

Original instructions

OMRON

Type G9SB-200□-□

Type G9SB-301□-□

Safety Relay Unit

G9SB provides a safety-related interruption of a safety circuit.

English

USER'S MANUAL

Thank you for purchasing G9SB Safety Relay Unit.

Please read and understand this manual before using the products.

Keep this manual ready to use whenever needed.

Only qualified person trained in professional electrical technique should handle G9SB.

Please consult your OMRON representative if you have any questions or comments.

Make sure that information written in this document are delivered to the final user of the product.

OMRON Corporation

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Instructions in the EU languages and a signed EU Declaration of Conformity are available on our website at <http://www.industrial.omron.eu/safety>.

Declaration of Conformity

OMRON declares that G9SB series are in conformity with the requirements of the following EU Directives and UK Legislation:

- EU: Machinery Regulation (EU) 2023/1230, EMC Directive 2014/30/EU, RoHS Directive 2011/65/EU, Lift Directive: 2014/33/EU
- UK: 2008 No. 1597 Machinery (Safety), 2016 No. 1091 EMC, 2012 No. 3032 RoHS, Lifts 2016 No. 1093

Safety Standards

G9SB series are designed and manufactured in accordance with the following standards:

- EN ISO13849-1: PL e Category 4
- EN 60947-5-1
- EN 81-20, EN 81-50
- UL508, CAN/CSA C22.2 No.14
- GB/T 14048.5

Precaution for Safe Use

Meanings of Signal Words
The following signal words are used in this manual.

⚠ WARNING

Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

⚠ WARNING

Serious injury may possibly occur due to breakdown of safety outputs. Do not connect loads beyond the rated value tothe safety outputs.

Serious injury may possibly occur due to loss of required safety functions. Wire G9SB properly so that supply voltages or voltages for loads do NOT touch the safety inputs accidentally or unintentionally.

Precautions for Safe Use

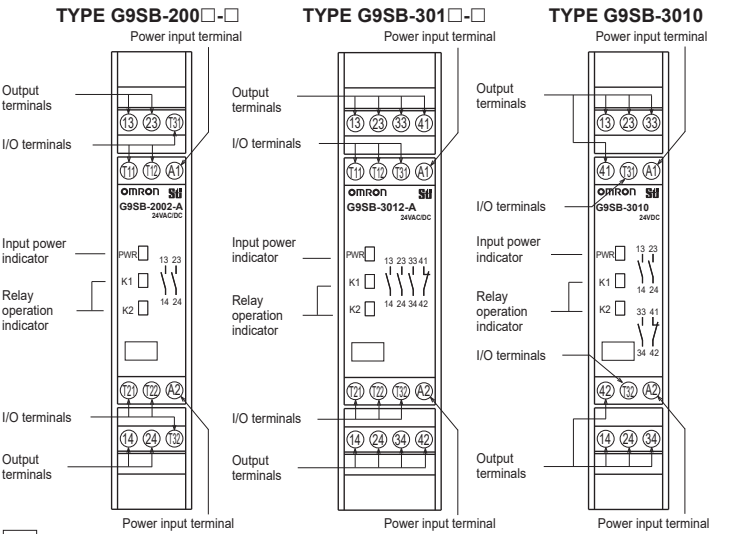
- (1) Use G9SB within an enclosure with IP54 protection or higher of IEC/EN60529.
- (2) When ready for wiring, the power source should be disconnected first. Further, at operating this unit, do not touch the terminals in order to prevent an electrical shock.
- (3) Do not wire in case threat of Lightning, otherwise an electric shock may occur.
- (4) Do not apply any excessive voltage or current to the input or output circuit the G9SB. Doing so may result in damage to the G9SB or cause a fire.
- (5) Do not apply any variable voltage, otherwise G9SB may malfunction.
- (6) Do not connect any overload to the output circuit, otherwise the G9SB in operation will generate excessive heat and the output elements of the G9SB may short-circuit or fire may result.
- (7) The lifetime of G9SB depends on the conditions of switching of its outputs. Be sure to conduct its test operation under actual operating conditions in advance and use it within appropriate switching cycles.Change the G9SB before expected operation. Over operation may cause may short-circuit or may malfunction.
- (8) Do not operate the G9SB with flammable or explosive gass. An arc with operation and the heat of relay will cause a fire or an explosion.
- (9) Do not disassemble, repair, or modify the G9SB, otherwise an electric shock may occur or the G9SB may malfunction.
- (10) Use protective device (Fuse of 5A current rating etc) for short-circuit protection and ground fault protection, otherwise a fire may occur or the G9SB may malfunction.

Precautions for Correct Use

- (1) When using the Unit with a power supply that has a long startup time, if the power is turned ON while input circuit is still closed, the internal circuit detects a power supply voltage abnormality, and the product does not operate. Apply the power supply voltage to the product after it has reached the rated voltage.
- (2) Do not drop the G9SB or shock or vibrate the G9SB excessively. Doing so may result in damage to the G9SB or cause G9SB to malfunction.
- (3) The G9SB can be installed in any direction.
- (4) Adhesion of solvent, likely Alcohol, Thinner, Trichloroethane, Gasoline, on the product should be prohibited. Such solvent cause erasing the marking and being inferior of the parts.
- (5) Do not operate or store the G9SB under the following conditions.
Doing so may result in damage to the G9SB or cause the G9SB to malfunction.
 1. The places with direct sunlight.
 2. The places with ambient temperature ranges not within -25°C to 55°C .
 3. The places with rapid temperature changes resulting in condensation or relative humidity ranges not within 35%RH to 85%RH.
 4. The places with atmospheric pressure out of the range 86 to 106kpa.
 5. The places with corrosive or inflammable gas.
 6. The places with vibration or shock affecting the G9SB.
 7. The places with water, oil, or chemical sprayed on the G9SB.
 8. The places with atmosphere containing dusts, saline or metal powder.
- (6) 1. When mounting multiple units close to each other, the rated current will be 3A.
Do not apply a current higher than 3A.
2. If the output current is 3A or more, make sure that there is a minimum distance of 10mm each between all adjacent G9SB units.
- (7) DIN rail mounting
Use end-plate to mount the G9SB tightened on DIN rail.
- (8) Wiring
 1. Use the following to wire the G9SB.
 - Stranded wire (Flexible wire): 0.2 to 2.5mm²
 - Solid wire: 0.2 to 2.5mm²
 - Maximum stripping length: 7mm Max.
 2. The G9SB may malfunction or generate heat.
 - Tighten each screw to a torque of 0.5 to 0.6N·m.
 3. External inputs connected to T11 and T12 or T21 and T22 of the G9SB must be no-voltage contact inputs.
 4. The G9SB can be grounded at A2 terminal, negative. When the machine is grounded at the positive, the G9SB can not be used.

- (9) For feedback purpose use devices with contacts capable of switching micro loads of 24VDC, 5mA.
- (10) If using multiple G9SB models, inputs cannot be made using the same switch. This is also true for other input terminals.
- (11) A positive thermistor (TH) is built into the G9SB internal circuit to detect ground shorts and shorts between channels 1 and 2. When such faults are detected, the safety outputs are interrupted. (Only G9SB-2002-□/3012-□ is able to detect shorts between channels 1 and 2.)
If the short breakdown is repaired, the G9SB automatically recovers.
Note: In order to detect earth short breakdowns, connect the minus side of the power supply to ground.
- (12) When only channel 1 of the 2-channel input turns OFF, the safety output is interrupted. In order to restart when this happens, it is necessary to turn OFF and ON both input channels. It is not possible to restart by resetting only channel 1.
- (13) Relay with Forcibly Guided Contact durability depends greatly on the switching condition. Confirm the actual conditions of operation in which the Relay will be used in order to make sure the permissible number of switching operations. When the accumulated number of operation exceeds its permissible range, it can cause failure of reset of safety control circuit. In such case, please replace the Relay immediately. If the Relay is used continuously without replacing, then it can lead to loss of safety function.
- (14) This is a class A product. In residential areas it may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.

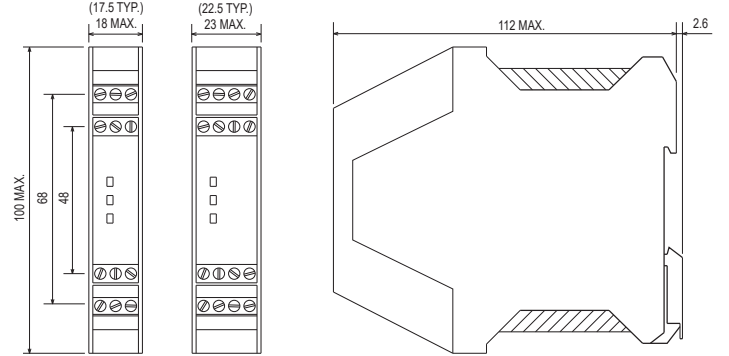
1 Designation



2 Internal connection

Refer to the product marking.

3 External Physical Dimensions

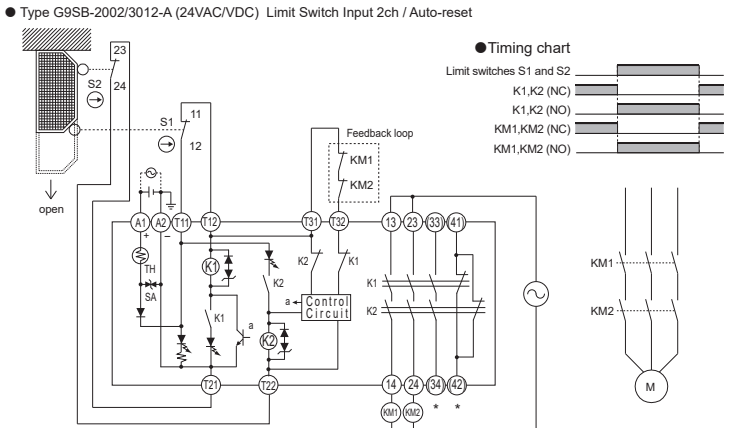


4 Specifications

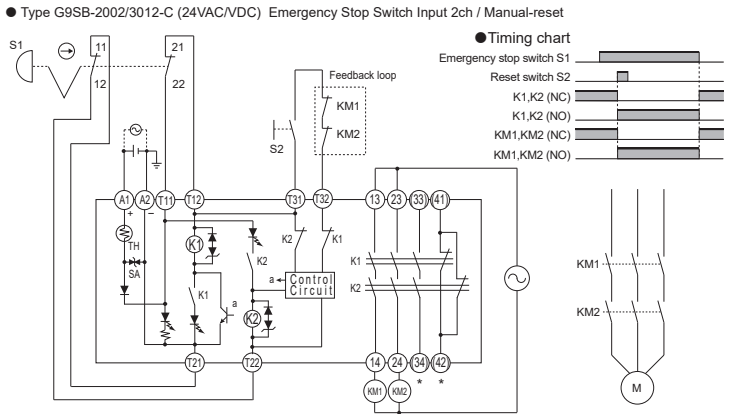
Ratings		G9SB-200□-□	G9SB-301□-□	G9SB-3010
Input	Rated supply voltage	24VAC / 24VDC		24VDC
	Operating voltage range	-15% to +10% of rated supply voltage		
	Rated power consumption	24VDC 1.4W MAX. 2.9VA MAX.	1.7W MAX. 3.6VA MAX.	1.7W MAX. ---
	Rated load	250VAC 5A cosφ=1 30VDC 5A L/R=0ms		
Output	IEC60947-5-1 Table 4	AC15 DC13	240VAC 2A cosφ=0.3 24VDC 1A L/R=48ms	
	Rated carry current	5A		
	Max. switching voltage	250VAC 125VDC		
	Conditional short-circuit current	1000A		
Weight		Approx. 115 g	Approx. 135 g	Approx. 120 g
● Characteristics				
Contact resistance *1		100 mΩ		
Operating time *2		30ms MAX.		
Response time *3		10ms MAX.		
Vibration resistance		10 to 55Hz, 0.375mm single amplitude (0.75mm double amplitude)		
Shock resistance		Destruction: 300m/s ² Malfunction: 100m/s ²		
Ambient temperature		-25°C to 55°C		
Ambient humidity		35% to 85%RH.		
Protection class		IP20		
Pollution degree		2		
● Isolation specification				
Isolation voltage(Ui)		250VAC		
Impulse withstand voltage(Uimp)		4kV		
Insulation resistance *4		Between inputs and outputs	100Mohm MIN. (by 500VDC Megger*)	
Dielectric strength		Between different poles of output		
		Between inputs and outputs	2,500VAC 1min.	
		Between different poles of output		
● Life expectancy *5				
Electrical endurance		100,000 operations MIN. Rated load Switching frequency 1,800 operations/h		
Mechanical endurance		5,000,000 operations MIN. Switching frequency 7,200 operations/h		

*1. The contact resistance was measured with 1 A at 5 VDC using the voltage-drop method.
*2. Not including bounce time.
*3. The response time is the time it takes for the main contact to open after the input is turned OFF. Includes bounce time.
*4. The insulation resistance was measured with 500 VDC at the same places that the dielectric strength was checked.
*5. The durability is for an ambient temperature of 15 to 35°C and an ambient humidity of 25% to 75%.

5 Application examples



Note. For Type G9SB-200/301-B, external wiring and timing chart are same as Type G9SB-2002/3012-A.
* Only Type G9SB-3012-A has 33, 34, 41 and 42.



Note. For Type G9SB-200/301-D, external wiring and timing chart are same as Type G9SB-2002/3012-C.
* Only Type G9SB-3012-C has 33, 34, 41 and 42.

6 For performance level safety category (EN ISO13849-1)

Type G9SB-200□-□/G9SB-301□-□ can construct the condition conforming to PL=e and category 4 requested by EN ISO13849-1 European standard. Type G9SB-3010 can construct PL=d and category 3 by using power-cut input. This category class is recognised and based on the circuits we made, so we would like you to conform the category class with G9SB at your application once. Category is judged by the condition of the whole control system.

- In order to be category 4 (EN ISO13849-1)
 1. 2 channels are needed to external input at T11-T12 and T21-T22.
 2. The switch at T11-T12 and T21-T22 shall be constructed with positive open form. In case of using Limit switch, another one is requested positive open construction type. And wiring must be done in a way that a short circuit between the wires of safety input can be excluded.
 3. The NC contact from a contactor is require to feed back signal T31-T32. (Refer to the application examples.)
 4. A2(-) terminal should be dropped to earth.
 5. In application with long term operation of devices, the G9SB has to be had cyclic operation every 24 hours at least in order to detect failures and a failure accumulation.

7 For Lift / Elevator application (EN81-20/-50)

Type G9SB-200□-□/G9SB-301□-□ can construct the condition conforming by EN81-20/-50 European standard. But Type G9SB-3010 can not construct the condition conforming.

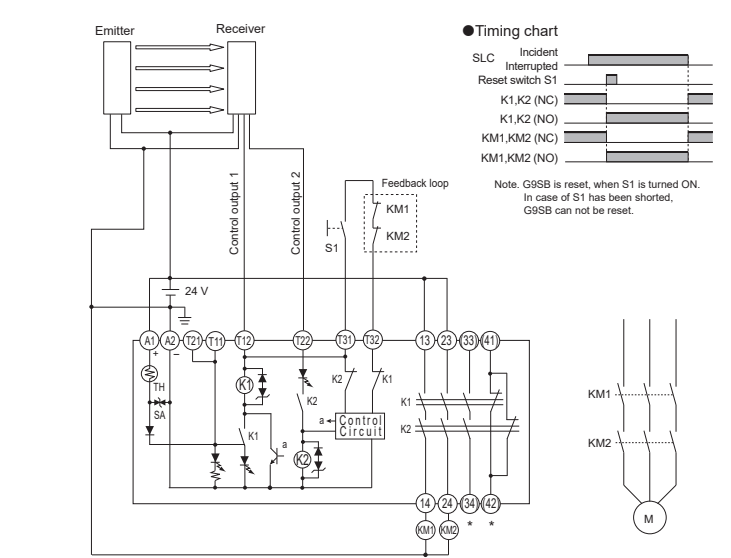
- In order to be EN81-20/-50
 1. 2 channels are needed to external input at T11-T12 and T21-T22.
 2. The switch at T11-T12 and T21-T22 shall be constructed with positive open form. In case of using Limit switch, another one is requested positive open construction type. And wiring must be done in a way that a short circuit between the wires of safety input can be excluded.
 3. In case of using Safety Light Curtain, Safety Light Curtain of Type 4 must be used.
 4. The NC contact from a contactor is require to feed back signal T31-T32. (Refer to the application examples.)
 5. A2(-) terminal should be dropped to earth.
 6. The power supply for the G9SB has to be installed in the same enclosure in which the G9SB is installed.
 7. In application with long term operation of devices, the G9SB has to be had cyclic operation every 1 year at least in order to detect failures and a failure accumulation.
 8. Use two Safety outputs (e.g. 13-14 and 23-24) to construct the system.
 9. In order to ensure sufficient failure detection, it is mandatory to use G9SB only together with contactors or relays with forcibly guided contacts.

8 Failure detection

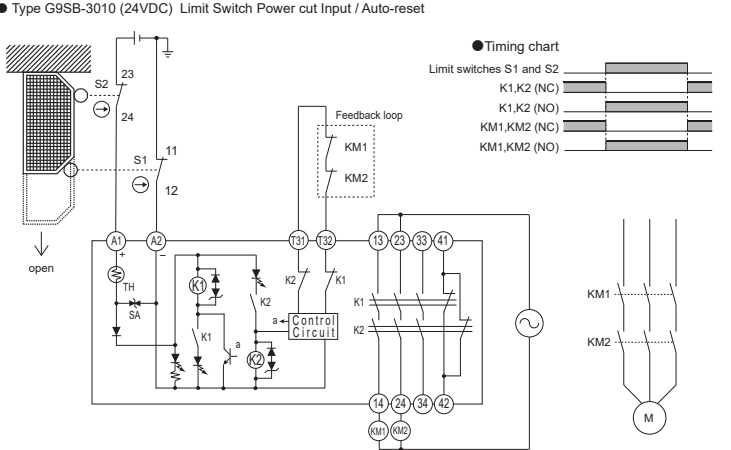
Type G9SB can detect the failure for the safety of internal circuit, parts condition and external wiring.

Failure indication by LED	Failure condition	Checking points and measures to take
K1 and K2 LED do not turn on.	Failures of the parts of the internal circuits. Failures involving the wiring of External input (input line). Failures of the parts of the External devices (Contactor etc).	Replace with a new product. Check the wiring to External input (input line). Replace with a new External devices (Contactor etc).
K1 or K2 LED does not turn on.	Failures of the parts of the internal circuits. Failures involving the wiring of External input (input line).	Replace with a new product. Check the wiring to External input (input line).
Power LED does not turn on.	Failures of the parts of the internal circuits. Supply voltage outside the rated value.	Replace with a new product. Check the supply voltage to Expansion.
All LED turn on. but the safety output doesn't on.	Failures involving the wiring of External input (output line). Failures of the parts of the Protective device (Fuse etc).	Check the wiring to External input (output line). Replace with a new Protective device (Fuse etc).

● Type G9SB-200/301-D (24VAC/VDC) Safety Light Curtain Input 2ch / Manual-reset



Note. For Type G9SB-200/301-B (Auto-reset), external wiring and timing chart are same as Type G9SB-200/301-D.
* Only Type G9SB-301-D has 33, 34, 41 and 42.



Suitability for Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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