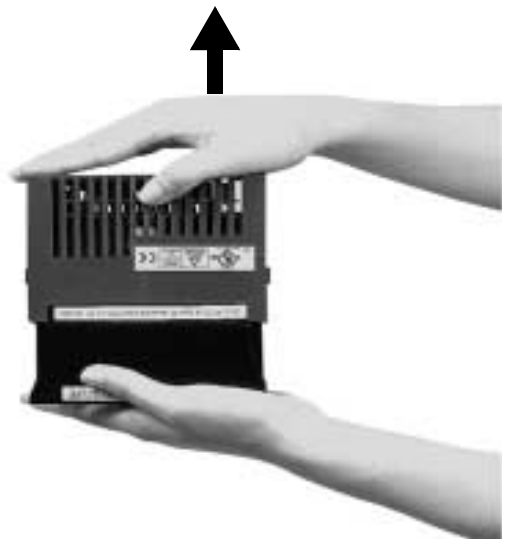
1-3 Handling the Product

Remove the surface cover as explained below.

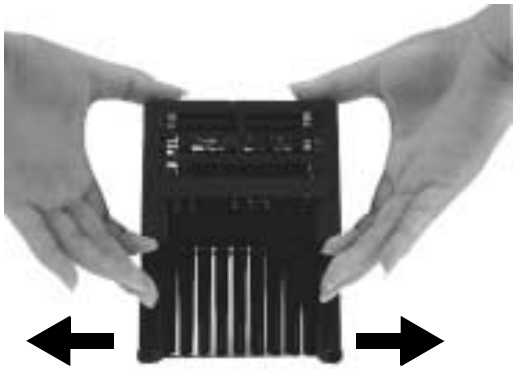
1) For GSX600-0.4-S to GSX600-0.75-S

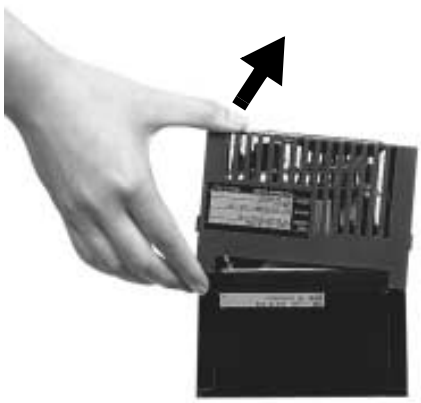
   Grasp the upper and lower parts of the cover with both hands and pull it to the front of the inverter.



2) For GSX600-1.5-S to GSX600-2.2-S

   Expand the lower part of the cover horizontally, lift the cover to the front, and then remove it.





1-4 Carrying

Always hold the main unit while carrying this product.
If it is carried by the cover or parts and not the main unit, the product may be damaged or dropped.
Force must not be applied to the inverter cover during carrying because it is made of plastic.

1-5 Storage and transportation

Store and transportation this product under the conditions listed in Table 1-5-1.

Item	Specifications	
Storage temperature Transportation temperature	-25 to +65 °C	Condensation or formation of ice must not be caused by sudden temperature changes.
Relative humidity	5 to 95% 1)	
Atmosphere	The product must not be exposed to dust, direct sunlight, corrosive gas, inflammable gas, oil mist, vapor, water drops, or vibration. There must be no salt in the atmosphere.	
Air pressure	86 to 106kPa (During storage)	
	70 to 106kPa (During transportation)	

Table 1-5-1 Storage and transportation environment

1) A large change in temperature within this humidity range may cause condensation or formation of ice. Do not store this product at a place where such changes occur.

[Storage precautions]

1. Do not locate this product directly on a floor; place it on a rack or shelf.
2. To store the product in a severe atmosphere, pack it in vinyl sheet.
3. If the product must be stored at a place where it may be affected by humidity, insert a drying agent such as silica gel and pack it in vinyl sheet.

2 Installation and Connection

2-1 Operating Environment

Install this product at a place satisfying the conditions listed in Table 2-1-1.

Item	Specifications
Place	Indoor
Ambient temperature	-10 to +50 °C
Ambient relative humidity	5 to 95%RH (No condensation allowed)
Atmosphere	The product must not be exposed to dust, direct sunlight, corrosive gas, inflammable gas, oil mist, vapor, or water drops. There must be no salt in the atmosphere. Condensation must not be caused by sudden changes in temperature.
Altitude	1000 m or less (Air pressure : 86kPa to 106kPa)
Vibration	3mm: 2 ~ 9 Hz or less 9.8 m/s^2: 9 ~ 20 Hz or less 2 m/s^2: 20 ~ 55 Hz or less 1 m/s^2: 55 ~ 200 Hz or less

Table 2-1-1 Operating environment

2-2 Installation Method

1. Tightly fasten the product in the upright position on a strong structure using four bolts (M4) with the characters GSX600 facing the front. Be sure not to turn the product upside down, and install it on a horizontal surface.
2. Heat is generated while the inverter is operating, so the gaps shown in Figure 2-2-1 are necessary for the passage of cooling air. The generated heat is radiated upward by the built-in cooling fan, so do not install this product below a device that is sensitive to heat.

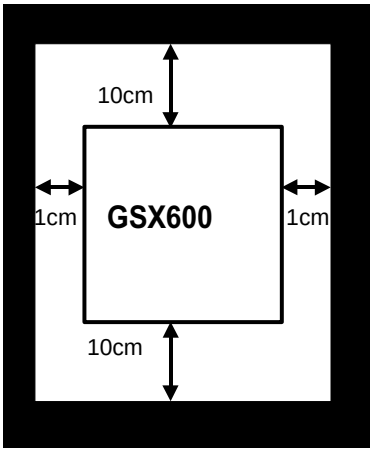
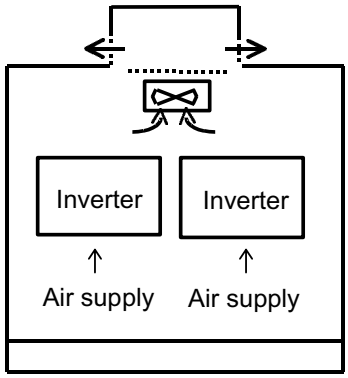


Figure 2-2-1 Installation direction and surrounding space

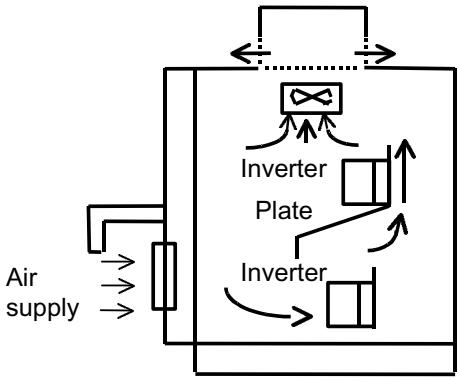
3. The temperature of the heat sink increases to about 90 °C while the inverter is operating. Therefore, the surface behind where the product is located must be able to withstand this temperature increase.

WARNING
Install this product on a nonflammable material such as metal.
Otherwise fire could occur.

4. When installing this product in a control panel, carefully consider the ventilation to prevent the ambient temperature of the inverter from exceeding the specified value. Do not install it in a hermetically sealed box from which heat is not radiated fully.
5. If two or more inverters need to be installed in the same device or control panel, they should be arranged horizontally to minimize the influence of heat between them. If two or more inverters must be installed vertically, place a plate between them to prevent the upper inverter from being affected by heat from the lower inverter.



a) Horizontal arrangement



b) Vertical arrangement

Figure 2-2-2 How to install two or more inverters

CAUTION

Do not allow foreign matter such as lint, paper dust, small chips of wood or metal, and dust to enter the inverter or adhere to the heat sink.
Otherwise, a disaster such as burning could occur.

WARNING

1. Always connect the ground wire.
   Otherwise electric shock and fire could occur.
2. Ensure that a licensed specialist performs the wiring work.
3. Check before starting the wiring that the power is off.
   Otherwise electric shock could occur.

2-3 Connection

Remove the surface cover to connect the terminal blocks. Correctly connect them according to the following procedures.

2-3-1 Basic connection

1. Always connect the power to the main power supply input terminal of the inverter. If it is connected to another terminal, the inverter will be damaged (see Figure 2-3-1).
2. Always ground the ground terminal to prevent disasters such as fire and electric shock and to minimize noise.
3. Use a reliable crimp terminal for connection between a terminal and wire.
4. After terminating the connection (wiring), check the following items:
   a. Whether the connection is correct
   b. Whether all necessary connections have been made
   c. Whether there is a short-circuit or ground fault between terminals and wires
5. Connection modification after power-on
   The smoothing capacitor in the direct current part of the main circuit cannot be discharged quickly after the power is turned off. Use a multimeter to check that the voltage of the direct current (DC) is reduced to the safety range (25V DC or less) after the charge lamp goes off to avoid danger. Check that the voltage is zero before short-circuiting a circuit because the residual voltage (electric charge) may cause sparks.

2-3-2 Connecting the main circuit and ground terminals

Symbol	Name	Explanation
L1/L,L2/N	Main power supply input	Connects single-phase power (Single-phase 200V input).
U, V, W	Inverter output	Connects 3-phase motor.
P1, P(+)	For connection of DC reactor	Connects input power- factor correcting DC reactor (optional).
P(+), N(-)	For DC intermediate circuit	Connected to DC link circuit terminal (for DC bus connection).
⏚G	For inverter grounding	Ground terminal for inverter chassis (case).

Table 2-3-1 Functions of main circuit and ground terminals

1) Main power supply input terminal
Single-phase 200V [L1/L,L2/N]

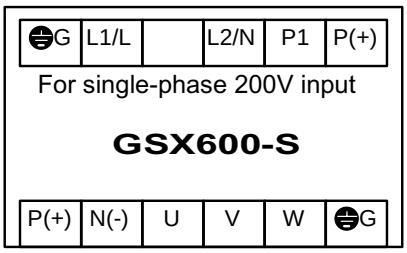


Figure 2-3-1 Arrangement of main circuit and ground terminals

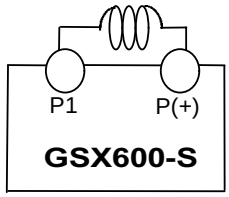
1. Connect the main power supply input terminals to the power supply via a molded case circuit breaker for circuit protection or earth leakage circuit breaker. An earth-leakage circuit breaker which can also detect DC current is recommended. Phase-sequence matching is unnecessary.
2. It is recommended that a magnetic contactor is connected to prevent any failure or accident from becoming serious by disconnecting the inverter from the power supply when the inverter protective function operates.
3. Do not turn on or off the main power supply to start or stop the inverter; instead, use the control circuit terminal FWD/REV or the RUN/STOP key on the keypad panel. If it is unavoidable to turn the main power supply on or off to start or stop the inverter, it must not exceed once per hour.

2) Inverter output terminal [U, V, W]

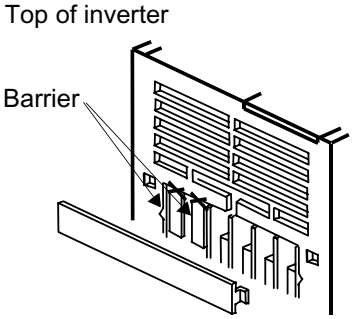
1. Connect these terminals to the 3-phase motor with the correct phase-sequence. If a motor rotation direction does not correspond to the correct rotation direction, exchange any two of the U, V, and W phases.
2. Do not connect a phase-advance capacitor or surge absorber to the inverter output.
3. A very long wiring length between the inverter and the motor causes a high frequency current to flow due to floating capacity between cables, making the inverter trip, increasing the leakage current and deteriorating the accuracy in the current display. To prevent such trouble, the wiring length to the motor should not exceed 50 meters.
When the inverter is operated in the low noise mode (carrier frequency: 8 to 15 kHz) and the wiring length is long, add an optional output circuit filter (OFL filter).

3) DC reactor connecting terminal [P1, P(+)]

1. Use this terminal to connect a input power-factor correcting DC reactor (optional). Remove the jumper connected in the factory before connecting the DC reactor (see Figure 2-3-2).



a) Connection diagram



b) Cutting of barrier

Figure 2-3-2 Connection of DC reactor

2. Use diagonal cutting pliers to cut the surface cover barriers from P1, P(+) terminals before connection.
3. If no DC reactor is used, do not remove the jumper.

4) Inverter grounding terminal [⏚G]
Always ground the inverter grounding terminal [⏚G] for safety and noise reduction. Grounding of the metal frames of electric equipment has to be done in accordance with the national and local safety specifications in force.

1. In Japan, the 200V system must be connected to a ground electrode provided with class D grounding, according to the electrical equipment technical standard.

Voltage system	Type of grounding work	Grounding resistance
200V	Class D grounding	100 Ω maximum

Table 2-3-2 Grounding of device according to electrical equipment technical standard

2. Connect a thick and short wire to the grounding terminal of the inverter for connection with a ground electrode prepared exclusively for the inverter system.

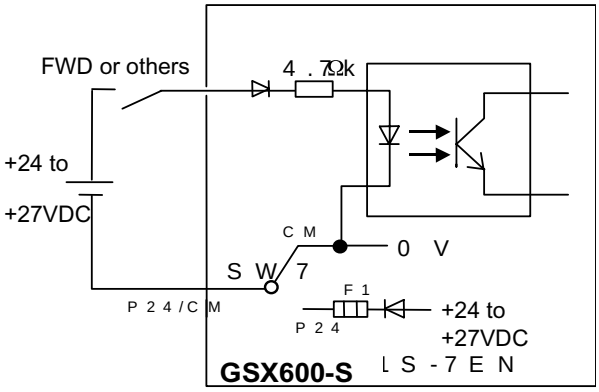
CAUTION

1. Check that the number of phases and the rated voltage of this product correspond to the number of phases and voltage of the AC power supply.
   Otherwise fire could occur.
2. Do not connect the AC power supply to the output terminals (U, V, W).
   Otherwise injury could occur.
3. Do not connect a braking resistor directly to the DC terminals P(+), N(-).
   Otherwise fire could occur.

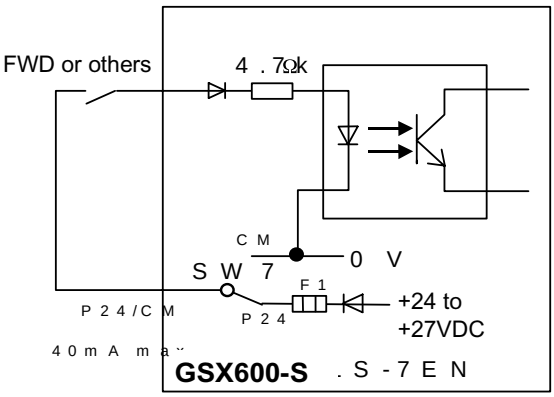
2-3-3 Connecting the control terminals

Table 2-3-4 lists the functions of the control circuit terminals.
The method of connecting a control circuit terminal depends on how its function is set.
Connect the control circuit terminals according to the set functions.

1) Digital input terminal
Figure 2-3-3 shows the circuit configuration.
Use a reliable contact without poor contact for input.



a) When SW7 is set to CM (factory setting)



b) When SW7 is set at P24

Figure 2-3-3 Digital input terminal

2) Run/stop command terminal [FWD, REV]
These terminals are left open in the factory. Pressing the RUN key on the keypad panel starts forward operation. When function F02 is set at 0 or 1, the terminal functions are as shown in Table 2-3-3.

F02	When SW7 is set at CM	When SW7 is set at P24
0	When +24 to +27 VDC is supplied to FWD - P24/CM, pressing the RUN key on the keypad panel starts forward operation. When +24 to +27 VDC is supplied to REV - P24/CM, pressing the RUN key on the keypad panel starts reverse operation. When +24 to +27 VDC is supplied to both FWD - P24/CM and REV - P24/CM, the inverter decelerates to stop.	When FWD is short-circuited to P24/CM and the RUN key on the keypad panel is pressed, forward operation starts. When REV is short-circuited to P24/CM and the RUN key on the keypad panel is pressed, reverse operation starts. When both FWD - P24/CM and REV - P24/CM are short-circuited, the inverter decelerates to stop.
1	When +24 to +27 VDC is supplied to FWD - P24/CM, forward operation starts. When +24 to +27 VDC is supplied to REV - P24/CM, reverse operation starts. When +24 to +27 VDC is supplied to both FWD - P24/CM and REV - P24/CM, the inverter decelerates to stop.	Short-circuit FWD to P24/CM for forward operation, or REV to P24/CM for reverse operation. Short-circuiting both FWD - P24/CM and REV - P24/CM brings the inverter to deceleration and stop.

Table 2-3-3 Description of function F02

CAUTION

In case P24 is short-circuited with 0V by outer circuit when SW7 is set to P24 side, poly switch (F1) turns the power off. To recover the power, open the short circuit and turn the inverter off to allow the temperature to lower.

3) Analog input terminal (13, 12, 11, C1)
Use these terminals to connect external input analog voltage and analog current and frequency setting device (POT). For connecting a contact to this circuit, use a twin contact for fine current signal.
Do not use a contact for terminal 11.

WARNING

The STOP key is valid only when the function has been set. Prepare another switch for emergency stop. When operation using an external signal terminal is selected, the operation cannot be stopped using the STOP key on the keypad panel.
Otherwise accidents could occur.

***Note the following when wiring:**

1) Surge absorber connection
When the exciting coil of the magnetic contactor or relay in the control circuit or inverter peripheral circuit is opened or closed, a surge voltage (noise) is generated with a sudden current change. Due to this surge voltage, the inverter control circuit or peripheral equipment may malfunction. If so, directly connect a surge absorber to both ends of the coil. (See Figure 2-3-4).

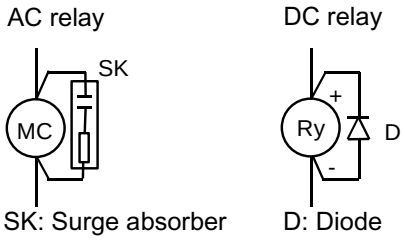


Figure 2-3-4 Surge absorber connection diagram

2) Control circuit wiring

1. Wires connected to control circuit terminals must be 0.5mm^2 shielded wire or twisted vinyl wire. Remove the sheath as shown in Figure 2-3-5 and then connect it.

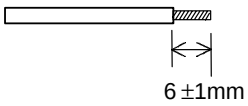


Figure 2-3-5 End treatment

2. Keep the wiring of the main circuit, external relay sequence circuit and control circuit as far away from each other as possible. If they must be adjacent, cross them at right angles.

3. Use a twisted-pair shielded wire for long wiring distances.

3) Shielding sheath connection
Connect one end of the shielding sheath of a shielded or twisted-pair shielded wire to the ground terminal as shown in Figure 2-3-6. Do not connect the other end.

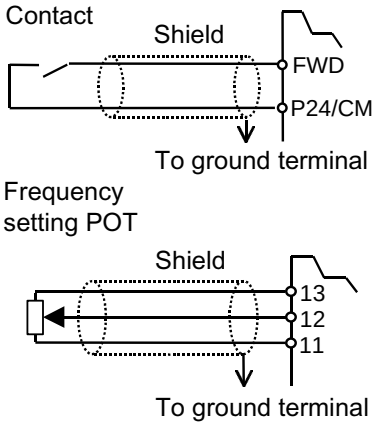


Figure 2-3-6 Connection of sheath of shielded wire

CAUTION

Noise is generated from the inverter, motor, and wiring. Take care that this noise does not cause malfunctions in peripheral sensors and equipment.
Otherwise accidents could occur.

4) Control terminal arrangement, screw size, and tightening torque.

   Screw size: M2.5
   Tightening torque: 0.4 Nm

   Figure 2-3-7 shows the control terminal block arrangement.

30A	30B	30C	FM	X1	X2	X3	FWD	REV	P24 /CM	11	12	13	C1

Figure 2-3-7 Control terminal block arrangement

5) Remove the plate at the bottom of the surface cover before performing inverter control wiring and reinstall it after the wiring as shown in Figure 2-3-8.

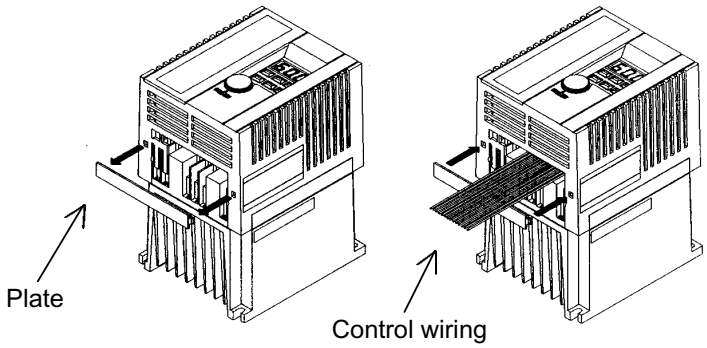


Figure 2-3-8 How to pull out the control wiring

Classifi-cation	Terminal symbol	Terminal name	Detailed specifications	Remarks
Analog input	13	Power supply for variable resistor	● Used as power supply for frequency setting device (POT: 1 to 5 kΩ). (+10VDC 10mADC max.)	
	12	Frequency setting voltage input	● 0 to +10VDC/0 to 100%,0 to +5VDC/0 to 100% (Input impedance : 22 kΩ)	
	C1	Frequency setting current input	● 4 to 20mADC/0 to 100% (Input impedance : 250 Ω)	
	11	Analog common	● Common terminal for analog input signals	
Digital input	FWD	Forward operation /Stop command	● Forward operation with FWD-P24/CM ON and deceleration-stop with FWD-P24/CM OFF (Switch SW7 to P24)	Decelera-tion-stop with FWD-P24/ CM and REV-P24/ CM ON
	REV	Reverse operation /Stop command	● Reverse operation with REV-P24/CM ON and deceleration-stop with REV-P24/CM OFF (Switch SW7 to P24)	
	X1	Digital input 1	● The functions listed below can be set by the X1 to X3 terminal functions.	Set with functions E01 to E03
	X2	Digital input 2		
	X3	Digital input 3		
	(SS1) (SS2)	Multistep frequency selection	● Up to four steps speed operation can be selected with SS1 and SS2 ON/OFF signals.	
	(BX)	Coast to stop command	● Inverter output is cut immediately and the motor coasts to a stop (no alarm output) if BX goes on.	
	(RST)	Alarm reset	● The inverter releases the status held after stop with an alarm when RST changes from ON to OFF.	
	(THR)	External alarm input	● The inverter stops with an alarm if THR is set to OFF.	
	(WE-KP)	Write-enable com-mand for keypad (data change al-lowed)	● Data rewriting for each function with the keypad panel is rejected if WE-KP is OFF. ● Rewriting with keypad panel is allowed if WE-KP is ON.	

Classifi-cation	Terminal symbol	Terminal name	Detailed specifications	Remarks
Digital input	(Hz/PID)	PID control cancel	● PID control cancel with Hz/PID ON ● PID control with Hz/PID OFF	
	(LE)	Link operation selection	● Operation based on command from RS485 with LE ON ● Inverter single operation with LE OFF	
Output/ Input	P24/CM	Power Supply/ Digital Common	● DC Power supply (SW7 set to P24) (+24 to +27 VDC, 40mA max.) ● Common terminal for digital input signal (SW7 set to CM) (factory setting)	Switching of P24/CM terminal with switch SW7
Analog output	FM, 11	Analog monitor	Data selected between the following items is output with DC voltage: ● Output frequency ● PID feedback value ● Output current ● DC link circuit voltage * Up to two analog voltmeters (input impedance : 10 kΩ) can be connected. **Note:** Output waveform: An AC pulse is output with consistent frequency and variable duty. The average DC voltage is proportional to output frequency and output current (frequency : 121.6 Hz).	
Contact output	30A 30B 30C	Alarm output for any fault	If the inverter is stopped with an alarm, the non-voltage contact signal (1SPDT) is output (Contact rating: 250V AC, 0.3 A, Power factor = 0.3) (48V DC, 0.5A for Low-voltage Directive or 42V DC, 0.5A for UL/cUL) * Whether an alarm is generated with an exciting operation or non-exciting operation can be switched.	
Optional	DX+ DX-	RS485 communication input/output	● Terminal for RS485 communication (when option board is installed) ● DX+ : Non-inverted signal, ● DX- : Inverted signal	Installed on optional board.

Table 2-3-4 Functions of control circuit terminals