

Ezi-STEP[®]

Micro Stepping System

- Micro Stepping
- Sensorless Stall Detection
- Software Damping
- Run / Stop Signal Output

MINI



Fast, Accurate, Smooth Motion

Features

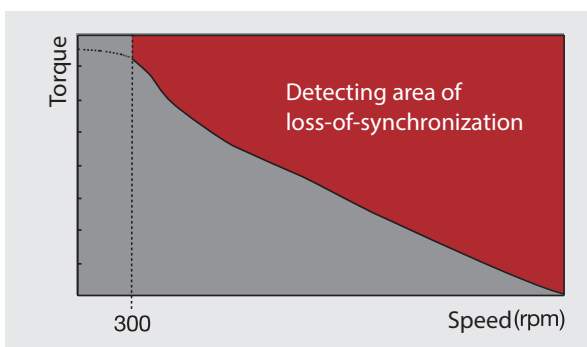
Ezi-STEP MINI is a micro stepping system that incorporates a motor and DSP(Digital Signal Processor) equipped drive that is integrated seamlessly together as a system. This makes it possible to incorporate many functions compared with a conventional stepping motors and drives, such as sensorless detection of loss of synchronization, smooth control over the whole velocity range, higher torque operation and no vibration at the low speed range. Ezi-STEP MINI's on-board high-performance digital signal processor and proprietary algorithms allow the Ezi-STEP MINI to operate at high speeds with unmatched precision. The unique position estimation algorithm instantaneously detects out-of-synchronization based on the rotor position of the stepping motor, which is not an easy task in a conventional stepping motor and drives(effective only over 300[rpm]) Utilizing a software damping and filtering algorithms, high speed operation is realized by the exciting angle control of a step-angle. The resolution of Ezi-STEP MINI can be selected from basic 1.8° up to 0.0072°(1/250). In addition, Ezi-STEP MINI generates various signals including sensorless stall detection, alarm and running signal. Ezi-STEP MINI is an economical ideal drive for vision systems, nanotech, packaging, semiconductor, pick and place, automation, laboratory testing, wood working and wherever smooth, quiet, precise, high torque operation is a requirement!

1. Sensorless Stall Detection

Detecting the loss-of-synchronization with on-board DSP(Patent pending) Ezi-STEP MINI can detect the loss-of-synchronization of a stepping motor without the addition of an external sensor.

By monitoring the voltage, current, and back-emf signal, the on-board DSP estimates the current position of a rotor and enables it to detect the loss-of-synchronization(an impossible task for a conventional stepping motor drive), this allows for high-speed operation at 100% torque rating without loss-of-synchronization. *1

*1 : Effective only over 300[rpm]

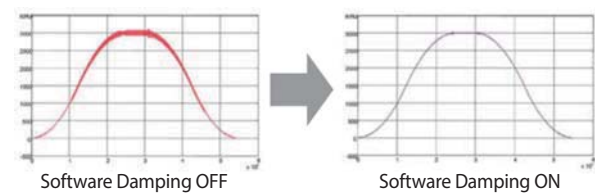


2. Microstep and Filtering

High precision Microstep function and Filtering(Patent pending) The high-performance DSP operates at step resolutions of 1.8° up to maximum 0.0072°(steps) and Ezi-STEP MINI adjusts PWM control signal in every 25μsec, which makes it possible for more precise current control, resulting in high-precision Microstep operation.

3. Software Damping

Vibration suppression and High-speed operation(Patent pending) Motor vibration is created by magnetic flux variations of the motor, lower current from the drive due to back-emf from the motor at high speeds and lowering of phase voltages from the drive. Ezi-STEP MINI drive detects these problems and the DSP adjusts the phase of the current according to the pole position of the motor, drastically suppressing vibration. This allows the smooth operation of the motor at high speeds.



[This is real measured speed that using 100000[ppr]encoder.]

4. Drive Output Signal Monitoring

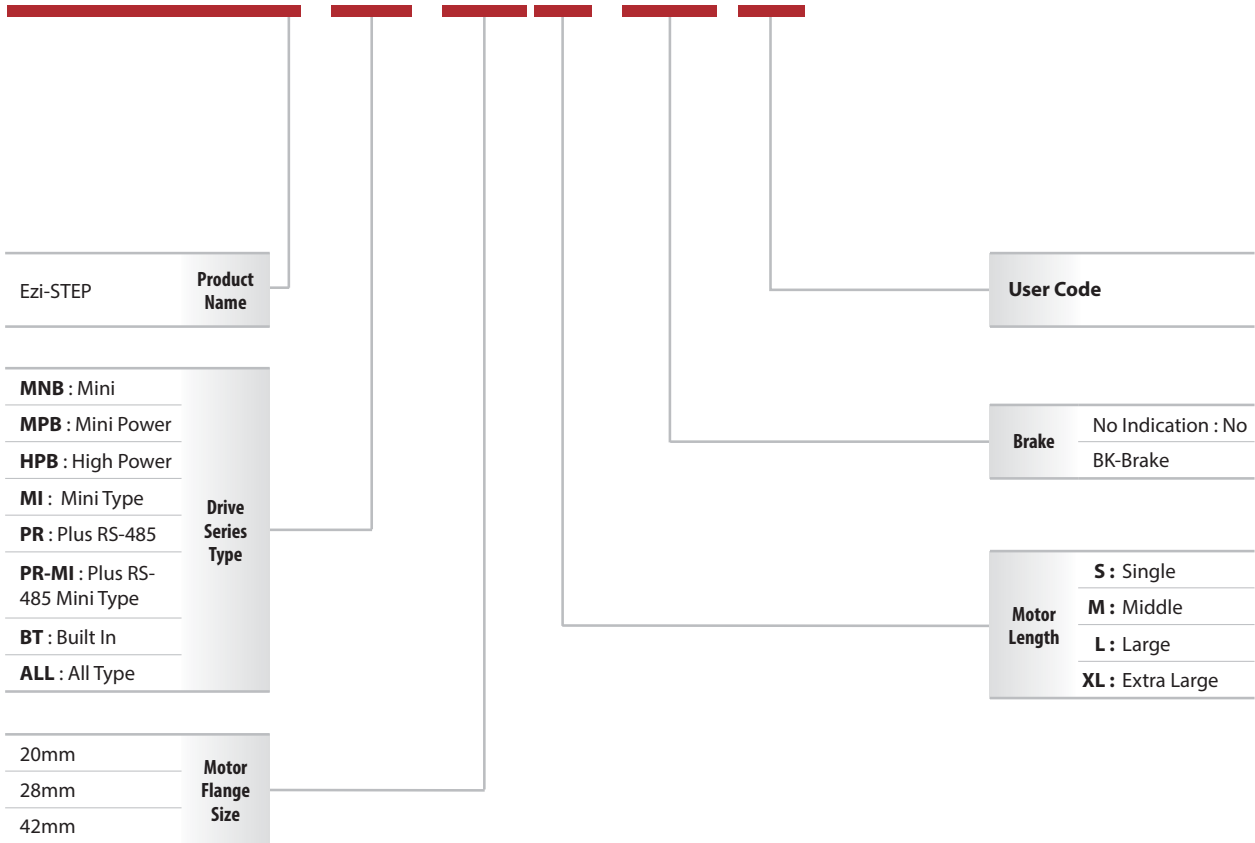
Ezi-STEP MINI provides loss of step, run / stop, over-current, over-heat, over-voltage, power, and motor connection alarms that can be monitored by the controller and visible by a motor-mounted flashing led indicator.

5. Improvement of High-Speed Driving

Depending on the speed of a stepping motor, Ezi-STEP MINI automatically increases the supply voltage and prevents the torque lowering due to the low operating voltage to the motor caused by back-emf voltage, this enables high-speed operation. Additionally, the software damping algorithm minimizes the vibration and prevents the loss-of-synchronization at high-speed.

Part Numbering Method

Ezi-STEP-MI-20M-BK-□

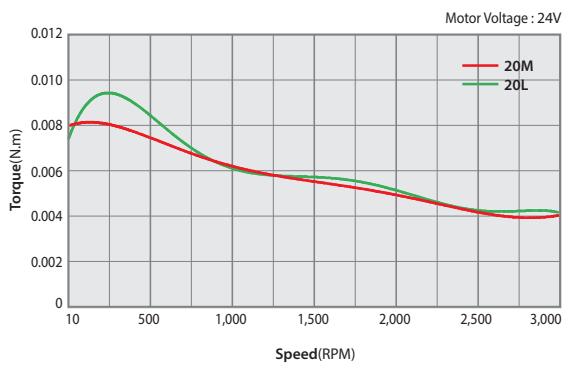


Motor, Drive Combination	UNIT No.	MOTOR No.	DRIVE No.
	Ezi-STEP-MI-20M	BM-20M	EzStep-MI-20M
	Ezi-STEP-MI-20L	BM-20L	EzStep-MI-20L
	Ezi-STEP-MI-28S	BM-28S	EzStep-MI-28S
	Ezi-STEP-MI-28M	BM-28M	EzStep-MI-28M
	Ezi-STEP-MI-28L	BM-28L	EzStep-MI-28L
	Ezi-STEP-MI-42S	BM-42S	EzStep-MI-42S
	Ezi-STEP-MI-42M	BM-42M	EzStep-MI-42M
	Ezi-STEP-MI-42L	BM-42L	EzStep-MI-42L
	Ezi-STEP-MI-42XL	BM-42XL	EzStep-MI-42XL

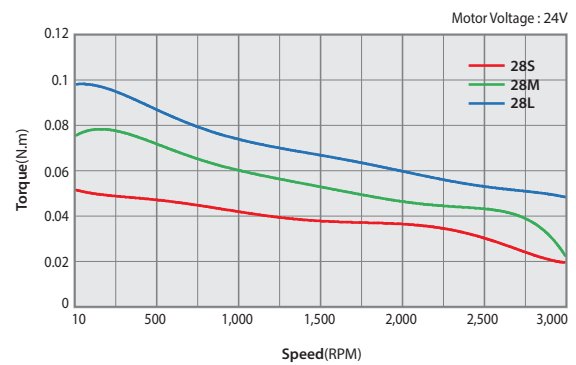
Motor Specification Table

Model	Unit	20		28			42				
		20M	20L	28S	28M	28L	42S	42M	42L	42XL	
DRIVE METHOD	-	BI-POLAR									
Number OF PHASES	-	2	2	2	2	2	2	2	2	2	
VOLTAGE	VDC	2.75	3.0	3.0	3.0	3.0	3.36	4.32	4.56	7.2	
CURRENT per PHASE	A	0.5	0.5	0.95	0.95	0.95	1.2	1.2	1.2	1.2	
RESISTANCE per PHASE	Ohm	5.5	6.0	3.2	3.2	3.2	2.8	3.6	3.8	6	
INDUCTANCE per PHASE	mH	2.0	2.6	2.0	2.7	3.2	5.4	7.2	8	15.6	
HOLDING TORQUE	N·m	0.016	0.025	0.069	0.10	0.12	0.320	0.440	0.500	0.800	
ROTOR INERTIA	g·cm ²	2.5	3.3	9	13	18	35	54	77	114	
WEIGHTS	g	50	80	110	140	200	250	280	350	500	
LENGTH(L)	mm	28	38	32	45	50	34	40	48	60	
ALLOWABLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	18	18	30	30	30	22	22	22	22
	8mm		30	30	38	38	38	26	26	26	26
	13mm		-	-	53	53	53	33	33	33	33
	18mm		-	-	-	-	-	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									

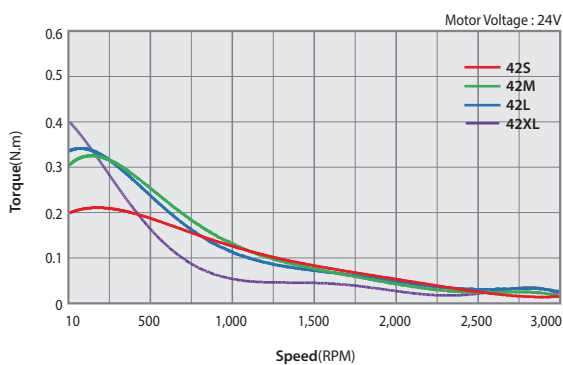
Ezi-STEP MINI_20 Series



Ezi-STEP MINI_28 Series

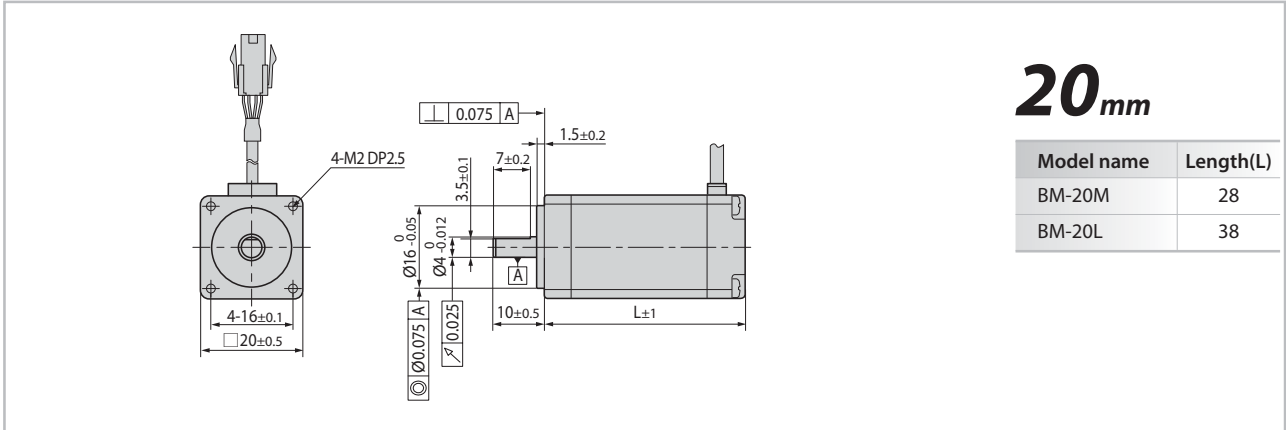


Ezi-STEP MINI_42 Series

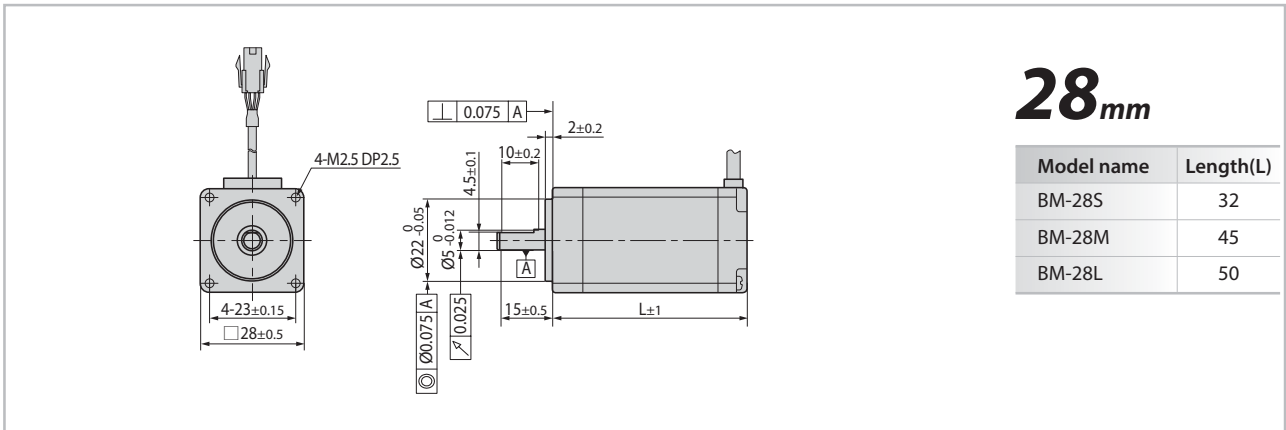


Motor Drawing

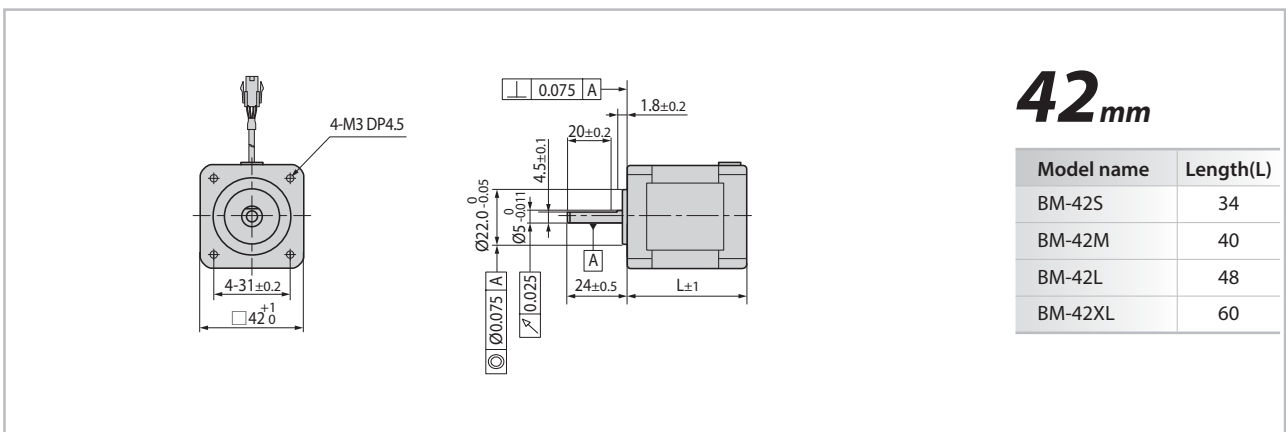
Ezi-STEP MINI_ 20mm



Ezi-STEP MINI_ 28mm



Ezi-STEP MINI_ 42mm

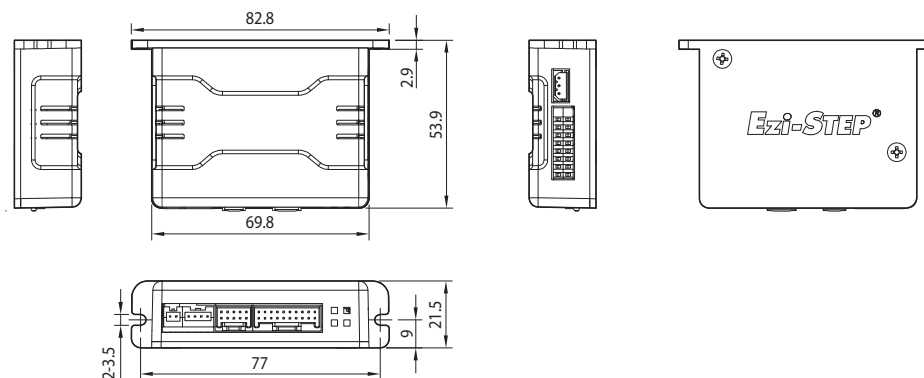


Drive Specification

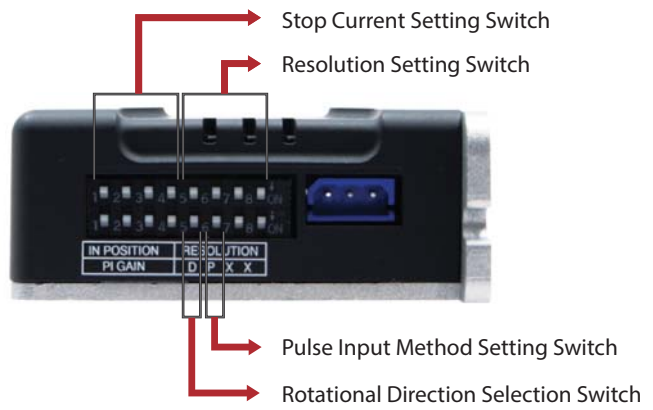
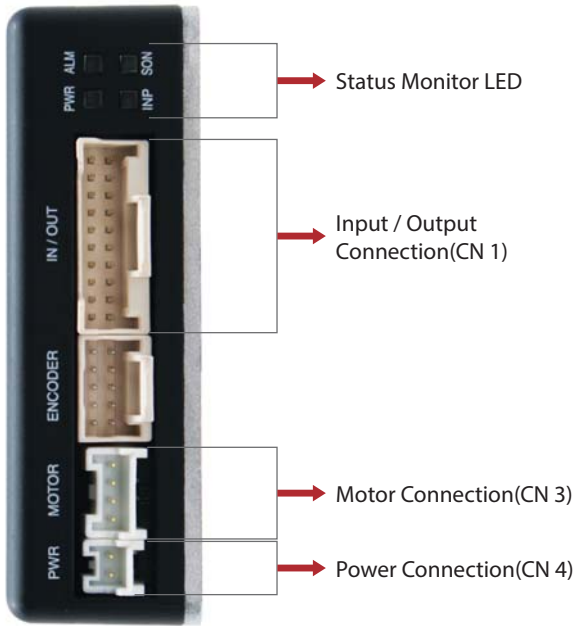
Specifications

Motor Model	BM-20 Series	BM-28 Series	BM-42 Series
Drive Model	Ezi-STEP-MI-20 Series	Ezi-STEP-MI-28 Series	Ezi-STEP-MI-42 Series
Input Voltage	24VDC \pm 10%		
Control Method	Bipolar PWM drive with 32bit DSP		
Current Consumption	Max. 500mA(Except Motor Current)		
Operating Condition	Temperature	· In Use : 0 ~ 50°C · In Storage : -20 ~ 70°C	
	Humidity	· In Use : 35 ~ 85% RH(Non-condensing) · In Storage : 10 ~ 90% RH(Non-condensing)	
	Vib. Resist.	0.5G	
	Resolution[ppr]	500 / 1,000 / 1,600 / 2,000 / 3,200 / 3,600 / 4,000 / 5,000 / 6,400 / 8,000 / 10,000 / 20,000 / 25,000 / 36,000 / 40,000 / 50,000(Selectable by DIP switch) ※ Default : 10,000	
	Max. Input Pulse Frequency	500KHz(Duty 50%)	
	Protection	Over Current Error, Over Speed Error, Step Out Error, Over Temperature Error, Over Regenerated Voltage Error, Motor Connection Error, Motor Voltage Error, System Error, ROM Error (Identifiable which alarm is activated by counting the blinking times of status monitor LED)	
	LED Display	Power Status(Green), Alarm Status(Red), CW Rotation(Yellow), CCW Rotation(Orange)	
	Stop Current	10% ~ 100%(Selectable by DIP switch) Be setted to set value of Stop Current after 0.1 second after motor stop. ※ Default : 50%	
	Pulse Input Method	1-Pulse / 2-Pulse(Selectable by DIP switch) 1-Pulse : Pulse / Direction, 2-Pulse : CW / CCW ※ Default : 2-Pulse	
	Rotational Direction	CW / CCW(Selectable by DIP switch) Used when changing the direction of motor rotate. ※ Default : CW	
	Speed / Position Control Command	Pulse Train Input(Photocoupler Input)	
I/O Signal	Input Signal	Alarm Reset(Photocoupler Input)	
	Output Signal	Alarm, Run / Stop(Photocoupler 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
ALM	Red	Alarm Indication	Flash when protection function is activated(Identifiable which protection mode is activated by counting the blinking times)
CW	Yellow	Motor Rotation Direction	Lights when motor rotate CW direction
CCW	Orange	Motor Rotation Direction	Lights when motor rotate CCW direction

2. Protection functions and LED flash times

Time	Protection	Conditions
1	Over Current	Excessive current flowed into a motor
2	Over Speed	Motor speed exceed 3,000[rpm]
3	Step out	Abnormally motor do not followed pulsed input
5	Over Temperature	Internal temperature of a motor drive exceeded 55°C
6	Over Regeneratived Voltage Error	Back EMF more than 50V
7	Motor Connect Error	The power is ON without connection of the motor cable to drive
9	Motor Voltage Error	Motor voltage is below 20V
11	System Error	Error occurs in drive system
12	ROM Error	Error occurs in parameter storage device(ROM)

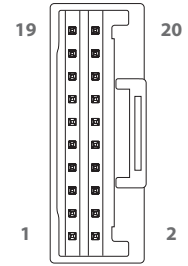
Alarm LED Flash(ex: Synchronization error)



Connector

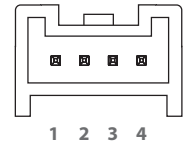
1. Input / Output Connection(CN 1)

No.	Function	I/O
1	CW+(Pulse+)	Input
2	CW-(Pulse-)	Input
3	CCW+(Dir+)	Input
4	CCW-(Dir-)	Input
11	Alarm	Output
12	Run / Stop	Output
14	Alarm Reset	Input
19	24VDC GND	Input
20	24VDC	Input



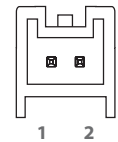
2. Motor Connection(CN 3)

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



3. Power Connection(CN 4)

No.	Function
1	24VDC ±10%
2	GND



Cable Connector

ITEM		Specification	Maker
Motor	Input / Output Connection(CN 1)	Housing	501646-2000
		Terminal	501648-1000(AWG 26 ~ 28)
		Connector	10120-3000VE
		Backshell	10320-52AO-008
	Motor Connection(CN 3)	Housing	PAP-04V-S
		Terminal	SPHD-001T-P0.5
	Motor Side	Housing	5557-04R
		Terminal	5556T
	Power Connection(CN 4)	Housing	PAP-02V-S
		Terminal	SPHD-001T-P0.5

Switch

1. Stop Current Selection

Stop Current means the motor current value automatically set in 0.1 sec after motor stops. This is to prevent the overheat of a motor when the motor is under long time idling. The unit of the selection value is a percentage.

Position(SW 1)				Stop Current(%)
4	3	2	1	
ON	ON	ON	ON	10
ON	ON	ON	OFF	20
ON	ON	OFF	ON	30
ON	ON	OFF	OFF	40
ON	OFF	ON	ON	50
ON	OFF	ON	OFF	60
ON	OFF	OFF	ON	70
ON	OFF	OFF	OFF	80

※ Default : 50%

Position(SW 1)				Stop Current(%)
4	3	2	1	
OFF	ON	ON	ON	90
OFF	ON	ON	OFF	100
OFF	ON	OFF	ON	10
OFF	ON	OFF	OFF	10
OFF	OFF	ON	ON	10
OFF	OFF	ON	OFF	10
OFF	OFF	OFF	ON	10
OFF	OFF	OFF	OFF	10

2. Resolution Setting Switch

The Number of pulse per revolution.

Position(SW 1)				Pulse/Revolution
8	7	6	5	
ON	ON	ON	ON	500
ON	ON	ON	OFF	1,000
ON	ON	OFF	ON	1,600
ON	ON	OFF	OFF	2,000
ON	OFF	ON	ON	3,200
ON	OFF	ON	OFF	3,600
ON	OFF	OFF	ON	4,000
ON	OFF	OFF	OFF	5,000

※The default factory setting is 10,000

Position(SW 1)				Pulse/Revolution
8	7	6	5	
OFF	ON	ON	ON	6,400
OFF	ON	ON	OFF	8,000
OFF	ON	OFF	ON	10,000
OFF	ON	OFF	OFF	20,000
OFF	OFF	ON	ON	25,000
OFF	OFF	ON	OFF	36,000
OFF	OFF	OFF	ON	40,000
OFF	OFF	OFF	OFF	50,000

3. Rotational Direction Selection Switch

Indication	Switch Name	Function
DIR	Rotational Direction Select Switch	Based on CW(+Dir signal) input to drive. · ON : CCW(-Dir.) · OFF : CW(+Dir.) ※ The default factory setting is CW (clockwise)



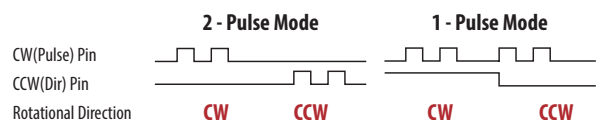
CCW Dir
Direction selection switch : 1



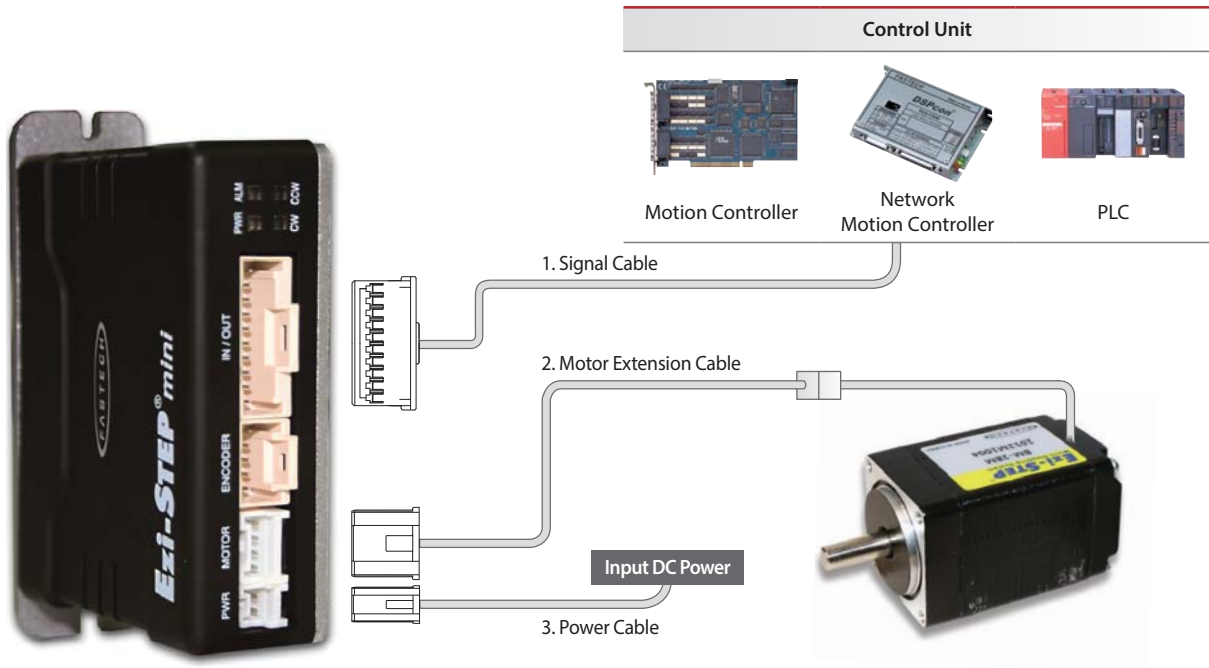
CW Dir
Direction selection switch : 0

4. Pulse Input Method Setting Switch

Indication	Switch Name	Function
2P/1P	Pulse Input Mode Select Switch	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



System Configuration



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

Option Cable

1. Signal Cable

Available to connect between Control System and Ezi-STEP 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.

3. Power Cable

Available to extended connection between motor and Ezi-STEP 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.

2. Motor Extension Cable

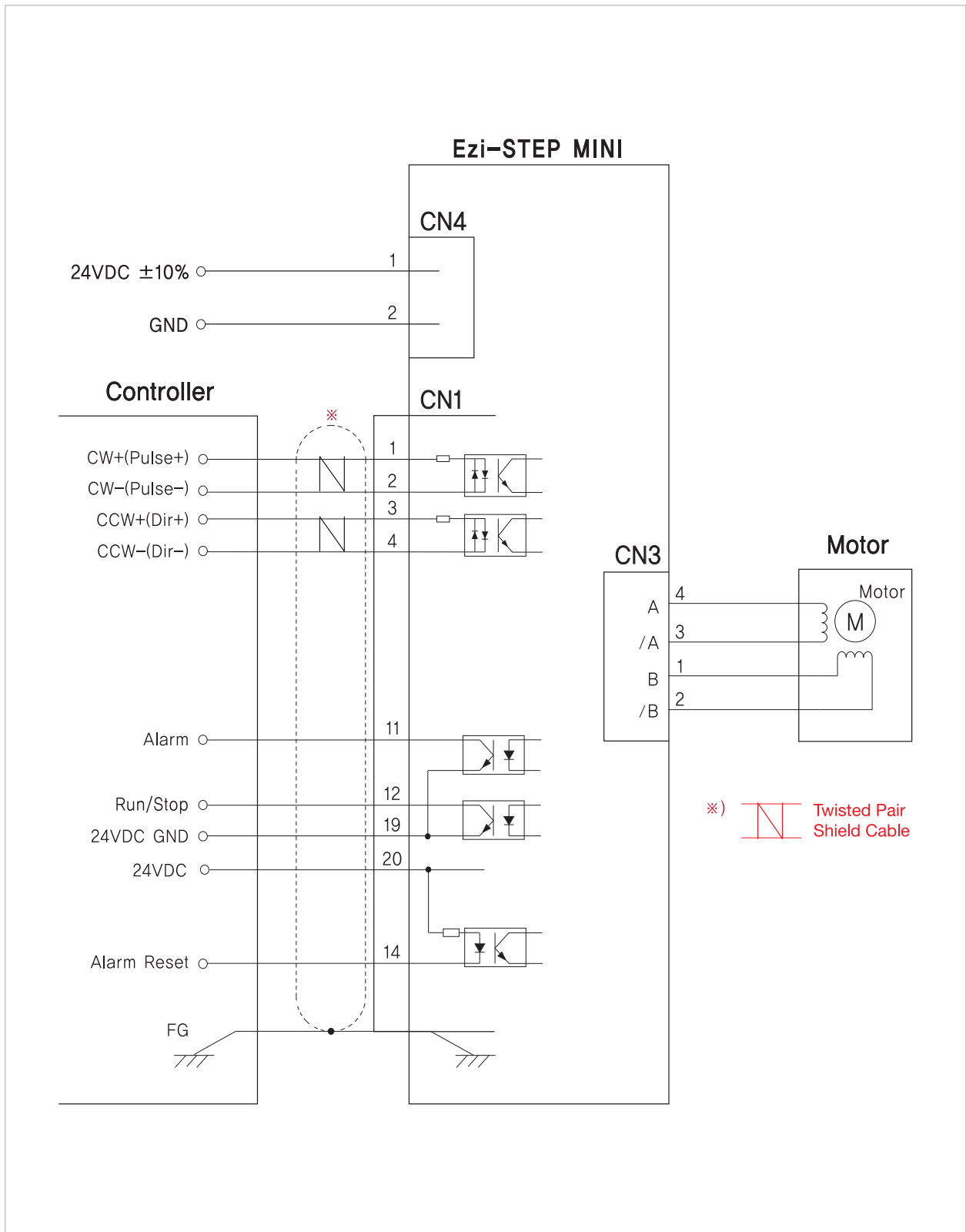
Available to connect between Power and Ezi-STEP MINI.

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.

External Wiring Diagram

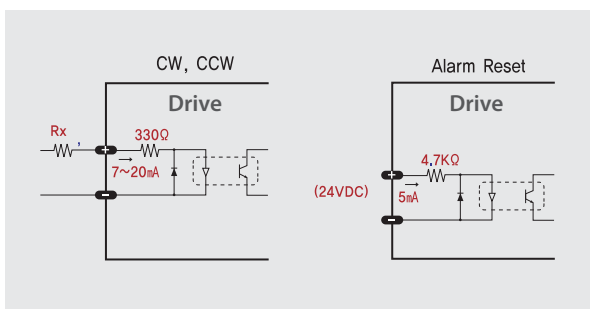
Ezi-STEP MINI



Control Signal Input / Output Description

Input Signal

Input signal 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.



1. CW, CCW Input

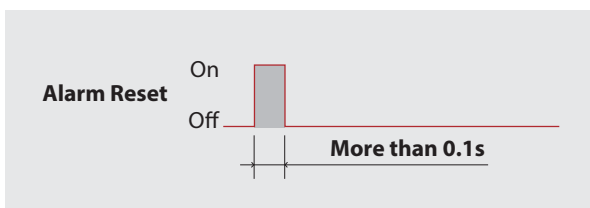
This signal can be used to receive a positioning pulse command from a user-side host motion controller. A user can select 1-Pulse Input mode of 2-Pulse Input mode. The input schematic of CW, CCW is designed for 5V TTL level. When using 5V level as an input signal, the resistor R_x is used and connect to the drive directly. When the level of input signal is more than 5V, have to add R_x . If this resistor is absent, the inner schematic can be broken. In input signal level is 12V case, R_x value is 680ohm and in 24V case, 1.8kohm is suitable for R_x value.

2. Motor Free 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 supply to the motor and recovers the holding torque. When driving a motor, one needs to set the signal [OFF]. In normal operations set the signal [OFF] or disconnect a wire to the signal. It operates reversely compare to Normal mode, when you set Inverse mode.

3. Alarm Reset Input

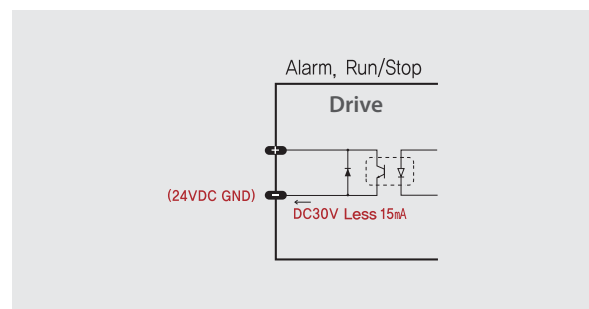
When a protection mode has been activated, a signal to this Alarm Reset input cancels the Alarm output. By setting the alarm reset input signal [ON], cancel Alarm output. Before cancel the Alarm output, have to remove the source of alarm.



[Caution] If Alarm Reset input signal still remains [ON], motor will be Free state. Keep in mind to change [ON] → [OFF] state. It operates reversely compare to Normal mode, when you set Inverse mode.

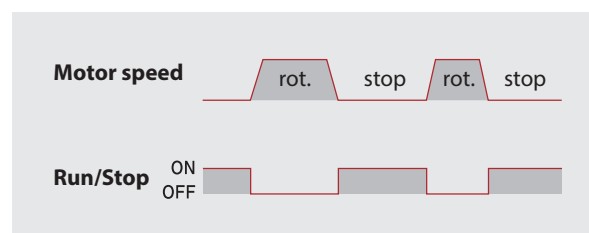
Output Signal

As the output signal from the drive, there are the photocoupler outputs(Alarm, Run / Stop). The signal status operate as [ON : conduction], [OFF : Non-conduction] of photocoupler not as the voltage level of signal.



1. Run / Stop Output

Run / Stop Output state is [ON] when motor positioning is completed. It operates reversely compare to Normal mode, when you set inverse mode.



2. Alarm Output

The Alarm output indicates [OFF] when the drive is in a normal operation. If a protection mode has been activated, it goes [ON]. 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 of over-current of a motor, it sets the Alarm output to [ON], flash the Alarm LED, disconnects the power to a motor, and stops the motor, simultaneously. It operates reversely compare to Normal mode, when you set Inverse mode.



Fast, Accurate, Smooth Motion

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