

Microstep Driver

2 Phase Bipolar Stepping Motor Driver

MB450 series



Fast, Accurate, Smooth Motion

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※ Before Operation ※

- Thank you for your purchasing MB450.
- MB450 is full digital position control step drive.
- This manual describes handling, maintenance, repair, diagnosis and troubleshooting of MB450.
- Before operating MB450, thoroughly read this manual.
- After reading the manual, keep the manual near the MB450 so that any user can read the manual whenever needed.

1. Precautions

◆ General Precautions

- Contents of this manual are subject to change without prior notice for functional improvement, change of specifications or user's better understanding. Thoroughly read the manual provided with the purchased MB450.
- When the manual is damaged or lost, please contact with Fastech's agents or our company at the address on the last page of the manual.
- Our company is not responsible for a product breakdown due to user's dismantling for the product, and such a breakdown is not guaranteed by the warranty.

◆ Put the Safety First

- Before installation, operation and repairing the MB450, thoroughly read the manual and fully understand the contents. Before operating the MB450 please, understand the mechanical characteristics of the MB450 and related safety information and precautions.
- This manual divides safety precautions into **Attention** and **Warning**.




Attention : If user does not properly handle the product, the user may seriously or slightly injured and damages may occur in the machine.




Warning : If user does not properly handle the product, a dangerous situation (such as an electric shock) may occur resulting in deaths or serious injuries.


- Although precaution is only a **Attention**, a serious result could be caused depending on the situation. Follow safety precautions.

◆ Check the Product


 Attention	<p>Check the Product is damaged or parts are missing. Otherwise, the machine may get damaged or the user may get injured.</p>
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◆ Installation

 Attention	<p>Carefully move the MB450. Otherwise the Product may get damaged or User's foot may get injured by dropping the product.</p> <p>Use non-flammable materials such as metal in the place where the MB450 is to be installed. Otherwise, a fire may occur.</p> <p>When installing several MB450 in a sealed place, install a cooling fan to keep the ambient temperature of the MB450 as 50°C or lower. Otherwise, a fire or other kinds of accidents may occur due to overheating.</p>
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 Warning	<p>The process of Installation, Connection, Operation, Checking and Repairing should be done with qualified person. Otherwise, a fire or other kinds of accidents may occur.</p>
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◆ Connect Cables

 Attention	<p>Keep the rated range of Input Voltage for MB450. Otherwise, a fire or other kinds of accidents may occur.</p> <p>Cable connection should follow the wiring diagram. Otherwise, a fire or other kinds of accidents may occur.</p>
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 Warning	<p>Before connecting cables, check if input power is off. Otherwise, an electric shock or a fire may occur.</p> <p>The case of the MB450 is insulated from the ground of the internal circuit by the condenser. Ground the MB450. Otherwise, an electric shock or a fire may occur.</p>
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◆ Operation



Attention

If a protection function(alarm) occurs, firstly remove its cause and then release(alarm reset) the protection function.

If you operate continuously without removing its cause, the machine may get damaged or the user may get injured.

Do not make Motor Free and make input signal to ON during operation.

Motor will stop and stop current will become zero. The machine may get damaged or the user may get injured.

Make all input signals to OFF before supply input voltage to MB450.

The machine may get damaged or the user may get injured by motor operation.

All parameter values are set by default factory setting value. Change this value after reading this manual throughly.

Otherwise, the machine may get damaged or other kinds of accidents may occur.

◆ Check and Repair



Warning

Stop to supply power to the main circuit and wait for a while before checking or repairing the MB450.

Electricity remaining in the capacitor may cause danger.

Do not change cabling while power is being supplied.

Otherwise, the user may get injured or the product may get damaged.

Do not reconstruct the MB450.

Otherwise, an electric shock may occur or the reconstructed product can not get After-Service.

2. Main Features

◆ High Precision Micro-step Function and Filtering

MB450 can be split up the default resolution of 1.8° up to $1/250$ (0.0072°). Unlike a conventional drive, MB450 perform PWM control for every 50μ sec, so more precise current control is possible. Therefore the high precision micro-step is possible. Also, at very low speed, smooth operation is possible by Software Filtering Technic of input pulse.

◆ Drive Output Signal Monitoring

MB450 provides loss of step, run/stop, over-current, over-heat, over-voltage, power, and motor connection alarms that can be monitored by the controller and visible by a motor-mounted flashing led indicator.

◆ Improvement of High-Speed Driving

Depending on the speed of a stepping motor, MB450 automatically increases the supply voltage and prevents the torque lowering due to the low operating voltage to the motor caused by back-emf voltage, this enables high-speed operation. Additionally, the software damping algorithm minimizes the vibration and prevents the loss-of-synchronization at high-speed.

3. Model and Motor Drive Combination

◆ MB450-C,T Drive Products

Drive Part Number	Motor Part Number	
	Standard	Brake Embedded Model
MB450-C MB450-T	MM-20L	-
	MM-28S	
	MM-28M	
	MM-28L	
	MM-35M	
	MM-35L	
	MM-42S	MM-42S-BK
	MM-42M	MM-42M-BK
	MM-42L	MM-42L-BK
	MM-42XL	MM-42XL-BK
	MM-56S	MM-56S-BK
	MM-56M	MM-56M-BK
	MM-56L	MM-56L-BK
	MM-60S	MM-60S-BK
	MM-60M	MM-60M-BK
	MM-60L	MM-60L-BK

◆ MB450-MINI Drive Products

Drive Part Number	Motor Part Number	
	Standard	Brake Embedded Model
MB450-MINI	MM-20L	-
	MM-28S	
	MM-28M	
	MM-28L	
	MM-35M	
	MM-35L	
	MM-42S	MM-42S-BK
	MM-42M	MM-42M-BK
	MM-42L	MM-42L-BK
	MM-42XL	MM-42XL-BK

4. Drive Specification and Dimension

4.1 Drive Specification

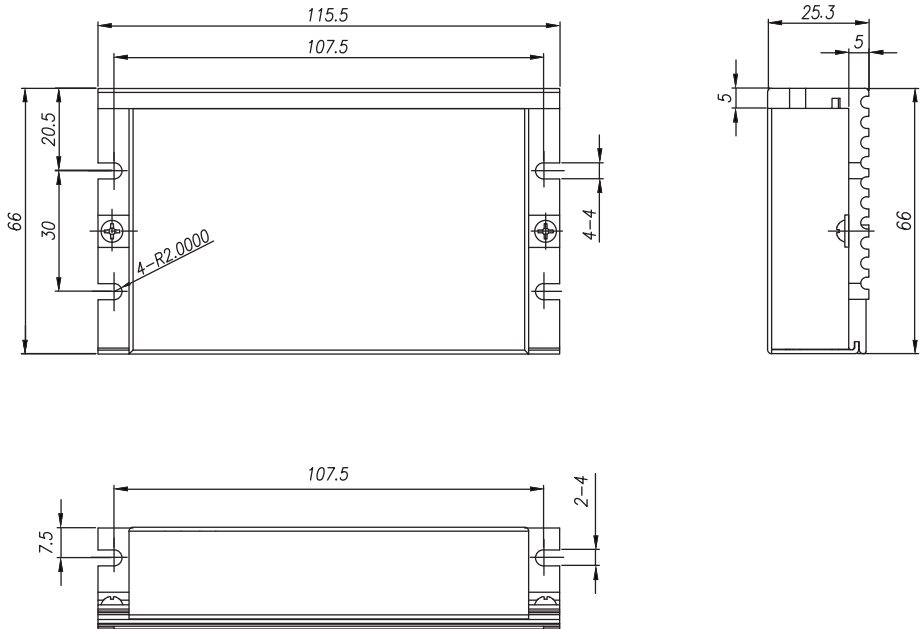
Specification/ Form	MB450-C	MB450-T	MB450-MINI
Input Voltage	DC24V ±10%		
Current Consumption	Maximum 500mA (Except motor current)		
Control Method	PWM operation method (By-polar operation)		
Motor Operation Current	0.5~4A	0.5~4A	0.5~3A
RUN Current	0.5A~4.0A (Selected by DIP switch), set the rated current of motor that is connected to drive. *Default : 0.5A		
STOP Current	10%~100% (Selected by DIP switch), When motor stop operation, after 0.1second the motor current will be set to STOP current value. *Default : 50%		
Speed/Position Control Command	Pulse input (Photo-coupler input)		
Maximum Input	500kHz (Duty 50%)		
Resolution (P/R)	500 1,000 1,600 2,000 3,200 3,600 4,000 5,000 6,400 8,000 10,000 20,000 25,000 36,000 40,000 50,000 (Selected by DIP switch) *Default : 10,000		
Pulse Input Method	1 Pulse/2 Pulse (Selected by DIP switch), 1 Pulse : Pulse/Direction, 2 Pulse : CW/CCW *Default : 2 Pulse		
Rotation Direction	CW/CCW (Selected by DIP switch), Used for changing rotation direction of the motor. *Default : CW		
Inductance Setting	0.7mH~12mH (Selected by DIP switch), Set the inductance value of motor that is connected to drive. *Default : 0.7mH ~1.4mH		
Protection Functions	Over Current Error, Over Speed Error, Over Temperature Error, Over Regenerated Voltage Error, Motor Connection Error, Motor Voltage Error, System Error, ROM Error, Input Voltage Error.		
LED Display	Power(Green), Alarm(Red), CW rotation(Yellow), CCW rotation (Orange)		
Input Signal	Motor Free/Alarm Reset (Photo-coupler input)		
Output Signal	Alarm, Run/Stop (Photo-coupler output), Brake control		
Ambient Temperature	0~50°C (Non-condensing)		
Storage Temperature	-20~70°C (Non-condensing)		
Humidity	35~85%RH (Non-condensing)		
Storage Humidity	10~90%RH (Non-condensing)		
Surrounding Environment	There should be no direct contact with corrosive gas, dust, water and oil		
Vib. Resist	0.5G		
Dimension (mm)	115.5 (W)×66 (D)×25.3 (H)	115.5 (W)×66 (D)×25.3 (H)	82.8 (W)×53.9 (D)×21.5 (H)
Weight(Except attachments)	179g	179.5g	89g

* Please refer to 「Setting and operating」 (18page) to obtain detailed function information

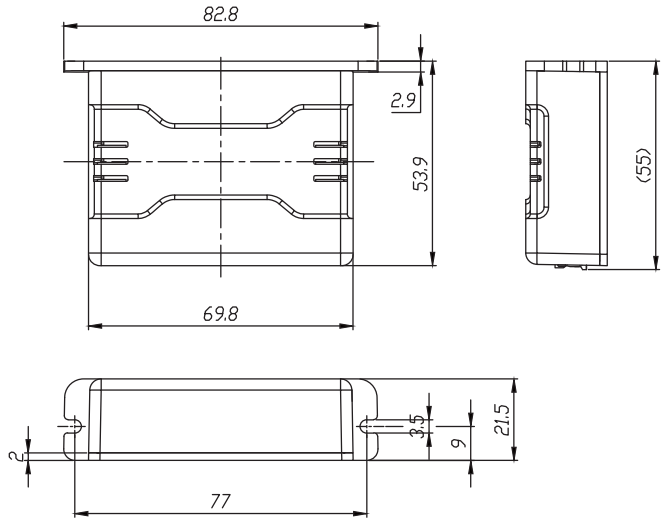
* Please refer to 「Control Input/Output explanation」 (27Page) to obtain detailed Input/Output signal information

4.2 Drive Dimension

◆ MB450-C,T Series

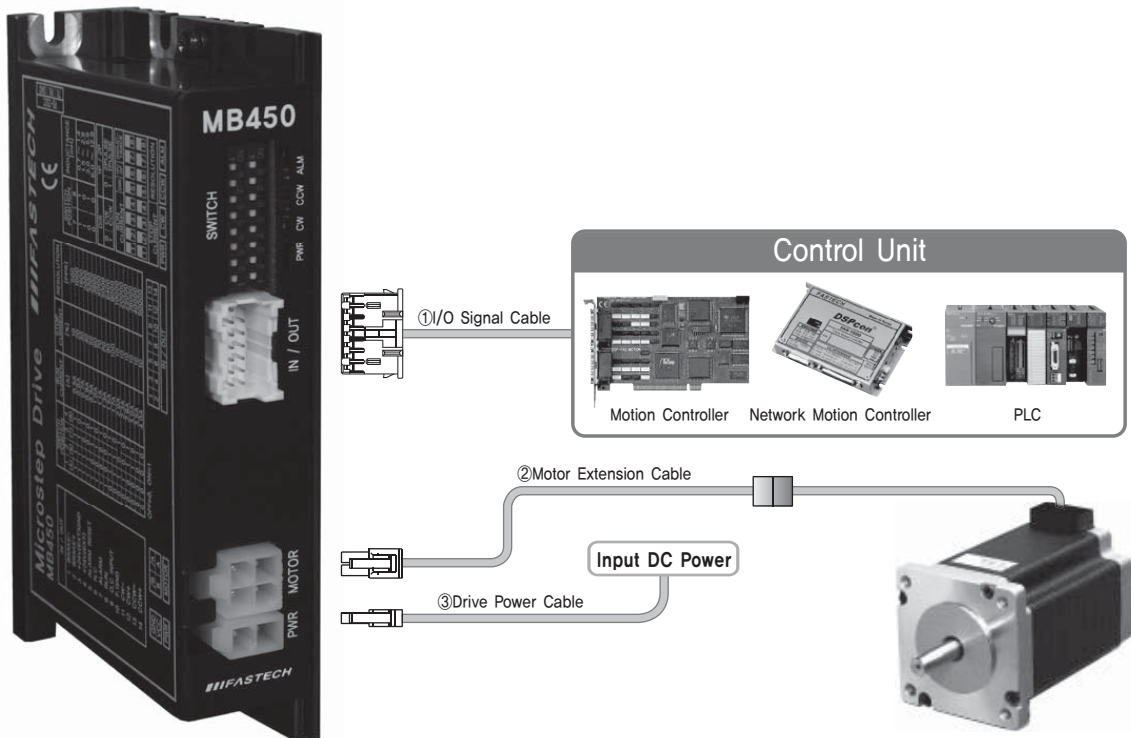


◆ MB450-MINI Series



5. System Configuration

5.1 MB450-C



Type	I/O Signal Cable	Motor Cable	Drive Power Cable
Standard Length	-	30cm	-
Max. Length	20m	20m	2m

Accessories [MB450-C]

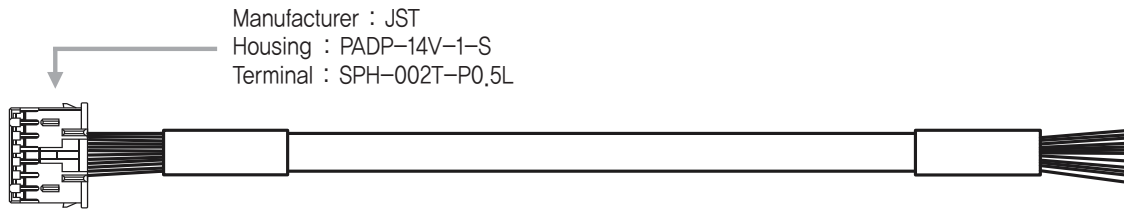
Purpose		ITEM	Standard	Manufacturer
I/O Connections(CN1)		Housing	PADP-14V-1-S	JST
		Terminal	SPH-002T-P0,5L	
Motor Connection	Drive Side(CN2)	Housing	5557-04R	MOLEX
		Terminal	5556T	
	Motor Side	Housing	5557-04R	
		Terminal	5556T	
Power Connection(CN4)		Housing	5557-02R	MOLEX
		Terminal	5556T	

[MB450-C] Cable Option

①Signal Cable

Model Name	Length(m)	Remark
CMBC-S-□□□F	□□□	Normal Cable
CMBC-S-□□□M	□□□	Robot Cable

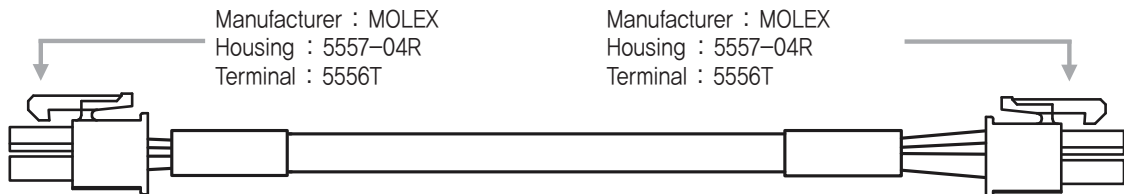
□ is for Cable Length, The unit is 1m and Max. 20m Length.



②Motor Extension Cable

Model Name	Length(m)	Remark
CSVO-M-□□□F	□□□	Normal Cable
CSVO-M-□□□M	□□□	Robot Cable

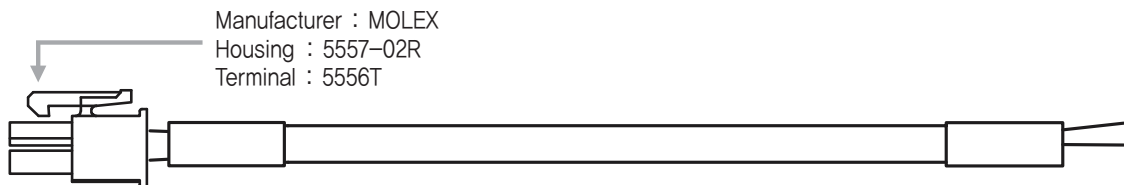
□ is for Cable Length, The unit is 1m and Max. 20m Length.



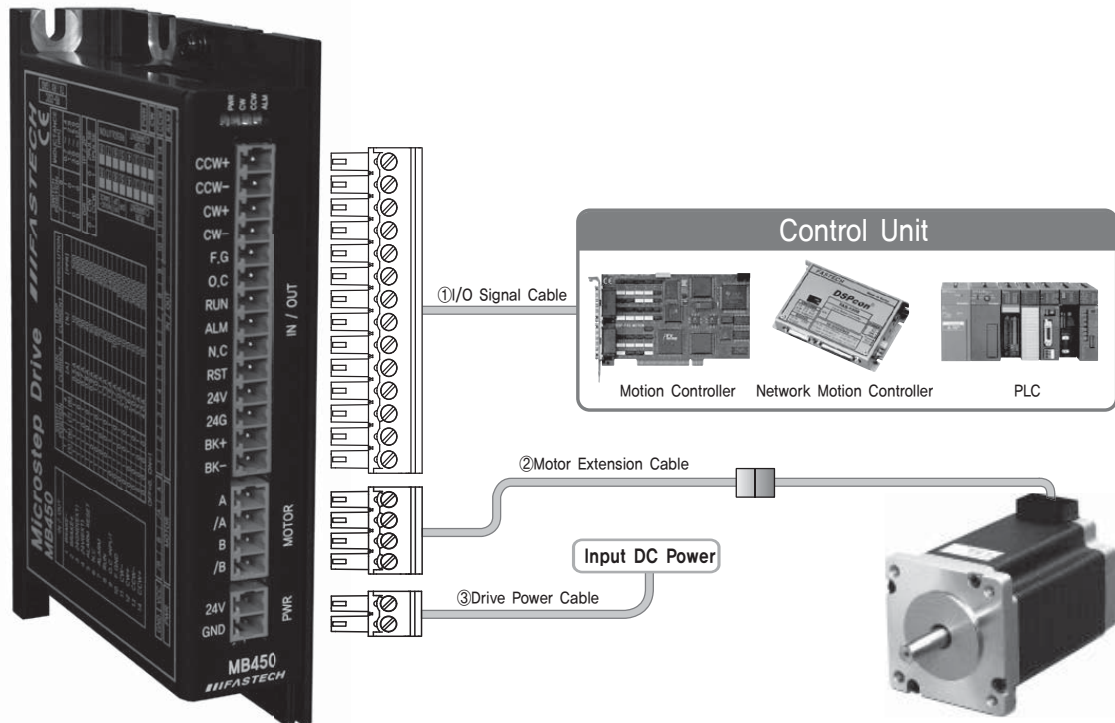
③Drive Power Cable

Model Name	Length(m)	Remark
CSVO-P-□□□F	□□□	Normal Cable
CSVO-P-□□□M	□□□	Robot Cable

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



5.2 MB450-T



Type	I/O Signal Cable	Motor Cable	Drive Power Cable
Standard Length	-	30cm	-
Max. Length	20m	20m	2m

Accessories [MB450-T]

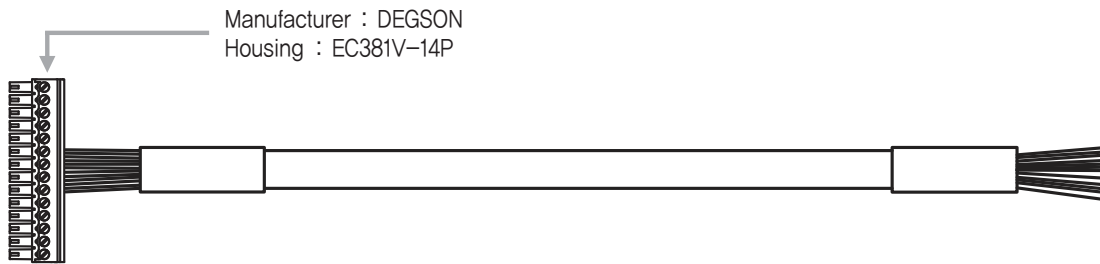
Purpose		ITEM	Standard	Manufacturer
I/O Connections(CN1)		Housing	EC381V-14P	DEGSON
Motor Connection	Drive Side(CN2)	Housing	EC381V-04P	DEGSON
	Motor Side	Housing	5557-04R	
		Terminal	5556T	
Power Connection(CN4)		Housing	EC381V-02P	DEGSON

[MB450-T] Cable Option

① Signal Cable

Model Name	Length(m)	Remark
CMBT-S-□□□F	□□□	Normal Cable
CMBT-S-□□□M	□□□	Robot Cable

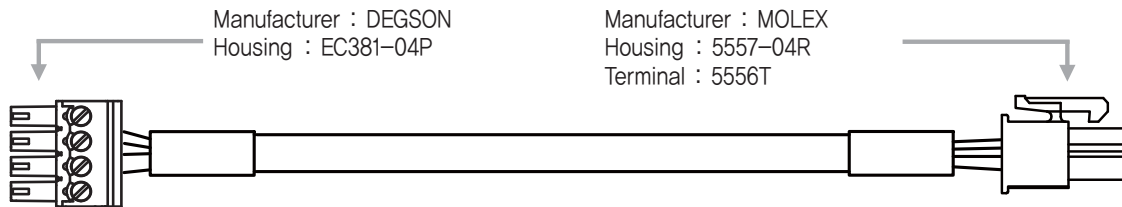
□ is for Cable Length, The unit is 1m and Max. 20m Length.



② Motor Extension Cable

Model Name	Length(m)	Remark
CMBT-M-□□□F	□□□	Normal Cable
CMBT-M-□□□M	□□□	Robot Cable

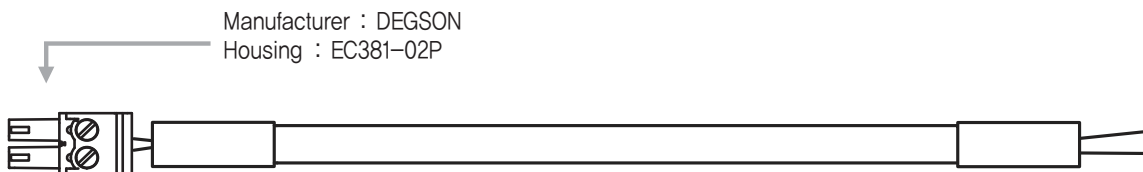
□ is for Cable Length, The unit is 1m and Max. 20m Length.



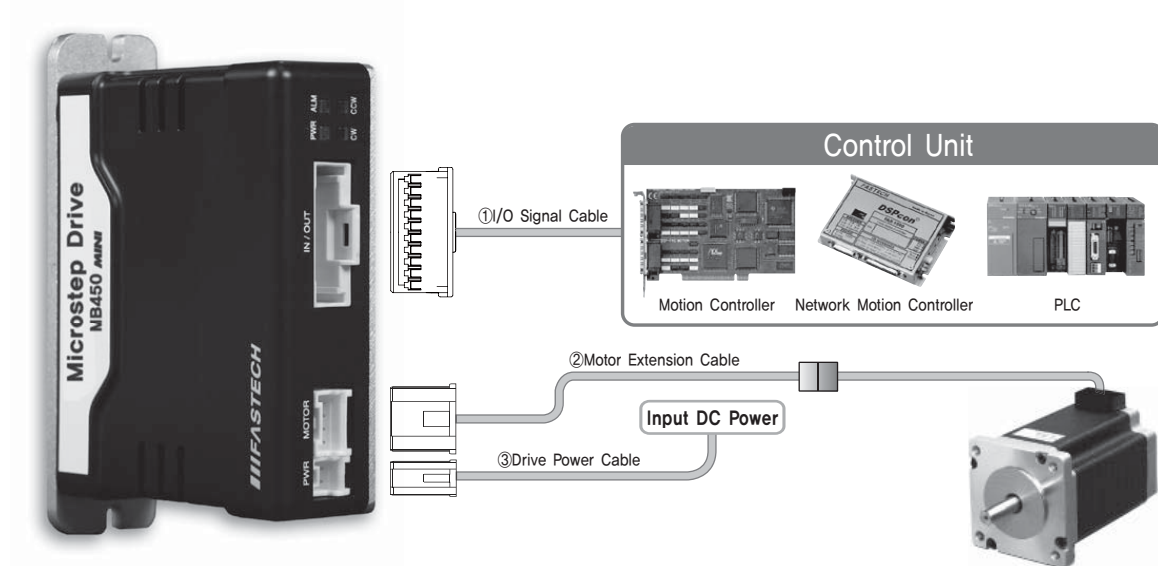
③ Drive Power Cable

Model Name	Length(m)	Remark
CMBT-P-□□□F	□□□	Normal Cable
CMBT-P-□□□M	□□□	Robot Cable

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



5.3 MB450-MINI



Type	I/O Signal Cable	Motor Cable	Drive Power Cable
Standard Length	-	30cm	-
Max. Length	20m	20m	2m

Accessories [MB450-MINI]

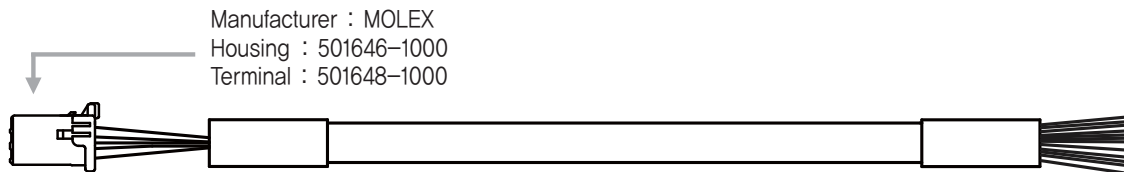
Purpose		ITEM	Standard	Manufacturer
I/O Connections(CN1)		Housing	501646-2000	MOLEX
		Terminal	501648-1000	
Motor Connection	Drive Side(CN2)	Housing	PAP-04V-S	JST
		Terminal	SPHD-001T-P0,5	
	Motor Side	Housing	5557-04R	MOLEX
		Terminal	5556T	
Power Connection(CN4)		Housing	PAP-02V-S	JST
		Terminal	SPHD-001T-P0,5	

[MB450-MINI] Cable Option

①Signal Cable

Model Name	Length(m)	Remark
CMBM-S-□□□F	□□□	Normal Cable
CMBM-S-□□□M	□□□	Robot Cable

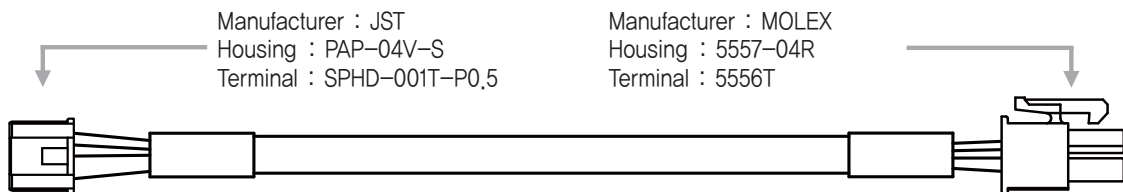
□ is for Cable Length, The unit is 1m and Max. 20m Length.



②Motor Extension Cable

Model Name	Length(m)	Remark
CMNB-M-□□□F	□□□	Normal Cable
CMNB-M-□□□M	□□□	Robot Cable

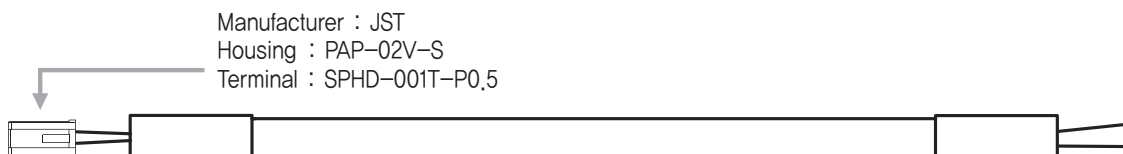
□ is for Cable Length, The unit is 1m and Max. 20m Length.



③Drive Power Cable

Model Name	Length(m)	Remark
CMNB-P-□□□F	□□□	Normal Cable
CMNB-P-□□□M	□□□	Robot Cable

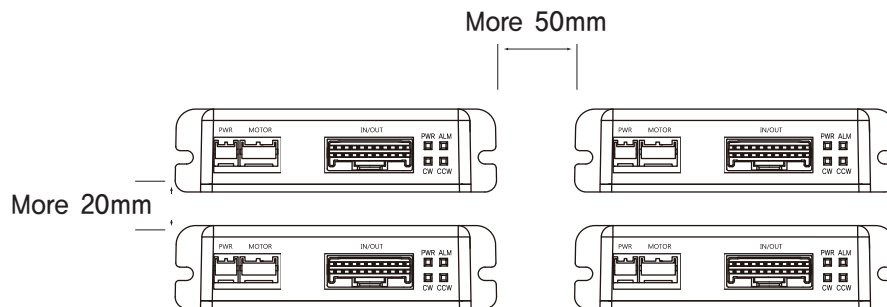
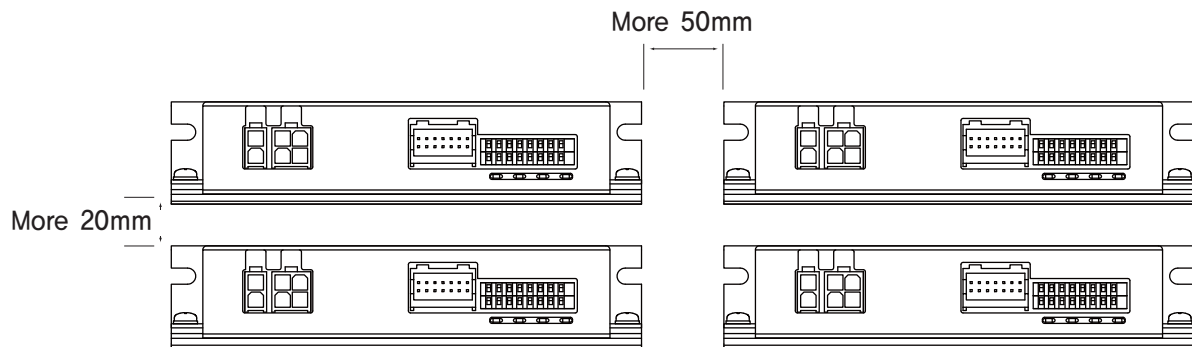
□ is for Cable Length, The unit is 1m and Max. 2m Length.



6. Installation and Cabling

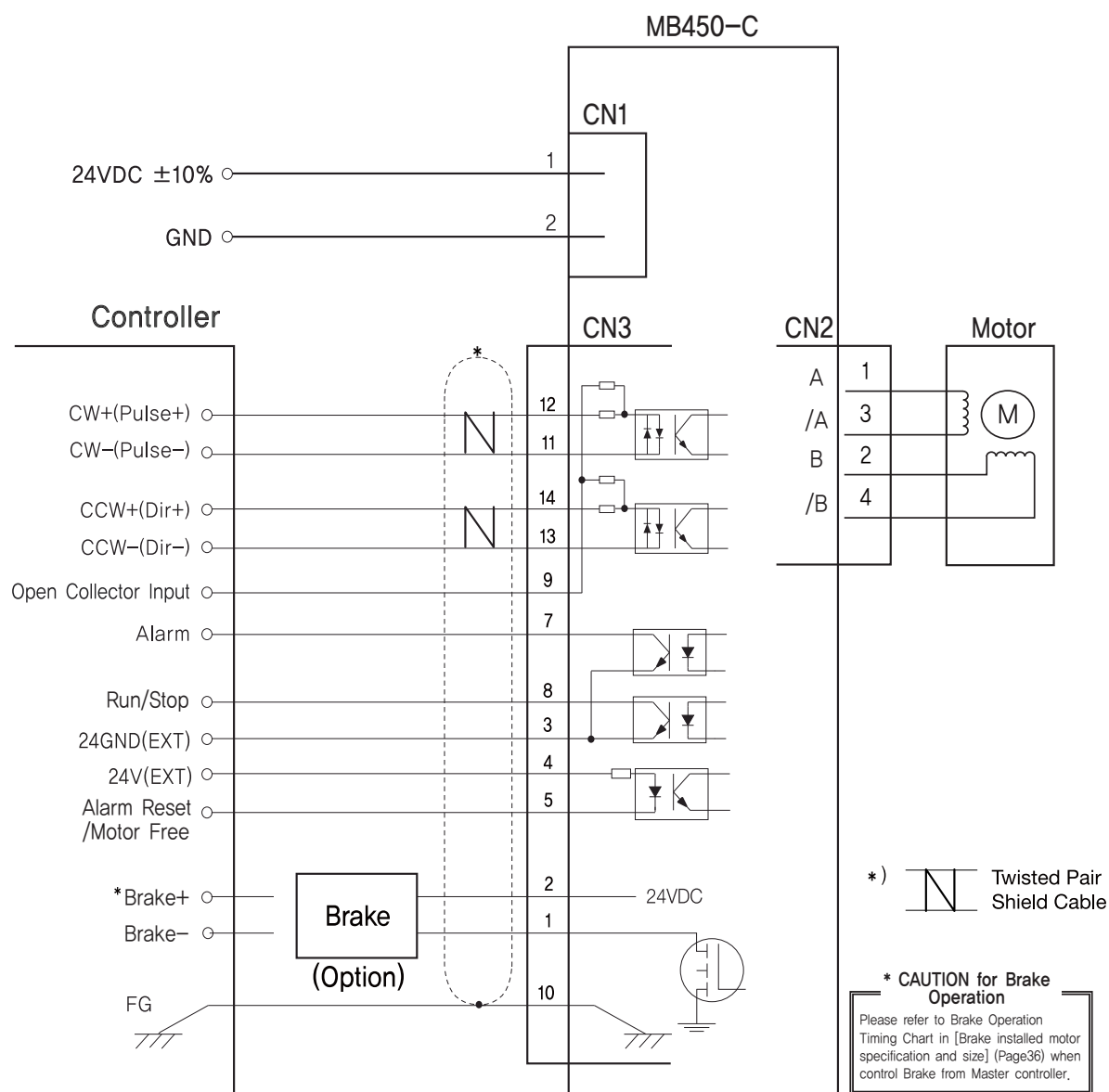
6.1 Installation Precautions

- 1) This unit is intended for indoor usage only.
- 2) Must be used under ambient temperature of 0°C~50°C.
- 3) When the temperature of the drive case is over 50°C the heat dissipation is required.
- 4) Should avoid from direct sunlight, magnetic or radioactive when install drive.
- 5) When connect I/O cable between host controller and drive, must turn off power of host controller and drive. Otherwise drive can be damaged.
- 6) Drive and motor should be grounded. To prevent the potential difference with surrounding control system device, it should be grounded directly to the ground point as short as possible.
- 7) When install two or more drives side-by-side, must be installed at a distance of at least 20mm at the horizontal direction and at a distance of at least 50mm at the vertical direction.



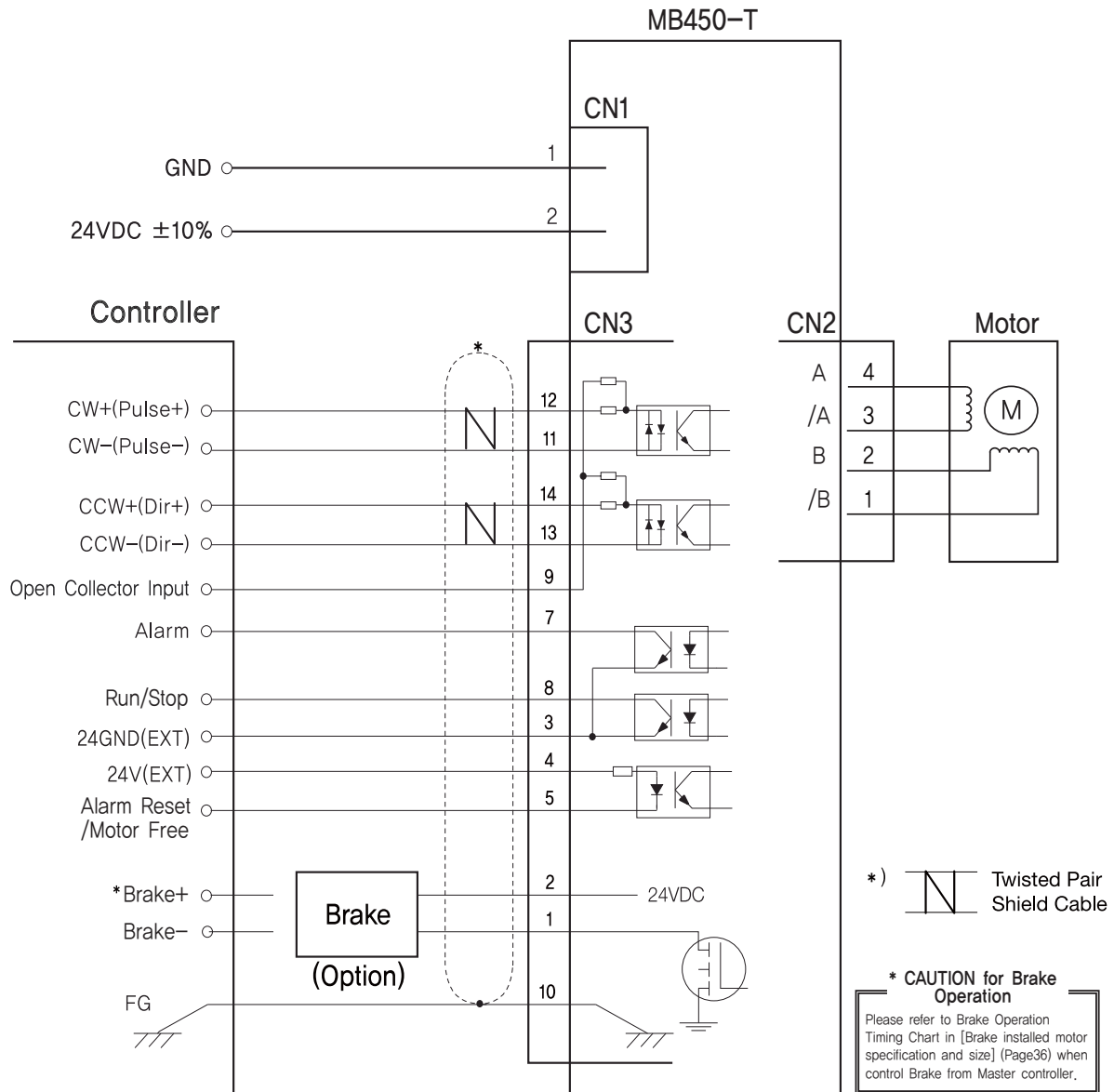
6.2 External Wiring Diagram

6.2.1 MB450-C



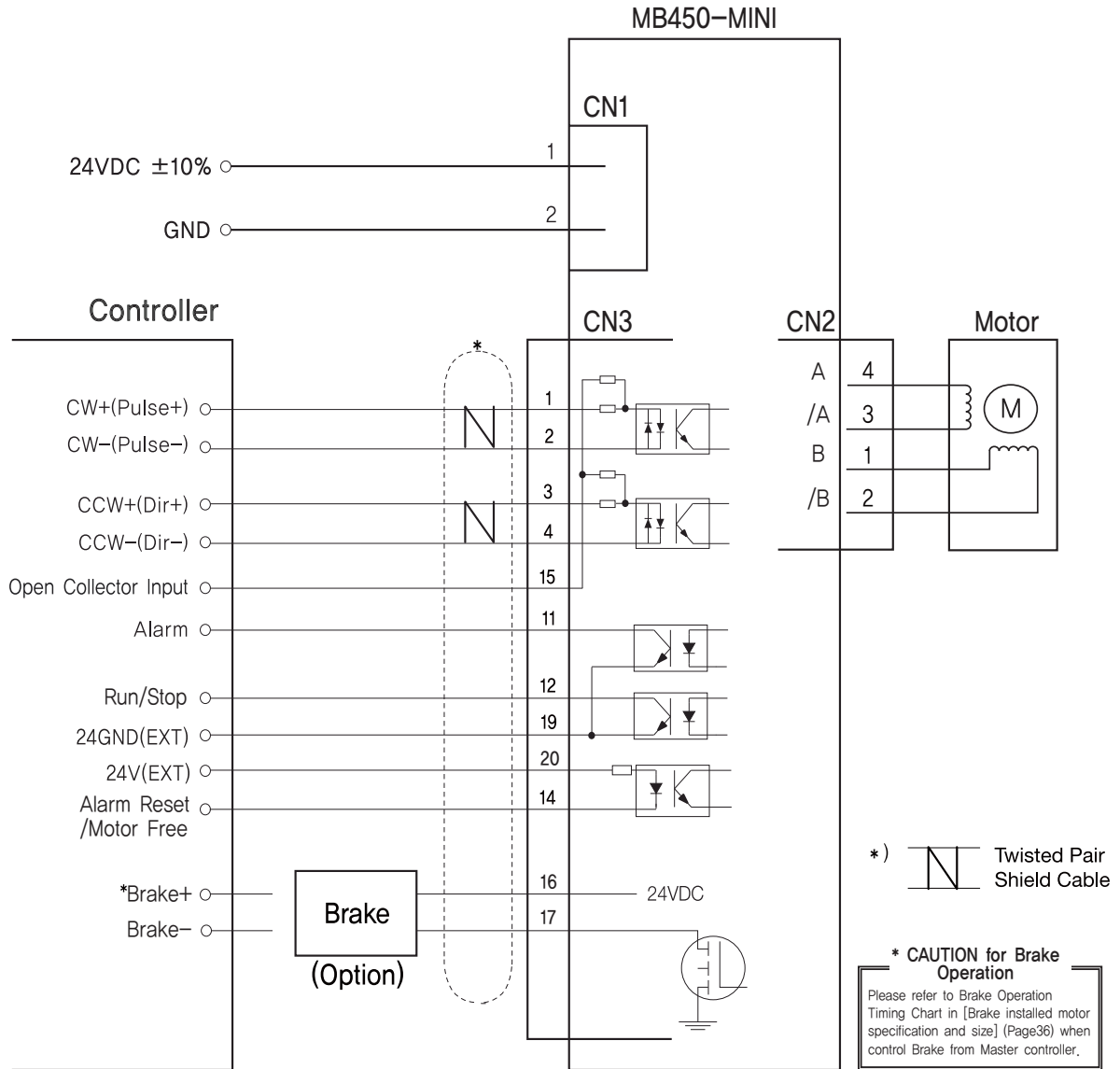
- * When connect I/O cable between host controller and drive, must turn off power of host controller and MB450-C drive. Otherwise drive can be damaged.
- * When the motor is installed on the movable parts, please use the flexible cable(Optional, sold separately). Otherwise, the cable can be disconnected.
- * I/O connection cable wiring to connect the drive and the host controller should be as short as possible. If longer, the maximum input frequency can be degraded or affected by noise cable.

6.2.2 MB450-T



- * When connect I/O cable between host controller and drive, must turn off power of host controller and MB450-T drive. Otherwise drive can be damaged.
- * When the motor is installed on the movable parts, please use the flexible cable(Optional, sold separately). Otherwise, the cable can be disconnected.
- * I/O connection cable wiring to connect the drive and the host controller should be as short as possible. If longer, the maximum input frequency can be degraded or affected by noise cable.

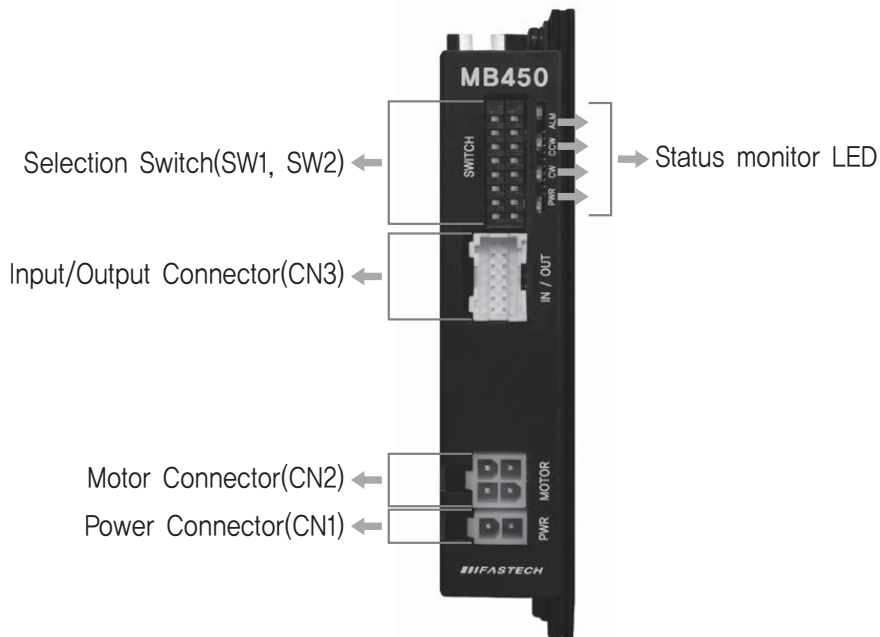
6.2.3 MB450-MINI



- * When connect I/O cable between host controller and drive, must turn off power of host controller and MB450-MINI drive. Otherwise drive can be damaged.
- * When the motor is installed on the movable parts, please use the flexible cable(Optional, sold separately). Otherwise, the cable can be disconnected.
- * I/O connection cable wiring to connect the drive and the host controller should be as short as possible. If longer, the maximum input frequency can be degraded or affected by noise cable.

7. Setting and Operating

7.1 MB450-C

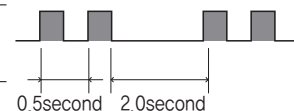


7.1.1 Status Monitor LED

Indication	Color	Function	Flash Condition
PWR	Green	Power Input Indication	Lights when power is ON Flashes when motor is Free status
ALM	Red	Alarm Indication	Flash when protection function is activated (Identifiable which protection mode is activated by counting the flash times)
CW	Yellow	Motor Rotation Direction	Lights when motor rotate CW direction
CCW	Orange	Motor Rotation Direction	Lights when motor rotate CCW direction

◆ Protection functions and LED flash times

Times	Protection	Conditions
1	Over Current Error	Excessive current flowed into a motor
2	Over Speed Error	Motor speed exceeded 3000 rpm
5	Over Temperature Error	Internal temperature of a motor drive exceeded 85°C
6	Over Regenerative Voltage Error	Back EMF more than 50V
7	Motor Connect Error	Power is ON without connection of motor cable to drive
9	Motor Voltage Error	Motor voltage is below 20V
11	System Error	Error occurs in drive system
12	ROM Error	Error occurs in parameter storage device(ROM)
14	Input Voltage Error	Power source voltage is out of limited value [20V~28V]



Alarm LED Flash
(For example:
Over Speed Error)

7.1.2 RUN Current Selection Switch(SW1.1~SW1.4)

The switch set the rated current of Motor which is connected to Drive

Position(SW1)				Run Current (A)	Position(SW1)				Run Current (A)
1	2	3	4		1	2	3	4	
1	1	1	1	0.5	0	1	1	1	1.5
1	1	1	0	0.6	0	1	1	0	1.7
1	1	0	1	0.7	0	1	0	1	2.0
1	1	0	0	0.8	0	1	0	0	2.3
1	0	1	1	0.9	0	0	1	1	2.6
1	0	1	0	1.0	0	0	1	0	3.0
1	0	0	1	1.1	0	0	0	1	3.5
1	0	0	0	1.3	0	0	0	0	4.0

7.1.3 Rotational Direction Selection Switch(SW1.5)

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

7.1.4 Pulse Input Selection Switch(SW1.6)

Indication	Switch Name	Functions
2P/1P	Selecting Pulse Input Mode	Selectable 1-Pulse input mode or 2-Pulse input mode as Pulse input signal. ON : 1-Pulse mode OFF : 2-Pulse mode * Default : 2-Pulse mode

7.1.5 Inductance Selection Switch(SW1.7~SW1.8)

The switch set the inductance value of Motor which is connected to Drive

Position(SW1)		Inductance[mH]
7	8	
1	1	0.7 ~ 1.4
1	0	1.5 ~ 2.9
0	1	3.0 ~ 5.9
0	0	6.0 ~ 12.0

7.1.6 Stop Current Setting Switch (SW2.1~SW2.4)

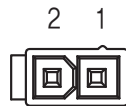
Stop current means a motor current which is set automatically after 0.1 seconds of motor stops. This is used to reduce the heat of the motor when the motor is stopped for an extended period of time. The set value of STOP current is % unit of Operating current

Position(SW2)				Stop Current (%)	Position(SW2)				Stop Current (%)
1	2	3	4		1	2	3	4	
1	1	1	1	10	0	1	1	1	90
1	1	1	0	20	0	1	1	0	100
1	1	0	1	30	0	1	0	1	10
1	1	0	0	40	0	1	0	0	10
1	0	1	1	50	0	0	1	1	10
1	0	1	0	60	0	0	1	0	10
1	0	0	1	70	0	0	0	1	10
1	0	0	0	80	0	0	0	0	10

* Default : 50%

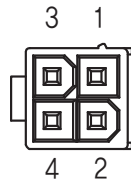
7.1.8 Power Connector(CN1)

NO.	Function
1	24VDC ±10%
2	GND



7.1.9 Motor Connector(CN2)

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



7.1.7 Resolution Selection Switch (SW2.5~SW2.8)

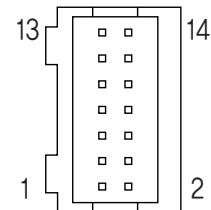
The number of pulse per revolution.

Position(SW2)				Pulse/Rotation	Position(SW2)				Pulse/Rotation
5	6	7	8		5	6	7	8	
1	1	1	1	500	0	1	1	1	6,400
1	1	1	0	1,000	0	1	1	0	8,000
1	1	0	1	1,600	0	1	0	1	10,000
1	1	0	0	2,000	0	1	0	0	20,000
1	0	1	1	3,200	0	0	1	1	25,000
1	0	1	0	3,600	0	0	1	0	36,000
1	0	0	1	4,000	0	0	0	1	40,000
1	0	0	0	5,000	0	0	0	0	50,000

* Default: 10,000

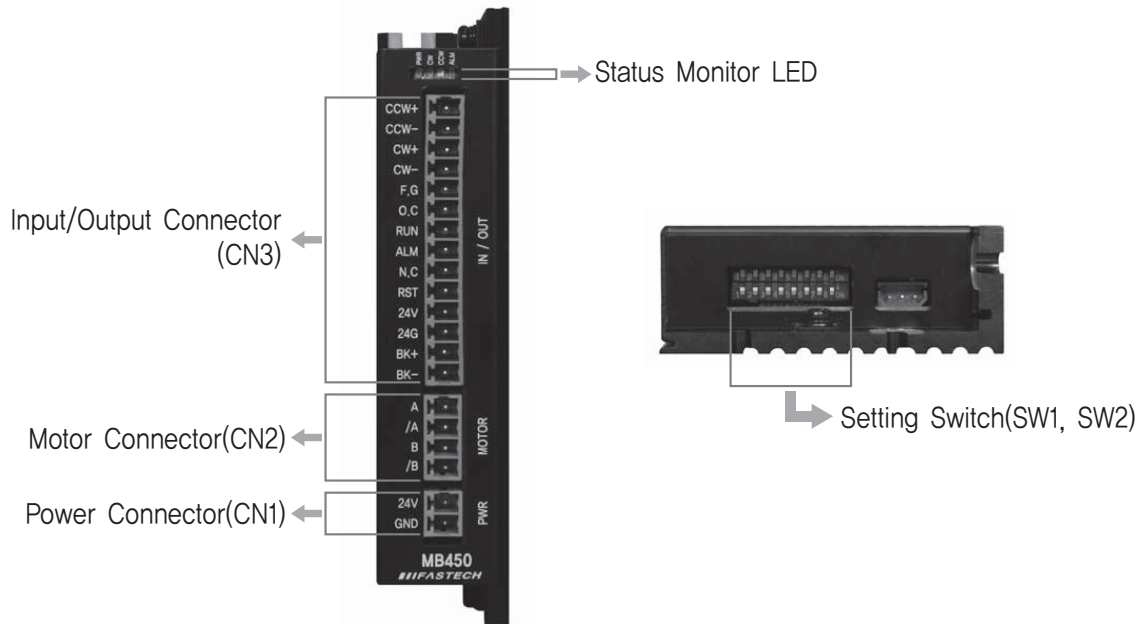
7.1.10 Input/Output Connector (CN3)

NO.	Function	I/O
1	Brake-	Output
2	Brake+	Output
3	24GND(EXT)	Input
4	24V(EXT)	Input
5	Alarm Reset	Input
6	NC	---
7	Alarm	Output
8	Run/Stop	Output
9	Open Collector Input	Input
10	F.GND	---
11	CW-(Pulse-)	Input
12	CW+(Pulse+)	Input
13	CCW-(Dir-)	Input
14	CCW+(Dir+)	Input



* BRAKE is optional.

7.2 MB450-T

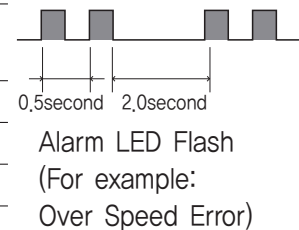


7.2.1 Status Monitor LED

Indication	Color	Function	Flash Condition
PWR	Green	Power Input Indication	Lights when power is ON Flashes when motor is Free status
ALM	Red	Alarm Indication	Flash when protection function is activated (Identifiable which protection mode is activated by counting the flash times)
CW	Yellow	Motor Rotation Direction	Lights when motor rotate CW direction
CCW	Orange	Motor Rotation Direction	Lights when motor rotate CCW direction

◆ Protection functions and LED flash times

Times	Protection	Conditions
1	Over Current Error	Excessive current flowed into a motor
2	Over Speed Error	Motor speed exceeded 3000 rpm
5	Over Temperature Error	Internal temperature of a motor drive exceeded 85°C
6	Over Regenerative Voltage Error	Back EMF more than 50V
7	Motor Connect Error	Power is ON without connection of motor cable to drive
9	Motor Voltage Error	Motor voltage is below 20V
11	System Error	Error occurs in drive system
12	ROM Error	Error occurs in parameter storage device(ROM)
14	Input Voltage Error	Power source voltage is out of limited value [20V~28V]



7.2.2 Run Current Setting Switch (SW1.1~SW1.4)

The switch to set the rated current of motor which is connected to drive.

Position(SW1)				Run Current(A)	Position(SW1)				Run Current(A)
1	2	3	4		1	2	3	4	
1	1	1	1	0.5	0	1	1	1	1.5
1	1	1	0	0.6	0	1	1	0	1.7
1	1	0	1	0.7	0	1	0	1	2.0
1	1	0	0	0.8	0	1	0	0	2.3
1	0	1	1	0.9	0	0	1	1	2.6
1	0	1	0	1.0	0	0	1	0	3.0
1	0	0	1	1.1	0	0	0	1	3.5
1	0	0	0	1.3	0	0	0	0	4.0

7.2.3 Rotational Direction Selection Switch(SW1.5)

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

7.2.4 Pulse Input Selection Switch(SW1.6)

Indication	Switch Name	Functions
2P/1P	Selecting Pulse Input Mode	Selectable 1-Pulse input mode or 2-Pulse input mode as Pulse input signal. ON : 1-Pulse mode OFF : 2-Pulse mode * Default : 2-Pulse mode

7.2.5 Inductance Selection Switch(SW1.7~SW1.8)

The switch to set the inductance of motor which is connected to drive.

Position(SW1)		Inductance[mH]
7	8	
1	1	0.7 ~ 1.4
1	0	1.5 ~ 2.9
0	1	3.0 ~ 5.9
0	0	6.0 ~ 12.0

7.2.6 Stop Current Setting Switch (SW2.1~SW2.4)

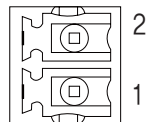
Stop current means a motor current which is set automatically after 0.1 seconds of motor stops. This is used to reduce the heat of the motor when the motor is stopped for an extended period of time. The set value of STOP current is % unit of Operating current

Position(SW2)				Stop Current (%)	Position(SW2)				Stop Current (%)
1	2	3	4		1	2	3	4	
1	1	1	1	10	0	1	1	1	90
1	1	1	0	20	0	1	1	0	100
1	1	0	1	30	0	1	0	1	10
1	1	0	0	40	0	1	0	0	10
1	0	1	1	50	0	0	1	1	10
1	0	1	0	60	0	0	1	0	10
1	0	0	1	70	0	0	0	1	10
1	0	0	0	80	0	0	0	0	10

* Default : 50%

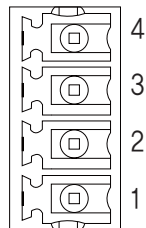
7.2.8 Power Connector(CN1)

NO.	Function
1	GND
2	24VDC±10%



7.2.9 Motor Connector(CN2)

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



7.2.7 Resolution Selection Switch (SW2.5~SW2.8)

The number of pulse per revolution.

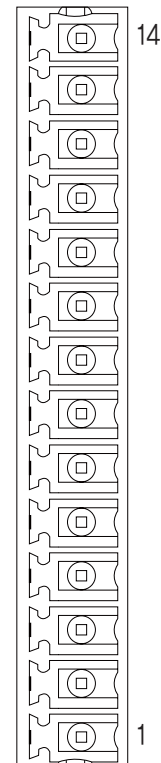
Position(SW2)				Pulse/Rotation	Position(SW2)				Pulse/Rotation
5	6	7	8		5	6	7	8	
1	1	1	1	500	0	1	1	1	6,400
1	1	1	0	1,000	0	1	1	0	8,000
1	1	0	1	1,600	0	1	0	1	10,000
1	1	0	0	2,000	0	1	0	0	20,000
1	0	1	1	3,200	0	0	1	1	25,000
1	0	1	0	3,600	0	0	1	0	36,000
1	0	0	1	4,000	0	0	0	1	40,000
1	0	0	0	5,000	0	0	0	0	50,000

* Default: 10,000

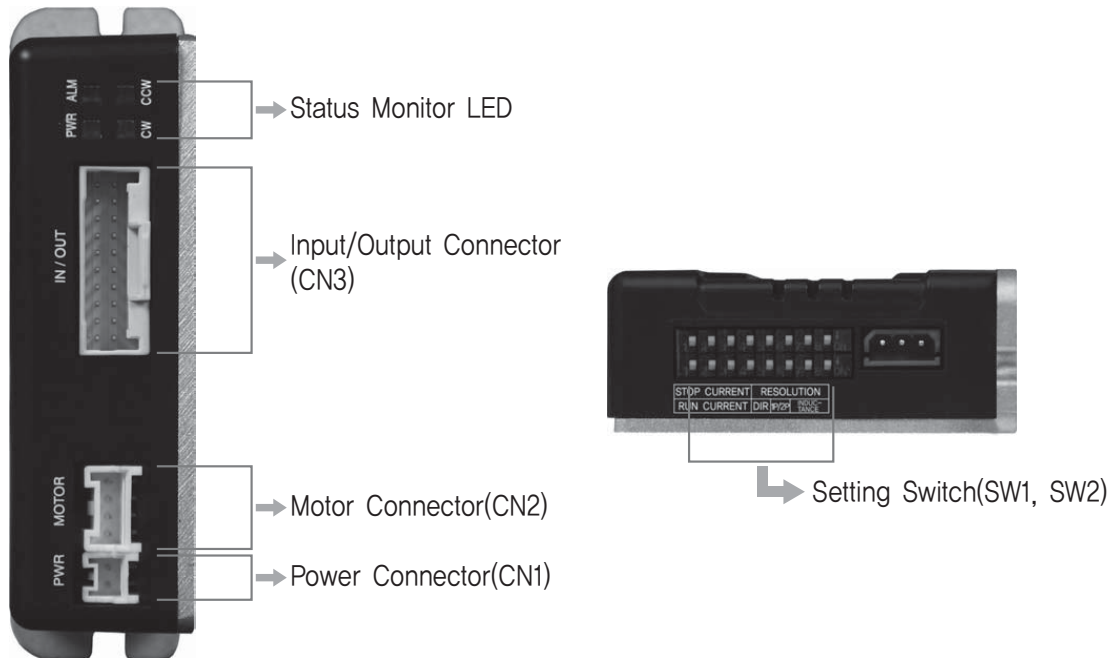
7.2.10 Input/Output Connector(CN3)

NO.	Function	I/O
1	Brake-	Output
2	Brake+	Output
3	24GND(EXT)	Input
4	24V(EXT)	Input
5	Alarm Reset	Input
6	NC	---
7	Alarm	Output
8	Run/Stop	Output
9	Open Collector Input	Input
10	F.GND	---
11	CW-(Pulse-)	Input
12	CW+(Pulse+)	Input
13	CCW-(Dir-)	Input
14	CCW+(Dir+)	Input

* BRAKE is optional.



7.3 MB450-MINI

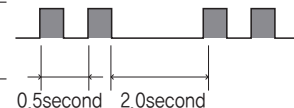


7.3.1 Status Monitor LED

Indication	Color	Function	Flash Condition
PWR	Green	Power Input Indication	Lights when power is ON Flashes when motor is Free status
ALM	Red	Alarm Indication	Flash when protection function is activated (Identifiable which protection mode is activated by counting the flash times)
CW	Yellow	Motor Rotation Direction	Lights when motor rotate CW direction
CCW	Orange	Motor Rotation Direction	Lights when motor rotate CCW direction

◆ Protection functions and LED flash times

Times	Protection	Conditions
1	Over Current Error	Excessive current flowed into a motor
2	Over Speed Error	Motor speed exceeded 3000 rpm
5	Over Temperature Error	Internal temperature of a motor drive exceeded 85°C
6	Over Regenerative Voltage Error	Back EMF more than 50V
7	Motor Connect Error	Power is ON without connection of motor cable to drive
9	Motor Voltage Error	Motor voltage is below 20V
11	System Error	Error occurs in drive system
12	ROM Error	Error occurs in parameter storage device(ROM)
14	Input Voltage Error	Power source voltage is out of limited value [20V~28V]



Alarm LED Flash
(For example:
Over Speed Error)

7.3.2 Run Current Setting Switch (SW1.1~SW1.4)

The switch to set the rated current of motor which is connected to drive.

Position(SW1)				Run Current(A)	Position(SW1)				Run Current(A)
1	2	3	4		1	2	3	4	
1	1	1	1	0.5	0	1	1	1	1.5
1	1	1	0	0.6	0	1	1	0	1.7
1	1	0	1	0.7	0	1	0	1	2.0
1	1	0	0	0.8	0	1	0	0	2.3
1	0	1	1	0.9	0	0	1	1	2.6
1	0	1	0	1.0	0	0	1	0	3.0
1	0	0	1	1.1	0	0	0	1	---
1	0	0	0	1.3	0	0	0	0	---

7.3.3 Rotational Direction Selection Switch(SW1.5)

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

7.3.4 Pulse Input Selection Switch(SW1.6)

Indication	Switch Name	Functions
2P/1P	Selecting Pulse Input Mode	Selectable 1-Pulse input mode or 2-Pulse input mode as Pulse input signal. ON : 1-Pulse mode OFF : 2-Pulse mode * Default : 2-Pulse mode

7.3.5 Inductance Selection Switch(SW1.7~SW1.8)

The switch to set the inductance of motor which is connected to drive.

Position(SW1)		Inductance[mH]
7	8	
1	1	0.7 ~ 1.4
1	0	1.5 ~ 2.9
0	1	3.0 ~ 5.9
0	0	6.0 ~ 12.0

7.3.6 Stop Current Setting Switch (SW2.1~SW2.4)

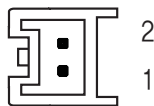
Stop current means a motor current which is set automatically after 0.1 seconds of motor stops. This is used to reduce the heat of the motor when the motor is stopped for an extended period of time. The set value of STOP current is % unit of Operating current

Position(SW2)				Stop Current (%)	Position(SW2)				Stop Current (%)
1	2	3	4		1	2	3	4	
1	1	1	1	10	0	1	1	1	90
1	1	1	0	20	0	1	1	0	100
1	1	0	1	30	0	1	0	1	10
1	1	0	0	40	0	1	0	0	10
1	0	1	1	50	0	0	1	1	10
1	0	1	0	60	0	0	1	0	10
1	0	0	1	70	0	0	0	1	10
1	0	0	0	80	0	0	0	0	10

* Default : 50%

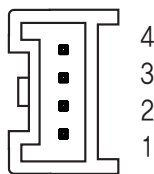
7.3.8 Power Connector(CN1)

NO.	Function
1	24VDC ±10%
2	GND



7.3.9 Motor Connector(CN2)

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



7.3.7 Resolution Selection Switch (SW2.5~SW2.8)

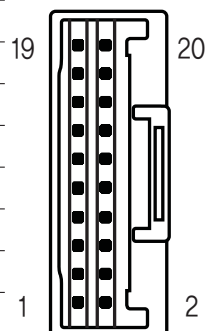
The number of pulse per revolution.

Position(SW2)				Pulse/Rotation	Position(SW2)				Pulse/Rotation
5	6	7	8		5	6	7	8	
1	1	1	1	500	0	1	1	1	6,400
1	1	1	0	1,000	0	1	1	0	8,000
1	1	0	1	1,600	0	1	0	1	10,000
1	1	0	0	2,000	0	1	0	0	20,000
1	0	1	1	3,200	0	0	1	1	25,000
1	0	1	0	3,600	0	0	1	0	36,000
1	0	0	1	4,000	0	0	0	1	40,000
1	0	0	0	5,000	0	0	0	0	50,000

* Default: 10,000

7.3.10 Input/Output Connector(CN3)

NO.	Function	I/O
1	CW+(Pulse+)	Input
2	CW-(Pulse-)	Input
3	CCW+(Dir+)	Input
4	CCW-(Dir-)	Input
5	NC	---
6	NC	---
7	NC	---
8	NC	---
9	NC	---
10	NC	---
11	Alarm	Output
12	Run/Stop	Output
13	NC	Input
14	Alarm Reset	Input
15	Open Collector Input	Input
16	Brake+	Output
17	Brake-	Output
18	NC	---
19	24GND(EXT)	Input
20	24V(EXT)	Input

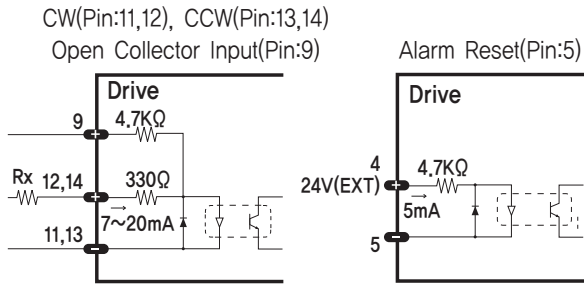


* BRAKE is optional.

8. Input and Output Signals

8.1 Input Signal

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



* MB450-MINI

CW(Pin:1,2), CCW(Pin:3,4), Alarm Reset(Pin:14)
Open Collector Input(Pin:15), 24V(EXT)(Pin:20)

◆ Motor Free Input

When Motor Free signal is [ON], the drive stop the power supply to the motor so possible to adjust the position of the output manually. When the Motor Free signal is [OFF], the drive supply the power to the motor and the holding torque is generated. Under operation, must [OFF] the Motor Free signal. Normally, set it [OFF] or do not connect.

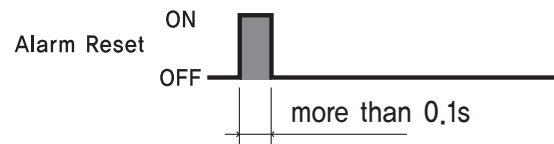
◆ CW, CCW Input

This signal can be used to receive a positioning pulse command from a user host motion controller. The user can select 1-pulse input mode or 2-pulse input mode (refer to switch No.1, SW1).

The input schematic of CW, CCW is designed for 5V TTL level. When using 5V level as an input signal, the resistor Rx is not used and connect to the driver directly. When the level of input signal is more than 5V, Rx resistor is required. If the resistor is absent, the drive will be damaged! If the input signal level is 12V, Rx value is 680ohm and 24V, Please use Open Collector Input.

◆ Alarm Reset Input

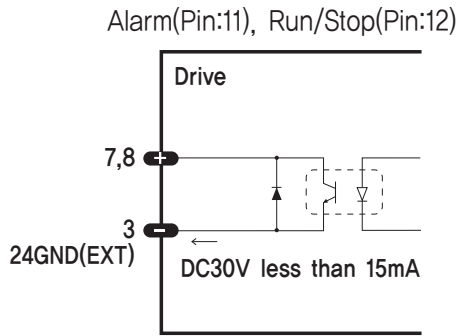
When a protection mode has been activated, a signal to this alarm reset input cancels the Alarm output. By setting the alarm reset input signal [ON], cancel the Alarm output. Before cancel the Alarm output, have to remove the source of alarm.



[Caution] If keep the Alarm Reset input [ON] , it become Motor Free status. Must set it [ON]→ [OFF]. If set it to Inverse status, it will be operated contrary to normal status.

8.2 Output Signals

Output signals from the driver are photocoupler protected: Alarm, In-Position. The signal indicates the status of internal photocouplers [ON: conduction], [OFF: Non-conduction], not displaying the voltage levels of the signal.



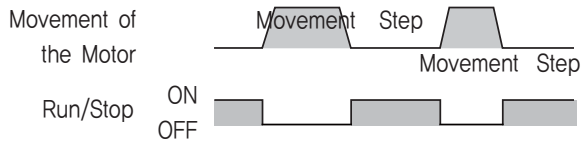
* MB450-MINI
Alarm(Pin:11), Run/Stop(Pin:12), 24GND(EXT)
(Pin:19)

◆ Alarm Output

The Alarm output indicates [OFF] when the driver is in normal operation. If a protection mode has been activated, it goes [ON]. A host controller needs to detect this signal and stop sending a motor driving command. When the driver detects an abnormal operation such as overload or over current of the motor, it sets the Alarm output to [ON], flashes the Alarm LED, disconnect the power to a motor and stops the motor simultaneously.

◆ Run/Stop Output

The Run/Stop output become [ON] when motor stop the movement. Movement, Stop.



9. Diagnosis and Rectification of Faults

9.1 When the Alarm LED is not Blinking

Even though the alarm LED is not blinking if the motor can not be operated as normal, please refer to below chart.

Phenomenon	Possible Cause	Rectification
Motor axis can be moved by hand	STOP Current is lower than limit.	When load is heavy, Motor can not stop correctly or can be moved manually if STOP Current is lower than limit. Please check STOP Current value.
	Motor Free status.	When Alarm LED is not flashing but Power LED(Green LED) is flashing, it means Motor Free status. Please check signal of controller.
Motor axis can not be moved by hand	Bad connection of Pulse input terminal.	Please check connection between Controller and Drive.
	When Pulse Mode of Drive is CW/CCW input method (2Pulse input method), CW+ line and CW- line may have been reversed or CCW+ line and CCW- line may have been reversed.	Please check connection status of CW+, CW-, CCW+ and CCW- lines.
Motor shaft moves only one direction	Pulse Mode of Drive is set as CW/CCW input method (2Pulse input method), then Controller send Pulse by CW/CCW method(1Pulse method).	Please check signal method of Controller.
	Pulse Mode of Drive is set as Pulse/Dir input method(1Pulse input method), then Controller send Pulse by Pulse/Dir method(2Pulse method).	Please check signal method of Controller.
Motor axis moves in the opposite direction to the specified direction	When Pulse Mode of Drive is CW/CCW input method (2Pulse input method), CW input and CCW input is connected reversely.	The CW Pulse signal should be connected to CW input, CCW Pulse signal should be connected to CCW input.
	When Pulse Mode of Drive is CW/CCW input method (2Pulse input method), setting of Motion Direction is set reversely.	Checking the Motion Direction Parameter of Drive.
	When Pulse Mode of Drive is Pulse/Dir input method (1Pulse input method), setting of Motion Direction is set reversely.	Checking the Motion Direction Parameter of Drive.
	When Pulse Mode of Drive is Pulse/Dir input method (1Pulse input method), CCW+(Dir+)line and CCW-(Dir-) may have been reversed.	Please check connection status of CCW+(Dir+), CCW-(Dir-) lines.
Motion of motor is unstable	Bad connection of Pulse signal cable	Please check connection of Controller and Drive.
Motor is too hot when not operated.	Stop current is too high.	If STOP Current is too high, motor become too hot when not operated. please check the set value and set it as low as possible
No retention of the brake	The brake is released. (Only for brake installed type)	Please stop the power supply to brake, so keep the locked state of brake.
Motor axis movement does not match to the set amount	The setting of resolution is difference.	Please check setting switch of resolution (SW1.1~4)

9.2 When the Alarm LED is Blinking

When Alarm LED of drive is blinking, the protection function is generated. Please count the number of blinking and refer to chart below. The Alarm LED is blinking 1 to 14 times (0.5 seconds on, 0.5 seconds off), the same number of blinking will be repeated after 2 seconds.

Flash Times	Alarm Contents	Conditions	The Cause of Error	Checking Point	Corrective Measure
1	Over Current	The current through motor-driven devices exceeds the limit value	If motor has a problem	Checking the status of the short-circuit of the motor cable. (A and/A, B and B, A or /A and motor body, B or /B and Motor body)	① Replace the motor.
			If drive has a problem		① If Alarm keep blinking after replace the motor, replace drive.
2	Over Speed	Motor speed exceed 3,000rpm	The host controller like PLC send speed command of over 3,000rpm	Checking speed command of host controller (PLC)	① Lower the speed command of the host controller.
5	Over Temperature	Inside temperature of drive exceeds 65°C	If the ambient temperature is too high or the heating element is near the drive	Checking the ambient temperature and make sure no heating element near the drive.	① Lower the room ambient temperature to under 25°C, and do heat dissipation by fan when the temperature of the case is over 50°C ② Remove the heating element from the drive.
			Distance between drive is below 50mm, so heat dissipation is difficult	Make sure the distance between drive is more than 50mm.	① Keeping the distance more than 50mm between drive. ② If ① is impossible, do heat dissipation by FAN.
			The drive may have problem		③ If Alarm keep blinking after tried all of above, replace the drive.
6	Over Regenerative Voltage	Back-EMF of motor exceeds 40V	The acceleration and deceleration value is too small	Checking the Acceleration and Deceleration conditions. (Difference depending on load and speed)	① Change the condition of Acceleration and Deceleration. ② Lower the operation speed of motor relatively.
			The drive may have problem		① If Alarm keep blinking after tried all of above, replace the drive.
7	Motor Connect Error	An error with the connection between the drive and the motor	The motor may have problem	Checking the disconnection of motor phase. (A and/A, B and/B)	① Replace the motor.
			If the motor cable between motor and drive is damaged	Checking the connection of the motor cable.	① Fix the error after check connection status of motor cable. ② Replace the extension cable between motor and drive, if there is problem.
			If Data Base of the Motor has problem.	Checking whether the Data Base of Motor and Drive is matched.	① Input correct Data Base.
			The drive may have problem		① If Alarm keep blinking after tried all of above, replace the drive.

Flash Times	Alarm Contents	Conditions	The Cause of Error	Checking Point	Corrective Measure
9	Motor Voltage Error	Motor supply voltage is lower than 20V	The voltage of power supply device is lower than 24V	Checking whether voltage of power supply device is 24V.	① If voltage of power supply is not 24V, disconnect drive and power supply and checking the voltage of power supply. If not reach 24V, adjust the voltage to 24V. ② If voltage of power supply can not adjusted as 24V, replace the power supply.
			The voltage input to the drive is lower than 24V	Checking the length and thickness of power cable of power supply to the motor.	① If not using standard cable, replace it to standard cable. ② If length of cable is too long, shorten it. ③ If ① and ② is impossible, adjust voltage of SMPS to make sure measured voltage of drive side will be bigger than 24V.
			The drive may have problem		① If Alarm keep blinking after tried all of above, replace the drive.
11	System Error	When problem occurred with Drive System (Watch Dog Timer)	Motor Control Program is not working well because of circuit error.	Checking whether any problem with power. Make sure voltage of drive input terminal is over 23V.	① If power is correct, turn off and turn it back on. If alarm keep blinking after tried above, replace the drive.
12	ROM Error	The ROM may have problem	The parameter Storage Devices(ROM) in the motor controller may have problem	Checking whether any problem with power. Make sure voltage of drive input terminal is over 23V.	① If power is correct, turn off and turn it back on. If alarm keep blinking after tried above, replace the drive.
14	Input Voltage Error	Input Voltage out of the 20V~28V range	The voltage of power supply out of the 20V~28V range.	Checking whether voltage of power supply is 24V.	① If voltage of power supply is not 24V, disconnect drive and power supply and checking the voltage of power supply. If not reach 24V, adjust the voltage to 24V. ② If voltage of power supply can not adjusted as 24V, replace the power supply.
			If drive has problem.		① If Alarm keep blinking after tried all of above, replace the drive.

Supplement

■ **Specification and Size of the Standard Motor**

Specification of the Motor

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Model	Unit	MM-20M	MM-20L	MM-28S	MM-28M	MM-28L	MM-35M	MM-35L
Current per Phase	A	0.6	0.6	0.67	0.67	0.67	0.8	1
Inductance per Phase	mH	2.2	5.5	4.2	4.9	5.7	3	0.43
Holding Torque	N · m	0.020	0.039	0.059	0.093	0.118	0.078	0.137
Rotor Inertia	g · cm ²	2.5	5	9	12	18	10	14
Weight	g	70	80	110	140	200	120	180
Length(L)	mm	33	38	32	45	51	26	36

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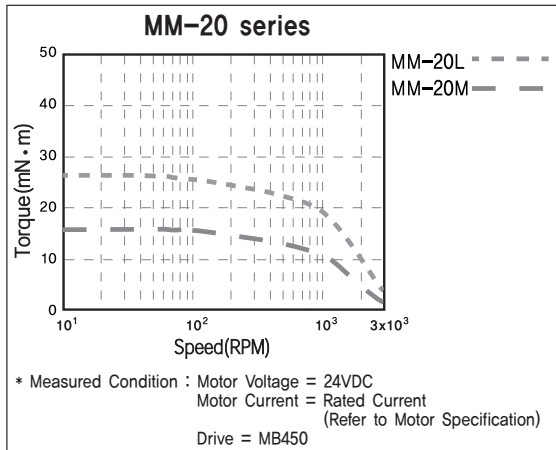
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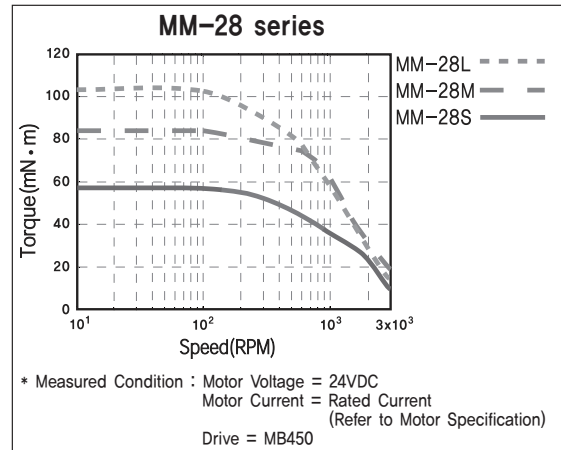
Model	Unit	MM-42S	MM-42M	MM-42L	MM-42XL	MM-56S	MM-56M	MM-56L	MM-60S	MM-60M	MM-60L
Current per Phase	A	1.33	1.68	1.68	1.2	2.8	2.8	2.8	4	4	4
Inductance per Phase	mH	2.5	3.2	2.8	15.6	4.4	2.5	3.6	3.6	4.6	6.8
Holding Torque	N · m	0.216	0.353	0.431	0.65	0.539	1.236	1.853	0.873	1.285	2.401
Rotor Inertia	g · cm ²	35	54	68	114	120	275	480	140	320	800
Weight	g	220	280	350	500	470	700	1000	600	900	1600
Length(L)	mm	33	39	47	59	41	51	76	46	56	90

Torque Characteristic

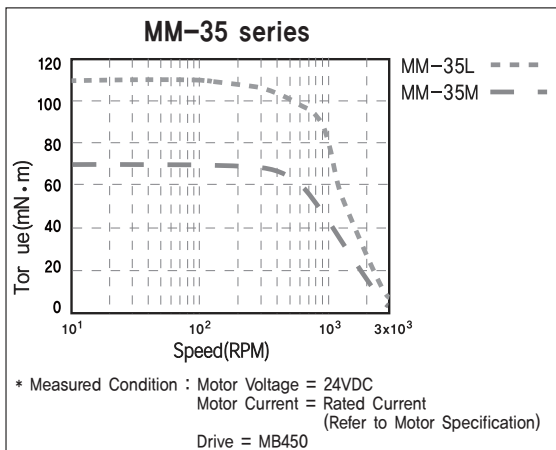
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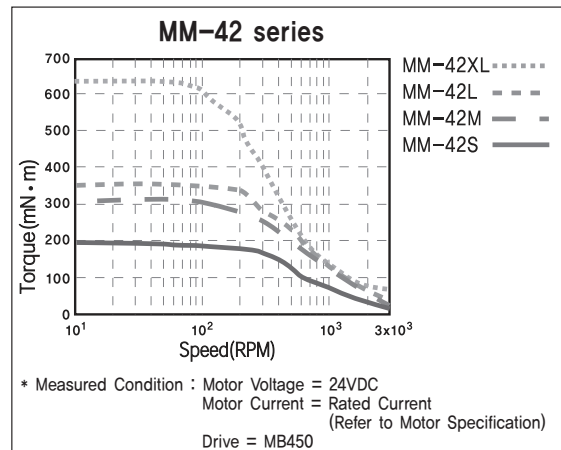
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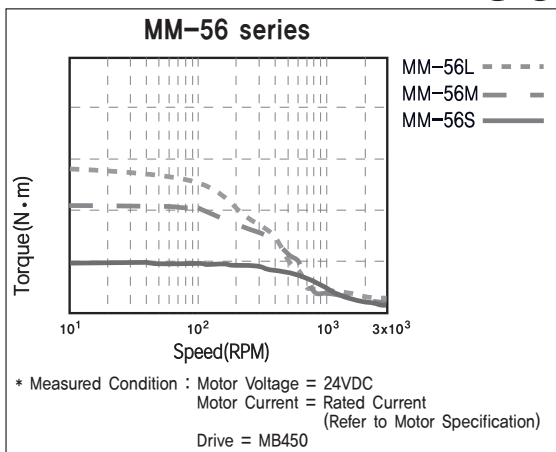
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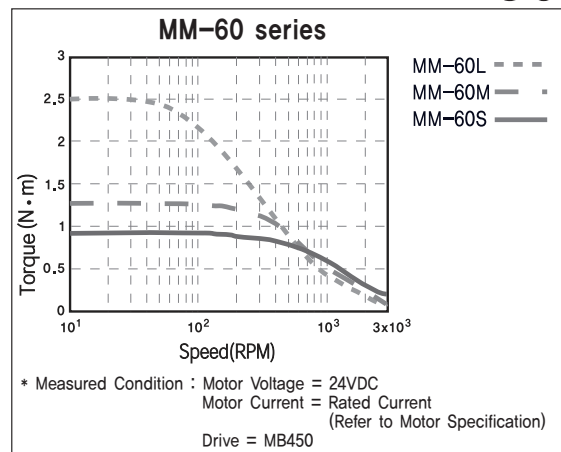
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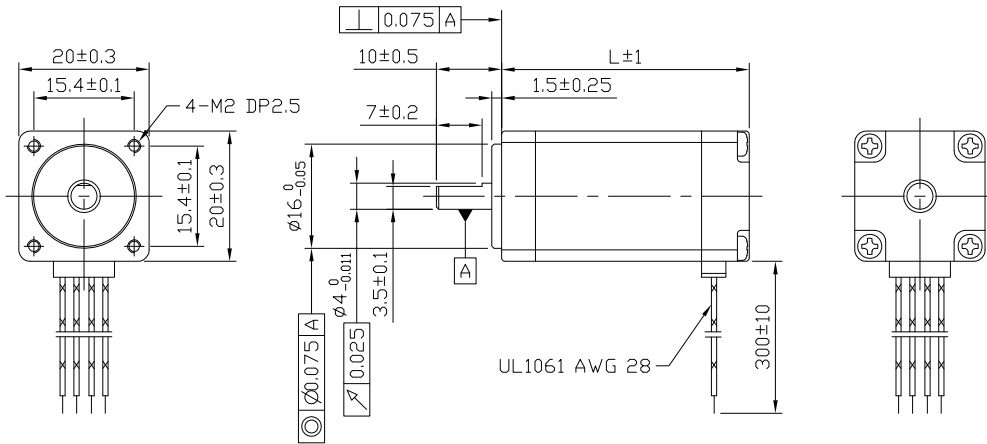


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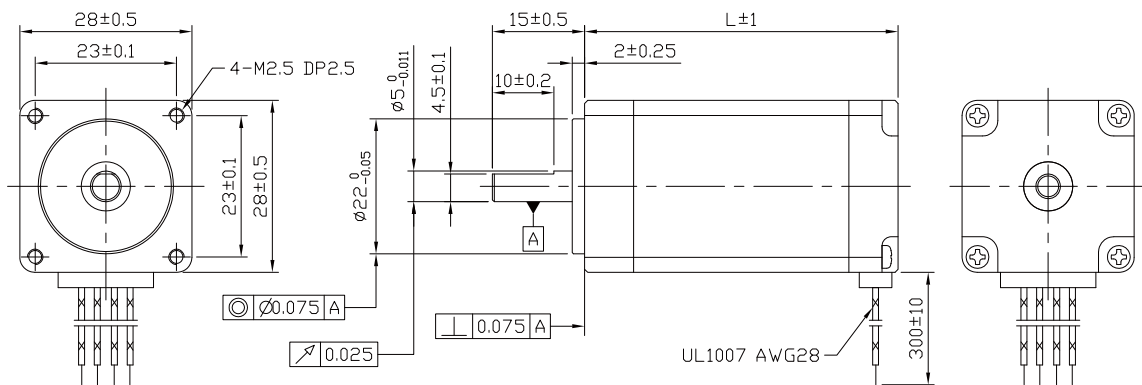


Motor Size

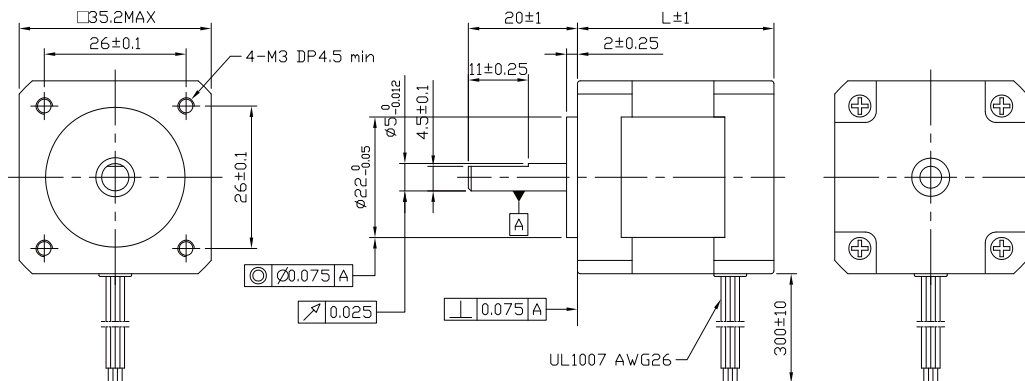
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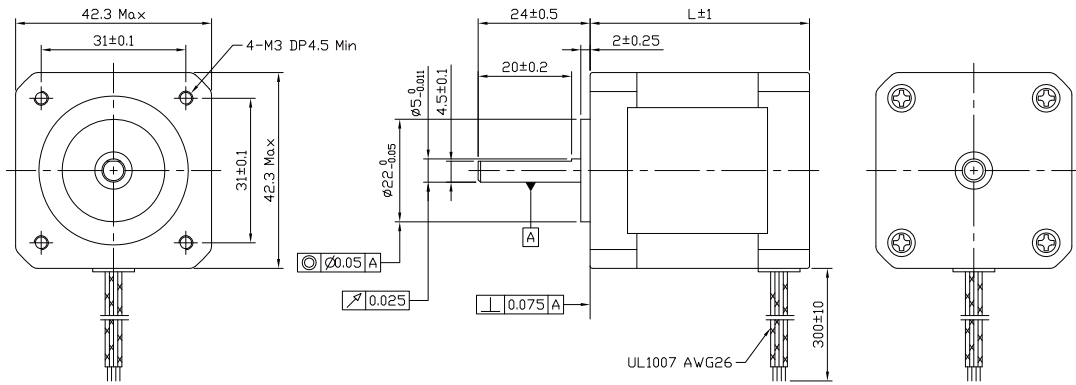
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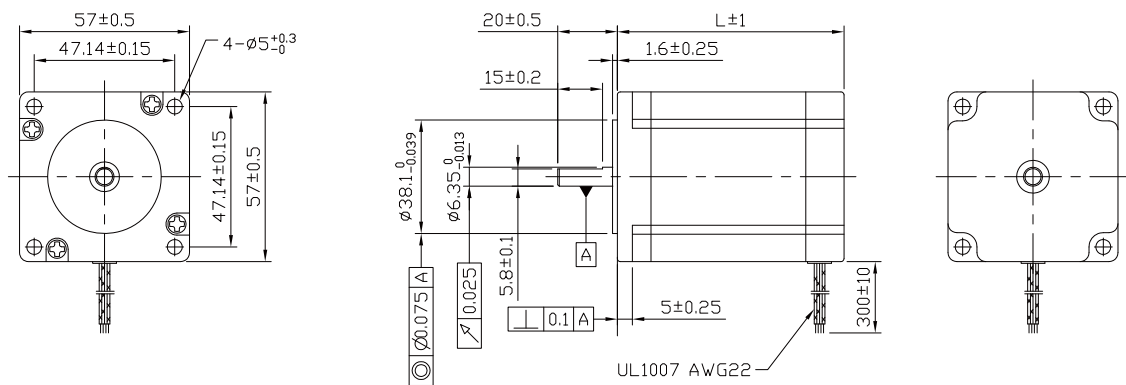
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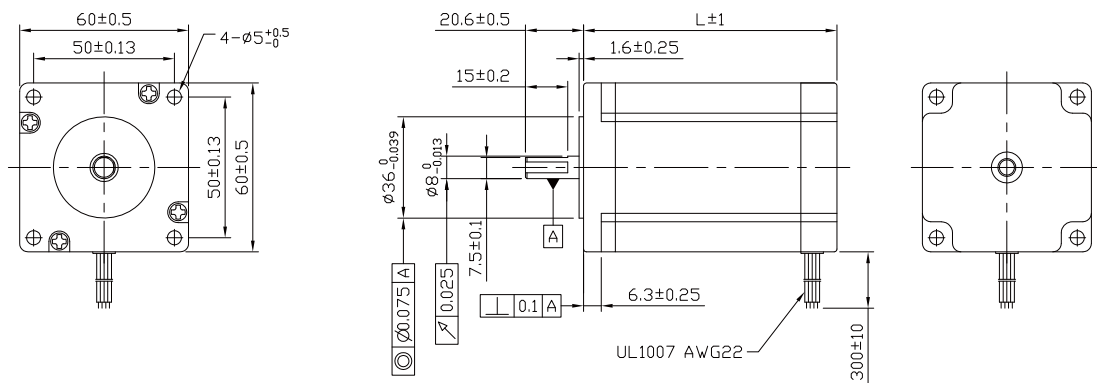
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■ Brake Embedded Motor Specification and Size

Motor Specification

Motor Part Number	Electronic Brake					Motor Unit Weight (g)	Permitted Overhung Load (N)				Permitted Thrust Load (N)	
	Type	Voltage Input (V)	Rated Current (A)	Power Consumption	Statical Friction Torque (N · m)		Length from Motor Point (mm)					
							3	8	13	18		
MM-42S-BK	Non-excitation run Type	24VDC ±10%	0.3A ±10%	8.2	0.2	510	22	26	33	46	Must be Lower than Unit's Weight	
MM-42M-BK						570						
MM-42L-BK						640						
MM-42XL-BK						770						
MM-56S-BK				7.5	0.7	870	52	65	85	123		
MM-56M-BK						1190						
MM-56L-BK						1380						
MM-60S-BK				7.5	0.7	1150	70	87	114	165		
MM-60M-BK												1350
MM-60L-BK												1960

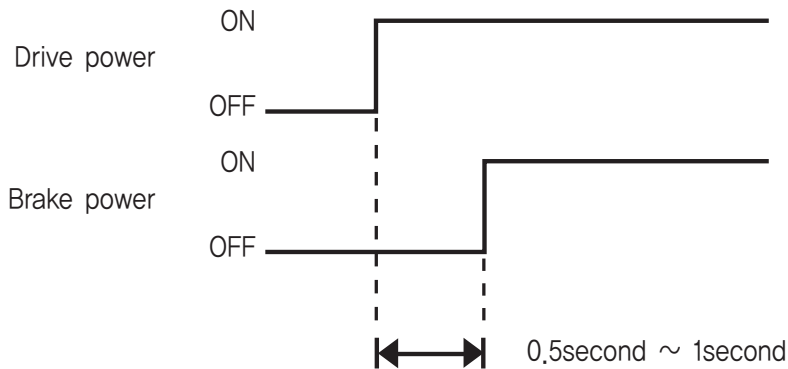
- * Electronic Brake cannot be used for braking. Position hold purpose only when power OFF.
- * The weight means Motor Unit Weight including Motor and Electronic Brake.
- * Motor Model Name is combined model name of Motor and Brake.
- * Motor specification and torque characteristic are same as Standard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

* Brake Operation Timing Chart

MB450 control Brake by Drive automatically.

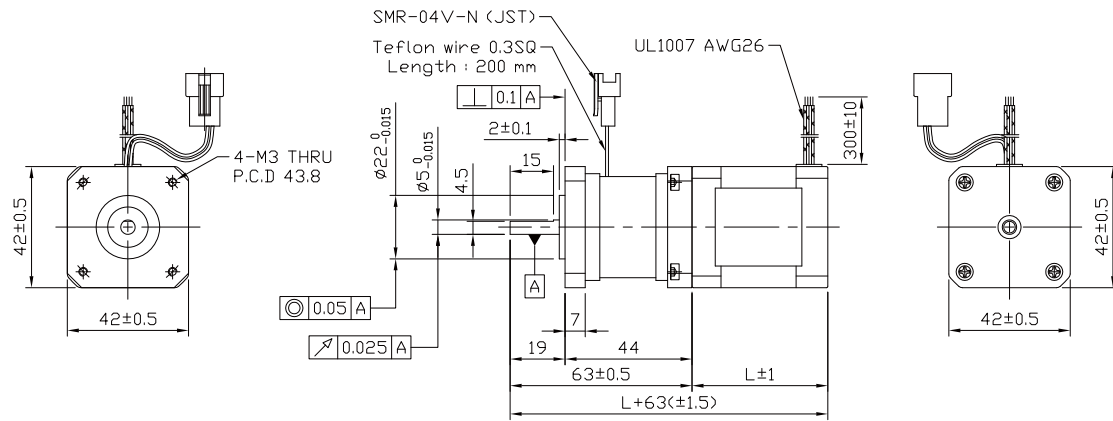
Please refer to below Timing Chart when control Brake from upper controller other than using MB450 Brake control. Otherwise, Drive malfunctioning and loads can be fall down.

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

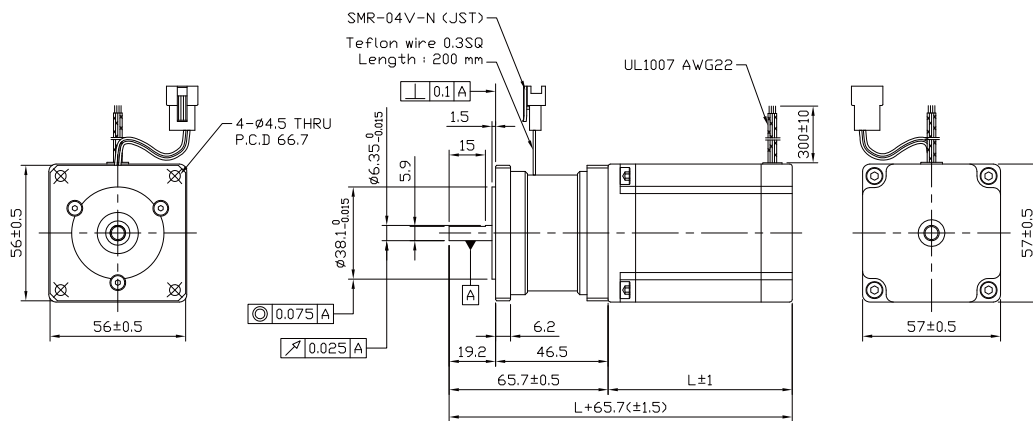


Motor Size

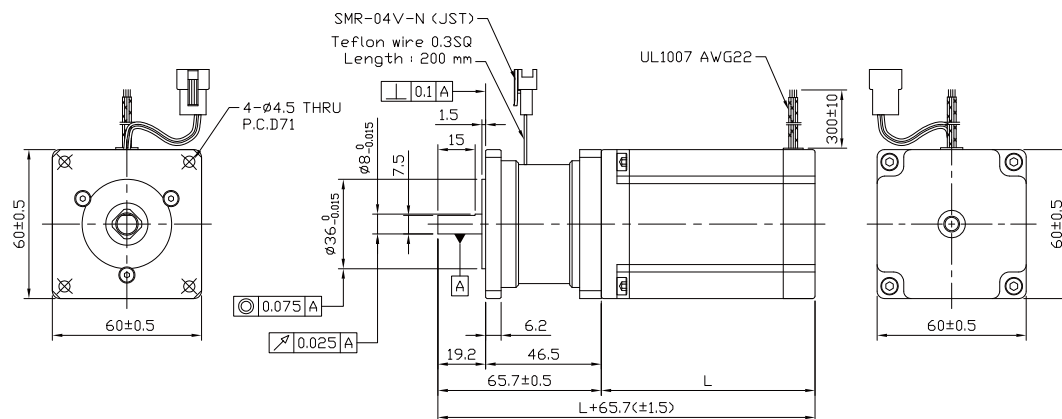
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