Ezi-STEP® II

Micro Stepping System

- CiA402 Drive Profile Support
- Microstepping
- Software Damping
- Space Saving / Reduced Wiring by Compact Drive

EtherCAT®

MINI

CE

FASTECH

Fast, Accurate, Smooth Motion

FASTECH

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Ezi-STEP® II

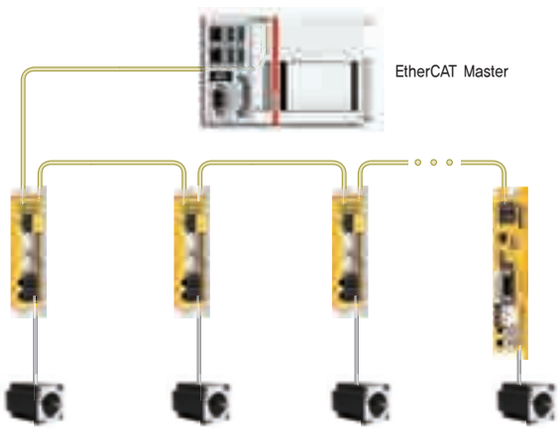
Micro Stepping System

EtherCAT®

MINI

1 EtherCAT Based Motion Control

Ezi-STEP II EtherCAT MINI is stepping motor control system using EtherCAT, high speed ethernet (100Mbps Full-Duplex) based fieldbus. Ezi-STEP II EtherCAT MINI is EtherCAT slave module which supports CAN application layer over EtherCAT (CoE). It employs CiA 402 Drive Profile and supports Profile Position Mode, Homing Mode, Cyclic Synchronous Position Mode.

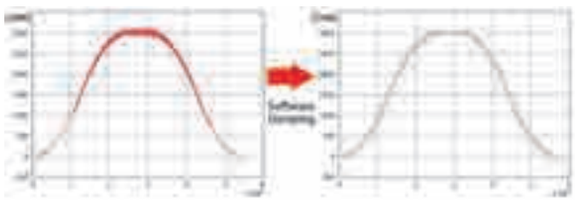


2 Microstep and Filtering

The high-performance MCU operates at step resolutions of 1.8° up to maximum 0.0072° (1/250 steps) and Ezi-STEP II adjusts PWM control signal in every 50μsec, which makes it possible for more precise current control, resulting in high-precision Microstep operation. In addition, Ezi-STEP II applies filtering control to enable smooth operation even at very low-speed.

3 Software Damping

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 II drive detects these problems and the MCU 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.



Software Damping OFF　　Software Damping ON

※ This is real measured speed that using 100,000 P/R encoder.

● Ezi-STEPII EtherCAT MINI Part Numbering

Ezi-STEP II -EC-MI-42S-BK

Product Name

Drive Series

EC-MI : EtherCAT Mini Type

Motor Flange Size

20 : 20mm
28 : 28mm
42 : 42mm
56 : 56mm
60 : 60mm

Motor Length

S : Small
M : Medium
L : Large
XL : Extra Large

Brake

Blank : Without Brake
BK : Brake

● Standard Combination

Unit Part Number	Motor Model Number	Drive Model Number
Ezi-STEP II-EC-MI-20M	BM-20M	EzT2-EC-MI-20M
Ezi-STEP II-EC-MI-20L	BM-20L	EzT2-EC-MI-20L
Ezi-STEP II-EC-MI-28S	BM-28S	EzT2-EC-MI-28S
Ezi-STEP II-EC-MI-28M	BM-28M	EzT2-EC-MI-28M
Ezi-STEP II-EC-MI-28L	BM-28L	EzT2-EC-MI-28L
Ezi-STEP II-EC-MI-42S	BM-42S	EzT2-EC-MI-42S
Ezi-STEP II-EC-MI-42M	BM-42M	EzT2-EC-MI-42M
Ezi-STEP II-EC-MI-42L	BM-42L	EzT2-EC-MI-42L
Ezi-STEP II-EC-MI-42XL	BM-42XL	EzT2-EC-MI-42XL
Ezi-STEP II-EC-MI-56S	BM-56S	EzT2-EC-MI-56S
Ezi-STEP II-EC-MI-56M	BM-56M	EzT2-EC-MI-56M
Ezi-STEP II-EC-MI-56L	BM-56L	EzT2-EC-MI-56L
Ezi-STEP II-EC-MI-60S	BM-60S	EzT2-EC-MI-60S
Ezi-STEP II-EC-MI-60M	BM-60M	EzT2-EC-MI-60M
Ezi-STEP II-EC-MI-60L	BM-60L	EzT2-EC-MI-60L

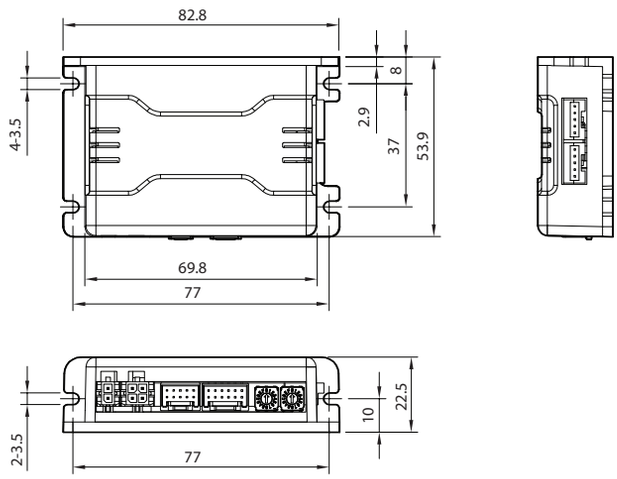
● Combination with Brake

Unit Part Number	Motor Model Number	Drive Model Number
Ezi-STEP II-EC-MI-42S-BK	BM-42S-BK	EzT2-EC-MI-42S
Ezi-STEP II-EC-MI-42M-BK	BM-42M-BK	EzT2-EC-MI-42M
Ezi-STEP II-EC-MI-42L-BK	BM-42L-BK	EzT2-EC-MI-42L
Ezi-STEP II-EC-MI-42XL-BK	BM-42XL-BK	EzT2-EC-MI-42XL
Ezi-STEP II-EC-MI-56S-BK	BM-56S-BK	EzT2-EC-MI-56S
Ezi-STEP II-EC-MI-56M-BK	BM-56M-BK	EzT2-EC-MI-56M
Ezi-STEP II-EC-MI-56L-BK	BM-56L-BK	EzT2-EC-MI-56L
Ezi-STEP II-EC-MI-60S-BK	BM-60S-BK	EzT2-EC-MI-60S
Ezi-STEP II-EC-MI-60M-BK	BM-60M-BK	EzT2-EC-MI-60M
Ezi-STEP II-EC-MI-60L-BK	BM-60L-BK	EzT2-EC-MI-60L

● Specifications of Drive

Motor Model		BM-20 series	BM-28 series	BM-42 series	BM-56 series	BM-60 series
Drive Model		EzT2-EC-MI-20 series	EzT2-EC-MI-28 series	EzT2-EC-MI-42 series	EzT2-EC-MI-56 series	EzT2-EC-MI-60 series
Input Voltage		DC24V±10%				
Control Method		Bipolar PWM drive with 32bit MCU				
Current Consumption		Max. 500mA (Except motor current)				
Operating Condition	Ambient Temperature	· In Use: 0~50℃ · In Storage: -20~70℃				
	Humidity	· In Use: 35~85%RH (Non-Condensing) · In Storage: 10~90%RH (Non-Condensing)				
	Vib. Resist.	0.5g				
Function	Rotation Speed	0~3,000r/min				
	Resolution	Configurable Resolution [P/R] 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 parameter)				
	Error Type	Over Current Error, Over Speed Error, Over Temperature Error, Over Regenerated Voltage Error, Motor Connect Error, ROM Error				
EtherCAT	Supported Protocol	CoE (CiA 402 Drive Profile), FoE (Firmware Download)				
	Supported Mode	Profile Position Mode, Homing Mode, Cyclic Synchronous Position Mode				
	Synchronization	Free Run, SM Event, DC SYNC Event				
I/O Signal	Input Signals	3 dedicated inputs (LIMIT+, LIMIT-, ORIGIN), 3 programmable inputs (Photocoupler Input)				
	Output Signals	2 programmable outputs (Photocoupler Output), 1 Brake output				

● Dimensions of Drive [mm]



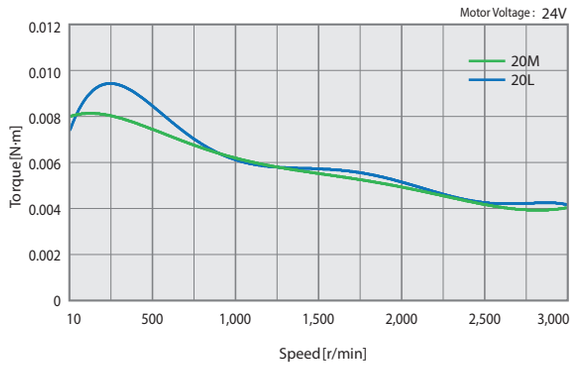
● Specifications of Motor

MODEL				BM-20 series		BM-28 series			BM-42 series			
			UNIT	20M	20L	28S	28M	28L	42S	42M	42L	42XL
DRIVE METHOD			–	Bipolar								
NUMBER OF PHASES			–	2 Phase								
CURRENT per PHASE			A/Phase	0.5	0.5	0.95	0.95	0.95	1.2	1.2	1.2	1.2
MAXIMUM HOLDING TORQUE			N·m	0.016	0.025	0.069	0.098	0.118	0.32	0.44	0.5	0.65
ROTOR INERTIA			$g \cdot cm^2$	2.5	3.3	9.0	13	18	35	54	77	114
WEIGHTS			kg	0.053	0.078	0.115	0.174	0.202	0.238	0.303	0.374	0.508
LENGTH(L)			mm	28	38	32	45	50	34	40	48	60
PERMISSIBLE RADIAL LOAD	DIS-TANCE 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
PERMISSIBLE AXIAL LOAD			N	Lower than Unit's Weight								
INSULATION RESISTANCE			MΩ	Min. 100(When measured with a DC500V insulation resistance meter)								
INSULATION CLASS			–	CLASS B(130℃)								
OPERATING TEMPERATURE			℃	0 ~ 55								

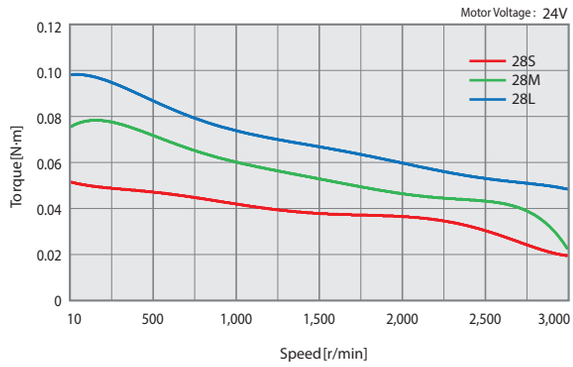
MODEL				BM-56 series			BM-60 series		
			UNIT	56S	56M	56L	60S	60M	60L
DRIVE METHOD			–	Bipolar					
NUMBER OF PHASES			–	2 Phase					
CURRENT per PHASE			A/Phase	3.0	3.0	3.0	4.0	4.0	4.0
MAXIMUM HOLDING TORQUE			N·m	0.64	1.0	1.5	0.88	1.28	2.4
ROTOR INERTIA			$g \cdot cm^2$	180	280	520	240	490	690
WEIGHTS			kg	0.548	0.726	1.159	0.616	0.793	1.349
LENGTH(L)			mm	46	55	80	47	56	85
PERMISSIBLE RADIAL LOAD	DIS-TANCE FROM END OF SHAFT	3mm	N	52	52	52	70	70	70
		8mm		65	65	65	87	87	87
		13mm		85	85	85	114	114	114
		18mm		123	123	123	165	165	165
PERMISSIBLE AXIAL LOAD			N	Lower than Unit's Weight					
INSULATION RESISTANCE			MΩ	Min. 100(When measured with a DC500V insulation resistance meter)					
INSULATION CLASS			–	CLASS B(130℃)					
OPERATING TEMPERATURE			℃	0 ~ 55					

Torque Characteristics of Motor

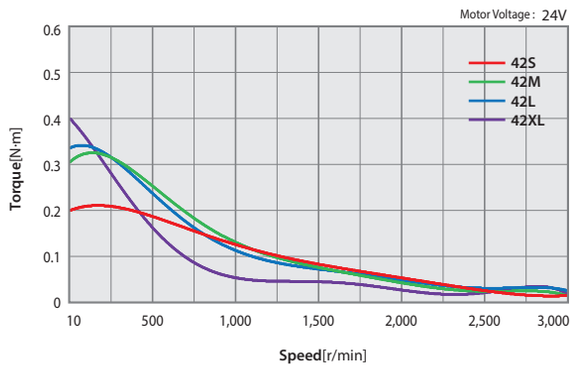
Ezi-STEP II-EC-MI-20 series



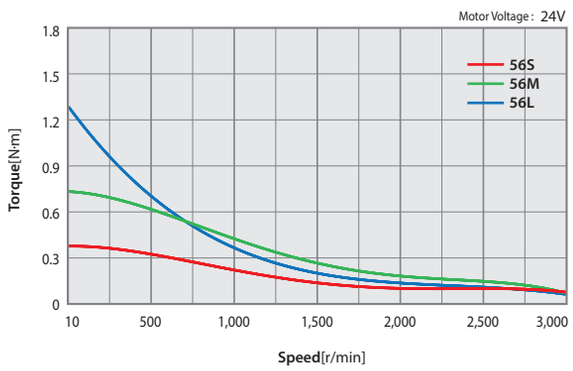
Ezi-STEP II-EC-MI-28 series



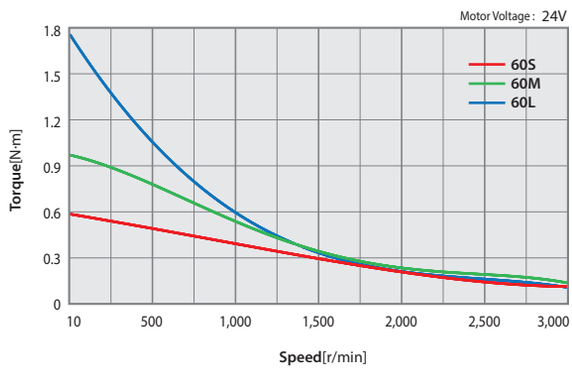
Ezi-STEP II-EC-MI-42 series



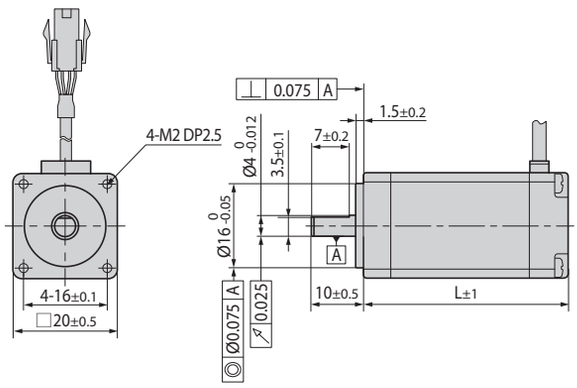
Ezi-STEP II-EC-MI-56 series



Ezi-STEP II-EC-MI-60 series

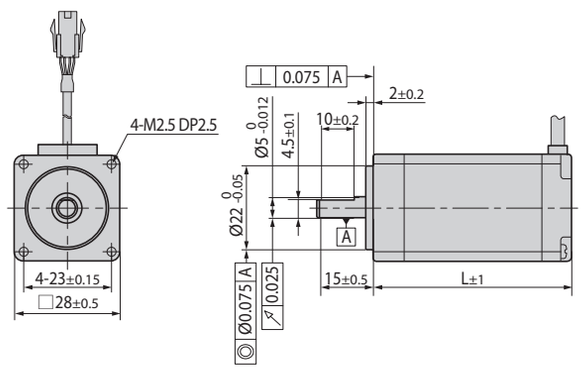


● Dimensions of Motor [mm]



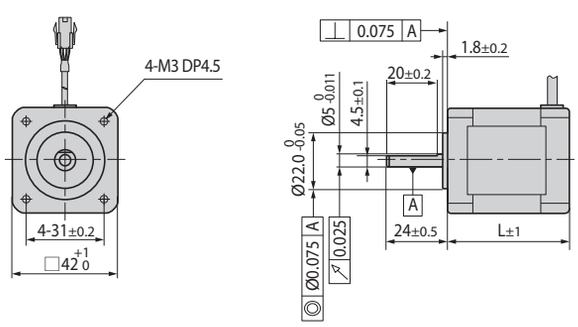
20mm

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



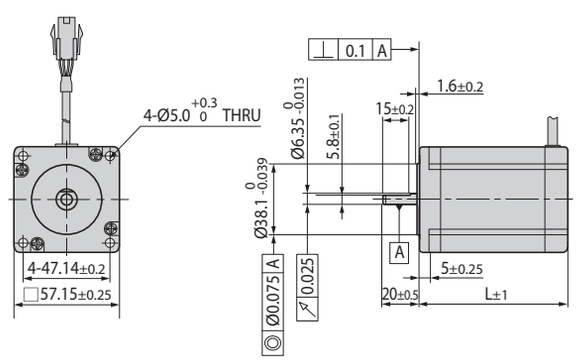
28mm

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



42mm

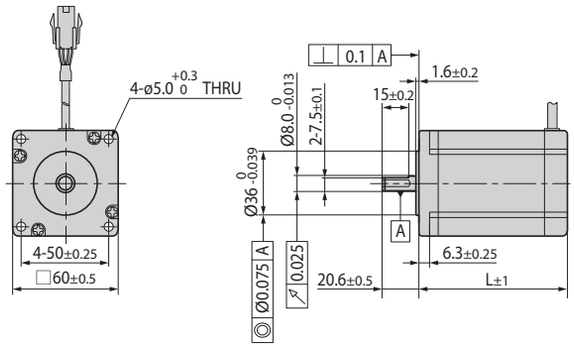
Model name	Length(L)
BM-42S	34
BM-42M	40
BM-42L	48
BM-42XL	60



56mm

Model name	Length(L)
BM-56S	46
BM-56M	55
BM-56L	80

● Dimensions of Motor [mm]



60mm

Model name	Length(L)
BM-60S	47
BM-60M	56
BM-60L	85

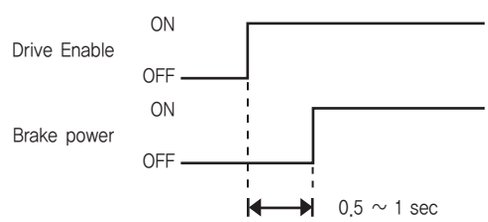
● Specifications of Motor with Brake

Unit Part Number	Motor Model Number	Electromagnetic Brake					Motor Unit Weight [kg]	Permissible Radial Load [N]				Permissible Axial Load [N]
		Type	Voltage Input [V]	Rated Current [A]	Power Consumption [W]	Static Friction Torque [N·m]		Distance from End of Shaft [mm]				
								3	8	13	18	
Ezi-STEP II-EC-MI-42S-BK	BM-42S-BK	Non-excitation run Type	DC24V ±10%	0.2	5	0.2	0.500	22	26	33	46	Must be Lower than Motor Unit Weight
Ezi-STEP II-EC-MI-42M-BK	BM-42M-BK						0.560					
Ezi-STEP II-EC-MI-42L-BK	BM-42L-BK						0.630					
Ezi-STEP II-EC-MI-42XL-BK	BM-42XL-BK						0.770					
Ezi-STEP II-EC-MI-56S-BK	BM-56S-BK			0.27	6.6	0.7	0.970	52	65	85	123	
Ezi-STEP II-EC-MI-56M-BK	BM-56M-BK						1.150					
Ezi-STEP II-EC-MI-56L-BK	BM-56L-BK						1.580					
Ezi-STEP II-EC-MI-60S-BK	BM-60S-BK						1.060	70	87	114	165	
Ezi-STEP II-EC-MI-60M-BK	BM-60M-BK						1.230					
Ezi-STEP II-EC-MI-60L-BK	BM-60L-BK						1.790					

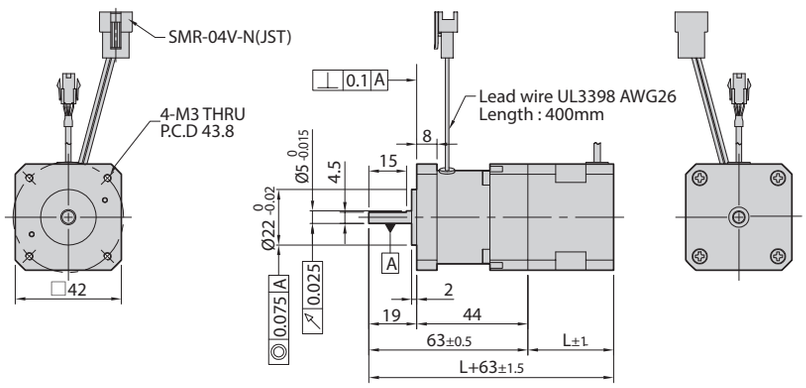
* Electronic Brake cannot be used for braking. Position hold purpose only when power OFF.
* The weight means Motor Unit Weight including Motor and Electronic Brake.
* Motor Model Number is combined model name of Motor and Brake.
* Motor specification and torque characteristic are same as Standard Motor.

* Brake Operation Timing Chart

Ezi-STEP II EtherCAT MINI controls Brake by Drive automatically.
Please refer to below Timing Chart when Brake is controlled by the upper controller other than using Ezi-STEP II EtherCAT MINI Brake control.
Otherwise, Drive might malfunction and loads might fall down.
Also, please do not operate Brake during motor operation to prevent damage.

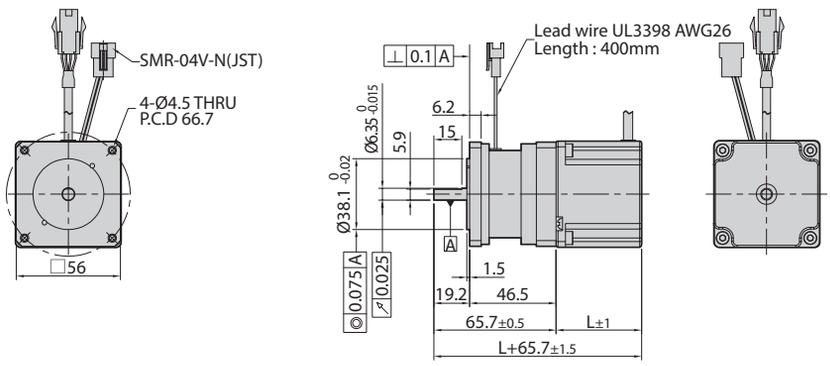


● Dimensions of Motor with Brake [mm]



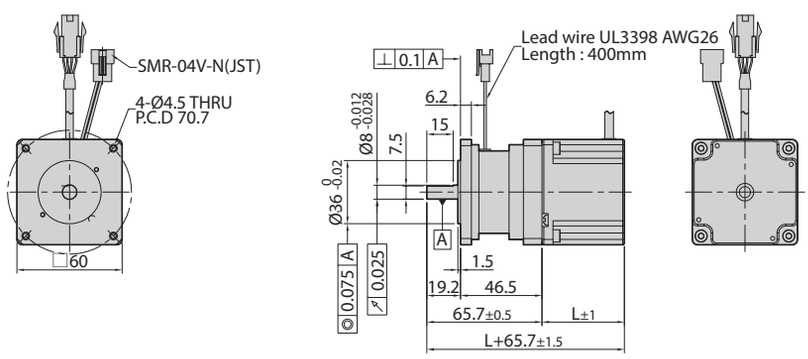
42mm

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



56mm

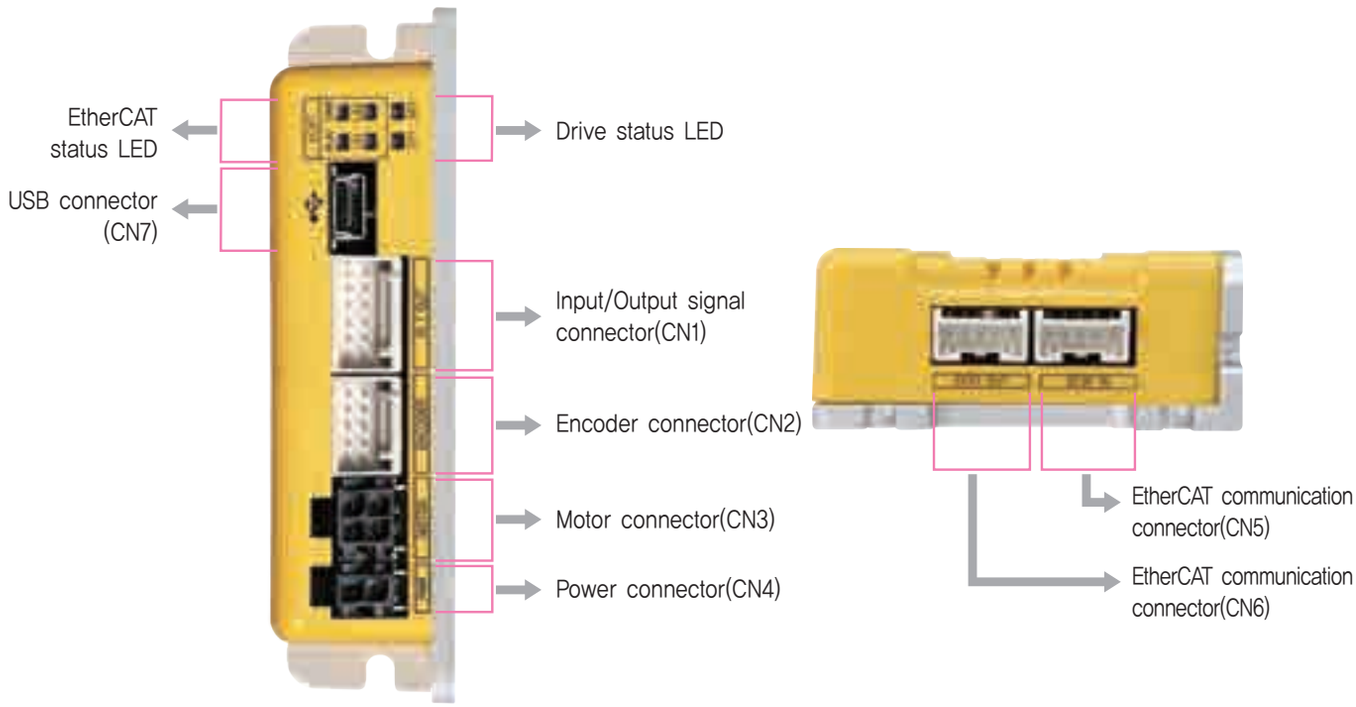
Model name	Length(L)
BM-56S	46
BM-56M	55
BM-56L	80



60mm

Model name	Length(L)
BM-60S	47
BM-60M	56
BM-60L	85

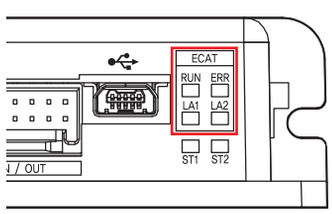
● Settings and Operation



1. EtherCAT Status LED

LED indicates communication status of EtherCAT.

Name	Color	Status	Description
RUN	Green	OFF	State INIT or Power OFF
		Blinking	State PRE-OPERATIONAL
		Single Flash	State SAFE-OPERATIONAL
		ON	State OPERATIONAL
		Flickering	State BOOTSTRAP



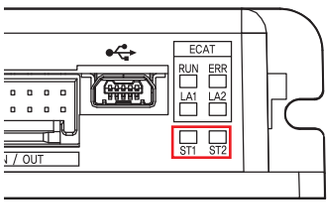
Name	Color	Status	Description
ERR	Red	OFF	No Error or Power OFF
		Blinking	Invalid Configuration
		Single Flash	Local Error
		Double Flash	Watchdog Time Out

Name	Color	Status	Description
LA1/ LA2	Green	OFF	Link not Established
		ON	Link Established
		Flickering	Link Established and in Operation

2. Drive Status LED

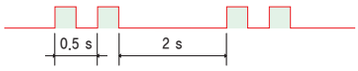
LED informs operation status of the drive.

LED Indication	LED Status	Explanation
ST1 : ▬ ▬ ▬ ▬ ST2 :	ST1 blinks, ST2 is OFF	STEP On
ST1 : ▬▬▬▬▬ ST2 :	ST1 is ON, ST2 is OFF	STEP Off
ST1 : ▬▬▬▬▬ ST2 : ▬▬▬▬▬	ST1 and ST2 are ON	In motion
ST1 : ST2 : ▬ ▬ ▬ ▬	ST1 is OFF, ST2 blinks repeatedly for a set number of times depending on the type of error.	Error



◆ List of error types by the number of ST2 LED blinking

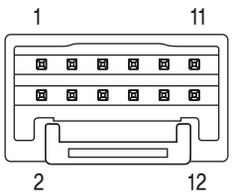
No.	Error Type	Causes
1	Over Current Error	The current through power devices in drive exceeds 4.8A
2	Over Speed Error	The motor speed exceeds 3,000r/min
5	Over Temperature Error	Internal temperature of the drive exceeds 85℃
6	Over Regenerative Voltage Error	Back-EMF is higher than 48V
7	Motor Connect Error	There is a problem with the connection between the drive and the motor
12	ROM Error	Error occurs in parameter storage device(ROM)



Alarm LED flash
(e.g., Over Speed Error)

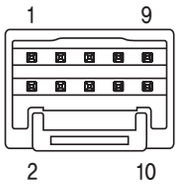
3. Input/Output Signal Connector (CN1)

No.	Function	I/O
1	EXT_DC24V	Input
2	EXT_GND	Input
3	BRAKE+	Output
4	BRAKE-	Output
5	LIMIT+	Input
6	LIMIT-	Input
7	ORIGIN	Input
8	Digital In1	Input
9	Digital In2	Input
10	Digital In3	Input
11	Digital Out1	Output
12	Digital Out2	Output



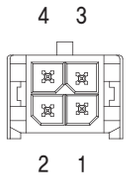
4. Encoder Connector (CN2)

No.	Function	I/O
1	A+	Input
2	A-	Input
3	B+	Input
4	B-	Input
5	Z+	Input
6	Z-	Input
7	DC5V	Output
8	GND	Output
9	F.GND	----
10	F.GND	----



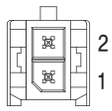
5. Motor Connector (CN3)

No.	Function	I/O
1	A Phase	Output
2	B Phase	Output
3	$\overline{A}$ Phase	Output
4	$\overline{B}$ Phase	Output



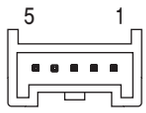
6. Power Connector (CN4)

No.	Function	I/O
1	DC24V	Input
2	GND	Input



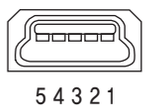
7. EtherCAT Communication Connector (CN5, CN6)

No.	Function
1	TD+
2	TD−
3	RD+
4	RD−
5	F.GND

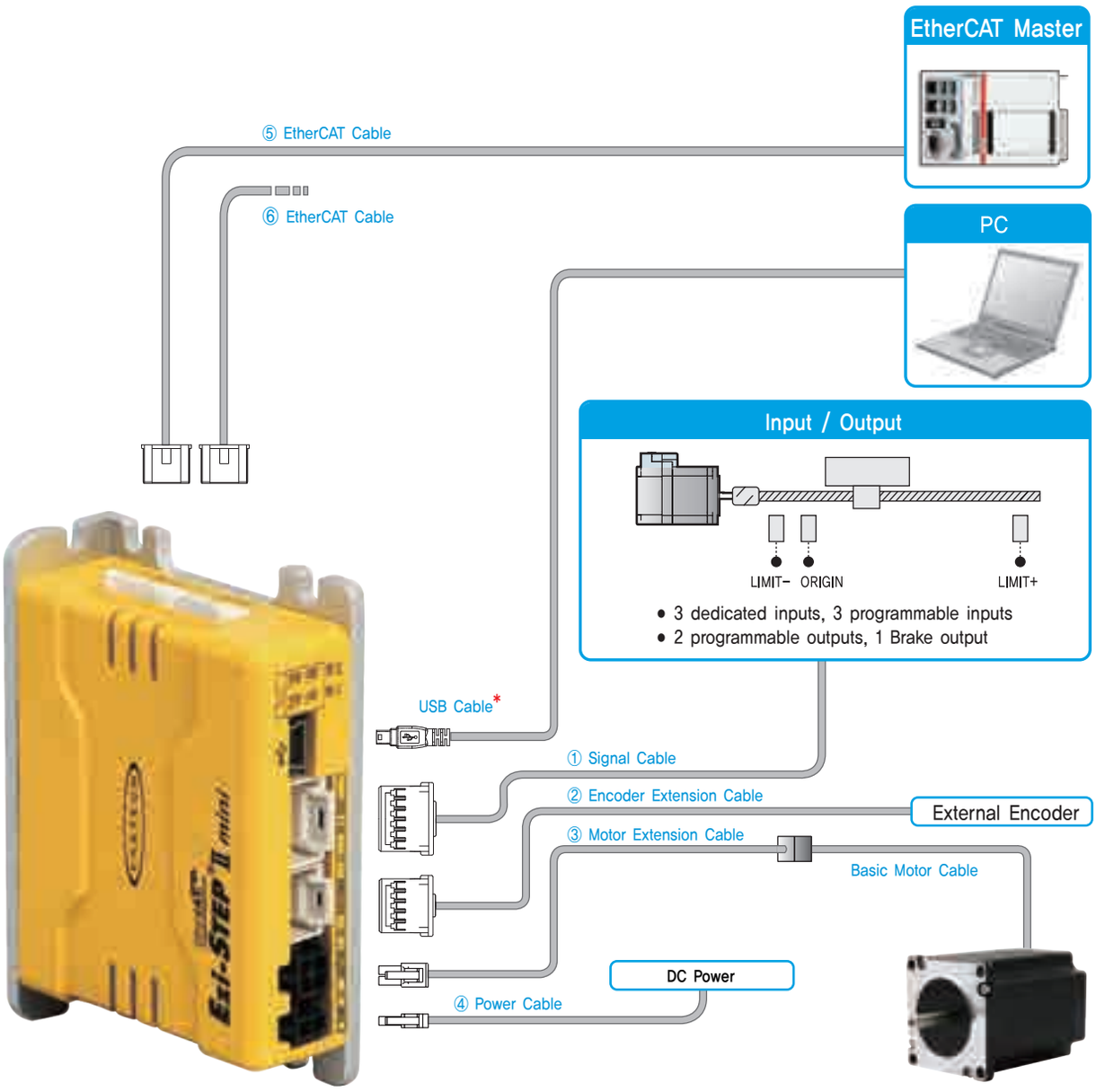


8. USB Connector (CN7)

No.	Function
1	V_{BUS}
2	D−
3	D+
4	−−−
5	GND



System Configuration



Cable Type	Max. Length	Remarks
① Signal Cable	20m	Options (Sold separately)
② Encoder Extension Cable	20m	
③ Motor Extension Cable	20m	
④ Power Cable	2m	
⑤/⑥ EtherCAT Cable	100m	
Basic Motora Cable	0.3m (Basic length)	Basic cables are attached to motors.
USB Cable	5m	* USB cables are not provided by FASTECH. We recommend using a standard USB cable (USB 2.0 Mini Type B).

1. Accessories

Connectors

These are connector specifications for drive cabling.

Purpose		Item	Part Number	Manufacturer
EtherCAT (CN5, CN6)		Housing	PAP-05V-S	JST
		Terminal	SPHD-001T-P0.5	
Power (CN4)		Housing	43025-0200	MOLEX
		Terminal	43030-0001	
Motor	Drive Side (CN3)	Housing	43025-0400	MOLEX
		Terminal	43030-0001	
	Motor Side	Housing	5557-04R	MOLEX
		Terminal	5556T	
Encoder	Drive Side (CN2)	Housing	501646-1000	MOLEX
		Terminal	501648-1000 (AWG 26~28)	
Signal (CN1)		Housing	501646-1200	MOLEX
		Terminal	501648-1000 (AWG 26~28)	

※ The connectors above are supplied with the product. If you are using other parts, please make sure they meet the specifications.

2. Options

① Signal Cable

These are the cables to connect Ezi-STEP II EtherCAT MINI drive and other input/output devices.

Purpose	Part Number	Length [m]	Cable Type	Remarks
Drive – I/O Device Connection	CSNR-S-001F	1	Normal Cable	Maximum Length: 20m
	CSNR-S-002F	2		
	CSNR-S-003F	3		
	CSNR-S-005F	5		
	CSNR-S-001M	1	Robot Cable	
	CSNR-S-002M	2		
	CSNR-S-003M	3		
	CSNR-S-005M	5		

* If you need cables with length(in units of 1m) not listed on the table, please contact FASTECH for more information.

② Encoder Extension Cable

These are the cables to connect Ezi-STEP II EtherCAT MINI drive and the encoder.

Purpose	Part Number	Length [m]	Cable Type	Remarks
Drive – External Encoder Connection	CTPM-E-001F	1	Normal Cable	Maximum Length: 20m
	CTPM-E-002F	2		
	CTPM-E-003F	3		
	CTPM-E-005F	5		
	CTPM-E-001M	1	Robot Cable	
	CTPM-E-002M	2		
	CTPM-E-003M	3		
	CTPM-E-005M	5		

* If you need cables with length(in units of 1m) not listed on the table, please contact FASTECH for more information.

③ Motor Extension Cable

These are the cables to connect Ezi-STEP II EtherCAT drive and the motor.

Purpose	Part Number	Length [m]	Cable Type	Remarks
Drive – Basic Motor Cable Connection	CSMI-M-001F	1	Normal Cable	Maximum Length: 20m
	CSMI-M-002F	2		
	CSMI-M-003F	3		
	CSMI-M-005F	5		
	CSMI-M-001M	1	Robot Cable	
	CSMI-M-002M	2		
	CSMI-M-003M	3		
	CSMI-M-005M	5		

* If you need cables with length(in units of 1m) not listed on the table, please contact FASTECH for more information.

④ Drive Power Cable

These are the cables to connect Ezi-STEP II EtherCAT drive and the power.

Purpose	Part Number	Length [m]	Cable Type	Remarks
Drive – Power Connection	CSMI-P-001F	1	Normal Cable	Maximum Length: 2m
	CSMI-P-002F	2		
	CSMI-P-001M	1	Robot Cable	
	CSMI-P-002M	2		

⑤ EtherCAT Cable (5 pin connector – RJ45)

These are the cables to connect Ezi-STEP II EtherCAT MINI drive and Ezi-STEP II EtherCAT with EtherCAT network.

Purpose	Part Number	Length [m]	Remarks
EtherCAT Connection	CGNE-EC-001F	1	· STP(Shielded Twisted Pair) Cable · Category 5e or higher · Maximum Length: 100m · Normal Cable
	CGNE-EC-002F	2	
	CGNE-EC-003F	3	
	CGNE-EC-005F	5	

* If you need cables with length(in units of 1m) not listed on the table, please contact FASTECH for more information.

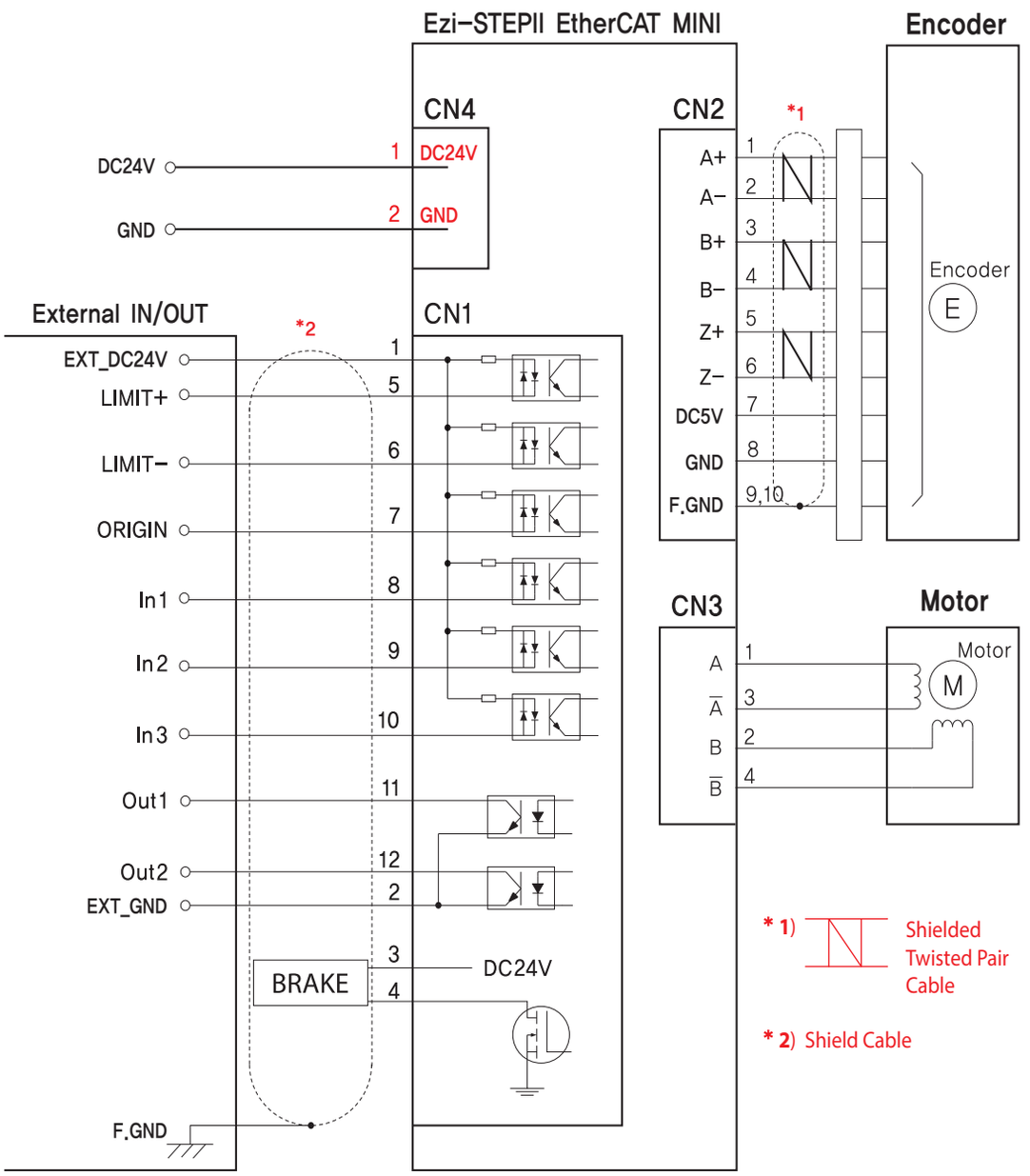
⑥ EtherCAT Cable (5 pin connector – 5 pin connector)

These are the cables to connect between Ezi-STEP II EtherCAT MINI drives with EtherCAT network.

Purpose	Part Number	Length [m]	Remarks
EtherCAT Connection	CGNI-EC-001F	1	· STP(Shielded Twisted Pair) Cable · Category 5e or higher · Maximum Length: 100m · Normal Cable
	CGNI-EC-002F	2	
	CGNI-EC-003F	3	
	CGNI-EC-005F	5	

* If you need cables with length(in units of 1m) not listed on the table, please contact FASTECH for more information.

● External Wiring Diagram



※ When connects I/O cable between controller and drive, please turn off the power of both controller and drive to prevent electric shock or to protect the drive from any damage.

CAUTION

In order to use the products listed in this catalog safely and correctly, be sure to read the instruction manual before using the product.

MEMO

FASTECH

Fast, Accurate, Smooth Motion

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