Electric Actuator

PISCO

Hi STEP

Pulse

EtherCAT

Ethernet

CC-Link

Closed Loop System

PISCO KOREA PNEUMATIC

2D / 3D Download

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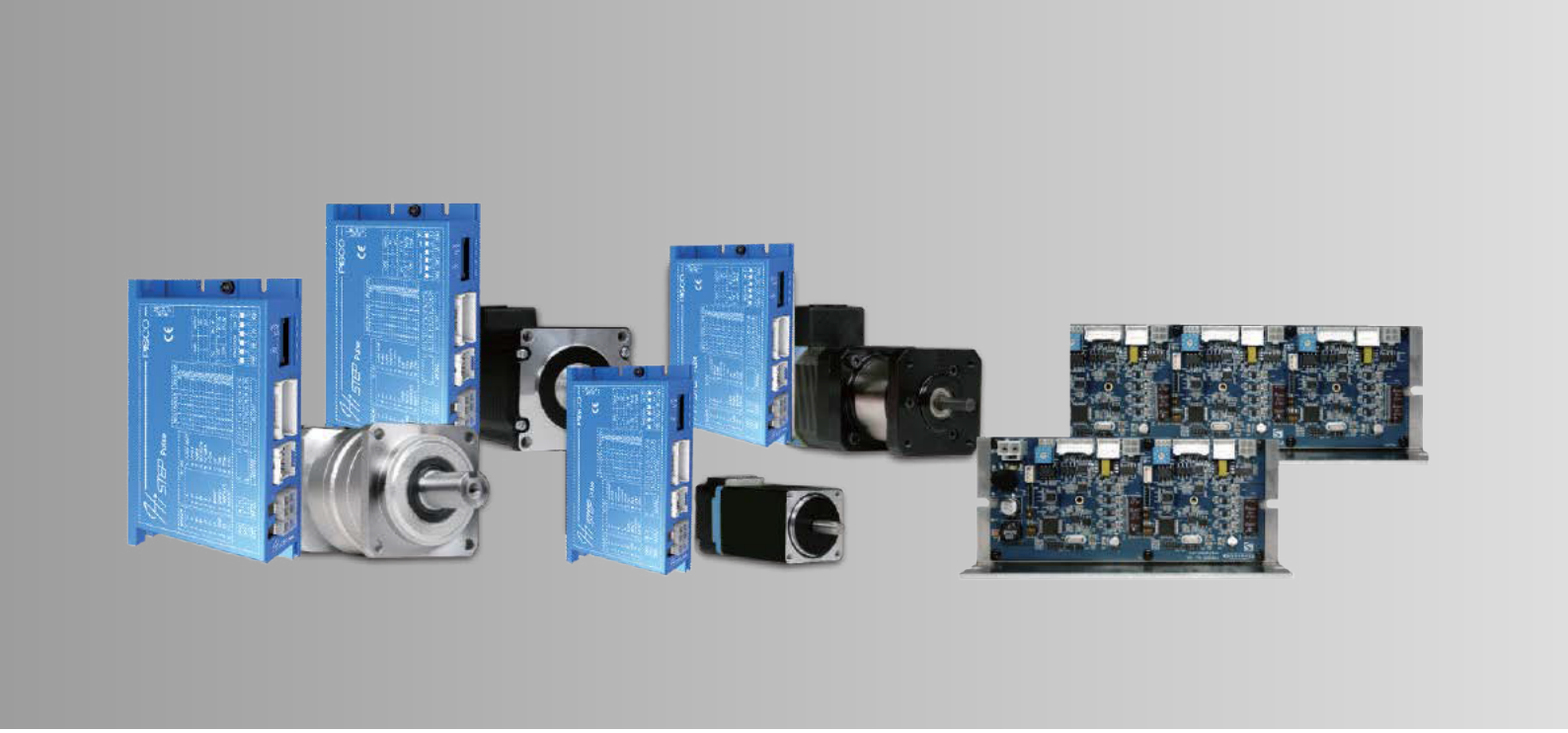
Hi STEP Pulse

Stepping motor control system without step out

PISCO

For more information
Please scan

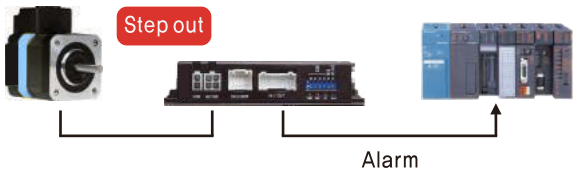
- Completely free from the Concern of Loss of Position
  (Alam Generation when Step-Out)
- Perfect Positioning and Completion
  (Positioning Completion Signal Generation)
- Don’t Care what the Phase of Motor is
  (Position Accuracy only Related to Encoder Resolution)
- Reduce the Motor Temperature and Energy Usage
  (Current Control According to load)
- Torque imporvenment by Run Current Control
  (Max. 150% Current Control)



1. No Step Out

(Alarm will be generated when step out)

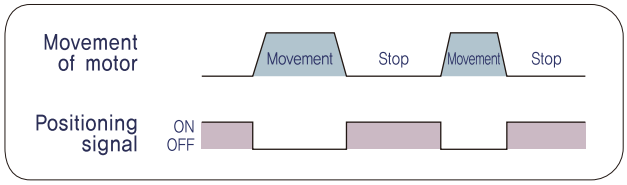
Because of mounted encoder constantly monitor the current position, step out cannot be occurred. If step out occurred by external force of overloads, alarm signal will be sent to upper controller. Thus, upper controller can recognize step out of step motor.



2. Perfect Positioning Completion Check

(Positioning completion signal will be generated)

When motor stops at the goal position, encoder detect it and send positioning completion signal to upper controller. Therefore Hi STEP resolve the problem of unclear positioning of current Open Loop System.



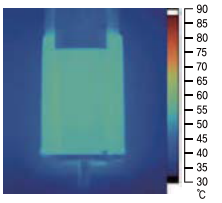
3. High Position Accuracy

Hi STEP controls position by using high precision of encoder. Regardless of motor type (2 Phase or 5 Phase), Hi STEP position precision is only related to mounted encoder resolution so high precision of positioning is possible unlike open loop micro step motor and driver which adapts 2 Phase or 5 Phase

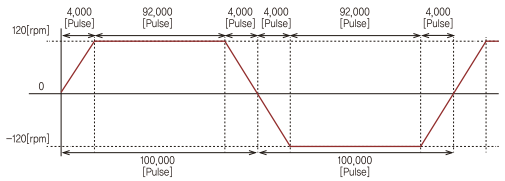
4. Heat Reduction / Energy Saving

(Motor Current Control according to load)

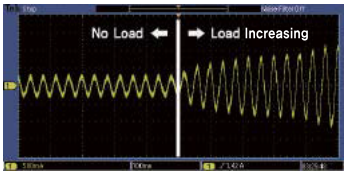
Hi STEP automatically controls motor current according to load. Hi STEP reduces motor current when motor load is low, and increases motor current when load is high. By optimizing the motor current, motor heat can be minimized and energy can be saved.



Motor temperature [Measured by Thermal Imaging Camera]



Condition to measure the motor temperature
[4hours operation, Motor surface temperature saturation]



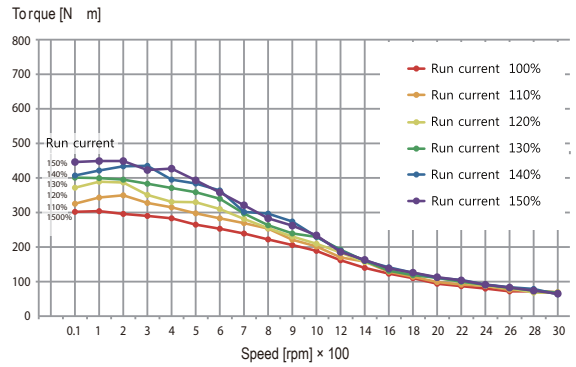
Example of the Motor Current Control according to load

5. Torque Improvement

(Motor Current Setting)

Hi STEP can increase the motor current up to 150% by setting the Run Current by parameter. Therefore, acceleration and deceleration characteristics and torque characteristics at low speed can be increased.

Hi STEP can improve the torque in the low speed range by about 30%.

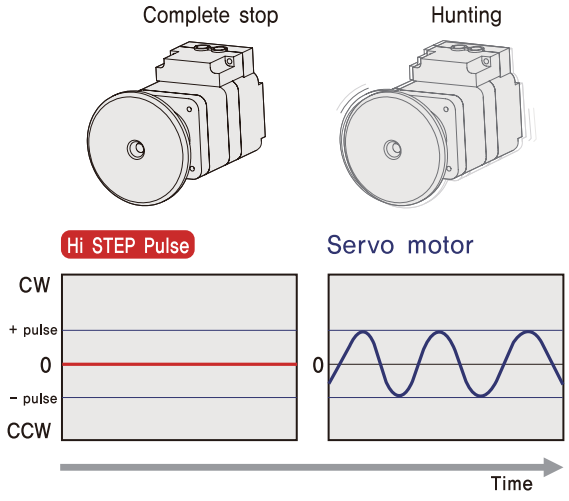


※ The torque at low speed is improved about 30%.

Measured Condition : Drive = HiSTEP-SST-42L
Motor Voltage = 24VDC
Input Voltage = 24VDC

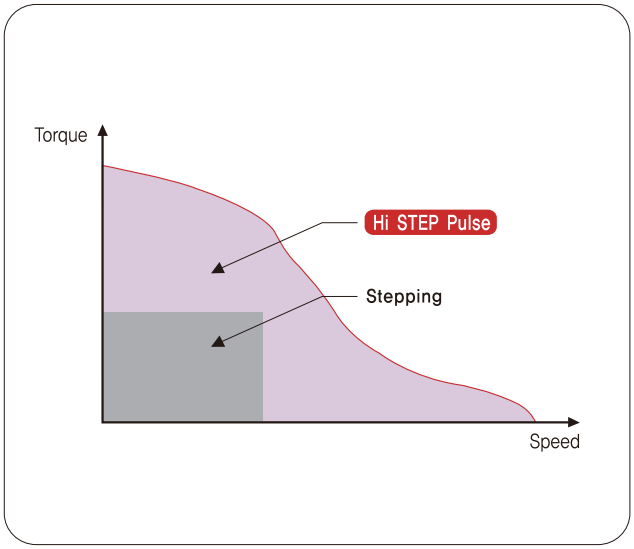
6. No Hunting

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 Hi STEP Motion Control System. Hi STEP 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.



7. High Torque

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



8. Variety of Protection Functions

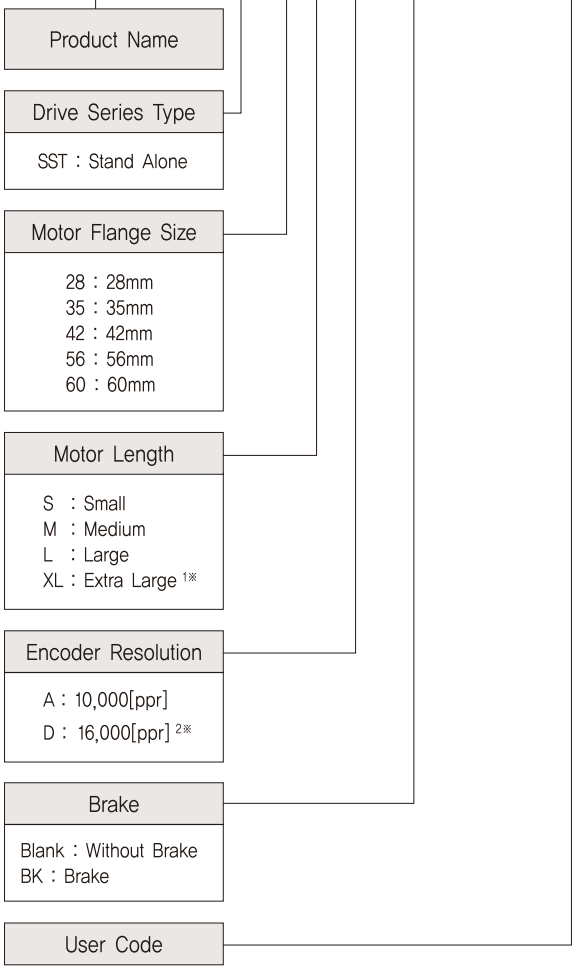
Drive and equipment can be protected by the alarm (11 kinds) of such as motor connection error, encoder connection error etc.

9. Variety of Position Command Unit

According to the purpose of usage, Hi STEP offer 16 stage (500~50,000P/R) of position command unit.

Hi STEP Pulse Part Numbering

Hi STEP -SST-56L-A-BK-PN05-□



1※ : Moter length XL only 42mm size

2※ : Encoder Resolution 16,000[ppr] only respond 28mm size

Standard Combination

■ Hi STEP Pulse series

Unit Part Number	Motor Model Number	Drive Model Number
HiSTEP-SST-28S-D	Hi-SM-28S-D	Hi-SD-P-28S-D
HiSTEP-SST-28M-D	Hi-SM-28M-D	Hi-SD-P-28M-D
HiSTEP-SST-28L-D	Hi-SM-28L-D	Hi-SD-P-28L-D
HiSTEP-SST-35M-A	Hi-SM-35M-A	Hi-SD-P-35M-A
HiSTEP-SST-35L-A	Hi-SM-35L-A	Hi-SD-P-35L-A
HiSTEP-SST-42S-A	Hi-SM-42S-A	Hi-SD-P-42S-A
HiSTEP-SST-42M-A	Hi-SM-42M-A	Hi-SD-P-42M-A
HiSTEP-SST-42XL-A	Hi-SM-42XL-A	Hi-SD-P-42XL-A
HiSTEP-SST-56S-A	Hi-SM-56S-A	Hi-SD-P-56S-A
HiSTEP-SST-56M-A	Hi-SM-56M-A	Hi-SD-P-56M-A
HiSTEP-SST-56L-A	Hi-SM-56L-A	Hi-SD-P-56L-A
HiSTEP-SST-60S-A	Hi-SM-60S-A	Hi-SD-P-60S-A
HiSTEP-SST-60M-A	Hi-SM-60M-A	Hi-SD-P-60M-A
HiSTEP-SST-60L-A	Hi-SM-60L-A	Hi-SD-P-60L-A

Combination with Brake

■ Hi STEP Pulse series

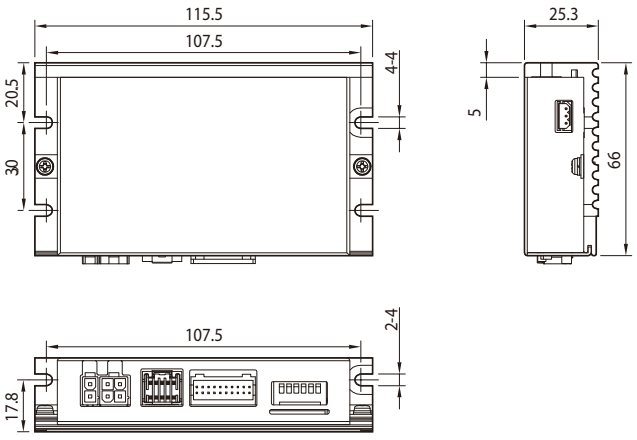
Unit Part Number	Motor Model Number	Drive Model Number
HiSTEP-SST-42S-A-BK	Hi-SM-42S-A-BK	Hi-SD-P-42S-A
HiSTEP-SST-42M-A-BK	Hi-SM-42M-A-BK	Hi-SD-P-42M-A
HiSTEP-SST-42XL-A-BK	Hi-SM-42XL-A-BK	Hi-SD-P-42XL-A
HiSTEP-SST-56S-A-BK	Hi-SM-56S-A-BK	Hi-SD-P-56S-A
HiSTEP-SST-56M-A-BK	Hi-SM-56M-A-BK	Hi-SD-P-56M-A
HiSTEP-SST-56L-A-BK	Hi-SM-56L-A-BK	Hi-SD-P-56L-A
HiSTEP-SST-60S-A-BK	Hi-SM-60S-A-BK	Hi-SD-P-60S-A
HiSTEP-SST-60M-A-BK	Hi-SM-60M-A-BK	Hi-SD-P-60M-A
HiSTEP-SST-60L-A-BK	Hi-SM-60L-A-BK	Hi-SD-P-60L-A

Specifications of Drive [HiSTEP Pulse]

Motor Model		Hi-SM-28 series	Hi-SM-35 series	Hi-SM-42 series	Hi-SM-56 series	Hi-SM-60 series
Driver Model		Hi-SD-P-28 series	Hi-SD-P-35 series	Hi-SD-P-42 series	Hi-SD-P-56 series	Hi-SD-P-60 series
Input Voltage		24VDC ±10%				
Control Method		Closed loop control with 32bit ARM				
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 *2	Rotation Speed	0~3,000 [rpm] *1				
	Resolution [ppr] *4	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				
	Maximum Frequency	500kHz (Duty 50%)				
	Protection Functions	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, In-Position Error, ROM Error, Position Overflow Error				
	LED Display	Power status, In-Position status, Enable status, Alarm status				
	RUN Current *5	50%~150% (Selectable by parameter) RUN current is current value which flows onto the motor during operation (rotation) of the motor and it is set based on rated current of the motor. * Default: 100%				
	STOP Current	20%~100% (Selectable by parameter) When motor stop operation, 0.1 second after motor current will be set to STOP current value. STOP current value is a percentage of the rated current of motor. * Default: 50%				
	Pulse Input Method	1 Pulse / 2 Pulse (Selectable by DIP Switch) * Default: 2 Pulse				
	Rotational Direction	CW/CCW (Selectable by DIP Switch) * Default: CW				
	Speed/Position Control Command	Pulse Train Input				
I/O Signal *3	Input Signals	Position Command Pulse, Enable, Alarm Reset (Photocoupler Input)				
	Output Signals	In-Position, Alarm (Photocoupler Output), Brake				

*1 : Up to the resolution of 10,000[ppr], maximum speed can be reached by 3,000[rpm] and with the resolution more than 10,000[ppr], maximum speed shall be reduced accordingly.
*2 : Please refer to 「Settings and Operating」 to obtain detailed function information.
*3 : Please refer to 「Control Input/Output Explanation」 to obtain detailed Input/Output signal information.
*4 : When selected resolution is more than encoder resolution, motor shall be operated by microstep between pulses.
*5 : For more detail information of RUN Current, please refer to the [Parameter Setting GUI] .

Dimensions of Drive [mm] [HiSTEP Pulse]



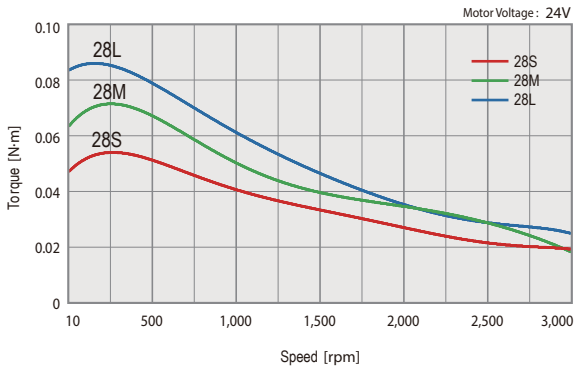
Specifications of Motor

MODEL			Hi-SM-28 series			Hi-SM-35 series	
		UNIT	28S	28M	28L	35M	35L
DRIVE METHOD		–	BI-POLAR				
NUMBER OF PHASES		–	2	2	2	2	2
VOLTAGE		VDC	3.75	4.55	6.2	3.8	2.7
CURRENT per PHASE		A	0.67	0.67	0.67	0.8	1.0
RESISTANCE per PHASE		Ohm	5.6	6.8	9.2	4.8	2.7
INDUCTANCE per PHASE		mH	4.2	4.9	5.7	4.0	4.3
HOLDING TORQUE		N·m	0.069	0.098	0.118	0.078	0.137
ROTOR INERTIA		$g \cdot cm^2$	9.0	13	18	10	14
WEIGHTS		g	110	140	200	120	180
LENGTH(L)		mm	32	45	50	26	36
PERMISSIBLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	30	30	30	22	22
	8mm		38	38	38	26	26
	13mm		53	53	53	33	33
	18mm		–	–	–	46	46
PERMISSIBLE THRUST LOAD		N	Lower than motor weight				
INSULATION RESISTANCE		Mohm	100 MIN.(at 500VDC)				
INSULATION CLASS		–	CLASS B(130℃)				
OPERATING TEMPERATURE		℃	0 to 55				

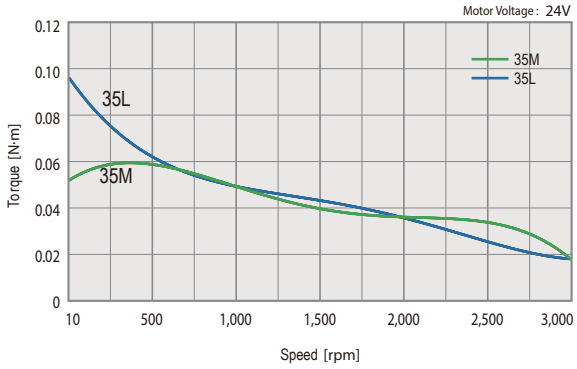
MODEL			Hi-SM-42 series				Hi-SM-56 series			Hi-SM-60 series		
		UNIT	42S	42M	42L	42XL	56S	56M	56L	60S	60M	60L
DRIVE METHOD		–	BI-POLAR									
NUMBER OF PHASES		–	2	2	2	2	2	2	2	2	2	2
VOLTAGE		VDC	2.8	2.8	2.8	7.2	1.96	2.52	3.16	1.32	1.48	2.2
CURRENT per PHASE		A	1.3	1.68	1.68	1.2	2.8	2.8	2.8	4.0	4.0	4.0
RESISTANCE per PHASE		Ohm	2.1	1.65	1.65	6.0	0.7	0.9	1.13	0.33	0.37	0.55
INDUCTANCE per PHASE		mH	2.5	3.2	2.8	15.6	1.4	2.5	3.6	0.75	1.1	2.7
HOLDING TORQUE		N·m	0.216	0.353	0.431	0.650	0.539	1.00	1.72	0.88	1.28	2.40
ROTOR INERTIA		$g \cdot cm^2$	35	54	68	114	120	300	480	240	490	690
WEIGHTS		g	220	280	350	500	470	700	1000	600	1000	1300
LENGTH(L)		mm	33	39	47	60	41	56	76	47	56	85
PERMISSIBLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	22	22	22	22	52	52	52	70	70	70
	8mm		26	26	26	26	65	65	65	87	87	87
	13mm		33	33	33	33	85	85	85	114	114	114
	18mm		46	46	46	46	123	123	123	165	165	165
PERMISSIBLE THRUST LOAD		N	Lower than motor weight									
INSULATION RESISTANCE		Mohm	100 MIN.(at 500VDC)									
INSULATION CLASS		–	CLASS B(130℃)									
OPERATING TEMPERATURE		℃	0 to 55									

Torque Characteristics of Motor

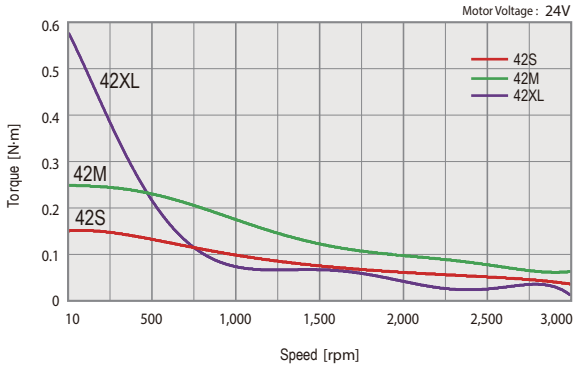
HiSTEP-SST-28series



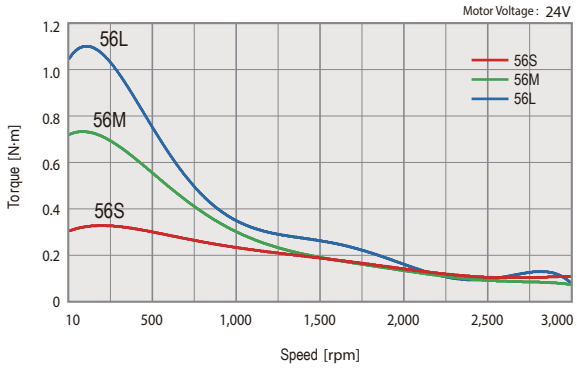
HiSTEP-SST-35series



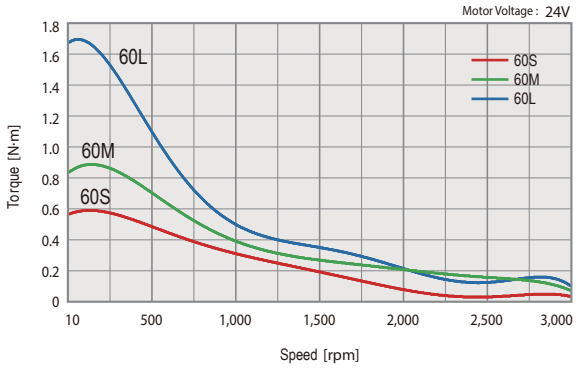
HiSTEP-SST-42series



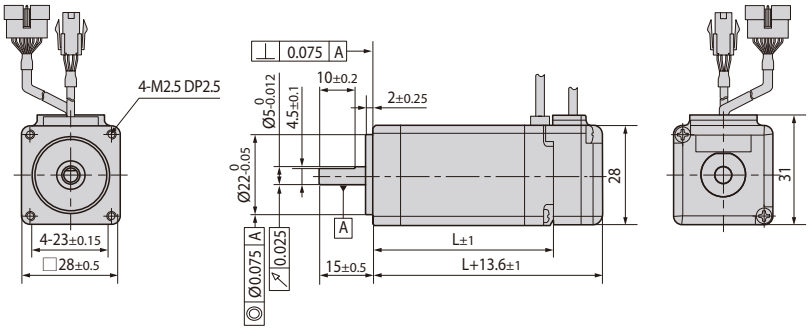
HiSTEP-SST-56series



HiSTEP-SST-60series

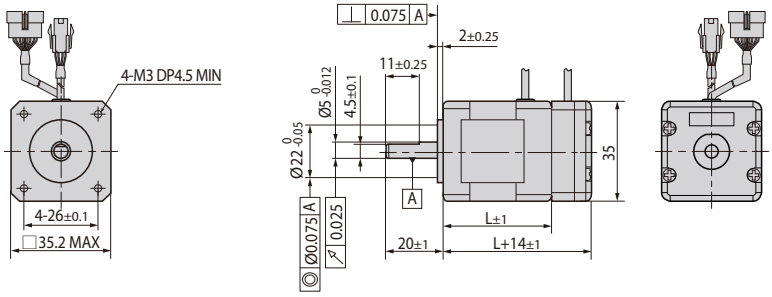


Dimensions of Motor [mm]



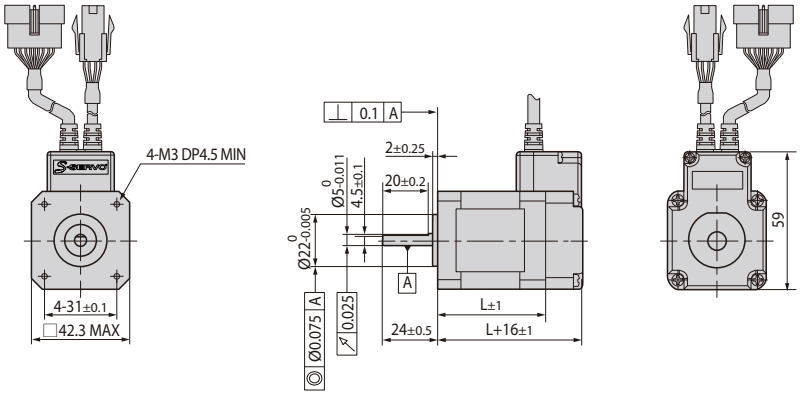
28mm

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



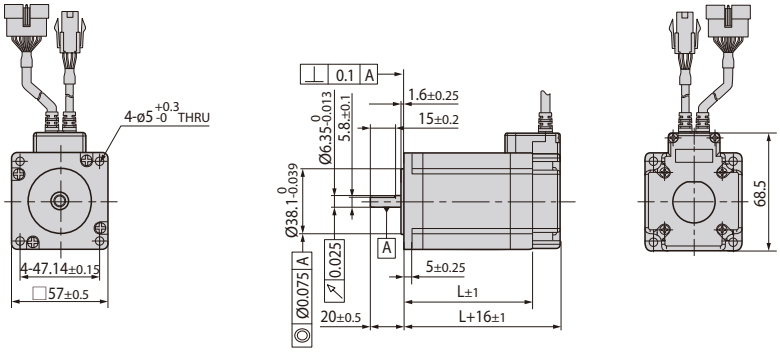
35mm

Model name	Length(L)
Hi-SM-35M	26
Hi-SM-35L	36



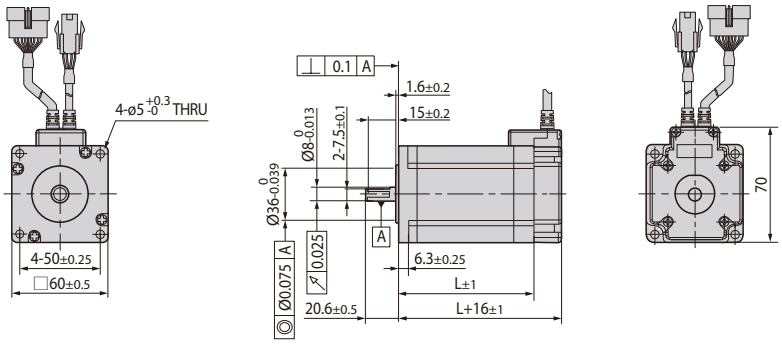
42mm

Model name	Length(L)
Hi-SM-42S	33
Hi-SM-42M	39
Hi-SM-42XL	60



56mm

Model name	Length(L)
Hi-SM-56S	41
Hi-SM-56M	56
Hi-SM-56L	76



60mm

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

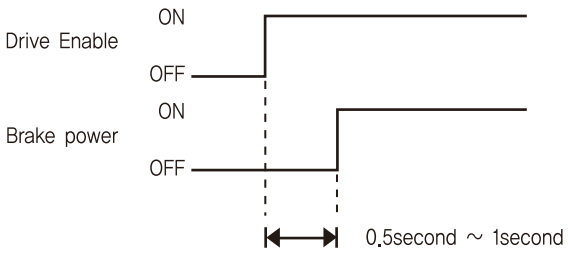
Specifications of Motor with Brake

Unit Part Number	Motor Model Number	Electronic Brake					Motor Unit Weight [g]	Permitted Overhung Load [N]				Permitted Thrust Load [N]
		Type	Voltage Input [V]	Rated Current [A]	Power Consumption [W]	Statical Friction Torque [N·m]		Length from Motor Point [mm]				
								3	8	13	18	
HiSTEP-SST-42S-■-BK	Hi-SM-42S-■-BK	Non-excitation run Type	24VDC ±10%	0.2	5	0.2	510	22	26	33	46	Must be Lower than Unit's Weight
HiSTEP-SST-42M-■-BK	Hi-SM-42M-■-BK						570					
HiSTEP-SST-42XL-■-BK	Hi-SM-42XL-■-BK						770					
HiSTEP-SST-56S-■-BK	Hi-SM-56S-■-BK			0.27	6.6	0.7	870	52	65	85	123	
HiSTEP-SST-56M-■-BK	Hi-SM-56M-■-BK						1190					
HiSTEP-SST-56L-■-BK	Hi-SM-56L-■-BK						1380					
HiSTEP-SST-60S-■-BK	Hi-SM-60S-■-BK						1150	70	87	114	165	
HiSTEP-SST-60M-■-BK	Hi-SM-60M-■-BK						1350					
HiSTEP-SST-60L-■-BK	Hi-SM-60L-■-BK						1960					

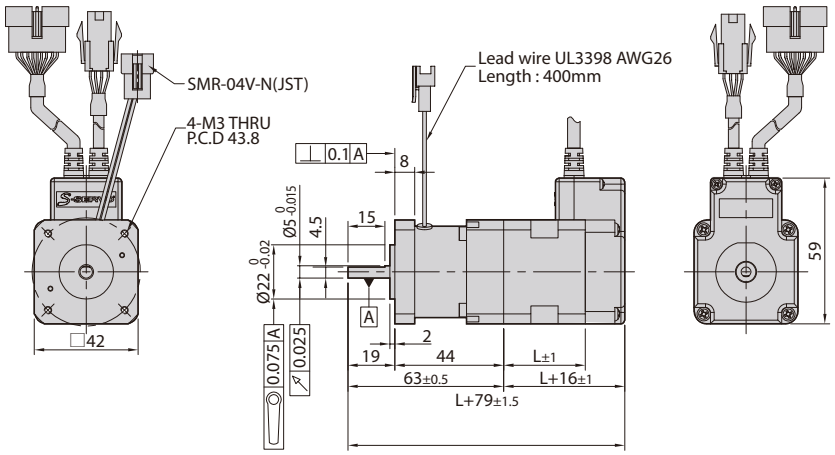
* The code of encoder resolution will be marked in "■"
* Electronic Brake cannot be used for braking. Position hold purpose only when power OFF.
* The weight means Motor Unit Weight including Motor and Electronic Brake.
* Motor Model Number is combined model name of Motor and Brake.
* Motor specification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

* Brake Operation Timing Chart

Hi STEP SST control Brake by Drive automatically.
Please refer to below Timing Chart when control Brake from upper controller other than using Hi STEP SST Brake control.
Otherwise, Drive malfunctioning and loads can be fall down.
Also, please do not operate Brake while motor operation to prevent damage.

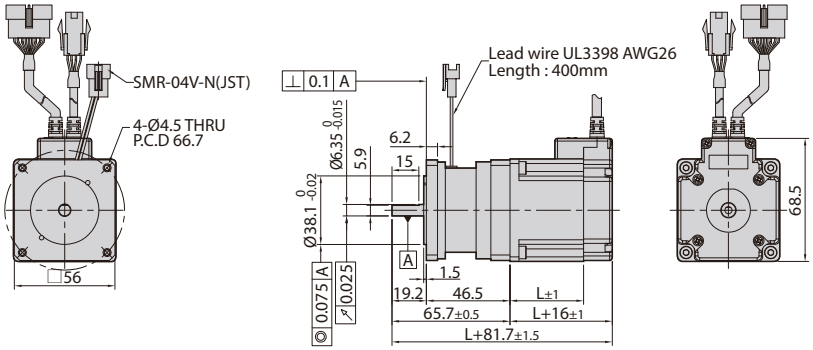


Dimensions of Motor with Brake [mm]



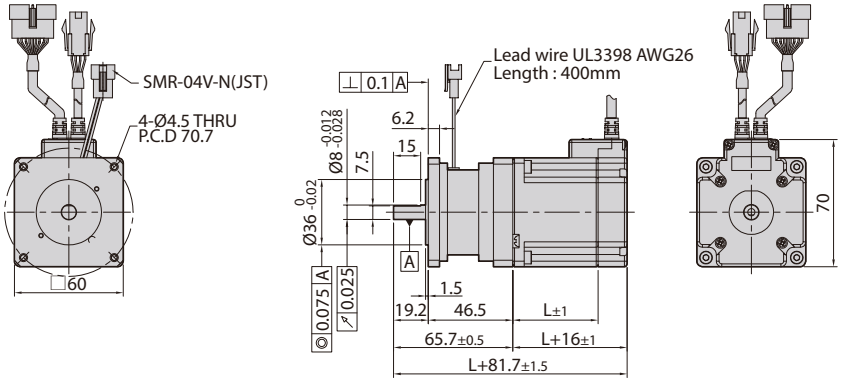
42mm

Model Name	Length(L)	Weight(kg)
Hi-SM-42S	33	0.51
Hi-SM-42M	39	0.57
Hi-SM-42XL	60	0.77



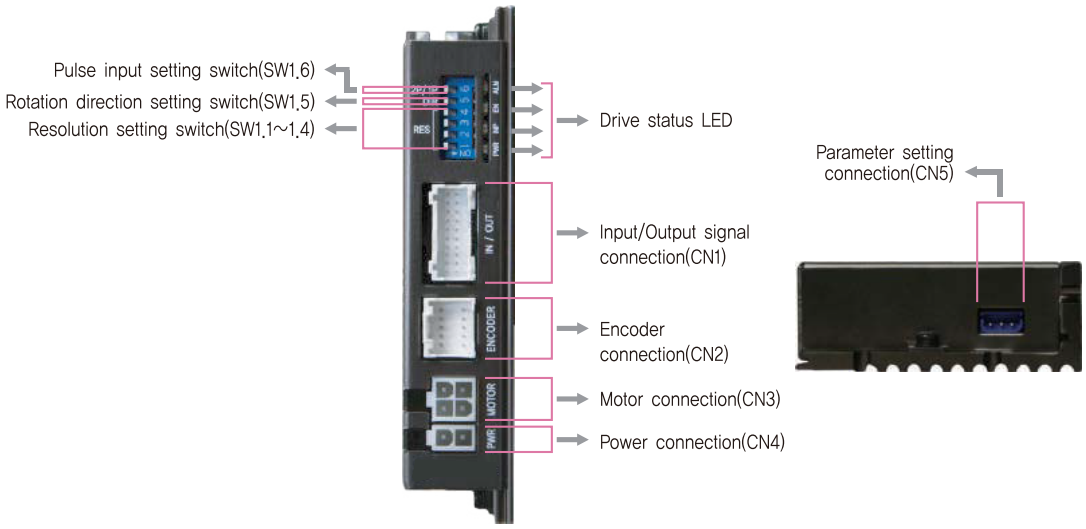
56mm

Model Name	Length(L)	Weight(kg)
Hi-SM-56S	41	0.87
Hi-SM-56M	56	1.19
Hi-SM-56L	76	1.38



60mm

Model Name	Length(L)	Weight(kg)
Hi-SM-60S	47	1.15
Hi-SM-60M	56	1.35
Hi-SM-60L	85	1.96



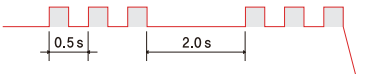
1. Drive Status LED

Indication	Color	Function	ON/OFF Condition
PWR	Green	Power input indication	LED is turned ON when power is applied
INP	Yellow	Complete Positioning Motion	Light on when Position Deviation located within preset value*1 from target position, after Position Command Pulse Input is completed
EN	Orange	Motor Enable Status	Enable: Lights On, Disable: Lights Off
ALM	Red	Alarm indication	Flash when protection function is activated (Identifiable which protection mode is activated by counting the blinking times)

*1 : Default = 0
Can be selected by parameter setting GUI

■ Protection functions and LED flash times

Times	Protection	Conditions
1	Over Current Error	The current through power devices in drive exceeds 4.8A
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℃
6	Over Regenerative Voltage Error	Back-EMF more than 48V
7	Motor Connect Error	The power is ON without connection of the motor cable to drive
8	Encoder Connect Error	Cable connection error in Encoder connection of drive
10	In-Position Error	After operation is finished, position error more than 1 pulse is continued for more than 3 seconds
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)

2. Resolution Setting Switch(SW1.1~SW1.4)

The Number of pulse per revolution.

Position				Pulse/Revolution	Position				Pulse/Revolution
1	2	3	4		1	2	3	4	
ON	ON	ON	ON	500	OFF	ON	ON	ON	6,400
ON	ON	ON	OFF	1,000	OFF	ON	ON	OFF	8,000
ON	ON	OFF	ON	1,600	OFF	ON	OFF	ON	10,000*1
ON	ON	OFF	OFF	2,000	OFF	ON	OFF	OFF	20,000
ON	OFF	ON	ON	3,200	OFF	OFF	ON	ON	25,000
ON	OFF	ON	OFF	3,600	OFF	OFF	ON	OFF	36,000
ON	OFF	OFF	ON	4,000	OFF	OFF	OFF	ON	40,000
ON	OFF	OFF	OFF	5,000	OFF	OFF	OFF	OFF	50,000

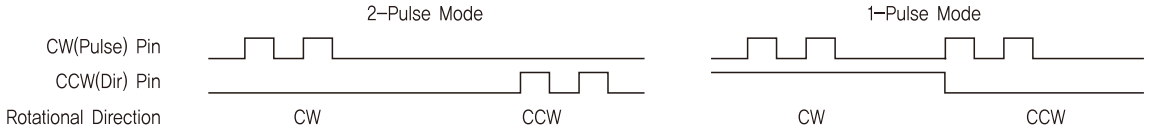
*1 : Default = 10,000

3. Rotational Direction Setting Switch(SW1.5)

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

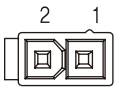
4. Pulse Input Setting Switch(SW1.6)

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



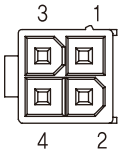
5. Power Connector(CN4)

NO.	Function	I/O
1	24VDC	Input
2	GND	Input



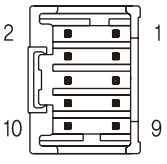
6. Motor Connector(CN3)

NO.	Function	I/O
1	A Phase	Output
2	B Phase	Output
3	/A Phase	Output
4	/B Phase	Output



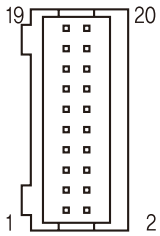
7. Encoder Connector(CN2)

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



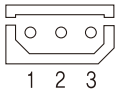
8. Input/Output Signal Connector(CN1)

NO.	Function	I/O
1	A−	Output
2	A+	Output
3	B−	Output
4	B+	Output
5	Z−	Output
6	Z+	Output
7	BRAKE−	Output
8	BRAKE+	Output
9	EXT_GND	Input
10	EXT_24VDC	Input
11	Alarm Reset	Input
12	Enable	Input
13	Alarm	Output
14	In−Position	Output
15	O.C Input	Input
16	S−GND	Output
17	CW−(Pulse−)	Input
18	CW+(Pulse+)	Input
19	CCW−(Dir−)	Input
20	CCW+(Dir+)	Input

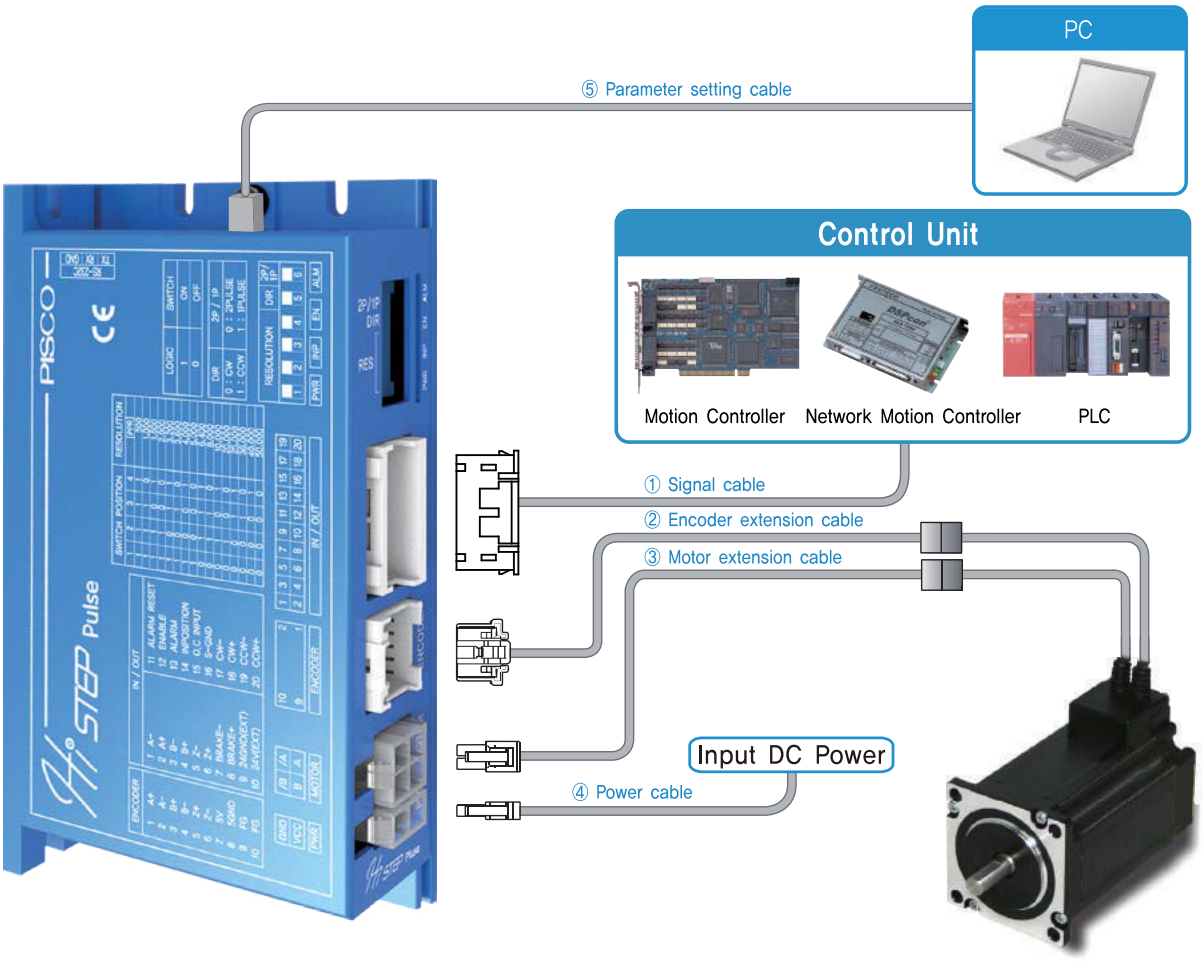


9. Parameter Setting Connector(CN5)

NO.	Function	I/O
1	Tx	Output
2	Rx	Input
3	GND	----



System Configuration [HiSTEP Pulse series]



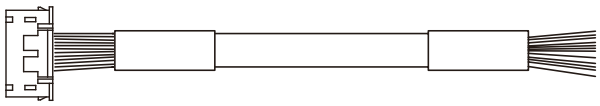
Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable	Parameter Setting Cable
Length supplied	–	30cm	30cm	–	–
Max. Length	20m	20m	20m	2m	3m

1. Options

① Signal Cable

Item	Length [m]	Remark
CSS2-S-□□□F	□□□	Normal Cable
CSS2-S-□□□M	□□□	Robot Cable

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

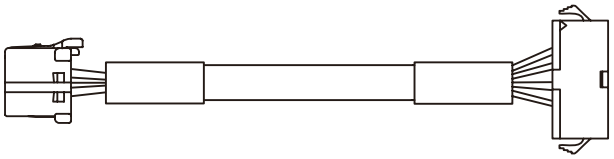


Manufacturer : JST
Housing : PADP-20V-1-S
Terminal : SPH-002T-P0.5L

② Encoder Extension Cable

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

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



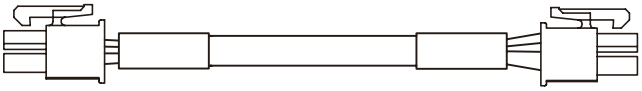
Manufacturer : MOLEX
Housing : 51353-1000
Terminal : 56134-9000

JST : Manufacturer
SMP-09V-NC : Housing
SHF-001T-0.8BS : Terminal

③ Motor Extension Cable

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

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



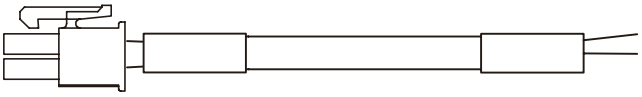
Manufacturer : MOLEX
Housing : 5557-04R
Terminal : 5556T

MOLEX : Manufacturer
5557-04R : Housing
5556T : Terminal

④ Power Cable

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

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

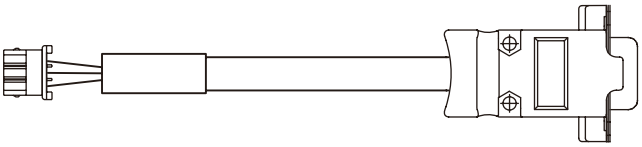


Manufacturer : MOLEX
Housing : 5557-02R
Terminal : 5556T

⑤ Parameter Setting Cable

Item	Length [m]	Remark
CBTS-C-□□□F	□□□	Normal Cable

□ is for Cable Length. The unit is 1m and Max. 3m length.



Manufacturer : MOLEX
Housing : 5264-03
Terminal : 5263

AMPHENOL : Manufacturer
L177SDE09S : Connector
17E-1657-09 : Backshell

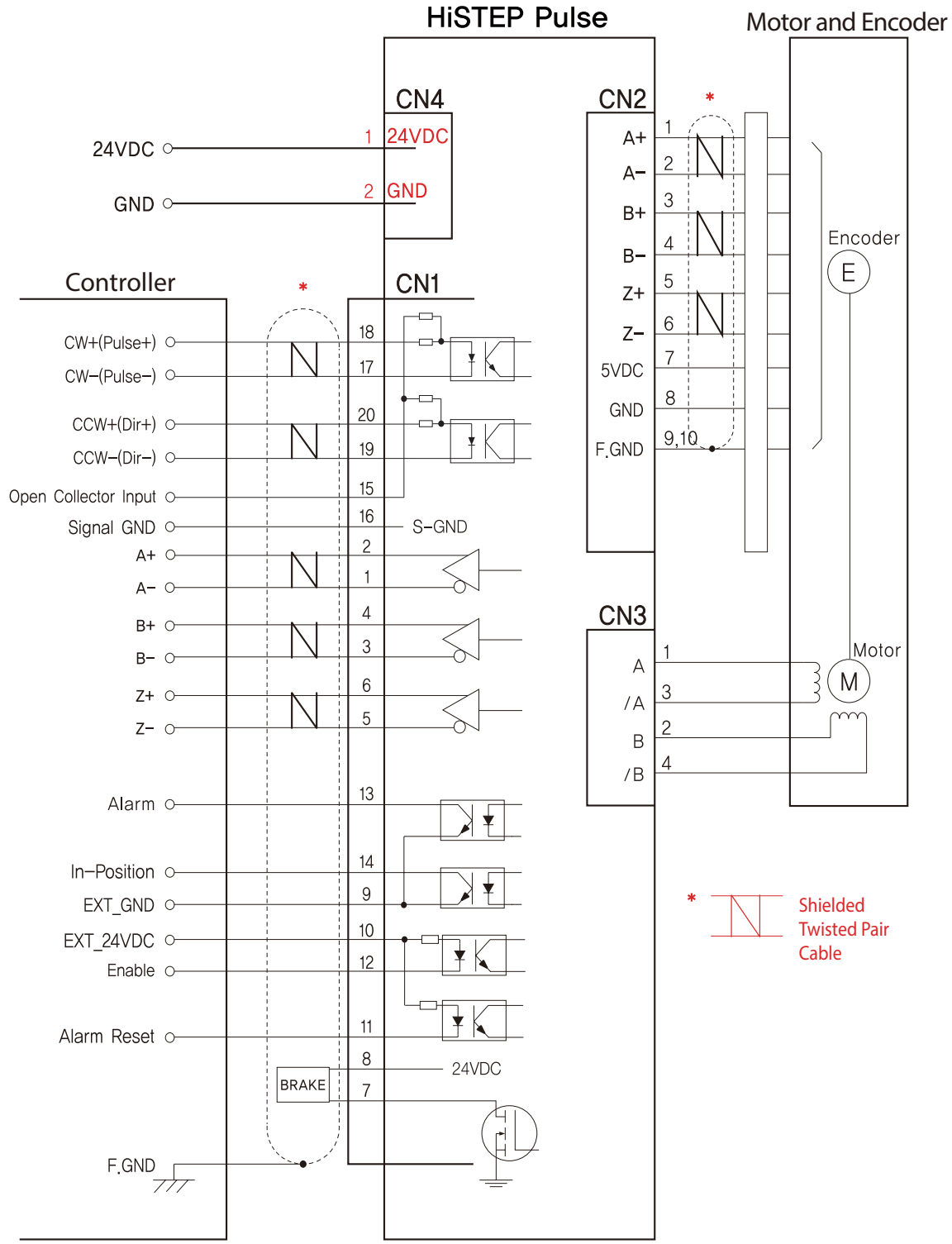
2. Connector Specifications

Connector specifications for cabling to drive.

Purpose		Item	Part Number	Manufacturer
I/O (CN1)		Housing Terminal	PAPD-20V-1S SPH-002T-P0.5L	JST
Encoder	Drive Side (CN2)	Housing Terminal	51353-1000 56134-9000	MOLEX
	Encoder Side	Housing Terminal	SMP-09V-NC SHF-001T-0.8BS	JST
Motor	Drive Side (CN3)	Housing Terminal	5557-04R 5556T	MOLEX
	Motor Side	Housing Terminal	5557-04R 5556T	MOLEX
Power (CN4)		Housing Terminal	5557-02R 5556T	MOLEX

※ Above connector is the most suitable product for the drive applied. Another equivalent connector can be used.

External Wiring Diagram [HiSTEP Pulse]



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

CAUTION

Please refer to the Manual when connects motor extension cable.

Careful connection will be required to protect the drive from any damages.

Hi STEP EtherCAT
closed loop stepping system

PISCO

For more information
Please scan

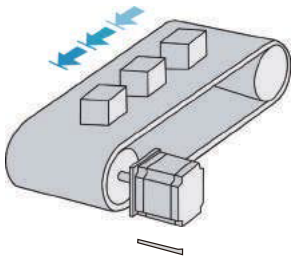
- CiA 402 Drive Profile Support
- Closed Loop System
- No Gain Tuning / No Hunting
- Heat Reduction / Torque Improvement
- High Resolution / Fast Response

1. EtherCAT Based Motion Control

Hi STEP EtherCAT is stepping motor control system using EtherCAT, high speed ethernet (100Mbps fullduplex) based fieldbus. Hi STEP EtherCAT is EtherCAT slave module which support CAN application layer over EtherCAT (CoE). CiA 402 Drive Profile implemented. Supported modes are Profile Position Mode, Homing Mode, Cyclic Synchronous Position Mode.

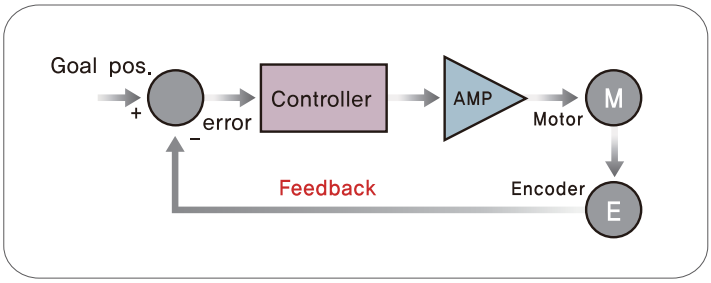
3. No Gain Tuning

To ensure machine performance, smoothness, positional error and low servo noise, Conventional servo systems require the adjustment of its servo' s gains as an initial crucial step. Even systems that employ auto-tuning require manual tuning after the system is installed, especially if more that one axis are interdependent. Hi STEP employs the best characteristics of stepper, closed loop motion controls and algorithms to eliminate the need of tedious gain tuning required for conventional closed loop servo systems. This means that Hi STEP is optimized for the application and ready to work right out of the box. The Hi STEP 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 II 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 additimal expensive and bulky gearbox. Hi STEP also performs exceptionally, even under heavy loads and high speeds.



2. Closed Loop System

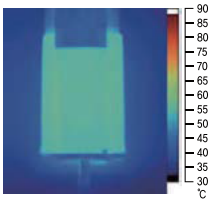
Hi STEP is an innovative closed loop stepping system that utilizes a high-resolution motor mounted encoder constantly to monitor the current position. The encoder feedback allows the Hi STEP to update the current position every 50 micro seconds. It allows the Hi STEP drive to compensate for the loss of position, ensuring accurate positioning. For example, due to a sudden load change, a conventional stepper motor and drive could lose a step but Hi STEP automatically correct the position by encoder feedback.



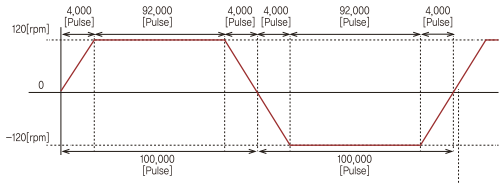
4. Heat Reduction / Energy Saving

(Motor Current Control according to load)

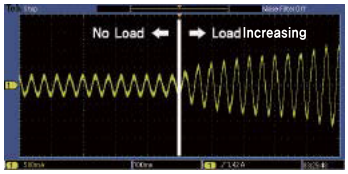
Hi STEP automatically controls motor current according to load. Hi STEP reduces motor current when motor load is low, and increases motor current when load is high. By optimizing the motor current, motor heat can be minimized and energy can be saved.



Motor temperature [Measured by Thermal Imaging Camera]



Condition to measure the motor temperature
[4hours operation, Motor surface temperature saturation]

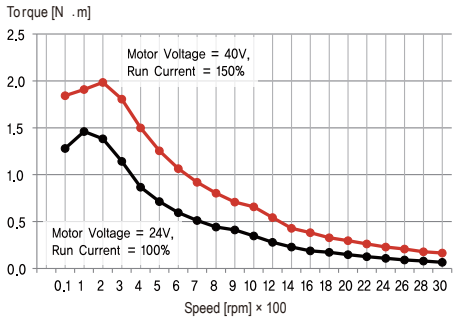


Example of the Motor Current Control according to load

5. Torque Improvement

(Motor Voltage Increasing and Motor Current Setting)

Hi STEP boosts the voltage supplied to the motor by internal DC-DC Converter. The torque at the high speed is increased. In addition, it is possible to set the Run Current up to 150%, whereby the torque at low speed is increased. Torque can be improved by about 30% over the entire speed range.

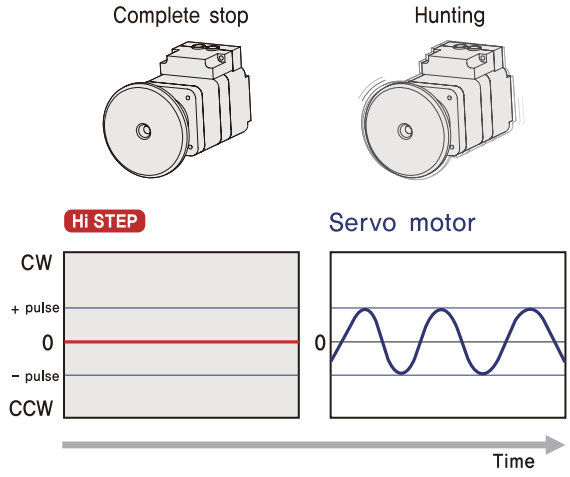


※ The torque at low speed and high speed is improved about 30%.

Measured Condition : Drive = Hi STEP-EEC-56L
Motor Voltage = 40VDC
Input Voltage = 24VDC

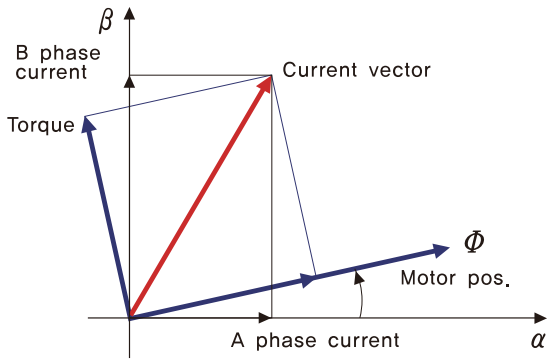
6. No Hunting

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 Hi STEP Motion Control System. Hi STEP 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.



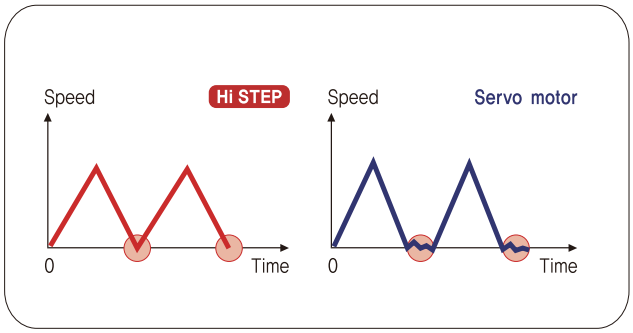
7. Smooth and Accurate

Hi STEP is a high-precision servo drive, using a high-resolution encoder with 20,000 pulses/revolution. Unlike a conventional Microstep drive, the on-board high perfo-rmance ARM (Advanced RISC Machine) performs vector control and filtering, producing a smooth rotational control with minimum ripples



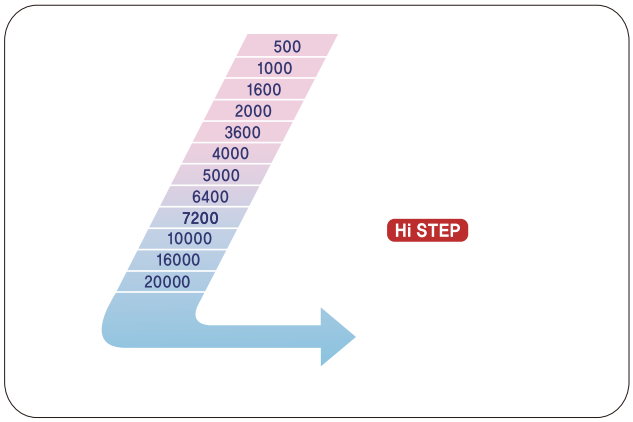
8. Fast Response

Similar to conventional stepping motors, Hi STEP instantly synchronizes with command pulses providing fast positional response. Hi STEP 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 called settling time between the command input signals and the resultant motion because of the constant monitoring of the current position.



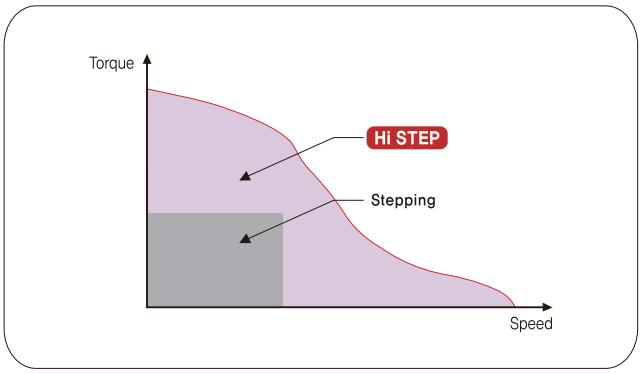
9. High Resolution

The unit of the position command can be divided precisely. (Max. 20,000 pulses/revolution)



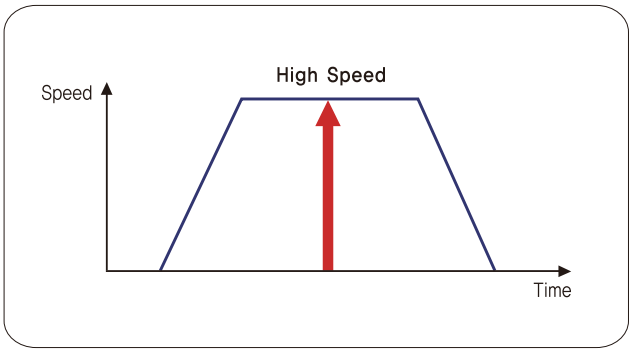
10. High Torque

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



11. High Speed

The Hi STEP operates well at high speed without the loss of synchronism or positioning error. Hi STEP' s ability of continuous current position monitoring of enables the stepping motor to generate high torque, even under a 100% load condition.



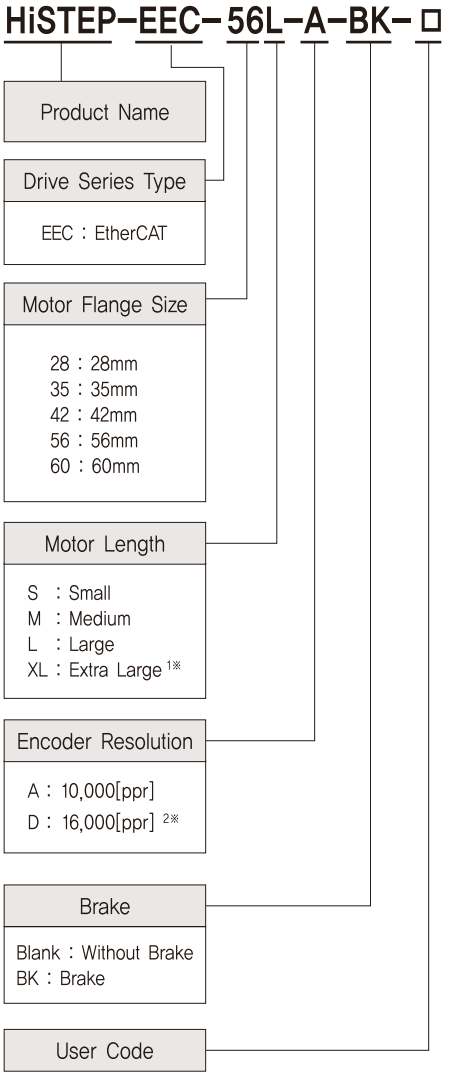
Advantages over Open-Loop Control Stepping Drive

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 external forces, such as mechanical vibration or vertical positional holding.
3. Hi STEP utilizes 100% of the full range of rated motor torque, contrary to a conventional open-loop stepping driver that can use up to 50% of the rated motor torque due to the loss of synchronism.
4. Capability to operate at high speed due to load-dependant current control, open-loop stepping drivers use a constant current control at all speed ranges without considering load varitions.

Advantages over Servo Motor Controller

1. No gain tuning. (Automatic gain adjustment in response to a load change)
2. Maintains the stable holding position without oscillation after completion of positioning.
3. Fast positioning due to the independent control by on-board ARM.
4. Continuous operation during rapid short-stroke movement due to instantaneous positioning.

Hi STEP EtherCAT Part Numbering



1※ : Moter length XL only 42mm size

2※ : Encoder Resolution 16,000[ppr] only respond 28mm size

Standard Combination

Unit Part Number	Motor Model Number	Drive Model Number
HiSTEP-ECC-28S-D	Hi-EM-28S-D	Hi-ED-EC-28S-D
HiSTEP-ECC-28M-D	Hi-EM-28M-D	Hi-ED-EC-28M-D
HiSTEP-ECC-28L-D	Hi-EM-28L-D	Hi-ED-EC-28L-D
HiSTEP-ECC-35M-A	Hi-EM-35M-A	Hi-ED-EC-35M-A
HiSTEP-ECC-35M-A	Hi-EM-35M-A	Hi-ED-EC-35M-A
HiSTEP-ECC-42S-A	Hi-EM-42S-A	Hi-ED-EC-42S-A
HiSTEP-ECC-42M-A	Hi-EM-42M-A	Hi-ED-EC-42M-A
HiSTEP-ECC-42XL-A	Hi-EM-42XL-A	Hi-ED-EC-42XL-A
HiSTEP-ECC-56S-A	Hi-EM-56S-A	Hi-ED-EC-56S-A
HiSTEP-ECC-56M-A	Hi-EM-56M-A	Hi-ED-EC-56M-A
HiSTEP-ECC-56L-A	Hi-EM-56L-A	Hi-ED-EC-56L-A
HiSTEP-ECC-60S-A	Hi-EM-60S-A	Hi-ED-EC-60S-A
HiSTEP-ECC-60M-A	Hi-EM-60M-A	Hi-ED-EC-60M-A
HiSTEP-ECC-60L-A	Hi-EM-60L-A	Hi-ED-EC-60L-A

Combination with Brake

Unit Part Number	Motor Model Number	Drive Model Number
HiSTEP-EEC-42S-A-BK	Hi-EM-42S-A-BK	Hi-ED-EC-42S-A
HiSTEP-EEC-42M-A-BK	Hi-EM-42M-A-BK	Hi-ED-EC-42M-A
HiSTEP-EEC-42XL-A-BK	Hi-EM-42XL-A-BK	Hi-ED-EC-42XL-A
HiSTEP-EEC-56S-A-BK	Hi-EM-56S-A-BK	Hi-ED-EC-56S-A
HiSTEP-EEC-56M-A-BK	Hi-EM-56M-A-BK	Hi-ED-EC-56M-A
HiSTEP-EEC-56L-A-BK	Hi-EM-56L-A-BK	Hi-ED-EC-56L-A
HiSTEP-EEC-60S-A-BK	Hi-EM-60S-A-BK	Hi-ED-EC-60S-A
HiSTEP-EEC-60M-A-BK	Hi-EM-60M-A-BK	Hi-ED-EC-60M-A
HiSTEP-EEC-60L-A-BK	Hi-EM-60L-A-BK	Hi-ED-EC-60L-A

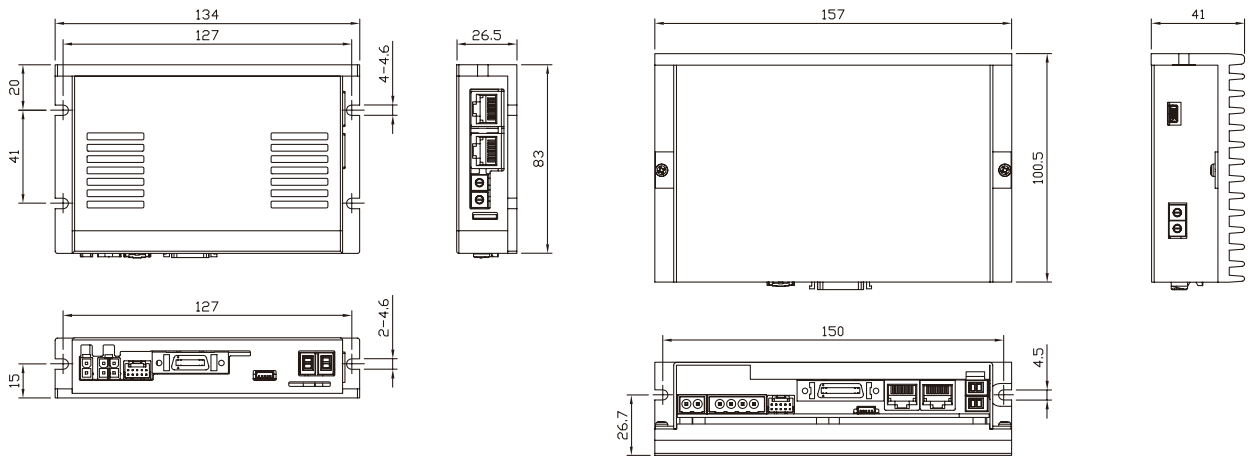
Specifications of Drive

Motor Model		Hi-EM-28 series	Hi-EM-35 series	Hi-EM-42 series	Hi-EM-56 series	Hi-EM-60 series
Driver Model		Hi-ED-EC-28 series	Hi-ED-EC-35 series	Hi-ED-EC-42 series	Hi-ED-EC-56 series	Hi-ED-EC-60 series
Input Voltage		24VDC ±10%				
Control Method		Closed loop control 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	0~3,000 [rpm] *1				
	Resolution [ppr]	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 (Selectable by parameter) *2				
	Protection Functions	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, In-Position Error, ROM Error, Position Overflow Error				
	LED Display	Power status, In-Position status, Servo On status, Alarm status				
EtherCAT	Supported Protocol	CoE (CiA402 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), 7 user inputs (Photocoupler Input)				
	Output Signals	6 user outputs (Photocoupler Output), Brake				

*1 : Up to the resolution of 10,000[ppr], maximum speed can be reached by 3,000[rpm] and with the resolution more than 10,000[ppr], maximum speed shall be reduced accordingly.

*2 : When selected resolution is more than encoder resolution, motor shall be operated by microstep between pulses.

Dimensions of Drive [mm]



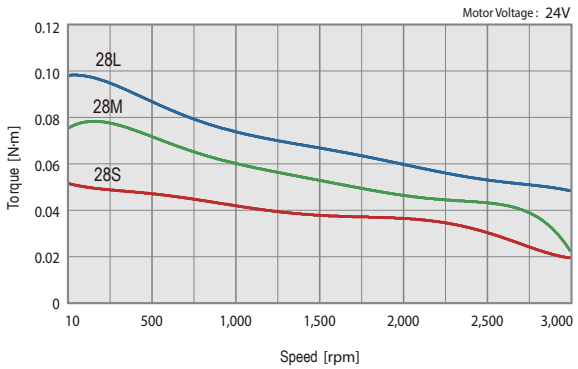
Specifications of Motor

MODEL			Hi-EM-28 series			Hi-EM-35 series		Hi-EM-42 series		
		UNIT	28S	28M	28L	35M	35L	42S	42M	42XL
DRIVE METHOD		-	BI-POLAR							
NUMBER OF PHASES		-	2	2	2	2	2	2	2	2
VOLTAGE		VDC	3.0	3.0	3.0	1.8	2.7	3.36	4.32	7.2
CURRENT per PHASE		A	0.95	0.95	0.95	1.5	1.5	1.2	1.2	1.2
RESISTANCE per PHASE		Ohm	3.2	3.2	3.2	1.2	1.8	2.8	3.6	6.0
INDUCTANCE per PHASE		mH	2.0	2.7	3.2	1.2	2.6	5.4	7.2	15.6
HOLDING TORQUE		N·m	0.069	0.098	0.118	0.13	0.23	0.32	0.44	0.65
ROTOR INERTIA		$g \cdot cm^2$	9.0	13	18	15	20	35	54	114
WEIGHTS		g	110	140	200	150	180	250	280	500
LENGTH(L)		mm	32	45	50	32	36	34	40	60
PERMISSIBLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	30	30	30	22	22	22	22	22
	8mm		38	38	38	26	26	26	26	26
	13mm		53	53	53	33	33	33	33	33
	18mm		-	-	-	46	46	46	46	46
PERMISSIBLE THRUST LOAD		N	Lower than motor weight							
INSULATION RESISTANCE		Mohm	100 MIN.(at 500VDC)							
INSULATION CLASS		-	CLASS B(130℃)							
OPERATING TEMPERATURE		℃	0 to 55							

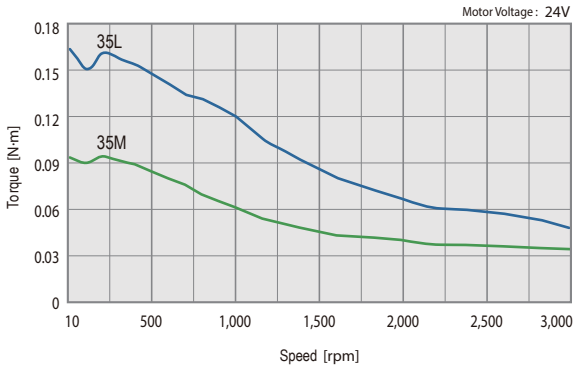
MODEL			Hi-EM-56 series			Hi-EM-60 series		
		UNIT	56S	56M	56L	60S	60M	60L
DRIVE METHOD		-	BI-POLAR					
NUMBER OF PHASES		-	2	2	2	2	2	2
VOLTAGE		VDC	1.56	1.62	2.64	1.32	1.48	2.2
CURRENT per PHASE		A	3.0	3.0	3.0	4.0	4.0	4.0
RESISTANCE per PHASE		Ohm	0.52	0.54	0.88	0.33	0.37	0.55
INDUCTANCE per PHASE		mH	1.2	2.0	4.0	0.75	1.1	2.7
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		g	500	720	1150	600	1000	1300
LENGTH(L)		mm	46	55	80	47	56	85
PERMISSIBLE OVERHUNG LOAD (DISTANCE 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 THRUST LOAD		N	Lower than motor weight					
INSULATION RESISTANCE		Mohm	100 MIN.(at 500VDC)					
INSULATION CLASS		-	CLASS B(130℃)					
OPERATING TEMPERATURE		℃	0 to 55					

Torque Characteristics of Motor

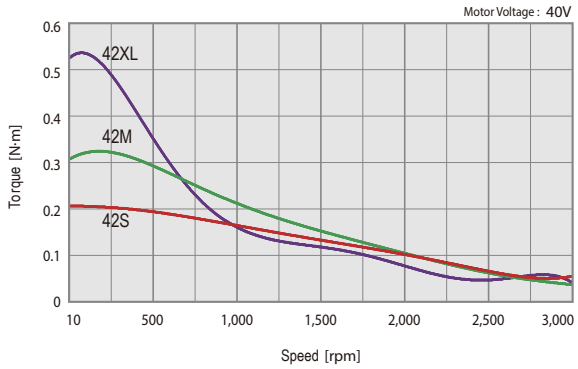
HiSTEP-ECC-28 series



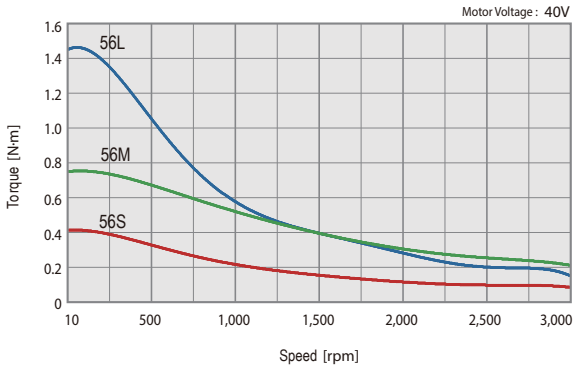
HiSTEP-ECC-35 series



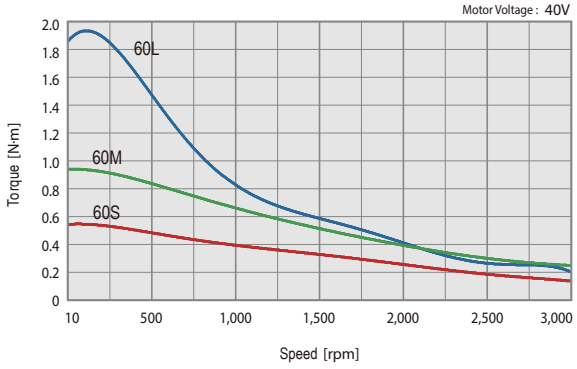
HiSTEP-ECC-42 series



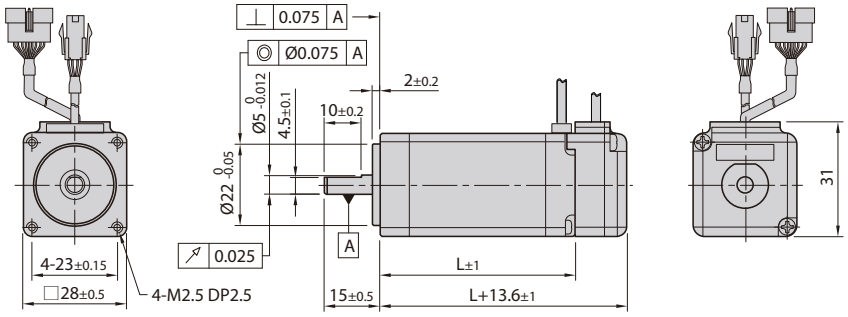
HiSTEP-ECC-56 series



HiSTEP-ECC-60 series

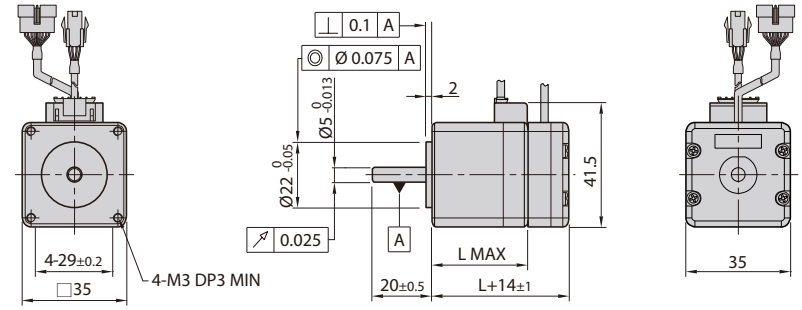


Dimensions of Motor [mm]



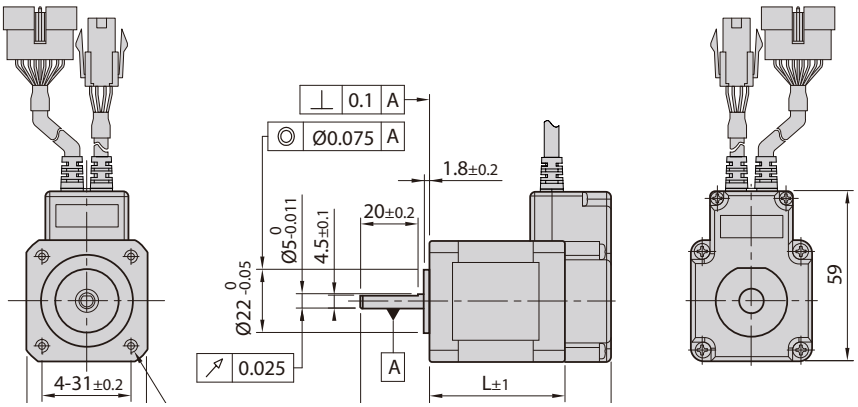
28mm

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



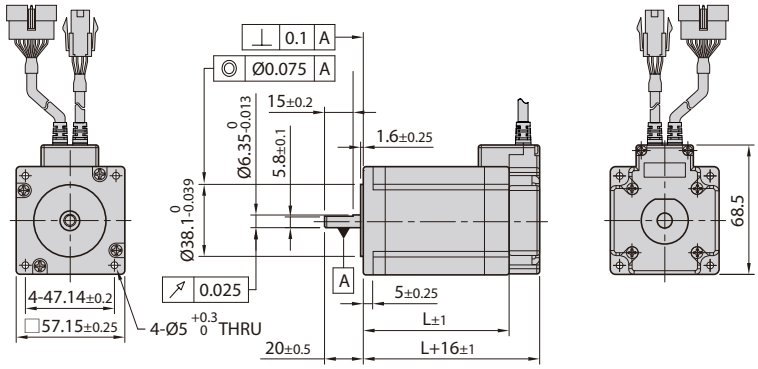
35mm

Model name	Length(L)
Hi-EM-35M	32
Hi-EM-35L	36



42mm

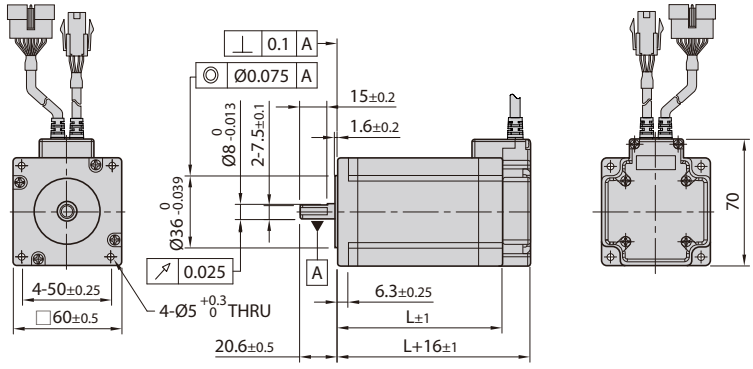
Model name	Length(L)
Hi-EM-42S	34
Hi-EM-42M	40
Hi-EM-42XL	60



56mm

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

※ There are 2 kinds size of front shaft diameter for Hi-EM-56 series as Ø6.35 and Ø8.0.



60mm

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

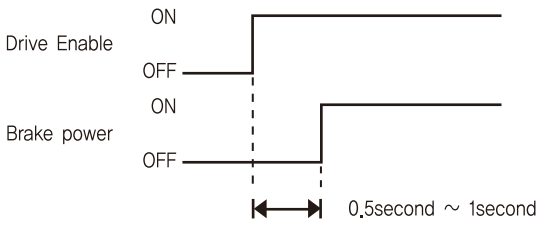
Specifications of Motor with Brake

Unit Part Number	Motor Model Number	Electronic Brake					Motor Unit Weight [g]	Permitted Overhung Load [N]				Permitted Thrust Load [N]
		Type	Voltage Input [V]	Rated Current [A]	Power Consumption [W]	Statical Friction Torque [N·m]		Length from Motor Point [mm]				
								3	8	13	18	
HiSTEP-EEC-42S-■-BK	Hi-EM-42S-■-BK	Non-excitation run Type	24VDC ±10%	0.2	5	0.2	510	22	26	33	46	Must be Lower than Unit's Weight
HiSTEP-EEC-42M-■-BK	Hi-EM-42M-■-BK						570					
HiSTEP-EEC-42XL-■-BK	Hi-EM-42XL-■-BK						770					
HiSTEP-EEC-56S-■-BK	Hi-EM-56S-■-BK			0.27	6.6	0.7	1030	52	65	85	123	
HiSTEP-EEC-56M-■-BK	Hi-EM-56M-■-BK						1190					
HiSTEP-EEC-56L-■-BK	Hi-EM-56L-■-BK						1630					
HiSTEP-EEC-60S-■-BK	Hi-EM-60S-■-BK						1150	70	87	114	165	
HiSTEP-EEC-60M-■-BK	Hi-EM-60M-■-BK						1350					
HiSTEP-EEC-60L-■-BK	Hi-EM-60L-■-BK						1960					

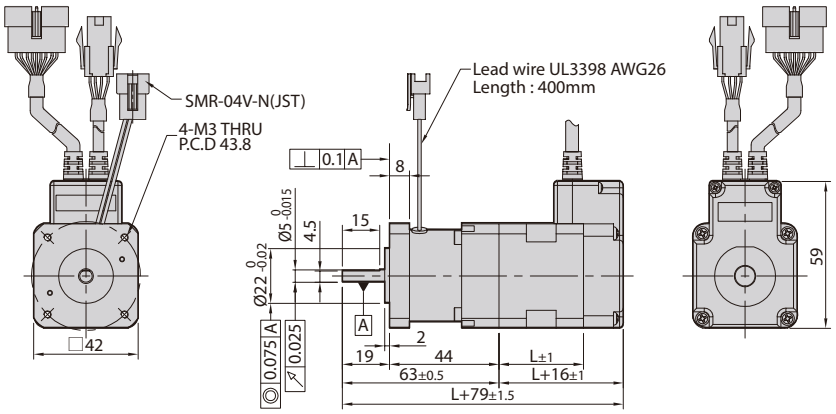
* The code of encoder resolution will be marked in "■"
* Electronic Brake cannot be used for braking. Position hold purpose only when power OFF.
* The weight means Motor Unit Weight including Motor and Electronic Brake.
* Motor Model Number is combined model name of Motor and Brake.
* Motor specification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

* Brake Operation Timing Chart

Hi STEP EtherCAT controls Brake by Drive automatically.
Please refer to below Timing Chart when Brake is controlled by the upper controller other than using Hi STEP EtherCAT Brake control. Otherwise, Drive malfunctioning and loads can be fall down.
Also, please do not operate Brake while motor operation to prevent damage.

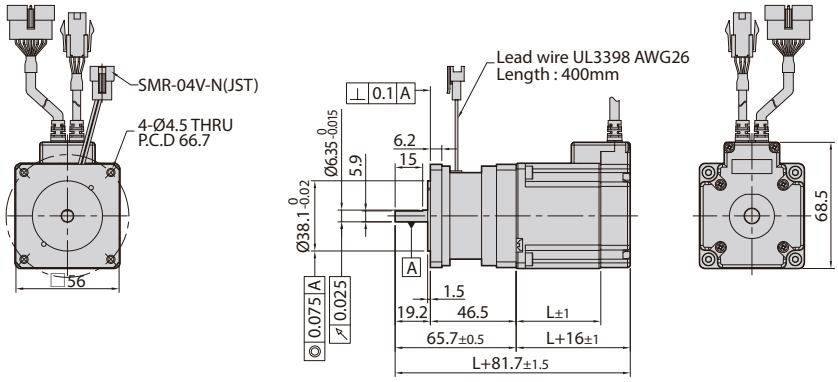


Dimensions of Motor with Brake [mm]



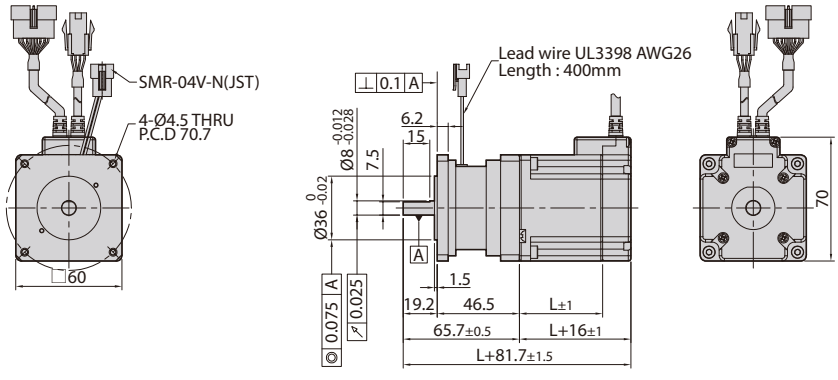
42mm

Model Name	Length(L)	Weight(kg)
Hi-EM-42S	34	0.51
Hi-EM-42M	40	0.57
Hi-EM-42XL	60	0.77



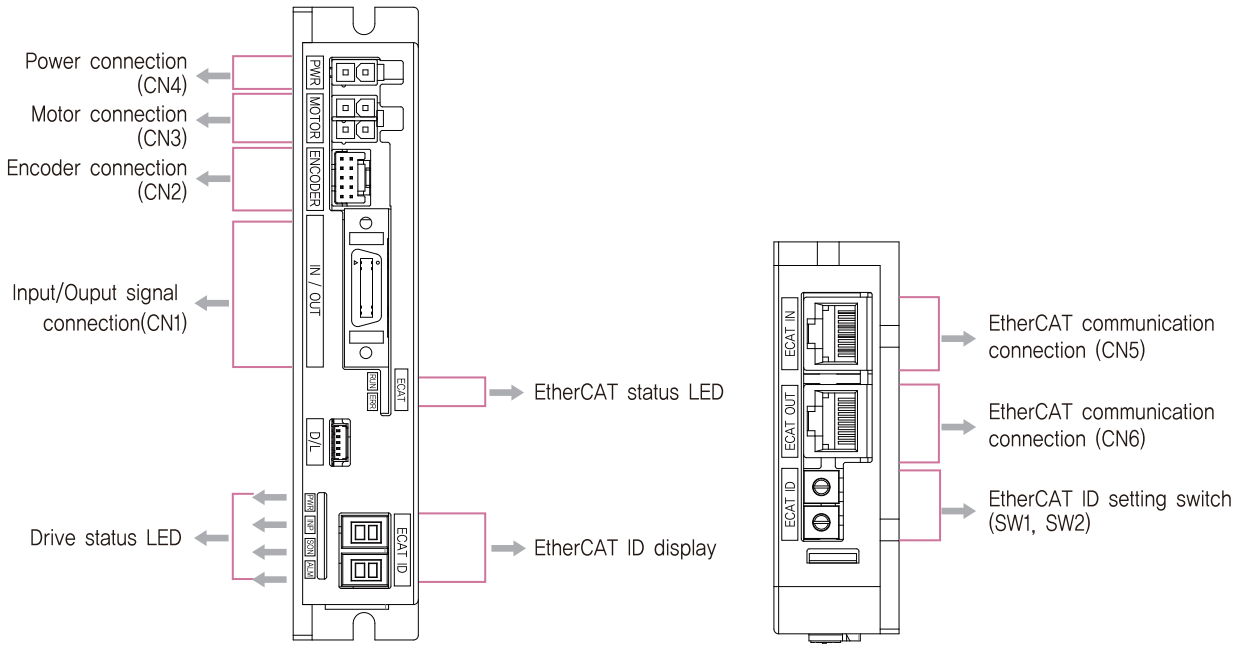
56mm

Model Name	Length(L)	Weight(kg)
Hi-EM-56S	46	1.03
Hi-EM-56M	55	1.19
Hi-EM-56L	80	1.63



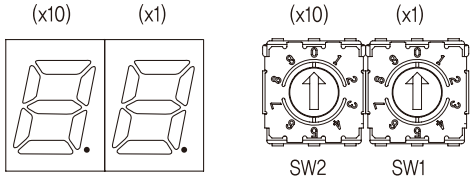
60mm

Model Name	Length(L)	Weight(kg)
Hi-EM-60S	47	1.15
Hi-EM-60M	56	1.35
Hi-EM-60L	85	1.96



1. EtherCAT ID Display and Setting Switch (SW1, SW2)

There are two Rotary Switches to set value of EtherCAT ID (ECAT Device ID). Switch on the right side indicates the ones' place(X1), and Switch on the left side indicates the tens' place(X10).



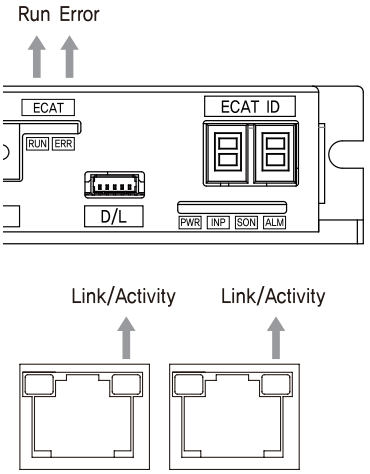
2. EtherCAT Status LED

LED indicates communication status of EtherCAT. Link/Activity LED exists on each port of EtherCAT.

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

Name	Color	Status	Explanation
Link/ Activity	Green	OFF	Link not Established
		ON	Link Established
		Flickering	Link Established and in Operation



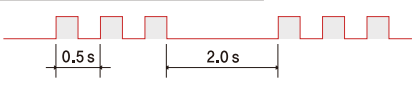
3. Drive Status LED

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 parameter
SON	Orange	Servo On/Off Indication	Servo On: Lights On, Servo Off: Lights Off
ALM	Red	Alarm indication	Flash when protection function is activated

■ Protection functions and LED flash times

Times	Error Code *4	Protection	Conditions
1	E-001	Over Current Error	The current through power devices in inverter exceeds the limit value *1
2	E-002	Over Speed Error	Motor speed exceeds 3,000 [rpm]
3	E-003	Position Tracking Error	Position error value is higher than 180° in motor run state *2
4	E-004	Over Load Error	The motor is continuously operated more than 5 seconds under a load exceeding the max. torque
5	E-005	Over Temperature Error	Inside temperature of drive exceeds 85℃
6	E-006	Over Regenerative Voltage Error	Back-EMF is higher than limit value *3
7	E-007	Motor Connect Error	The power is ON without connection of the motor cable to drive
8	E-008	Encoder Connect Error	Cable connection error in Encoder connection of drive
10	E-010	In-Position Error	After operation is finished, position error more than 1 pulse is continued for more than 3 seconds
12	E-012	ROM Error	Error occurs in parameter storage device(ROM)
15	E-015	Position Overflow Error	Position error value is higher than 180° in motor stop state *2

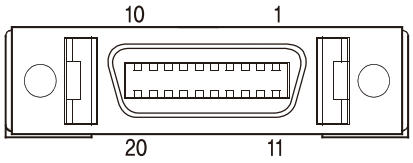
*1 : Limit value depends on motor model. (Refer to the Manual)
*2 : Default value can be changed by parameter. (Refer to the Manual)
*3 : Voltage limit of Back-EMF depends on motor model. (Refer to the Manual)
*4 : When an alarm occurs, error code is displayed on the 7-segment instead of EtherCAT ID.
※ Please refer to uer Manual for the details of protection functions.



Alarm LED flash
(Ex, Position tracking error)

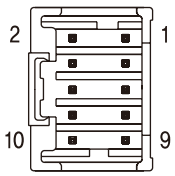
4. Input/Output Signal Connector(CN1)

NO.	Function	I/O
1	LIMIT+	Input
2	LIMIT–	Input
3	ORIGIN	Input
4	Digital In1	Input
5	Digital In2	Input
6	Digital In3	Input
7	Digital In4	Input
8	Digital In5	Input
9	Digital In6	Input
10	Digital In7	Input
11	Digital Out1	Output
12	Digital Out2	Output
13	Digital Out3	Output
14	Digital Out4	Output
15	Digital Out5	Output
16	Digital Out6	Output
17	BRAKE+	Output
18	BRAKE–	Output
19	EXT_GND	Input
20	EXT_24VDC	Input



5. Encoder Connector(CN2)

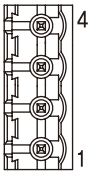
NO.	Function	I/O
1	A+	Input
2	A–	Input
3	B+	Input
4	B–	Input
5	Z+	Input
6	Z–	Input
7	5VDC	Output
8	GND	Output
9	F.GND	----
10	F.GND	----



6. Motor Connector(CN3)

NO.	Function	I/O
1	A Phase	Output
2	B Phase	Output
3	/A Phase	Output
4	/B Phase	Output

NO.	Function	I/O
1	/B Phase	Output
2	B Phase	Output
3	/A Phase	Output
4	A Phase	Output



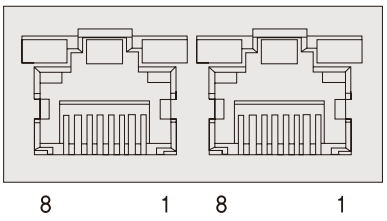
7. Power Connector(CN4)

NO.	Function	I/O
1	24VDC	Input
2	GND	Input

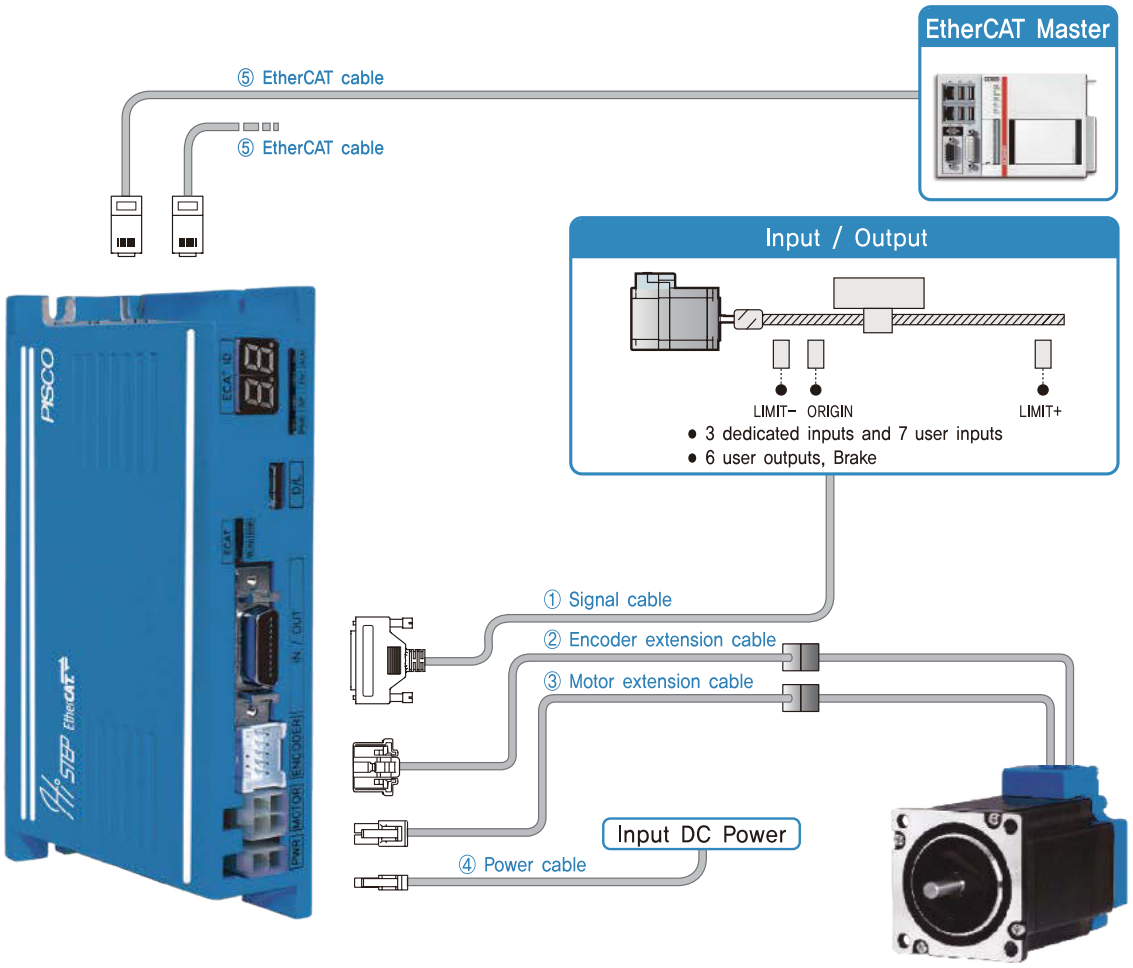
NO.	Function	I/O
1	GND	Input
2	40~70VDC	Input

8. EtherCAT Communication Connector(CN5, CN6)

NO.	Function	NO.	Function
1	TD+	6	RD–
2	TD–	7	----
3	RD+	8	----
4	----	Connection hood	F.GND
5	----		



System Configuration



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable	EtherCAT Cable
Length supplied	–	30cm	30cm	–	–
Max. Length	20m	20m	20m	2m	100m

1. Options

① Signal Cable

Available to connect between Input/Output signals and and Hi STEP EtherCAT.

Item	Length [m]	Remark
CSVN-S-□□□F	□□□	Normal Cable
CSVN-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 Hi STEP EtherCAT.

Item	Length [m]	Remark
CSVO-E-□□□F	□□□	Normal Cable
CSVO-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 Hi STEP EtherCAT.

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

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

④ Power Cable

Available to connect between Power and Hi STEP EtherCAT.

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

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

⑤ EtherCAT Cable

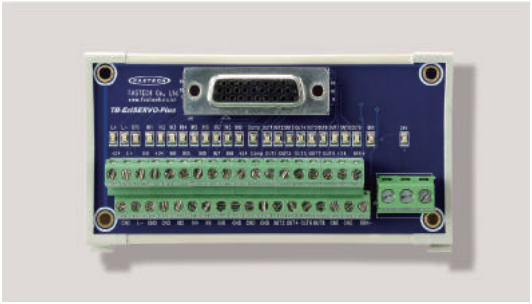
STP(Shielded twisted pair) cable of category 5e or higher.

Item	Length [m]	Remark
CGNR-EC-□□□F	□□□	Normal Cable

□ is for Cable Length. The unit is 1m and Max. 100m length.

⑥ TB-Plus(Interface Board)

Available to connect more conveniently between Input/ Output signal and Hi STEP EtherCAT.



⑦ Interface Cable for TB-Plus

Available to Connect between TB-Plus Interface Board and Hi STEP EtherCAT.

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

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

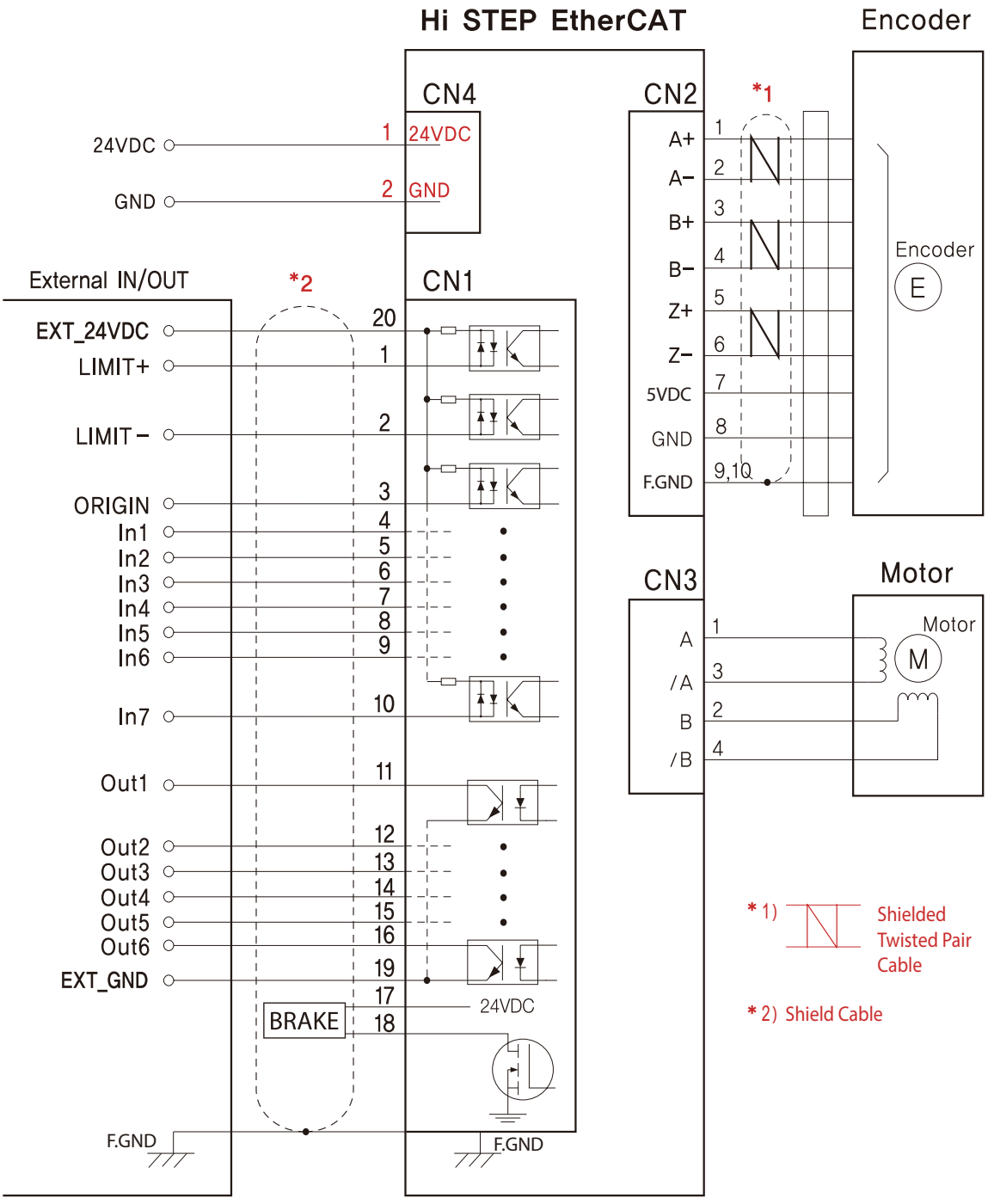
2. Connector Specifications

Connector specifications for cabling to drive.

Purpose		Item	Part Number	Manufacturer
Power (CN4)		Housing Terminal	5557-02R 5556T	MOLEX
Motor	Drive Side (CN3)	Housing Terminal	5557-04R 5556T	MOLEX
	Motor Side	Housing Terminal	5557-04R 5556T	MOLEX
Encoder	Drive Side (CN2)	Housing Terminal	51353-1000 56134-9000	MOLEX
	Encoder Side	Housing Terminal	SMP-09V-NC SHF-001T-0.8BS	JST
Signal (CN1)		Connector Backshell	10120-3000PE 10320-52A0-008	3M

※ Above connector is the most suitable product for the drive applied. Another equivalent connector can be used.

External Wiring Diagram



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

CAUTION

Please refer to the Manual when connects motor extension cable.

Careful connection will be required to protect the drive from any damages.

Hi STEP Ethernet

closed loop stepping system

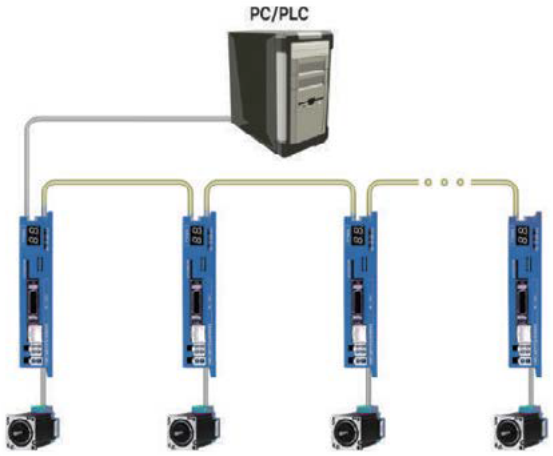
PISCO

For more information
Please scan

- Embeded Controller
- EtherNet Interface
- Position Table
- Closed Loop System
- No Gain Tuning / No Hunting
- High Resolution / Fast Response
- Heat Reduction / Torque Improvement

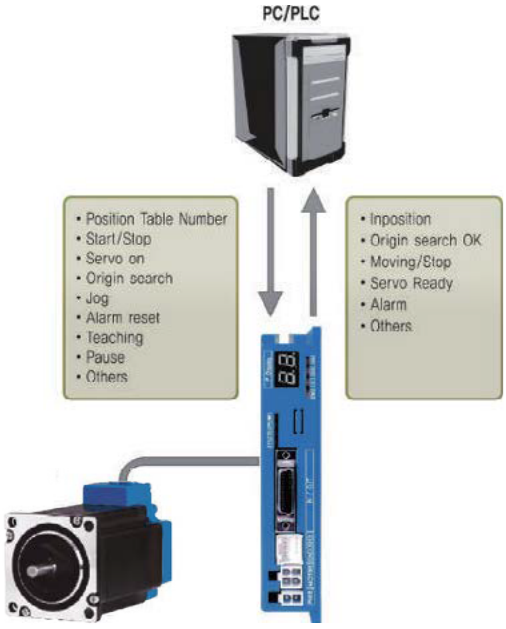
1. Network Based Motion Control

A maximum of 254 axes can be operated from a PC through EtherNet communications. And daisy-chain connection is available thru internally equipped EtherNet HUB. All of the Motion conditions are set through the network and saved in Flash ROM as a parameter. Motion Library(DLL) is provided for programming under Windows XP/7/8/10.



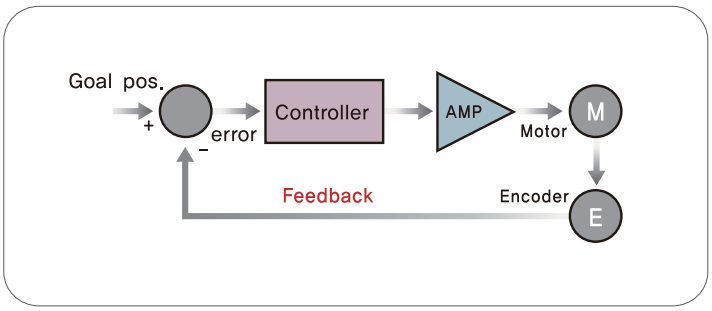
2. Position Table Function

Position Table can be used for motion control by digital input and output signals of host controller.
You can operate the motor directly by sending the position table number, start/stop, origin search and other digital input values from a PC.
The PC can monitor the In-Position, origin search, moving/stop, servo ready and other digital output signals from a drive. A maximum of 256 positioning points can be set from PC.



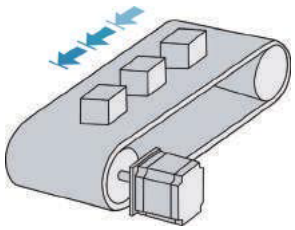
3. Closed Loop System

Hi STEP is an innovative closed loop stepping system that utilizes a high-resolution motor mounted encoder constantly to monitor the current position. The encoder feedback allows the Hi STEP to update the current position every 50 micro seconds. It allows the Hi STEP 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 but Hi STEP automatically correct the position by encoder feedback.



4. No Gain Tuning

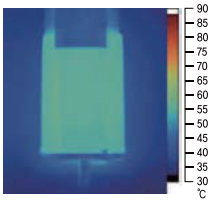
To ensure machine performance, smoothness, positional error and low servo noise, Conventional servo systems require the adjustment of its servo' s gains as an initial crucial step. Even systems that employ auto-tuning require manual tuning after the system is installed, especially if more that one axis are interdependent. Hi STEP employs the best characteristics of stepper, closed loop motion controls and algorithms to eliminate the need of tedious gain tuning required for conventional closed loop servo systems. This means that Hi STEP is optimized for the application and ready to work right out of the box. The Hi STEP 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. Hi STEP 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 additimal expensive and bulky gearbox. exceptionally, even under heavy loads and high speeds.



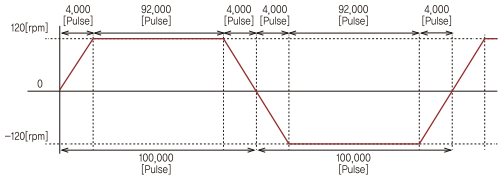
5. Heat Reduction / Energy Saving

(Motor Current Control according to load)

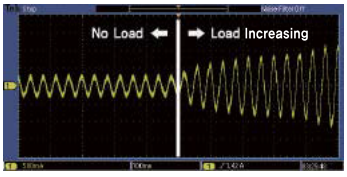
Hi STEP automatically controls motor current according to load. Hi STEP reduces motor current when motor load is low, and increases motor current when load is high. By optimizing the motor current, motor heat can be minimized and energy can be saved.



Motor temperature [Measured by Thermal Imaging Camera]



Condition to measure the motor temperature
[4hours operation, Motor surface temperature saturation]

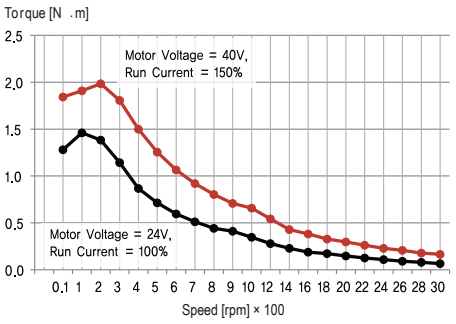


Example of the Motor Current Control according to load

6. Torque Improvement

(Motor Voltage Increasing and Motor Current Setting)

Hi STEP boosts the voltage supplied to the motor by internal DC-DC Converter. The torque at the high speed is increased. In addition, it is possible to set the Run Current up to 150%, whereby the torque at low speed is increased. Torque can be improved by about 30% over the entire speed range.

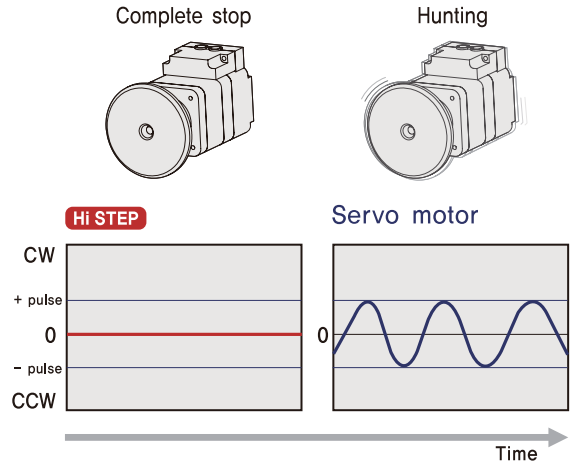


※ The torque at low speed and high speed is improved about 30%.

Measured Condition : Drive = Hi STEP-EEN-56L
Motor Voltage = 40VDC
Input Voltage = 24VDC

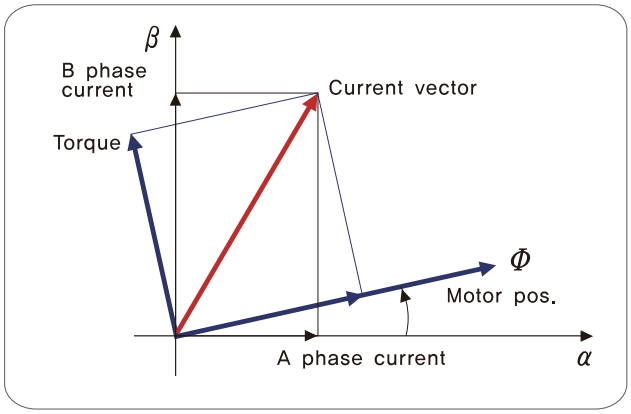
7. No Hunting

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 Hi STEP Motion Control System. Hi STEP 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 manu-facturing, semiconductor fabrication, vision systems and ink jet printing in which system oscillation and vibration could be a problem.



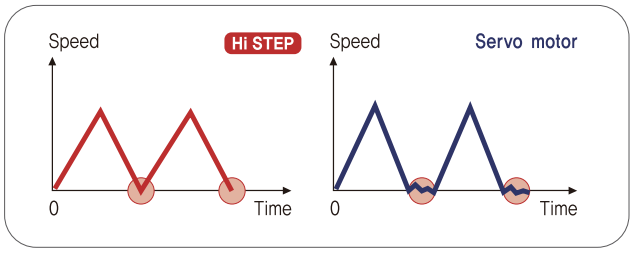
8. Smooth and Accurate

Hi STEP is a high-precision servo drive, using a high-resolution encoder with 20,000 pulses/revolution. Unlike a conventional Microstep drive, the on-board high perfo-rmance ARM (Advanced RISC Machine) performs vector control and filtering, producing a smooth rotational control with minimum ripples



9. Fast Response

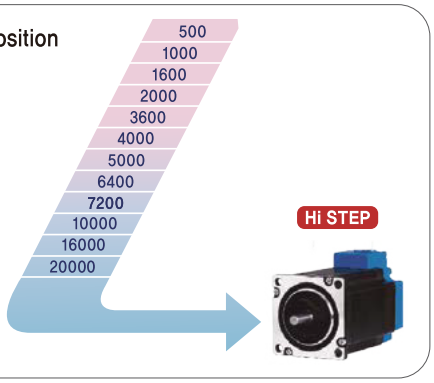
Similar to conventional stepping motors, Hi STEP instantly synchronizes with command pulses providing fast positional response. Hi STEP is the optimum choice when zero-speed stability and rapid motions within a short distance are required. Traditional servo motor systems have a natural delay called settling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



10. High Resolution

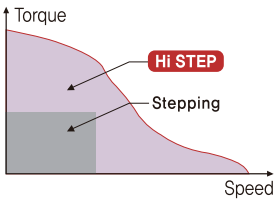
The unit of the position command can be divided precisely.

(Max. 20,000 pulses/revolution)



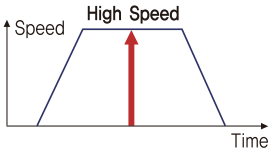
11. High Torque

Compared with common step motors and drives, Hi STEP motion control systems can maintain a high torque state over relatively long period of time. This means that Hi STEP continuously operates without loss of position under 100% of the load. Unlike conventional Microstep drives, Hi STEP exploits continuous high torqueoperation during high speed motion due toits innovative optimum current phase control.



12. High Speed

The Hi STEP operates well at high speed without the loss of synchronism or positioning error. Hi STEP' s ability of continuous current position monitoring of enables the stepping motor to generate high torque, even under a 100% load condition.



Advantages over Open-Loop Control Stepping Drive

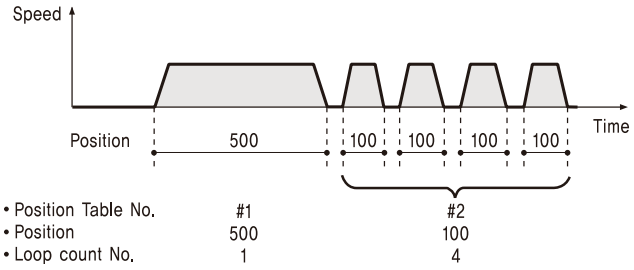
1. Reliable positioning without loss of synchronism.
2. Holding stable position and automatically recovering to the original position even after experiencing positioning error due to external forces, such as mechanical vibration or vertical positional holding.
3. Hi STEP utilizes 100% of the full range of rated motor torque, contrary to a conventional open-loop stepping driver that can use up to 50% of the rated motor torque due to the loss of synchronism.
4. Capability to operate at high speed due to load-dependant current control, open-loop stepping drivers use a constant current control at all speed ranges without considering load varitions.

Advantages over Servo Motor Controller

1. No gain tuning. (Automatic gain adjustment in response to a load change)
2. Maintains the stable holding position without oscillation after completion of positioning.
3. Fast positioning due to the independent control by on-board ARM.
4. Continuous operation during rapid short-stroke movement due to instantaneous positioning.

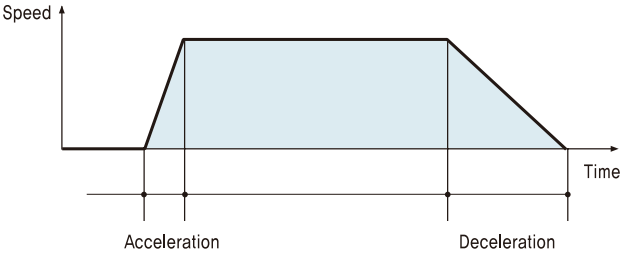
1. Loop Count

This function allows positioning repeatedly according to the Loop Count Number.



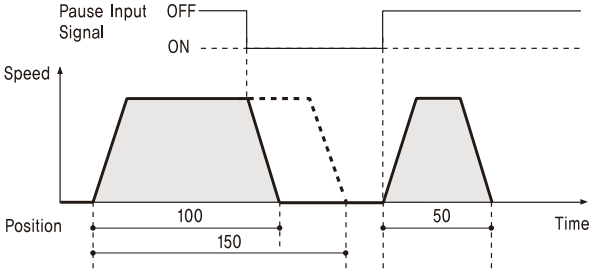
2. Acceleration/Deceleration

For quick acceleration and gradual deceleration, you can set each acceleration and deceleration time separately.



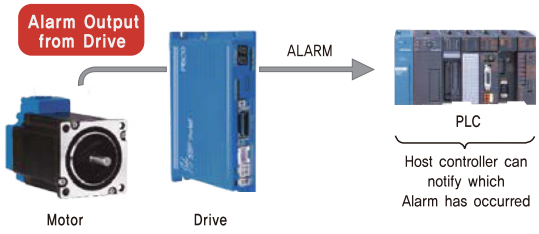
3. Pause

You can pause the motion upon the input of an external signal. When Pause signal change to OFF, the motor will restart to original target position.



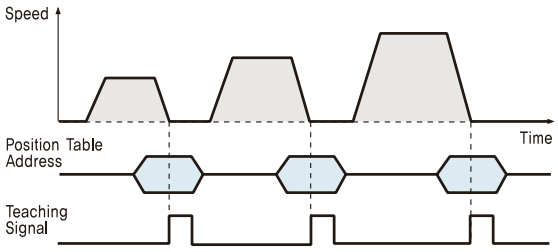
4. Alarm

The number of LED flashing time and information displayed on the 7-Segment indicates which Alarm has occurred.



5. Teaching

Teaching signal is used to memorize current Position data into the selected Position Table item.

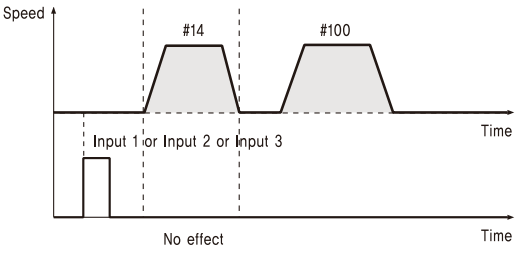


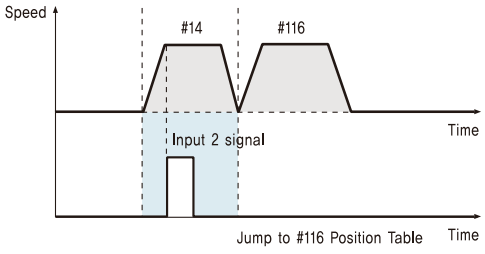
6. Jump

Within one Position Table, you can select various Position Table numbers that you want to jump.
With three external input signal during movement, the next jump Position Table number can be select.

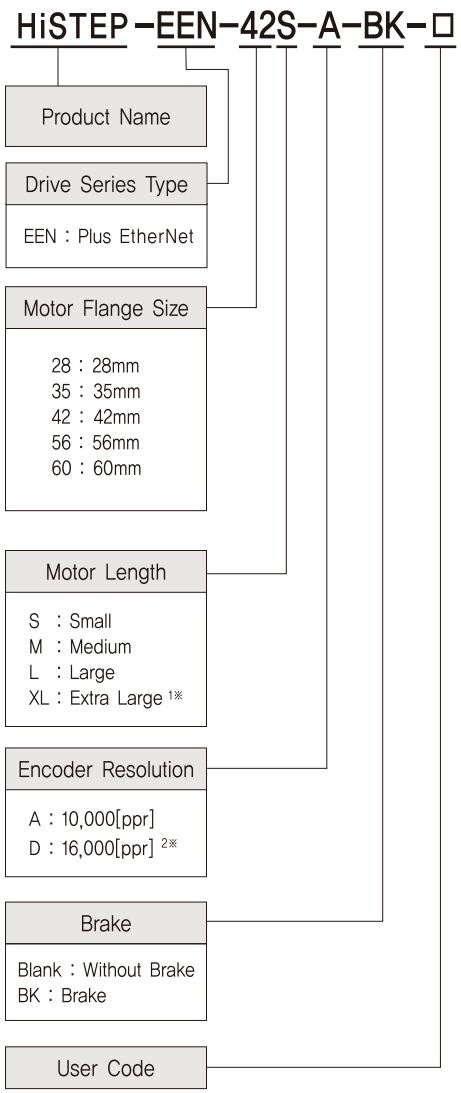
■ Position Table #14

Position	– – –	Next	– – –	Input 1	Input 2	Input 3	– – –
10000		100		115	116	117	





Hi STEP Ethernet Part Numbering



1※ : Moter length XL only 42mm size

2※ : Encoder Resolution 16,000[ppr] only respond 28mm size

Standard Combination

Unit Part Number	Motor Model Number	Drive Model Number
HiSTEP-EEN-28S-D	Hi-EM-28S-D	Hi-ED-PE-28S-D
HiSTEP-EEN-28M-D	Hi-EM-28M-D	Hi-ED-PE-28M-D
HiSTEP-EEN-28L-D	Hi-EM-28L-D	Hi-ED-PE-28L-D
HiSTEP-EEN-35M-A	Hi-EM-35M-A	Hi-ED-PE-35M-A
HiSTEP-EEN-35L-A	Hi-EM-35L-A	Hi-ED-PE-35L-A
HiSTEP-EEN-42S-A	Hi-EM-42S-A	Hi-ED-PE-42S-A
HiSTEP-EEN-42M-A	Hi-EM-42M-A	Hi-ED-PE-42M-A
HiSTEP-EEN-42XL-A	Hi-EM-42XL-A	Hi-ED-PE-42XL-A
HiSTEP-EEN-56S-A	Hi-EM-56S-A	Hi-ED-PE-56S-A
HiSTEP-EEN-56M-A	Hi-EM-56M-A	Hi-ED-PE-56M-A
HiSTEP-EEN-56L-A	Hi-EM-56L-A	Hi-ED-PE-56L-A
HiSTEP-EEN-60S-A	Hi-EM-60S-A	Hi-ED-PE-60S-A
HiSTEP-EEN-60M-A	Hi-EM-60M-A	Hi-ED-PE-60M-A
HiSTEP-EEN-60L-A	Hi-EM-60L-A	Hi-ED-PE-60L-A

Combination with Brake

Unit Part Number	Motor Model Number	Drive Model Number
HiSTEP-EEN-42S-A-BK	Hi-EM-42S-A-BK	Hi-ED-PE-42S-A
HiSTEP-EEN-42M-A-BK	Hi-EM-42M-A-BK	Hi-ED-PE-42M-A
HiSTEP-EEN-42XL-A-BK	Hi-EM-42XL-A-BK	Hi-ED-PE-42XL-A
HiSTEP-EEN-56S-A-BK	Hi-EM-56S-A-BK	Hi-ED-PE-56S-A
HiSTEP-EEN-56M-A-BK	Hi-EM-56M-A-BK	Hi-ED-PE-56M-A
HiSTEP-EEN-56L-A-BK	Hi-EM-56L-A-BK	Hi-ED-PE-56L-A
HiSTEP-EEN-60S-A-BK	Hi-EM-60S-A-BK	Hi-ED-PE-60S-A
HiSTEP-EEN-60M-A-BK	Hi-EM-60M-A-BK	Hi-ED-PE-60M-A
HiSTEP-EEN-60L-A-BK	Hi-EM-60L-A-BK	Hi-ED-PE-60L-A

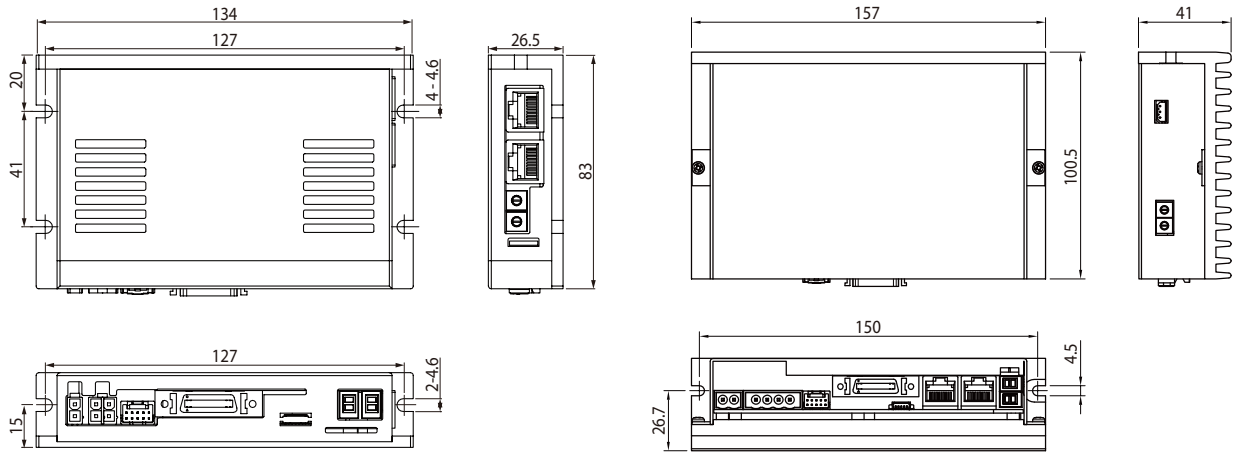
Specifications of Drive

Motor Model		Hi-EM-28 series	Hi-EM-35 series	Hi-EM-42 series	Hi-EM-56 series	Hi-EM-60 series
Driver Model		Hi-ED-PE-28 series	Hi-ED-PE-35 series	Hi-ED-PE-42 series	Hi-ED-PE-56 series	Hi-ED-PE-60 series
Input Voltage		24VDC ±10%				
Control Method		Closed loop control with 32bit MCU				
Multi Axes Drive		Maximum 254 axis operating (Selectable IP: 1~254)				
Position Table		256 motion command steps (Speed, External start, Jump, Loop, Wait and PT finish etc.)				
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	0~3,000 [rpm] *1				
	Resolution [ppr]	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 (Selectable by parameter) *2				
	Protection Functions	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, ROM Error, Position Overflow Error				
	LED Display	Power status, In-Position status, Servo On status, Alarm status				
	In-Position Selection	0~63 (Selectable by parameter)				
	Position Gain Selection	0~63 (Selectable by parameter)				
	Rotational Direction	CW/CCW (Selectable by parameter)				
I/O Signal	Input Signals	3 dedicated inputs (LIMIT+, LIMIT-, ORIGIN), 9 programmable inputs (Photocoupler)				
	Output Signals	1 dedicated output (Compare Out), 9 programmable outputs (Photocoupler), Brake				
Communication Interface		EtherNet communication, Dual port EtherNet switch embeded, Communication speed: 10/100 Base - T/TX Full-Duplex				
Position Control		· Incremental mode / Absolute mode Data Range: -134,217,728 to +134,217,727 [pulse] · Operating speed: Max. 3,000 [rpm]				
Return to Origin		Origin Sensor, Z phase, ±Limit sensor, Torque				
GUI		User Interface Program within Windows				
Library		Motion Library (DLL) for windows XP/7/8/10				

*1 : Up to the resolution of 10,000[ppr], maximum speed can be reached by 3,000[rpm] and with the resolution more than 10,000[ppr], maximum speed shall be reduced accordingly.

*2 : When selected resolution is more than encoder resolution, motor shall be operated by microstep between pulses.

Dimensions of Drive [mm]



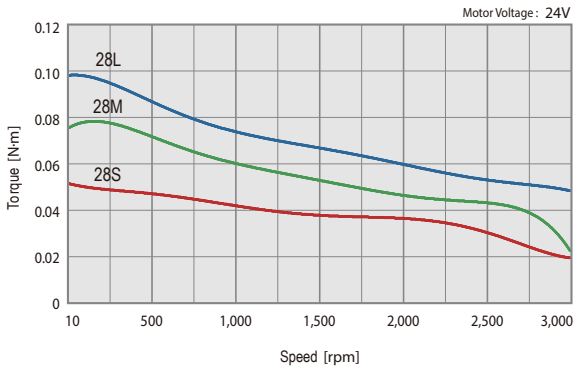
Specifications of Moter

MODEL			Hi-EM-28 series			Hi-EM-35 series		Hi-EM-42 series		
		UNIT	28S	28M	28L	35M	35L	42S	42M	42XL
DRIVE METHOD		-	BI-POLAR							
NUMBER OF PHASES		-	2	2	2	2	2	2	2	2
VOLTAGE		VDC	3.0	3.0	3.0	2.88	4.59	3.36	4.32	7.2
CURRENT per PHASE		A	0.95	0.95	0.95	0.6	0.85	1.2	1.2	1.2
RESISTANCE per PHASE		Ohm	3.2	3.2	3.2	4.8	5.4	2.8	3.6	6.0
INDUCTANCE per PHASE		mH	2.0	2.7	3.2	6.1	6.5	5.4	7.2	15.6
HOLDING TORQUE		N·m	0.069	0.098	0.118	0.05	0.176	0.32	0.44	0.65
ROTOR INERTIA		g·cm^2	9.0	13	18	8	11	35	54	114
WEIGHTS		g	110	140	200	120	200	250	280	500
LENGTH(L)		mm	32	45	50	26	38	34	40	60
PERMISSIBLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	30	30	30	22	22	22	22	22
	8mm		38	38	38	26	26	26	26	26
	13mm		53	53	53	33	33	33	33	33
	18mm		-	-	-	46	46	46	46	46
PERMISSIBLE THRUST LOAD		N	Lower than motor weight							
INSULATION RESISTANCE		Mohm	100 MIN.(at 500VDC)							
INSULATION CLASS		-	CLASS B(130℃)							
OPERATING TEMPERATURE		℃	0 to 55							

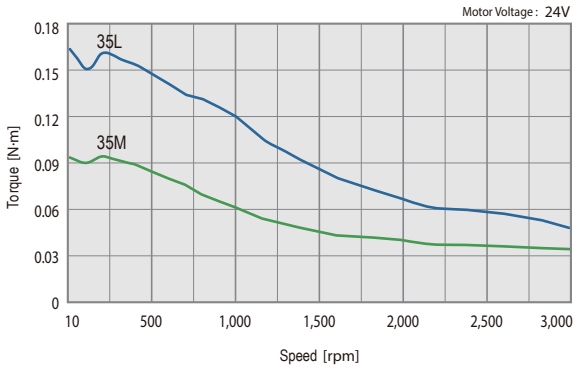
MODEL			Hi-EM-56 series			Hi-EM-60 series		
		UNIT	56S	56M	56L	60S	60M	60L
DRIVE METHOD		-	BI-POLAR					
NUMBER OF PHASES		-	2	2	2	2	2	2
VOLTAGE		VDC	1.56	1.62	2.64	1.32	1.48	2.2
CURRENT per PHASE		A	3.0	3.0	3.0	4.0	4.0	4.0
RESISTANCE per PHASE		Ohm	0.52	0.54	0.88	0.33	0.37	0.55
INDUCTANCE per PHASE		mH	1.2	2.0	4.0	0.75	1.1	2.7
HOLDING TORQUE		N·m	0.64	1.0	1.5	0.88	1.28	2.4
ROTOR INERTIA		g·cm^2	180	280	520	240	490	690
WEIGHTS		g	500	720	1150	600	1000	1300
LENGTH(L)		mm	46	55	80	47	56	85
PERMISSIBLE OVERHUNG LOAD (DISTANCE 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 THRUST LOAD		N	Lower than motor weight					
INSULATION RESISTANCE		Mohm	100 MIN.(at 500VDC)					
INSULATION CLASS		-	CLASS B(130℃)					
OPERATING TEMPERATURE		℃	0 to 55					

Torque Characteristics of Motor

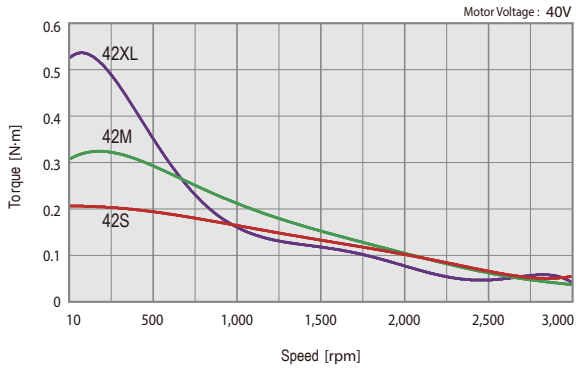
HiSTEP-EEN-28 series



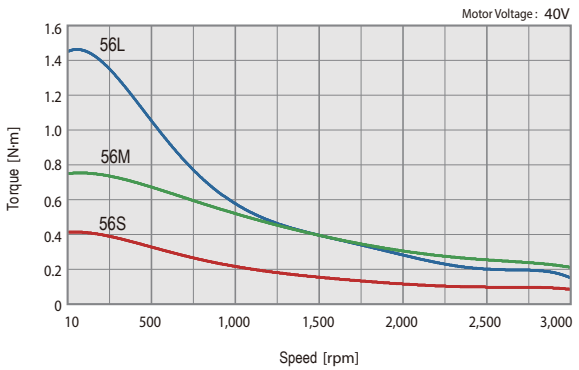
HiSTEP-EEN-35 series



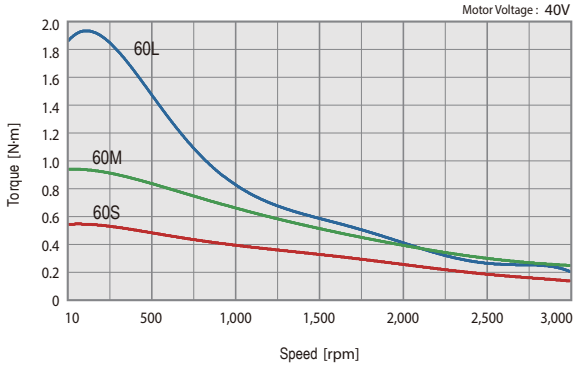
HiSTEP-EEN-42 series



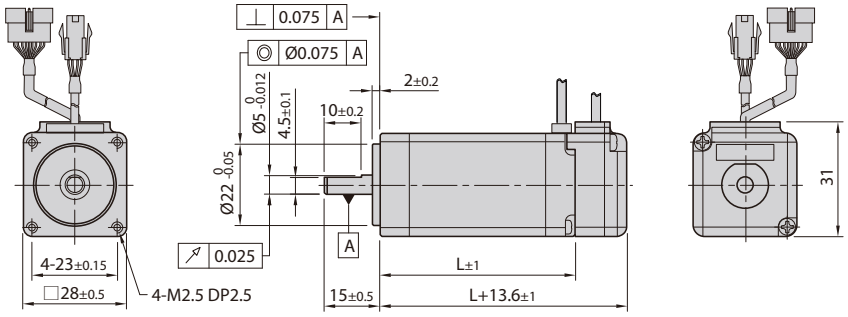
HiSTEP-EEN-56 series



HiSTEP-EEN-60 series

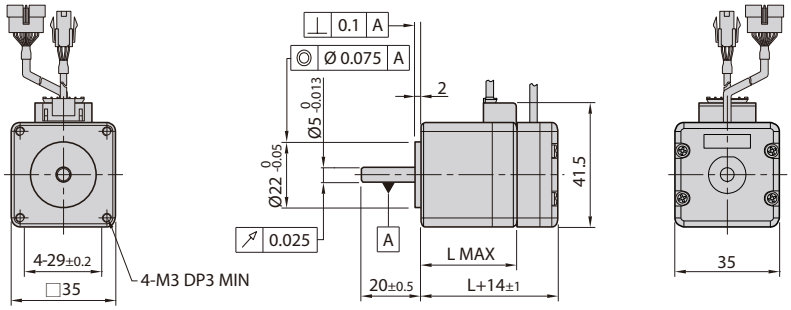


Dimensions of Motor [mm]



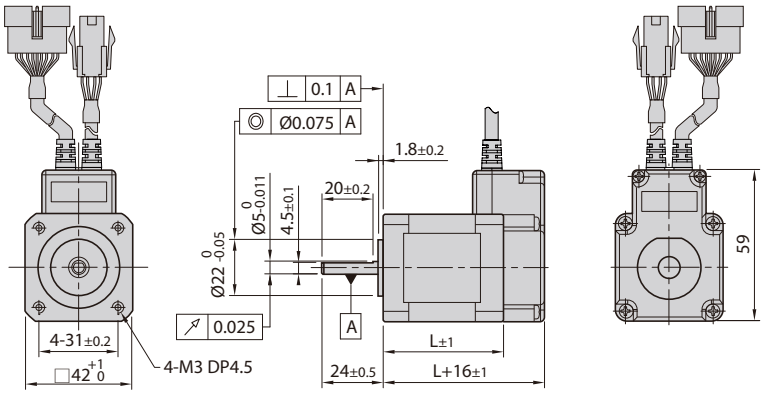
28mm

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



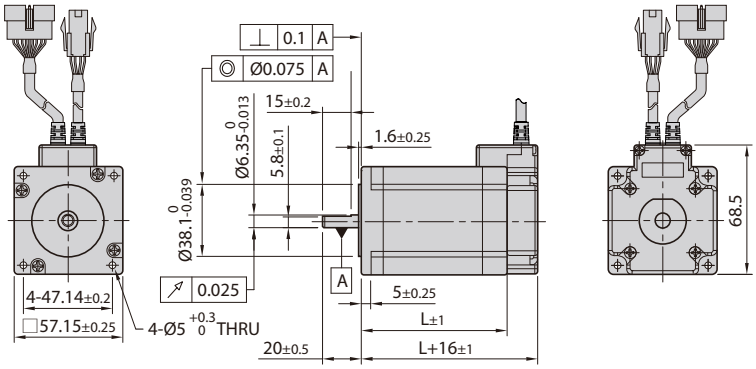
35mm

Model name	Length(L)
Hi-EM-35M	32
Hi-EM-35L	36



42mm

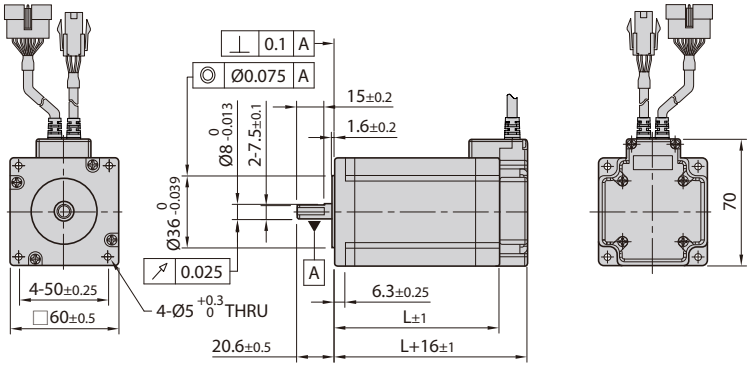
Model name	Length(L)
Hi-EM-42S	34
Hi-EM-42M	40
Hi-EM-42XL	60



56mm

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

※ There are 2 kinds size of front shaft diameter for Hi-EM-56 series as Ø6.35 and Ø8.0.



60mm

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

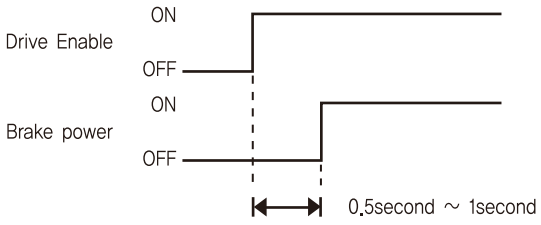
Specifications of Motor with Brake

Unit Part Number	Motor Model Number	Electronic Brake					Motor Unit Weight [g]	Permitted Overhung Load [N]				Permitted Thrust Load [N]
		Type	Voltage Input [V]	Rated Current [A]	Power Consumption [W]	Statical Friction Torque [N·m]		Length from Motor Point [mm]				
								3	8	13	18	
HiSTEP-EEN-42S-■-BK	Hi-EM-42S-■-BK	Non-excitation run Type	24VDC ±10%	0.2	5	0.2	510	22	26	33	46	Must be Lower than Unit's Weight
HiSTEP-EEN-42M-■-BK	Hi-EM-42M-■-BK						570					
HiSTEP-EEN-42XL-■-BK	Hi-EM-42XL-■-BK						770					
HiSTEP-EEN-56S-■-BK	Hi-EM-56S-■-BK			0.27	6.6	0.7	1030	52	65	85	123	
HiSTEP-EEN-56M-■-BK	Hi-EM-56M-■-BK						1190					
HiSTEP-EEN-56L-■-BK	Hi-EM-56L-■-BK						1630					
HiSTEP-EEN-60S-■-BK	Hi-EM-60S-■-BK						1150	70	87	114	165	
HiSTEP-EEN-60M-■-BK	Hi-EM-60M-■-BK						1350					
HiSTEP-EEN-60L-■-BK	Hi-EM-60L-■-BK						1960					

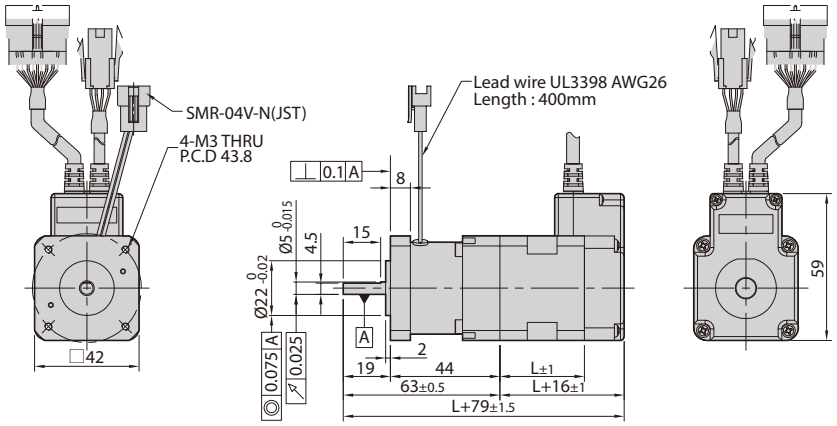
* The code of encoder resolution will be marked in "■"
* Electronic Brake cannot be used for braking. Position hold purpose only when power OFF.
* The weight means Motor Unit Weight including Motor and Electronic Brake.
* Motor Model Number is combined model name of Motor and Brake.
* Motor specification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

* Brake Operation Timing Chart

Hi STEP EtherNet controls Brake by Drive automatically.
Please refer to below Timing Chart when Brake is controlled by the upper controller other than using Hi STEP EtherNet Brake control. Otherwise, Drive malfunctioning and loads can be fall down.
Also, please do not operate Brake while motor operation to prevent damage.

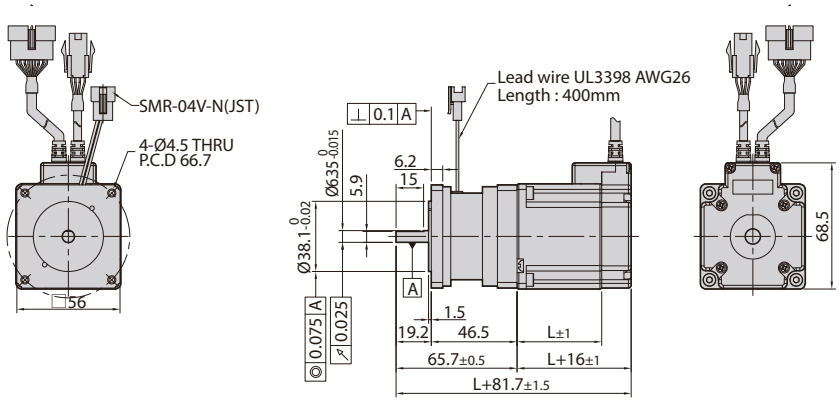


Dimensions of Motor With Brake [mm]



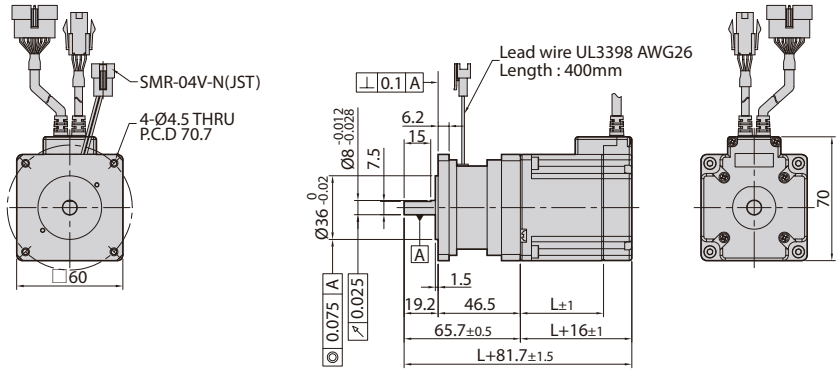
42mm

Model Name	Length(L)	Weight(kg)
Hi-EM-42S	34	0.51
Hi-EM-42M	40	0.57
Hi-EM-42XL	60	0.77



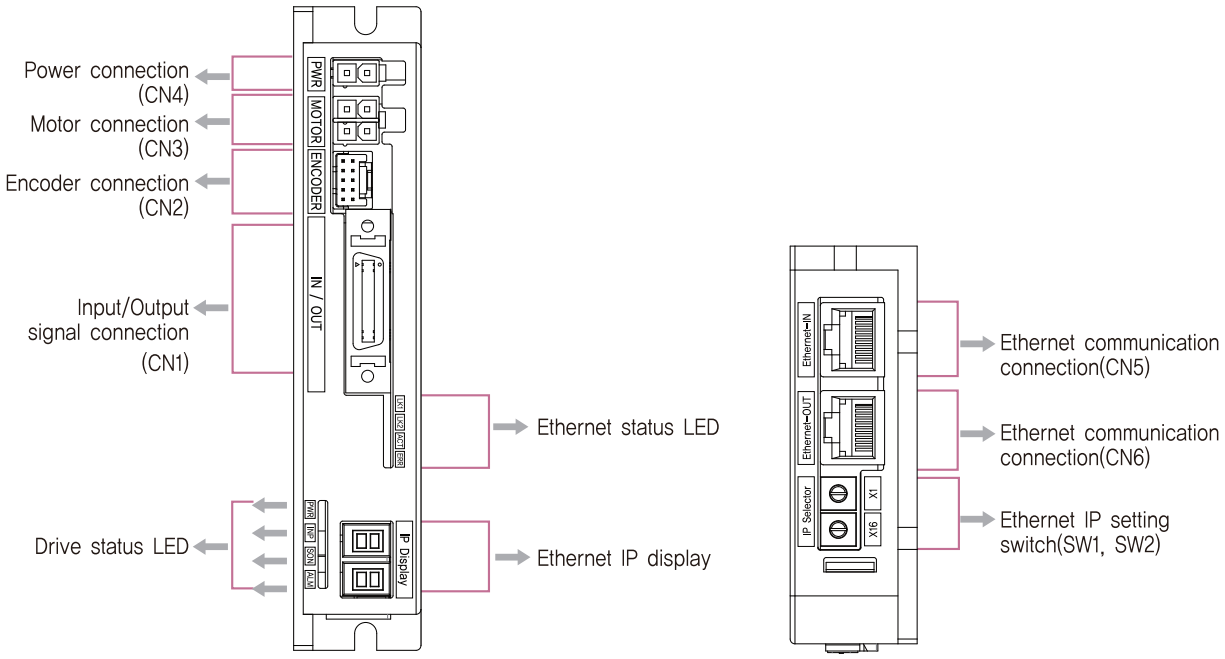
56mm

Model Name	Length(L)	Weight(kg)
Hi-EM-56S	46	1.03
Hi-EM-56M	55	1.19
Hi-EM-56L	80	1.63



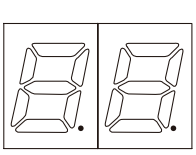
60mm

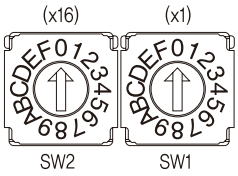
Model Name	Length(L)	Weight(kg)
Hi-EM-60S	47	1.15
Hi-EM-60M	56	1.35
Hi-EM-60L	85	1.96



1. Ethernet IP Display and Setting Switch(SW1, SW2)

It is to be set from 1 to 254. Please set the IP not to overap each other.
(Basic set up is "192.168.0.xxx" and xxx is to be set by switch)





Ex) In case of SW1 : **7** and SW2 : **5**
(5×16) + (7×1)= **87**
IP is to be set as 192.168.0.**87**

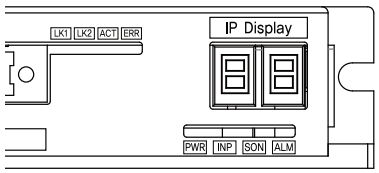
2. Ethernet Status LED

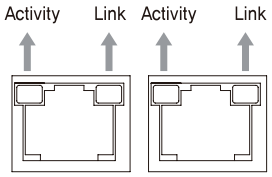
LED indicates communication status of EtherNet. Link/Activity LED exists on each port of Ethernet.

Name	Color	Status	Explanation
Error	Red	OFF	No Error status
		ON	Local Error

Name	Color	Status	Explanation
LK1 / LK2	Green	OFF	Link deactivated
		ON	Link activated

Name	Color	Status	Explanation
Activity	Yellow	OFF	No operating
		Flickering	Operting



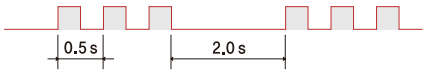


3. Drive Status LED

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 parameter
SON	Orange	Servo On / Off Indication	Servo On: Lights On, Servo Off: Lights Off
ALM	Red	Alarm indication	Flash when protection function is activated

■ Protection functions and LED flash times

Times	Error Code *4	Protection	Conditions
1	E-001	Over Current Error	The current through power devices in drive exceeds 4.8A *1
2	E-002	Over Speed Error	Motor speed exceeds 3,000 [rpm]
3	E-003	Position Tracking Error	Position error value is higher than 180° in motor run state *2
4	E-004	Over Load Error	The motor is continuously operated more than 5 seconds under a load exceeding the max. torque
5	E-005	Over Temperature Error	Temperature of inside of drive exceed 85℃
6	E-006	Over Regenerative Voltage Error	Back-EMF is higher than limit value *3
7	E-007	Motor Connect Error	The power is ON without connection of the motor cable to drive
8	E-008	Encoder Connect Error	Cable connection error in Encoder connection of drive
10	E-010	In-Position Error	After operation is finished, position error more than 1 pulse is continued for more than 3 seconds
12	E-012	ROM Error	Error occurs in parameter storage device(ROM)
15	E-015	Position Overflow Error	Position error value is higher than 180° in motor stop state *2

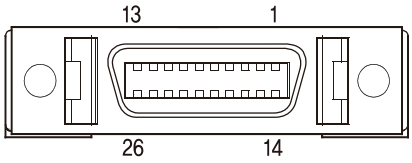


Alarm LED flash
(Ex, Position tracking error)

*1 : Limit value depends on motor model. (Refer to the Manual)
*2 : Default value can be changed by parameter. (Refer to the Manual)
*3 : Voltage limit of Back-EMF depends on motor model. (Refer to the Manual)
*4 : When an alarm occurs, error code is displayed on the 7-segment instead of EtherNet IP.
※ Please refer to uer Manual for the details of protection functions.

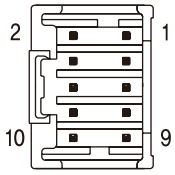
4. Input/Output Signal Connector(CN1)

NO.	Function	I/O
1	LIMIT+	Input
2	LIMIT–	Input
3	ORIGIN	Input
4	Digital In1	Input
5	Digital In6	Input
6	Digital In7	Input
7	Compare Out	Output
8	Digital Out1	Output
9	Digital Out2	Output
10	Digital Out3	Output
11	Digital Out4	Output
12	Digital Out5	Output
13	Digital Out6	Output
14	Digital In2	Input
15	Digital In3	Input
16	Digital In4	Input
17	Digital In5	Input
18	Digital In8	Input
19	Digital In9	Input
20	Digital Out7	Output
21	Digital Out8	Output
22	Digital Out9	Output
23	BRAKE+	Output
24	BRAKE–	Output
25	EXT_GND	Input
26	EXT_24VDC	Input



5. Encoder Connector(CN2)

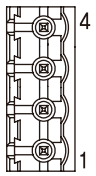
NO.	Function	I/O
1	A+	Input
2	A–	Input
3	B+	Input
4	B–	Input
5	Z+	Input
6	Z–	Input
7	5VDC	Output
8	GND	Output
9	F.GND	----
10	F.GND	----



6. Motor Connector(CN3)

NO.	Function	I/O
1	A Phase	Output
2	B Phase	Output
3	/A Phase	Output
4	/B Phase	Output

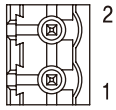
NO.	Function	I/O
1	/B Phase	Output
2	B Phase	Output
3	/A Phase	Output
4	A Phase	Output



7. Power Connector(CN4)

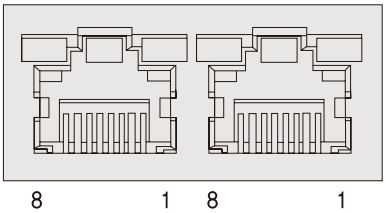
NO.	Function	I/O
1	24VDC	Input
2	GND	Input

NO.	Function	I/O
1	GND	Input
2	40~70VDC	Input

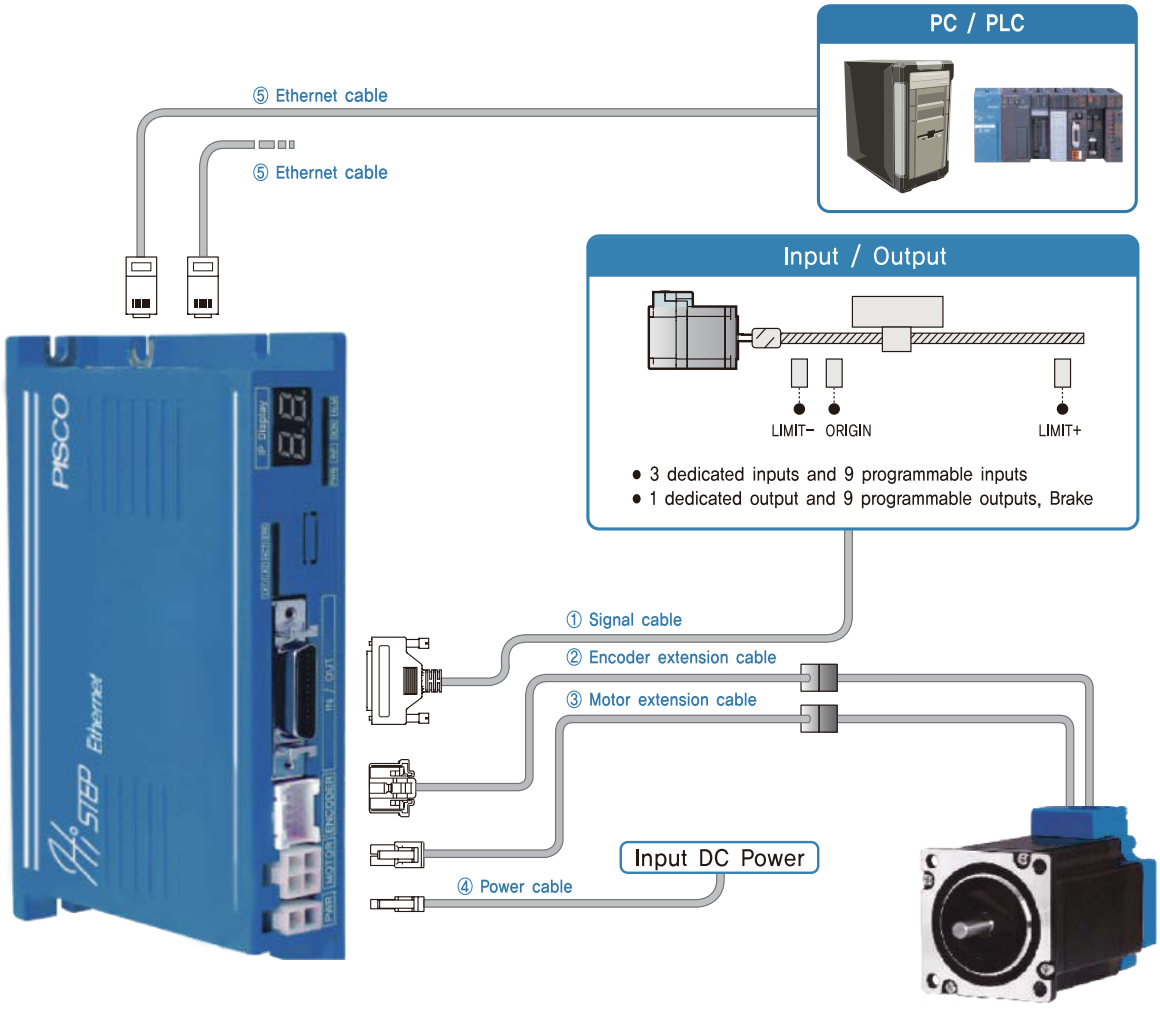


8. EtherNet Communication Connector(CN5, CN6)

NO.	Function	NO.	Function
1	TD+	6	RD–
2	TD–	7	----
3	RD+	8	----
4	----	Connection hood	F.GND
5	----		



System Configuration



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable	EtherNet Cable
Length supplied	–	30cm	30cm	–	–
Max. Length	20m	20m	20m	2m	100m

1. Options

① Signal Cable

Available to connect between Input/Output signals and Hi STEP EtherNet

Item	Length [m]	Remark
CSVR-S-□□□F	□□□	Normal Cable
CSVR-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 Hi STEP EtherNet

Item	Length [m]	Remark
CSVO-E-□□□F	□□□	Normal Cable
CSVO-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 Hi STEP EtherNet.

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

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

④ Power Cable

Available to connect between Power and Hi STEP EtherNet.

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

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

⑤ Ethernet Cable

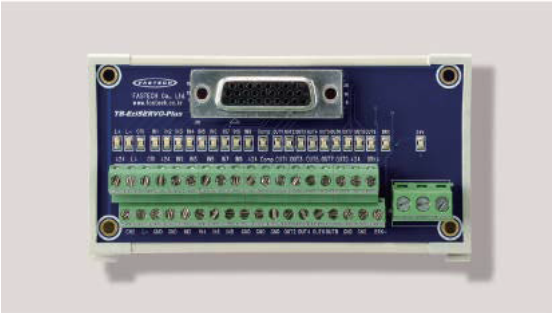
STP(Shielded twisted pair) cable of category 5e or higher.

Item	Length [m]	Remark
CGNR-EC-□□□F	□□□	Normal Cable

□ is for Cable Length. The unit is 1m and Max. 100m length.

⑥ TB-Plus(Interface Board)

Available to connect more conveniently between Input/Output signal and Hi STEP EtherNet.



⑦ Interface Cable for TB-Plus

Available to Connect between TB-Plus Interface Board and Hi STEP EtherNet.

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

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

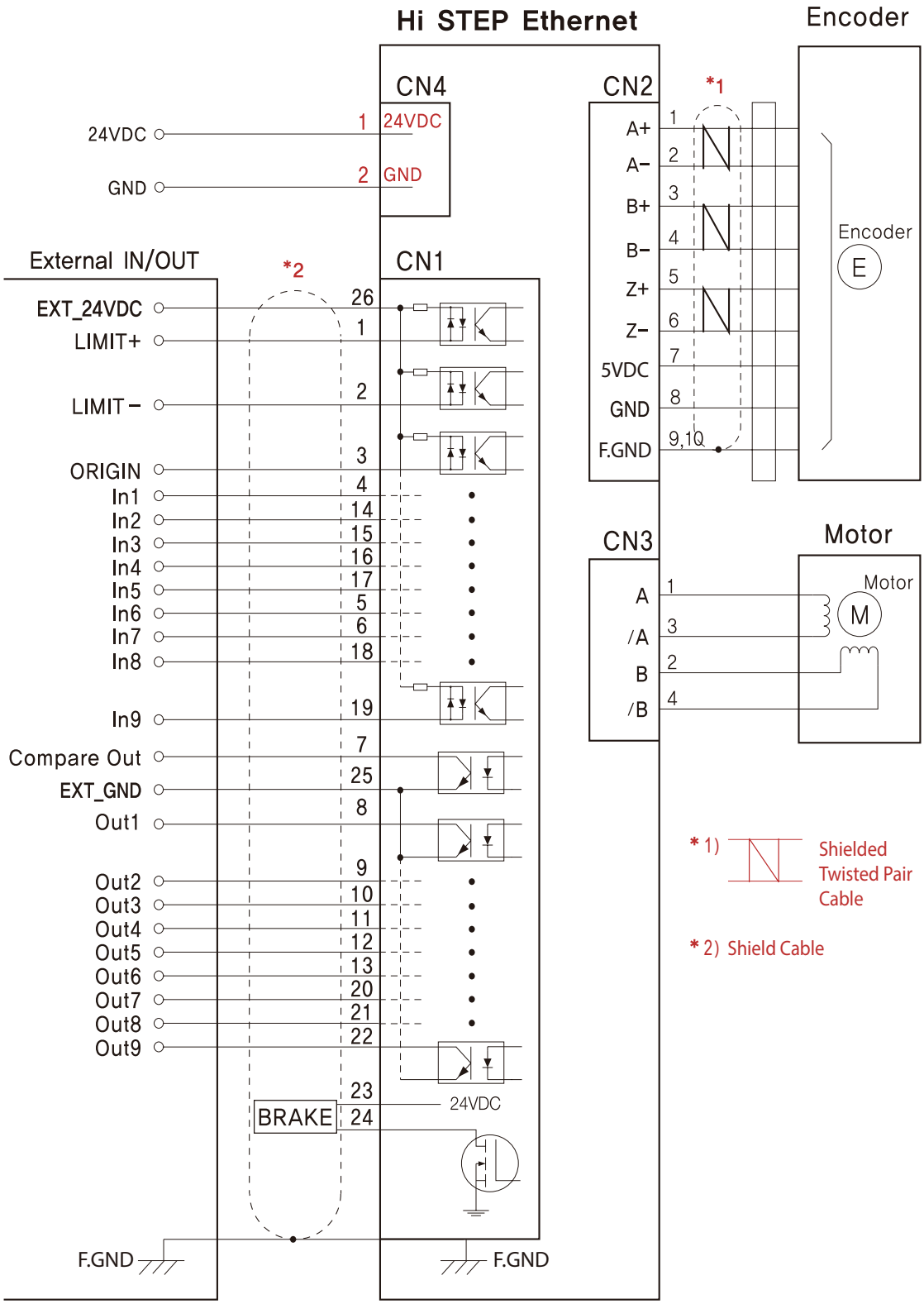
2. Connector Specifications

Connector specifications for cabling to drive.

Purpose		Item	Part Number	Manufacturer
Power (CN4)		Housing Terminal	5557-02R 5556T	MOLEX
Motor	Drive Side (CN3)	Housing Terminal	5557-04R 5556T	MOLEX
	Motor Side	Housing Terminal	5557-04R 5556T	MOLEX
Encoder	Drive Side (CN2)	Housing Terminal	51353-1000 56134-9000	MOLEX
	Encoder Side	Housing Terminal	SMP-09V-NC SHF-001T-0.8BS	JST
Signal (CN1)		Connector Backshell	10126-3000PE 10326-52F0-008	3M

※ Above connector is the most suitable product for the drive applied. Another equivalent connector can be used.

External Wiring Diagram



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

CAUTION

Please refer to the Manual when connects motor extension cable.

Careful connection will be required to protect the drive from any damages.

Hi STEP CC-Link

closed loop stepping system

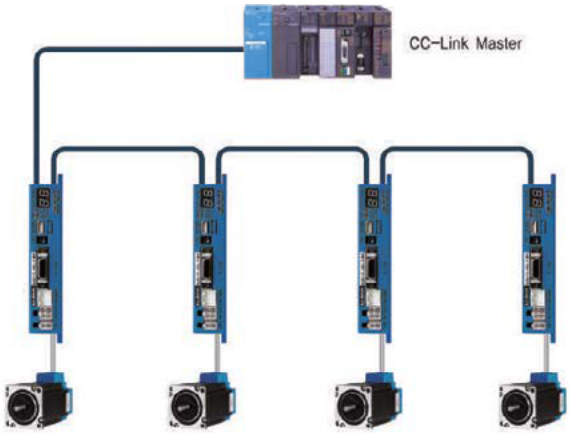
PISCO

For more information
Please scan

- Embeded Controller
- Position Table
- Closed Loop System
- No Gain Tuning / No Hunting
- Heat Reduction / Torque Improvement

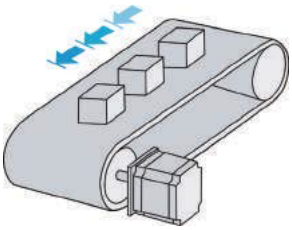
1. CC-Link Based Motion Control

Hi STEP CC-Link is a stepping motor control system that supports CC-Link with high speed fieldbus (max. 10Mbps).
Hi STEP CC-Link is a remote device module supporting CC-Link network. Multi-function control is possible by occupying 1 station and 2 stations in CC-Link, and motion and monitoring functions are processed by device commands.



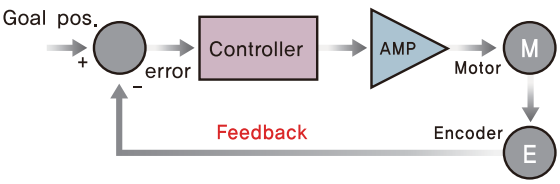
3. No Gain Tuning

To ensure machine performance, smoothness, positional error and low servo noise, conventional servo systems require the adjustment of its servo's gains as an initial crucial step. Even systems that employ auto-tuning require manual tuning after the system is installed, especially if more that one axis are interdependent. Hi STEP employs the best characteristics of stepper, closed loop motion controls and algorithms to eliminate the need of tedious gain tuning required for conventional closed loop servo systems. This means that Hi STEP is optimized for the application and ready to work right out of the box. The Hi STEP 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. Hi STEP is especially well suited for low stiffness loads (for example, a belt and pulley system) that sometime require conventional systems to inertia match with the additimal expensive and bulky gearbox.
Hi STEP also perform exceptionally, even under heavy loads and high speeds.



2. Closed Loop System

Hi STEP is an innovative closed loop stepping system that utilizes a high-resolution motor mounted encoder constantly to monitor the current position. The encoder feedback allows the Hi STEP to update the current position every 50 micro seconds. It allows the Hi STEP 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 but Hi STEP automatically correct the position by encoder feedback.

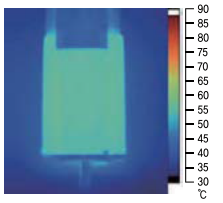


4. Heat Reduction / Energy Saving

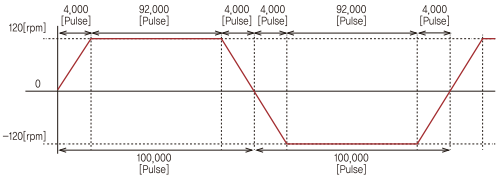
(Motor Current Control according to load)

Hi STEP automatically controls motor current according to load.

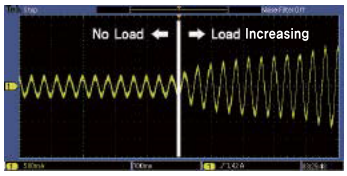
Hi STEP reduces motor current when motor load is low, and increases motor current when load is high. By optimizing the motor current, motor heat can be minimized and energy can be saved.



Motor temperature [Measured by Thermal Imaging Camera]



Condition to measure the motor temperature
[4hours operation, Motor surface temperature saturation]



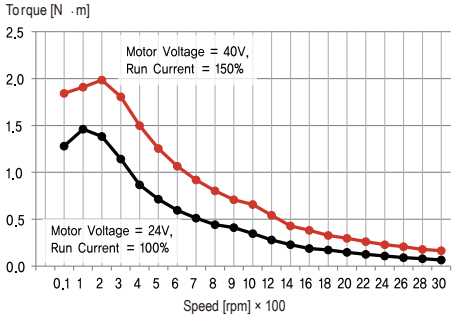
Example of the Motor Current Control according to load

5. Torque Improvement

(Motor Voltage Increasing and Motor Current Setting)

Hi STEP boosts the voltage supplied to the motor by internal DC-DC Converter. The torque at the high speed is increased. In addition, it is possible to set the Run Current up to 150%, whereby the torque at low speed is increased.

Torque can be improved by about 30% over the entire speed range.

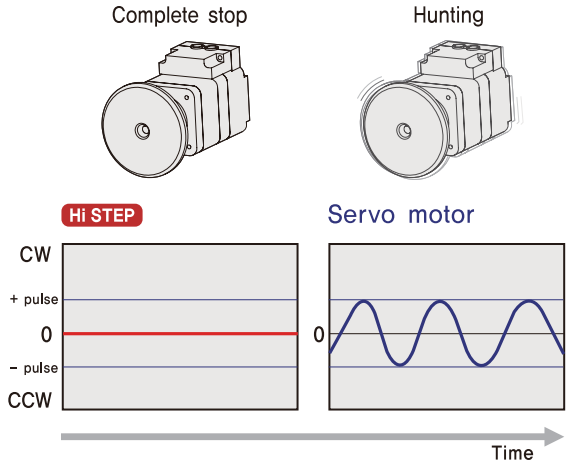


※ The torque at low speed and high speed is improved about 30%.

Measured Condition : Drive = Hi STEP-ECL-56L
Motor Voltage = 40VDC
Input Voltage = 24VDC

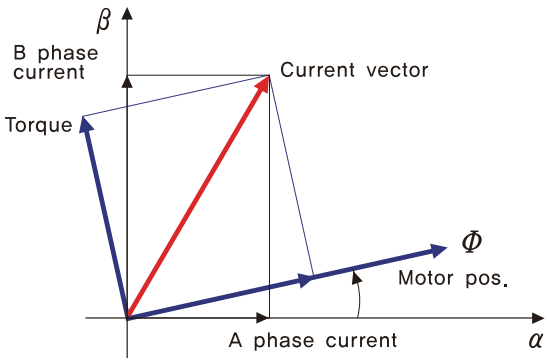
6. No Hunting

Traditional CC-Link 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 Hi STEP Motion Control System. Hi STEP 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.



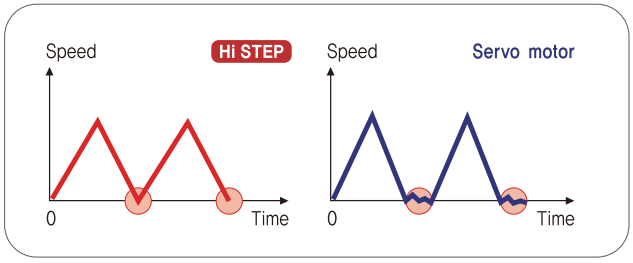
7. Smooth and Accurate

Hi STEP is a high-precision servo drive, using a high-resolution encoder with 20,000 pulses/revolution. Unlike a conventional Microstep drive, the on-board high performance ARM (Advanced RISC Machine) performs vector control and filtering, producing a smooth rotational control with minimum ripples.



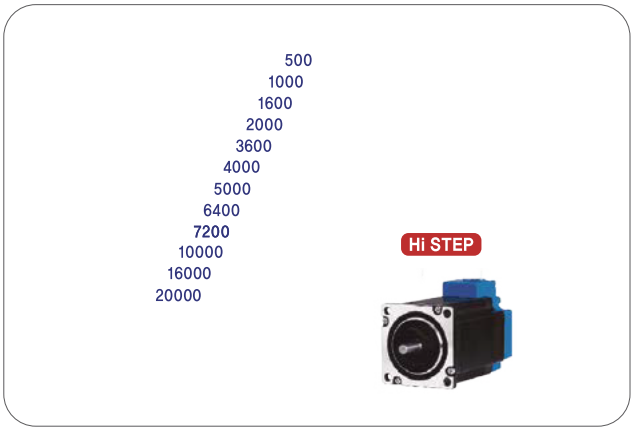
8. Fast Response

Similar to conventional stepping motors, Hi STEP instantly synchronizes with command pulses providing fast positional response. Hi STEP 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 called settling time between the command input signals and the resultant motion because of the constant monitoring of the current position.



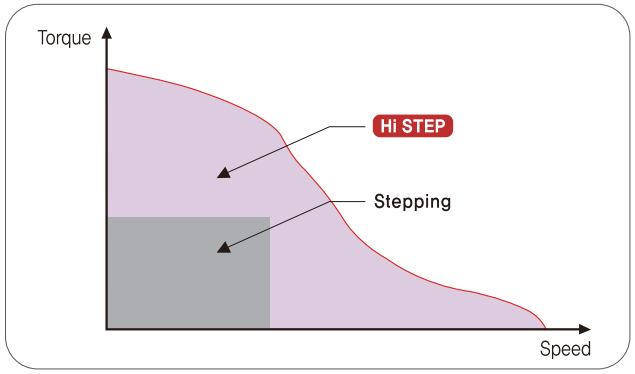
9. High Resolution

The unit of the position command can be divided precisely. (Max. 20,000 pulses/revolution)



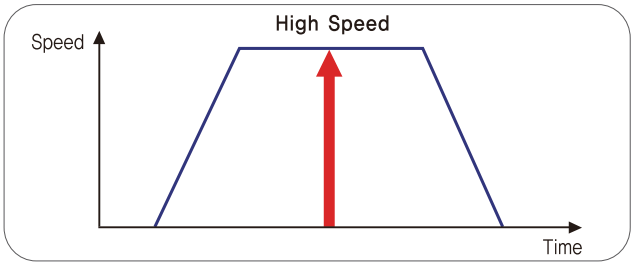
10. High Torque

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



11. High Speed

The Hi STEP operates well at high speed without the loss of synchronism or positioning error.
Hi STEP's ability of continuous current position monitoring of enables the stepping motor to generate high torque, even under a 100% load condition.



Advantages over Open-Loop Control Stepping Drive

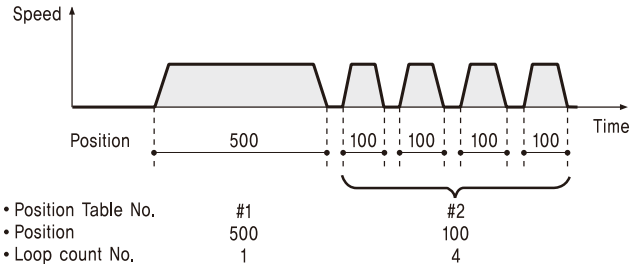
1. Reliable positioning without loss of synchronism.
2. Holding stable position and automatically recovering to the original position even after experiencing positioning error due to external forces, such as mechanical vibration or vertical positional holding.
3. Hi STEP utilizes 100% of the full range of rated motor torque, contrary to a conventional open-loop stepping driver that can use up to 50% of the rated motor torque due to the loss of synchronism.
4. Capability to operate at high speed due to load-dependant current control, open-loop stepping drivers use a constant current control at all speed ranges without considering load varitions.

Advantages over Servo Motor Controller

1. No gain tuning. (Automatic gain adjustment in response to a load change)
2. Maintains the stable holding position without oscillation after completion of positioning.
3. Fast positioning due to the independent control by on-board ARM.
4. Continuous operation during rapid short-stroke movement due to instantaneous positioning.

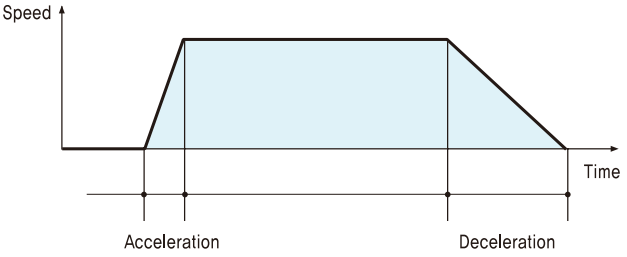
1. Loop Count

This function allows positioning repeatedly according to the Loop Count Number.



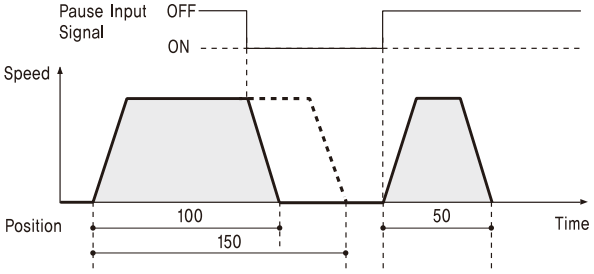
2. Acceleration/Deceleration

For quick acceleration and gradual deceleration, you can set each acceleration and deceleration time separately.



3. Pause

You can pause the motion upon the input of an external signal. When Pause signal change to OFF, the motor will restart to original target position.

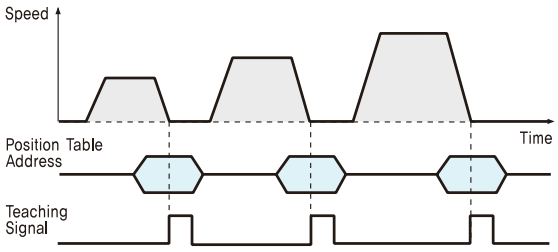


4. Alarm

The number of LED flashing time and information displayed on the 7-Segment indicates which Alarm has occurred.

5. Teaching

Teaching signal is used to memorize current Position data into the selected Position Table item.

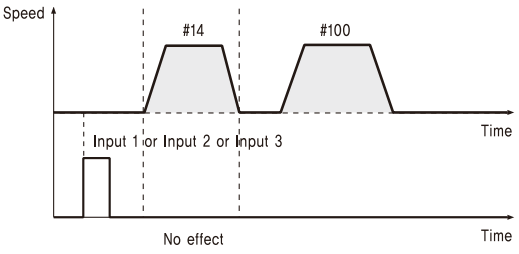


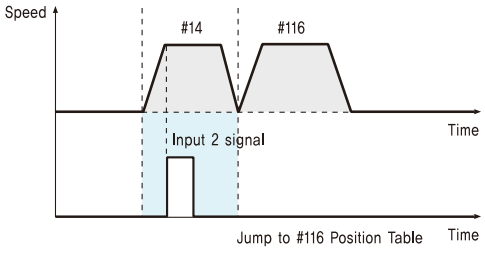
6. Jump

Within one Position Table, you can select various Position Table numbers that you want to jump.
With three external input signal during movement, the next jump Position Table number can be select.

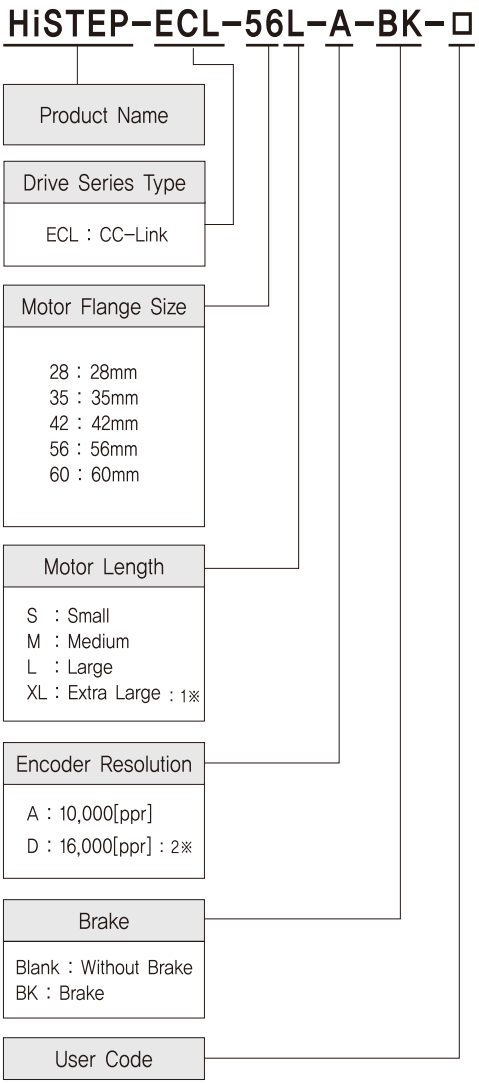
■ Position Table #14

Position	– – –	Next	– – –	Input 1	Input 2	Input 3	– – –
10000		100		115	116	117	





Hi STEP CC-Link Part Numbering



1※ : Moter langth XL only 42mm size

2※ : Encoder Resolution 16,000[ppr] only respond 28mm size

Standard Combination

Unit Part Number	Motor Model Number	Drive Model Number
HiSTEP-ECL-28S-D	Hi-EM-28S-D	Hi-ED-CL-28S-D
HiSTEP-ECL-28M-D	Hi-EM-28M-D	Hi-ED-CL-28M-D
HiSTEP-ECL-28L-D	Hi-EM-28L-D	Hi-ED-CL-28L-D
HiSTEP-ECL-35M-A	Hi-EM-35M-A	Hi-ED-CL-35M-A
HiSTEP-ECL-35L-A	Hi-EM-35L-A	Hi-ED-CL-35L-A
HiSTEP-ECL-42S-A	Hi-EM-42S-A	Hi-ED-CL-42S-A
HiSTEP-ECL-42M-A	Hi-EM-42M-A	Hi-ED-CL-42M-A
HiSTEP-ECL-42XL-A	Hi-EM-42XL-A	Hi-ED-CL-42XL-A
HiSTEP-ECL-56S-A	Hi-EM-56S-A	Hi-ED-CL-56S-A
HiSTEP-ECL-56M-A	Hi-EM-56M-A	Hi-ED-CL-56M-A
HiSTEP-ECL-56L-A	Hi-EM-56L-A	Hi-ED-CL-56L-A
HiSTEP-ECL-60S-A	Hi-EM-60S-A	Hi-ED-CL-60S-A
HiSTEP-ECL-60M-A	Hi-EM-60M-A	Hi-ED-CL-60M-A
HiSTEP-ECL-60L-A	Hi-EM-60L-A	Hi-ED-CL-60L-A

Combination with Brake

Unit Part Number	Motor Model Number	Drive Model Number
HiSTEP-ECL-42S-A-BK	Hi-EM-42S-A-BK	Hi-ED-CL-42S-A
HiSTEP-ECL-42M-A-BK	Hi-EM-42M-A-BK	Hi-ED-CL-42M-A
HiSTEP-ECL-42XL-A-BK	Hi-EM-42XL-A-BK	Hi-ED-CL-42XL-A
HiSTEP-ECL-56S-A-BK	Hi-EM-56S-A-BK	Hi-ED-CL-56S-A
HiSTEP-ECL-56M-A-BK	Hi-EM-56M-A-BK	Hi-ED-CL-56M-A
HiSTEP-ECL-56L-A-BK	Hi-EM-56L-A-BK	Hi-ED-CL-56L-A
HiSTEP-ECL-60S-A-BK	Hi-EM-60S-A-BK	Hi-ED-CL-60S-A
HiSTEP-ECL-60M-A-BK	Hi-EM-60M-A-BK	Hi-ED-CL-60M-A
HiSTEP-ECL-60L-A-BK	Hi-EM-60L-A-BK	Hi-ED-CL-60L-A

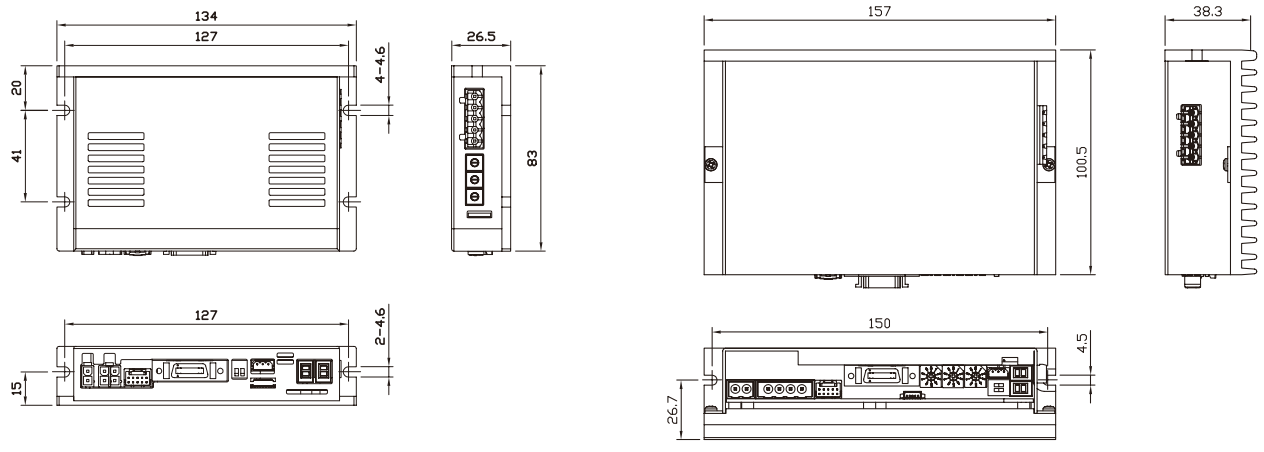
Specifications of Drive

Motor Model		Hi-EM-28 series	Hi-EM-35 series	Hi-EM-42 series	Hi-EM-56 series	Hi-EM-60 series
Driver Model		Hi-ED-CL-28 series	Hi-ED-CL-35 series	Hi-ED-CL-42 series	Hi-ED-CL-56 series	Hi-ED-CL-60 series
Input Voltage		24VDC ±10%				
Control Method		Closed loop control 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	0~3,000 [rpm] *1				
	Resolution [ppr]	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 (Selectable by parameter) *2				
	Protection Functions	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, ROM Error, Position Overflow Error				
	LED Display	Power status, Alarm status, In-Position status, Servo On status				
	In-Position Selection	0~63 (Selectable by parameter)				
	Position Gain Selection	0~63 (Selectable by parameter)				
	Rotational Direction	CW/CCW (Selectable by parameter)				
CC-Link	Station Type	Remote Device Station				
	Number of Occupied Station	1 station, 2 station				
I/O Signal	Input Signals	3 dedicated inputs (LIMIT+, LIMIT-, ORIGIN), 7 programmable inputs (Photocoupler)				
	Output Signals	6 programmable outputs (Photocoupler), Brake				

*1 : Up to the resolution of 10,000[ppr], maximum speed can be reached by 3,000[rpm] and with the resolution more than 10,000[ppr], maximum speed shall be reduced accordingly.

*2 : When selected resolution is more than encoder resolution, motor shall be operated by microstep between pulses.

Dimensions of Drive [mm]



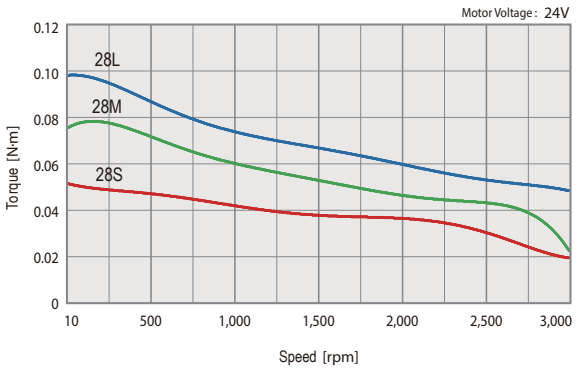
Specifications of Moter

MODEL			Hi-EM-28 series			Hi-EM-35 series		Hi-EM-42 series		
		UNIT	28S	28M	28L	35M	35L	42S	42M	42XL
DRIVE METHOD		-	BI-POLAR							
NUMBER OF PHASES		-	2	2	2	2	2	2	2	2
VOLTAGE		VDC	3.0	3.0	3.0	2.88	4.59	3.36	4.32	7.2
CURRENT per PHASE		A	0.95	0.95	0.95	0.6	0.85	1.2	1.2	1.2
RESISTANCE per PHASE		Ohm	3.2	3.2	3.2	4.8	5.4	2.8	3.6	6.0
INDUCTANCE per PHASE		mH	2.0	2.7	3.2	6.1	6.5	5.4	7.2	15.6
HOLDING TORQUE		N·m	0.069	0.098	0.118	0.05	0.176	0.32	0.44	0.65
ROTOR INERTIA		g·cm^2	9.0	13	18	8	11	35	54	114
WEIGHTS		g	110	140	200	120	200	250	280	500
LENGTH(L)		mm	32	45	50	26	38	34	40	60
PERMISSIBLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	30	30	30	22	22	22	22	22
	8mm		38	38	38	26	26	26	26	26
	13mm		53	53	53	33	33	33	33	33
	18mm		-	-	-	46	46	46	46	46
PERMISSIBLE THRUST LOAD		N	Lower than motor weight							
INSULATION RESISTANCE		Mohm	100 MIN.(at 500VDC)							
INSULATION CLASS		-	CLASS B(130℃)							
OPERATING TEMPERATURE		℃	0 to 55							

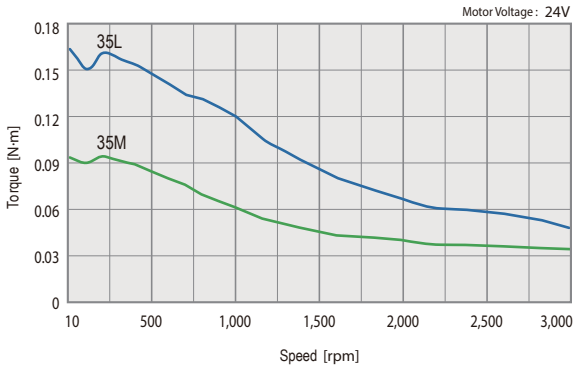
MODEL			Hi-EM-56 series			Hi-EM-60 series		
		UNIT	56S	56M	56L	60S	60M	60L
DRIVE METHOD		-	BI-POLAR					
NUMBER OF PHASES		-	2	2	2	2	2	2
VOLTAGE		VDC	1.56	1.62	2.64	1.32	1.48	2.2
CURRENT per PHASE		A	3.0	3.0	3.0	4.0	4.0	4.0
RESISTANCE per PHASE		Ohm	0.52	0.54	0.88	0.33	0.37	0.55
INDUCTANCE per PHASE		mH	1.2	2.0	4.0	0.75	1.1	2.7
HOLDING TORQUE		N·m	0.64	1.0	1.5	0.88	1.28	2.4
ROTOR INERTIA		g·cm^2	180	280	520	240	490	690
WEIGHTS		g	500	720	1150	600	1000	1300
LENGTH(L)		mm	46	55	80	47	56	85
PERMISSIBLE OVERHUNG LOAD (DISTANCE 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 THRUST LOAD		N	Lower than motor weight					
INSULATION RESISTANCE		Mohm	100 MIN.(at 500VDC)					
INSULATION CLASS		-	CLASS B(130℃)					
OPERATING TEMPERATURE		℃	0 to 55					

Torque Characteristics of Motor

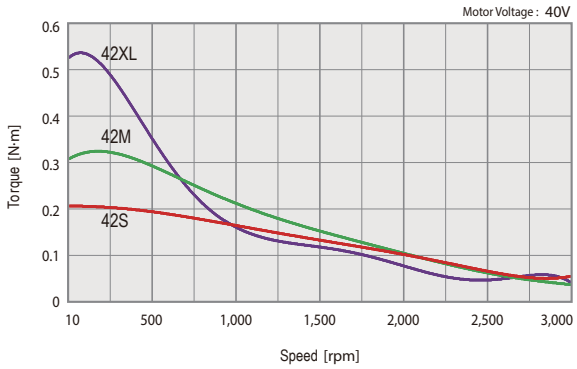
HiSTEP-ECL-28 series



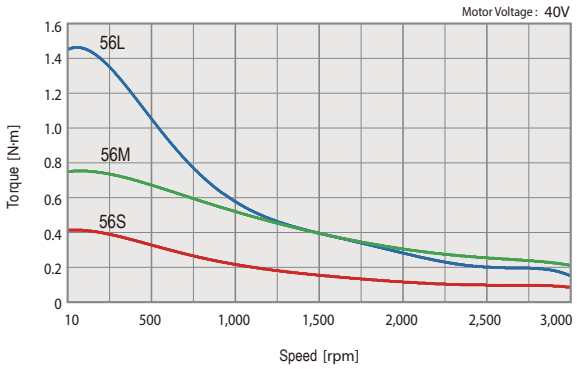
HiSTEP-ECL-35 series



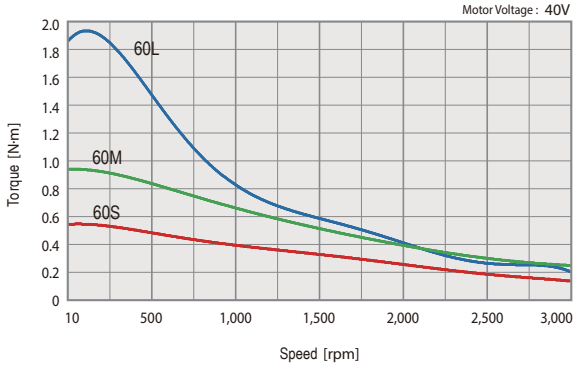
HiSTEP-ECL-42 series



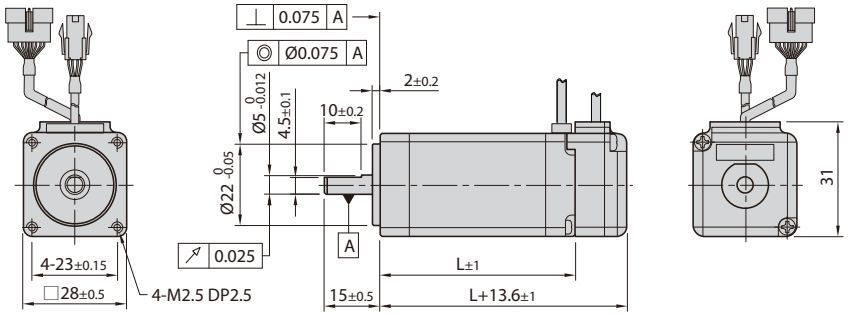
HiSTEP-ECL-56 series



HiSTEP-ECL-60 series

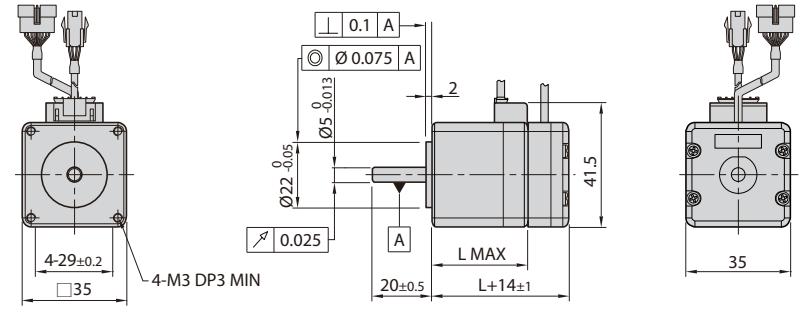


Dimensions of Motor [mm]



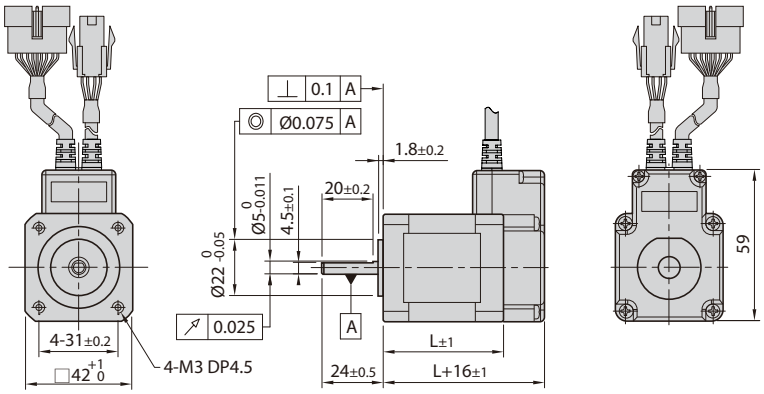
28mm

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



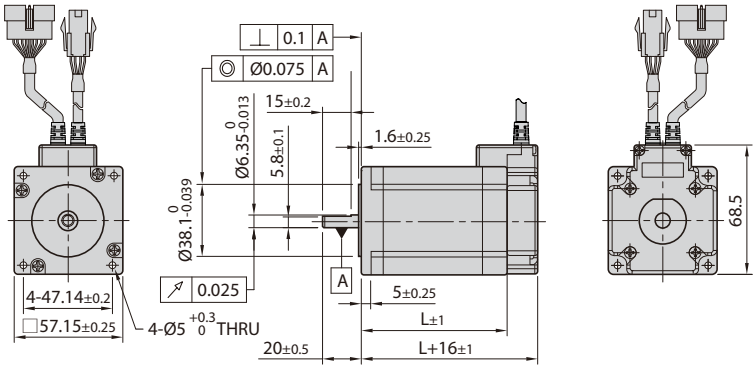
35mm

Model name	Length(L)
Hi-EM-35M	32
Hi-EM-35L	36



42mm

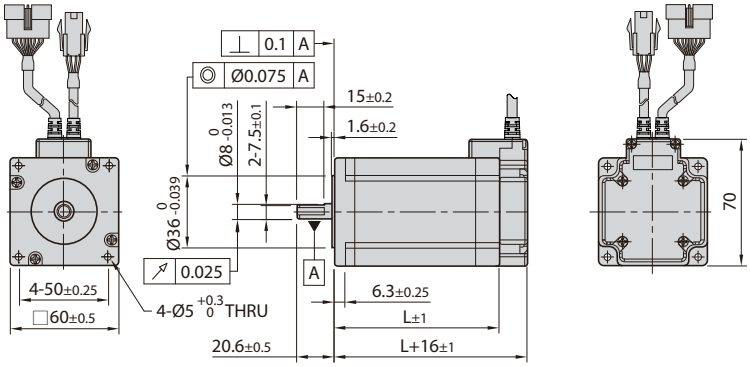
Model name	Length(L)
Hi-EM-42S	34
Hi-EM-42M	40
Hi-EM-42XL	60



56mm

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

※ There are 2 kinds size of front shaft diameter for Hi-EM-56 series as Ø6.35 and Ø8.0.



60mm

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

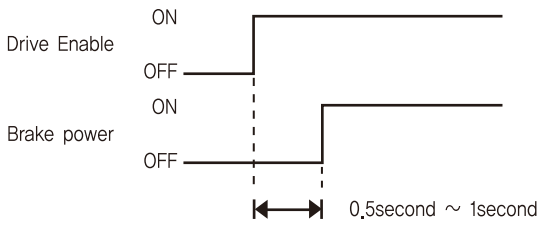
Specifications of Motor with Brake

Unit Part Number	Motor Model Number	Electronic Brake					Motor Unit Weight [g]	Permitted Overhung Load [N]				Permitted Thrust Load [N]
		Type	Voltage Input [V]	Rated Current [A]	Power Consumption [W]	Statical Friction Torque [N·m]		Length from Motor Point [mm]				
								3	8	13	18	
HiSTEP-CL-42S-■-BK	Hi-EM-42S-■-BK	Non-excitation run Type	24VDC ±10%	0.2	5	0.2	510	22	26	33	46	Must be Lower than Unit's Weight
HiSTEP-CL-42M-■-BK	Hi-EM-42M-■-BK						570					
HiSTEP-CL-42XL-■-BK	Hi-EM-42XL-■-BK						770					
HiSTEP-CL-56S-■-BK	Hi-EM-56S-■-BK			0.27	6.6	0.7	1030	52	65	85	123	
HiSTEP-CL-56M-■-BK	Hi-EM-56M-■-BK						1190					
HiSTEP-CL-56L-■-BK	Hi-EM-56L-■-BK						1630					
HiSTEP-CL-60S-■-BK	Hi-EM-60S-■-BK						1150	70	87	114	165	
HiSTEP-CL-60M-■-BK	Hi-EM-60M-■-BK						1350					
HiSTEP-CL-60L-■-BK	Hi-EM-60L-■-BK						1960					

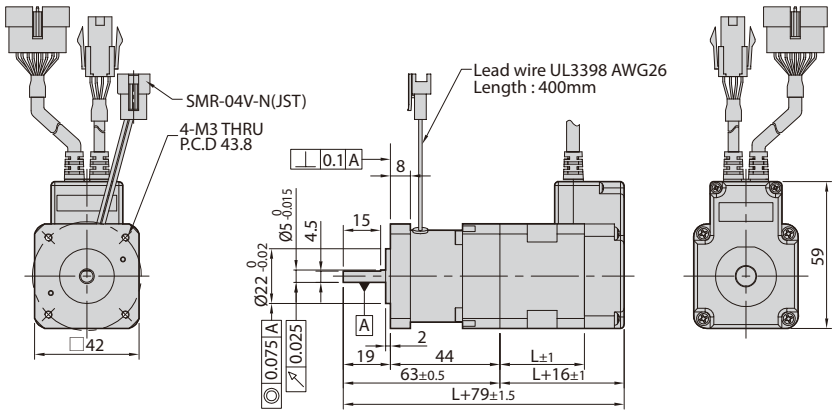
* The code of encoder resolution will be marked in "■"
* Electronic Brake cannot be used for braking. Position hold purpose only when power OFF.
* The weight means Motor Unit Weight including Motor and Electronic Brake.
* Motor Model Number is combined model name of Motor and Brake.
* Motor specification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

* Brake Operation Timing Chart

Hi STEP CC-Link controls Brake by Drive automatically.
Please refer to below Timing Chart when Brake is controlled by the upper controller other than using Hi STEP CC-Link Brake control. Otherwise, Drive malfunctioning and loads can be fall down.
Also, please do not operate Brake while motor operation to prevent damage.

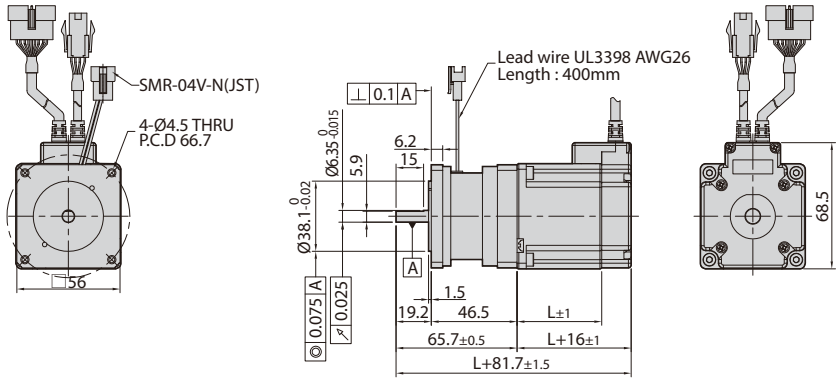


Dimensions of Motor With Brake [mm]



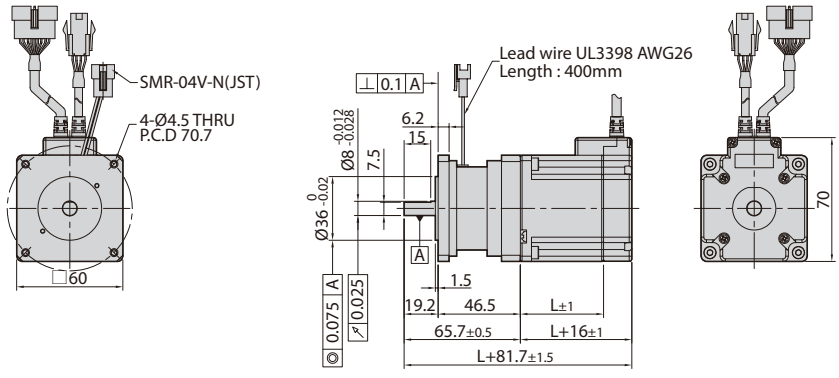
42mm

Model Name	Length(L)	Weight(kg)
Hi-EM-42S	34	0.51
Hi-EM-42M	40	0.57
Hi-EM-42XL	60	0.77



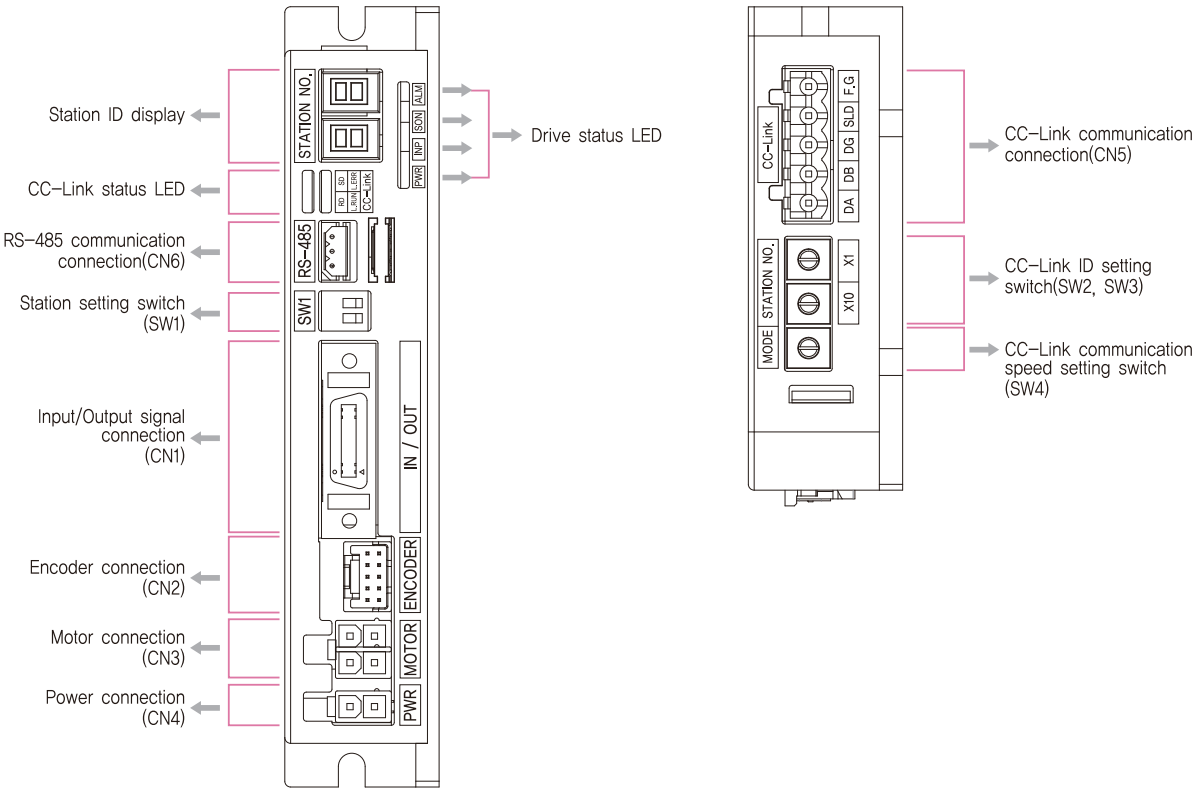
56mm

Model Name	Length(L)	Weight(kg)
Hi-EM-56S	46	1.03
Hi-EM-56M	55	1.19
Hi-EM-56L	80	1.63



60mm

Model Name	Length(L)	Weight(kg)
Hi-EM-60S	47	1.15
Hi-EM-60M	56	1.35
Hi-EM-60L	85	1.96


Station ID display
CC-Link status LED
RS-485 communication connection(CN6)
Station setting switch (SW1)
Input/Output signal connection (CN1)
Encoder connection (CN2)
Motor connection (CN3)
Power connection (CN4)
Drive status LED
CC-Link communication connection(CN5)
CC-Link ID setting switch(SW2, SW3)
CC-Link communication speed setting switch (SW4)
STATION NO.
ALM
SDN
INP
PWR
SD
RD
L.RUN
L.ERR
CC-Link
RS-485
SW1
IN / OUT
ENCODER
MOTOR
PWR
F.G
SLD
DG
DB
DA
X1
X10
MODE

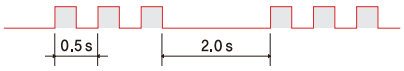
1. Drive Status LED

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 parameter
SON	Orange	Servo On / Off Indication	Servo On: Lights On, Servo Off: Lights Off
ALM	Red	Alarm indication	Flash when protection function is activated

■ Protection functions and LED flash times

Times	Error Code*4	Protection	Conditions
1	E-□01	Over Current Error	The current through power devices in inverter exceeds the limit value *1
2	E-□02	Over Speed Error	Motor speed exceeds 3,000 [rpm]
3	E-□03	Position Tracking Error	Position error value is higher than 180° in motor run state *2
4	E-□04	Over Load Error	The motor is continuously operated more than 5 seconds under a load exceeding the max. torque
5	E-□05	Over Temperature Error	Temperature of inside of drive exceed 85℃
6	E-□06	Over Regeneratived Voltage Error	Back-EMF is higher than limit value *3
7	E-□07	Motor Connect Error	The power is ON without connection of the motor cable to drive
8	E-□08	Encoder Connect Error	Cable connection error in Encoder connection of drive
10	E-□0A	In-Position Error	After operation is finished, a position error occurs
12	E-□0C	ROM Error	Error occurs in parameter storage device(ROM)
15	E-□0F	Position Overflow Error	Position error value is higher than 180° in motor stop state *2

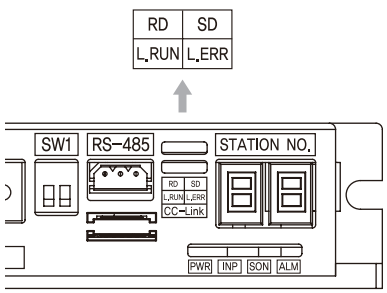
*1 : Limit value depends on motor model. (Refer to the Manual)
*2 : Default value can be changed by parameter. (Refer to the Manual)
*3 : Voltage limit of Back-EMP depends on motor model. (Refer to the Manual)
*4 : When an alarm occurs, error code is displayed on the 7-segment instead of CC-Link ID.
※ Please refer to the Manual for the details of protection functions.
※ □ is the CC-Link error code.



Alarm LED flash
(Ex, Position tracking error)

2. CC-Link Status LED

Name	Color	Status	Function	Explanation
L.RUN	Green	Off	Power Off	Checking the power status.
			No network connection	Checking the status of the network cable and Master controller.
		On	Normal operation	CC-Link network connection is normal status.
L.ERR	Red	Off	Normal operation	No error occurred
		On	Critical error	Communication process fails.
		Flashing	Communication error	Error occurred in the CC-Link network. Check the 7-segment display information and process it.
		Random flashing	CRC error, Network cable error	There is a contact error of the network connector or noise in the cable line. To Check the terminating resistor attachment status, network wiring and the grounding status of the frame.
RD	Orange	Off	No Data receiving	
		On	Data receiving	
SD	Yellow	Off	No Data transmissiOn	
		On	Data transmitting	



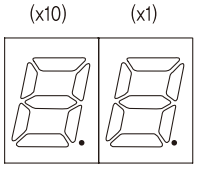
■ CC-Link network status 7-segment display information

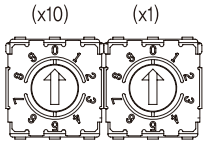
Error Code	Description
E-0□□.	Normal CC-Link network status
E-1□□.	CC-Link station number switch setting is incorrect
E-2□□.	CC-Link mode switch setting is incorrect
E-3□□.	CC-Link station number switch setting is changed
E-4□□.	CC-Link mode switch setting is changed
E-5□□.	CRC error occurs in CC-Link communication
E-6□□.	Timeout occurs during communication with master
E-7□□.	Communication with master is disconnected
E-8□□.	CC-Link Processor Error 1
E-9□□.	CC-Link Processor Error 2
E-A□□.	Data link error
E-B□□.	Remote I/O error
E-C□□.	Remote register error

※□□ is the drive error code.

3. CC-Link Station Display and Setting Switch(SW2, SW3)

There are two Rotary switch to set value of CC-Link station No. Switch on the right side(×1) indicates the one's(1) digit and Switch on the left side(×10) indicates ten's(10) digit.





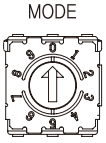
※ Default setting is '00'

4. CC-Link Communication Speed Setting Switch(SW4)

This is a switch to set communication speed of CC-Link. (The case of the product is marked with 'MODE'.)

MODE	CC-Link Baud Rate
0	156 kbps*1
1	625 kbps
3	2.5 Mbps
4	5 Mbps
5	10 Mbps
6	NONE
7	NONE
8	NONE
9	NONE

*1 : Defaule = 156kbps



5. CC-Link Station Setting Switch(SW1)

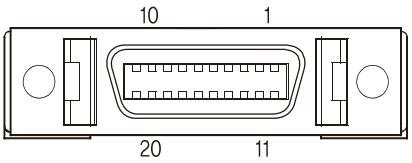
Hi STEP CC-Link provides various functions depending on the station occupancy. Select the station occupancy with Dip-switch(SW1).

SW1.1	SW1.2	Occupation
OFF	OFF	1 station occupation*1
ON	OFF	2 station occupation

*1 : Defaule = '1 station occupation'

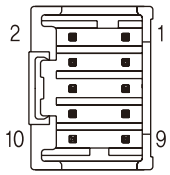
6. Input/Output Signal Connector(CN1)

NO.	Function	I/O
1	LIMIT+	Input
2	LIMIT−	Input
3	ORIGIN	Input
4	Digital In1	Input
5	Digital In2	Input
6	Digital In3	Input
7	Digital In4	Input
8	Digital In5	Input
9	Digital In6	Input
10	Digital In7	Input
11	Digital Out1	Output
12	Digital Out2	Output
13	Digital Out3	Output
14	Digital Out4	Output
15	Digital Out5	Output
16	Digital Out6	Output
17	BRAKE+	Output
18	BRAKE−	Output
19	EXT_GND	Input
20	EXT_24VDC	Input



7. Encoder Connector(CN2)

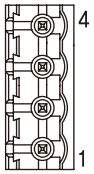
NO.	Function	I/O
1	A+	Input
2	A−	Input
3	B+	Input
4	B−	Input
5	Z+	Input
6	Z−	Input
7	5VDC	Output
8	GND	Output
9	F.GND	----
10	F.GND	----



8. Motor Connector(CN3)

NO.	Function	I/O
1	A Phase	Output
2	B Phase	Output
3	/A Phase	Output
4	/B Phase	Output

NO.	Function	I/O
1	/B Phase	Output
2	B Phase	Output
3	/A Phase	Output
4	A Phase	Output



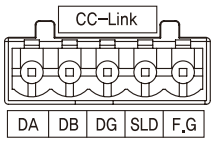
9. Power Connector(CN4)

NO.	Function	I/O
1	24VDC	Input
2	GND	Input

NO.	Function	I/O
1	GND	Input
2	40~70VDC	Input

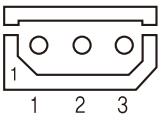
10. CC-Link Communication Connector(CN5)

NO.	Function
1	DA
2	DB
3	DG
4	SLD
5	F.GND

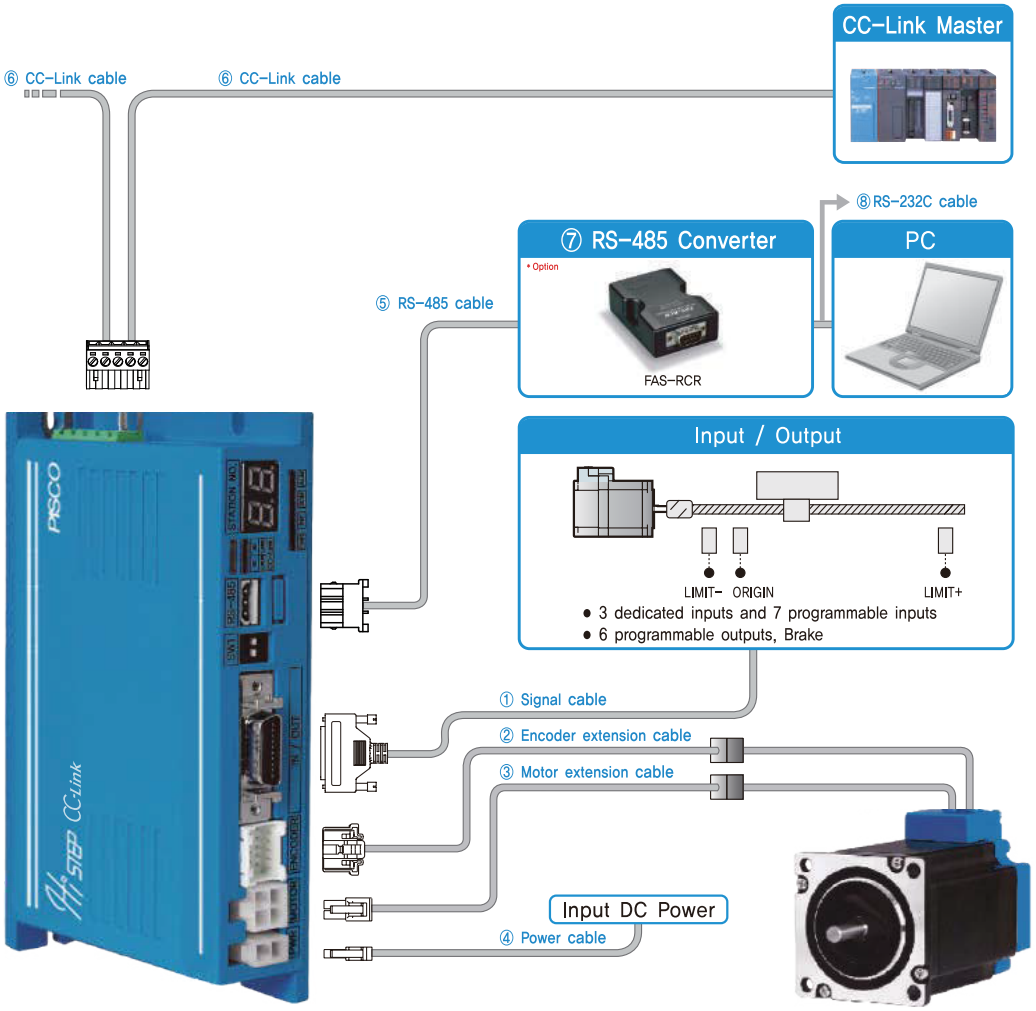


12. RS-485 Communication Connector(CN6)

NO.	Function
1	Data+
2	Data−
3	GND



System Configuration



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable	CC-Link Cable	RS-485 Cable
Length supplied	–	30cm	30cm	–	–	–
Max. Length	20m	20m	20m	2m	100m	2m

1. Options

① Signal Cable

Available to connect between Input/Output signals and Hi STEP CC-Link.

Item	Length [m]	Remark
CSVN-S-□□□F	□□□	Normal Cable
CSVN-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 Hi STEP CC-Link.

Item	Length [m]	Remark
CSVO-E-□□□F	□□□	Normal Cable
CSVO-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 Hi STEP CC-Link.

Item	Length [m]	Remark
CSVO-M-□□□F	□□□	Normal Cable
CSVO-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 Hi STEP CC-Link.

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

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

⑤ RS-485 Cable

Hi STEP CC-Link RS-485 network.

Item	Length [m]	Remark
CGNR-RT-□□□F	□□□	Normal Cable

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

⑥ CC-Link Network Cable

It is a cable to connect Hi STEP CC-Link to CC-Link network.

* This cable is not provided and it is recommended to use the cable specified by CC-Link Association.

⑦ FAS-RCR(RS-232C to RS-485 Converter)

Item	Specification
Comm. Speed	Max. 115.2 [kbps]
Comm. Distance	RS-232C: Max. 15m RS-485: Max. 1.2km
Connection Type	RS-232C: DB9 Female RS-485: RJ-45
Dimension	50×75×23mm
Weight	38g
Power	Powered from PC (Usable for external DC5~24V)

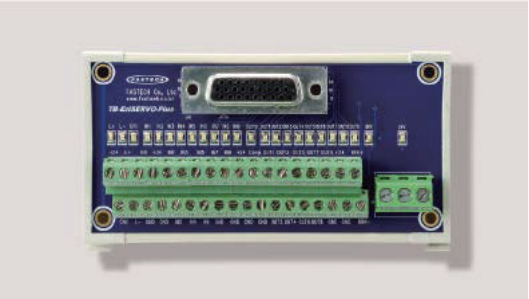
⑧ RS-232C Cable

Available to connect between RS-232C port of master and FAS-RCR.

Item	Length [m]	Remark
CGNR-C-002F CGNR-C-003F CGNR-C-005F	2 3 5	Normal Cable

⑨ TB-Plus(Interface Board)

Available to connect more conveniently between Input/Output signal and Hi STEP CC-Link.



⑩ Interface Cable

Available to Connect between TB-Plus Interface Board and Hi STEP CC-Link.

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

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

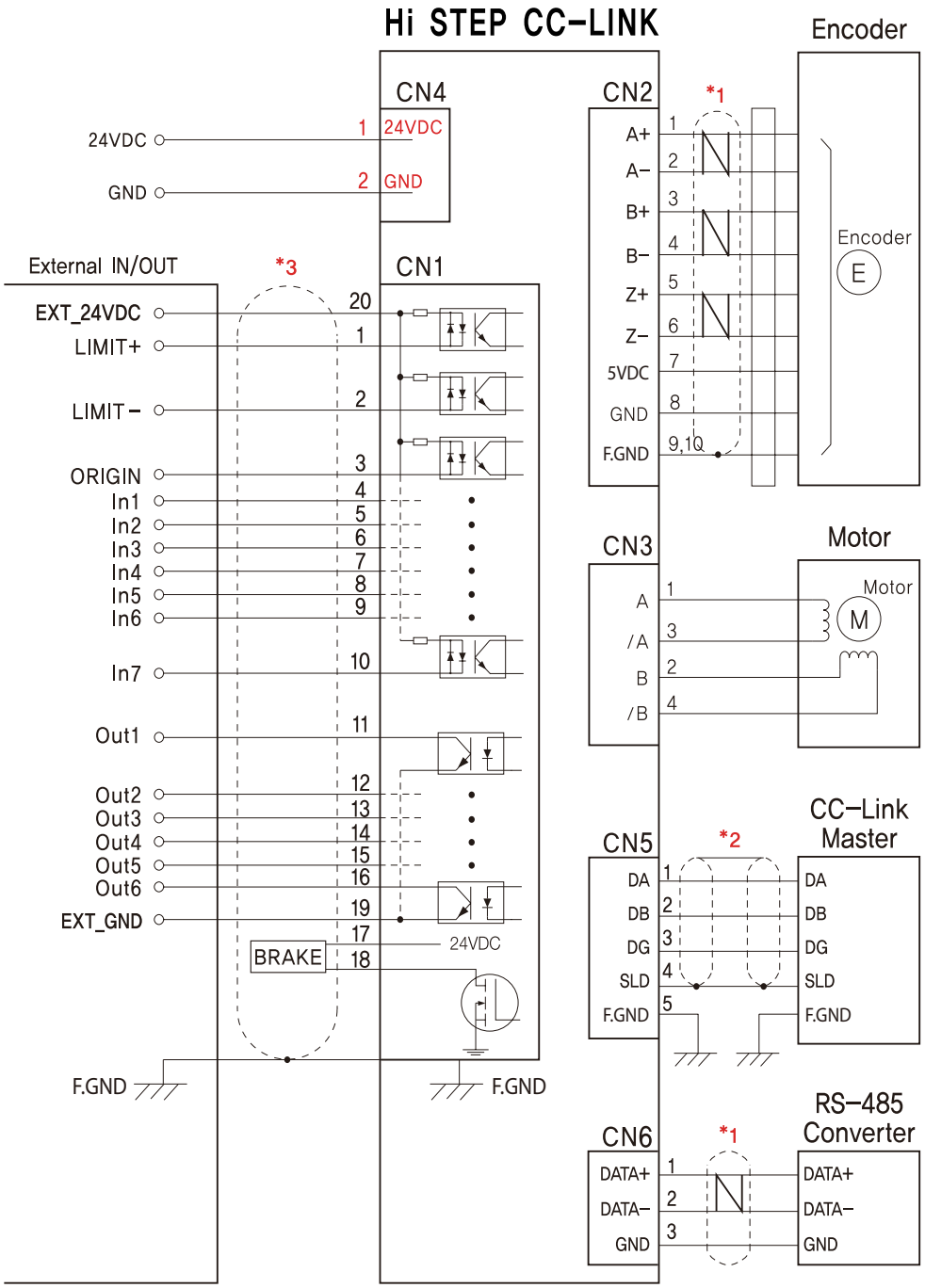
2. Connector Specifications

Connector specifications for cabling to drive.

Purpose		Item	Part Number	Manufacturer
Power (CN4)		Housing Terminal	5557-02R 5556T	MOLEX
Motor	Drive Side (CN3)	Housing Terminal	5557-04R 5556T	MOLEX
	Motor Side	Housing Terminal	5557-04R 5556T	MOLEX
Encoder	Drive Side (CN2)	Housing Terminal	51353-1000 56134-9000	MOLEX
	Encoder Side	Housing Terminal	SMP-09V-NC SHF-001T-0.8BS	JST
Signal (CN1)		Connector Backshell	10120-3000PE 10320-52A0-008	3M
CC-Link Communication (CN5)		Terminal Block	AK950-5	PTR
RS-485 Communication (CN6)		Housing Terminal	5264-03 5263PBT	MOLEX

※ Above Connector is the most suitable product for the drive applied. Another equivalent Connector can be used.

External Wiring Diagram



* 1) Shielded Twisted Pair Cable

* 2) CC-Link Cable

* 3) Shield Cable

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

CAUTION

Please refer to the Manual when connects motor extension cable.

Careful connection will be required to protect the drive from any damages.

PISCO

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