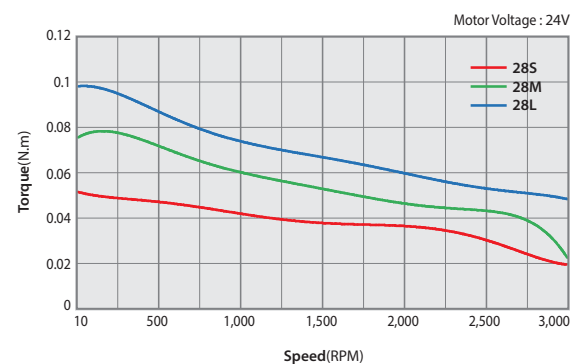
Motor Specification Table

Model	Unit	20		28			35		42			
		20M	20L	28S	28M	28L	35M	35L	42S	42M	42L	42XL
DRIVE METHOD	-	BI-POLAR										
Number OF PHASES	-	2	2	2	2	2	2	2	2	2	2	2
VOLTAGE	VDC	2.75	3	3	3	3	2.88	4.59	3.36	4.32	4.56	7.2
CURRENT per PHASE	A	0.5	0.5	0.95	0.95	0.95	0.6	0.85	1.2	1.2	1.2	1.2
RESISTANCE per PHASE	Ohm	5.5	6	3.2	3.2	3.2	4.8	5.4	2.8	3.6	3.8	6
INDUCTANCE per PHASE	mH	2	2.6	2	2.7	3.2	6.1	6.5	5.4	7.2	8	15.6
HOLDING TORQUE	N·m	0.016	0.025	0.069	0.098	0.118	0.050	0.176	0.32	0.44	0.5	0.65
ROTOR INERTIA	g·cm ²	2.5	3.3	9	13	18	8	11	35	54	77	114
WEIGHTS	g	50	80	110	140	200	180	260	250	280	350	500
LENGTH(L)	mm	28	38	32	45	50	26	38	34	40	48	60
ALLOWABLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	18	18	30	30	30	22	22	22	22	22	22
	8mm	30	30	38	38	38	26	26	26	26	26	26
	13mm	-	-	53	53	53	33	33	33	33	33	33
	18mm	-	-	-	-	-	46	46	46	46	46	46
ALLOWABLE THRUST LOAD	N	Lower than motor weight										
INSULATION RESISTANCE	Mohm	100 MΩ MIN.(at 500VDC)										
INSULATION CLASS	-	CLASS B(130°C)										
OPERATING TEMPERATURE	°C	0 to 55										

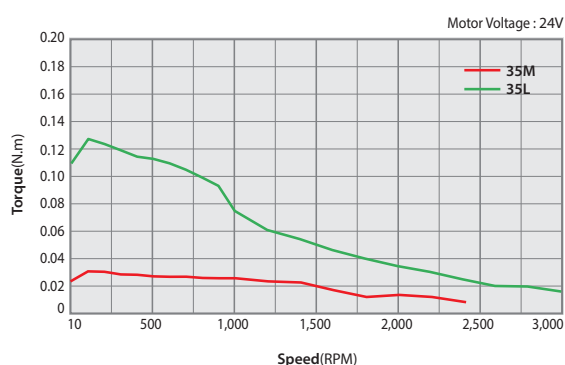
Ezi-SERVO MINI_ 20 Series



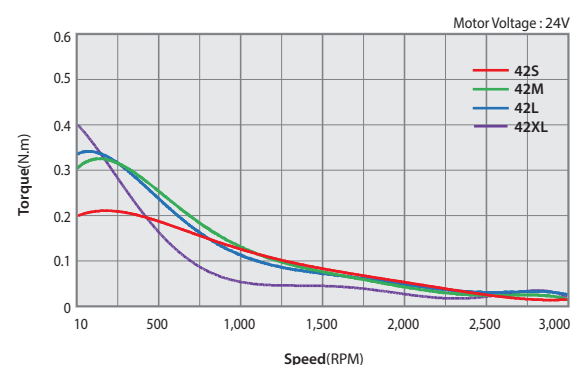
Ezi-SERVO MINI_ 28 Series



Ezi-SERVO MINI_ 35 Series



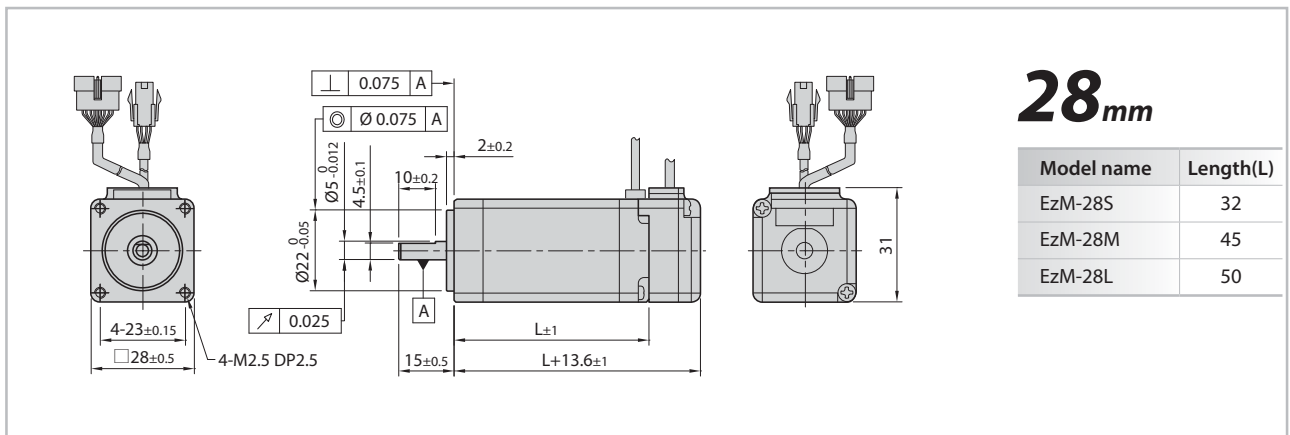
Ezi-SERVO MINI_ 42 Series



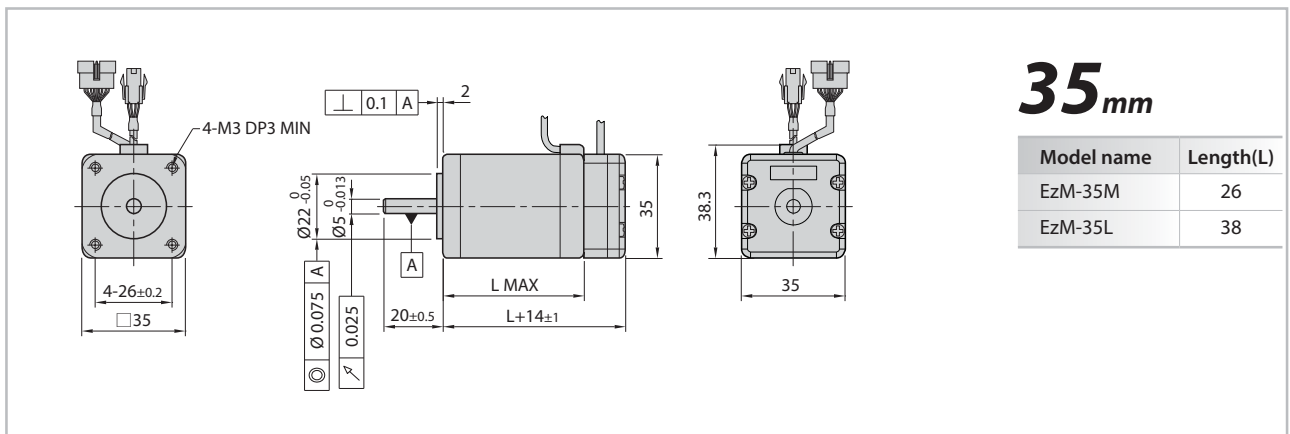
20mm

Model name	Length(L)
EzM-20M	28
EzM-20L	38

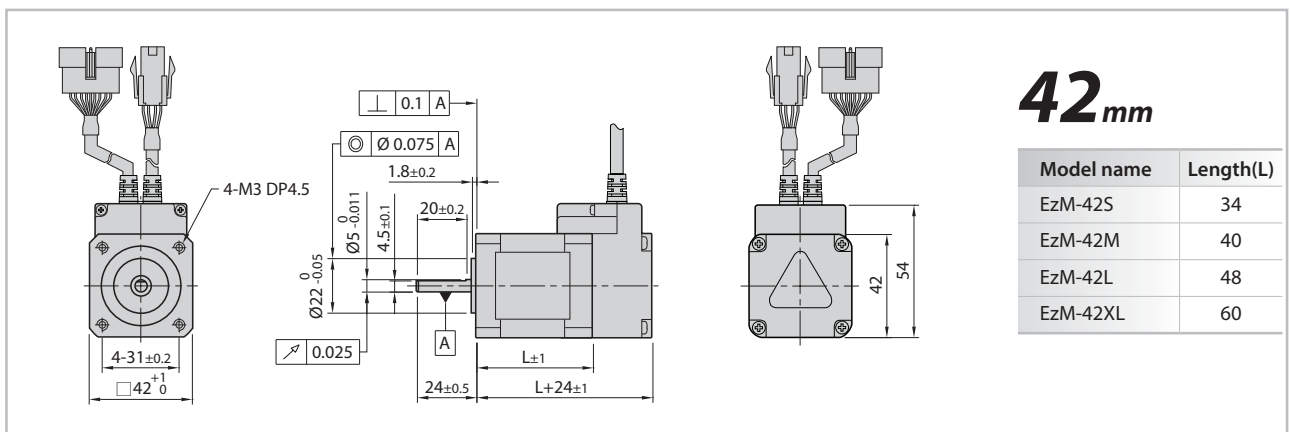
Model name	Length(L)
EzM-20M	28
EzM-20L	38



Model name	Length(L)
EzM-28S	32
EzM-28M	45
EzM-28L	50



Model name	Length(L)
EzM-35M	26
EzM-35L	38



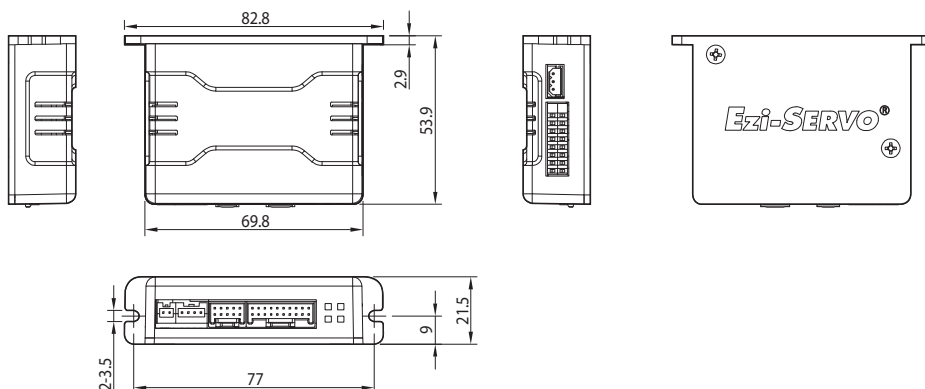
Model name	Length(L)
EzM-42S	34
EzM-42M	40
EzM-42L	48
EzM-42XL	60

Drive Specification

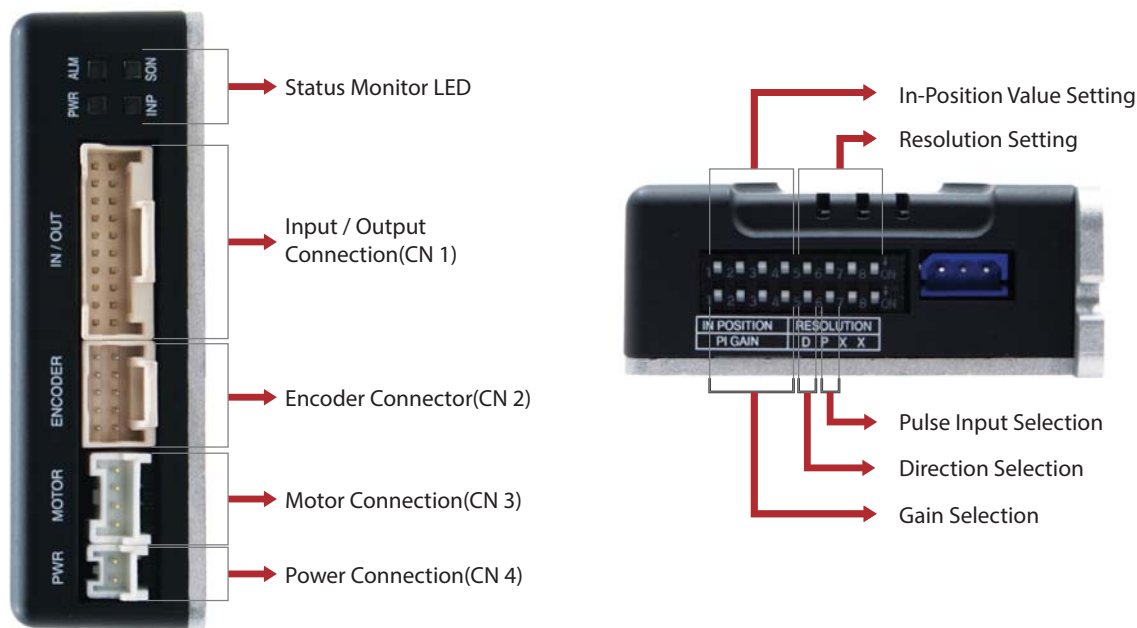
Specifications

Motor Model		EzM-20 Series	EzM-28 Series	EzM-35 Series	EzM-42 Series
Drive Model		EzS-PD-MI-20 Series	EzS-PD-MI-28 Series	EzS-PD-MI-35 Series	EzS-PD-MI-42 Series
Input Voltage		24VDC $\pm 10\%$			
Control Method		Closed Loop Control with 32bit DSP			
Current Consumption		Max. 500mA(Except Motor Current)			
Operating Condition	Ambient Temperature	· In Use : 0 ~ 50°C · In Storage : 10 ~ 90°C			
	Humidity	· In Use : 35 ~ 85% RH(Non-Condensing) · In Storage : 10 ~ 90% RH(Non-Condensing)			
	Vib. Resist.	0.5G			
Function	Rotation Speed	0 ~ 3,000[rpm]			
	Resolution[ppr]	· 4,000[ppr] Encoder model : 500 / 1,000 / 1,600 / 2,000 / 3,600 / 5,000 / 6,400 / 7,200 / 10,000 / 4,000 · 10,000[ppr] Encoder model : 500 / 1,000 / 1,600 / 2,000 / 3,600 / 5,000 / 6,400 / 7,200 / 10,000 · 16,000[ppr] Encoder model : 500 / 1,000 / 1,600 / 2,000 / 3,600 / 5,000 / 6,400 / 7,200 / 10,000 / 16,000 · 20,000[ppr] Encoder model : 500 / 1,000 / 1,600 / 2,000 / 3,600 / 5,000 / 6,400 / 7,200 / 10,000 / 20,000 · 32,000[ppr] 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)			
	Max. Input Pulse Frequency	500KHz(Duty 50%)			
	Protection	Over Current Error, Over Speed Error, Position Tracking Error, Over Load Error, Over Temperature Error, Over Regenerated Voltage Error, Motor Connect Error, Encoder Connect Error, Motor Voltage Error, In-Position Error, System Error, ROM Error, Position Overflow Error			
	LED Display	Power status, In-Position status, Servo On status, Alarm status,			
	In-Position Selection	16(Selectable with DIP Switch)			
	Position Gain Selection	16(Selectable with DIP Switch)			
	Pulse Input Method	1-Pulse / 2-Pulse(Selectable with DIP Switch)			
	Rotational Direction	CW / CCW(Selectable with DIP Switch)			
	Speed / Position Control Command	Pulse Train Input			
I/O Signal	Input Signal	Position command pulse, Servo On / Off, Alarm reset(Photocoupler Input)			
	Output Signal	In-Position, Alarm(Photocoupler Output) Encoder Signal(A+, A-, B+, B-, Z+, Z-, 26C31 of Equivalent)(Line Drive Output)			

Drive Dimension(mm)



Setting and Operation



System Operation Manual

Status Monitor LED

1. Status Monitor LED

Indication	Color	Function	ON/OFF Condition
PWR	Green	Power input indication	LED is turned ON when power is applied
INP	Yellow	Complete Positioning Motion	Lights On when Positioning error reaches within the preset pulse selected by DIP 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 blinking times)

2. Protection functions and LED flash times

Times	Protection	Conditions
1	Over Current Error	The current through power devices in inverter exceeds the limit value
2	Over Speed Error	Motor speed exceed 3,000[rpm]
3	Position Tracking Error	Position error value is higher than 90° in motor run state
4	Over Load Error	The motor is continuously operated more than 5 second under a load exceeding the Max. torque
5	Over Temperature Error	Inside temperature of drive exceeds 85°C
6	Over Regenerated Voltage Error	Back-EMF more than 50V
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
10	In-Position 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)
15	Position Overflow Error	Position error value is higher than 90° in motor stop state

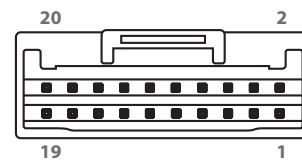
Alarm LED Flash(ex : Position Tracking Error)



Connector

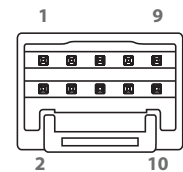
1. Input / Output Signal(CN 1)

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



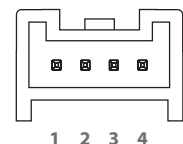
2. Encoder Connector(CN 2)

No.	Function	I/O
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	----



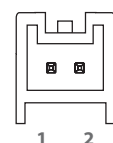
3. Motor Connection(CN 3)

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



4. Power Connection(CN 4)

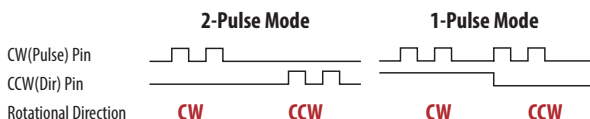
No.	Function
1	24VDC ±10%
2	GND



Switch

1. Pulse Input Selection Switch

Indicaion	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



3. Resolution Selection Switch

The Number of pulse per revolution.

Switch Position				Pulse/Revolution
8	7	6	5	
ON	ON	ON	ON	4,000 or 16,000 *1
ON	ON	ON	OFF	500
ON	ON	OFF	ON	1,000
ON	ON	OFF	OFF	1,600
ON	OFF	ON	ON	2,000
ON	OFF	ON	OFF	3,600
ON	OFF	OFF	ON	5,000
ON	OFF	OFF	OFF	6,400

*1 : Resolution value depend on encoder type.(Refer to the Manual)

*2 : Default = 10,000

2. Rotational Direction Selection Switch

Indicaion	Switch Name	Functions
DIR	Switching Rotational Direction	Based on CW(+Dir signal) input to drive. · ON : CCW(-Direction) · OFF : CW(+Direction) ※Default : CW mode



CCW Dir

Direction Selection Switch : ON



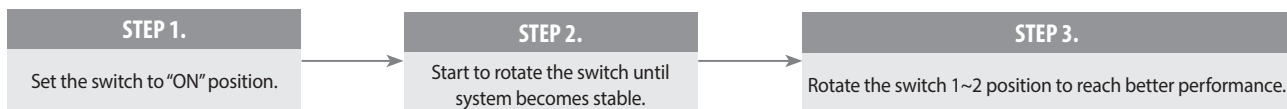
CW Dir

Direction Selection Switch : OFF

Switch Position				Pulse/Revolution
8	7	6	5	
OFF	ON	ON	ON	7,200
OFF	ON	ON	OFF	10,000 *2
OFF	ON	OFF	ON	NC
OFF	ON	OFF	OFF	NC
OFF	OFF	ON	ON	NC
OFF	OFF	ON	OFF	NC
OFF	OFF	OFF	ON	NC
OFF	OFF	OFF	OFF	NC

4. Position Controller Gain Selection Switch

The Position Controller Gain Switch allows for the correction of the motor position deviation after stopping caused by load and friction. Depending on the motor load, the user may have to select a different gain position to stabilize and to correct positional error quickly.



Switch Position				Time Constant of the 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

*1 : Value 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

Switch Position				Time Constant of the Integral part	Proportional Gain *1
4	3	2	1		
OFF	ON	ON	ON	2	3
OFF	ON	ON	OFF	2	4
OFF	ON	OFF	ON	2	5
OFF	ON	OFF	OFF	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

5. In-Position Value Setting Switch

To select the output condition of In-position signal. In-position output signal is generated when the pulse number of positional error is lower than selected In-position value set by this switch after positioning command is executed.

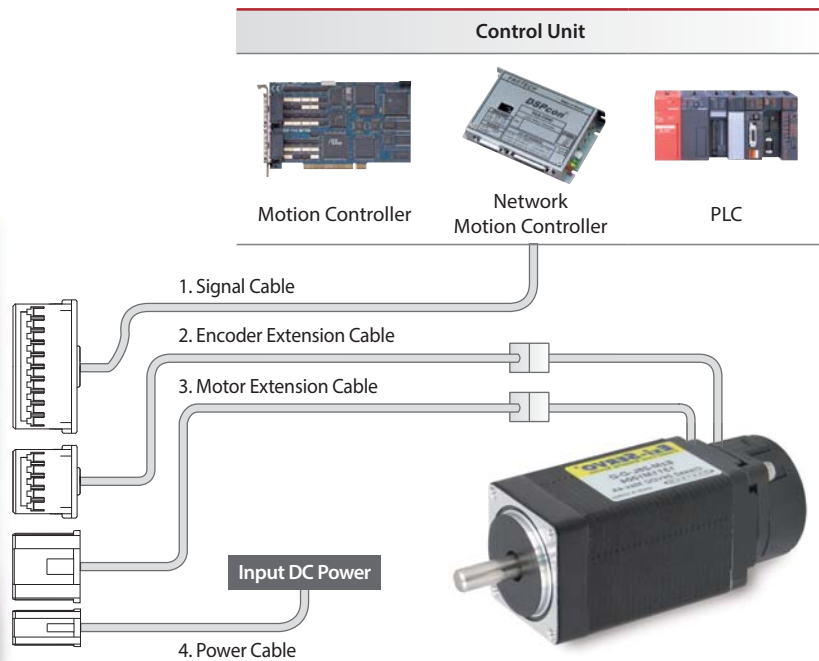
Switch Position				In-Position Valuepulse Fast Response
4	3	2	1	
ON	ON	ON	ON	0 *1
ON	ON	ON	OFF	1
ON	ON	OFF	ON	2
ON	ON	OFF	OFF	3
ON	OFF	ON	ON	4
ON	OFF	ON	OFF	5
ON	OFF	OFF	ON	6
ON	OFF	OFF	OFF	7

*1 : Default = 0

※ Please refer to User Manual for setup.

Switch Position				In-Position Valuepulse Accurate Response
4	3	2	1	
OFF	ON	ON	ON	0
OFF	ON	ON	OFF	1
OFF	ON	OFF	ON	2
OFF	ON	OFF	OFF	3
OFF	OFF	ON	ON	4
OFF	OFF	ON	OFF	5
OFF	OFF	OFF	ON	6
OFF	OFF	OFF	OFF	7

System Configuration



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable
Standard Length	-	30cm	30cm	-
Max. Length	20m	20m	20m	2m

Option Cable

1. Signal Cable

Available to connect between Control System and Ezi-SERVO MINI.

Model Name	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.

2. Encoder Extension Cable

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

Model Name	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.

3. Motor Extension Cable

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

Model Name	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.

4. Power Cable

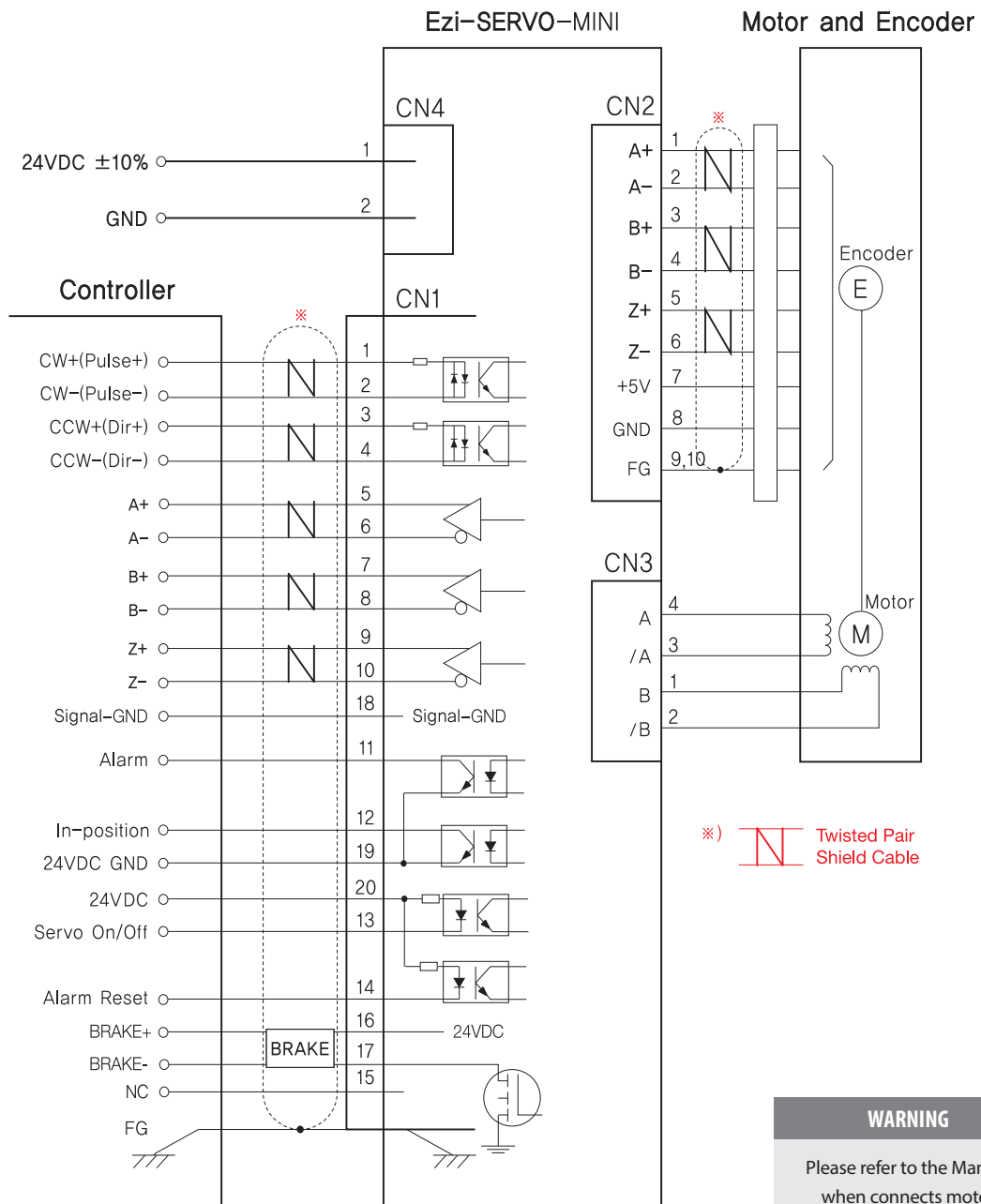
Available to connect between Power and Ezi-SERVO MINI.

Model Name	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.

External Wiring Diagram

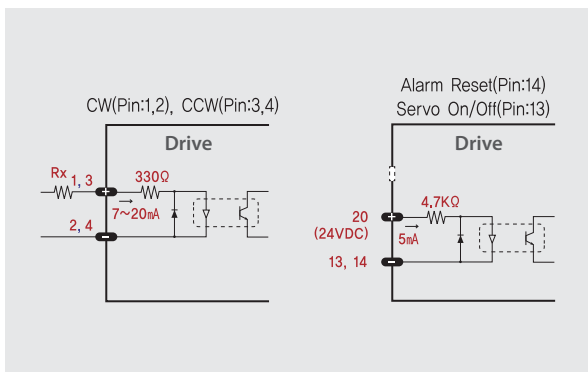
Ezi-SERVO MINI



Control Signal Input / Output Description

Input Signal

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



1. CW, CCW Input

This signal can be used to receive a positioning pulse command from a user host motion controller. The user can select 1-Pulse Input mode or 2-Pulse Input mode(refer to switch No.1, SW 1). 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 drive directly.

When the level of input signal is more than 5V, Rx resistor is required.

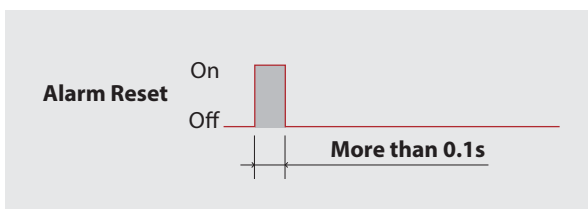
If the resistor is absent, the drive will be damaged! If the input signal level is 12V, Rx value is 680ohm and 24V, Rx value is 1.8Kohm.

2. 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 drive cuts off the power supply to the motor. Then, one can manually adjust output position. When setting the signal back to [OFF], the drive resumes the power to the motor and recovers the holding torque. When driving a motor, one needs to set the signal [OFF].

3. Alarm Reset Input

When a protection mode has been activated, a signal to this alarm reset input cancels the Alarm output.

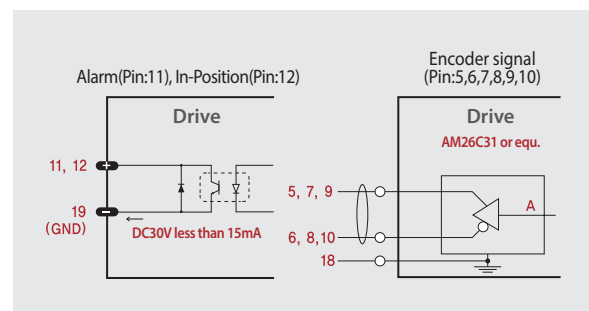


※ By setting the alarm reset input signal [ON], cancel the Alarm output.
Before cancel the Alarm output, have to remove the source of alarm.

Output Signal

Output signals from the drive are photocoupler protected: Alarm, In-Position and the Line Drive 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.

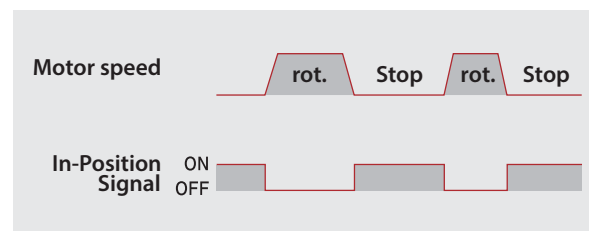


1. Alarm Output

The Alarm output indicates [ON] when the drive 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 drive detects an abnormal operation such as overload or over current of the motor, it sets the Alarm output to [OFF], flashes the Alarm LED, disconnect the power to a motor and stops the motor simultaneously.

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

2. 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 SW 4.

3. Encoder Signal Output

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



Fast, Accurate, Smooth Motion

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