Cheonsei

CHEONSEI METERING PUMPS

BLDC M/C UNIT

BLDC Motor & Driver
(0.25~1.5kW AC200V~240V / AC380V~480V)

Instruction Manual

www.cheonsei.co.kr

Thank you very much for purchasing CHEONSEI BLDC Automatic Control Metering Pump.
Before beginning operation, please read this instruction manual carefully. Correct handling, repair, & maintenance are described easily.
Please use this product safely to be guaranteed performance & long life of the product after reading this instruction manual.
This manual specify handling method only for BLDC motor & Driver.
In case of handling method for metering pump, please refer to enclosed pump instruction manual.
Please keep this instruction manual at the place where you can find it easily.

CONTENTS

1 Notice for Safety

1-1 Introduction

- To use the products safely, the signs are showed on the manual as below.
- As it is a matter of safety, please be sure to keep the directions in manual.
- The signs and indications are as follows

⚠ Warning

Person death or serious injury will be occurred, if warning is not kept by wrong handling.

⚠ Caution

Person injury or property damage will be occurred, if caution is not kept by wrong handling.

1-2 Cautions for Operation Condition

⚠ Caution

- Avoid the place where high temperature, humidity, dust, corrosive gas, explosive gas, flammable gas, sea water exist and install the pump in the place where is well-ventilated and not exposed to direct sunlight.
  Otherwise it may cause breakdown and fire.
- Do not install product at the place where ambient temperature is higher than 40℃ and lower than -10 ℃. If product is installed at the place, it may be mal-functioned.
- Do not install product at the place where severe vibrations occur.
  Parts inside Driver may be damaged by effect of vibration or mal-functioned by loose connection.

1-3 Warning for Handling Condition

⚠ Warning

- Install this pump beyond the reach of children and/or unauthorized person.
- Do connect rated voltage that is specified in the Instruction Manual. Otherwise, it may cause injury or fire.
- Pump should be properly grounded. If pump is not grounded, it may cause electric shock or fire.
- Entrust the wiring to electrical engineer. Otherwise, electric accident may cause serious injury or death.
- Do not touch with wet hands. Electric shock may occur. Specially, if there is liquid on the floor, wear insulated shoes or gloves.
- Do wiring after turning off the power.
  If power is on during work, it may cause electric shock & fire.
- Do not take apart the front cover of Driver when power is on.
  If skin is contacted to the circuit board, it may cause electric shock because circuit board is in high voltage. Be careful, although the power is off, there still remains charged voltage in the internal circuit for 5 minutes.
- If pump is stoped and operated by electromagnetic switch which input voltage is opened & shut, do not frequently open & shut input voltage. Semiconductor of Driver may be damaged by inrush current or overcurrent.

⚠ Caution

- Use this product only for the applicable pumps designated by CHEONSEI and do not use this product for other purposes or do not arbitrarily reconstruct this product.
  Otherwise it may cause accident & trouble.
- Motor and Driver can not be used separately.
  If Motor and Driver are separated, mal-function will occur and it may cause breakdown.
- There are a lot of ICs in the Driver.
  ICs can be damaged by strong static or electromagnetic wave.
- Do not touch motor with bare hands during operation. High temperatures can cause burns.

2 Confirmation of Product

2-1 Check Point When Unpacking

Please check following points immediately after receiving the product.
If the defect is found, please request it to local agent or CHEONSEI.
We will do our best to solve the problem as soon as possible.

1. Is specification correct as ordered?
2. Is there any missing parts?
3. Is there any visible damage caused by vibration or shock during transportation?
4. Is there any loosened bolt or nut?

2-2 Standard Accessories

1. Instruction manual

※ In case of standard accessories related with pump, please refer to the standard accessories list specified in the pump instruction manual.

3 General

BLDC motor is Synchronous Motor to which permanent magnet is attached and decrease in torque is small at the low RPM, has wide range of speed change in high efficiency.
BLDC M/C UNIT measure RPM by the changes of hall sensor inside of the motor, and compensate RPM change caused by change of load with comparing the measured RPM and command signal.
Therefore, although load is changed, desired RPM can be maintained.
There are Automatic operation type and manual type, depending on the type of Driver.
Automatic operation type has simple setting for operation method & simple circuit configuration and it can select remote operation & on-site operation.
And also it is possible with easy setting of operation method to control RPM.
RPM setting can be changed by the analog input signal of DC4~20mA or data change with Keypad.
Manual type is immediately operated without any setting or handling, when the power is turned on.

4 Model Code

4-1 BLDC M/C UNIT

BMD	020	—	2	A	0
①	②		③	④	⑤

① BLDC MOTOR & DRIVER				
② Output	020 : 0.25kW		040 : 0.55kW	
	075 : 0.75kW		150 : 1.5kW	
③ Input Voltage	2	: 200V Class	4	: 400V Class
④ Control Method	A	: Auto. Operation	M	: only for Manual
⑤ Additional Function	0	: None		

4-2 BLDC MOTOR

BM	020	—	2
①	②		③

① BLDC MOTOR
② Output 020 : 0.25kW 040 : 0.55kW
075 : 0.75kW 150 : 1.5kW
③ Input Voltage 2 : 200V Class 4 : 400V Class

4-3 BLDC DRIVER

BD	040	—	2	A	0
①	②		③	④	⑤

① BLDC DRIVER
② Output 040 : 0.25~0.55kW 150 : 0.75~1.5kW
③ Input Voltage 2 : 200V Class 4 : 400V Class
④ Control Method A : Auto. Operation M : only for Manual
⑤ Additional Function 0 : None

※ M: Manual type is immediately operated without any handling, when the power is turned on.

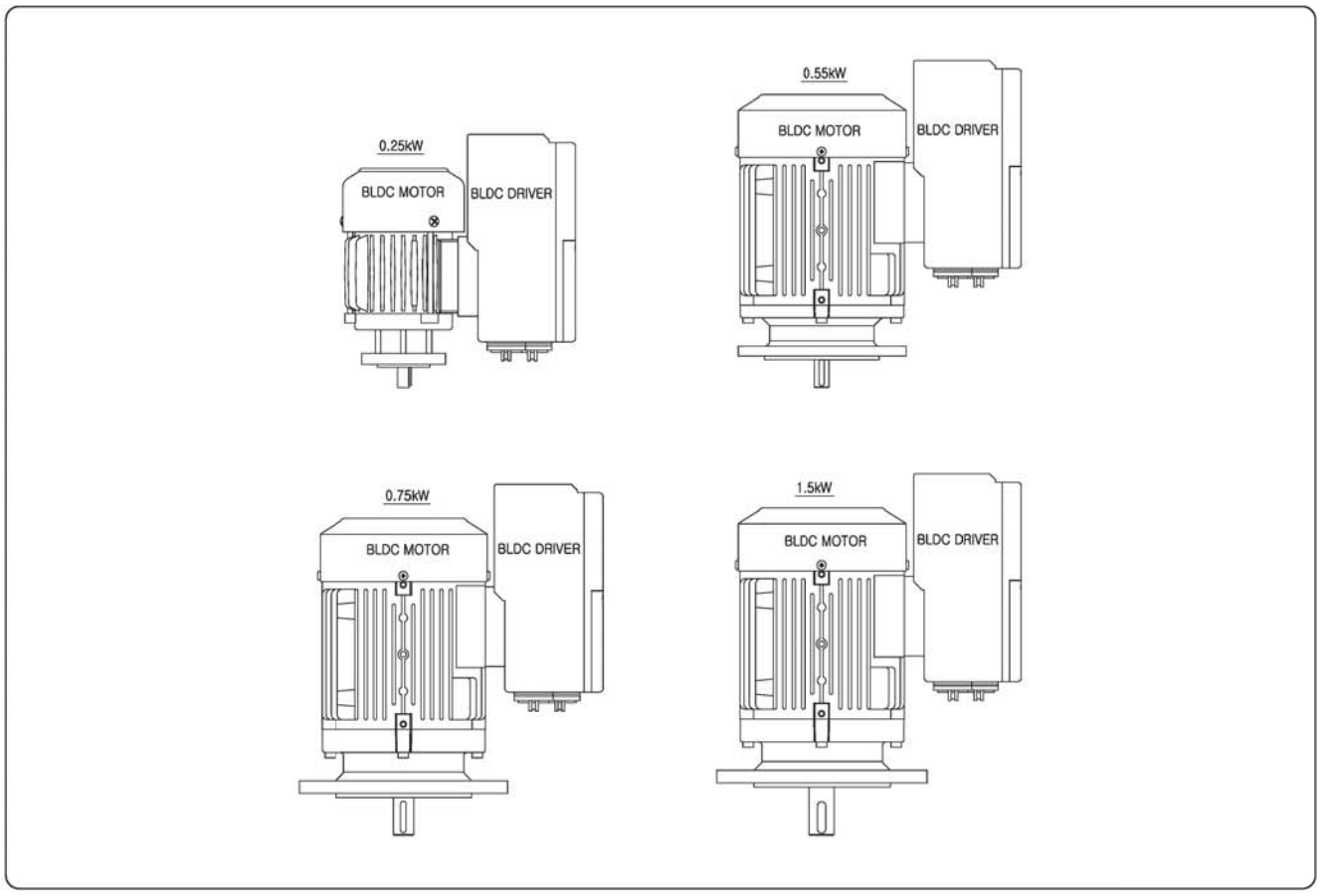
5 Specification

Classification			Specification
Driver	Input Voltage	200V Class	1 ø/3 ø AC200~240V 50/60Hz
		400V Class	3 ø AC380~480V 50/60Hz
	Input Signal (Auto.)	RPM	DC4~20mA
		Run/Stop	CLOSE : Run OPEN : Stop
	Output Signal (Auto.)	RPM	DC4~20mA (Insulated. Load Resistance Below 500 Ω)
		Operation Setting	REMOTE, LOCAL, AUTO, MANU Dry Contact(1a)
		Operation Status	RUN, TRIP Dry Contact (Run:1a, Trip:1a1b)
		Capacity of contact	AC250V5A DC30V5A
	Rated Current (A)	200V Class(1 ø/3 ø)	0.25kW 2.3/1.3 / 0.55kW 3.8/2.3 / 0.75kW 3.8(3 ø) / 1.5kW 6.4(3 ø)
		400V Class(380/440V)	0.25kW 0.9/0.7 / 0.55kW 1.4/1.2 / 0.75kW 1.9/1.7 / 1.5kW 3.2/2.9
	Protection Function		Over Current : E.oC, Shot Circuit : E.SC, Problem of Hall Sensor : E.HS Problem of Analog Input Signal : E.or, Overheat inside Driver : E.tE
	Speed Control Range		5.0~100.0%(Max. 1750RPM)
	Case Material		BODY : Aluminum COVER : Engineering plastic
Motor	Type		Brushless DC Motor(Sensored SPM)
	Structure		TENV(Totally Enclosed, Non Ventilated)
	Pole / Insulation Class		8 Poles / F Class
General Spec.	Protection Class		IP66 (Motor and Driver)
	Ambient Temp. &Humidity		-10℃ ~ 40℃ Relative humidity below 80%RH (Dew Condensation don' t be formed)
	Installation Place		There is no corrosive gas, flammable gas, sea water, oil drop & dust.
	Painting		Munsell No. 0.6 PB 4.8/10.6
	Weight(Kg) (Motor+Driver)		0.25kW 5.2 / 0.55kW 10 / 0.75kW 13.5 / 1.5kW 15.5

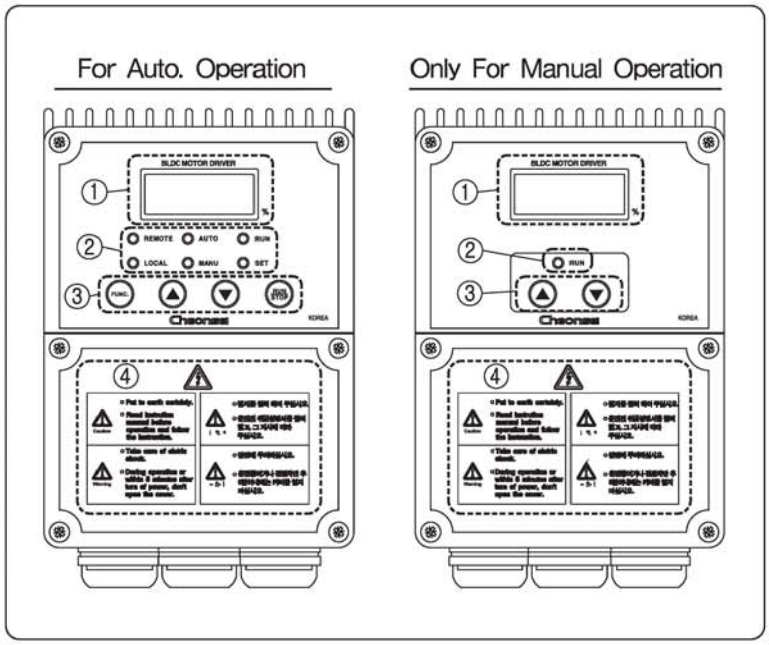
6 Name and Function of Each Part

6-1 Name of Each Part

[1] BLDC M/C UNIT



[2] BLDC DRIVER



① Data Display
② Status Lamp
③ Keypad
④ Warning & Caution

6-2 Functions

[1] Data Display
Indicate RPM by percentage (%) during operation and display the data when setting the function.

[2] Status Lamp
Indicate setting status of Driver and operation status of Motor.
BLDC M/C UNIT only for manual operation has Run Led only.
① REMOTE LED : Lighted when setting the motor to remote operation.
② LOCAL LED : Lighted when setting the motor to local operation.
③ AUTO LED : Lighted when setting to control the flow rate by Auto Signal(4~20mA)
④ MANU LED : Lighted when setting to control the flow rate by manual(Keypad)
⑤ RUN LED : Lighted during motor operation and Flicker when problem in Motor & Driver occurs.
⑥ SET LED : Lighted when changing driver operation setting.

[3] Keypad
BLDC Driver only for manual operation has UP ▲ switch and DOWN ▼ switch only.
① FUNC. FUNC switch : a switch used for driver settings.
② UP ▲ switch : a switch used for data changes.
③ DOWN ▼ switch : a switch used for data changes.
④ RUN/STOP RUN/STOP switch : RUN/STOP switch when the driver is set to LOCAL.

[4] Warning & Caution
There are notices to keep in mind for safe use.

7 Electric Wiring and Connection Method

⚠ Warning

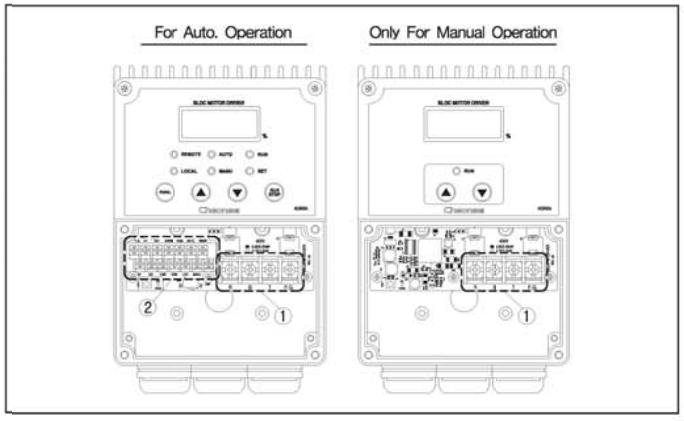
- Do not touch with wet hands. Electric shock may occur.

⚠ Caution

- Do connect rated voltage that is specified in the Instruction Manual. Otherwise, it may cause injury or fire.
- Product should be properly grounded in order to prevent electric shock or fire.
- Entrust the wiring to electrical engineer.
- Standard products should be used for wiring, and be careful of safety according to technical standard & wiring regulation of electric installation.
- Do not arbitrarily disassemble or modify the internal parts of the Driver . It may cause breakdown or malfunction.

7-1 Power Wiring

[1] Open the Terminal Cover after loosening 4 bolts on the terminal cover.

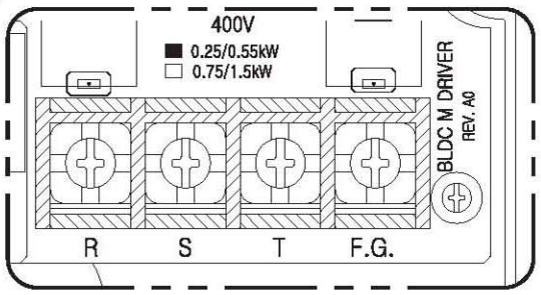


① Power Terminal Block
② Control Terminal Block

※ BLDC Driver only for manual operation has no Control Terminal Block.

[2] Connect the specified power supply to the power terminal.

① Power Terminal Block



Terminal Name	Specification for connection
R	200V Class : 1 ø/3 ø AC200~240V 50/60Hz
S	(0.75/1.5kW are only for 3 ø)
T	400V Class : 3 ø AC380~480V 50/60Hz
F.G.	Ground

② Wire standard suitable for the Terminal : AWG12~20

③ Terminal Bolt / Washer : M4 ×8 / 10.5 ×9.0

7-2 Control Wiring

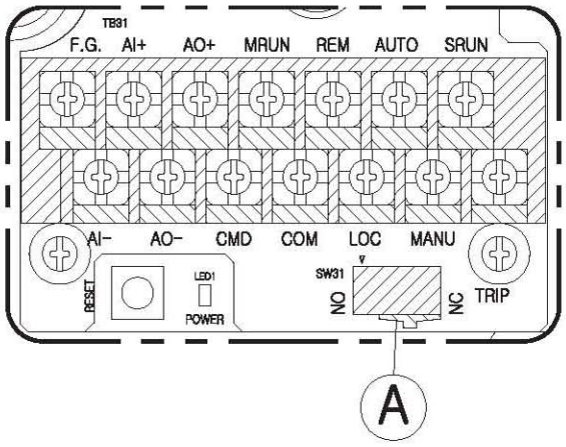
※ BLDC M/C UNIT only for manual operation has no Control Terminal Block.

[1] Cover is put on the top of Control Terminal Block.

Connect wire after lift the cover to reveal bolts of the terminal when connecting the cables to the Terminal Block.

[2] Terminal connection is described on a sticker attached to the inside of the Terminal Block Cover.

① Control Terminal Block



Function	Terminal Name	Specification
Control Signal	F.G.	Ground
	AI+	Analog Input+
	AI-	Analog Input-
	AO+	Analog Output+
	AO-	Analog Output-
	CMD	Operation Commend(Power)
	MRUN	Operation Commend(NPN Base)
Status Output	COM	Status output of COMMON
	REM	Status output of REMOTE operation
	LOC	Status output of LOCAL operation
	AUTO	Status output of AUTO operation
	MANU	Status output of MANU operation
	RUN	Status output of RUN
	TRIP	Status output of TRIP

② Wire standard suitable for the Terminal : AWG18~26

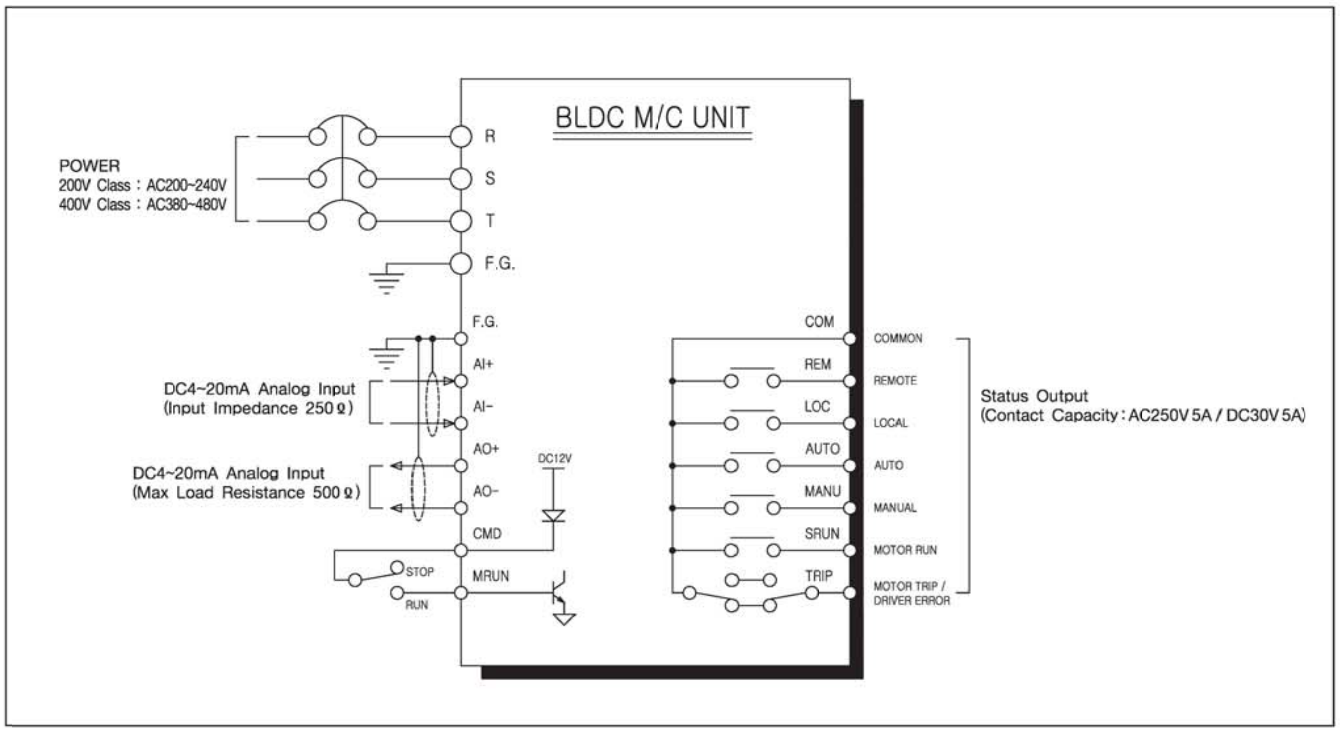
③ Terminal Bolt / Washer : M3 × 6 / 6 × 6

④ In case of TRIP terminal, you can choose NO(Normal Open) and NC(Normal Close) by using the switch Ⓐ.

It is NO(Normal Open) when turning the switch into the left and it is NC(Normal Close) when turning the switch into the right.

Factory default setting is NO(Normal Open).

7-3 Standard Diagram



8 Driver Setting and Operation Method

8-1 Driver Setting

※ BLDC M/C UNIT only for manual operation does not need any driver setting.
It is immediately operated, when the power is turned on.

1 If FUNC. switch is pressed at standby, the mode is changed to REMOTE/LOCAL setting mode.

REMOTE / LOCAL setting

① REMOTE : If UP ▲ switch is pressed, Driver Setting become REMOTE.
You can run or stop the motor remotely, by using CMD/MRUN terminal.
If the terminal is OPEN, Motor is stopped and, if the terminal is CLOSE, Motor is run.
REM LED : Flicker
SET LED : Flicker
Data Display : rEt

② LOCAL : If DOWN ▼ switch is pressed, Driver Setting become LOCAL.
You can run or stop the motor at the site, by pressing RUN/STOP switch.
If RUN/STOP switch is pressed at the stop status, motor is run, and, if it is pressed at the run status, motor is stopped.
LOC LED : Flicker
SET LED : Flicker
Data Display : LoC

2 If FUNC. switch is pressed at REMOTE/LOCAL setting mode, the mode is changed to AUTO/MANU setting mode.

AUTO / MANU setting

① AUTO : If UP ▲ switch is pressed, Driver Setting become AUTO.
You can control the RPM of motor remotely, by using AI+/AI- terminal.
Input is DC4~20mA Analog Signal and it is 100% at 20mA & 0% at 4mA.

Input Impedance is 250 Ω and the Resolution of ADC is 12bit.
AUTO LED : Flicker
SET LED : Flicker
Data Display : AUt

② MANU : If DOWN ▼ switch is pressed, Driver Setting become MANU.
You can control the RPM of motor at the site, by pressing UP ▲ switch & DOWN ▼ switch.
It is controlled by 0.1%.
MANU LED : Flicker
SET LED : Flicker
Data Display : nnE

3 If FUNC. FUNC is pressed at AUTO/MANU setting mode, the mode is changed to RATIO setting mode.
RATIO setting
① You can change RATIO at the site, by pressing UP ▲ switch & DOWN ▼ switch.
It is changed by 0.1%.
② RATIO : It is used to change the RPM ratio for the analog input signal.
Ex.) If analog input signal is 12mA(50%) and RATIO setting is 50%, RPM will be 0.5(50%) X 0.5(50%) = 0.25(25%).
SET LED : Flicker
Data Display : r.100 (RATIO:100%)

8-2 Operation Method

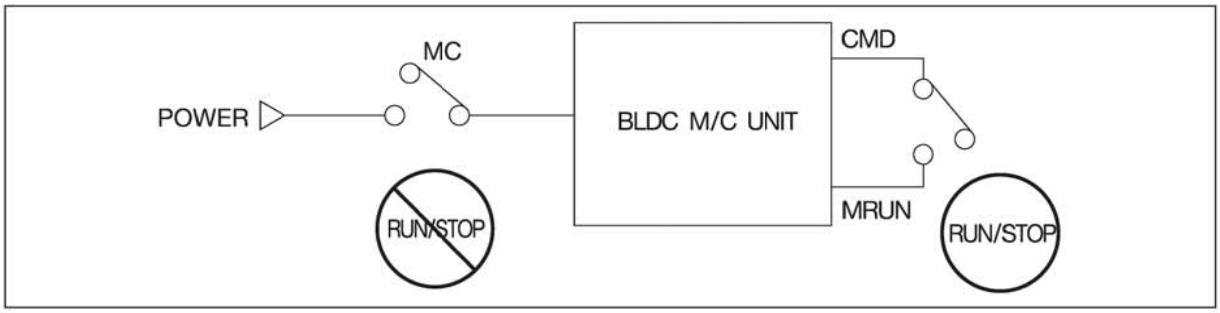
1 BLDC M/C UNIT for automatic operation

Driver Setting / User interface		REMOTE/LOCAL setting		AUTO/MANU setting	
		REMOTE	LOCAL	AUTO	MANU
Run/Stop of Motor	Remote : use the contact of driver terminal block	●			
	Local : press driver switch		●		
RPM Control of Motor	Remote : use the analog input of driver terminal block			●	
	Local : press driver switch				●

2 BLDC M/C UNIT only for manual operation
① Run/Stop of Motor : Power is on/off
② RPM Control of Motor : Press driver switch at the site

9 Notice

1 Do not install Electromagnetic Contactor(MC) in front of BLDC M/C UNIT for manual operation to control run and stop. Operate run and stop by using the Terminal for Operation Commend(CMD/MRUN).



2 Power on/off should not be done more than twice in one minute. Driver may burn out.
3 If motor protection circuit breaker is used, trip may occur in circuit breaker when power is on since instantaneous trip current is low. If motor protection circuit breaker is used, It may not be normally operated because BLDC M/C UNIT is not AC Induction Motor.
4 Additional functions of Over Current Relay such as open phase, unbalance, undercurrent, & etc. may make a trip during operation. In case of three phase, each phase may not consume same amount of current since there are charging circuit and rectifier circuit in the BLDC M/C UNIT.
Deactivate additional functions from the Over Current Relay and use it, except over current operating characteristics of Over Current Relay.
5 Close the Terminal Cover and use the BLDC M/C UNIT in order to prevent dust & etc.
Avoid moisture & oil and, if dust, metal powder, & etc. are penetrated inside of Driver, it may cause an electric breakdown.
6 Be careful not to make wrong connection & disconnection and connect wire to the terminal securely.

10 Maintenance and Inspection

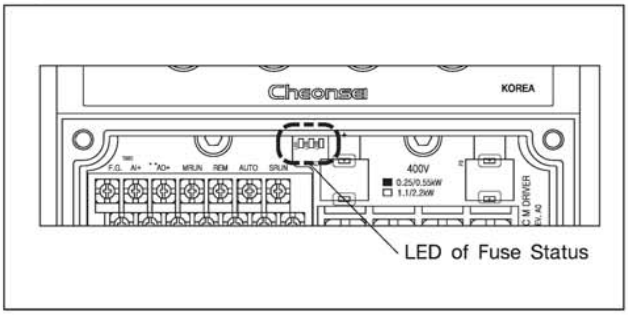
⚠ Warning

- Turn off the power when repair & maintenance, because of concerns for electric shock.
  Although the power is off, there still remains charged voltage in the internal circuit .
  Do work after turn off the power and confirm that the light of LED on the internal circuit board goes out.

1 Inspection

Item	Check Point	Method	Criteria
Ambient environment	Check ambient temperature,humidity, dust, harmful gas,Oil leakage, & etc.	sight, thermometer, hygrometer	Ambient Temp. -10~40℃ No freezing Ambient humidity 80%RH No condensation
Device	Is there any vibration or noise?	hearing	No Vibration or noise
Power	Check a source of electric power	Tester	200V Class : AC200~240V 400V Class : AC380~480V
	Insulation resistance test	500V Insulation resistance tester	Over 100M Ω
	Check whether a fuse has blown	sight	Status of Fuse, LED Light
Power Control	Is there any damage in the terminal block?	sight	Should have no problem
	Check whether the bolt of terminal block is tightly fastened	sight	Should have no problem
Display Operation	Is there any damage or breakdown?	sight	Should have no problem
	Check whether LED light is normal	sight	Display shall be legible correctly

2 Check for Fuse

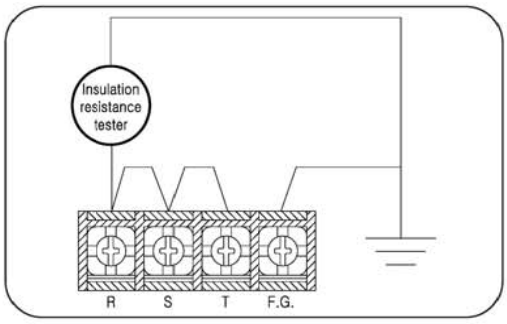


① If the front terminal cover of Driver is opened, three Red LEDs are in the position as shown in the left picture.
It shows the fuse status for R, S, T phase from the left side and, if fuse is normal status, the LEDs light up when power is turned on.
If the LED is not lighted even though Power is turned on, the fuse relevant to the phase is disconnected.
In case of single phase, only the LED of phase connected to the power is lighted.

② Fuse Standard

BD040-2□□ : 250V 5A
BD040-4□□ : 600V 3A
BD150-2□□ : 250V 10A
BD150-4□□ : 600V 5A

3 Insulation Resistance Test



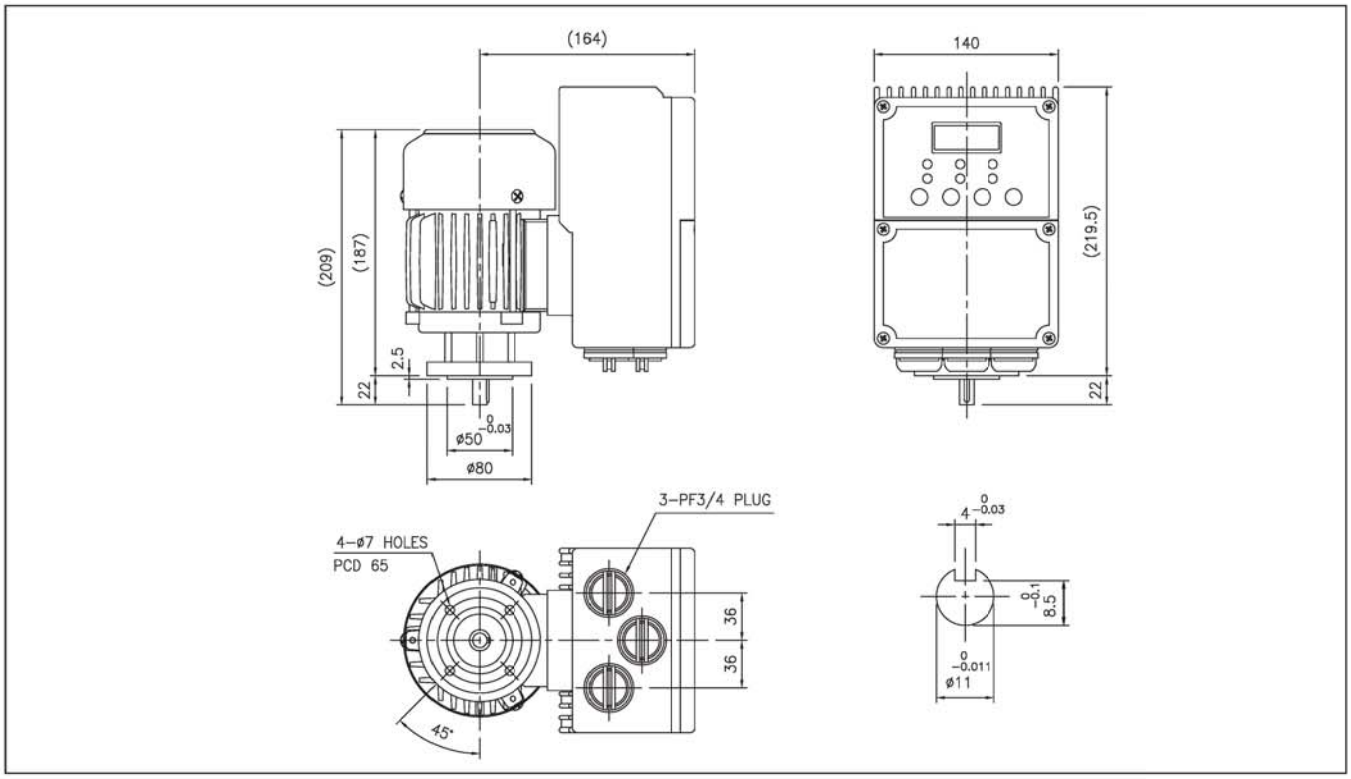
Operate the test by short-circuiting the power terminal as shown in above picture.
Do not operate the Insulation Resistance Test to the control terminal.
Use 500V Insulation resistance tester.

11 Cause of Trouble and Troubleshooting

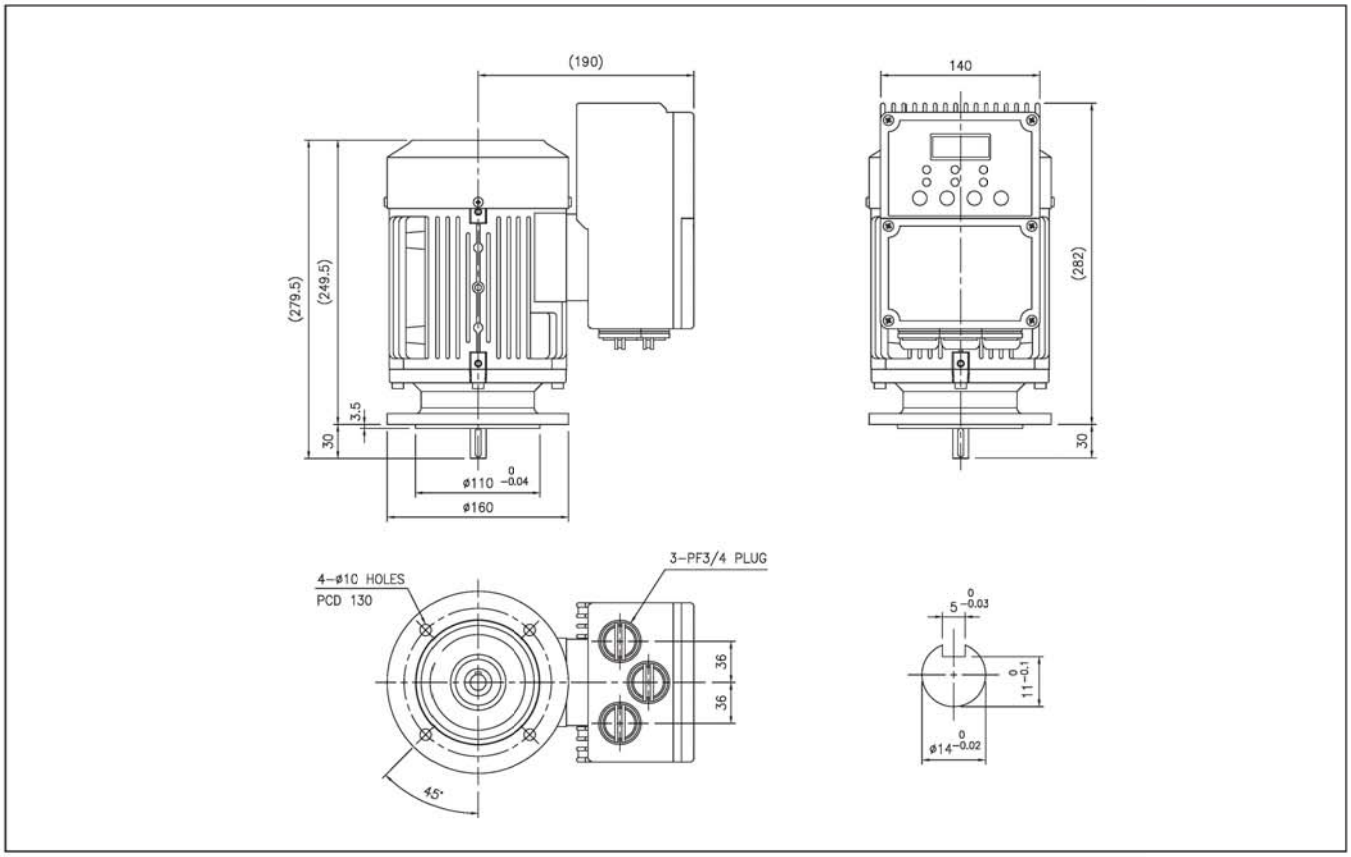
Trouble	Display	Cause of Trouble	Troubleshooting
Motor does not work	E. oC	Disconnect over current	Check pump & load or driver
	E. SC	Short circuit	Insulation Resistance Test
	E. or	Abnormal analog input signal	Check analog input signal or cable
	E. HS	Damage to hall sensor in motor	Replace or repair motor
	E. tE	Temperature rise of driver	Check ambient temperature & driver
	0.0	No contact signal when REMOTE operation	Check contact point of control terminal
		0.0 RATIO setting when AUTO operation	Revise RATIO value
		Problem of RUN/STOP key when LOCAL operation	Repair driver
	No display	Disconnection of fuse	Replace fuse or check driver
		Problem of power supply	Supply rated voltage suitable for specifications
		Open circuit breaker	Close circuit breaker
		Bad contact of power terminal	Re-connect terminal or repair
		Disconnection of power cable	wiring or replacement
Motor speed is not under control		Input problem of analog signal when AUTO operation	Check system or repair driver
		Error of RATIO setting when AUTO operation	Revise RATIO value
		Problem of switch & when MANU operation	Repair driver

12 Dimension

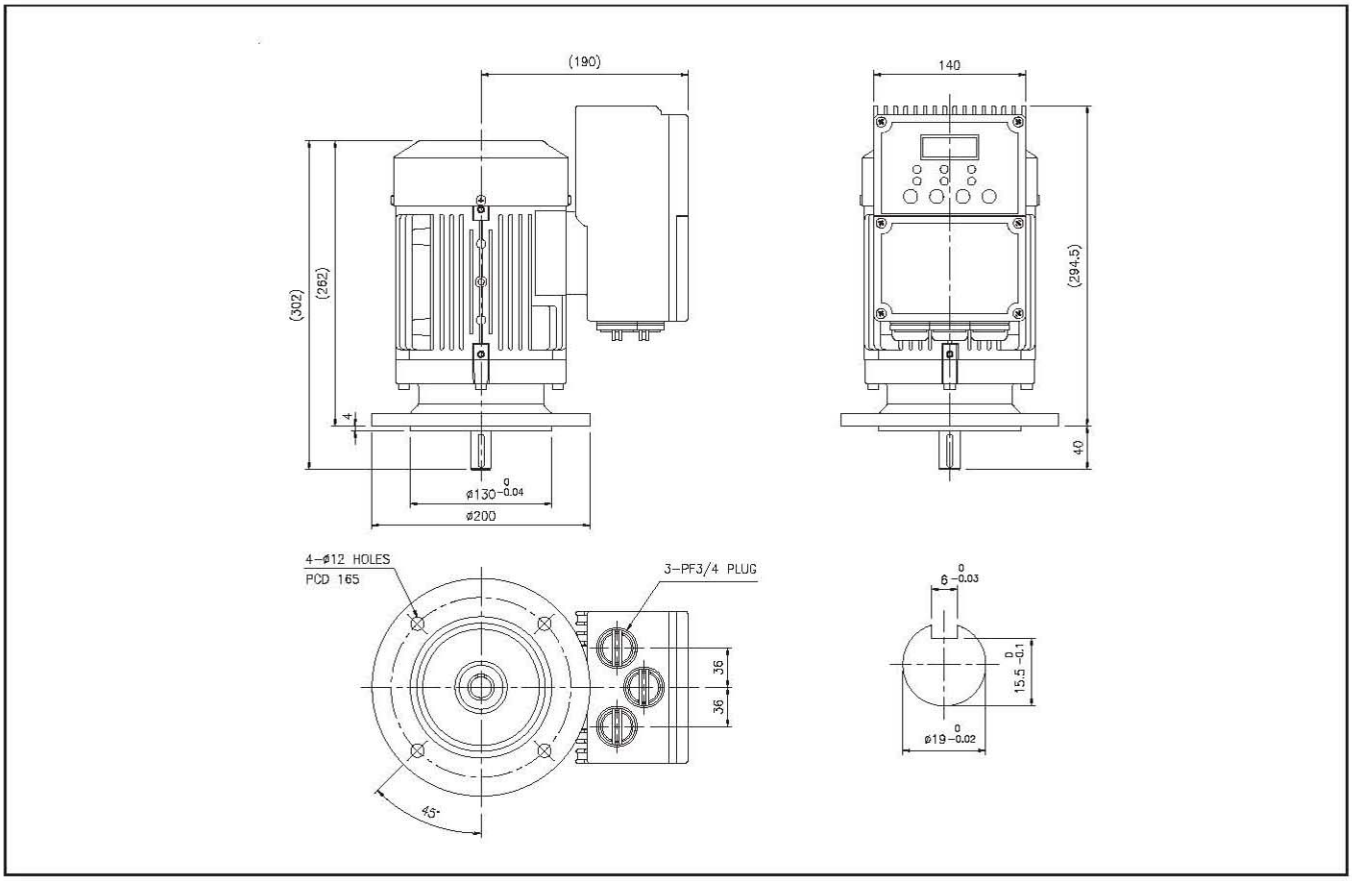
1 0.25kW



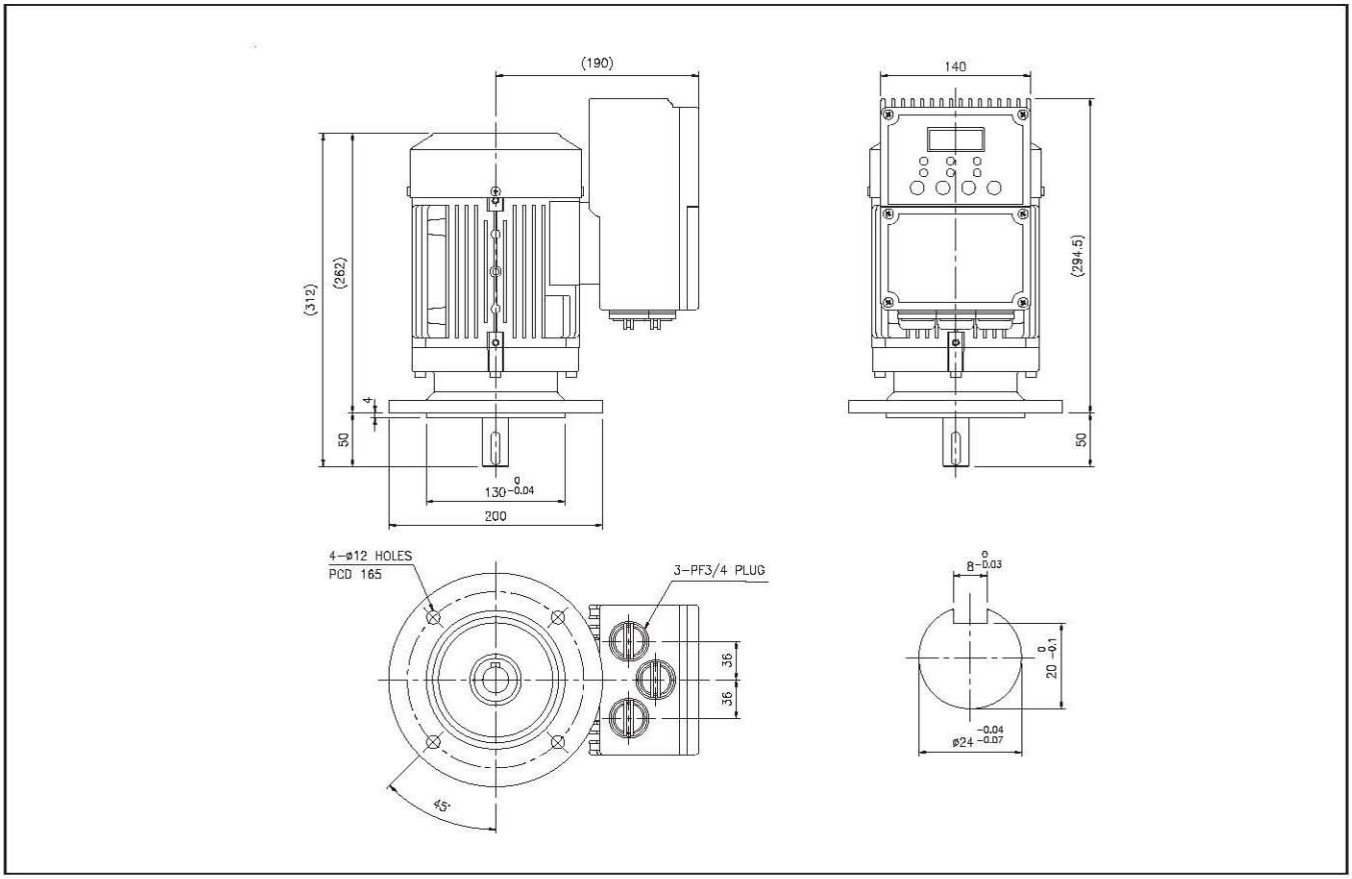
2 0.55kW



3 0.75kW



4 1.5kW



13 Warranty

⚠ Caution

- If the product is reconstructed arbitrarily or the undesignated parts are used into the product, CHEONSEI will not warrant and CHEONSEI is not responsible for any expense caused by accident or trouble.

[1] Warranty period is one year from purchase date.
[2] During warranty period, repair or change of product is free of charge, if trouble or damage of product due to design or manufacturing of CHEONSEI .(Consumable parts are excluded)
[3] Repair or change product due to following reasons will be charged regardless the warranty period.
① Trouble or damage of product expired warranty period
② Trouble of using by careless handling
③ Trouble or damage due to using non-designated part & reconstructing the product arbitrarily
④ Trouble or damage caused by repairing or modifying the product from the person or company undesignated by CHEONSEI
⑤ Trouble by fire or natural disaster

14 Repair Service

⚠ Caution

- When the product is sent to factory for repair service, be careful to don' t be damaged during transportation. Send the product after tightly fastening the Bolt & components to prevent loss.

[1] Contact to our A/S team or local distributor specified on the back of the manual, if you have any problem or questions.
[2] If you want to repair, please inform the followings.
① Model Name & manufacture number written in name plate
② Used period, using condition, and state
[3] If warranty period is over, Repair fee may be charged according to repair part.
Please contact with sales agent for more information.
[4] Minimum retention period of parts for repair is 5 years from the date of production.

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