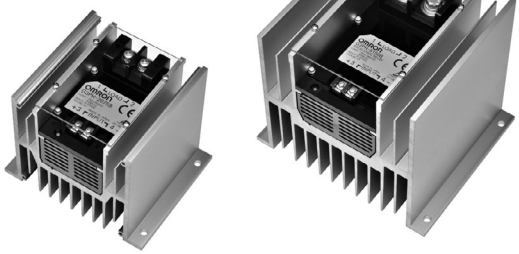
OMRON

High-power Solid State Relays
G3PH

High-power, Load-control SSRs with High Current of 75 or 150 A and High Voltage of 240 or 480 VAC



- **RoHS compliant.**
- **Models also available with no zero cross.**
- **Replaceable power elements.**
- **Conforms to cULus standards and EN standards (TÜV certification).**

⚠ **Refer to *Safety Precautions for All Solid State Relays*.**

Ordering Information

Solid State Relays

Insulation method	Operation indicator	Zero cross function	Applicable output load*	Rated input voltage	Model
Photocoupler	Yes (yellow)	Yes	75 A, 100 to 240 VAC	5 to 24 VDC	**G3PH-2075B DC5-24**
				100 to 240 VAC	**G3PH-2075B AC100-240**
			150 A, 100 to 240 VAC	5 to 24 VDC	**G3PH-2150B DC5-24**
				100 to 240 VAC	**G3PH-2150B AC100-240**
		No	75 A, 100 to 240 VAC	5 to 24 VDC	**G3PH-2075BL DC5-24**
			150 A, 100 to 240 VAC	5 to 24 VDC	**G3PH-2150BL DC5-24**
		Yes	75 A, 180 to 480 VAC	5 to 24 VDC	**G3PH-5075B DC5-24**
				100 to 240 VAC	**G3PH-5075B AC100-240**
			150 A, 180 to 480 VAC	5 to 24 VDC	**G3PH-5150B DC5-24**
				100 to 240 VAC	**G3PH-5150B AC100-240**
		No	75 A, 180 to 480 VAC	5 to 24 VDC	**G3PH-5075BL DC5-24**
			150 A, 180 to 480 VAC	5 to 24 VDC	**G3PH-5150BL DC5-24**

Note: The Thyristor Module is built in.
*The applicable output load depends on the ambient temperature. For details, refer to *Load Current vs. Ambient Temperature* in *Engineering Data* on page 2.

Options (Order Separately)

Thyristor Module

Name	Applicable output load*	Applicable models	Model
Thyristor Module	75 A, 75 to 264 VAC	G3PH-2075B(L)	**G32A-P2075**
	150 A, 75 to 264 VAC	G3PH-2150B(L)	**G32A-P2150**
	75 A, 150 to 520 VAC	G3PH-5075B(L)	**G32A-P5075**
	150 A, 150 to 528 VAC	G3PH-5150B(L)	**G32A-P5150**

*The applicable output load depends on the ambient temperature. For details, refer to *Load Current vs. Ambient Temperature* in *Engineering Data* on page 2.

Specifications

Ratings

Input

Rated voltage	Operating voltage	Impedance (input current)	Voltage level	
			Must operate voltage	Must release voltage
5 to 24 VDC	4 to 30 VDC	(5 mA max.)*	4 VDC max.	1.0 VDC max.
100 to 240 VAC	75 to 264 VAC	41 kΩ ±20%	75 VAC max.	20 VAC max.

*A constant-current circuit is used for the input current to the G3PH.

Output

Item / Model	Applicable load			
	Rated load voltage	Load voltage range	Load current*	Inrush current resistance
G3PH-2075B(L)	100 to 240 VAC	75 to 264 VAC	1 to 75 A (at 40°C)	800 A (60 Hz, 1 cycle)
G3PH-2150B(L)	100 to 240 VAC	75 to 264 VAC	1 to 150 A (at 40°C)	1,800 A (60 Hz, 1 cycle)
G3PH-5075B(L)	180 to 480 VAC	150 to 528 VAC	1 to 75 A (at 40°C)	800 A (60 Hz, 1 cycle)
G3PH-5150B(L)	180 to 480 VAC	150 to 528 VAC	1 to 150 A (at 40°C)	1,800 A (60 Hz, 1 cycle)

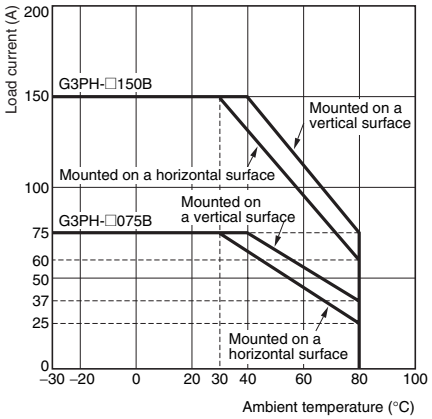
*The load current depends on the ambient temperature. For details, refer to *Load Current vs. Ambient Temperature* in *Engineering Data* on page 2.

Characteristics

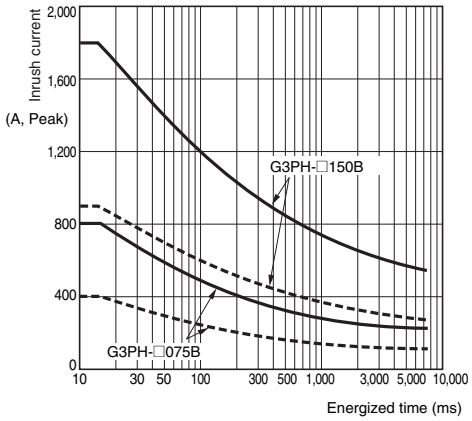
Item / Model	G3PH-2075B	G3PH-2150B	G3PH-5075B	G3PH-5150B	G3PH-2075BL	G3PH-2150BL	G3PH-5075BL	G3PH-5150BL
Operate time	1/2 of load power source cycle + 1 ms max. for DC input 3/2 of load power source cycle + 1 ms max. for AC input				1 ms max.			
Release time	1/2 of load power source cycle + 1 ms max. for DC input 3/2 of load power source cycle + 1 ms max. for AC input				1/2 of load power source cyde + 1 ms max.			
Output ON voltage drop	1.6 V (RMS) max.							
Leakage current	30 mA max. (at 200 VAC)		60 mA max. (at 400 VAC)		30 mA max. (at 200 VAC)		60 mA max. (at 400 VAC)	
Insulation resistance	100 MΩ min. (at 500 VDC)							
Dielectric strength	2,500 VAC, 50/60 Hz for 1 min							
Vibration resistance	10 to 55 to10 Hz, 0.375-mm single amplitude (0.75-mm double amplitude)							
Shock resistance	500 m/s^2							
Ambient storage temperature	−30 to 100°C (with no icing or condensation)							
Ambient operating temperature	−30 to 80°C (with no icing or condensation)							
Ambient operating humidity	45% to 85%							
Weight	Approx. 1.8 kg	Approx. 3.0 kg	Approx. 1.8 kg	Approx. 3.0 kg	Approx. 1.8 kg	Approx. 3.0 kg	Approx. 1.8 kg	Approx. 3.0 kg

Engineering Data

Load Current vs. Ambient Temperature
G3PH-□075B (L) and G3PH-□150B (L)

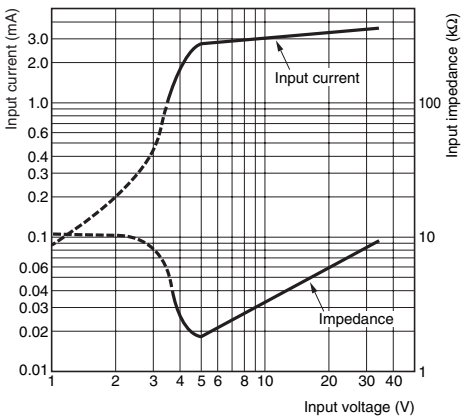


Inrush Current Resistance: Non-repetitive
G3PH-□075B (L) and G3PH-□150B (L)

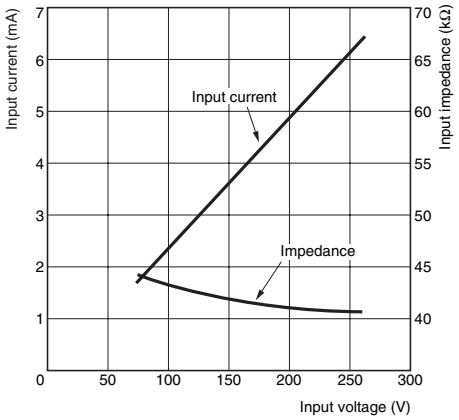


Keep the inrush current to below the inrush current resistance value (i.e., below the broken line) if it occurs repetitively.

Input Voltage vs. Input Impedance
G3PH (4 to 30 VDC)



G3PH (75 to 264 VAC)



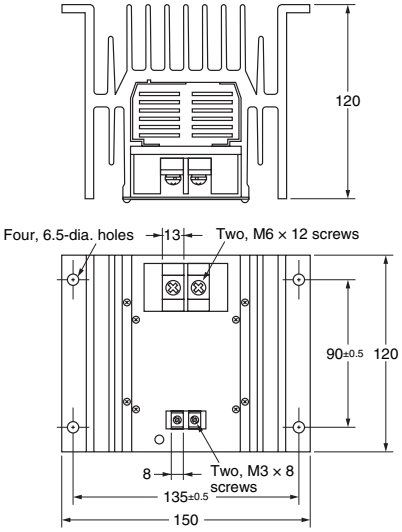
Dimensions

Note:All units are in millimeters unless otherwise indicated.

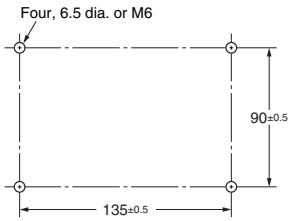
Solid State Relays

G3PH-2075B (L)
G3PH-5075B (L)

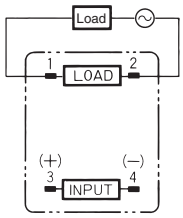




Mounting Hole Dimensions

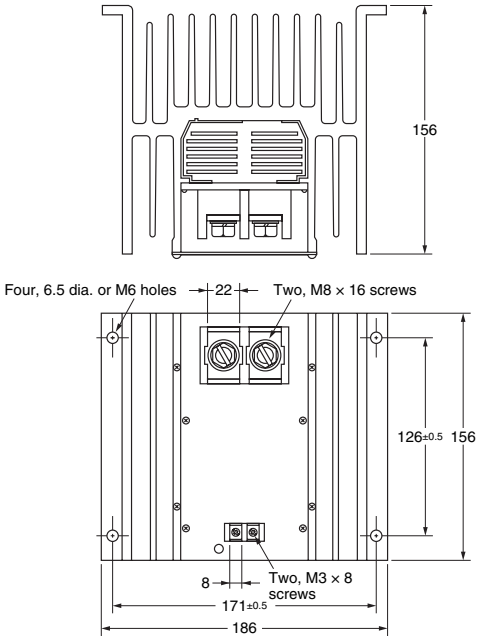


Terminal Arrangement/Internal Connections (Top View)

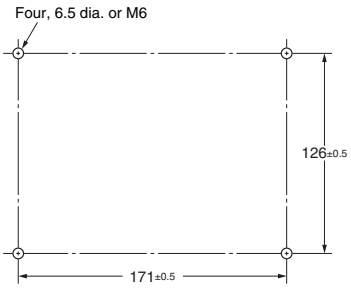


G3PH-2150B (L)
G3PH-5150B (L)

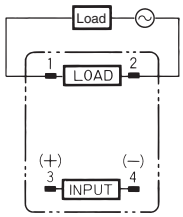




Mounting Hole Dimensions



Terminal Arrangement/Internal Connections (Top View)



Related Products

Replacement Parts

G32A-P Thyristor Module

The Thyristor Module can be replaced if the element is damaged by a load short circuit.



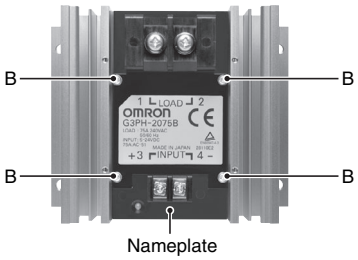
● Replacing the Thyristor Module

Always turn OFF the input and load power supplies before performing the following procedure.

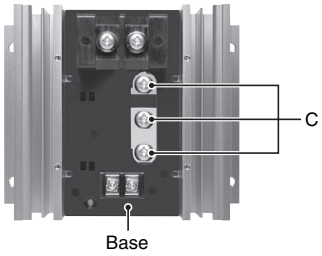
(1) Remove the four screws labeled “A,” remove the transparent cover, and remove the wiring.



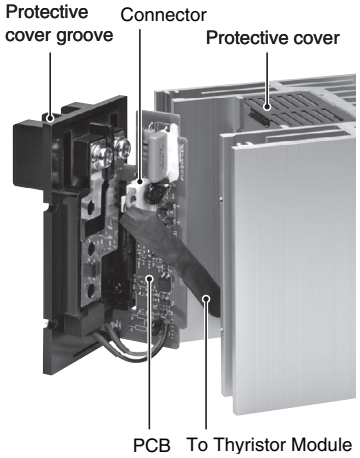
(2) Remove the four screws labeled “B” and remove the nameplate.



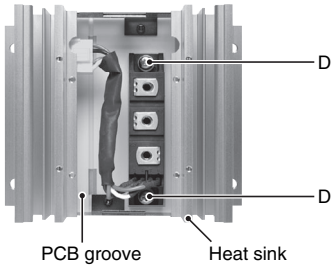
(3) Remove the screws labeled “C” to free the base assembly. Pull out the base assembly.
(The base assembly cannot be removed completely due to the lead wires.)



(4) Remove the connectors that connect the lead wires to the Thyristor Module, and remove the Module.
If there is an abnormality in the electronic components on the PCB, the Thyristor Module may fail again after replacement. Consult with your OMRON representative if there is an abnormality in the electronic components on the PCB.



(5) You should be able to see the Thyristor Module. Remove the screws labeled “D” and remove the Thyristor Module.



Reverse the order of the above steps to assemble the SSR again.

(6) When replacing the Thyristor Module, wipe all silicon grease off the heat sink and make sure there is no foreign matter on the contact surfaces of the Thyristor Module and heat sink. Apply a thin, even coating of new grease (provided) to the contact surfaces, and tighten the screws labeled "D" tentatively and then tighten them evenly to 2.5 to 4.0 N·m.
The silicon grease should be thin enough so that it does squirt out from between the contact surfaces when the screws are tightened.

(7) Connect the Thyristor Module and PCB with the socket. (The socket can be connected in either direction.) Being careful not to get the lead wires caught, assemble the base assembly and heat sink. Align the PCB with the PCB groove, and the protective cover with the protective cover groove.

(8) Tighten the screws labeled “C.” A large current flows through this section. Be sure that there is no foreign matter present, and tighten the screws to between 4.41 and 4.90 N·m.

(9) Check again to be sure that the lead wires are not caught, that the protective cover is in its groove, and that the PCB is in its groove, and then place the nameplate in the original position and tighten the screws labeled “B.”

(10) Wire the SSR, attach the protective cover, and tighten the screws labeled “A.”

(11) Turn ON the power supplies and check operation.

Safety Precautions

● **Refer to *Safety Precautions for All Solid State Relays*.**

⚠ CAUTION

Minor electrical shock may occasionally occur. Do not touch the G3PH terminal section (i.e., current-carrying parts) while the power is being supplied. Also, always attach the cover terminal.



The G3PH may rupture if short-circuit current flows. As protection against accidents due to short-circuiting, be sure to install protective devices, such as fuses and no-fuse breakers, on the power supply side.



Minor electrical shock may occasionally occur. Do not touch the main circuit terminals on the G3PH immediately after the power supply has been turned OFF. Shock may result due to the electrical charge stored in the built-in snubber circuit.



Minor burns may occasionally occur. Do not touch the G3PH or the heat sink while the power is being supplied or immediately after the power supply has been turned OFF. The G3PH and heat sink become extremely hot.



Precautions for Safe Use

OMRON constantly strives to improve quality and reliability. SSRs, however, use semiconductors, and semiconductors may commonly malfunction or fail. In particular, it may not be possible to ensure safety if the SSRs are used outside the rated ranges.

Therefore, always use the SSRs within the ratings. When using an SSR, always design the system to ensure safety and prevent human accidents, fires, and social harm in the event of SSR failure. System design must include measures such as system redundancy, measures to prevent fires from spreading, and designs to prevent malfunction.

● Transport

Do not transport the G3PH under the following conditions. Doing so may result in damage, malfunction, or deterioration of performance characteristics.

- Conditions in which the G3PH may be subject to water or oil.
- Conditions in which the G3PH may be subject to high temperature or high humidity.
- Conditions in which the G3PH is not packaged.

● Operating and Storage Environments

Do not use or store the G3PH in the following locations. Doing so may result in damage, malfunction, or deterioration of performance characteristics.

- Locations subject to rainwater or water splashes.
- Locations subject to exposure to water, oil, or chemicals.
- Locations subject to high temperature or high humidity.
- Do not store in locations subject to ambient storage temperatures outside the range −30 to 100°C.
- Do not use in locations subject to relative humidity outside the range 45% to 85%.
- Locations subject to corrosive gases.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to direct sunlight.
- Locations subject to shock or vibration.

● Installation and Handling

- Do not block the movement of the air surrounding the G3PH or heat sink. Abnormal heating of the G3PH may result in shorting failures of the output elements or burn damage.
- Do not use the G3PH if the heat radiation fins have been bent by being dropped. Doing so may result in malfunction due to a reduction in the heat radiation performance.
- Do not handle the G3PH with oily or dusty (especially iron dust) hands. Doing so may result in malfunction.

● Installation and Mounting

- The SSR must be mounted on a vertical surface. Mount the G3PH in the specified direction. Otherwise excessive heat generated by the G3PH may cause short-circuit failures of the output elements or burn damage.
- Make sure that there is no excess ambient temperature rise due to the heat generation of the G3PH. If the G3PH is mounted inside a panel, install a fan so that the interior of the panel is fully ventilated.
- When using screws to mount the SSR to a control panel or other surface, tighten the screws securely. Keep the screws tightened to between 4.41 and 4.90 N·m. If the screws are not tight enough, the SSR may fall off.

● Installation and Wiring

- Use wires that are suited to the load current. Otherwise, excessive heat generated by the wires may cause burning.
- Do not use wires with a damaged outer covering. Otherwise, it may result in electric shock or ground leakage.
- Do not wire any wiring in the same duct or conduit as power or high-tension lines. Otherwise, inductive noise may damage the G3PH or cause it to malfunction.
- When tightening terminal screws, prevent any non-conducting material from becoming caught between the screws and the tightening surface. Otherwise, excessive heat generated by the terminal may cause burning.
- Do not use the G3PH with loose a terminal screw. Otherwise, excessive heat generated by the wire may cause burning.
- Tighten each terminal to the torque specified below. Improper tightening may result in abnormal heat generation at the terminal, which may cause burning. (M3: 0.50 to 0.60 N·m, M6: 4.41 to 4.90 N·m M8: 8.82 to 9.80 N·m)
- If a current of 40 A or higher will flow, use M6 or M8 crimp terminals that are suitable for the wire size. Improper wiring may result in burning, melted cable coverings, electric shock, or ground faults.
- Always turn OFF the power supply before performing wiring. Not doing so may cause electrical shock.

● Installation and Usage

- Select a load within the rated values. Not doing so may result in malfunction, failure, or burning.
- Select a power supply within the rated frequencies. Not doing so may result in malfunction, failure, or burning.
- The G3PH contains a circuit that protects the internal circuits from being destroyed by forcing the output element to fire when there is a surge voltage. The G3PH therefore cannot be used for motor loads. Doing so may result in load motor malfunction.

Precautions for Correct Use

The SSR in operation may cause an unexpected accident. Therefore it is necessary to test the SSR under the variety of conditions that are possible. As for the characteristics of the SSR, it is necessary to consider differences in characteristics between individual SSRs.

The ratings in this catalog are tested values in a temperature range between 15°C and 30°C, a relative humidity range between 25% and 85%, and an atmospheric pressure range between 86 and 106 kPa. It will be necessary to provide the above conditions as well as the load conditions if the user wants to confirm the ratings of specific SSRs.

● Causes of Failure

- Do not drop the G3PH or subject it to abnormal vibration or shock during transportation or mounting. Doing so may result in deterioration of performance, malfunction, or failure.
- Tighten each terminal to the torque specified below. Improper tightening may result in abnormal heat generation at the terminal, which may cause burning.

Terminals		Screw terminal diameter	Tightening torque
Input terminals		M3	0.50 to 0.60 N·m
Output terminals	G3PH-□075B (L)	M6	4.41 to 4.90 N·m
	G3PH-□150B (L)	M8	8.82 to 9.80 N·m

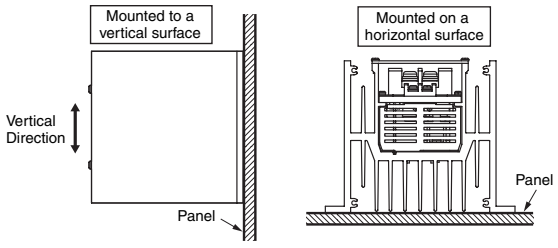
- Do not supply overvoltage to the input circuits or output circuits. Doing so may result in failure or burning.
- Do not use or store the G3PH in the following conditions. Doing so may result in deterioration of performance.
  - Locations subject to static electricity or noise
  - Locations subject to strong electric or magnetic fields
  - Locations subject to radioactivity

● Mounting

- The SSR is heavy. Mount it securely to the panel under the following conditions.

  Screw diameter: M6

  Tightening torque: 4.41 to 4.90 N·m



● Wiring

- Make sure that all lead wires are thick enough for the current.
- The output terminal will be charged even when the SSR is OFF. Touching the terminal may result in electric shock. To isolate the SSR from the power supply, install an appropriate circuit breaker between the power supply and the SSR. Always turn OFF the power supply before wiring the SSR.

● Fuses

- Use a quick-burning fuse on the output terminals to prevent accidents due to short-circuiting. Use a fuse with equal or greater performance than those given in the following table.

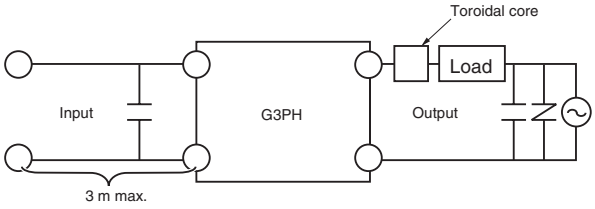
Recommended Fuse Capacity

Rated G3PH output current	Applicable SSR	Fuse (IEC 60269-4)
75 A	G3PH-□075B Series	100 A
150 A	G3PH-□150B Series	200 A

● Compliance with EN (EMC) Standards

The G3PH complies with EN (EMC) standards under the following conditions.

- A capacitor is connected to the input power line.
- A capacitor, varistor, and toroidal core are connected to the load power line.
- The input cable is 3 m or less.



Recommended Capacitor (Film Capacitor) Load: 0.05 μF, 500 VAC
Input: 0.1 μF, 200 VAC
Recommended varistor: 470 V, 1,750 A
Recommended toroidal core: NEC TOKIN ESD-R-25B or equivalent

● EMI

This is a Class A product (for industrial environments). In a domestic environment, the G3PH may cause radio interference, in which case the user may be required to take appropriate measures.

● Noise and Surge Effects

If noise or an electrical surge occurs that exceeds the malfunction withstand limit for the G3PH output circuit, the output will turn ON for a maximum of one half cycle to absorb the noise or surge. Confirm that turning the output ON for a half cycle will not cause a problem for the device or system in which the G3PH is being used prior to actual use. The G3PH malfunction withstand limit is shown below.

- Malfunction withstand limit (reference value): 500 V

Note: This value was measured under the following conditions.
Noise duration: 100 ns and 1 μs
Repetition period: 100 Hz
Noise application time: 3 min

● Replacing the Thyristor Module

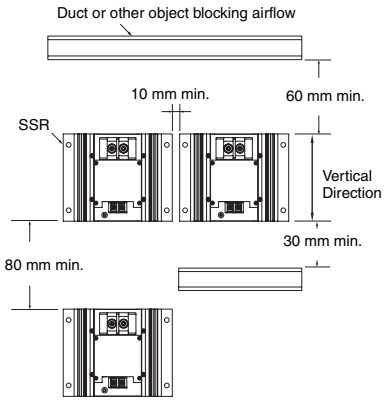
- Always apply the enclosed silicon grease to the contact surfaces when replacing the Thyristor Module.
- Tighten the screws to the following torque to secure the Thyristor Module to the SSR to enable proper heat dissipation.

Tightening torque: 2.45 to 2.94 N·m

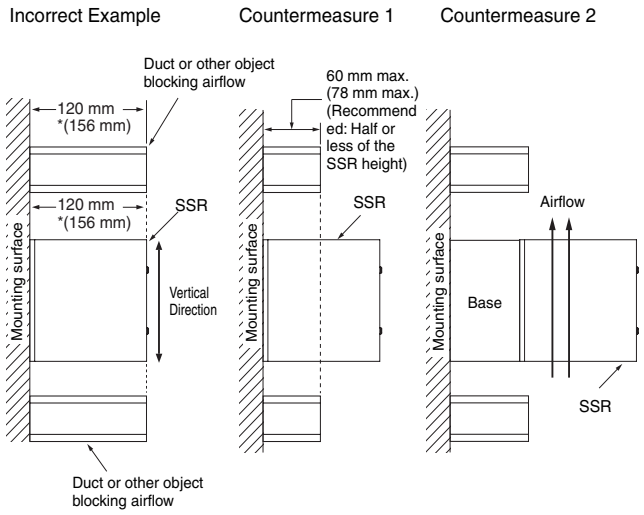
● Mounting to Control Panel

The SSR is heavy. Mount it securely to the panel.
If the panel is airtight, heat from the SSR will build up inside, which may reduce the current carry ability of the SSR or adversely affect other electrical devices. Be sure to install ventilation holes on the top and bottom of the panel.

SSR Mounting Pitch (Panel Mounting)

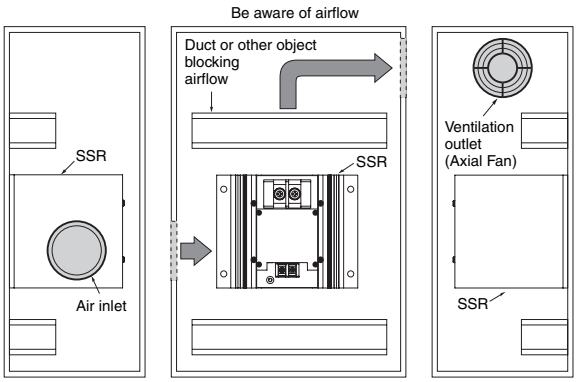


● Relationship between the G3PH and Ducts or Other Objects Blocking Airflow



*Values in parentheses are for the G3PH-□150B.

● Ventilation Outside the Control Panel



Note 1. If the air inlet or air outlet has a filter, clean the filter regularly to prevent it from clogging to ensure an efficient flow of air.
2. Do not locate any objects around the air inlet or air outlet, otherwise the objects may obstruct the proper ventilation of the control panel.
3. A heat exchanger, if used, should be located in front of the G3PH to ensure the efficiency of the heat exchanger.

● G3PH Ambient Temperature

The rated current of the G3PH is measured at an ambient temperature of 40°C.
The G3PH uses a semiconductor to switch the load. This causes the temperature inside the control panel to increase due to heating resulting from the flow of electrical current through the load. The G3PH reliability can be increased by adding a ventilation fan to the control panel to dispel this heat, thus lowering the ambient temperature of the G3PH.
(Arrhenius's law suggests that life expectancy is doubled by each 10°C reduction in ambient temperature.)

SSR rated current (A)	75 A	150 A
Required number of fans per SSR	1.16	2.33

Example: Ten, 75-A SSRs require 1.16 × 10, or 12 fans.

Note 1. Size of fans: 92 mm × 92 mm, Air volume: 0.7 m^3/min, Ambient temperature of control panel: 30°C
2. If there are other instruments that generate heat in the control panel in addition to SSRs, more ventilation will be required.

MEMO

MEMO

Warranty and Application Considerations

Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used.

Know and observe all prohibitions of use applicable to this product.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Disclaimers

PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON *Warranty and Limitations of Liability.*

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your OMRON representative at any time to confirm actual specifications of purchased product.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

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