Electric Actuator

No. PK-HiSERV025-10

PISCO

http://www.pisco.co.kr

Hi-SERVO

Stepping motor control system without step out

Pulse EtherCAT Ethernet CC-Link

PISCO KOREA

Company Introduction

PISCO KOREA

NIHON PISCO, was established 1976 in Nagano Prefecture, Japan. After foundation of U.S., Taiwan, and Singapore branch, Korean subsidiary PISCO KOREA PNEUMATICS Co., Ltd. was founded in 1999 at Yeouido, Seoul(transferred head office to Seowoon Industrial Complex to Incheon in 2019). PISCO KOREA is a global company specializing in pneumatic and electric devices, and under the slogan Humanism&System, all employees continue to grow every year with like a family, teamwork and a great office system.

History

1976 NIHON PISCO Co., Ltd. Established

1986 The Ina Plant (current Ina 1st Plant) newly constructed

1992 PISCO TAIWAN Co., Ltd.established

1993 PISCO USA, Inc. established

1994 ISO 9001 (Quality Management System) certification was acquired

1996 The Ina Second Plant newly constructed

1998 ISO 14001 (environmental management system) certification was acquired

1999 PISCO KOREA PNEUMATICS Co., Ltd. established

2010 NIHON PISCO TAIWAN Co., Ltd. established.

2013 The Ina Third Plant newly constructed

2014 Launches CARTESIAN ROBOT of PISCO KOREA Co., Ltd.
Logistic Center&Manufacturing Site established of PISCO KOREA Co., Ltd.

2015 Certification of corporate research insitute of PISCO KOREA Co., Ltd.
Launches BELT TYPE ROBOT "PSR Series" of PISCO KOREA Co., Ltd.
Expanded relocation Head office of PISCO KOREA Co., Ltd.

2018 Launches VP-CLF Series , VL Series of PISCO KOREA Co., Ltd.
PISCO VIETNAM Co., Ltd. (sales office) opened

2019 Completion of the new building of PISCO KOREA Co., Ltd.
ISO 9001 (quality management system) certification was acquired in KOREA

2020 Change mission of PISCO KOREA
PISCO KOREA CO., LTD. ▶ PISCO KOREA Co., Ltd.

2021 Three Million Dollar Export Tower Award

2022 Large-flow Multi Vacuum Gripper VLG

2023 Launches Vacuum Generator VA Series

2024 Launches Cartesian Robot PER Series and Electric Actuator PE Series of PISCO KOREA Co., Ltd.

Business

Pisco Korea products consist of Vacuum, Drive, Control, Piping and Electric equipments that use air and electricity, and are used for factory automation of industrial devices in various fields such as semiconductors, OLEDs, mobile phones, secondary batteries, and automobiles.

Certificate

INDEX

Hi-SERVO series

Hi-SERVO Pulse 005

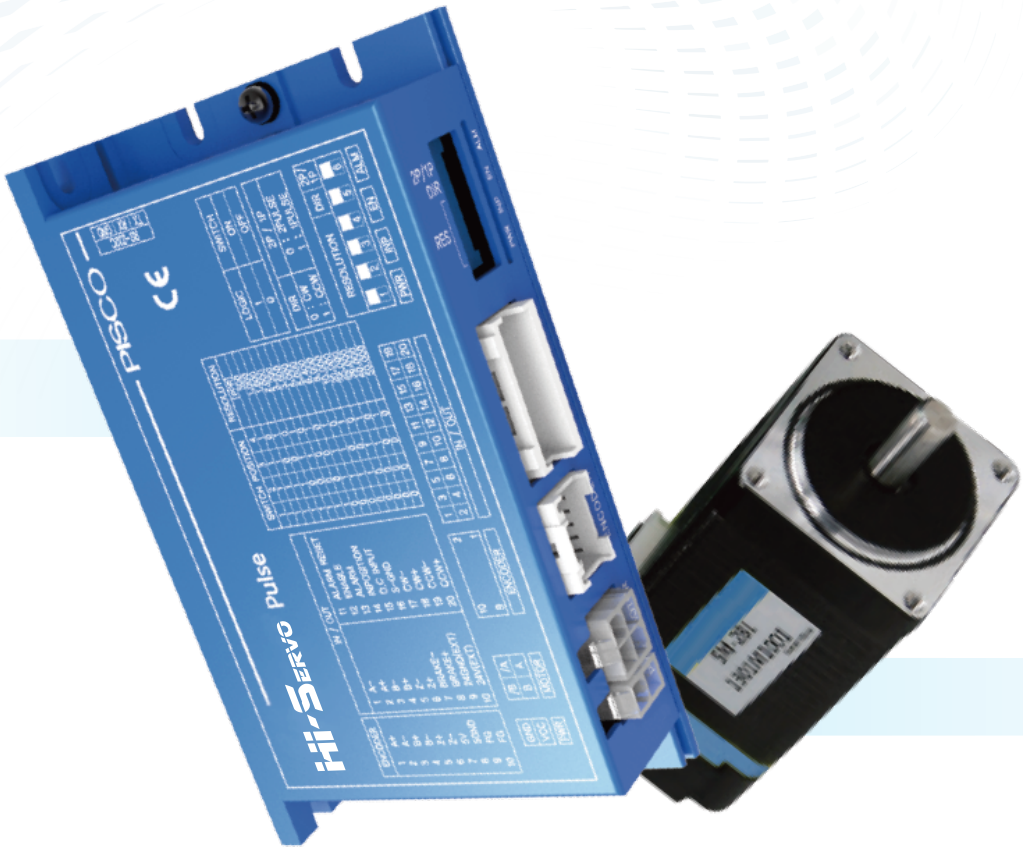
Hi-SERVO EtherCAT 021

Hi-SERVO Ethernet 041

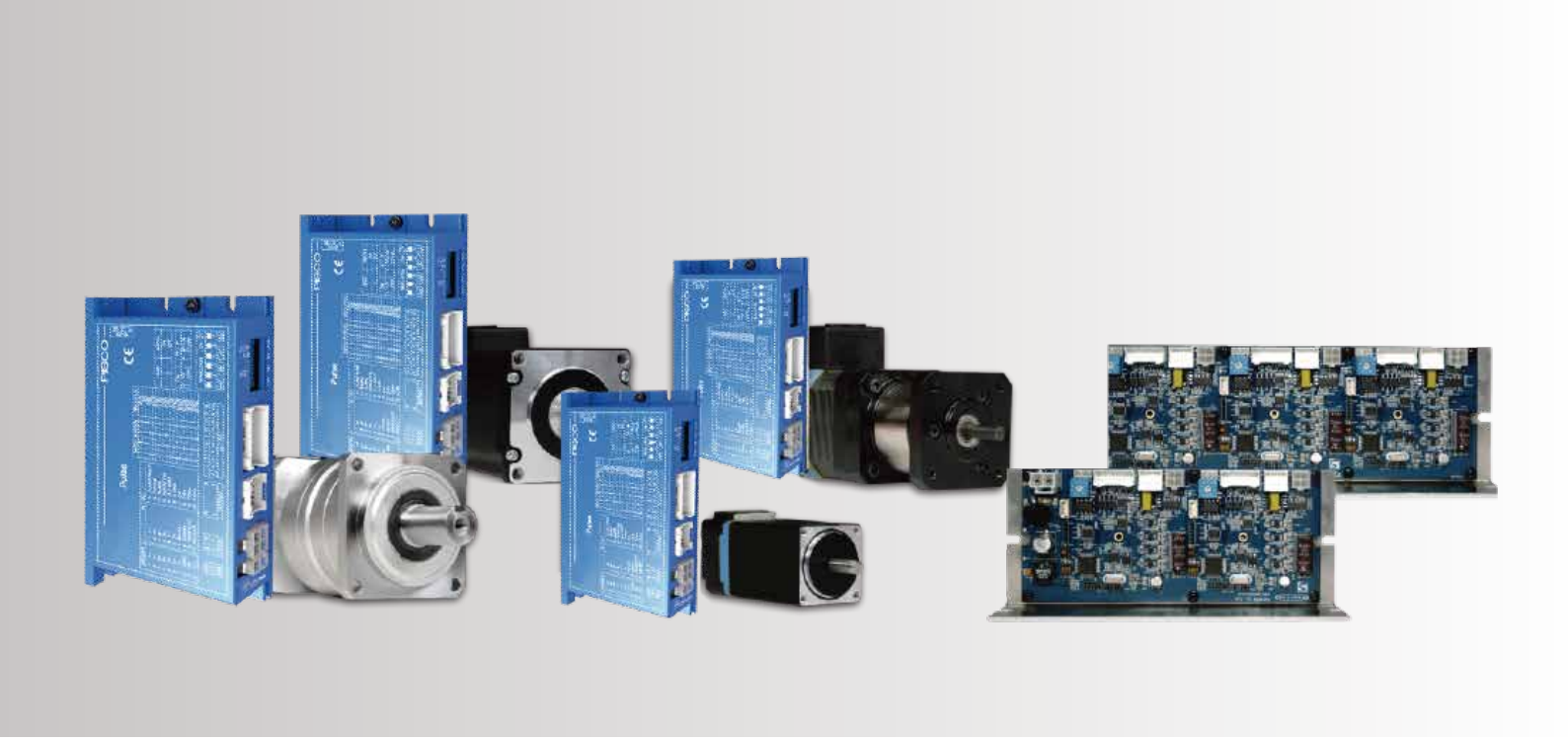
Hi-SERVO CC-Link 063

Hi-Servo Pulse

Stepping Motor Control System Without Step out

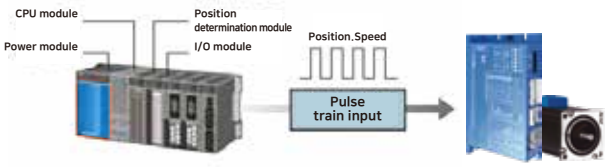


- Completely free from the Concern of Loss of Position
- Perfect Positioning and Completion
- Don’t Care what the Phase of Motor is
- Reduce the Moto Temperature and Energy Usage
- Torque Improvement by Run Current Control



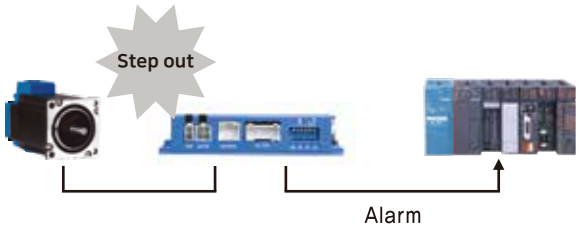
1. Pulse train input System

Hi-SERVO motor series is a standalone stepping motor control system that drives the motor by receiving pulse signals from the positioning module(pulse oscillator).



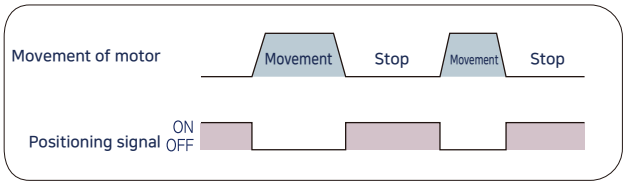
2. No Step Out

(Alarm signal output when step-out occurs)
Hi-SERVO is a servo system that can prevent step-out by constantly monitoring the current position with an encoder mounted on the motor. If a position error occurs due to external force or overload, the upper controller can report the alarm staus, check the operating state of the motor, and take appropriate measures.



3. Position completion signal fuction

Hi-SERVO is a motor that sends a position completion signal to the upper controller when it stops at the target position, detected by the encoder. This solves the problem of uncertainty in position completion, which is a disadvantage of the open-loop type system.

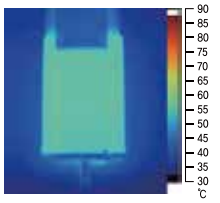


4. High-Precision Control

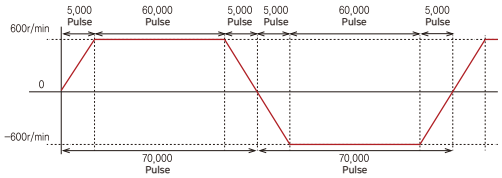
Hi-SERVO controls position by using high-precision encoder.The position accuracy of Hi-SERVO is determined by the precision of the encoder mounted on the motor, regardless of the type of motor is 2-phase and 5-phase, so it can achieve high-precision position determination compared to the open-loop type drive using 2-phase and 5-phase motors.

5. Low Heat Generation / Energy Savings

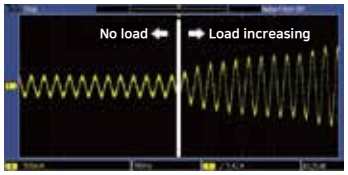
Hi-SERVO automatically controls motor current according to load. Hi-SERVO reduces motor current when motor load is low and increases motor current when load is high. By optimizing the motor current, motor heat can be minimized and energy can be saved.



Motor temperature[Thermography]



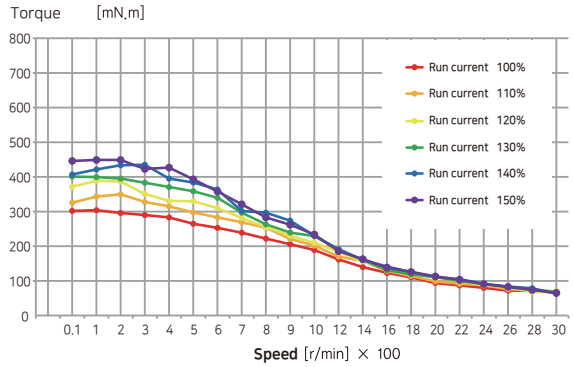
Condition to measure the motor temperature
[4hours operation, Motor surface temperature saturation]



Example of the Motor Current Control according to load

6. High Torque

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

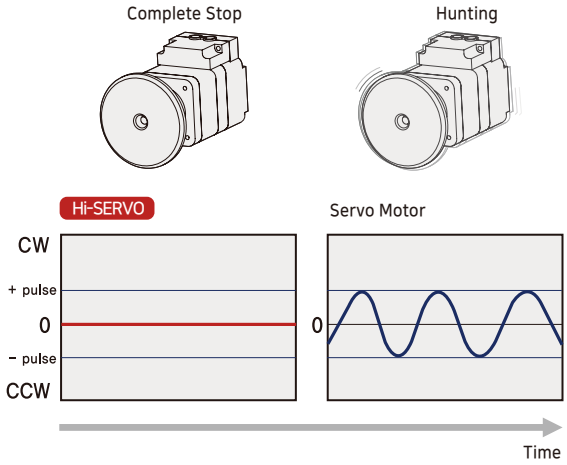


※ The torque at low speed and high speed is improved about 30%

Measured Condition : Drive = HSC-SST-42XL
Motor Voltage = DC24V
Input Voltage = DC24V

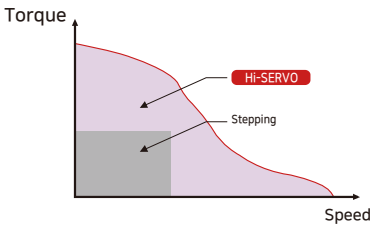
7. No Hunting

Hi-SERVO utilizes the unique characteristics of stepping motors and locks itself into the desired target position, perventing vibration and eliminating Null Hunt which happens to the conventional servo systems. This feature is especially useful in applications such as vision systems in which system oscillation and vibration could be a problem.



8. High Torque / Continuous Operation

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



9. Variety of Protection Functions

Drive and equipment can be protected by the alarm(1 kinds) of such as motor connection error, encoder connection error and other errors that can be occurred while installation and running the device.

10. Variety of Position Command Unit

Hi-SERVO is a device that can adjust the resolution by dividing the position command according to the purpose.(-Maximum 50,000 pulses/resolution)

Hi-SERVO Pulse

HSC	-	SST	-	56	L	-	A	-	BK	-	PN05
Hi-SERVO Combination		①		②	③		④		⑤		⑥

① Communication Type

SST	Pulse

② Motor Size

28	28mm
35	35mm
42	42mm
56	56mm
60	60mm

③ Motor Length

S	Small
M	Medium
L	Large
XL	Extra Large (※)

※ Motor length XL is only 42mm Size.

④ Encoder Resolution

A	10,000P/R
D	16,000P/R (※)

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

⑤ Brake

None	Without Brake
BK	Brake

※ If you need a speed reducer, contact your dealer or sales office.

⑥ Gear Ratio

None	Without Gear
PN03	1:3
PN05	1:5
PN08	1:8
PN10	1:10
PN15	1:15
PN25	1:25
PN40	1:40
PN50	1:50

Standard Combination

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

※ When places an order for Stopper type 28mm,35mm motor, please write 'M' additionally after motor length of unit product number. (ex. HSC-SST-28LM-D)

Combination with Brake

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

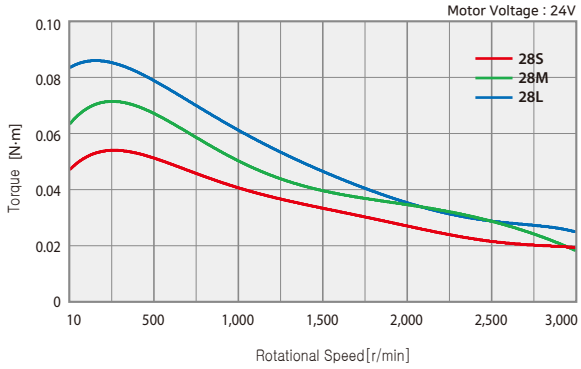
Specification of Motor

Model		Unit	HS-SM-28 series			HS-SM-35 series	
			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		Ω	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·㎠	9.0	13	18	10	14
Weights		g	110	140	200	120	180
Length(L)		mm	32	45	50	26	36
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				

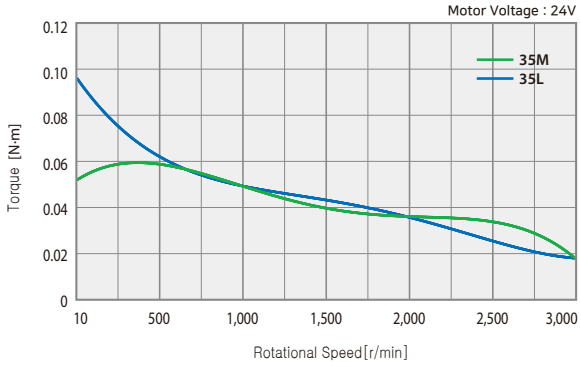
Model		Unit	HS-SM-42 series			HS-SM-56 series			HS-SM-60 series		
			42S	42M	42XL	56S	56M	56L	60S	60M	60L
Drive Method		-	BI-POLAR								
Number Of Phases		-	2	2	2	2	2	2	2	2	2
Voltage		VDC	2.8	2.8	7.2	1.96	2.52	3.16	1.32	1.48	2.2
Current per Phase		A	1.3	1.68	1.2	2.8	2.8	2.8	4.0	4.0	4.0
Resistance per Phase		Ω	2.1	1.65	6.0	0.7	0.9	1.13	0.33	0.37	0.55
Inductance per Phase		mH	2.5	3.2	15.6	1.4	2.5	3.6	0.75	1.1	2.7
Holding Torque		N·m	0.216	0.353	0.650	0.539	1.00	1.72	0.88	1.28	2.40
Rotor Inertia		g·㎠	35	54	114	120	300	480	240	490	690
Weights		g	220	280	500	470	700	1000	600	1000	1300
Length(L)		mm	33	39	60	41	56	76	47	56	85
Distance From End Of Shaft	3mm	N	22	22	22	52	52	52	70	70	70
	8mm		26	26	26	65	65	65	87	87	87
	13mm		33	33	33	85	85	85	114	114	114
	18mm		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

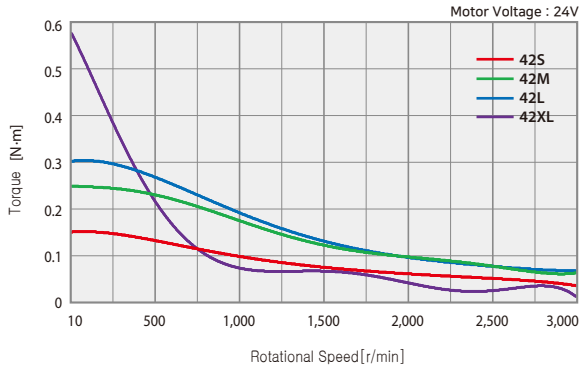
HSC-SST-28series



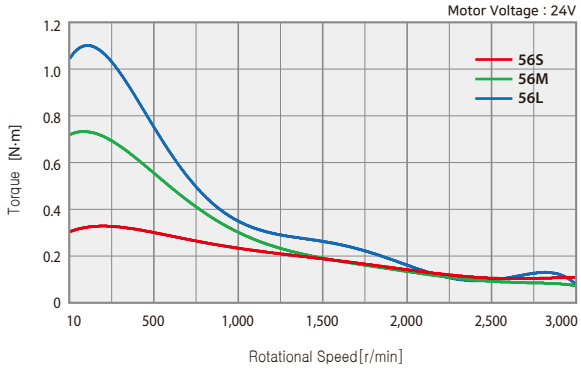
HSC-SST-35series



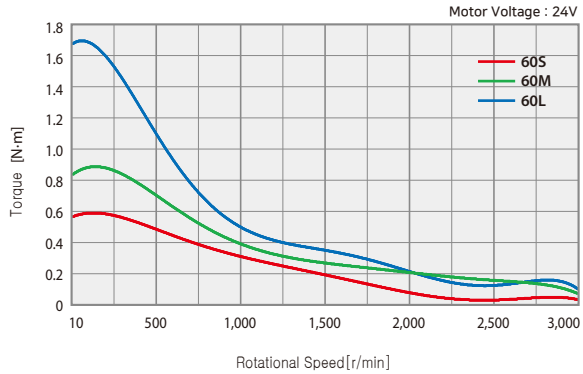
HSC-SST-42series



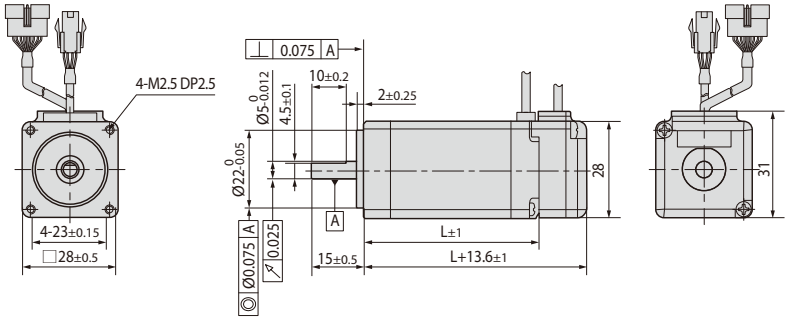
HSC-SST-56series



HSC-SST-60series

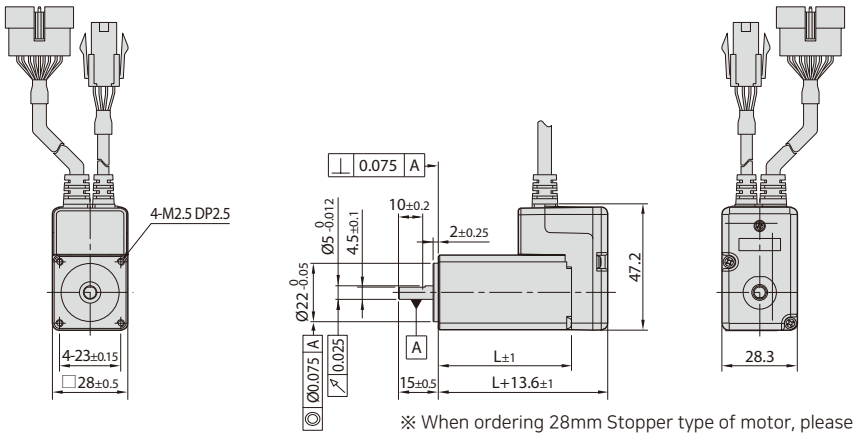


Dimensions of Motor[mm]



28mm

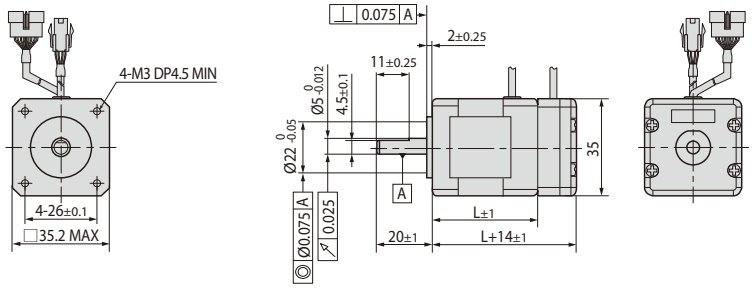
Motor	Length(L)
HS-SM-28S	32
HS-SM-28M	45
HS-SM-28L	50



28mm *(Stopper Type)*

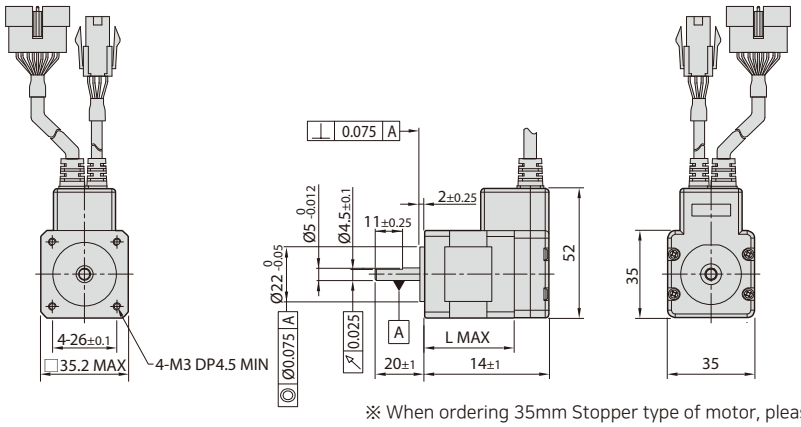
Motor	Length(L)
HS-SM-28SM	32
HS-SM-28MM	45
HS-SM-28LM	50

※ When ordering 28mm Stopper type of motor, please add "M" after standard motor model number.



35mm

Motor	Length(L)
HS-SM-35M	26
HS-SM-35L	36

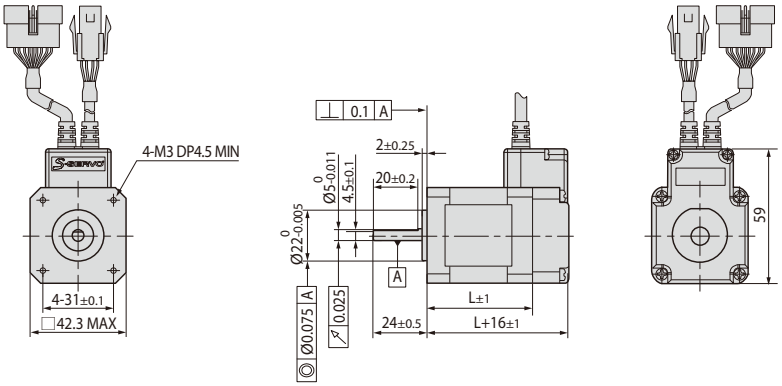


35mm *(Stopper Type)*

Motor	Length(L)
HS-SM-35MM	26
HS-SM-35LM	36

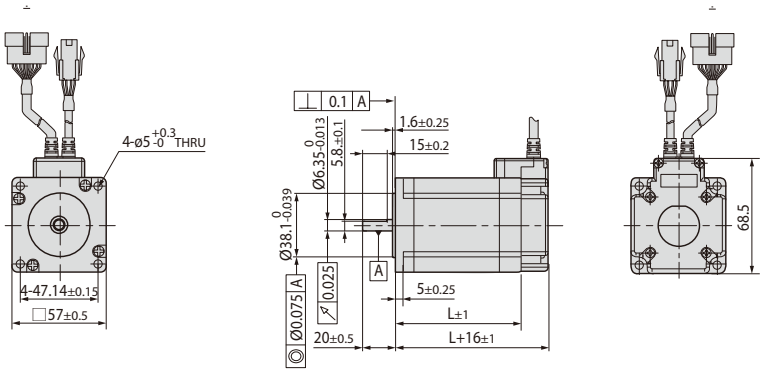
※ When ordering 35mm Stopper type of motor, please add "M" after standard motor model number.

Dimensions of Motor[mm]



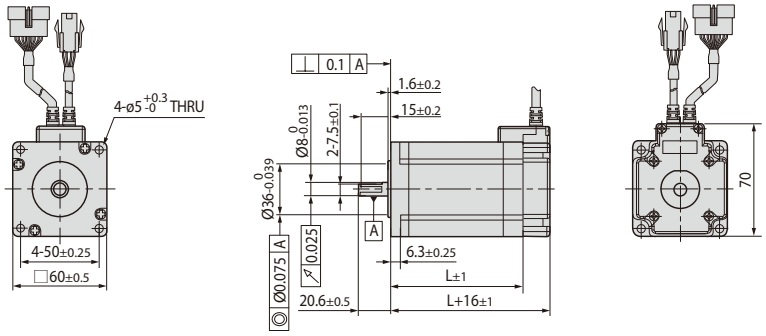
42mm

Motor	Length(L)
HS-SM-42S	33
HS-SM-42M	39
HS-SM-42XL	60



56mm

Motor	Length(L)
HS-SM-56S	41
HS-SM-56M	55
HS-SM-56L	76



60mm

Motor	Length(L)
HS-SM-60S	47
HS-SM-60M	56
HS-SM-60L	85

Specifications of Motor with Brake

Unit Part Number	Moto Model Number	Electromagnetic Brake					Motor Unit Weight [kg]	Permissible Radial Load [N]				Permissible Axial Load [N]
		Type	Voltage Input [V]	Rated Current [A]	Power Consumption [W]	Statical Friction Torque [N·m]		Distance from End of Shaft [mm]				
								3	8	13	18	
HSC-SST-42S-■-BK	HS-SM-42S-■-BK	Non-excitation run Type	24VDC ±10%	0.2	5	0.2	0.54	22	26	33	46	Must be Lower than Unit's Weight
HSC-SST-42M-■-BK	HS-SM-42M-■-BK						0.60					
HSC-SST-42XL-■-BK	HS-SM-42XL-■-BK						0.83					
HSC-SST-56S-■-BK	HS-SM-56S-■-BK			0.27	6.6	0.7	0.93	52	65	85	123	
HSC-SST-56M-■-BK	HS-SM-56M-■-BK						1.16					
HSC-SST-56L-■-BK	HS-SM-56L-■-BK						1.50					
HSC-SST-60S-■-BK	HS-SM-60S-■-BK						1.14	70	87	114	165	
HSC-SST-60M-■-BK	HS-SM-60M-■-BK						1.30					
HSC-SST-60L-■-BK	HS-SM-60L-■-BK						1.86					

※ The code of encoder resolution will be marked in"■"

※ Electronic Brake cannot be used for braking. Position hold purpose only when power OFF.

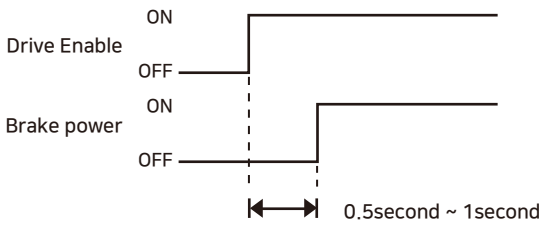
※ The weight means Motor Unit Weight including Motor and Electronic Brake.

※ Motor Model Number is combined model name of Motor and Brake.

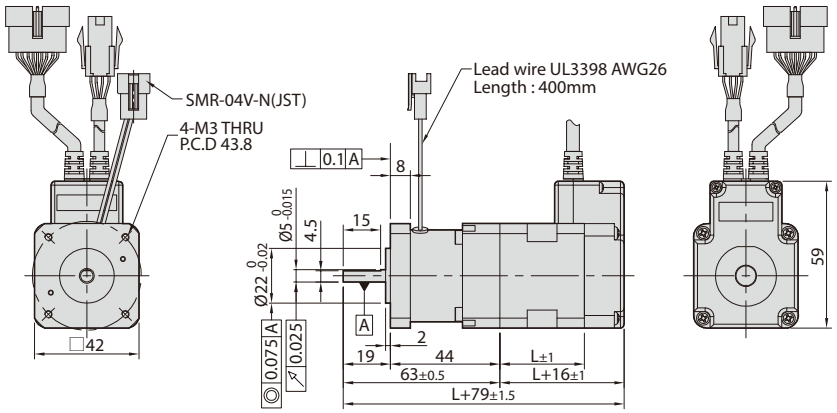
※ Motor specification and torque characteristic are same as Standard Motor.

* Brake Operation Timing Chart

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

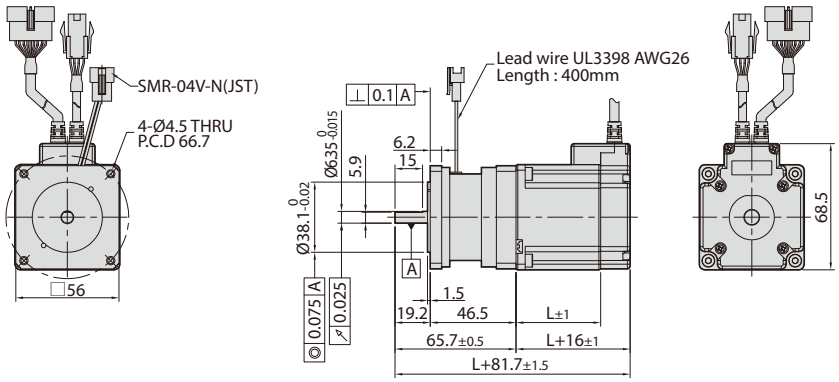


Dimensions of Motor with Brake[mm]



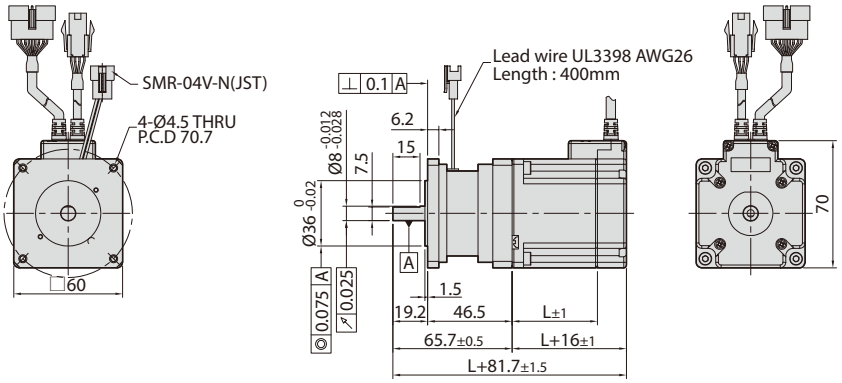
42mm

Motor	Length(L)
HS-SM-42S	33
HS-SM-42M	39
HS-SM-42XL	60



56mm

Motor	Length(L)
HS-SM-56S	41
HS-SM-56M	55
HS-SM-56L	76



60mm

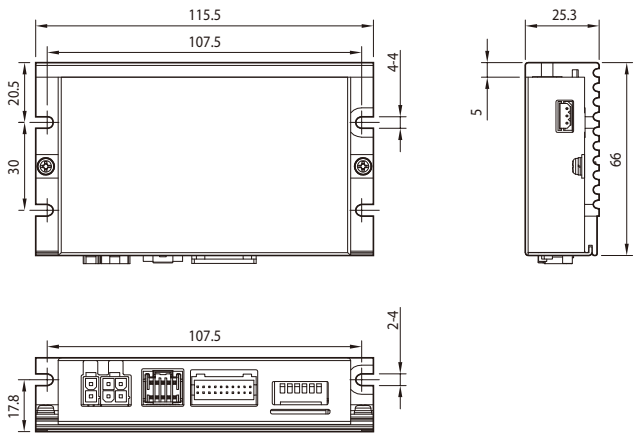
Motor	Length(L)
HS-SM-60S	47
HS-SM-60M	56
HS-SM-60L	85

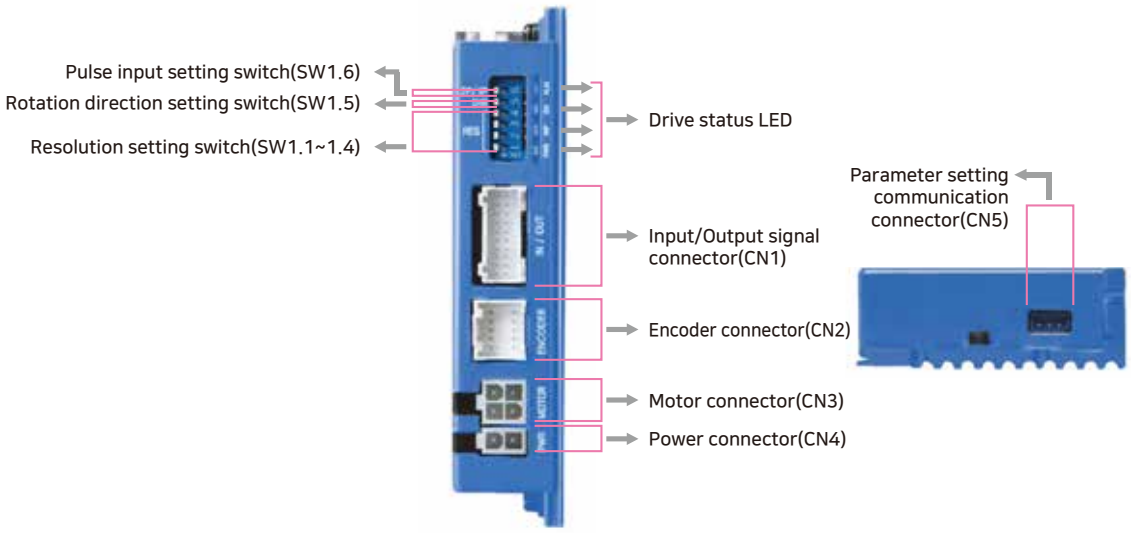
Specification of Drive

Motor Model		HS-SM-28 series	HS-SM-35 series	HS-SM-42 series	HS-SM-56 series	HS-SM-60 series
Drive Model		HS-SD-P-28 series	HS-SD-P-35 series	HS-SD-P-42 series	HS-SD-P-56 series	HS-SD-P-60 series
Input Voltage		DC24V±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	0~3,000r/min (※1)				
	Resolution	Encoder Resolution[P/R] / Configurable Resolution [P/R] 4,000 / 500 1,000 1,600 2,000 3,200 3,600 4,000 5,000 6,400 8,000 10,000 / 10,000 20,000 25,000 36,000 40,000 50,000 15,000 (Selectable by DIP Switch)				
	Maximum Frequency	500kHz (Duty 50%)				
	Error Types	Over Current Error, Over Speed Error, Position Tracking Error, Over Load Error, Over Temperaure 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				
	In-Position Selection	0~63 (Set by parameter)				
	Position Gain Selection	0~63 (Set by parameter)				
	Pulse Input Method	1Pulse / 2Pulse (Selectable by DIP Switch)				
	Rotation Direction	CW/CCW (Selectable by DIP Switch)				
	Speed/Position Control Command	Pulse Train Input				
I/O Signal	Input Signals	Position Command Pulse, Enable, Alarm Reset (Photocoupler Input)				
	Output Signals	In-position, Alarm(Photocoupler Output) Encoder Signal(A+, A-, B+, B-, Z+, Z-, 26C31 Significant Line Drive Output), Brake Signal Output				

※ 1 : Up to the resolution of 10,000P/R, maximum speed can be reached by 3,000r/min and with the resolution more than 10,000P/R, maximum speed shall be reduced accordingly.

Dimensions of Drive[mm]





1. Drive Status LED

Indication	Color	Function	Description
PWR	Green	Power Input Indication	LED is turned ON when power is applied.
INP	Yellow	Positioning Completion Indication	LED is turned ON when Positioning error reaches within the preset pulse after the positioning is complete.
EN	Orange	Motor Enable Status	Enable : Lights ON, Disable : Lights OFF
ALM	Red	Alarm Indication	LED blinks when an error occurs.

■ List of error types by the number of alarm LED blinking

LED Times	Protection	Conditions
1	Over Current Error	The current through power devices in drive exceeds 4.8A
2	Over Speed Error	Motor speed exceeds 3,000r/min
3	Position Tracking Error	Position error value is higher than 180 ° in motor run state.
4	Over Load Error	The motor is continuously operated more than 5 seconds under a load exceeding the max. torque
5	Over Temperature Error	Inside temperature of drive exceeds 85℃
6	Over Regeneratived Voltage Error	Back-EMF is higher than 48V
7	Motor Connect Error	The power is ON without connection of the motor cable to drive
8	Encoder Connect	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)
13	Position Overflow Error	Position error value is higer than 180 ° in motor stop state

Alarm LED flash(e.g.,Position tracking error)

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

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
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)

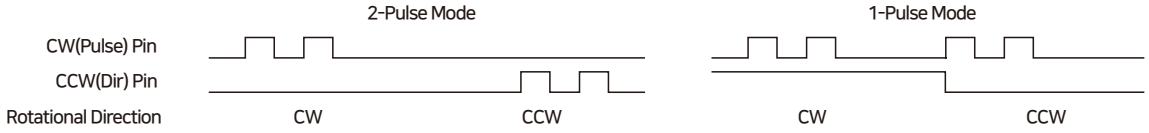
※1 : In case of products with an encoder resolution of 16,000 the corresponding pulse/rotation is 16,000.

3. Rotation Direction Setting Switch (SW1.5)

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

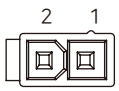
4. Pulse Input Setting Switch(SW1.6)

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



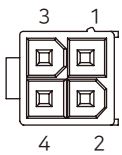
5. Power Connector(CN4)

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



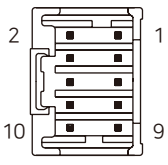
6. Motor Connector(CN3)

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



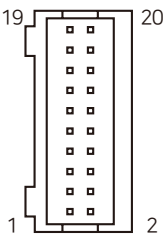
7. Encoder Connector(CN2)

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



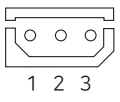
8. Input/Output Signal Connector(CN1)

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_DC24V	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

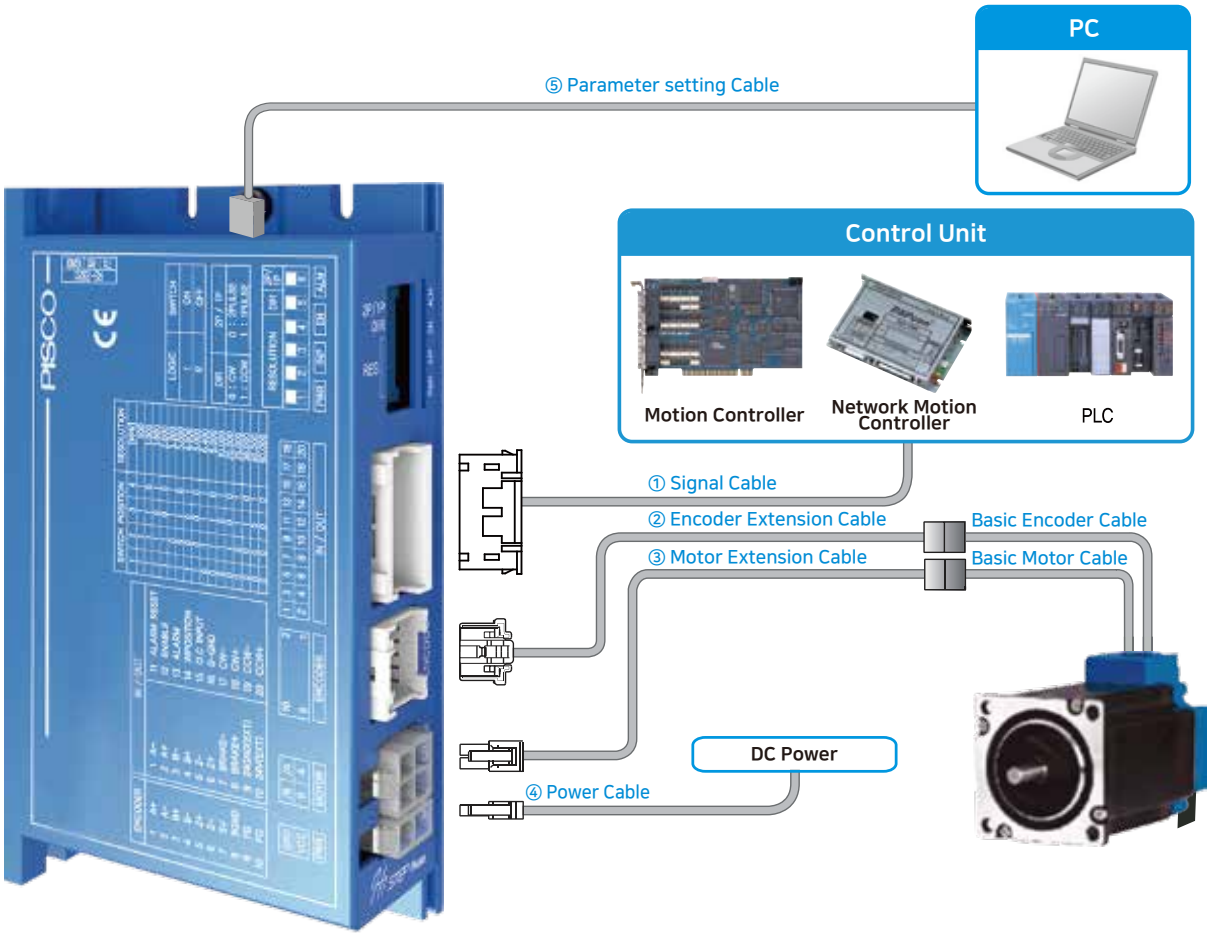


9. Parameter Setting Communication Connector(CN5)

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



System Configuration



Cable	Max. Length	Remarks
① Signal Cable	20m	Options(Sold separately)
② Encoder Extension Cable	20m	
③ Motor Extension Cable	20m	
④ Power Cable	2m	
Basic Encoder Cable	0.3m(Basic Length)	Basic cables are attached to motors.
Basic Motor Cable	0.3m(Basic Length)	

1. Accessories

Connectors

These are connector specifications for drive cabling.

Purpose		Item	Part Number	Manufacturer
Power(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	5557-04T 5556T	MOLEX
Signal(CN4)		Housing Terminal	5557-02R 5556T	MOLEX

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

2. Options

① Signal Cable

These are the cables to connect Hi-SERVO Pulse drive and other input/output devices.

Purpose	Item	Length[m]	Cable Type	Remarks
Drive-I/O Device Connection	HS-CSS2-S-001F	1	Normal Cable	Maximum Length : 20m
	HS-CSS2-S-002F	2		
	HS-CSS2-S-003F	3		
	HS-CSS2-S-005F	5		
	HS-CSS2-S-001M	1	Robot Cable	
	HS-CSS2-S-002M	2		
	HS-CSS2-S-003M	3		
	HS-CSS2-S-005M	5		

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

② Encoder Extension Cable

These are the cables to connect Hi-SERVO Pulse drive and the encoder.

Purpose	Item	Length[m]	Cable Type	Remarks
Drive-Basic Encoder Cable Connection	HS-CSVO-E-001F	1	Normal Cable	Maximum Length : 20m
	HS-CSVO-E-002F	2		
	HS-CSVO-E-003F	3		
	HS-CSVO-E-005F	5		
	HS-CSVO-E-001M	1	Robot Cable	
	HS-CSVO-E-002M	2		
	HS-CSVO-E-003M	3		
	HS-CSVO-E-005M	5		

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

③ Motor Extension Cable

These are the cables to connect Hi-SERVO Pulse drive and the motor.

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

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

④ Drive Power Cable

These are the cables to connect Hi-SERVO Pulse drive and the power.

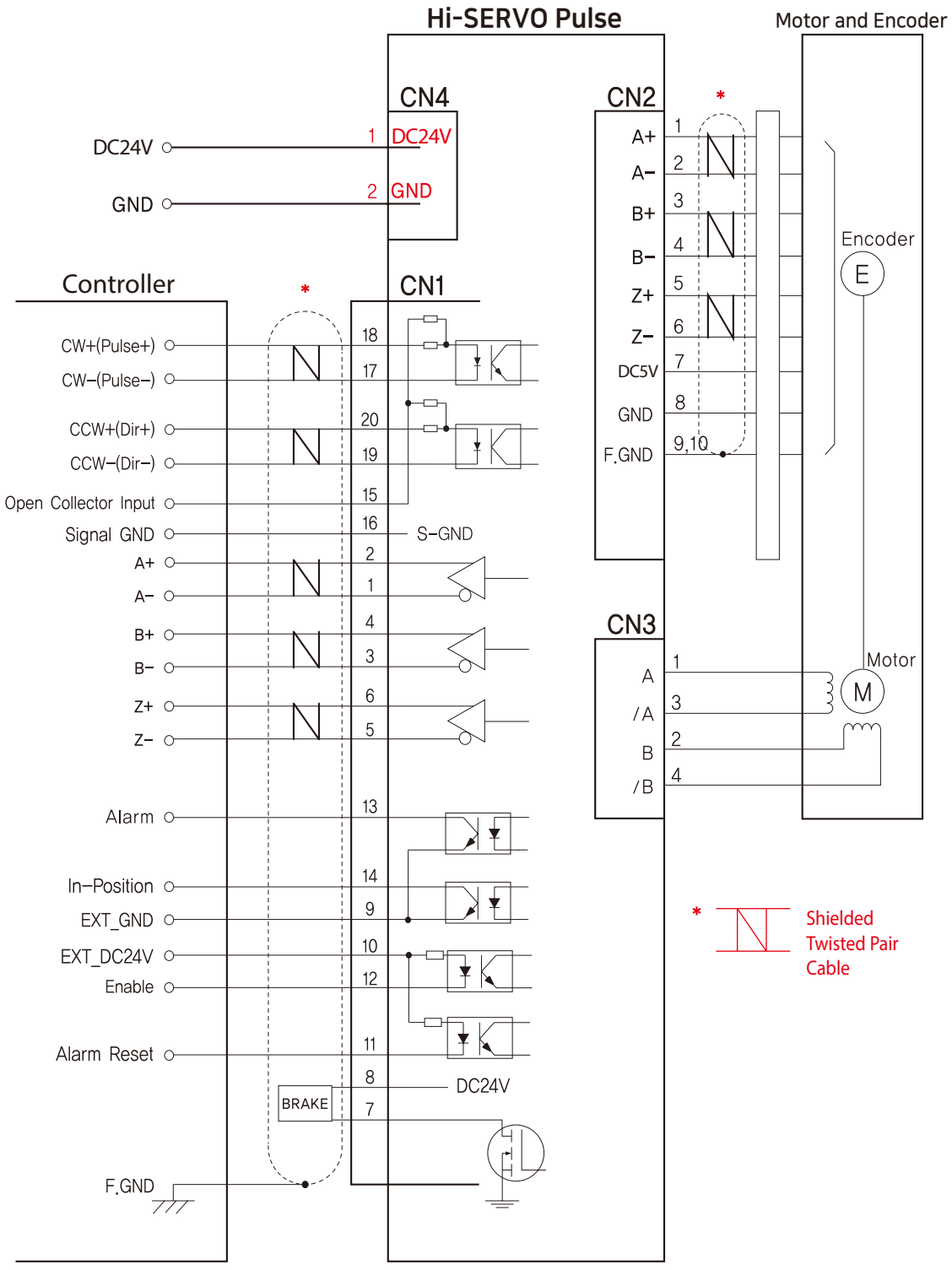
Purpose	Item	Length[m]	Cable Type	Remarks
Drive-Power Connection	HS-CSVO-P-001F	1	Normal Cable	Maximum Length : 2m
	HS-CSVO-P-002F	2		
	HS-CSVO-P-001M	1	Robot Cable	
	HS-CSVO-P-002M	2		

⑤ Parameter Setting Cable

These are the cables to connect Hi-SERVO Pulse drive and computer. This cable is used to change the parameter settings on the drive.

Purpose	Item	Length[m]	Cable Type	Remarks
Drive-Parameter Network Connection	HS-CBTS-C-001F	1	Normal Cable	Maximum Length : 3m
	HS-CBTS-C-002F	2		
	HS-CBTS-C-003F	3		

External Wiring Diagram



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

CAUTION

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

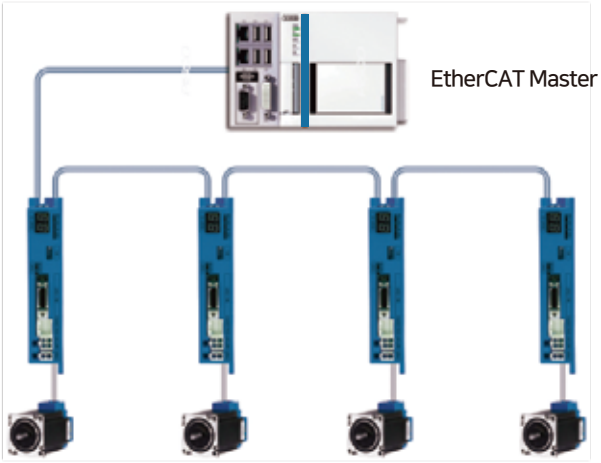
Hi-Servo EtherCAT

Closed Loop Stepping System

- CiA402 Drive Profile Support
- Closed-Loop Stepping system
- Tuning Not Required / No Hunting
- Low Heat Generation / High Torque
- High Resolution / High Response

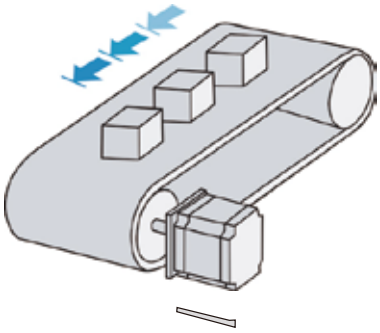
1. Based Motion Control

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



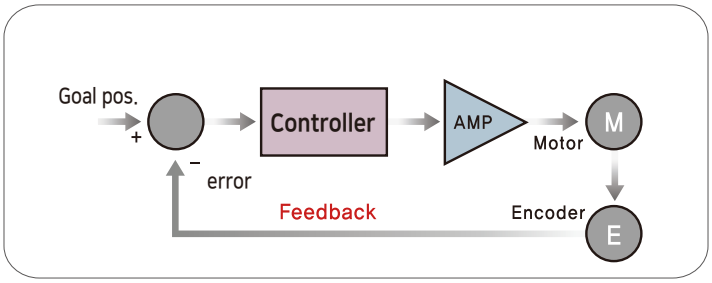
3. Tuning Not Required

To ensure machine performance, 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. Hi-SERVO employs the best characteristics of the stepping motor to eliminate the need of tedious gain tuning required for conventional closed-loop servo systems. Hi-SERVO is especially well suited for low-rigidity loads(e.g., a belt and pulley system) thath sometimes require conventional servo systems to use the additional bulky and expensive gearbox.



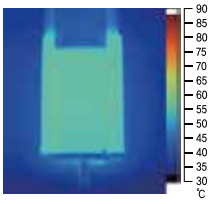
2. Closed Loop System

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

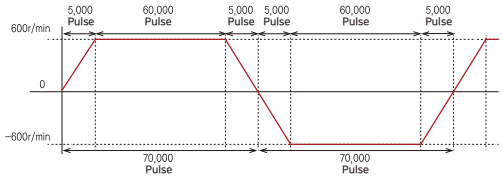


4. Low Heat Generation / Energy Savings

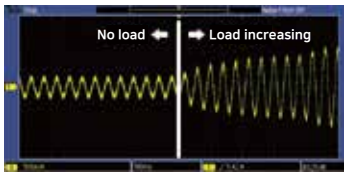
(Motor Current Control according to load)
Hi-SERVO automatically controls motor current according to load. Hi-SERVO reduces motor current when motor load is low and increases motor current when load is high. By optimizing the motor current, motor heat can be minimized and energy can be saved.



Motor temperature[Thermography]



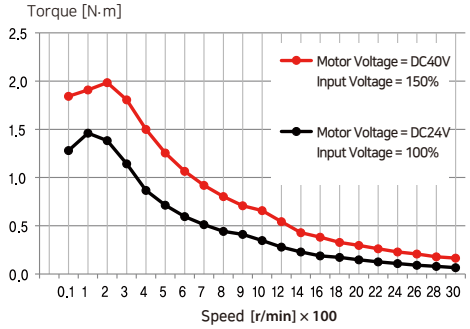
Condition to measure the motor temperature
[4hours operation, Motor surface temperature saturation]



Example of the Motor Current Control according to load

5. High Torque

(Motor Voltage Increasing and Motor Current Setting)
Hi-SERVO 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.

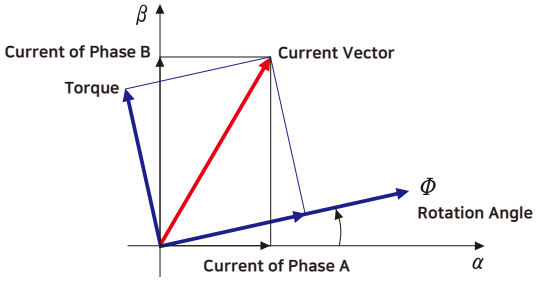


※ The torque at low speed and high speed is improved about 30%

Measured Condition : Drive = HSC-EEC-56L
Motor Voltage = DC40V
Input Voltage = DC24V

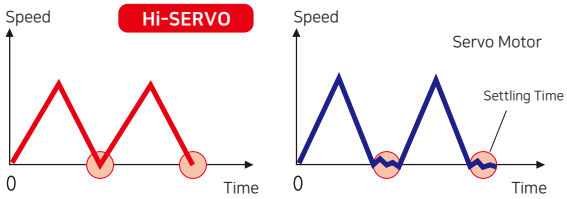
6. Smooth and Accurate Operation

Hi-SERVO 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 MCU (Micro Controller Unit) performs vector control and filtering, producing a smooth rotational control with minimum ripples.



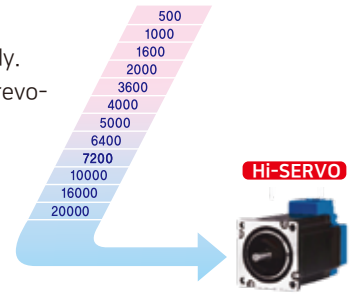
7. High Response

Similar to conventional stepping motors, Hi-SERVO instantly synchronizes with command pulses providing fast positional response. Hi-SERVO is the optimal 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.



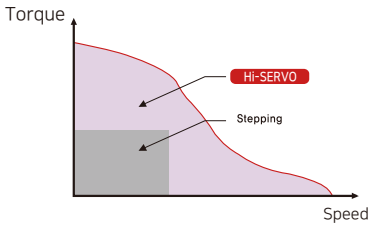
8. High Resolution

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



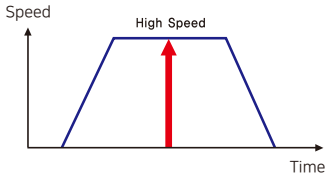
9. High Torque / Continuous Operation

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



10. High Speed

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



Advantages over Open-Loop Stepping Systems

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-SERVO utilizes 100% of the full range of rated motor torque, contrary to a conventional open-loop stepping drive 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-dependent current control, open-loop stepping drives use a constant current control at all speed ranges without considering load variations.

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

Hi-SERVO EtherCAT

HSC - EEC - 56 L - A - BK - PN05

Hi-SERVO Combination	①	②	③	④	⑤	⑥

① Communication Type

EEC	EtherCAT

② Motor Size

28	28mm
35	35mm
42	42mm
56	56mm
60	60mm

③ Motor Length

S	Small
M	Medium
L	Large
XL	Extra Large (※)

※ Motor length XL is only 42mm Size.

④ Encoder Resolution

A	10,000P/R
D	16,000P/R (※)

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

⑤ Brake

None	Without Brake
BK	Brake

※If you need a speed reducer, contact your dealer or sales office.

⑥ Gear Ratio

None	Without Gear
PN03	1:3
PN05	1:5
PN08	1:8
PN10	1:10
PN15	1:15
PN25	1:25
PN40	1:40
PN50	1:50

Standard Combination

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

※When places an order for Stopper type 28mm motor, please write 'M' additionally after motor length of unit product number. (ex. Hi-SERVO-EEC-28LM-D)

Combination with Brake

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

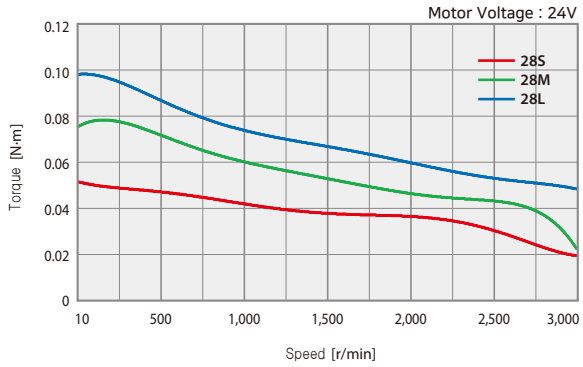
Specification of Motor

Model			Unit	HS-EM-28 series			HS-EM-35 series		HS-EM-42 series		
				28S	28M	28L	35M	35L	42S	42M	42XL
Input Voltage			-	Bipolar							
Number of phase			-	2 Phase							
Current per Phase			A/Phase	0.95	0.95	0.95	1.5	1.25	1.2	1.2	1.2
Maximum Holding Torque			N·m	0.069	0.098	0.118	0.13	0.23	0.32	0.44	0.65
Rotor Inertia			$g·cm^2$	9.0	13	18	15	20	35	54	114
Weight			kg	0.147	0.204	0.232	0.194	0.226	0.294	0.357	0.564
Length			mm	32	45	50	32	36	34	40	60
Permissible Radial 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 Axial Load			N	Lower than Motor Unit's Weight							
Insulation resistance			Ω	Min. 100(When measured with a DC500V insulation resistance meter)							
Insulation class			-	CLASS B(130℃)							
Operating temperature			℃	0 ~ 55							

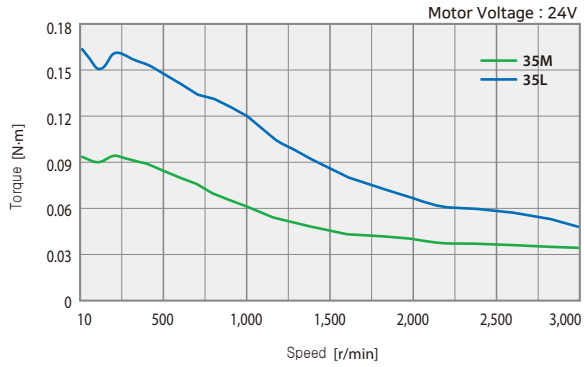
Model			Unit	HS-EM-56 series			HS-EM-60 series		
				56S	56M	56L	60S	60M	60L
Input Voltage			-	Bipolar					
Number of phase			-	2 Phase					
Current per Phase			A/Phase	3.0	3.0	3.0	4.0	4.0	4.0
Maximum Holding Torque			N·m	0.64	1.0	1.5	0.88	1.28	2.4
Rotor Inertia			$g·cm^2$	180	280	520	240	490	690
Weight			kg	0.608	0.784	1.230	0.693	0.856	1.419
Length			mm	46	55	80	47	56	85
Permissible Radial 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 Axial Load			N	Lower than Motor Unit's Weight					
Insulation resistance			Ω	Min. 100(When measured with a DC500V insulation resistance meter)					
Insulation class			-	CLASS B(130℃)					
Operating temperature			℃	0 ~ 55					

Torque Characteristics of Motor

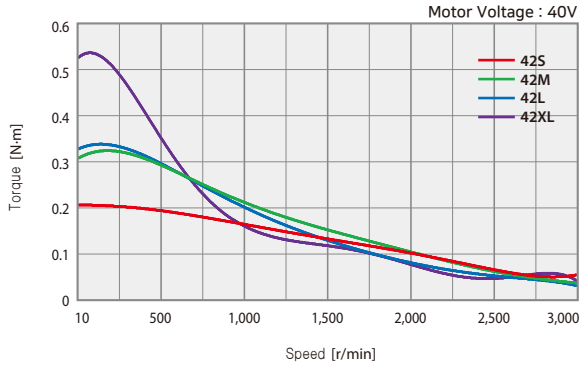
HSC-ECC-28 series



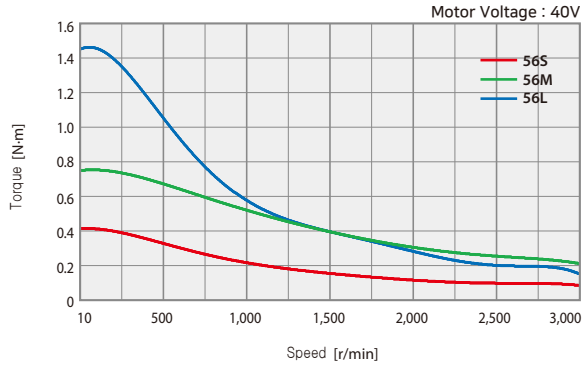
HSC-ECC-35 series



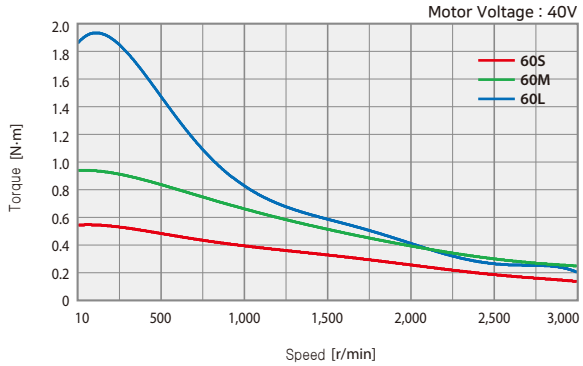
HSC-ECC-42 series



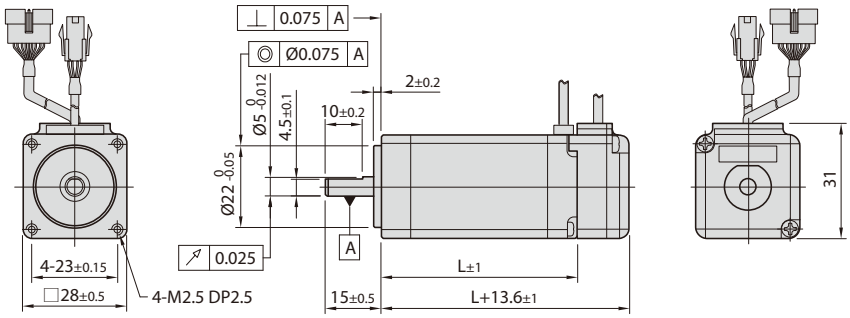
HSC-ECC-56 series



HSC-ECC-60 series

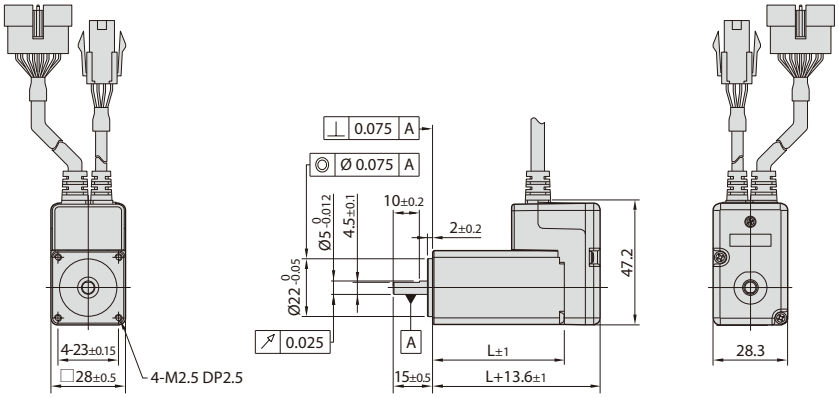


Dimensions of Motor[mm]



28mm

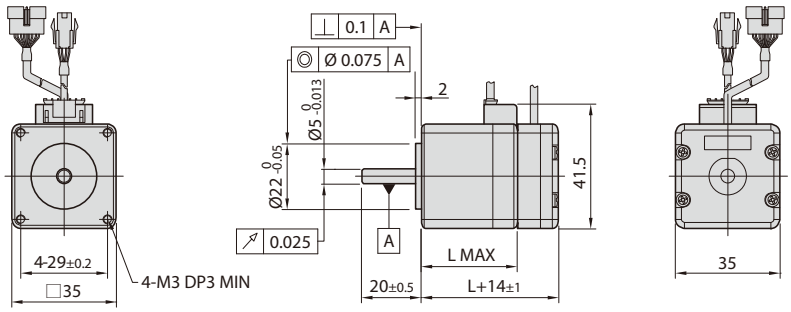
Motor	Length(L)
HS-EM-28L	50



28mm *(Stopper Type)*

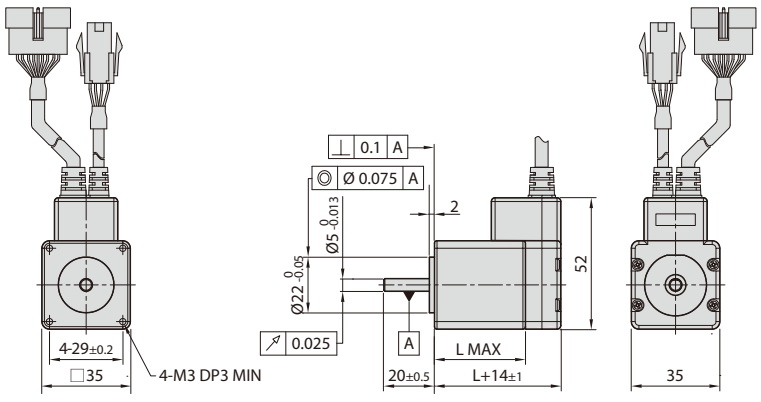
Motor	Length(L)
HS-EM-28LM	50

※ When ordering 28mm Stopper type of motor, please add "M" after standard motor model number.



35mm

Motor	Length(L)
HS-EM-35M	32
HS-EM-35L	36

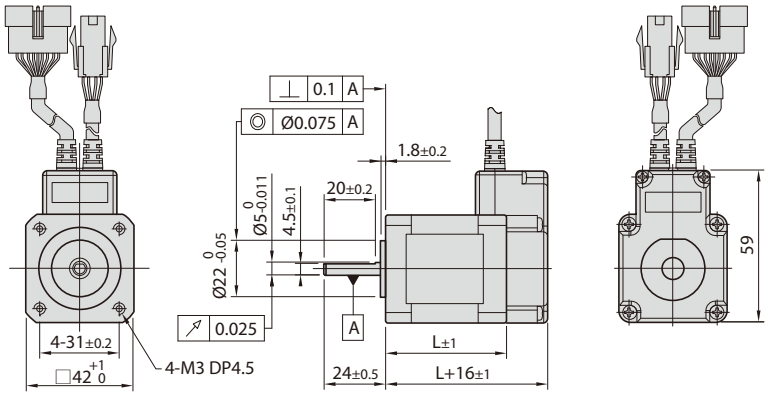


35mm *(Stopper Type)*

Motor	Length(L)
HS-EM-35MM	32
HS-EM-35LM	36

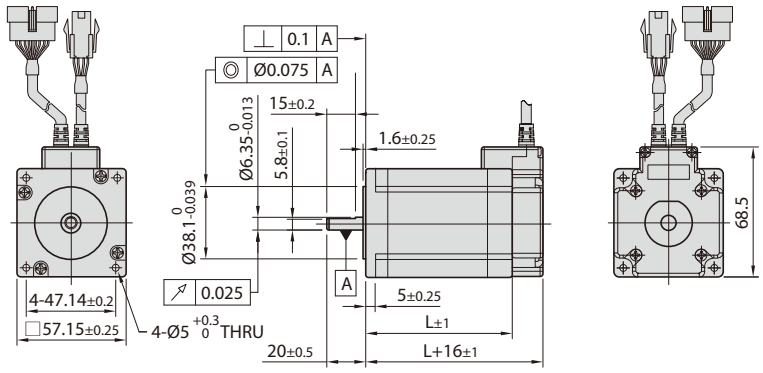
※ When ordering 35mm Stopper type of motor, please add "M" after standard motor model number.

Dimensions of Motor[mm]



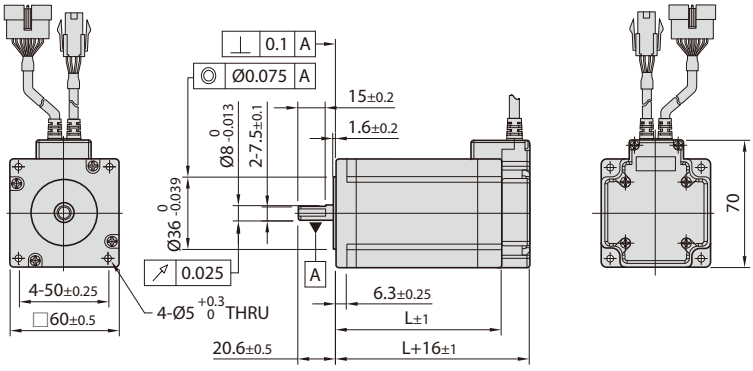
42mm

Motor	Length(L)
HS-EM-42S	34
HS-EM-42M	40
HS-EM-42XL	60



56mm

Motor	Length(L)
HS-EM-56S	46
HS-EM-56M	55
HS-EM-56L	80



60mm

Motor	Length(L)
HS-EM-60S	47
HS-EM-60M	56
HS-EM-60L	85

Specifications of Motor with Brake

Unit Part Number	Motor Model Number	Electromagnetic Brake					Motor Unit Weight [kg]	Permissible Radial Load [N]				Permissible Axial Load [N]
		Type	Voltage Input [V]	Rated Current [A]	Power Consumption [W]	Statical Friction Torque [N·m]		Distance from End of Shaft [mm]				
								3	8	13	18	
HSC-EEC-42S-■-BK	HS-EM-42S-■-BK	Non-excitation run Type	24VDC ±10%	0.2	5	0.2	0.55	22	26	33	46	Must be Lower than Unit's Weight
HSC-EEC-42M-■-BK	HS-EM-42M-■-BK						0.62					
HSC-EEC-42XL-■-BK	HS-EM-42XL-■-BK						0.82					
HSC-EEC-56S-■-BK	HS-EM-56S-■-BK			0.27	6.6	0.7	1.03	52	65	85	123	
HSC-EEC-56M-■-BK	HS-EM-56M-■-BK						1.20					
HSC-EEC-56L-■-BK	HS-EM-56L-■-BK						1.65					
HSC-EEC-60S-■-BK	HS-EM-60S-■-BK						1.11	70	87	114	165	
HSC-EEC-60M-■-BK	HS-EM-60M-■-BK						1.30					
HSC-EEC-60L-■-BK	HS-EM-60L-■-BK						1.86					

※ 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.

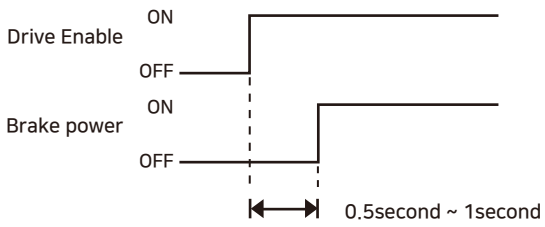
* Brake Operation Timing Chart

Hi-SERVO EtherCAT control Brake by Drive automatically.

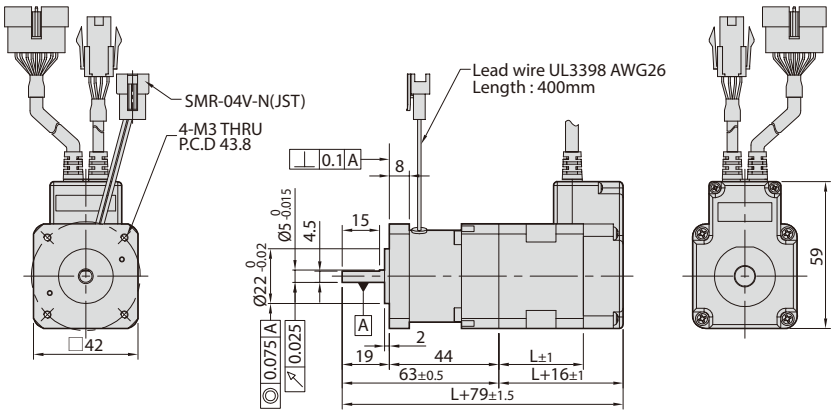
Please refer to below Timing Chart when control Brake from upper controller other than using Hi-SERVO EtherCAT Brake control.

Otherwise, Drive malfunctioning and loads can be fall down.

Also, please do not operate Brake while motor operation to prevent damage.

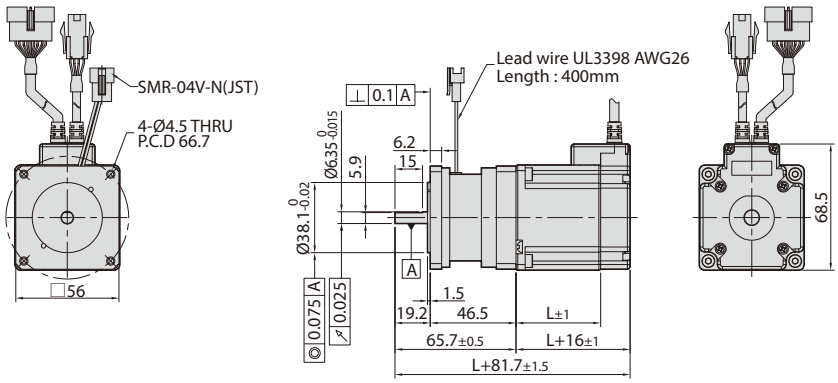


Dimensions of Motor with Brake[mm]



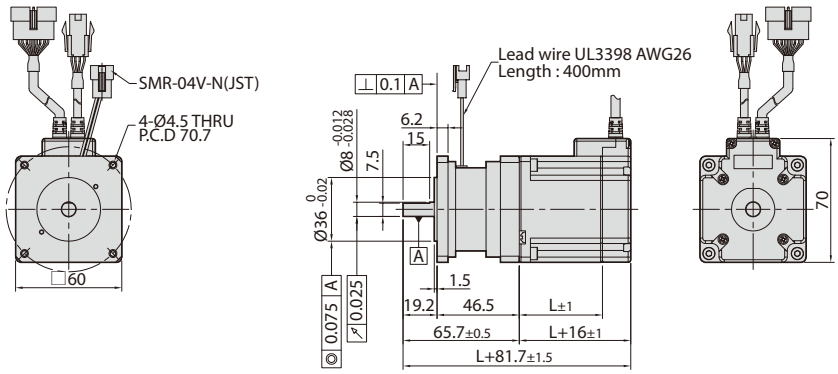
42mm

Motor	Length(L)
HS-EM-42S	34
HS-EM-42M	40
HS-EM-42XL	60



56mm

Motor	Length(L)
HS-EM-56S	46
HS-EM-56M	55
HS-EM-56L	80



60mm

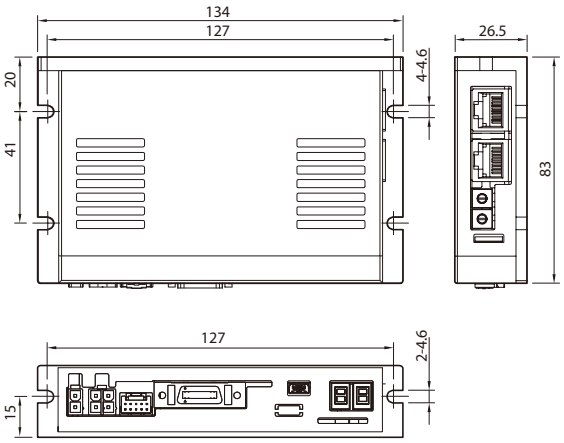
Motor	Length(L)
HS-EM-60S	47
HS-EM-60M	56
HS-EM-60L	85

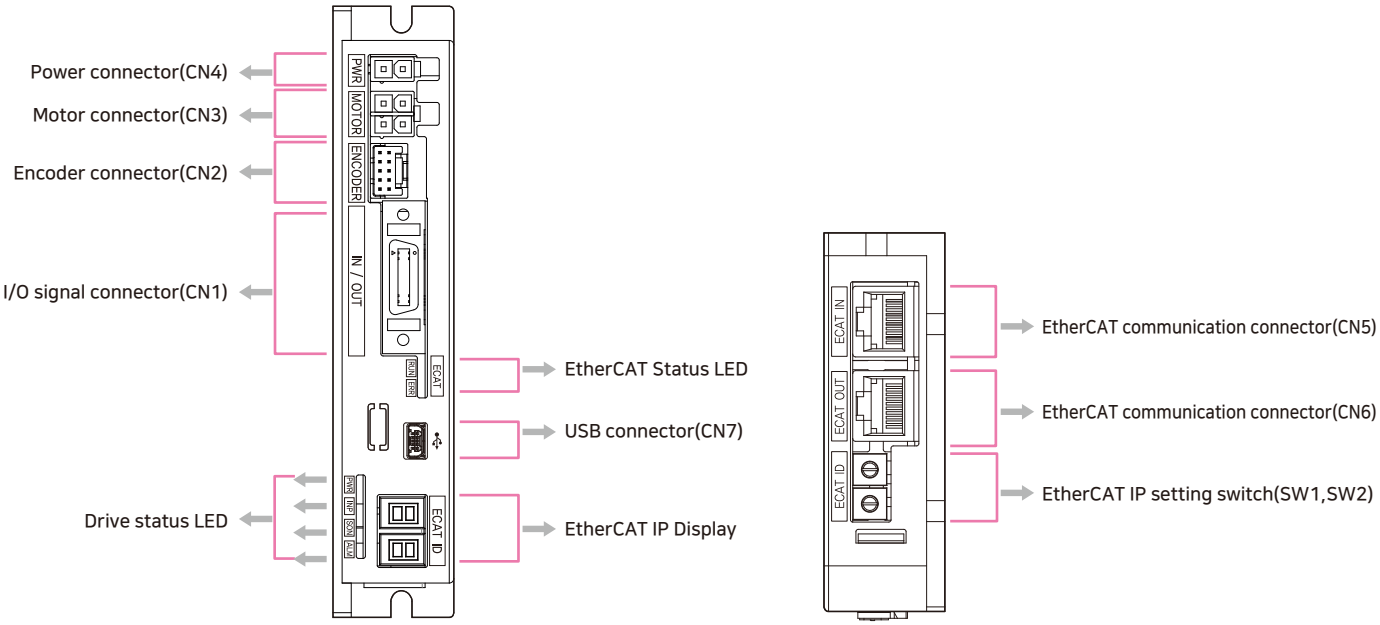
Specification of Drive

Motor Model		HS-EM-28 series	HS-EM-35 series	HS-EM-42 series	HS-EM-56 series	HS-EM-60 series
Drive Model		HS-ED-EC-28 series	HS-ED-EC-35 series	HS-ED-EC-42 series	HS-ED-EC-56 series	HS-ED-EC-60 series
Input Voltage		DC24V±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	0~3,000r/min (※1)				
	Resolution	Encoder Resolution[P/R] / Configurable Resolution [P/R] 4,000 : 500, 1,000, 1,600, 2,000, 3,600, 4,000, 5,000, 6,400, 7,200, 10,000 10,000 : 500, 1,000, 1,600, 2,000, 3,600, 5,000, 6,400, 7,200, 10,000 16,000 : 500, 1,000, 1,600, 2,000, 3,600, 5,000, 6,400, 7,200, 10,000, 16,000 20,000 : 500, 1,000, 1,600, 2,000, 3,600, 5,000, 6,400, 7,200, 10,000, 20,000 (Selectable by parameter)				
	Error Types	Over Current Error, Over Speed Error, Position Tracking Error, Over Load Error, Over Temperaure 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				
Ether CAT	LED Display	CoE(CiA402 Drive Profile), FoE(Firmware Download)				
	Supported Mode	Profile Position Mode, Homing Mode, Cyclic Synchronous Position Mode				
	Synchronization	Free Run Mode, SM Event Mode, DC SYNC Event				
I/O Signal	Input Signals	3 dedicated inputs (LIMIT+, LIMIT-, ORIGIN), 7 programmable inputs (Photocoupler Input)				
	Output Signals	6 programmable outputs (Photocoupler Input), 1 Brake output				

※ 1 : Up to the resolution of 10,000P/R, maximum speed can be reached by 3,000r/min and with the resolution more than 10,000P/R, maximum speed shall be reduced accordingly.

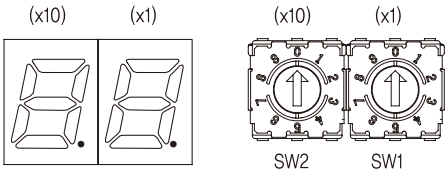
Dimensions of Drive[mm]





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

Use two rotary switches to set EtherCAT ID(ECAT Device ID). Set ones digit(x1) of EtherCAT ID on the right rotary switch(SW1), and set tens digit (x10) of EtherCAT ID on the left rotary switch(SW2).



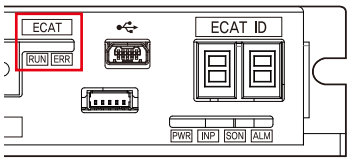
2. EtherCAT Status LED

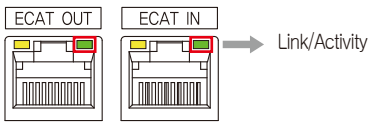
LED indicates communication status of EtherCAT. Link/Activity LED exists on each port of EtherCAT.

Indication	Color	Status	Description
RUN	Green	OFF	State INT or Power OFF
		Blinking	State PRE-OPERATIONAL
		Single Flash	State SAFE-OPERATIONAL
		ON	State OPERATIONAL
		Double Flash	State BOOTSTRAP

Indication	Color	Status	Description
ERR	Red	OFF	No Error or Power OFF
		Blinking	Invalid Configuration
		Single Flash	Communication Data Error
		Double Flash	Watchdog Time Out

Indication	Color	Status	Description
Link/ Activity	Green	OFF	Link deactivated
		ON	Link activated
		Flickering	Link Established and in Operation





3. Drive Status LED

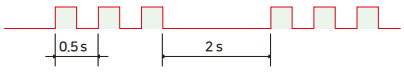
Indication	Color	Function	Description
PWR	Green	Power Input Indication	LED is turned ON when power is applied.
INP	Yellow	Positioning Completion Indication	LED is turned ON when Positioning error reaches within the preset pulse after the positioning is complete.
SON	Orange	Servo On/Off Indication	Servo ON : Lights ON, Servo OFF : Lights OFF
ALM	Red	Alarm Indication	LED blinks when an error occurs.

■ List of error types by the number of alarm LED blinking

Times	Error Code(※4)	Protection	Conditions
1	E-001	Over Current Error	The current through power devices in drive exceeds the limit.(※1)
2	E-002	Over Speed Error	Motor speed exceeds 3,000r/min
3	E-003	Position Tracking Error	Position error value is greater than the reference value while the motor is running.(※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 Regenerativted 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	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 greater than the refernce value while the motor is stopped.(※2)

※1. Limit value depends on motor model. (Refer to the Manual)
※2. The default reference value is 180 ˚ , and it 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 LED display instead of Ethernet IP.

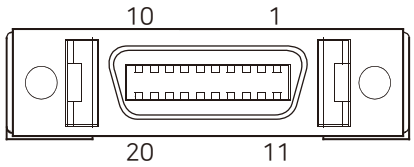
※ Please refer to user Manual for the details of protection functions.



Alarm LED flash
(e.g., Position tracking error)

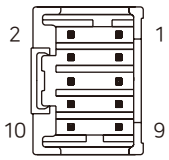
4. I/O Connector(CN1)

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_DC24V	Input



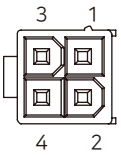
5. Encoder Connector(CN2)

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



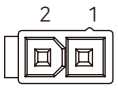
6. Motor Connector(CN3)

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



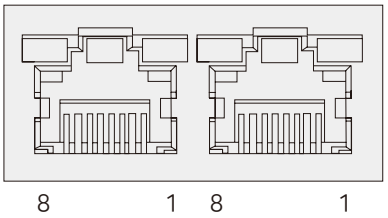
7. Connector(CN4)

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



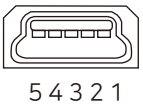
8. Communication Connector(CN5, CN6)

No.	Function	No.	Function
1	TD+	6	RD-
2	TD-	7	----
3	RD+	8	----
4	----	Connector Hood	F.GND
5	----		

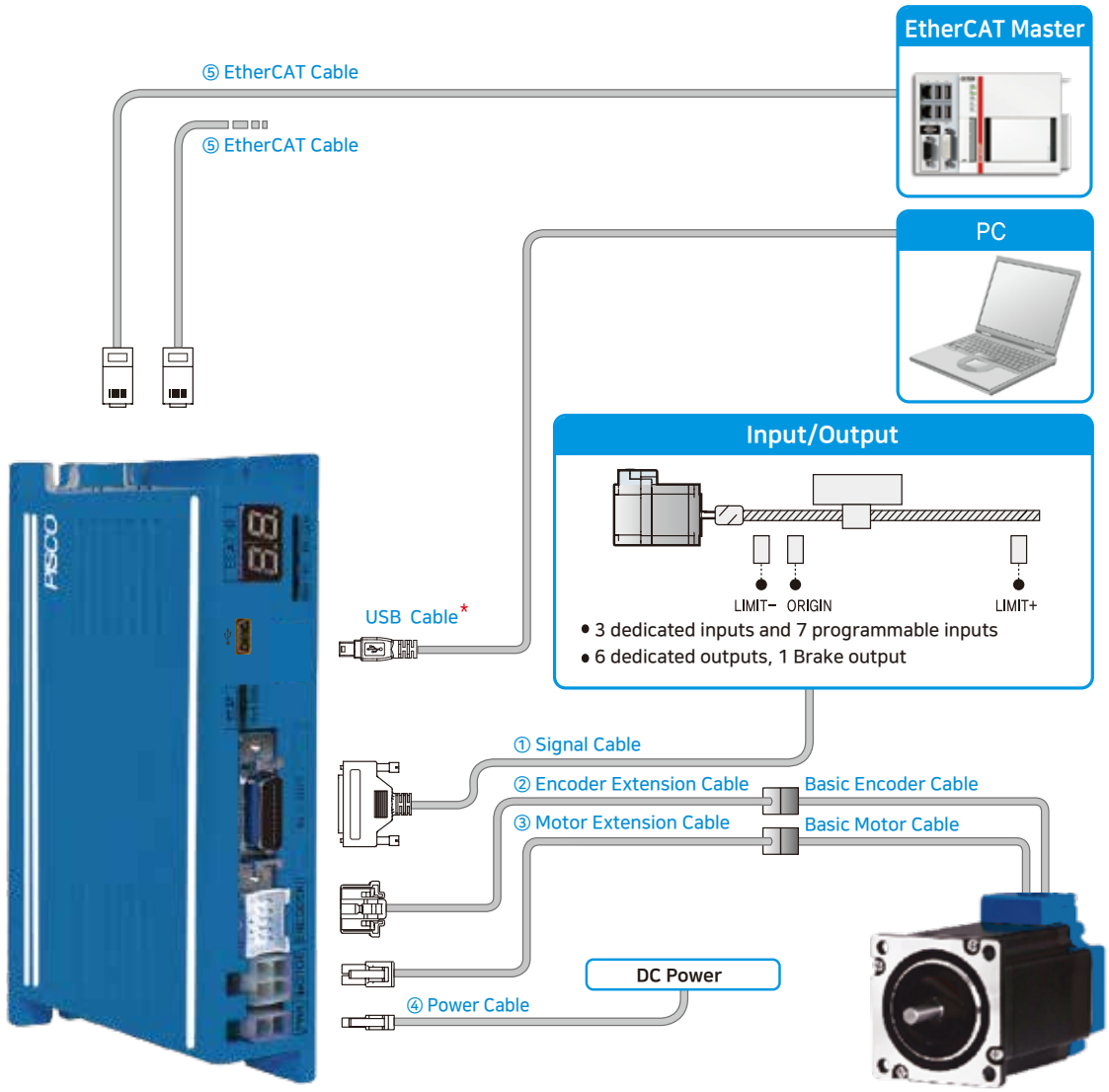


9. USB Connector(CN7)

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



System Configuration



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

1. Accessories

Connectors

These are connector specifications for drive cabling.

Purpose		Item	Part Number	Manufacturer
Power(CN4) Power		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	10120-3000PE	3M
		Connector Cover	10320-52A0-008	

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

2. Options

① Signal Cable

These are the cables to connect Hi-SERVO EtherCAT drive and other input/output devices.

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

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

② Encoder Extension Cable

These are the cables to connect Hi-SERVO EtherCAT drive and the encoder.

Purpose	Item	Length[m]	Cable Type	Remarks
Drive-Basic Encoder Cable Connection	HS-CSVO-E-001F	1	Normal Cable	Maximum Length : 20m
	HS-CSVO-E-002F	2		
	HS-CSVO-E-003F	3		
	HS-CSVO-E-005F	5		
	HS-CSVO-E-001M	1	Robot Cable	
	HS-CSVO-E-002M	2		
	HS-CSVO-E-003M	3		
	HS-CSVO-E-005M	5		

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

③ Motor Extension Cable

These are the cables to connect Hi-SERVO EtherCAT drive and the motor.

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

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

④ Drive Power Cable

These are the cables to connect Hi-SERVO EtherCAT drive and the power.

Purpose	Item	Length[m]	Cable Type	Remarks
Drive-Power Connection	HS-CSVO-P-001F	1	Normal Cable	Maximum Length : 2m
	HS-CSVO-P-002F	2		
	HS-CSVO-P-001M	1	Robot Cable	
	HS-CSVO-P-002M	2		

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

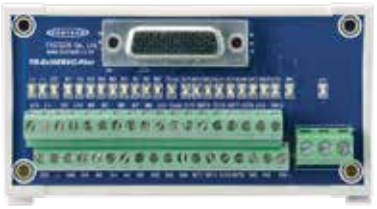
⑤ EtherCAT Cable

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

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

[Option] TB-Plus Interface Board

This is an interface board to connect Hi-SERVO EtherCAT drive and I/O signals more conveniently.

Purpose	Item	Product Image
Drive - I/O signal Connection Board	TB-Plus	

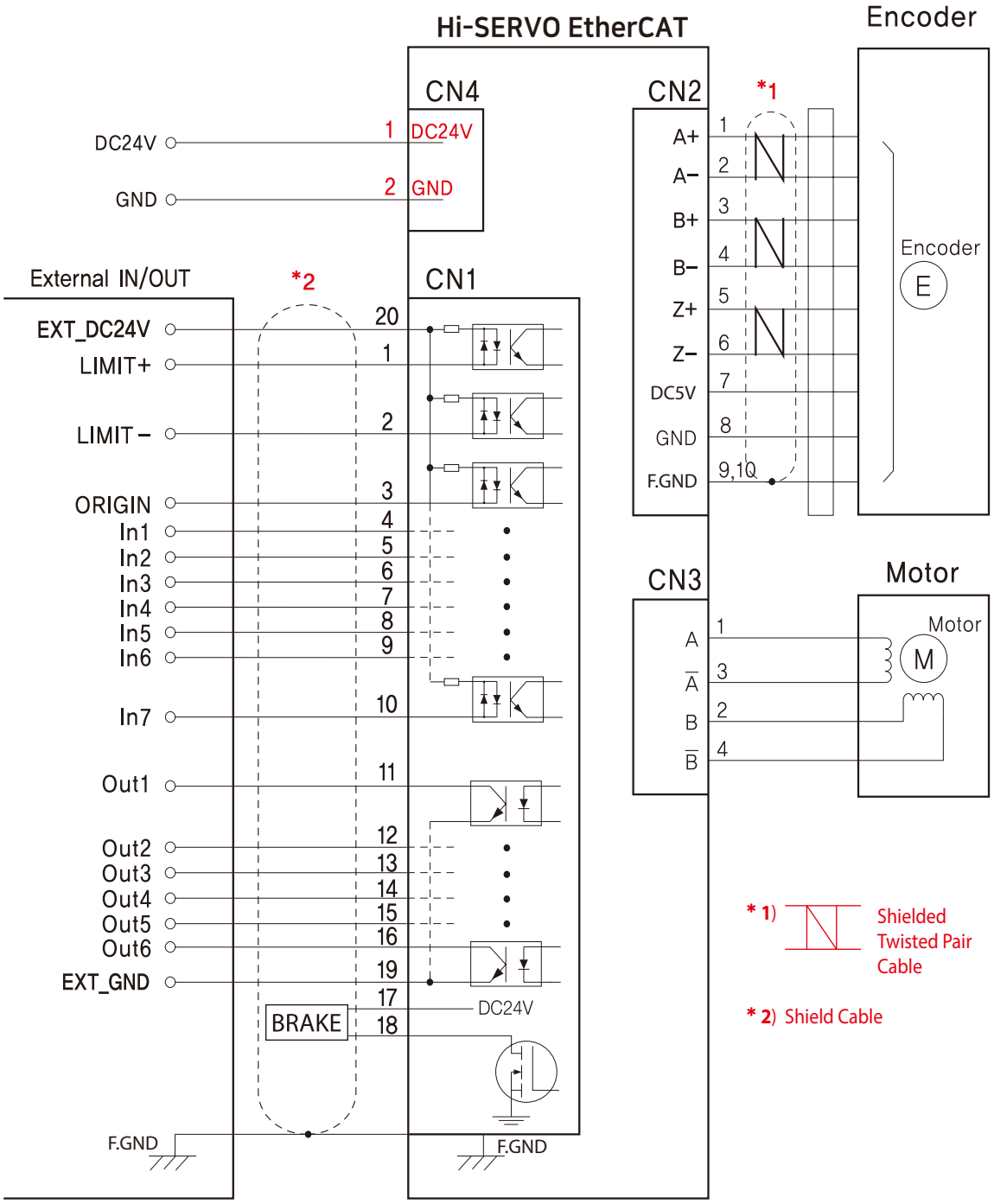
[Option] TB-Plus Interface Cable

There are the cables to connect Hi-SERVO EtherCAT and TB-Plus interface board.

Purpose	Item	Length[m]	Cable Type	Remarks
Drive - I/O signal Connection Board	HS-CIFN-S-001F	1	Normal Cable	Maximum Length : 20m
	HS-CIFN-S-002F	2		
	HS-CIFN-S-003F	3		
	HS-CIFN-S-005F	5		
	HS-CIFN-S-001M	1	Robot Cable	
	HS-CIFN-S-002M	2		
	HS-CIFN-S-003M	3		
	HS-CIFN-S-005M	5		

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

External Wiring Diagram



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

CAUTION

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

MEMO

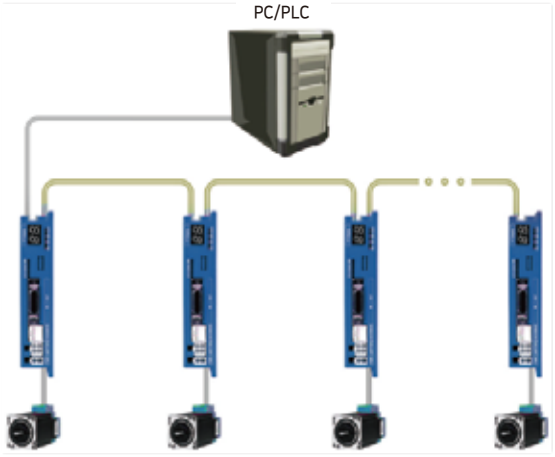
Hi-Servo Ethernet

Closed Loop Stepping System

- Embeded Motion Controller
- Ethernet Interface
- Position Table
- Closed-Loop Stepping System
- Tuning Not Required / No Hunting
- High Resolution / High Response
- Low Heat Generation / High Torque

1. Network Based Motion Control

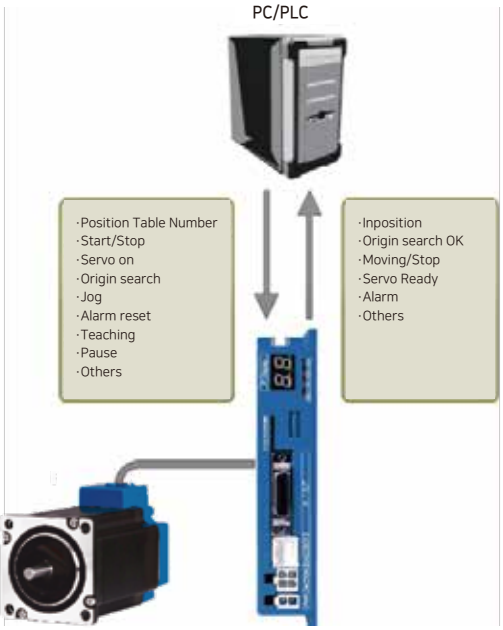
Hi-SERVO Ethernet is a stepping motor control system that supports Ethernet, an open field network based on RS-485. Hi-SERVO Ethernet is a remote device station connected to the Ethernet system. It performs various controls and processes motion and monitoring functions with device commands.



2. PT : Position Table Function

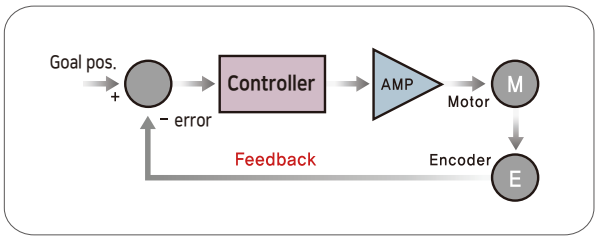
Position Table can be used for motion control by digital input and output signals of host controller. You can operate the motor directly by sending the position table number, start/stop, origin search and other digital input values from a PC.

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.



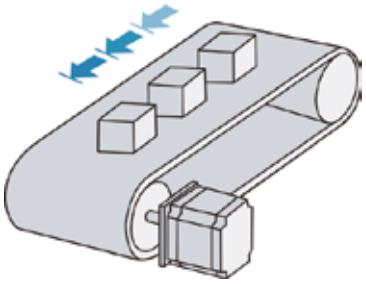
3. Closed-Loop System

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



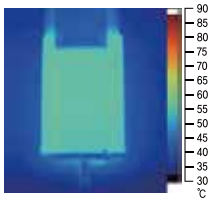
4. Tuning Not Required

To ensure machine performance, 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. Hi-SERVO employs the best characteristics of the stepping motor to eliminate the need of tedious gain tuning required for conventional closed-loop servo systems. Hi-SERVO is especially well suited for low-rigidity loads(e.g., a belt and pulley system) thath sometimes require conventional servo systems to use the additional bulky and expensive gearbox.

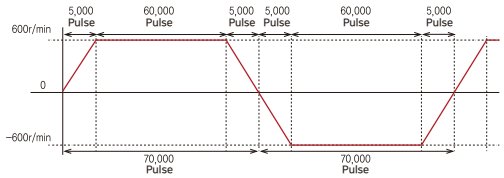


5. Low Heat Generation / Energy Savings

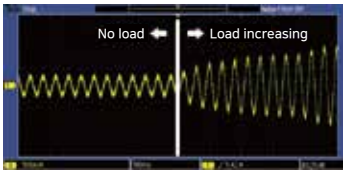
(Motor Current Control according to load)
Hi-SERVO automatically controls motor current according to load. Hi-SERVO reduces motor current when motor load is low and increases motor current when load is high. By optimizing the motor current, motor heat can be minimized and energy can be saved.



Motor temperature[Thermography]로 측정



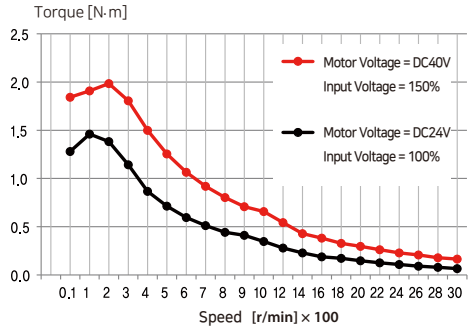
Condition to measure the motor temperature
[4hours operation, Motor surface temperature saturation]



Example of the Motor Current Control according to load

6. High Torque

(Motor Voltage Increasing and Motor Current Setting)
Hi-SERVO 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.

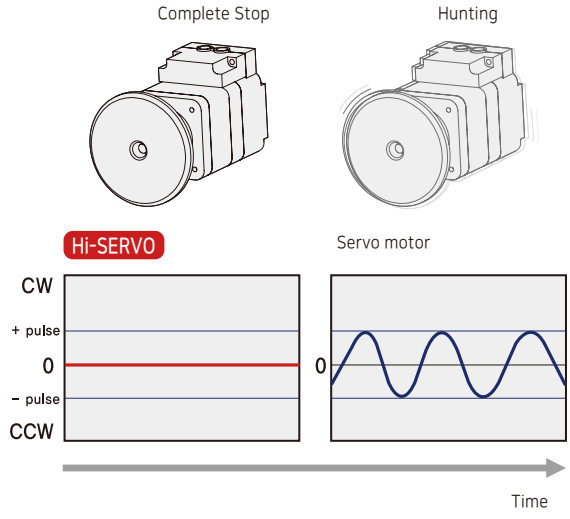


※ The torque at low speed and high speed is improved about 30%

Measured Condition : Drive = HSC-EEN-56L
Motor Voltage = DC40V
Input Voltage = DC24V

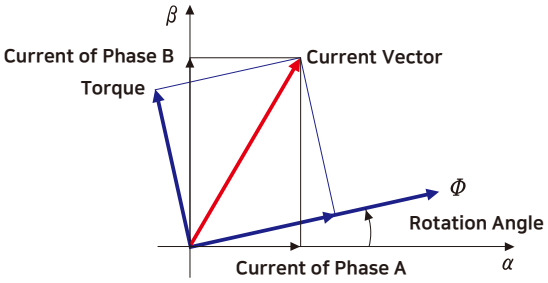
7. No Hunting

Hi-SERVO utilizes the unique characteristics of stepping motors and locks itself into the desired target position, preventing vibration and eliminating Null Hunt which happens to the conventional servo systems. This feature is especially useful in applications such as vision systems in which system oscillation and vibration could be a problem.



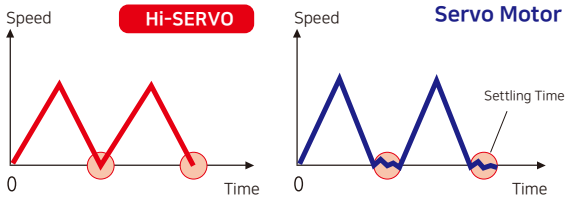
8. Smooth and Accurate Operation

Hi-SERVO 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 MCU (Micro Controller Unit) performs vector control and filtering, producing a smooth rotational control with minimum ripples.



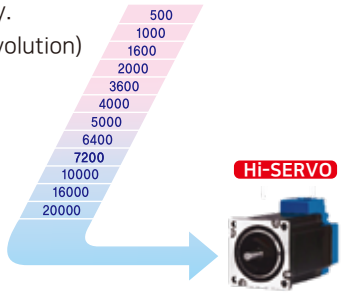
9. High Response

Similar to conventional stepping motors, Hi-SERVO instantly synchronizes with command pulses providing fast positional response. Hi-SERVO is the optimal 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.



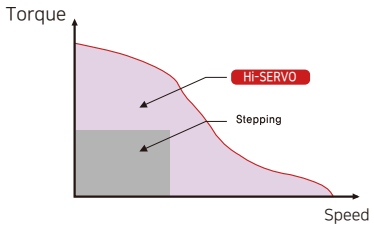
10. High Resolution

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



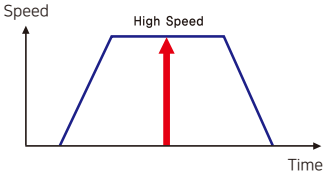
11. High Torque / Continuous Operation

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



12. High Speed

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



Advantages over Open-Loop Stepping Systems

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-SERVO utilizes 100% of the full range of rated motor torque, contrary to a conventional open-loop stepping drive 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-dependent current control, open-loop stepping drives use a constant current control at all speed ranges without considering load variations.

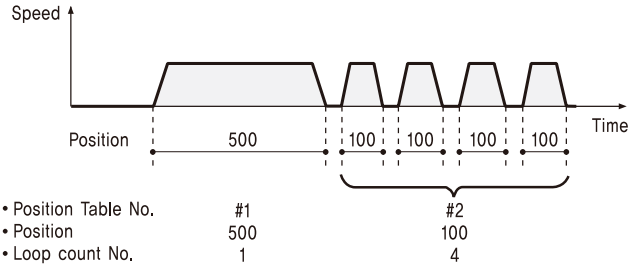
Advantages over Servo Motor Controller

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

Motion Controller Features

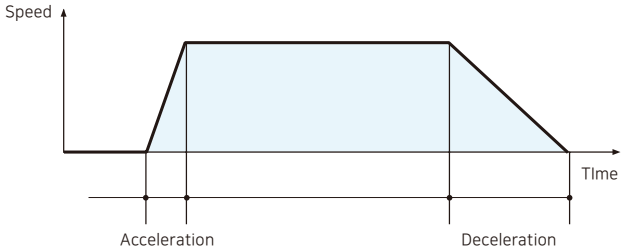
1. Loop Count

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



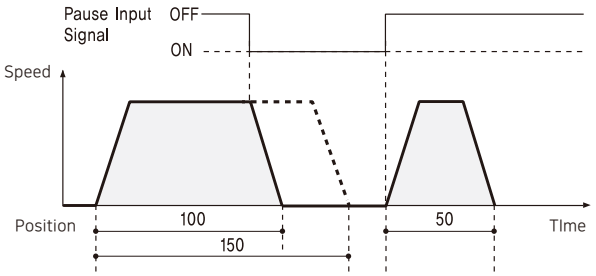
2. Acceleration/Deceleration

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



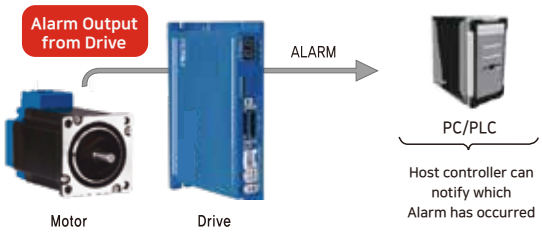
3. Pause

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



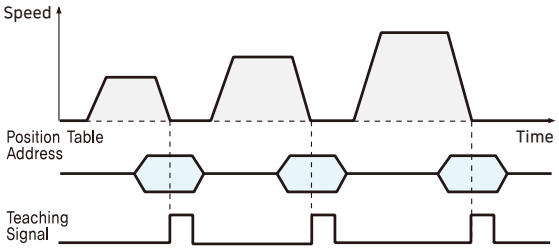
4. Alarm

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



5. Teaching

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

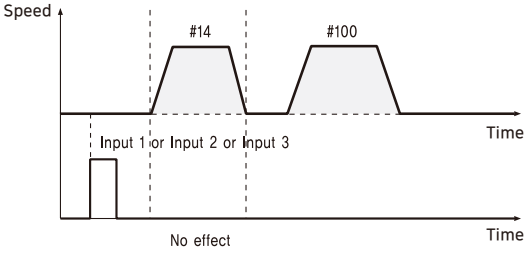


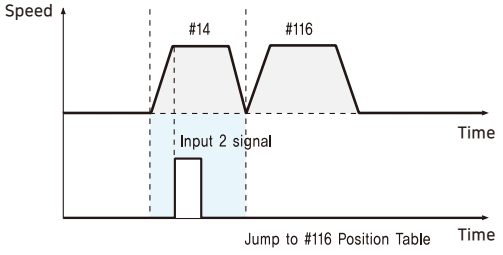
6. Jump

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-SERVO Ethernet

HSC - EEN - 56 L - A - BK - PN10

Hi-SERVO Combination	①	②	③	④	⑤	⑥

① Communication Type

EEN	Ethernet

② Motor Size

28	28mm
35	35mm
42	42mm
56	56mm
60	60mm

③ Motor Length

S	Small
M	Medium
L	Large
XL	Extra Large (※)

※ Motor length XL is only 42mm Size.

④ Encoder Resolution

A	10,000P/R
D	16,000P/R (※)

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

⑤ Brake

None	Without Brake
BK	Brake

※ If you need a speed reducer, contact your dealer or sales office.

⑥ Gear Ratio

None	Without Gear
PN03	1:3
PN05	1:5
PN08	1:8
PN10	1:10
PN15	1:15
PN25	1:25
PN40	1:40
PN50	1:50

Standard Combination

Unit Part Number	Motor Model Number	Drive Model Number
HSC-EEN-28S-D	HS-EM-28S-D	HS-ED-EN-28S-D
HSC-EEN-28M-D	HS-EM-28M-D	HS-ED-EN-28M-D
HSC-EEN-28L-D	HS-EM-28L-D	HS-ED-EN-28L-D
HSC-EEN-35M-A	HS-EM-35M-A	HS-ED-EN-35M-A
HSC-EEN-35L-A	HS-EM-35L-A	HS-ED-EN-35L-A
HSC-EEN-42S-A	HS-EM-42S-A	HS-ED-EN-42S-A
HSC-EEN-42M-A	HS-EM-42M-A	HS-ED-EN-42M-A
HSC-EEN-42XL-A	HS-EM-42XL-A	HS-ED-EN-42XL-A
HSC-EEN-56S-A	HS-EM-56S-A	HS-ED-EN-56S-A
HSC-EEN-56M-A	HS-EM-56M-A	HS-ED-EN-56M-A
HSC-EEN-56L-A	HS-EM-56L-A	HS-ED-EN-56L-A
HSC-EEN-60S-A	HS-EM-60S-A	HS-ED-EN-60S-A
HSC-EEN-60M-A	HS-EM-60M-A	HS-ED-EN-60M-A
HSC-EEN-60L-A	HS-EM-60L-A	HS-ED-EN-60L-A

Combination with Brake

Unit Part Number	Motor Model Number	Drive Model Number
HSC-EEN-42S-A-BK	HS-EM-42S-A-BK	HS-ED-EN-42S-A
HSC-EEN-42M-A-BK	HS-EM-42M-A-BK	HS-ED-EN-42M-A
HSC-EEN-42XL-A-BK	HS-EM-42XL-A-BK	HS-ED-EN-42XL-A
HSC-EEN-56S-A-BK	HS-EM-56S-A-BK	HS-ED-EN-56S-A
HSC-EEN-56M-A-BK	HS-EM-56M-A-BK	HS-ED-EN-56M-A
HSC-EEN-56L-A-BK	HS-EM-56L-A-BK	HS-ED-EN-56L-A
HSC-EEN-60S-A-BK	HS-EM-60S-A-BK	HS-ED-EN-60S-A
HSC-EEN-60M-A-BK	HS-EM-60M-A-BK	HS-ED-EN-60M-A
HSC-EEN-60L-A-BK	HS-EM-60L-A-BK	HS-ED-EN-60L-A

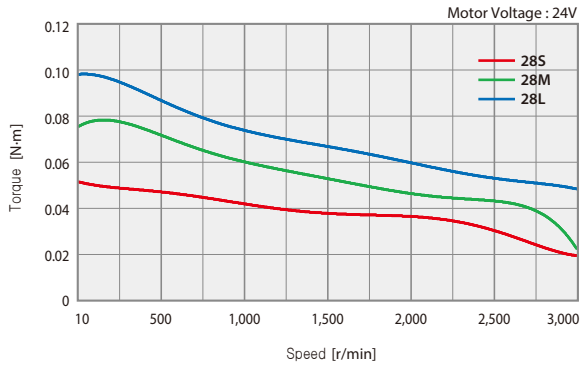
Specification of Motor

Model			Unit	HS-EM-28 series			HS-EM-35 series		HS-EM-42 series		
				28S	28M	28L	35M	35L	42S	42M	42XL
Input Voltage			-	Bipolar							
Number of phase			-	2 Phase							
Current per Phase			A/Phase	0.95	0.95	0.95	1.5	1.25	1.2	1.2	1.2
Maximum Holding Torque			N·m	0.069	0.098	0.118	0.13	0.23	0.32	0.44	0.65
Rotor Inertia			g·cm^2	9.0	13	18	15	20	35	54	114
Weight			kg	0.147	0.204	0.232	0.194	0.226	0.294	0.357	0.564
Length(L)			mm	32	45	50	32	36	34	40	60
Permissible Radial 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 Axial Load			N	Lower than Motor Unit's Weight							
Insulation resistance			Ω	Min. 100(When measured with a DC500V insulation resistance meter)							
Insulation class			-	CLASS B(130℃)							
Operating temperature			℃	0 ~ 55							

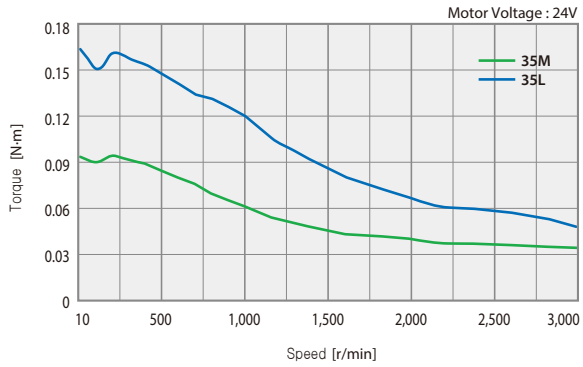
Model			Unit	HS-EM-56 series			HS-EM-60 series		
				56S	56M	56L	60S	60M	60L
Input Voltage			-	Bipolar					
Number of phase			-	2 Phase					
Current per Phase			A/Phase	3.0	3.0	3.0	4.0	4.0	4.0
Maximum Holding Torque			N·m	0.64	1.0	1.5	0.88	1.28	2.4
Rotor Inertia			g·cm^2	180	280	520	240	490	690
Weight			kg	0.608	0.784	1.230	0.693	0.856	1.419
Length(L)			mm	46	55	80	47	56	85
Permissible Radial 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 Axial Load			N	Lower than Motor Unit's Weight					
Insulation resistance			Ω	Min. 100(When measured with a DC500V insulation resistance meter)					
Insulation class			-	CLASS B(130℃)					
Operating temperature			℃	0 ~ 55					

Torque Characteristics of Motor

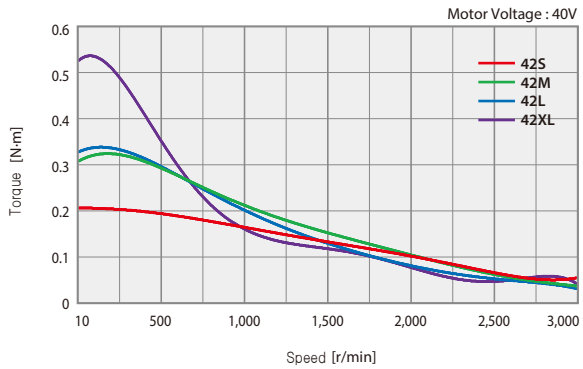
HSC-ECC-28 series



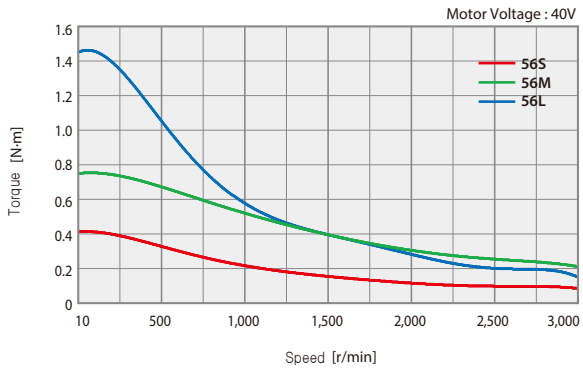
HSC-ECC-35 series



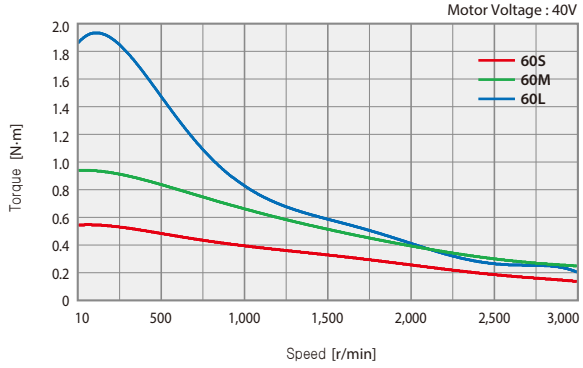
HSC-ECC-42 series



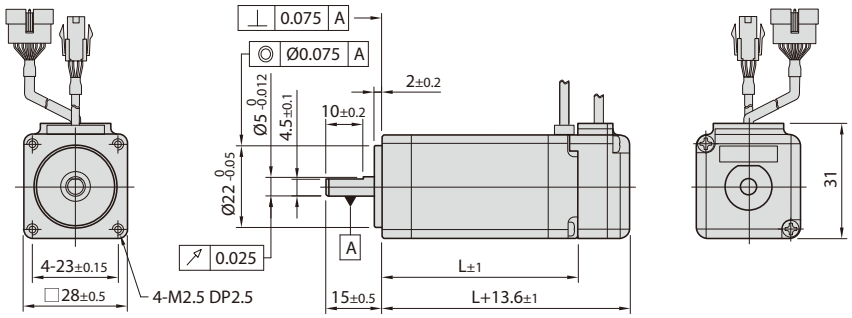
HSC-ECC-56 series



HSC-ECC-60 series

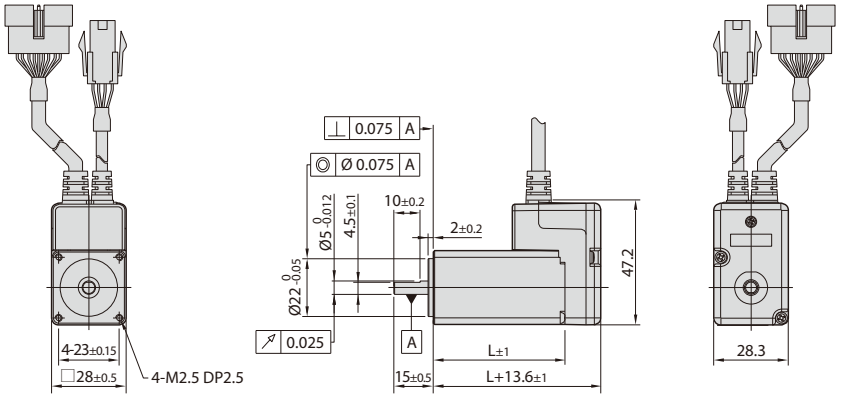


Dimensions of Motor[mm]



28mm

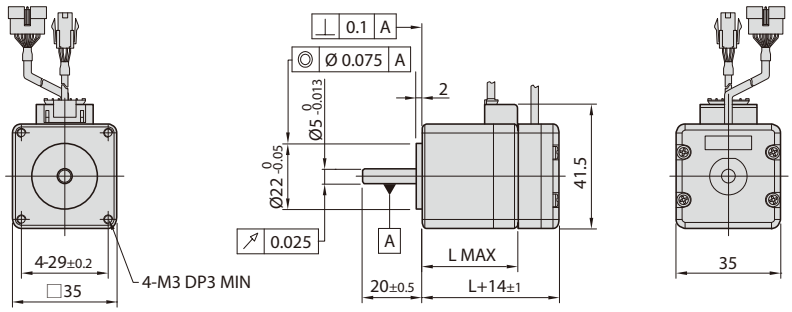
Motor	Length(L)
HS-EM-28S	32
HS-EM-28M	45
HS-EM-28L	50



28mm *(Stopper Type)*

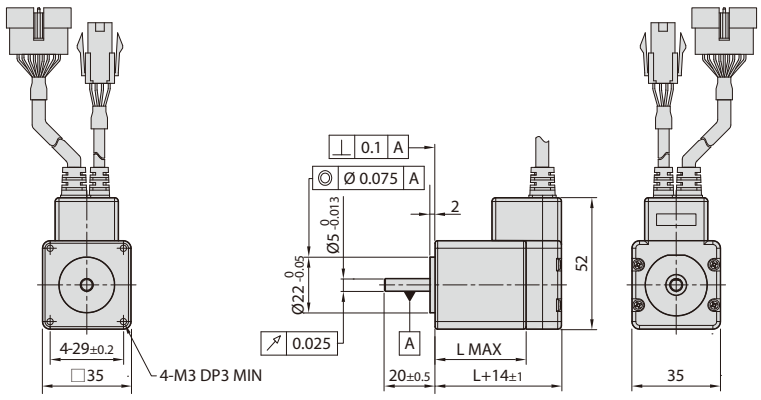
Motor	Length(L)
HS-EM-28SM	32
HS-EM-28MM	45
HS-EM-28LM	50

※ When ordering 28mm Stopper type of motor, please add "M" after standard motor model number.



35mm

Motor	Length(L)
HS-EM-35M	32
HS-EM-35L	36

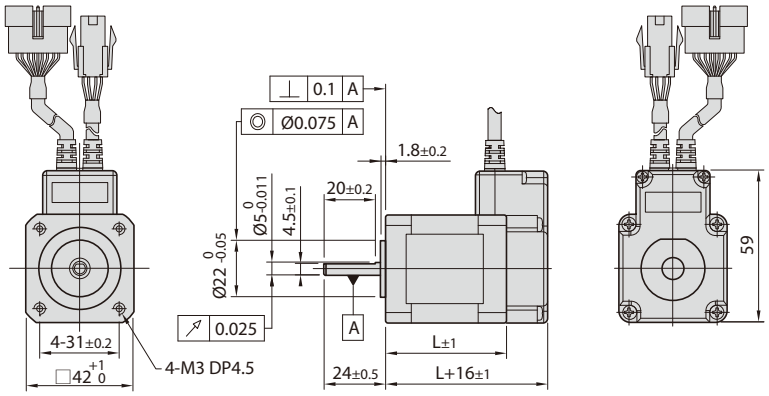


35mm *(Stopper Type)*

Motor	Length(L)
HS-EM-35MM	32
HS-EM-35LM	36

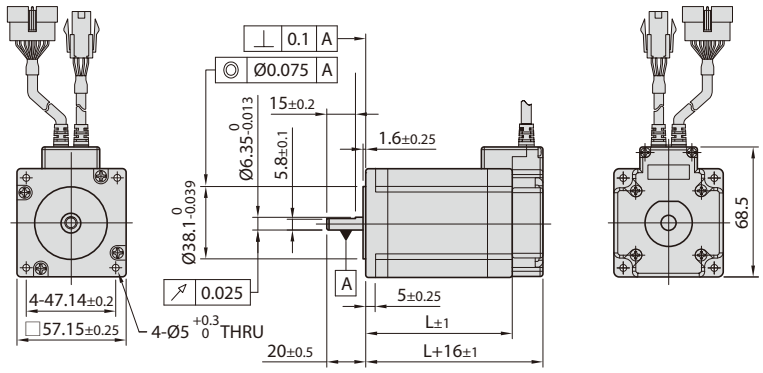
※ When ordering 35mm Stopper type of motor, please add "M" after standard motor model number.

Dimensions of Motor[mm]



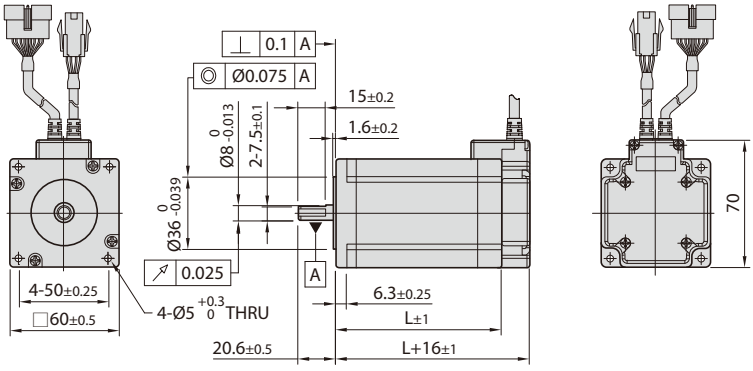
42mm

Motor	Length(L)
HS-EM-42S	34
HS-EM-42M	40
HS-EM-42XL	60



56mm

Motor	Length(L)
HS-EM-56S	46
HS-EM-56M	55
HS-EM-56L	80



60mm

Motor	Length(L)
HS-EM-60S	47
HS-EM-60M	56
HS-EM-60L	85

Specifications of Motor with Brake

Unit Part Number	Motor Model Number	Electromagnetic Brake					Motor Unit Weight [kg]	Permissible Radial Load [N]				Permissible Axial Load [N]
		Type	Voltage Input [V]	Rated Current [A]	Power Consumption [W]	Statical Friction Torque [N·m]		Distance from End of Shaft [mm]				
								3	8	13	18	
HSC-EEN-42S-■-BK	HS-EM-42S-■-BK	Non-excitation run Type	24VDC ±10%	0.2	5	0.2	0.55	22	26	33	46	Must be Lower than Unit's Weight
HSC-EEN-42M-■-BK	HS-EM-42M-■-BK						0.62					
HSC-EEN-42XL-■-BK	HS-EM-42XL-■-BK						0.82					
HSC-EEN-56S-■-BK	HS-EM-56S-■-BK			0.27	6.6	0.7	1.03	52	65	85	123	
HSC-EEN-56M-■-BK	HS-EM-56M-■-BK						1.20					
HSC-EEN-56L-■-BK	HS-EM-56L-■-BK						1.65					
HSC-EEN-60S-■-BK	HS-EM-60S-■-BK						1.11	70	87	114	165	
HSC-EEN-60M-■-BK	HS-EM-60M-■-BK						1.30					
HSC-EEN-60L-■-BK	HS-EM-60L-■-BK						1.86					

※ The code of encoder resolution will be marked in"■"

※ Electronic Brake cannot be used for braking. Position hold purpose only when power OFF.

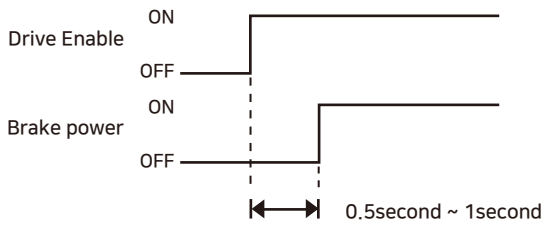
※ The weight means Motor Unit Weight including Motor and Electronic Brake.

※ Motor Model Number is combined model name of Motor and Brake.

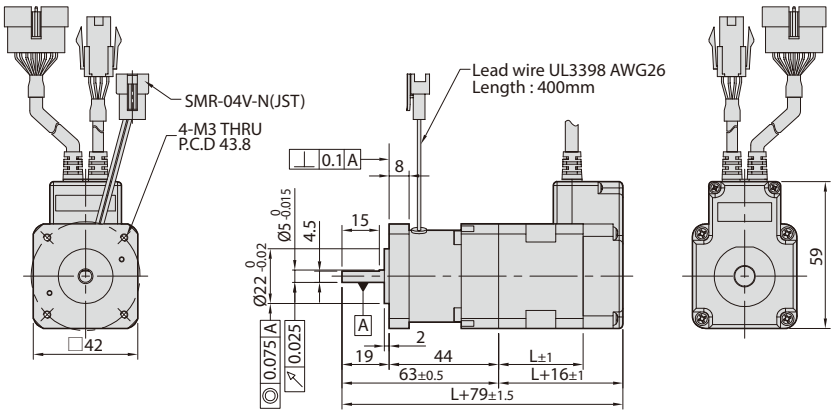
※ Motor specification and torque characteristic are same as Standard Motor.

* Brake Operation Timing Chart

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

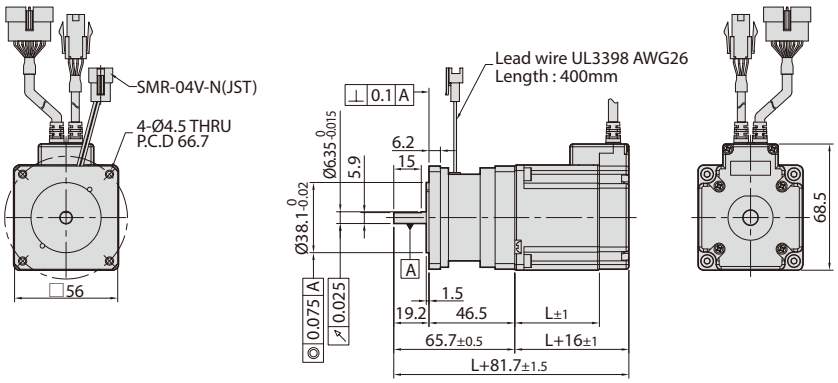


Dimensions of Motor with Brake[mm]



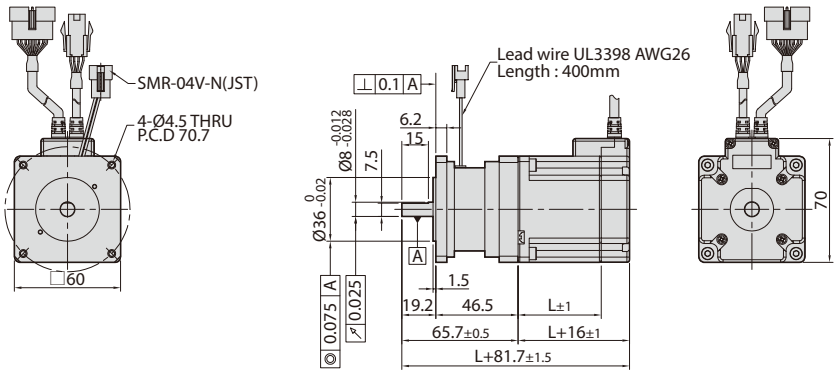
42mm

Motor	Length(L)
HS-EM-42S	34
HS-EM-42M	40
HS-EM-42XL	60



56mm

Motor	Length(L)
HS-EM-56S	46
HS-EM-56M	55
HS-EM-56L	80



60mm

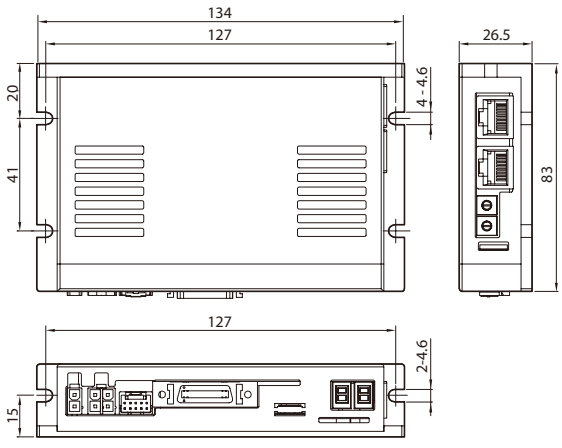
Motor	Length(L)
HS-EM-60S	47
HS-EM-60M	56
HS-EM-60L	85

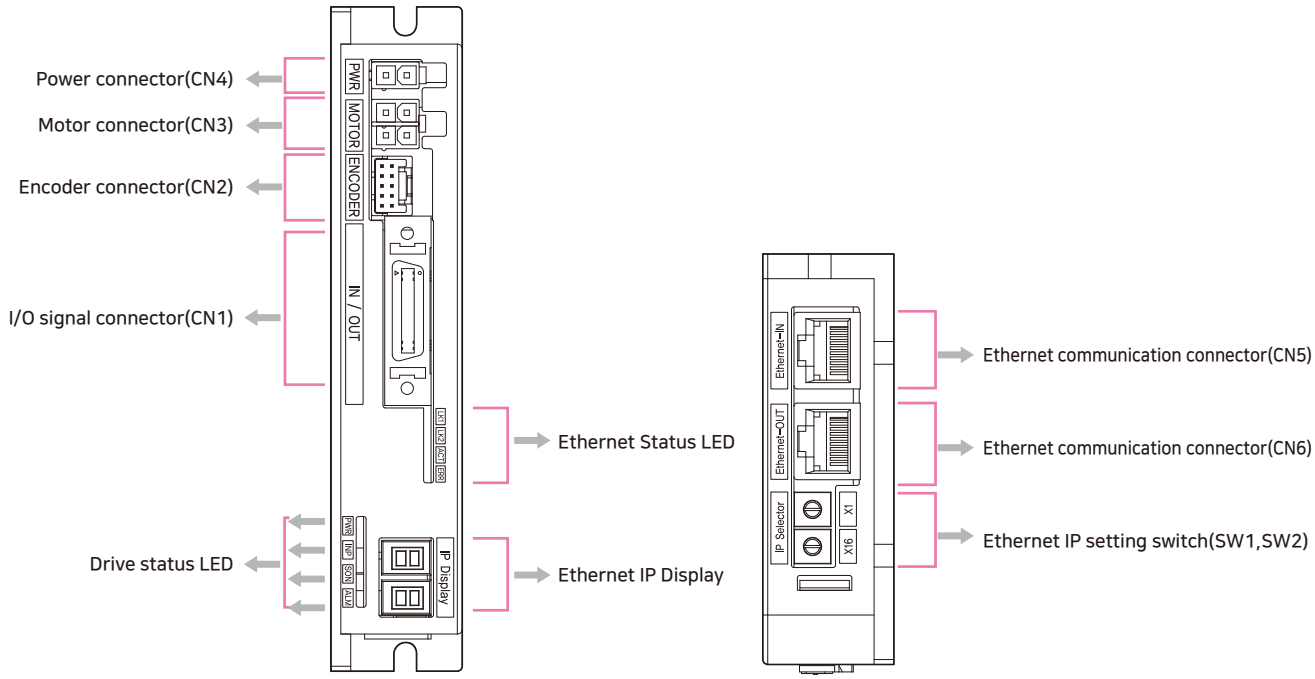
Specification of Drive

Motor Model		HS-EM-28 series	HS-EM-35 series	HS-EM-42 series	HS-EM-56 series	HS-EM-60 series
Drive Model		HS-ED-EN-28 series	HS-ED-EN-35 series	HS-ED-EN-42 series	HS-ED-EN-56 series	HS-ED-PE-60 series
Input Voltage		DC24V±10%				
Control Method		Closed loop control with 32bit MCU				
Multi Axis Drive		Maximum 254 axis operating(Selectable IP: 1~254)				
Position Table		256 motion command steps				
Current Consumption		Max. 500mA (Except motor current)				
Operating Condition	Ambient Temperature	· In Use : 0~50℃ · In Storage : -20~70℃				
	Humidity	· In Use : 35~85% RH (Non-Condensing) · In Storage : 10~90% RH (Non-Condensing)				
	Vib.Resist.	0.5g				
Function	Rotation Speed	0~3,000r/min (※1)				
	Resolution	Encoder Resolution[P/R] / Configurable Resolution [P/R] 4,000 / 500 1,000 1,600 2,000 3,600 4,000 5,000 6,400 7,200 10,000 10,000 / 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 16,000 / 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 16,000 20,000 / 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 20,000 (Selectable by parameter)				
	Error Types	Over Current Error, Over Speed Error, Position Tracking Error, Over Load Error, Over Temperaure 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				
	In-Position Selection	0~63 (Set by parameter)				
	Position Gain Selection	0~63 (Set by parameter)				
	Rotation Direction	CW/CCW (Set by parameter)				
I/O Signal	Input Signals	3 dedicated inputs (LIMIT+, LIMIT-, ORIGIN), 9 programmable inputs (Photocoupler Input)				
	Output Signals	1 programmable outputs, 9 programmable output(Photocoupler Input), 1 Brake output				
Communication Interface		· Ethernet Standard : 10BASE-T, 100BASE-TX · Full-Duplex · Dual port Ethernet switch embedded				
Position Control		· Incremental mode / Absolute mode Data Range : -134,217,728~+134,217,727Pulse · Operating speed : Max. 3,000 r/min				
Return to Origin		Origin Sensor, Z phase, ±Limit sensor, Torque				
GUI		User Interface Program within Windows				
Library		Motion Library (DLL) for windows 7/8/10				

※ 1 : Up to the resolution of 10,000P/R, maximum speed can be reached by 3,000r/min and with the resolution more than 10,000P/R, maximum speed shall be reduced accordingly.

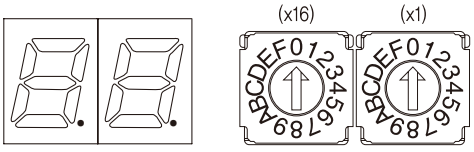
Dimensions of Drive[mm]





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

These switches set the 4th octet of Ethernet IP, and the value is shown in 7-segment LED display.
The 1st octet, the 2nd octet, and the 3rd octet are set by GUI. If the switches are set to 255(FF), DHCP function is activated, and IP is automatically set, ignoring the set value.
(Please refer to the manual for details.)



e.g.,)In case of SW2 : 5 and SW1 : 7
(5x16)+(7x1)=87
IP is to be set as 192.168.0.87

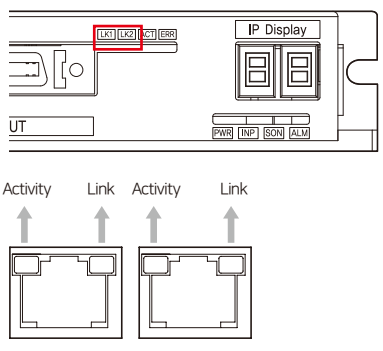
2. Ethernet Status LED

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

Indication	Color	Status	Description
ERR	Red	OFF	No Error status
		ON	Communication Data Error

Indication	Color	Status	Description
LK1/ LK2	Green	OFF	Link deactivated
		ON	Link activated

Indication	Color	Status	Description
Activity	Yellow	OFF	Stand-by
		Flickering	In operation



3. Drive Status LED

Indication	Color	Function	Description
PWR	Green	Power Input Indication	LED is turned ON when power is applied.
INP	Yellow	Positioning Completion Indication	LED is turned ON when Positioning error reaches within the preset pulse after the positioning is complete.
SON	Orange	Indication	Servo ON : Lights ON, Servo OFF : Lights OFF
ALM	Red	Alarm Indication	LED blinks when an error occurs.

■ List of error types by the number of alarm LED blinking

Times	Error Code(※4)	Protection	Conditions
1	E-001	Over Current Error	The current through power devices in drive exceeds the limit. (※1)
2	E-002	Over Speed Error	Motor speed exceeds 3,000r/min
3	E-003	Position Tracking Error	Position error value is greater than the reference value while the motor is running. (※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 Regeneratived 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	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 greater than the refernce value while the motor is stopped. (※2)

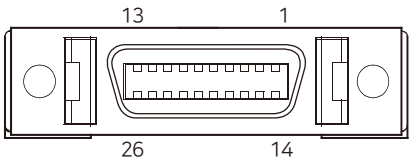
※1. Limit value depends on motor model. (Refer to the Manual)
※2. The default reference value is 180 ˚ , and it can be changed by parameter.(Refer to the Manual)
※3. Voltage limit of Back-EMP depends on motor model. (Refer to the Manual)
※4. When an alarm occurs, error code is displayed on the 7-segment LED display instead of Ethernet IP.

※ Please refer to user Manual for the details of protection functions.

Alarm LED flash
(e.g.,Position tracking error)

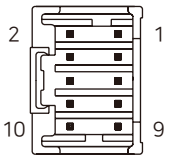
4. I/O Connector(CN1)

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_DC24V	Input



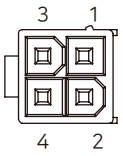
5. Encoder Connector(CN2)

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



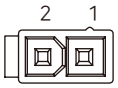
6. Motor Connector(CN3)

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



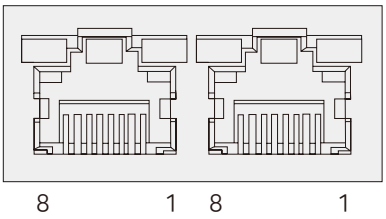
7. Power Connector(CN4)

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

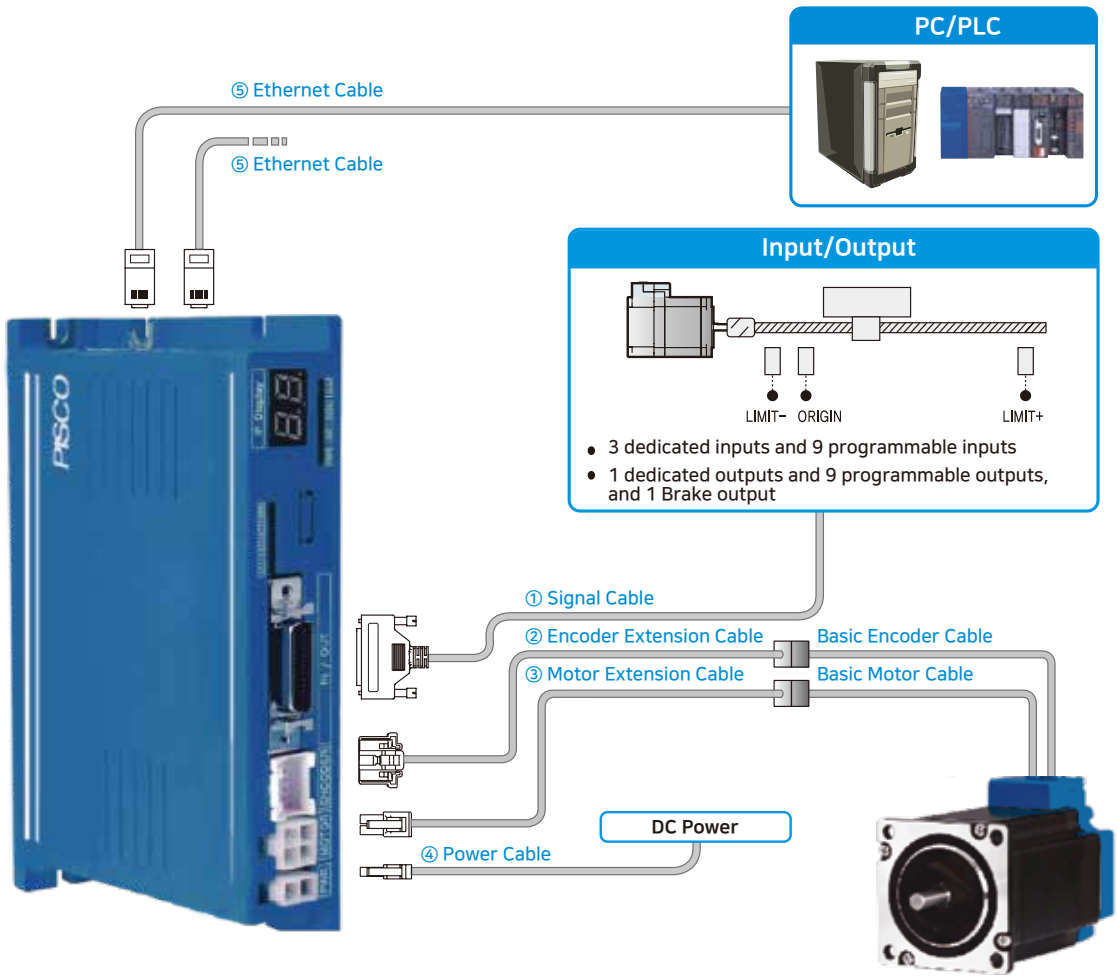


8. Ethernet Communication Connector(CN5, CN6)

No.	Function	No.	Function
1	TD+	6	RD-
2	TD-	7	----
3	RD+	8	----
4	----	Connector Hood	F.GND
5	----		



System Configuration



Cable	Max. Length	Remarks
① Signal Cable	20m	Options(Sold separately)
② Encoder Extension Cable	20m	
③ Motor Extension Cable	20m	
④ Power Cable	2m	
⑤ Ethernet Cable	100m	
Basic Encoder Cable	0.3m(Basic Length)	Basic cables are attached to motors.
Basic Motor Cable	0.3m(Basic Length)	

1. Accessories

Connectors

These are connector specifications for drive cabling.

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	10126-3000PE	3M
		Connector Cover	10326-52F0-008	

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

2. Options

① Signal Cable

These are the cables to connect Hi-SERVO Ethernet drive and other input/output devices.

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

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

② Encoder Extension Cable

These are the cables to connect Hi-SERVO Ethernet drive and the encoder.

Purpose	Item	Length[m]	Cable Type	Remarks
Drive-Basic Encoder Cable Connection	HS-CSVO-E-001F	1	Normal Cable	Maximum Length : 20m
	HS-CSVO-E-002F	2		
	HS-CSVO-E-003F	3		
	HS-CSVO-E-005F	5		
	HS-CSVO-E-001M	1	Robot Cable	
	HS-CSVO-E-002M	2		
	HS-CSVO-E-003M	3		
	HS-CSVO-E-005M	5		

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

③ Motor Extension Cable

These are the cables to connect Hi-SERVO Ethernet drive and the motor.

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

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

④ Drive Power Cable

These are the cables to connect Hi-SERVO Ethernet drive and the power.

Purpose	Item	Length[m]	Cable Type	Remarks
Drive-Power Connection	HS-CSVO-P-001F	1	Normal Cable	Maximum Length : 2m
	HS-CSVO-P-002F	2		
	HS-CSVO-P-001M	1	Robot Cable	
	HS-CSVO-P-002M	2		

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

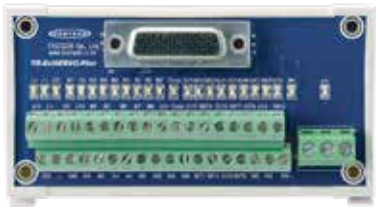
⑤ Cable

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

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

[Option] TB-Plus Interface Board

This is an interface board to connect Hi-SERVO Pulse drive and I/O signals more conveniently.

Purpose	Item	Product Image
Drive - I/O signal Connection Board	TB-Plus	

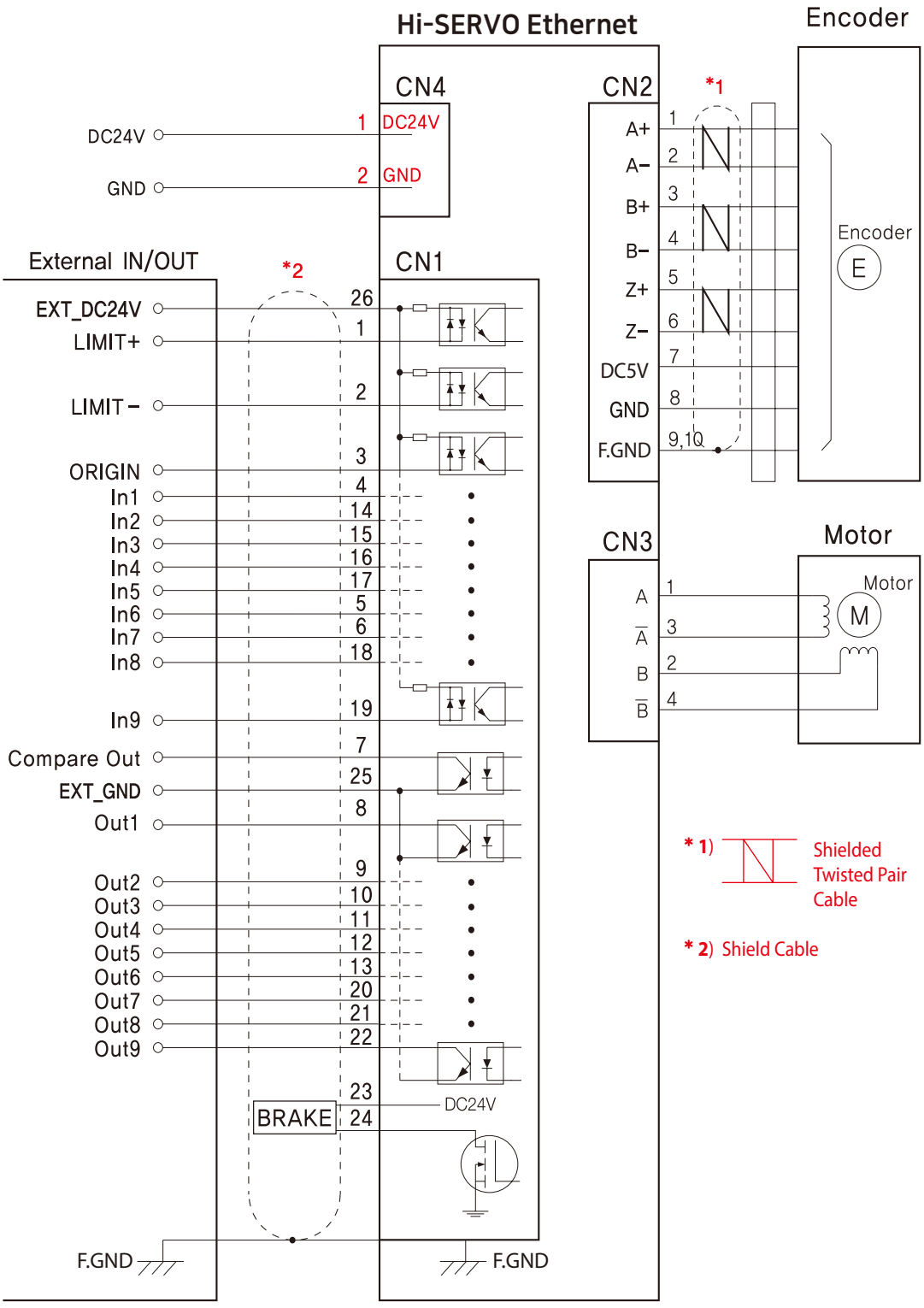
[Option] TB-Plus Interface Cable

There are the cables to connect Hi-SERVO Ethernet and TB-Plus interface board.

Purpose	Item	Length[m]	Cable Type	Remarks
Drive - Interface(TB-Plus) Connection	HS-CIFD-S-001F	1	Normal Cable	Maximum Length : 20m
	HS-CIFD-S-002F	2		
	HS-CIFD-S-003F	3		
	HS-CIFD-S-005F	5		
	HS-CIFD-S-001M	1	Robot Cable	
	HS-CIFD-S-002M	2		
	HS-CIFD-S-003M	3		
	HS-CIFD-S-005M	5		

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

External Wiring Diagram



* 1) Shielded Twisted Pair Cable

* 2) Shield Cable

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

CAUTION

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

MEMO

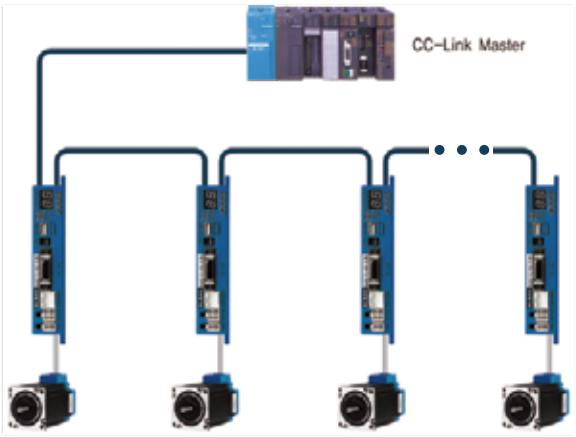
Hi-Servo CC-Link

Closed Loop Stepping System

- Embeded Motion Controller
- Position Table
- Closed Loop Stepping System
- Tuning Not Required / No Hunting
- Low heat Generation / High Torque

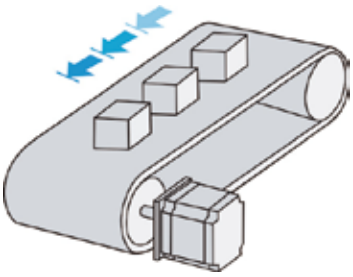
1. CC-Link Based Motion Control

Hi-SERVO CC-Link is a stepping motor control system that supports CC-Link, an open field network based on RS-485.
Hi-SERVO CC-Link is a remote device station connected to the CC-Link system. It performs various controls and processes motion and monitoring functions with device commands.



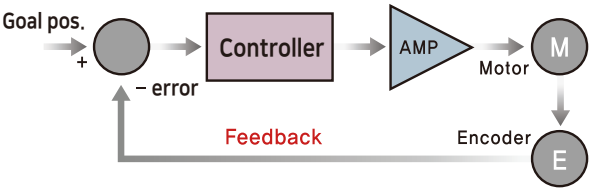
3. Tuning Not Required

To ensure machine performance, conventional servo systems require the adjustment of its servo's gains as an initial crucial step. Even systems that emply auto-tuning require manual tuning after the system is installed.
Hi-SERVO employs the best characteristics of the stepping motor to eliminate the need of tedious gain tuning required for conventional closed-loop servo systems. Hi-SERVO is especially well suited for low-rigidity loads(e.g.,a belt and pulley system)that sometimes require conventional servo systems to use the additional bulky and expensive gearbox.



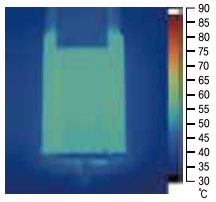
2. Closed Loop System

Hi-SERVO is an innvative Closed-Loop system that utilizes a high-resolution motor mounted encoder constantly to monitor the current position. The encoder feedback allows the Hi-SERVO drive to compensate for the loss of position, ensuring accurate positioniing. For example, due to asudden load change, a conventional stepping motor and drive could lose a step but Hi-SERVO automatically correct the position by encoder feedback.

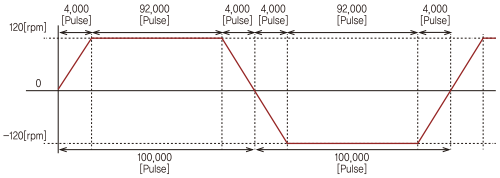


4. Low Heat Generation / Energy Savings

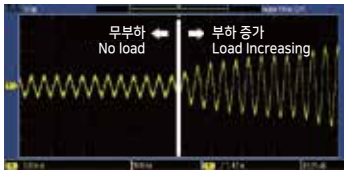
Hi-SERVO automatically controls motor current according to load. Hi-SERVO reduces motor current when motor load is low and increases motor current when load is high, By optimizing the motor current, motor heat can be minimized and energy can be saved.



Motor Temperature [Measured by Thermal Imaging Camera]



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

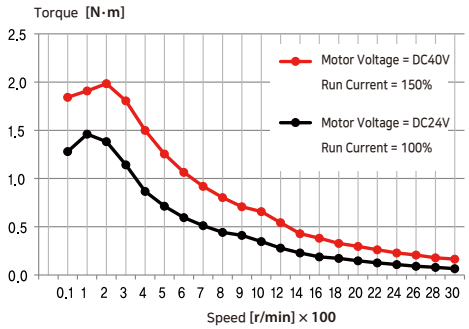


모터 전류 Example of the Motor Current Control according to load
[부하에 따른 모터 전류 제어로 모터 전류가 변하는 것을 오실로스코프로 측정한 모터 전류 파형]

5. Torque Improvement

(Motor Voltage Increasing and Motor Current Setting)

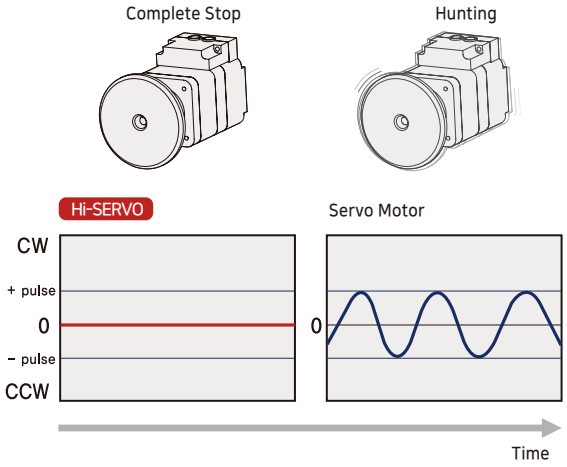
Hi-SERVO boosts the voltage supplied to the motor by internal DC-DC Converter. The torque at the high speed is increased. In addition, it is possible to set the Run Current up to 150% whereby the torque at low speed is increased. Torque can be improved by about 30% over the entire speed range.



※ The torque at low speed and high speed is improved about 30%.
Measured Condition : Drive = HSC-ECL-56L
Motor Voltage = DC40V
Input Voltage = DC24V

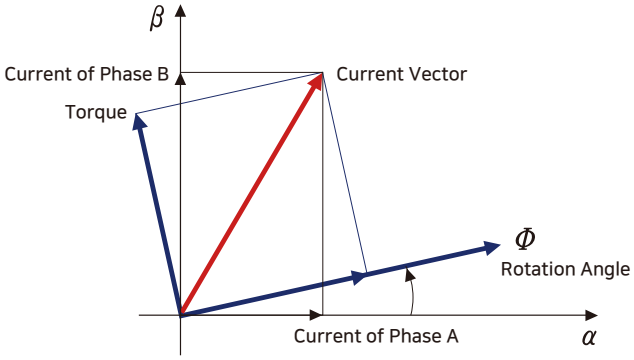
6. No Hunting

Hi-SERVO utilizes the unique characteristics of stepping motors and locks itself into the desired target position, perventing vibration and eliminating Null Hunt which happens to the conventional servo systems. This feature is especially useful in applications such as vision systems in which system oscillation and vibration could be a problem.



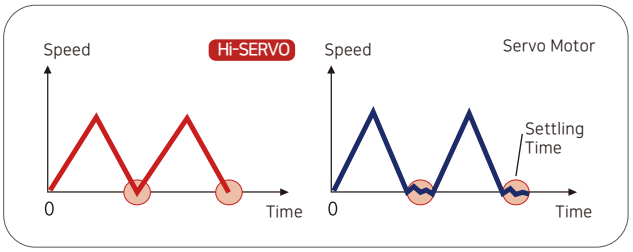
7. Smooth and Accurate Operation

Hi-SERVO is a high-precision serve drive, using a high-resolution encoder with 20,000 pulses/revolution. Unlike a conventional Microstep drive, the on-board high performance MCU (Micro Controller Unit)performs vector control adn filtering, producing a smooth rotational control with minimum ripples.



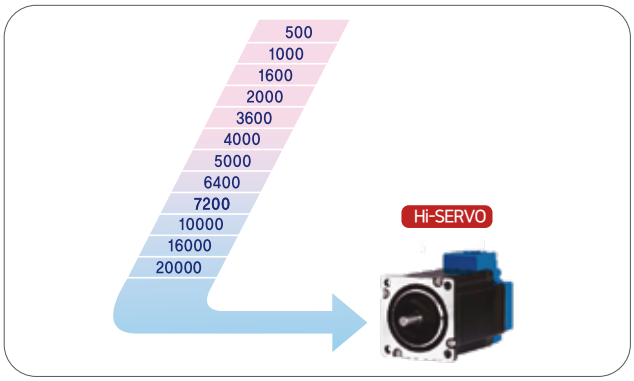
8. Fast Response

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



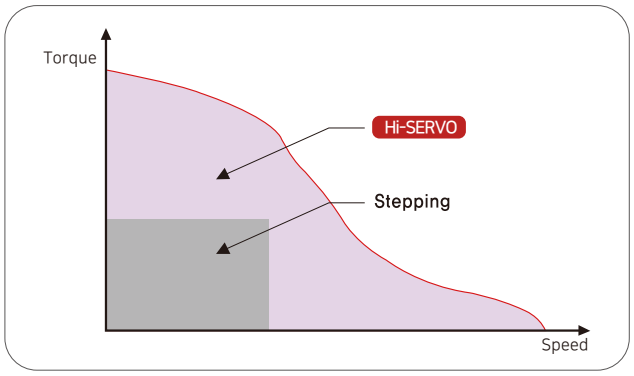
9. High Resolution

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



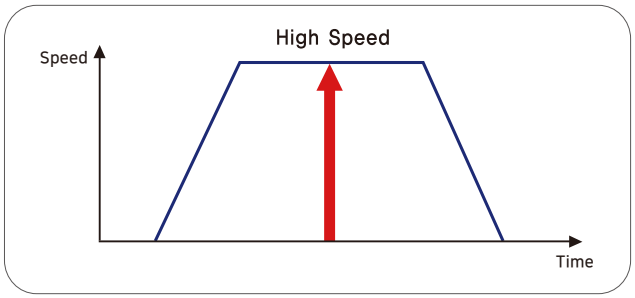
10. High Torque / Continuous Operation

Compared with common stepping motors and drives, Hi SERVO motion control systems can caintain a high torque state over relatively long period of time. This meansthat Hi SERVO continu-ously operates without loss of position under 100% of the load. Unlike conventional Microstep drives, Hi SERVO exploits contin-uous high torque operation during high speed motion due to its innovative optimum current phase control.



11. High Speed

The Hi-SERVO operates well at high speed without the loss of synchronism or positioning error. Hi-SERVO ability to monitor current position continuously enables the stepping motor to generate high torque, even under a 100% load condition.



Advantages over Open-Loop Stepping Systems

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-SERVO utilizes 100% of the full range of rated motor torque, contrary to a conventional open-loop stepping drive 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-dependent current control, open-loop stepping drives use a constant current control at all speed ranges without considering load variations.

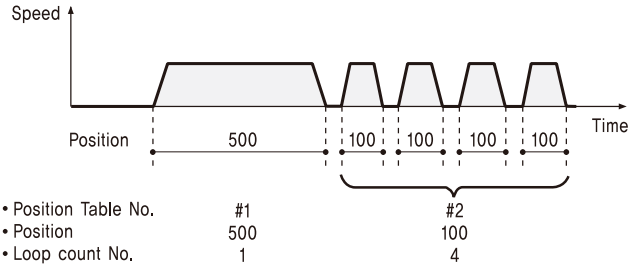
Advantages over Servo Motor Controller

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

Motion Controller Features

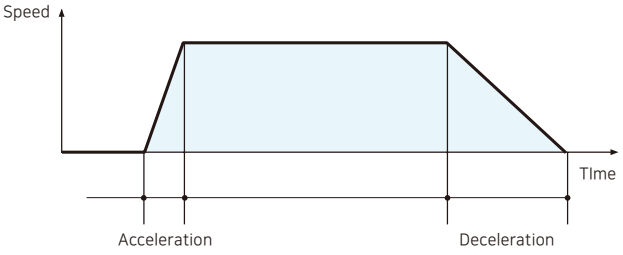
1. Loop Count

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



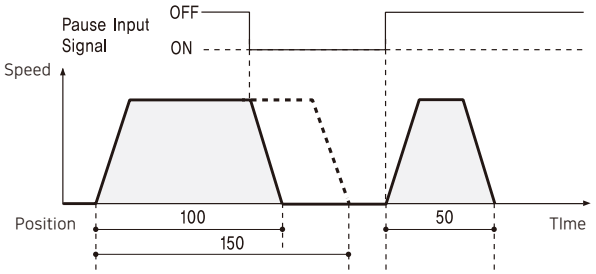
2. Acceleration/Deceleration

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



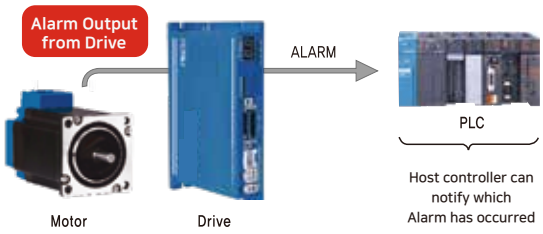
3. Pause

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



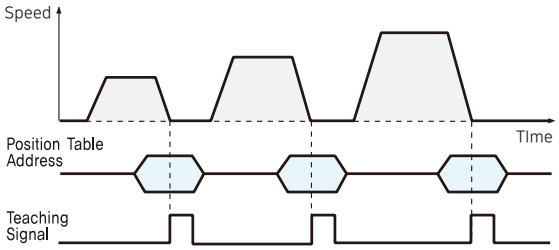
4. Alarm

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



5. Teaching

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

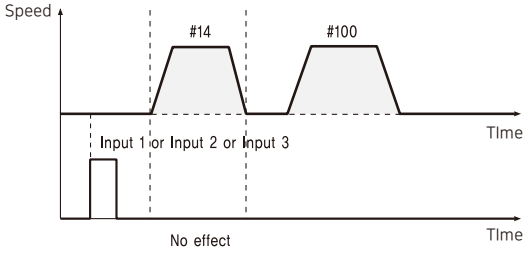


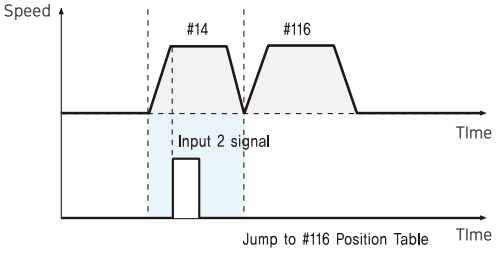
6. Jump

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-SERVO CC-Link

HSC - ECL - 56 L - A - BK - PN05

Hi-SERVO Combination	①	②	③	④	⑤	⑥

① Communication Type

ECL	CC-Link

② Motor Size

28	28mm
35	35mm
42	42mm
56	56mm
60	60mm

③ Motor Length

S	Small
M	Medium
L	Large
XL	Extra Large (※)

※ Motor length XL is only 42mm Size.

④ Encoder Resolution

A	10,000P/R
D	16,000P/R (※)

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

⑤ Brake

None	Without Brake
BK	Brake

※ If you need a speed reducer, contact your dealer or sales office.

⑥ Gear Ratio

None	Without Gear
PN03	1:3
PN05	1:5
PN08	1:8
PN10	1:10
PN15	1:15
PN25	1:25
PN40	1:40
PN50	1:50

Standard Combination

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

Combination with Brake

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

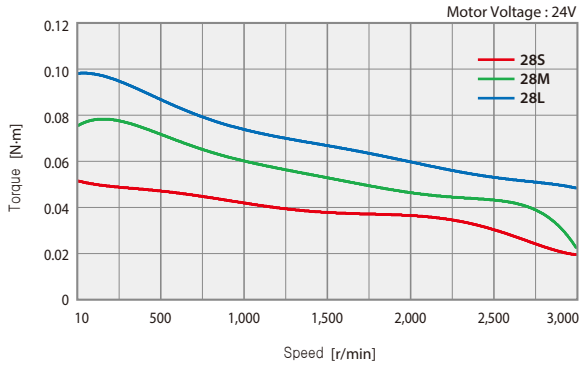
Specification of Motor

Model			Unit	HS-EM-28 series			HS-EM-35 series		HS-EM-42 series		
				28S	28M	28L	35M	35L	42S	42M	42XL
Input Voltage			-	Bipolar							
Number of phase			-	2 Phase							
Current per Phase			A/Phase	0.95	0.95	0.95	1.5	1.25	1.2	1.2	1.2
Maximum Holding Torque			N·m	0.069	0.098	0.118	0.13	0.23	0.32	0.44	0.65
Rotor Inertia			g·cm^2	9.0	13	18	15	20	35	54	114
Weight			kg	0.147	0.204	0.232	0.194	0.226	0.294	0.357	0.564
Length			mm	32	45	50	32	36	34	40	60
Permissible Radial 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 Axial Load			N	Lower than Motor Unit's Weight							
Insulation resistance			Ω	Min. 100(When measured with a DC500V insulation resistance meter)							
Insulation class			-	CLASS B(130℃)							
Operating temperature			℃	0 ~ 55							

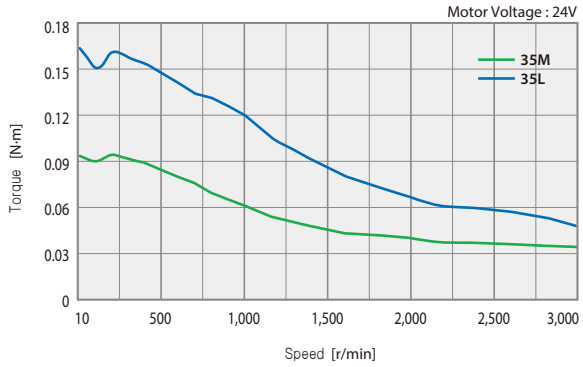
Model			Unit	HS-EM-56 series			HS-EM-60 series		
				56S	56M	56L	60S	60M	60L
Input Voltage			-	Bipolar					
Number of phase			-	2 Phase					
Current per Phase			A/Phase	3.0	3.0	3.0	4.0	4.0	4.0
Maximum Holding Torque			N·m	0.64	1.0	1.5	0.88	1.28	2.4
Rotor Inertia			g·cm^2	180	280	520	240	490	690
Weight			kg	0.608	0.784	1.230	0.693	0.856	1.419
Length			mm	46	55	80	47	56	85
Permissible Radial 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 Axial Load			N	Lower than Motor Unit's Weight					
Insulation resistance			Ω	Min. 100(When measured with a DC500V insulation resistance meter)					
Insulation class			-	CLASS B(130℃)					
Operating temperature			℃	0 ~ 55					

Torque Characteristics of Motor

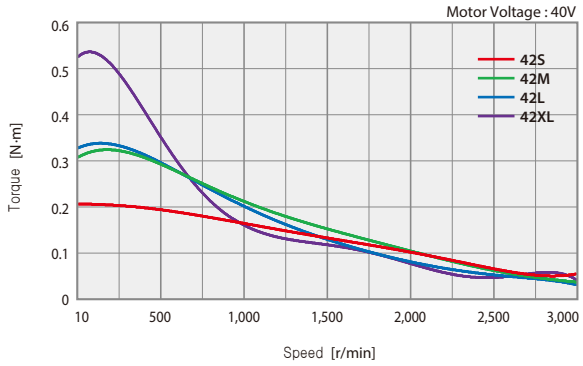
HSC-ECC-28 series



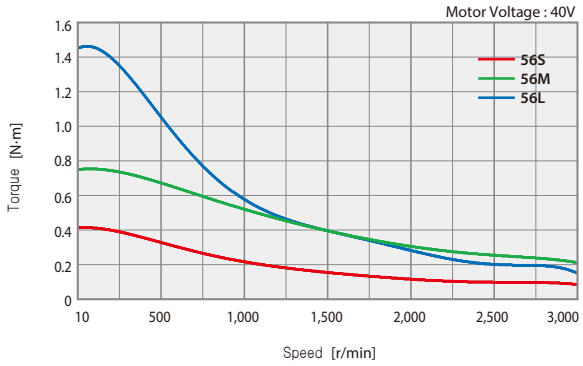
HSC-ECC-35 series



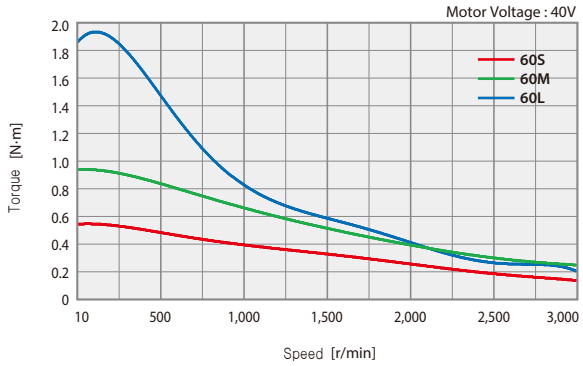
HSC-ECC-42 series



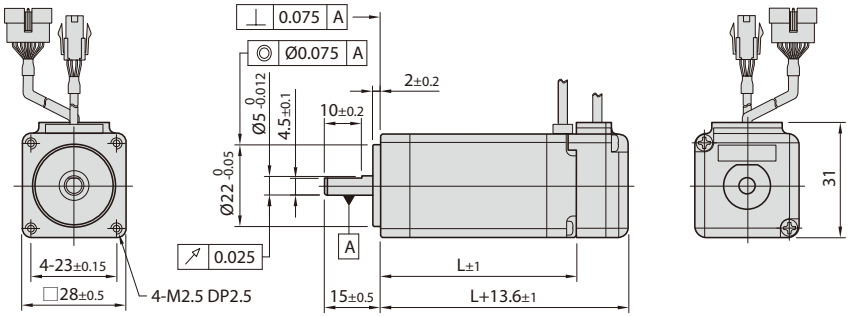
HSC-ECC-56 series



HSC-ECC-60 series

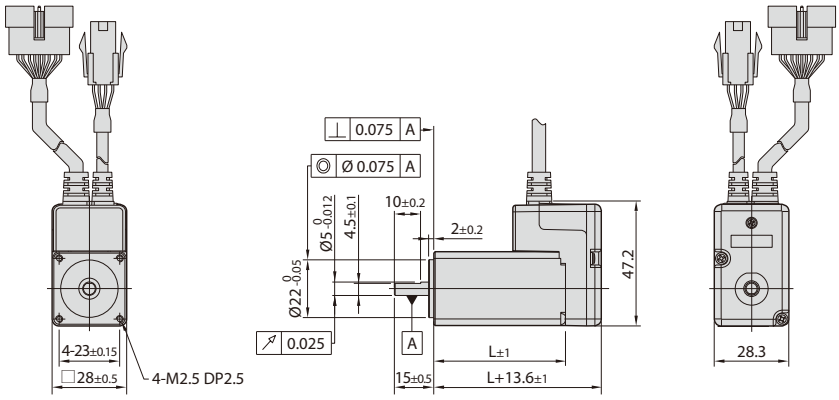


Dimensions of Motor[mm]



28mm

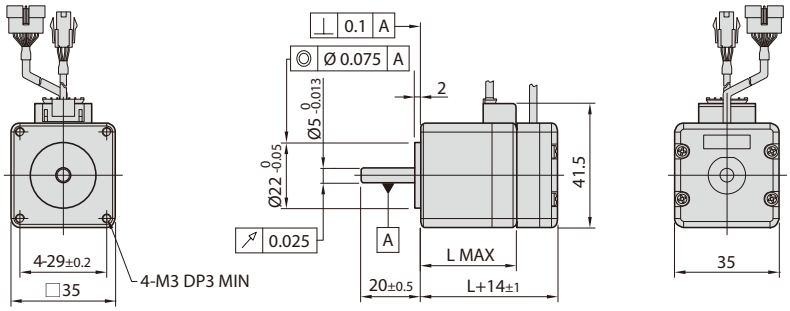
Motor	Length(L)
HS-EM-28S	32
HS-EM-28M	45
HS-EM-28L	50



28mm *(Stopper Type)*

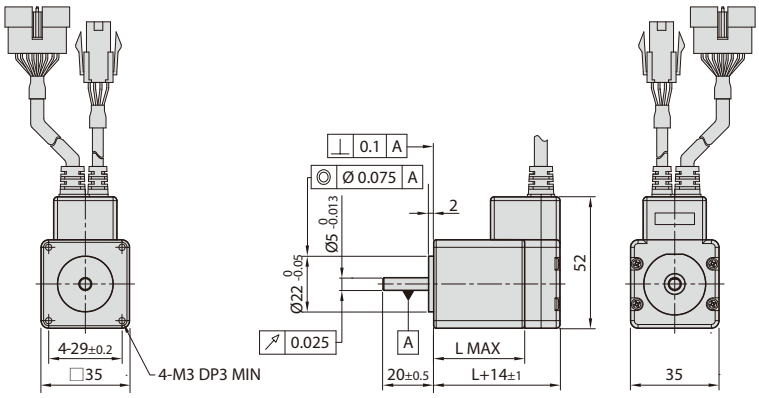
Motor	Length(L)
HS-EM-28SM	32
HS-EM-28MM	45
HS-EM-28LM	50

※ When ordering 28mm Stopper type of motor, please add "M" after standard motor model number.



35mm

Motor	Length(L)
HS-EM-35M	32
HS-EM-35L	36

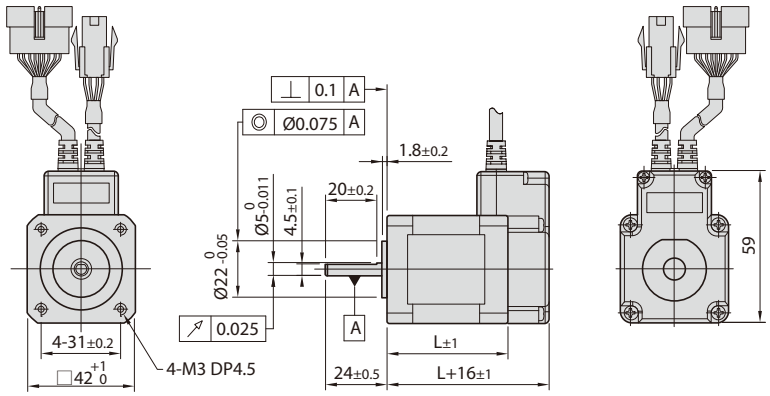


35mm *(Stopper Type)*

Motor	Length(L)
HS-EM-35MM	32
HS-EM-35LM	36

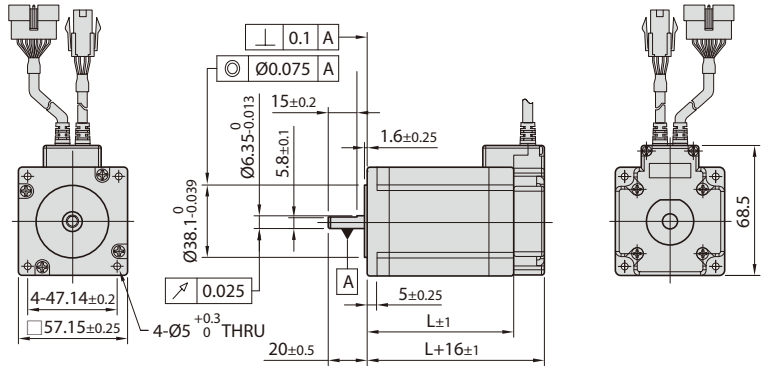
※ When ordering 35mm Stopper type of motor, please add "M" after standard motor model number.

Dimensions of Motor[mm]



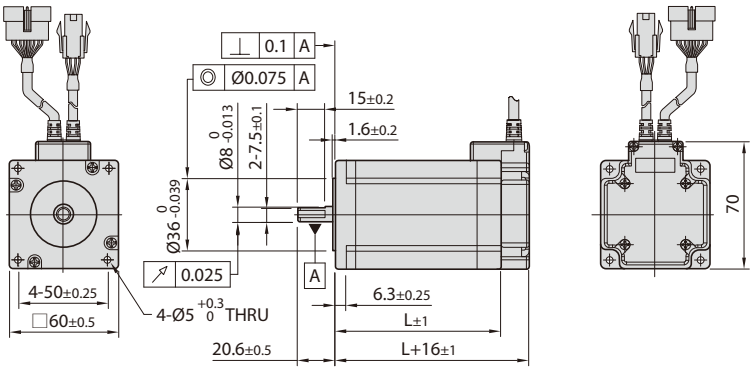
42mm

Motor	Length(L)
HS-EM-42S	34
HS-EM-42M	40
HS-EM-42XL	60



56mm

Motor	Length(L)
HS-EM-56S	46
HS-EM-56M	55
HS-EM-56L	80



60mm

Motor	Length(L)
HS-EM-60S	47
HS-EM-60M	56
HS-EM-60L	85

Specifications of Motor with Brake

Unit Part Number	Motor Model Number	Electromagnetic Brake					Motor Unit Weight [kg]	Permissible Radial Load [N]				Permissible Axial Load [N]
		Type	Voltage Input [V]	Rated Current [A]	Power Consumption [W]	Statical Friction Torque [N·m]		Distance from End of Shaft [mm]				
								3	8	13	18	
HSC-ECL-42S-■-BK	HS-EM-42S-■-BK	Non-excitation run Type	24VDC ±10%	0.2	5	0.2	0.55	22	26	33	46	Must be Lower than Unit's Weight
HSC-ECL-42M-■-BK	HS-EM-42M-■-BK						0.62					
HSC-ECL-42XL-■-BK	HS-EM-42XL-■-BK						0.82					
HSC-ECL-56S-■-BK	HS-EM-56S-■-BK			0.27	6.6	0.7	1.03	52	65	85	123	
HSC-ECL-56M-■-BK	HS-EM-56M-■-BK						1.20					
HSC-ECL-56L-■-BK	HS-EM-56L-■-BK						1.65					
HSC-ECL-60S-■-BK	HS-EM-60S-■-BK						1.11	70	87	114	165	
HSC-ECL-60M-■-BK	HS-EM-60M-■-BK						1.30					
HSC-ECL-60L-■-BK	HS-EM-60L-■-BK						1.86					

※ The code of encoder resolution will be marked in"■"

※ Electronic Brake cannot be used for braking. Position hold purpose only when power OFF.

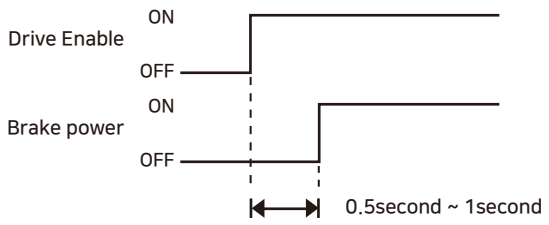
※ The weight means Motor Unit Weight including Motor and Electronic Brake.

※ Motor Model Number is combined model name of Motor and Brake.

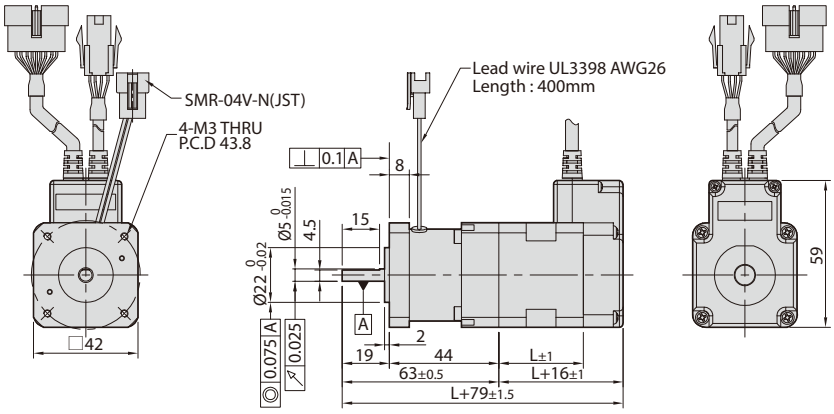
※ Motor specification and torque characteristic are same as Standard Motor.

* Brake Operation Timing Chart

Hi-SERVO CC-Link control Brake by Drive automatically.
Please refer to below Timing Chart when control Brake from upper controller other than using Hi-SERVO 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.

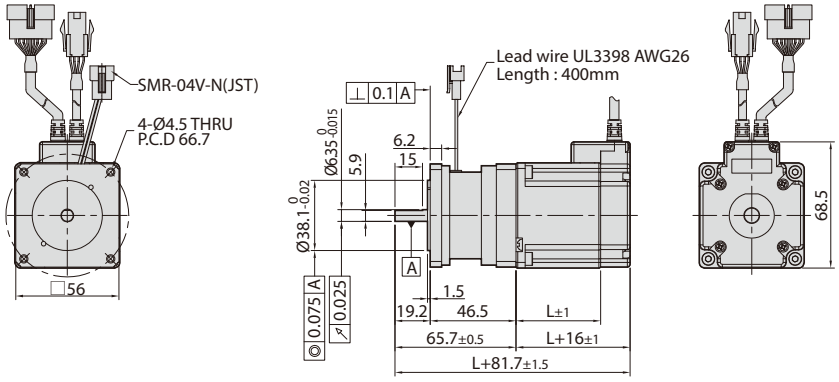


Dimensions of Motor with Brake[mm]



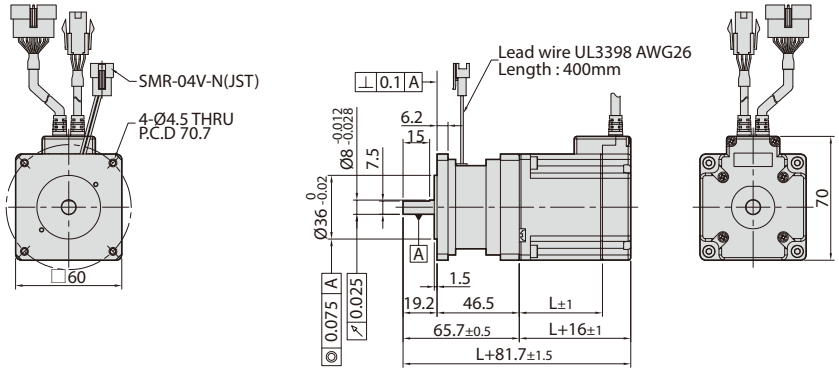
42mm

Motor	Length(L)
HS-EM-42S	34
HS-EM-42M	40
HS-EM-42XL	60



56mm

Motor	Length(L)
HS-EM-56S	46
HS-EM-56M	55
HS-EM-56L	80



60mm

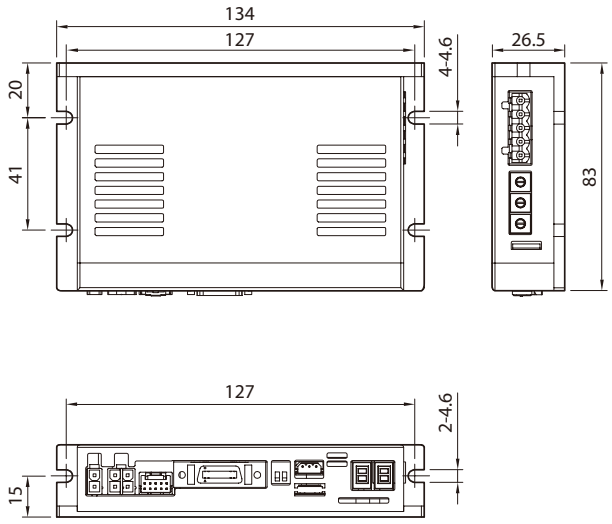
Motor	Length(L)
HS-EM-60S	47
HS-EM-60M	56
HS-EM-60L	85

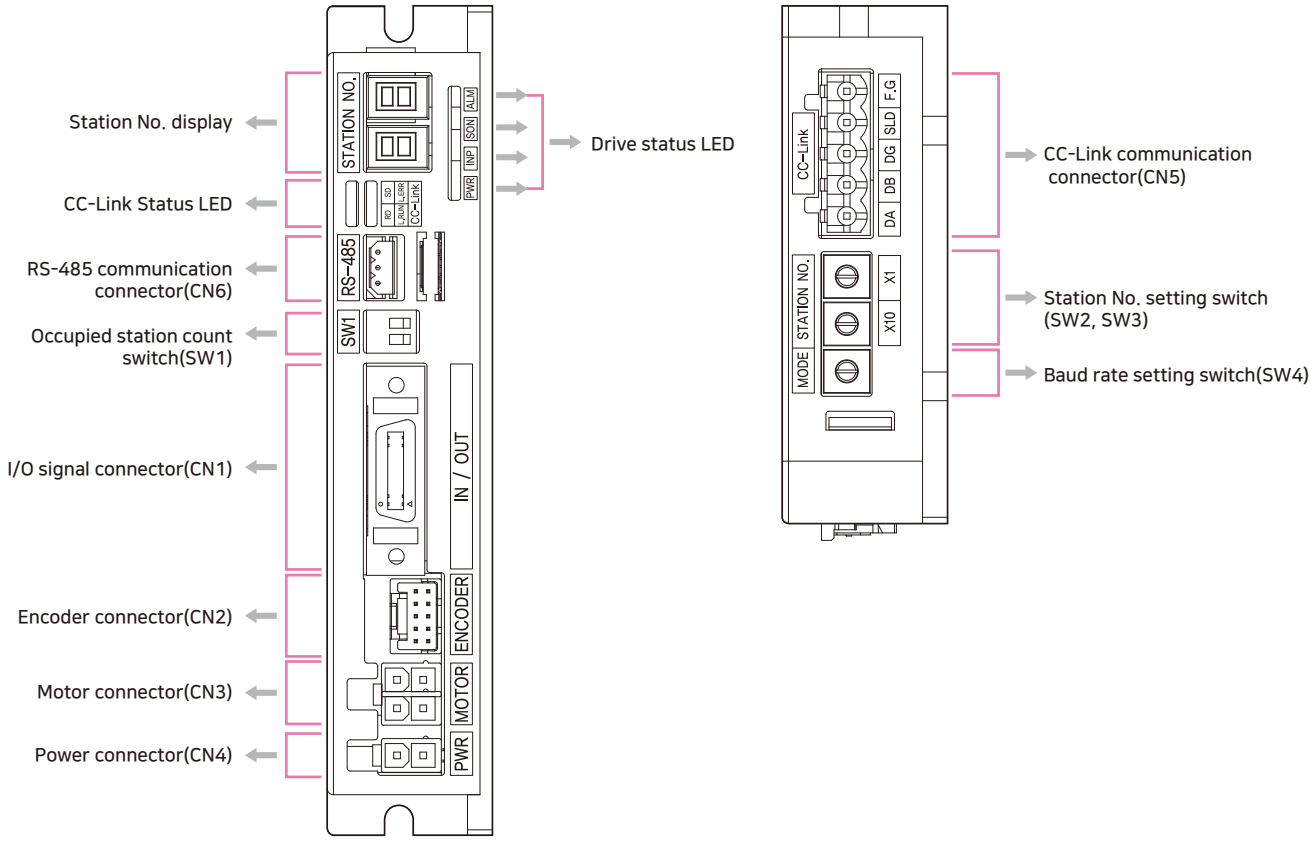
Specification of Drive

Motor Model		HS-EM-28 series	HS-EM-35 series	HS-EM-42 series	HS-EM-56 series	HS-EM-60 series
Drive Model		HS-ED-CL-28 series	HS-ED-CL-35 series	HS-ED-CL-42 series	HS-ED-CL-56 series	HS-ED-CL-60 series
Input Voltage		DC24V±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	0~3,000r/min (※1)				
	Resolution	Encoder Resolution[P/R] / Configurable Resolution [P/R] 4,000 : 500 1,000 1,600 2,000 3,600 4,000 5,000 6,400 7,200 10,000 10,000 : 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 16,000 : 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 16,000 20,000 : 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 20,000 (Selectable by parameter)				
	Error Types	Over Current Error, Over Speed Error, Position Tracking Error, Over Load Error, Over Temperaure 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				
	In-Position Selection	0~63 (Set by parameter)				
	Position Gain Selection	0~63 (Set by parameter)				
	Rotation Direction	CW/CCW (Set by parameter)				
CC-Link	Station Type	Remote Device Station				
	No. of Occupied Station	1~3 Station				
	Max. No. of Connectable Axis	· 1 Station Occupied : 42axis · 3 Station Occupied : 24axis · 2 Station Occupied : 32axis				
I/O Signal	Input Signals	3 dedicated inputs (LIMIT+, LIMIT-, ORIGIN), 7 programmable inputs (Photocoupler Input)				
	Output Signals	6 programmable outputs (Photocoupler Input), 1 Brake output				

※ 1 : Up to the resolution of 10,000P/R, maximum speed can be reached by 3,000r/min and with the resolution more than 10,000P/R, maximum speed shall be reduced accordingly.

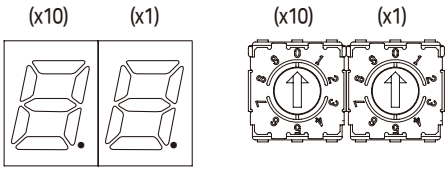
Dimensions of Drive





1. Station No. Display and Setting Switch(SW2, SW3)

These switches set the station number of the device station in decimal number.
SW2 sets the units digit(X1) and SW3 sets the tens digit(X10).



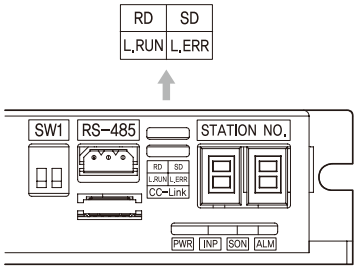
2. CC-Link Status LED

Indication	Color	Status	Description
L.RUN	Green	OFF	Power OFF or Data Link s not running
		ON	Data Link is running

Indication	Color	Status	Description
L.ERR	Red	OFF	No Error
		ON	Data Link Error
		Flashing at regular intervals	Communcation Error
		Flashing at irregular intervals	CRC Error or Network Cable Error

Indication	Color	Status	Description
RD	Orange	OFF	Not Receiving Data
		ON	Receiving Data

Indication	Color	Status	Description
SD	Yellow	OFF	Not Transmitting Data
		ON	Transmitting Data



3. Drive Status LED

Indication	Color	Function	Description
PWR	Green	Power Input Indication	LED is turned ON when power is applied.
INP	Yellow	Positioning Completion Indication	LED is turned ON when Positioning error reaches within the preset pulse after the positioning is complete.
SON	Orange	Servo On/Off Indication	Servo ON : Lights ON, Servo OFF : Lights OFF
ALM	Red	Alarm Indication	LED blinks when an error occurs.

■ List of error types by the number of alarm LED blinking

Times	Error Code(※4)	Protection	Conditions
1	E-□01	Over Current Error	The current through power devices in drive exceeds the limit. (※1)
2	E-□02	Over Speed Error	Motor speed exceeds 3,000r/min
3	E-□03	Position Tracking Error	Position error value is greater than the reference value while the motor is running.(※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	Inside temperature of drive exceeds 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	Cable connection error in Encoder connection of drive
10	E-□0A	In-Position Error	After operation is finished, position error more than 1 pulse is continued for more than 3 seconds
12	E-□0C	ROM Error	Error occurs in parameter storage device(ROM)
15	E-□0F	Position Overflow Error	Position error value is greater than the refernce value while the motor is stopped. (※2)

※1. Limit value depends on motor model. (Refer to the Manual)
※2. The default reference value is 180 ˚ , and it 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 LED display instead of Station No.

※ Please refer to user Manual for the details of protection functions.
※ □ is the CC-Link error code.

■ CC-Link Error Code

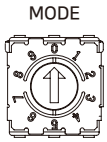
Error Code	Description
E-0□□.	Operation is normal.
E-1□□.	Station No. switch setting is incorrect.
E-2□□.	Baud rate setting is incorrect.
E-3□□.	Station No. is changed during the operation.
E-4□□.	Baud rate is changed during the operation.
E-5□□.	CRC error
E-6□□.	Timeout error occurred during the communication with the 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

※ □□ refers to drive alarm status.

4. Baud Rate Setting Switch(SW4)

This switch sets the baud rate.
('MODE' is marked on the case.)

MODE	Baud Rate
0	Without Gear
1	156 kbps
2	625 kbps
3	2.5 Mbps
4	5 Mbps
5	10 Mbps
6	NONE
7	NONE
8	NONE
9	NONE



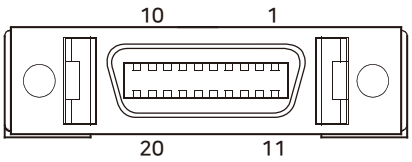
5. Occupied Station Count Switch(SW1)

This switch sets the number of occupied stations.

SW1.1	SW1.2	No. of Occupied Station
OFF	OFF	1 Station Occupied
ON	OFF	2 Station Occupied
OFF	OFF	3 Station Occupied

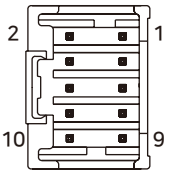
6. Input/Output Signal Connector(CN1)

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_DC24V	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	DC5V	Output
8	GND	Output
9	F.GND	----
10	F.GND	----



8. Motor Connector(CN3)

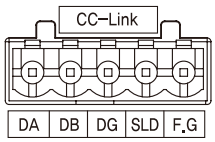
No.	Function	I/O
1	A Phase	Output
2	B Phase	Output
3	$\overline{A}$ Phase	Output
4	$\overline{B}$ Phase	Output

9. Power Connector(CN4)

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

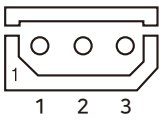
10. CC-Link Communication Connector(CN5)

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

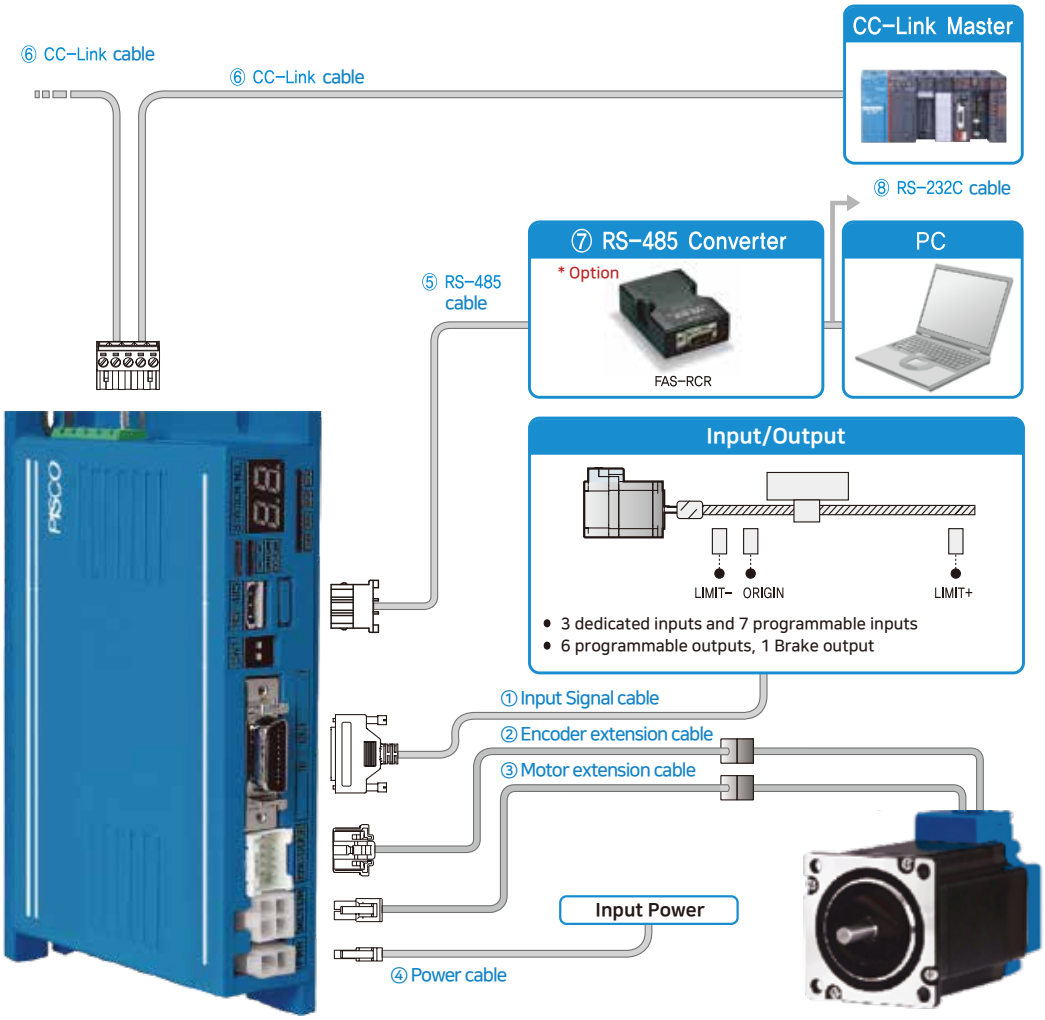


11. RS-485 Connector(CN6)

No.	Function
1	Data+
2	Data-
3	GND



System Configuration



Cable	Max. Length	Remarks
① Signal Cable	20m	Options(Sold separately)
② Encoder Extension Cable	20m	
③ Motor Extension Cable	20m	
④ Power Cable	2m	
⑤ CC-Link Cable	100m	
⑥ RS-485 Cable	2m	
Basic Encoder Cable	0.3m(Basic Length)	Basic cables are attached to motors.
Basic Motor Cable	0.3m(Basic Length)	

1. Accessories

Connectors

These are connector specifications for drive cabling.

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	10120-3000PE	3M
		Connector Cover	10320-52A0-008	
CC-Link Communication(CN5)		Terminal Block	AK950-5	PTR
RS-485 Communication(CN6)		Housing	5264-03	MOLEX
		Terminal	5263PBT	

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

2. Options

① Signal Cable

These are the cables to connect Hi-SERVO CC-Link drive and other input/output devices.

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

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

② Encoder Extension Cable

These are the cables to connect Hi-SERVO CC-Link drive and the encoder.

Purpose	Item	Length[m]	Cable Type	Remarks
Drive-Basic Encoder Cable Connection	HS-CSVO-E-001F	1	Normal Cable	Maximum Length : 20m
	HS-CSVO-E-002F	2		
	HS-CSVO-E-003F	3		
	HS-CSVO-E-005F	5		
	HS-CSVO-E-001M	1	Robot Cable	
	HS-CSVO-E-002M	2		
	HS-CSVO-E-003M	3		
	HS-CSVO-E-005M	5		

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

③ Motor Extension Cable

These are the cables to connect Hi-SERVO CC-Link drive and the motor.

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

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

④ Drive Power Cable

These are the cables to connect Hi-SERVO CC-Link drive and the power.

Purpose	Item	Length[m]	Cable Type	Remarks
Drive-Power Connection	HS-CSVO-P-001F	1	Normal Cable	Maximum Length : 2m
	HS-CSVO-P-002F	2		
	HS-CSVO-P-001M	1	Robot Cable	
	HS-CSVO-P-002M	2		

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

⑤ RS-485 Cable

Purpose	Item	Length[m]	Remarks
RS-485 Connection	HS-CGNR-RT-001F	1	Normal Cable
	HS-CGNR-RT-002F	2	
	HS-CGNR-RT-003F	3	
	HS-CGNR-RT-005F	5	

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

⑥ CC-Link Cable

It is the cable to connect Hi-SERVO CC-Link drive and the CC-Link system.

※ This cable is not provided by PISCO KOREA. It is recommended to use the standard cable specified by the CC-Link Association.

⑦ RS-485 Converter

Purpose	Item	Specifications		Product Image
RS-232C to RS-485 Converter	FAS-RCR	Baud Rate	Max. 115.2kbps	
		Comm. Distance	RS-232C: Max. 15m RS-485: Max. 1.2km	
		Connector	RS-232C: DB9 Female RS-485: RJ-45	
		Dimensions	50X75X23mm	
		Weight	38g	
		Power	Power supplied by RS-232C (DC5~24V external power can be applied)	
USB to RS-485 Two-way Convertoer	FAS-RCV	· USB and RS-485 power and signal isolation type · Works with USB power · Compatible with a variety of OSs that support USB v1.1 and V2.0 - Windows98, 98SE, ME, 2000, Server 2003, XP(x84, x64), Server 2008, Vista(x86, x64) - Windows 7(x86, x64) - Win CE 4.2, 5.0, 6.0 - MAC OS 8/9, OSX - Linux 2.4 and later · Up to 921,600 bps communication speed support (HSA-EPR) - Available up to 1 Mbps on kita equipment · Built-in end resistance selection switch (120 ohms) · Communication status representation with status indicator LEDs (TXD, RXD)		

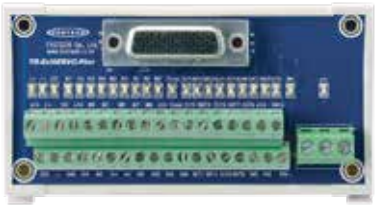
⑧ RS-232C Cable

These are the cables to connect FAS-RCR and RS-232C port of the host controller.

Purpose	Item	Length[m]	Cable Type
FAS-RCR-RS-232C Connection	HS-CGNR-C-002F	2	Normal Cable
	HS-CGNR-C-003F	3	
	HS-CGNR-C-005F	5	

[Option] TB-Plus Interface Board

This is an inerface board to connect Hi-SERVO CC-Link drive and I/O signals more conveniently.

Purpose	Item	Product Image
Drive-I/O Connection Board	TB-Plus	

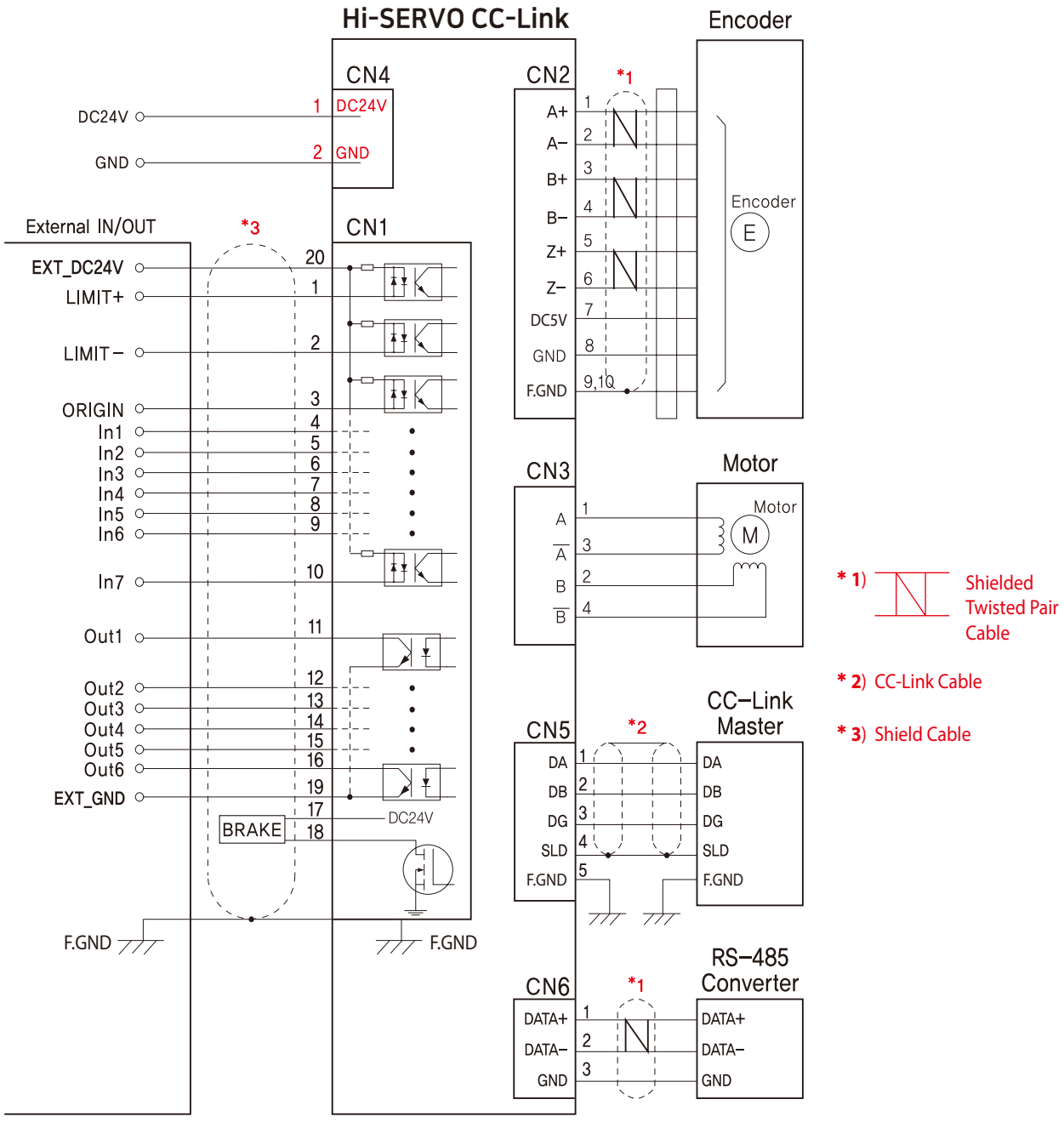
[Option] TB-Plus Interface Board

These are the cables to connect Hi-SERVO CC-Link and TB-Plus interface board.

Purpose	Item	Length[m]	Cable Type	Remarks
Drive-Interface(TB-Plus) Connection	HS-CIFN-S-001F	1	Normal Cable	Maximum Length : 20m
	HS-CIFN-S-002F	2		
	HS-CIFN-S-003F	3		
	HS-CIFN-S-005F	5		
	HS-CIFN-S-001M	1	Robot Cable	
	HS-CIFN-S-002M	2		
	HS-CIFN-S-003M	3		
	HS-CIFN-S-005M	5		

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

System Configuration



*** 1)** Shielded Twisted Pair Cable

*** 2)** CC-Link Cable

*** 3)** Shield Cable

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

CAUTION

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

MEMO

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