

USER MANYAL

Brushless DC Motor Driver

XGVD series

(Basic)



SPG Co., Ltd.

<http://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.

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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 Vdamage 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.
- Consult product manual before installation or operation of the BDM.
- Operation of this equipment requires detailed installation and operation instructions provided in the installation/operation manual intended for use with this product. This information is provided on an electronic storage device included in the container this BDM was packaged in. It should be retained with this BDM at all times. A hard copy of this information may be obtained from the manufacturer.

**[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°C during operation, do not touch the motor, control unit during operating or after stopping. high temperature can result in person's burning.

[Important]

- XGVD Series are exclusively used for XGVM 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]

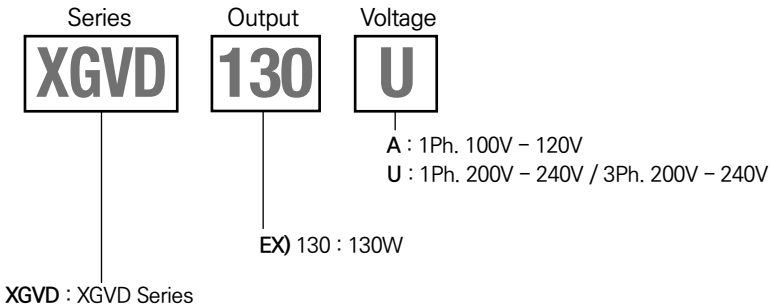
- Please check if the delivered product is the product you have ordered. Installation of different product may cause injury or fire.
- Please check if the products below are all in the place. If not, or if they are damaged, please contact the nearest service center or place of purchase.

2.1 Checklist

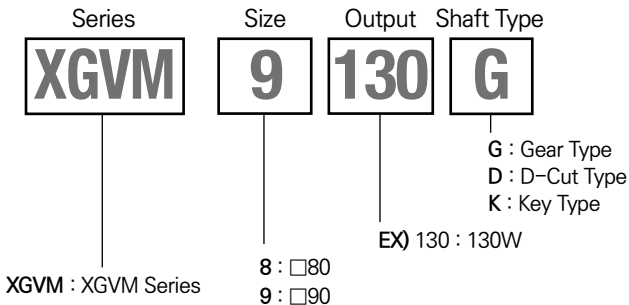
- Control Unit ----- 1 EA
- Power Connector ----- 1 EA
- I/O Connector ----- 1 EA
- User's manual ----- 1 EA

3. CODING SYSTEM

■ CONTROL UNIT



■ MOTOR



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°C ~ +50°C (+32F ~ +122 F)
- 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). (Max 10m) 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.

Please install the CONTROL UNIT with a distance of at least 10mm (0.5 in.) horizontally from the HOUSING and other devices within the HOUSING. When installing two or more CONTROL UNITS side by side, maintain a horizontal distance of at least 10mm (0.5 in.) between them.

[Important]

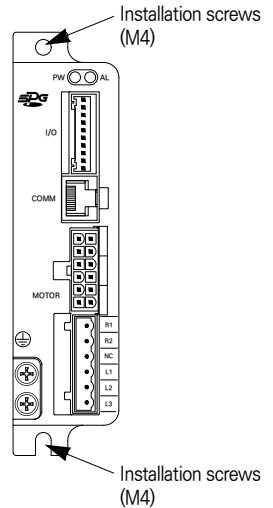
- Please install the control unit within the housing.
- Do not install machineries that produces noises or heat near the control unit.
- If the surrounding temperature is higher than 50°C (122F), please reset the ventilation facility.

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 of Control Unit

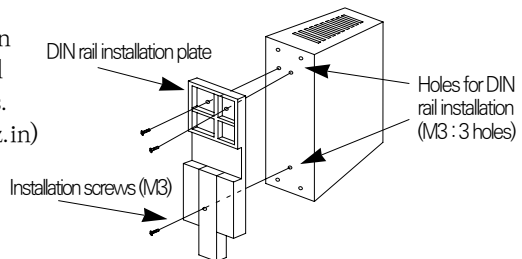
1. When installing the CONTROL UNIT on the metal plate, secure it with the two screws (M4) to prevent any gap between the metal plate and the metal plate.
※Fastening torque : 1.35~1.65Nm(71~85 oz.in)



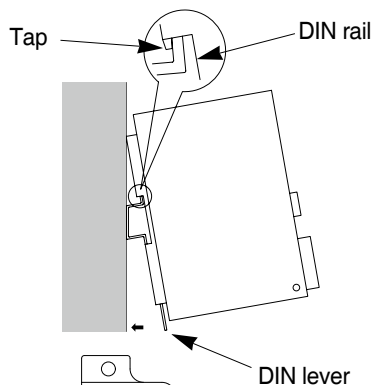
■ Installation using the DIN rail

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.

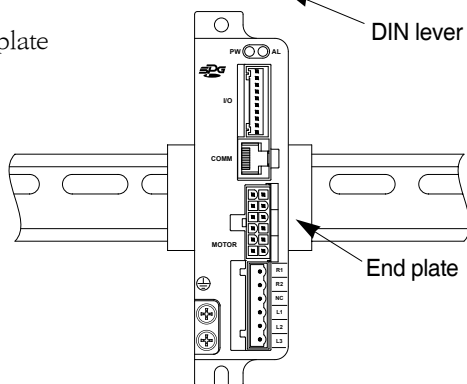
1. Install the DIN rail plate to the installation holes (Which is in the back of the control unit - 3 holes)by using installation screws.
※Fastening torque : 0.3~0.4Nm(42~56 oz.in)



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.

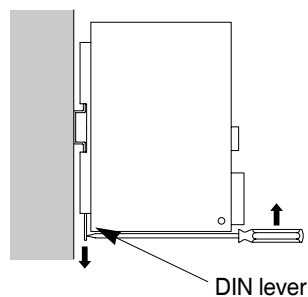


3. Fixate the control unit with the end plate (Not included)



■ Disassembling from the DIN rail

You may disassemble 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

XGVD 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 Standarda

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 XGVD Series, and for XGVD Series itself are not devised, the performance of the machine equipment may suffer from serious malfunctions. XGVD 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	3Ph. 200V~240V
KEMI	SG-2006-HT9	TF-2010-UTA

- 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 AWG18:0.75mm²) and the output cable of the AC line filter (above AWG18:0.75mm²) 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.

■ CB (Circuit breaker)

Be sure to connect a CB (Circuit breaker) to the power line of the driver to protect the primary circuit

〈Rating〉 Voltage : 440V, Current : 5A, Short-circuit capacity : 10KA

■ 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).

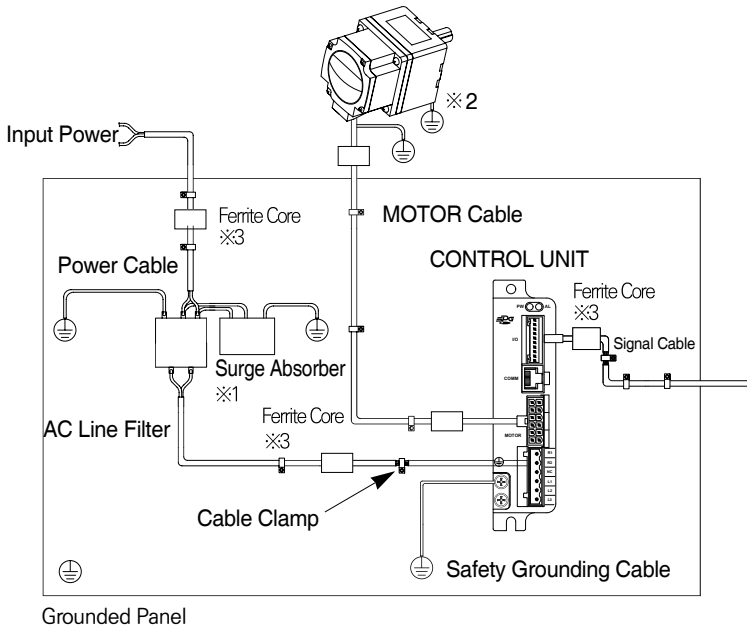
■ Wiring of Signal Cable

Please wire the signal cable of CONTROL UNIT as short as possible, using a shield cable with a diameter of AWG24~22(0.2~0.3mm²) 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



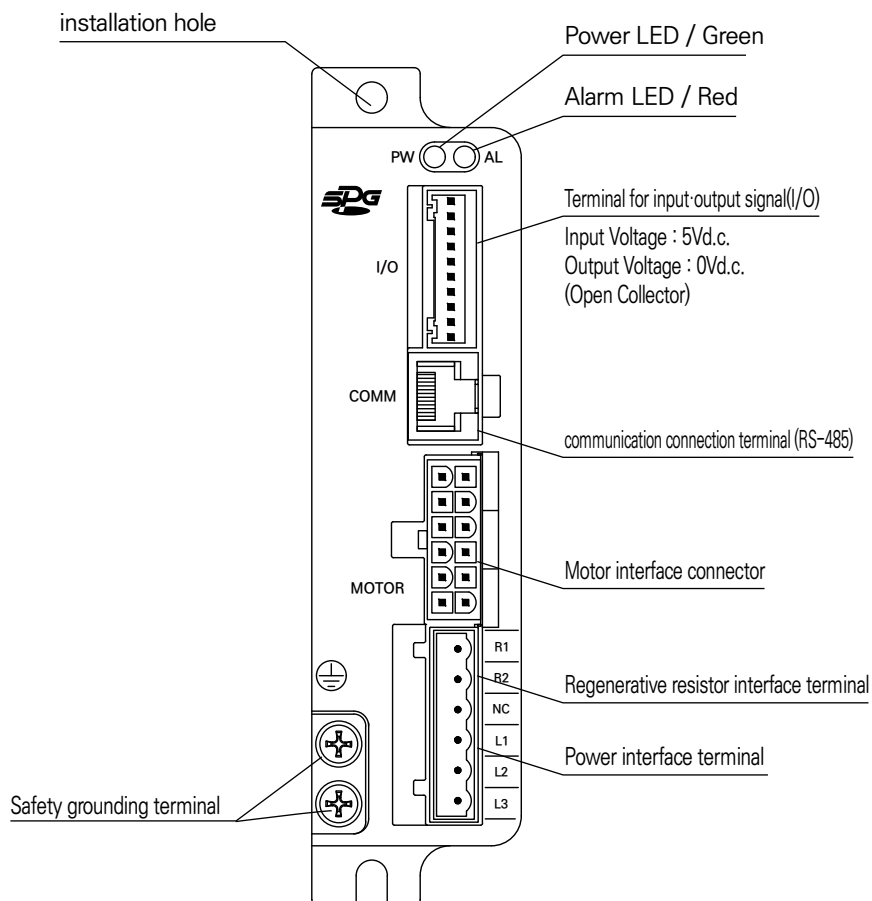
[Important]

- ※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. XGVM850□, XGVM990□, XGVM9130□
- ※ 3. Ferrite Core (TDK-ZCAT3035-1330)

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.

5. Designation and Function by unit



6. Connection



[Warning]

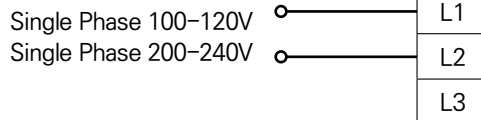
- Do not connect when an electricity current flows. Resume the operation after turning off the power. If not, this may cause an electric shock.

6.1 Connecting Power

6.1.1 Connecting DRIVER Power

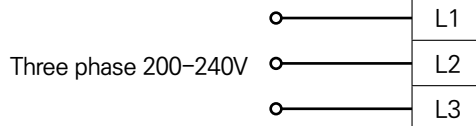
■ Single Phase 100-120V / Single Phase 200-240V

There is no power line attached. Please prepare it separately
(Power cable: 1.6 mm – 2.0 mm)



■ Three phase 200-240V

There is no power line attached. Please prepare it separately
(Power cable: 1.6 mm – 2.0 mm)



[Important]

- Do not route the power cable of the DRIVER within the same conduit as other power lines or MOTOR cables.
- When reapplying power or disconnecting and reconnecting the MOTOR cable connector, ensure that the power is turned off and the Power LED is completely off before proceeding.

6.1.2 Grounding Method

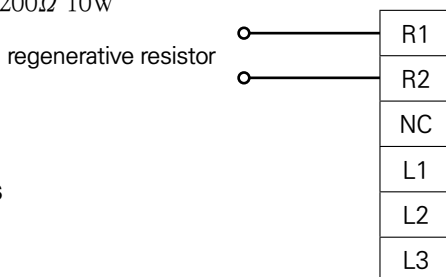
To avoid potential differences at the grounding location, use a thick wire for grounding the MOTOR and DRIVER, and ground them to the shortest possible point.

Use a wide, thick, and uniform conductive surface for the grounding point.

6.1.3 Connection of Regenerative Resistor

For operations with frequent and rapid acceleration and deceleration of large inertia loads, use the optional (sold separately) regenerative resistor.

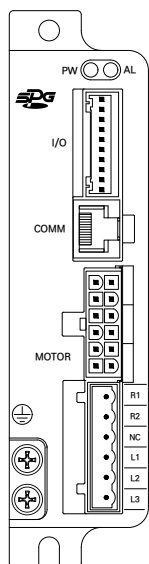
- For single-phase 100-120V: 50Ω 10W
- or single-phase/three-phase 200-240V: 200Ω 10W



6.2 Input/Output Signal Connections

6.2.1 Connection Diagram

■ I/O Signal



Pin No	Signal Name	Function
10	O2* ¹	Speed Signal Output Terminal * ¹
9	O1* ¹	Alarm Signal Output Terminal * ¹
8	H	External Speed Setting Power Supply (5Vdc) (Not to be used for other purposes)
7	M	Analog Input Terminal (0-5Vdc).
6	GND	I/O Common GND
5	I5* ¹	Free Input * ¹ Natural stop when signal is shorted to [GND]
4	I4* ¹	A/CLR Input * ¹ Clears the alarm when signal is shorted to [GND]
3	I3* ¹	Free Input * ¹ Natural stop when signal is shorted to [GND]
2	I2* ¹	CCW / CW Input * ¹ Selects CCW when signal is shorted to [GND]
1	I1* ¹	Run / Stop Input * ¹ Operates when signal is shorted to [GND]

- *1 Input/Output functions can be changed via the keypad. Default values are shown. Refer to the Parameter function for details.
- *2 The rotation direction is as seen from the motor output shaft. When a reducer is attached, the rotation direction of the motor may be opposite to the rotation direction of the reducer output shaft depending on the reduction ratio.
- *3 When using an external variable resistor, if GND is not connected, 5V will be input to the M terminal regardless of the variable resistor setting, and the upper speed limit will be set. Therefore, always connect the GND.
- When extending the signal lines, please keep the length within 5 meters.

■ Input Signals

The I1, I2, I3, I4, I5 inputs are photo-coupler inputs.
(Internal resistance 1k Ω / Internal voltage +5V)

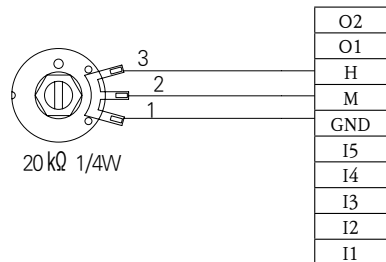
■ Output Signals

The SPEED OUT and ALARM OUT outputs are photo-coupler (OPEN COLLECTOR) outputs.(External usage conditions: MAX 30V, 50mA or less)

6.2.2 Connection of External Speed Setter

For the connection of the external speed setter, please use the attached external speed setter and the signal lines for wiring the external speed setter (sold separately).

1. Connect the lead wire of the signal line (hereafter referred to as the signal line) to terminal 3 of the external speed setter and the H input terminal.
2. Connect the lead wire of the signal line to terminal 2 of the external speed setter and the M input terminal.
3. Connect the lead wire of the signal line to terminal 1 of the external speed setter and the L input terminal.
4. Connect the shield wire of the signal line to the COM terminal.
(Ensure that the shield wire on the external speed setter side does not come into contact with other terminals.)



6.2.3 Connection of External DC Power

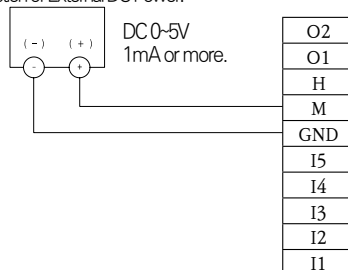
For external DC voltage, please use a DC power supply (DC0~5V) with reinforced insulation between the primary and secondary sides.

1. Connect the lead wire of the signal line (hereafter referred to as the signal line) to the + terminal of the external DC power and the M input terminal.

2. Connect the lead wire of the signal line to the - terminal of the external DC power and the L input terminal.

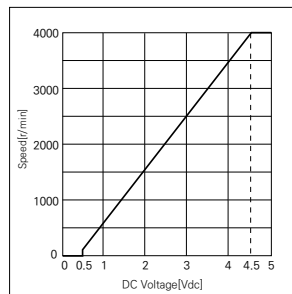
3. Connect the shield wire of the signal line to the COM terminal. (Ensure that the shield wire on the external speed setter side does not come into contact with other terminals.)
The L input is connected to GND inside the CONTROL UNIT.

Connection of External DC Power.



[Important]

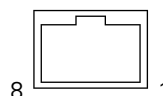
- The voltage of the external DC power supply must be DC5V or less to avoid damaging the CONTROL UNIT.
- When connecting the external DC power, be careful not to reverse the polarity, as this may damage the CONTROL UNIT.



6.2.4 Communication access

Terminal number	Terminal symbol	Terminal explanation
1	—	NC
2	+5V	DC 5V (Supplied from the Driver)
3	—	NC
4	—	NC
5	RS485(+)	RS485(+) Connection terminal.
6	RS485(-)	RS485(-) Connection terminal.
7	GND	GNG
8	SCK	Interface (keypad)

* The pin numbers for the RJ45 terminal are The RJ45 terminal numbers are as shown in the diagram below.as shown in the diagram below.



7. Inspections

- The alarm details will only be displayed if the keypad (optional) is connected.
- The protection functions will operate even if the keypad is not connected, but they will not be displayed.

Alarm Code	Protection Functions	Cause	Action	Keypad Display
1	Sensor error	During operation, if the motor's sensor signal line is disconnected or if the sensor connector is detached.	Check the wiring between the driver and motor.	E-01
-	Low Voltage Warning (Default)	If the voltage applied to the driver is lower than the specified value.	Check the input voltage of the driver.	L
2	Low Voltage Protection	If the voltage applied to the driver is lower than the specified value.	Check the input voltage of the driver.	E-02
3	Overvoltage Protection	If the voltage applied to the driver is higher than the specified value.	Check the input voltage of the driver.	E-03
-	Overload Warning (Electronic Thermal)	If the load rate reaches the 100% overload warning level.	Reduce the load rate to below 100%.	Flashing
4	Overload Protection (Electronic Thermal Relay)	If a load exceeding the motor's rating continues for an extended period.	Reduce the load rate to below 100%.	E-04
5	Overspeed Protection	If the motor speed exceeds 6,000 r/min, causing an abnormal speed condition.	Set the acceleration and deceleration times.	E-05
7	Locked rotor protection	If the motor becomes a locked rotor due to overload or any other factor.	Check the load condition.	E-07

Alarm Code	Protection Functions	Cause	Action	Keypad Display
8	Overcurrent Protection	If overcurrent occurs, such as ground fault current.	Set the acceleration and deceleration times and reduce the gain.	E-08
9	Overheat Protection	If the internal temperature of the driver overheats.	Check the ambient temperature around the driver and the cooling conditions. Check the load rate and operating pattern.	E-09
10	E-STOP	If the E-STOP input is ON.	Check the E-STOP input status.	E-10
12	RS485 Communication error	If an RS485 communication error occurs.	Malfunctions may occur due to external noise. Inspect and eliminate the cause.	E-12
15	Open-Phase protection	During operation, the motor u/v/w line of the cable between the motor and driver was disconnected, or the motor connector came off.	Check the wiring between the driver and motor	E-15
90 91	Parameter error	If the parameters stored in EEPROM are abnormal.	E-90 : Please verify and reset all parameters. E-91 : There may be an internal parameter error.	E-90 E-91
99	CPU error	If there is an abnormality in the internal CPU of the driver.	Malfunctions may occur due to external noise. Inspect and eliminate the cause.	E-99

8. TROUBLESHOOTING

If the MOTOR does not operate normally, please inspect according to the table below. If the MOTOR still does not operate normally even after all checks are found to be normal, please contact the customer service department at the main office or the dealer from whom you purchased the product.

8.1 When the motor does not operate

[Possible Factor]		[Solution]
The wiring is incorrect.	➡	Correct the wiring.
The protection function is activated.	➡	Remove the cause of the alarm.
The Power LED is off.	➡	Apply power.
The speed setting is not configured.	➡	Set the speed.

8.2 When the motor operates to opposite direction

[Possible Factor]		[Solution]
The rotation direction input is reversed.	➡	Correct the wiring.
A reducer is being used.	➡	The rotation direction may be reversed according to the reduction ratio. Please refer to the catalog.

8.3 If the MOTOR operation is unstable or there is excessive vibration

[Possible Factor]		[Solution]
The load fluctuation is severe.	➡	Reduce the load fluctuation. Increase the motor capacity.

8.4 If the Parameter cannot be changed

[Possible Factor]		[Solution]
An operation signal is being input.	➡	If it is running according to a parameter, it may not be possible to change it. Stop the motor.

9. Specifications

CONTROL UNIT ※1	XGVD50□		XGVD90□		XGVD130□	
MOTOR ※2	XGVM850□		XGVM990□		XGVM9130□	
Motor rated output [W]	50		90		130	
Input voltage [V]	1ph. 200-240	3ph. 200-240	1ph. 200-240	3ph. 200-240	1ph. 200-240	3ph. 200-240
Input voltage tolerance	±10%					
Frequency [Hz]	50 / 60					
Input current [A]	0.75	0.30	1.20	0.50	1.59	0.67
Output voltage	0-310 Vd.c. peak					
Rated speed	3000 r/min					
Speed control range	200 ~ 4000 r/min					
Protective class	Protective class I					
DVC As circuit	Input signal : 5 Vd.c. Output signal : open collector					
Ambient temperature	0°C to + 50°C (+32°F to +122°F)					
Ambient humidity	Less than 85% (non condensing)					
Vibration	Do not apply continuous vibration or excessive impact.					
Electrical overvoltage	Electrical overvoltage category : II					

※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.

※ DVC classification

DVC C : Main input power, Output motor power

DVC A : Internal, Output Communication and Other SELV.

Potential free terminals (location, OVC, system voltage, etc.) : I/O Connector (DB2ERD-2.5-10P)

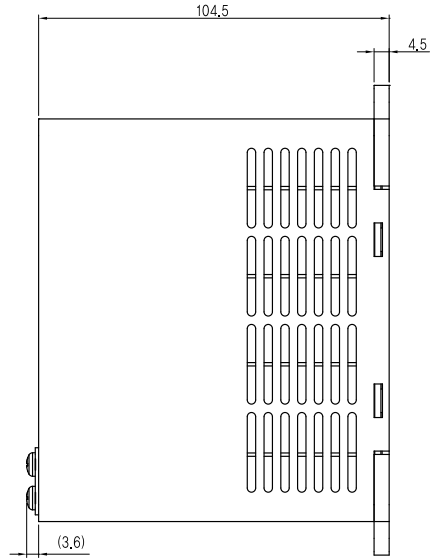
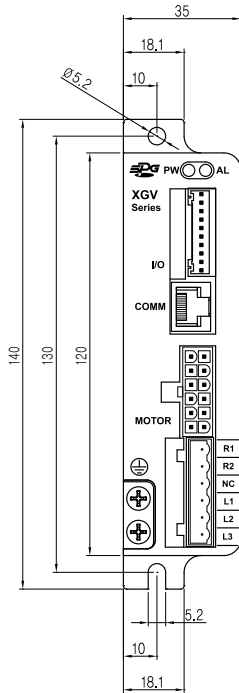
※ DVC As circuit not evaluated

"Not for use in wet locations" or "Not for use in salt water-wet locations"

10. Dimensions

■ Driver

[unit : mm]



21C, for world geared motor!

USER MANYAL

 **SPG Co., Ltd.**

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

■ **Head office**

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