USER MANUAL

Brushless DC Motor Control UNIT

XBD series

OTOR

SPG Co., Ltd.

www.spg.co.kr

Thank you for purchasing the product of the SPG Motor. For the safe use of this product, please be sure to be thoroughly informed of all the contents in this user's manual.

〈 INDEX 〉

1. Safety Precautions

In this user's manual, safety warning signs are divided into "Warning" and "Caution".

[Warning]	• A possibility of heavy injury or death when inappropriately handled.
[Caution]	• A Possibility of minor injury when inappropriately handled.

The lists in "Caution" can also lead to serious injury or damage depending on the situation. Please be informed of both categories for you safety.

[Warning]

- Do not use in the explosion, flammable, corrosive, combustible material and water place. it will cause fire, electric shock, injury.
- Do not touch the machine with wet hands. You may receive electric shock.
- Please turn off the machine before installation, verify and inspection. If not, you may receive electric shock.
- Installation, connection, operation, handling and inspection should always be done by qualified professionals. If not, it may be the main reason of electric shock.
- Grounding should always be done after installing the motor and the control unit. Failing to do so may cause electric shock
- The input voltage of the control unit must not exceed the rated range. If so, ou may received electric shock.
- After the connection is done, Make sure to install terminal cover over the power terminal and the input/output signal terminal. Failure to do so may cause electric shock or fire.
- Do not stress unnecessary force into the power cable or the motor cable. It may cause electric shock or fire.
- Make sure to turn off the control unit when the electricity is out. Sudden operation of the motor after the electricity comes back on may seriously damage the machine.
- Do not use the machine in elevators. Safety guard of the control unit will be activated and can make the motor stop. Which can damage the machine.
- Do not touch the control unit within ten seconds after the power is off. Doing so may cause electric shock.
- Do not dismantle or rebuild the motor, reduction gear and the control unit. It may cause injury to the user and damage to the machine.
- For inspections and repairs, please contact the nearest agency or the head office.

[Caution]

- Do not exceed the recommended limit of the motor and the control unit. You may be injured, receive electric shock and the machine may be damaged.
- Do not pull the output shaft or cables of the motor. You may be injured.
- Do not place inflammable materials near the motor and the control unit. It may cause fire, electric shock or cause damage to the machine.
- Make sure to cover the cycling head of the motor. If not, you may be injured.
- Do not put foreign elements in the input shaft of the control unit. It may cause fire, electric shock and damage to the machine.
- When installing the motor or the motor with reduction gear, be careful not have your finger in between the installing machine and the motor. It may cause injury.
- When assembling the motor(gear type shaft) and reduction gear, keep you fingers away from them. You may be injured.
- Please operate the motor and the control unit with recommended setting. If not, it may cause fire, electric shock an damage to the machine.
- Always be prepared use the emergency break when test-operating. If not, you may be injured.
- When the machine malfunctions, immediately stop the operation and turn off the control unit. If not, it may cause fire, electric shock or injury.
- When safety guard operates, turn down the power, handle the cause and turn the power back on. Continuous operation of the machine without handling the cause may have you injured or cause damage to the machine.
- Slow run/slow stop controller of the control unit needs to be handled with insulated precision tools. If not, it may cause electric shock.
- During the insulation resistance evaluation, and insulation internal pressure test, never touch the terminal. For it may cause electric shock.
- The motor and the control unit should be disposed as an industrial waste.
- As the surface temperature of motor and control unit can exceed 70℃ during operation, do not touch the motor, control unit during operating or after stopping. high temperature can result in person's burning.
- DOUBLE POLE/NEUTRAL FUSING

[Important]

- XBD Series are exclusively used for XBM Series among SPG motor. Therefore it is not compatible with other company and user should combine exclusive control unit with exclusive motor.
- Once power has been turned off, do not turn power on again or remove or insert the motor connector until the POWER LED is completely extinguished (at least 30 seconds).

2. Things to check after purchase

[Caution]

- Please check if the delivered product is the product you have ordered. Installation of different product may cause injury or fire.
- Please check if the products below are all in the place. If not, or if they are damaged, please contact the nearest service center or place of purchase.

2.1 Checklist

- Control Unit ---------- 1 EA
- External Speed controller ---------- 1 EA
- Control Unit Installation Bracket ---------- 2 EA
- Screws for Control Unit Installation Bracket ---------- 4 EA
- User's manual ---------- 1 EA

3. Coding System

■ **CONTROL UNIT**

Series	Output	Voltage
XBD	75	B

A : 1Ph. 100V - 120V
B : 1Ph. 200V - 240V
U : 3Ph. 200V - 240V

EX) 75 : 75W

XBD : XBD Series

■ **MOTOR**

Series	Size	Output	Shaft Type
XBM	9	75	G

G : Gear Type
D : D-Cut Type
K : Key Type

6: □60
8: □80
9: □90
10: □104

EX) 75 : 75W

XBM : XLM Series

4. Installation

[Place for Installing]

Motor and control unit should be installed in a place that satisfies the given conditions. If not, the product may be damaged.

- Indoor use only. The product is made to be used indoor.
- Use the product in a place with temperature of 0℃ ~ +50℃ (+32F ~ +122 F) (Recognized as Maximum Surrounding Air Temperature 50℃ UL/CSA standard)
- Use the product in a place with humidity rate under 85%
- Use the product in a place free of explosive, inflammable and acid gas
- Use the product in a place free of direct sunlight
- Use the product in a place free of possible influence of dust and metal particles
- Use the product in a place without water and oil
- Use the product in a place capable of heat radiation
- Do not stress constant vibration and excessive shock to the machine
- Use the product in a place without radioactive materials, magnetic fields. Refrain from using the product in a vacuum space
- Use the product in a place free from effect of electric noise(welders, motors)

[Important]

- The following installation conditions must be rigidly adhered to in order to ensure that products are used with greater safety

- Over voltage : Category Ⅱ ※1 - Pollution Degree : Class 2※2

(※1 Over voltage Category Ⅱ : Circuits, secondary circuits on transformers in industrial machinery, home appliances powered by commercial electrical power, office equipment and other power sources where major overvoltage are not produced.

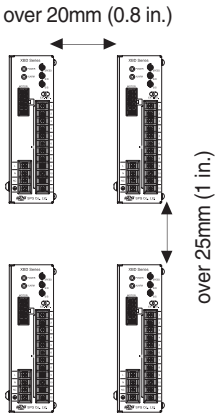
(※2 Pollution Degree 2 : Possible machine contamination through pollution due to the presence of charged particles with moderate pollutant forming tendencies (offices, research laboratories).

- When extending the space between MOTOR and CONTROL UNIT, use the optional relay cable (sold separately). In case of the EMC test, use the relay cable of our company.

4.1 Installation of Control Unit

4.1.1 Installing direction

The control unit is designed to radiate heat in accordance to heat conduction and convection current of air. In installing the control unit to the housing, be sure to install it vertically by using the installation holes. Vertical/horizontal distance between control unit and the housing, and that of control unit and the units in housing should be farther than 25mm (1 in.). When two control units are installed in a row(As shown in the picture), have the horizontal distance of more than 20mm (0.8 in.) and vertical distance of more than 25mm (1 in.)



[Important]

- Please install the control unit within the housing.
- Do not install machineries that produces noises or heat near the control unit.
- If the surrounding temperature is higher than 50'C (122F), please reset the ventilation facility.

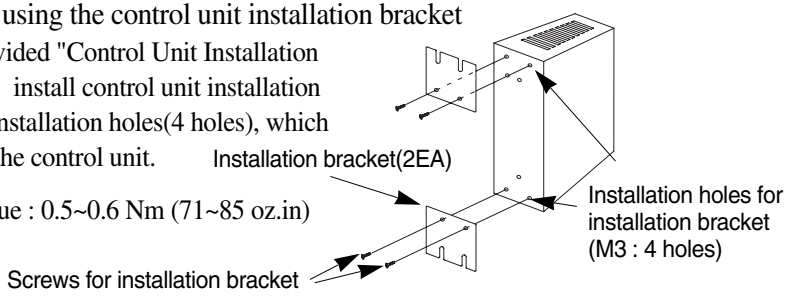
4.1.2 Installation method

Please install the control unit on a flat, metal panel that has strong endurance to vibration and is high in heat conduction

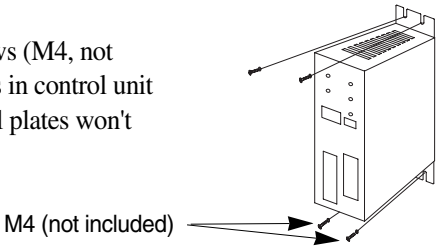
■ Installation by using the control unit installation bracket

1. By using the provided "Control Unit Installation Bracket Screws", install control unit installation bracket into the installation holes(4 holes), which is in the back of the control unit.

※Fastening torque : 0.5~0.6 Nm (71~85 oz.in)



2. Fixate the control unit with 4 screws (M4, not included) and the installation holes in control unit installation bracket so that the steel plates won't create any space in between them.



[Important]

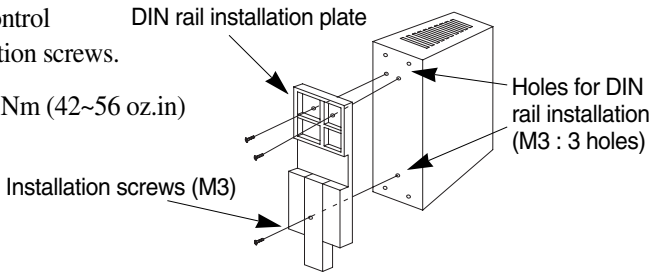
- The Installation holes in the back of the installation bracket should not be used for purposes other than fixation.
- During the fixation of the control unit's installation, provided screws must only be used

■ Installation using the DIN rail

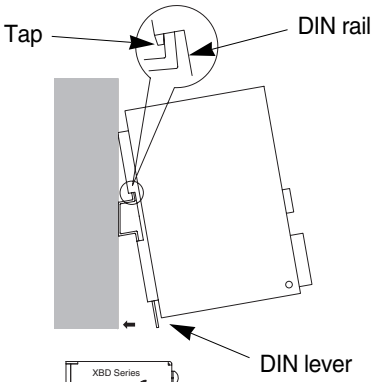
To install the control unit to DIN rail, use the DIN rail installation plate(sold separately) and install it to DIN rail with 35mm width.

1. Install the DIN rail plate to the installation holes (Which is in the back of the control unit - 3 holes)by using installation screws.

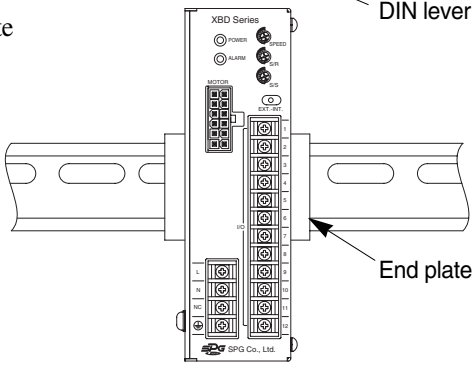
※Fastening torque : 0.3 ~ 0.4 Nm (42~56 oz.in)



2. Pull the DIN lever down and hang it to the tap (Which is in the top of the DIN rail installation plate) and push the control unit until the DIN lever is full fixated.

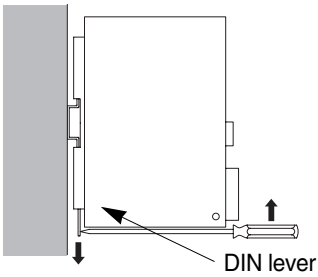


3. Fixate the control unit with the end plate (Not included)



■ Dissembling from the DIN rail

You may dissemble it by pulling the DIN lever with screw driver and push up the control unit from below. When pulling the lever down, do so with the strength of 10N~20N (2.2~4.5lb). Excessive force may damage the DIN lever



[Important]

- The Installation holes in the back of the control unit should not be used for purposes other than fixing DIN rail installation plate.
- The included screws must only be used for fixing the DIN rail installation plate. Using screws that goes in deeper than 3mm from the surface of the control unit may damage the control unit.

4.2 Appropriate Installation and Wiring Method for EMC Instructions

4.2.1 EMC Instructions

XBD Series are designed and produced as parts for machine equipment. To process EMC instructions, it requires the compatibility of client's machine equipment that is equipped with this product. The installation of MOTOR/CONTROL UNIT and the wiring method are introduced here to explain the fundamental installation and wiring method valid for the EMC instructions of the machine equipment. As for the final machine equipment's compatibility of the EMC instructions, clients are recommended to self-test the EMC of the machine equipment because the compatibility may vary depending on other control system machines used with MOTOR/CONTROL UNIT, composition of electrical components, wiring, arrangement status, and risk.

※ Application Standard

Main : EN 61800-3,

Adjustable speed electrical power drive system - Part 3: EMC requirements and specific test methods

Emission : EN 55011,

Industrial, scientific and medical(ISM) radio-frequency equipment - Radio disturbance characteristics - Limits and methods of measurement
- Conducted Disturbance
- Radiated Disturbance

EN 61000-3-2, Harmonic current
EN 61000-3-3, Voltage fluctuation and flicker

Immunity :

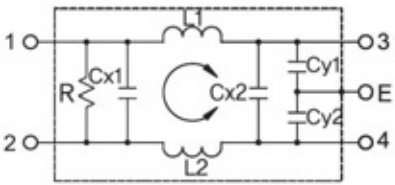
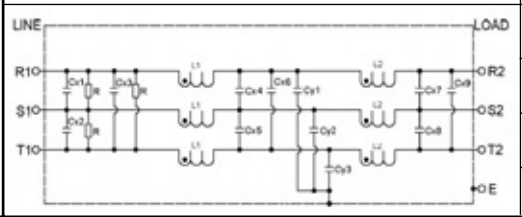
EN 61000-4-2, Electrostatic discharge immunity
EN 61000-4-3, Radiated, radio-frequency, electromagnetic field immunity
EN 61000-4-4, Electrical fast transient/burst immunity
EN 61000-4-5, Surge immunity
EN 61000-4-6, Immunity to conducted disturbances, induced by radio-frequency field
IEC 61000-2-1, Immunity to voltage dips and short interruptions
IEC 61000-2-4, Immunity to harmonics, voltage deviations, voltage unbalance, frequency variations and frequency rate of change
IEC 60146-1-1, Commutation notches

4.2.2 Appropriate Installation and Wiring Method for EMC Instructions

If countermeasures for the EMI of surrounding control systems, for the EMS of XBD Series, and for XBD Series itself are not devised, the performance of the machine equipment may suffer from serious malfunctions. XBD Series make it possible to execute EMC instructions by performing the following installation and wiring processes.

■ Connecting AC Line Filter of Power Line

Please connect the AC line filter to the AC input line to prevent the noise generated by CONTROL UNIT from propagating to the outside through the power line. For the AC line filter, please use the following or its equivalent products shown below.

Manufacturer	1Ph.100V- 120V / 1Ph.200V- 240V		
DONG IL TECHNOLOGY,LTD	ES1-F10		
	Circuit diagram	Part	Specification
		Inductor L1, 2(mH)+50%, −30%	4.2mH
		X-Capacitor Cx1,2(μF)±20%	0.22μF
		Y-Capacitor Cy1, 2(pF)±20%	3300pF
		Resitor R(kΩ)±10%	510KΩ, 1/2w
	3Ph. 200V		
	Circuit diagram	Part	Specification
		Inductor L1, 2(mH)+50%, −30%	1.7mH
		X-Capacitor Cx1-9(μF)±20%	0.47μF
		Y-Capacitor Cy1, 2, 3(pF)±20%	4700pF
		Resitor R(kΩ)±10%	300KΩ, 1/2w

- Please install the AC line filter close to CONTROL UNIT if possible. Firmly fix the input cable and output cable by using a cable clamp to prevent them from coming off the metal surface of HOUSING.
- Please use a thick cable for the grounding terminal for the AC line filter, if possible, and ground it to the grounding point at the shortest distance.
- Please do not wire the input cable of the AC (above AWG18:0.75mm^2) and the output cable of the AC line filter (above AWG18:0.75mm^2) side by side. If they are wired next to each other, the noise inside HOUSING may be directly coupled with the power cable through floating capacity and consequently reduces the effect of the AC line filter.

■ Grounding Method

To prevent the generation of potential difference in grounding location, CONTROL UNIT, MOTOR, and the AC line filter should be grounded with thick cables, if possible, at the shortest distance. Please use a wide, thick, and uniform grounded panel at the grounding point (Please refer to page 41 for the grounding method of CONTROL UNIT).

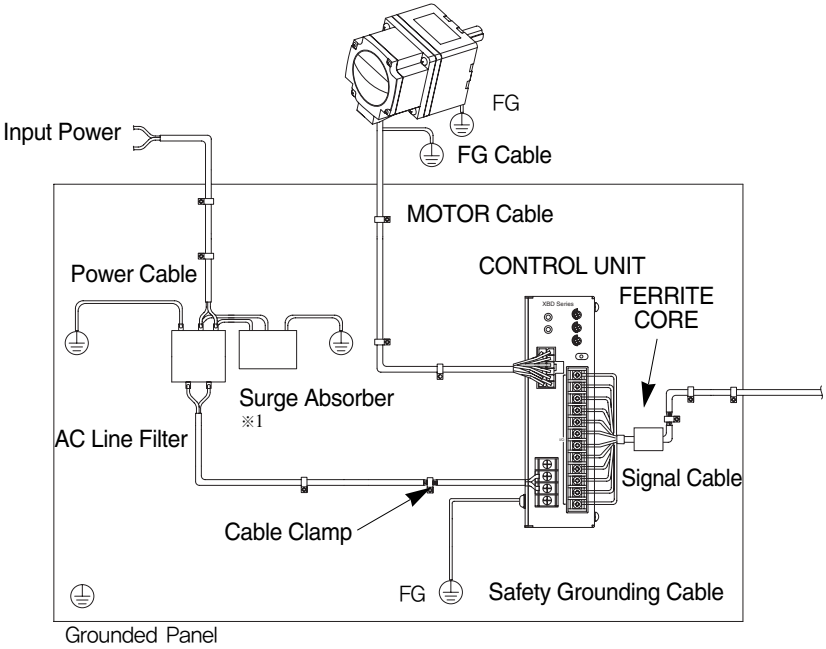
■ Wiring of Signal Cable

Please wire the signal cable of CONTROL UNIT as short as possible, using a shield cable with a diameter of AWG24~22(0.2~0.3mm^2) and Ferrite Core (FEELUX CO LTD, G8A, TR48×3×15). When grounding the shield cable, use a metallic clamp touching a pole of the shield cable. Place the cable clamp at the front of the shield cable and ground it to an appropriate grounding point.

[Important]

- Directly ground MOTOR and CONTROL UNIT to the grounding point, preventing a possible potential difference between the electric potential of the grounded MOTOR and CONTROL UNIT and that of the grounded surrounding control system.
- When using a relay and electric switch together, make the AC line filter and CR circuit absorb the surge.
- Wire cables short, if possible, and do not wind or tie the remainder of the cable.
- Separate electric power cables (MOTOR cable and power cable) and signal cables and wire them, setting them apart about 100~200mm (4~8 in.). If the electric power cables and signal cables intersect, make them cross at right angles and wire them. Furthermore, the AC input cable of the AC line filter and the output cable should be separately wired.

■ Example of Installing/Wiring MOTOR and CONTROL UNIT



[Important]

※ 1. In case of single phase of 200-240V, when using the machine in the scope of overvoltage category III, install and connect the surge absorber to the first noise filter.
(Overvoltage category III stands for the first time of TRANSFORMER at which a significant overvoltage is expected to occur. It is an urgent change from the switchboard of factories.)

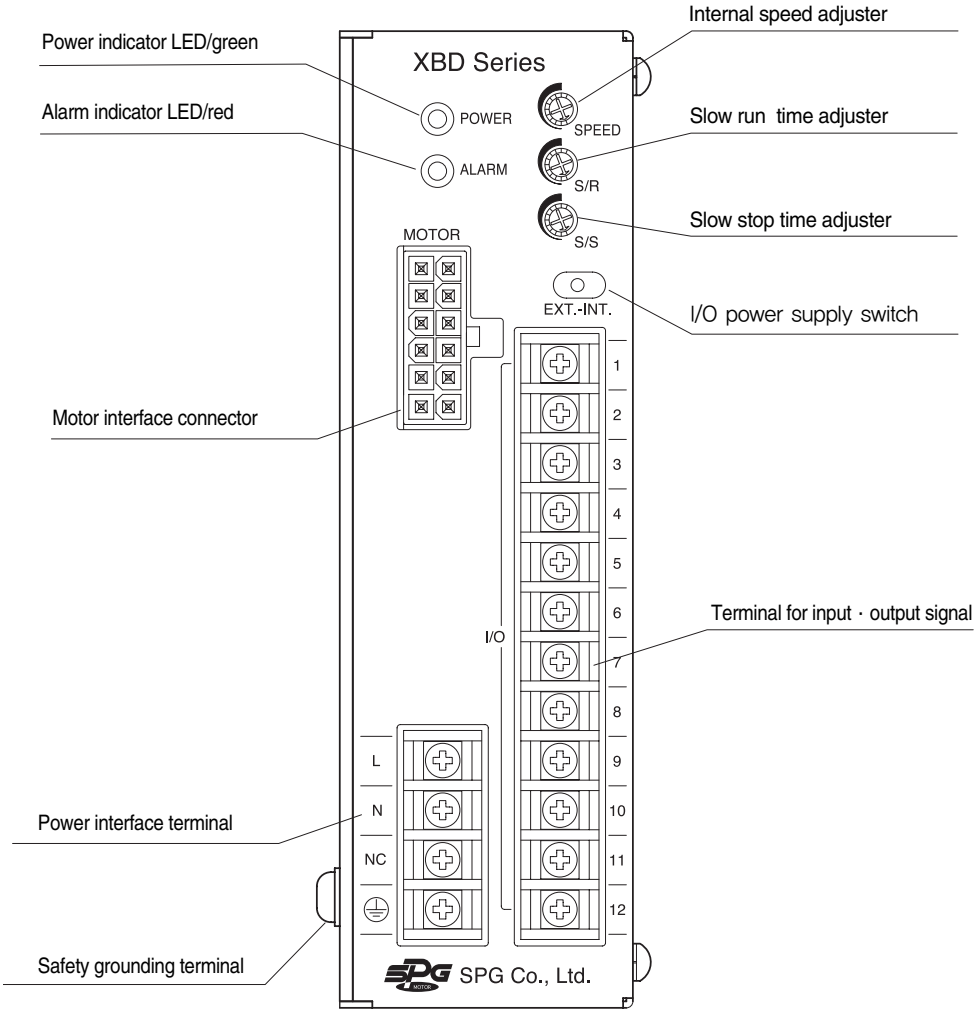
※ 2. In case of XBM10200□, XBM10400□

※ 3. In case of XBM620□, XBM840□, XBM975□, XBM9120□, XBM9150□

4.2.3 Precautions about Static Electricity

CONTROL UNIT may malfunction or get damaged by static electricity. When CONTROL UNIT is connected to power, carefully handle CONTROL UNIT and do not approach or touch it with hands. When adjusting the VR (SPEED.S/R.S/S) built in CONTROL UNIT, always use insulated drivers.

5. Designation and Function by unit



6. Connection

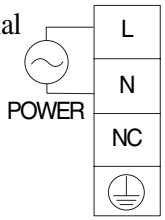
[Warning]

- Do not connect when an electricity current flows. Resume the operation after turning off the power. If not, this may cause an electric shock.
- After terminating the connection, cover the power connection terminal (accessory). If not, this may cause an electric shock.

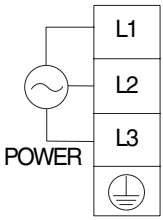
6.1 Connecting Power

6.1.1 Power Connection Terminal's Size of Terminal Screw and Cable Size In case of connecting the power connection terminal, use a circular compressed terminal that is insulated and adhesive.

- The size of a terminal screw: M3
- Fastening torque: 0.8 ~ 1 Nm(113~142 oz.in)
- The size of a cable available for connection: AWG16~18 (1.25~0.75 mm^2)



<single-phase power terminal>



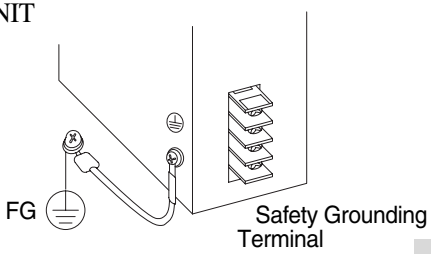
<three-phase power terminal>

single-phase 100V terminal is connected to the power source of single phase 100-120 V ± 50/60 Hz. single-phase 200V terminal is connected to the power source of single phase 200-240 V ± 50/60 Hz. single-phase terminal connects the single phase L to the LIVE and N to NEUTRAL. N.C. is not connected at any points. three-phase is connected to L1, L2, L3.(However, for three phases power, use the three phases and three lines power.)

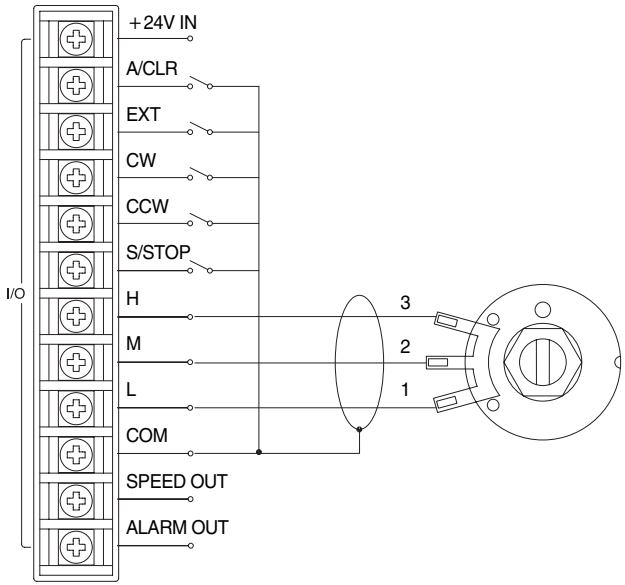
6.1.2 Grounding CONTROL UNIT

The safety grounding terminal next to CONTROL UNIT must be grounded. A grounding cable thicker than AWG18(0.75mm^2) should be used. The grounding cable must not be used with either welding machine or electric power machines. When grounding, make it grounded in close proximity to CONTROL UNIT by using a circular terminal that is insulated.

※For three phases power, use two types ground.



6.2.2 Rate of Connection



Name	Function
+24V IN	I/O power supply switch (UL 24Vdc class II)
A/CLR	ALARM CLEAR input terminal
EXT	Input terminal for internal/external speed adjuster selection
CW	CW signal input terminal
CCW	CCW signal input terminal
S/STOP	SLOW STOP Input terminal
H/M/L	Input terminal for external speed setting/external direct current power
SPEED OUT	SPEED signal output terminal
COM	Common GND for input/output signals
ALARM OUT	ALARM signal output terminal

■ About Input Signal

A/CLR input, EXT input, CW input, CCW input, and S/STOP input are photocoupler inputs. (Internal resistance 2KΩ / internal voltage +12V)

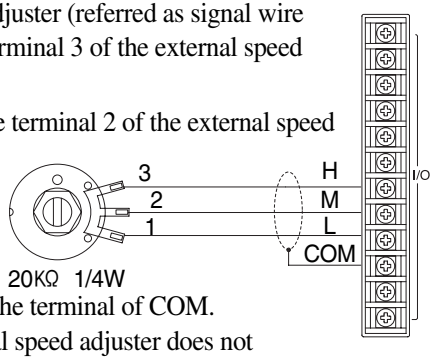
■ About Output Signal

SPEED OUT output and ALARM OUT output are photocoupler (OPEN COLLECTOR) outputs. (The condition for external usage: Under DC 4.5~30V 10mA)

6.2.3 Connecting External Speed Adjuster

When connecting an external speed adjuster, use the enclosed external speed adjuster and the signal wire exclusively designed for the external speed adjuster.

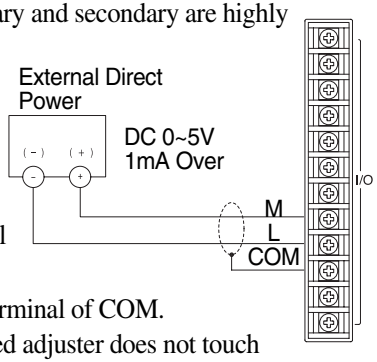
1. Among signal wires for the external speed adjuster (referred as signal wire from now on), connect the lead wire to the terminal 3 of the external speed adjuster and H input terminal.
2. Connect the lead wire of the signal wire to the terminal 2 of the external speed adjuster and M input terminal.
3. Connect the lead wire of the signal wire to the terminal 1 of the external speed adjuster and L input terminal.
4. Connect the shield wire of the signal wire to the terminal of COM. (Make sure that the shield wire of the external speed adjuster does not touch other terminals.)



6.2.4 Connecting External Direct Current Power

Use a direct current power(DC0~5V) of which primary and secondary are highly insulated to be used for an external direct current.

1. Connect the lead wire of the signal wire intended for the external speed adjuster (signal wire) to the external direct current's +terminal and M input terminal.
2. Connect the lead wire of the signal wire to external direct current's-terminal and L input terminal.
3. Connect the shield wire of the signal wire to the terminal of COM. (Make sure that the shield wire of the external speed adjuster does not touch other terminals.) L input is connected to GND inside CONTROL UNIT.



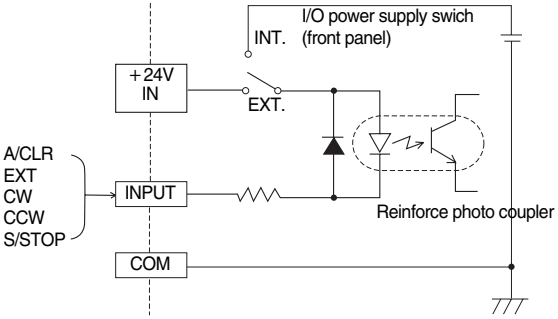
[Important]

- The voltage of the external direct current power must be under DC5V. If not, CONTROL UNIT may get damaged.
- When connecting the external direct current power, be careful with polarity. If not, CONTROL UNIT may get damaged.

6.3 Input/Output signals

6.3.1 Input Signal

(1) Input Circuit



The input circuits function by means of photocoupler input, as shown in the diagram at left. The input photocoupler can be driven by either the internal power supply or by an external DC power supply (DC24V class to)Input circuit is insurated dangerous voltages by the reinforce photo couplers.

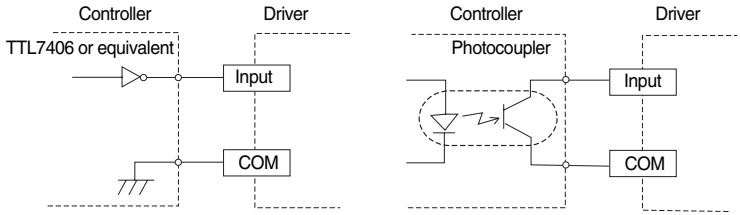
(2) Input Circuit Connection

This connection is used for A/CLR EXT VR, CW, CCW, and S/STOP input

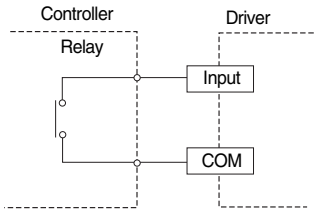
■ When using the driver's built-in power supply

Flip the I/O power supply switch to "INT." Signals will not be input if it is set to "EXT."

<Non-contact control>

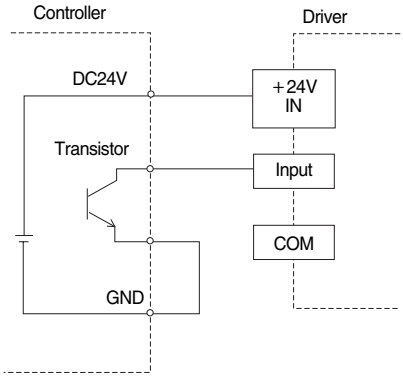


<Contact control>



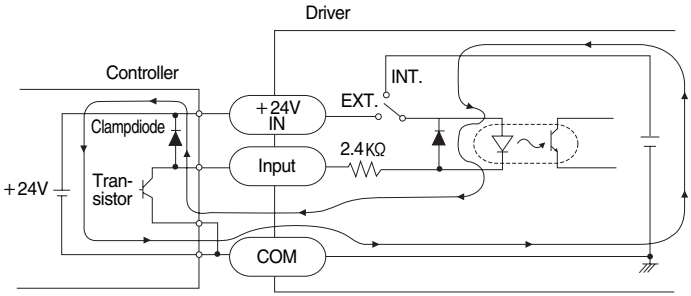
■ When using an external DC power supply

Flip the I/O power supply switch to "EXT." (set at time of shipment)



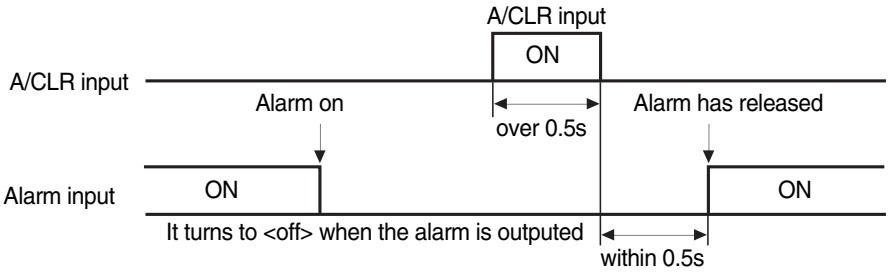
■ Cautions to observe when using a controller with an internal clamp diode

When using a controller with an internal clamp diode, the I/O power supply switch to "EXT." If the I/O power supply switch is the "INT." position, current will flow as indicated by the arrows in the diagram, thereby causing the motor to run unexpectedly.



■ A/CLR input

It resets the protection function as an alarm clear input and resets the control unit. It is used to call off the protection guard when the electricity is back on. However, it cannot be turned off when the protection guard functioned for over currency. In such case, reset the main power and turn off the alarm input.
(Once power has been turned off, do not turn power on again or remove or insert the motor connector until the POWER LED is completely extinguished (at least 30 seconds).



■ EXT input

In <off>(H level) mode, choose internal speed controller. In <on>(L level), choose external speed controller or external direct current voltage.

■ CW input

When CW input is <on>, it accelerates and operates in direction of the CW in accordance to time set up by the slow run time controller.
When CW input is <off>, it automatically slows downs and turns off in accordance to the S/Stop input terminal.

■ CCW input

When CCW input is <on>, it accelerates and operates towards the CCW in accordance to time set up by the slow run time controller
When CCW input is <off>, it automatically slows downs and turns off in accordance to the S/Stop input terminal

[Important]

• When CW input and CCW input get turned <on> at the same time CW has priority
  -Immediate seize operation is impossible
  -Please have 20msec of time in between CW and CCW input

■ S/Stop input

When the S/Stop input is adjusted to <on>(L level), slow stop function will come on. With the control unit of the front panel's slow stop time controller, it can be set up in the range of 0.5~15sec. (in 3000r/min mode)

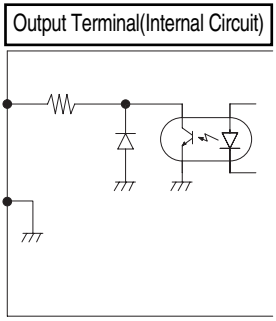
If S/STOP input is set to OFF [H level], may be stopped by inertia automatically.

■ H/M/L

It is a terminal connected for external speed controller and external direct current voltage. Please refer to page 42.

6.3.2 Output signals

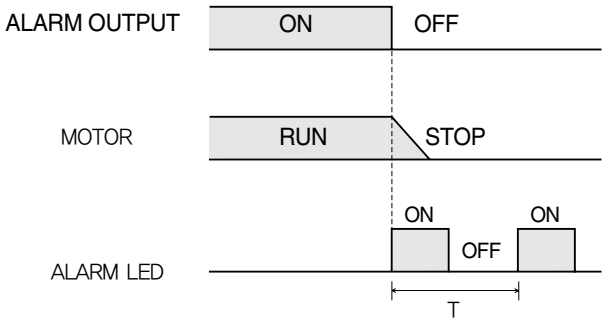
The signal status does not show the voltage level but its photocoupler's <on : electricity flows>, <off : electricity does not flow> status



■ Alarm Out

In the following condition, the protection guard of the control unit comes on, alarm out function turns <On> (L level), and the motor gets turned off.

※ It is shown by the LED's on/flashing sign. Make sure to be informed of the protection guard function.



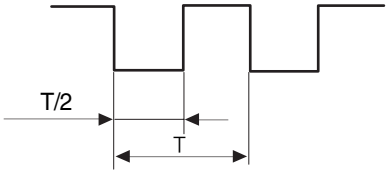
Type of protection function		Action
Alarm Signal Output	Overload protection	Activated when a load exceeding the rated torque (load torque or motor current of 130% max. of rated load or rated motor current) is applied to the motor for 5 seconds or more or when the motor is operated in short cycles of stopping/starting or CW/CCW rotation.
	Overvoltage protection	Protects the driver against damage when the motor is driving an inertial load exceeding the permissible inertial load, or when the motor shaft is turned by the load (during lowering operation).
	Under voltage protection	Activated when a input voltage to the driver is less than specified voltage.
	Open-Phase protection	Prevents motor malfunction when the sensor cable within the motor cable is disconnected during motor operation. (An alarm signal will not be output while the motor is at a standstill.)
	Overspeed Protection	Activated when the speed of the motor exceed 4000r/min or when it shows abnormal speed.

When connected as above, alarm out gets <off>(H level) if the control unit is normal, and <on>(L level) when it alarms. When the alarm out is <on>, stop the operation of the motor and shut down the control unit. When the motor cable is normal, re-check the usage conditions (overload torque, operation patterns, voltage)

■ Speed out

In accordance to the motor operation, it outputs 12/15 pulse per cycle(of the motor's output shaft). Thus it is possible to calculate the cycling speed of the motor by measuring the output frequency of the speed out.

$$\text{Speed out output frequency(Hz)} = \frac{1}{T}$$



■ With 20W

$$\text{Cycling speed of the motor(r/min)} = \frac{\text{Output frequency of the Speed Out(Hz)}}{12} \times 60$$

■ With 40W/75W/120W/150W/200W/400W

$$\text{Cycling speed of the motor(r/min)} = \frac{\text{Output frequency of the Speed Out(Hz)}}{15} \times 60$$

If you need the cycling speed of the motor's cycling head or that of reduction gear, Digital Speed Indicator(SID 250) is available.(Sold separately)

[Important]

- To extend the input/output cables, please do so under 2m.
- Input/output cables should be wired separately from power cables and motor cables.

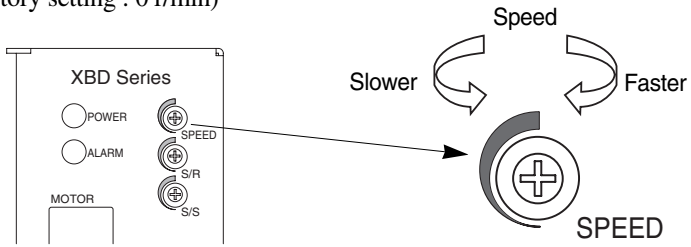
7. Operation

7.1 Selecting operation speed

The speed of the motor can be controlled by the internal speed controller within the control unit. It can also be controlled through the attached external speed controller or external direct current voltage. Speed selection ranges are 300~3000r/min. The speed selection can be controlled two ways by using the mixture of internal speed controller/external speed controller and internal speed controller/external direct current voltage.

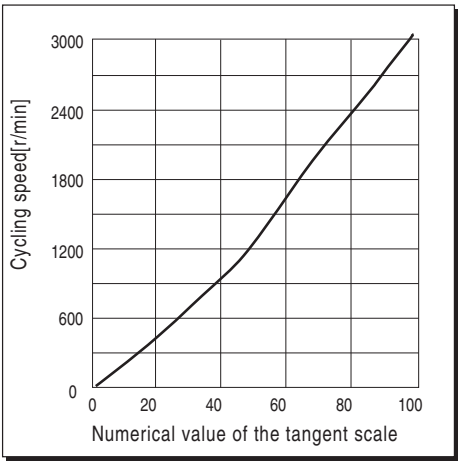
7.1.1 Selecting by internal speed controller.

Please do so with precision driver. Winding it clock-wise will operate the motor faster. (Factory setting : 0 r/min)



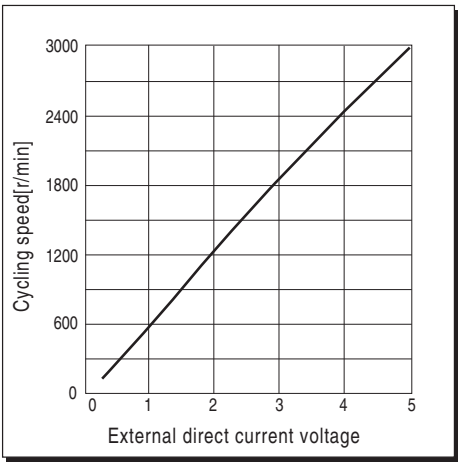
7.1.2 Selecting through the external speed controllercontroller.

When the external speed controller is connected to the control unit terminal, the speed can be selected through the range of 200~3000 r/min. To stop the motor, wind the controller counter clock-wise.

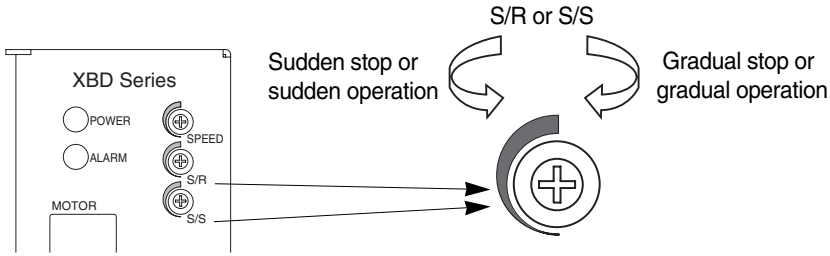


7.1.3 Selecting through the external direct current voltage.

With an external direct current of 0~5V, the speed of the motor can be changed through the range of 200~3000r/min, When the direct current hits 0V, the motor will stop. (Please have direct current of with capacity of over 1mA prepared)



7.1.4 Setting the time for Slow Run / Slow Stop

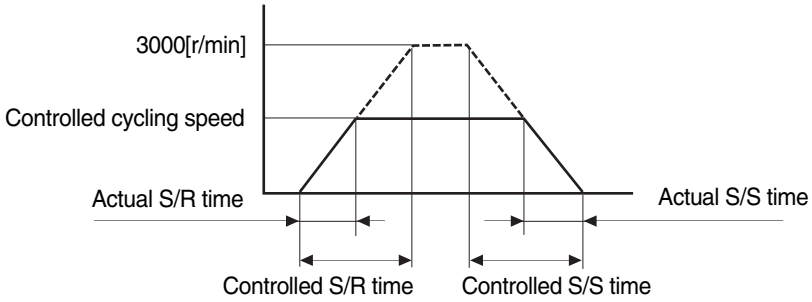


■ Slow Run Time Controller

The length of time between the start of the engine to the reach of desired speed is controlled by the "Slow Run Time Controller". When it is wound clock-wise, the time expands. The range of selection is in between 0.5sec ~ 15sec. (Factory setting : 0sec)

■ Slow Stop Time Controller

The length of time between the regular operation of the engine to a full stop of the engine is controlled by the "Slow Stop Time Controller". When it is wound clock-wise, the time expands. The range of selection is in between 0.5sec ~ 15sec. (Factory setting : 0sec)



[Important]

- To change the cycling direction of the motor, slow down the motor with "Slow Stop Time Controller" and start the motor with "Slow Run Time Controller".
- If S/STOP input is set to OFF [H level], may be stopped by inertia automatically.

7.2 Parallel Operation

To operate two or more motors with same speed, you can do so by using "External Direct Current Voltage" or "External Speed Controller".

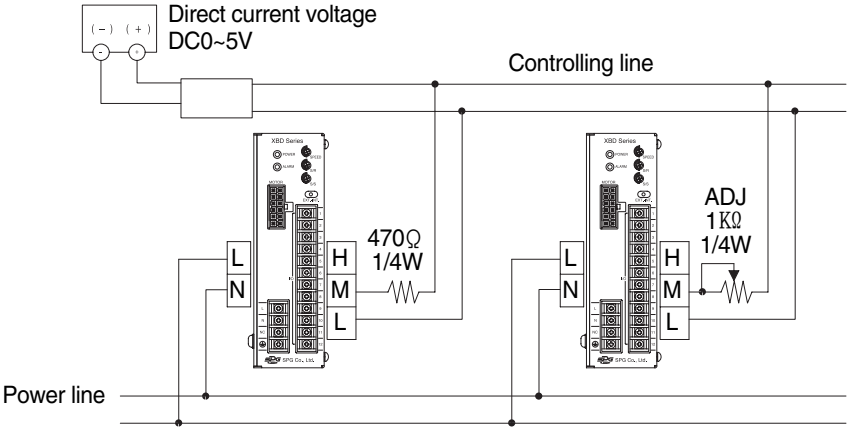
7.2.1 Using the External Direct Current Voltage

1) Please use direct current that has higher capacity than the value below

> Current capacity of N number of control unit I = 1 × N [mA]
> Ex) Two control unit would be over 2mA

2) Other input/output signals should be connected to each of it's control unit

3) Each motor's speed difference should be controlled by connecting 470Ω ,1/4W of resistance to the first control unit's M terminal, and connecting 1KΩ , 1/4W of variable resistance unit to other control unit's M terminal.



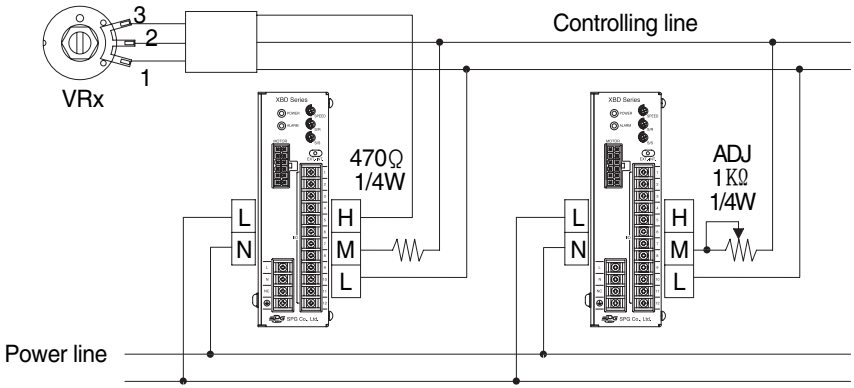
7.2.2 Using the External Speed Controller

1) Parallel operation refers to operation of several motors in same cycle by using a single external speed controller. As shown in the picture below, it controls the speed in VRx by using the same power line and speed controlling line.

2) The resistance value of the external speed controller can be calculated as follows

> The resistance value of N number of control unit VRx = 20/N KΩ, N/4 (W)
> Ex) When there are 2 control units, the value is 10 KΩ, 1/2W

3) Other input/output signals should be connected to each of its control unit
4) Each motor's speed difference should be controlled by connecting 470Ω ,1/4W of resistance to the first control unit's M terminal, and connecting 1㏀, 1/4W of variable resistance unit to other control unit's M terminal.
5) With external speed controller, please keep the parallel operation to under 20 machines.



8. Inspections

We recommend you to check the followings periodically. When malfunction occures, immediately stop using the product and call the nearest service center.

8.1 Checklist

1. Are the screws in motor/gear head tightened?
2. Is there any weird sounds in the motor's supporters? (Ex. Ball bearings)
3. Are the input shaft and the load shaft of the motor/gear head properly centered?
4. Are the motor cables, stress and control unit connected tightly?
5. Is the opening space free of dust?
6. Are the installation screws in control unit and power connection terminal screwed tightly?
7. Are the power cells and smooth condensers in the control unit functioning properly? are they free of smell?

[Important]

• Electrostatic may damage control unit for it contains semiconductor cell. Please be careful.

9. Troubleshooting

When the motor malfunctions, please inspect it according to the list below. If the motor still malfunctions after all the inspection, please contact our customer service depot or our agency.

9.1 When the motor does not operate

[Possible Factor]	[Solution]
CW input and the CCW input is both [off]	Have one of CW or CCW [on]
Internal speed controller not on	Wind the internal speed controller clock-wise (Factory setting : 0r/min)
The connection of external speed controller is bad	Check the condition of the external speed controller
External direct current's connection is bad	Check the condition of the external direct current's connection
Safety guard is on	Get rid of the cause and turn the power back on

9.2 When the motor operates to opposite direction

[Possible Factor]	[Solution]
CW input and the CCW input is wrongly wired, or the connection is bad	Make a proper arrangement
Reduction gear with reduction rate of 1/30, 1/50, 1/100 is currently at use	In reduction rate of 1/30, 1/50, 1/100, the motor cycles in opposite direction. Control the CW input and CCW input backwards

9.3 When the motor operates unstably

[Possible Factor]	[Solution]
The input shaft and the head shaft of the motor(gear head) is not properly centered	Check the condition of both head shaft and the input shaft
Motor and the reduction gear does not match	Check the reduction gear's gear type
It is being effected by noise	Check if the operation is controlled with controller unit and necessary controller only. If the noise is found, stay it away from the product and rewire according to it. In addition, change the signal cables to shield cables or install ferrite core.

9.4 When the motor does not stop swiftly

[Possible Factor]	[Solution]
Load inertia is too big	Check the load inertia
The slow stop time controller is fully wound clock-wise	Switch the S/Stop input to <Off> (H level) or wind the slow stop time controller counter clock-wise

10. Specifications

Control Unit ※1		XBD20□	XBD40□	XBD75□	XBD120□	XBD150□
Motor ※2		XBM620□	XBM840□	XBM975□	XBM9120□	XBM9150□
Rated voltage		Single-Phase 100V-120V / Single-Phase 200V-240V / Three-Phase 200V-240V				
Recommended range of voltage usage		± 10% (Based on the rated voltage)				
Power frequency		50 / 60 Hz				
Motor output		20W	40W	75W	120W	150W
Rated speed		3000 r/min				
Speed controlling range		200 ~ 3000 r/min (Speed ratio 1:15)				
Speed fluctuation rate	Against load	Under±1% [0~rated torque, in rated speed]				
	Against voltage	Under±1% [Rated voltage : ±10%, rated speed, without load]				
	Against temperature	Under±1% [0~50℃ <+32F ~ +122F>, rated speed, without load] (UL Surrounding Air Temperature 50℃)				
Slow run/ Slow stop		0.5 sec ~15 sec, (3000 r/min, without load)				
Speed selection		Front panel/external speed adjuster/external DC voltage				
Input signal		Photo coupler style / Input resistance 2KΩ (operated through internal power, for both CW and CCW)				
Output signal		Photo coupler style / External usage condition DC 30V, under 10mA, (For both speed out and alarm out)				
Protection guard ※3		When the following protection guards are on, the alarm will go on and the motor will stop automatically 1. Protection for machine overload : When an overload that exceeds the motor's rate torque has been continued for more than 5 seconds 2. Protection for overvoltage : When the voltage permitted for the control unit has exceed specified voltage 3. Protection guard for image formation : When malfunction occures in the motor feedback signals due to cables disconnection and connector disconnection. 4. Protection for undervoltage : When the voltage permitted at the control unit has shortage of more than specified voltage 5. Protection for over speeding : When the speed of the motor exceed 3800r/min				

※1. In the control unit models refer to voltage specifications. More details are provided in the catalogue
※2. In the motor models refer to voltage specification and shaft type. More details are provided in the catalogue.
※3. The speed of the motor cannot be controlled through motor cycling from load operation. When the load capacity exceeds its limit, the motor will be stopped by the protection guard. More details are provided in the catalogue.

XBD200□	XBD400□
XBM10200□	XBM10400□
	Three-Phase 200V-240V

200W	400W

21C, for world geared motor!

사 용 설 명 서

SPG Co., Ltd.

※For further development of the product, specification and design can be changed without notice. For other information, please contact costumer service depot of the head office or sales department.

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