

Original instructions

Type G9SA-301
Type G9SA-321-T
100-240VAC
Safety Relay Unit

Type G9SA-501
Type G9SA-TH301

English **USER'S MANUAL**

Thank you for purchasing G9SA Safety Relay Unit. Please read and understand this manual before using the products. Only qualified person trained in professional electrical technique should handle G9SA. 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.
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EU Declaration of Conformity

OMRON declares that G9SA series are in conformity with the requirements of the following EU Directives:
 - EMC Directive: 2014/30/EU
 - Machinery Directive: 2006/42/EC

Standards

G9SA series are designed and manufactured in accordance with the following standards:
 - EN ISO13849-1: 2015 PL e Category 4
 - EN 574: 1996/A1: 2008 (G9SA-TH301 only)
 - EN 60947-5-1: 2017
 - UL508, CAN/CSA C22.2 No.14
 - GB/T 14048.5

Safety Precautions

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.

Meaning of Alert Symbols
 The following alert symbols are used in this manual.

Indicates prohibited actions Indicates mandatory actions

Alert Statements

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

WARNING
 Serious injury may possibly occur due to loss of required safety functions. Wire G9SA properly so that supply voltages or voltages for loads do NOT touch the safety inputs accidentally or unintentionally.

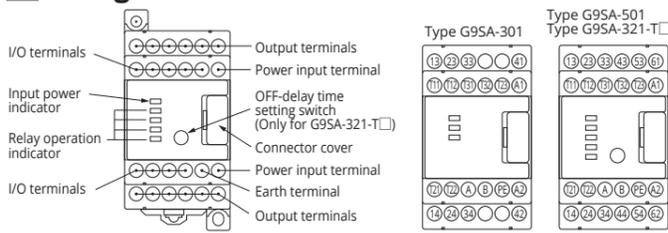
Precautions for Safe Use

- (1) When ready for wiring, the power source should be disconnected first. Further, at operating this unit, the terminal cover should be closed correctly in order to prevent an electrical shock.
- (2) Do not wire in case of threat of Lightning, otherwise an electric shock may occur.
- (3) Do not apply any excessive voltage or current to the input or output circuit of the G9SA. Doing so may result in damage to the G9SA or cause a fire.
- (4) Do not apply any variable voltage, otherwise G9SA may malfunction.
- (5) Do not connect any overload to the output circuit, otherwise the G9SA in operation will generate excessive heat and the output elements of the G9SA may short-circuit or fire may result.
- (6) The lifetime of G9SA 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 G9SA before expected operation. Over operation may cause may short-circuit or may malfunction.
- (7) Do not operate the G9SA with flammable or explosive gas. An arc with operation and the heat of relay will cause a fire or an explosion.
- (8) Do not disassemble, repair, or modify the G9SA, otherwise an electric shock may occur or the G9SA may malfunction.
- (9) Use protective device (Fuse of 5A current rating etc) for short-circuit protection and ground fault protection, otherwise a fire may occur or the G9SA may malfunction.

Precautions for Correct Use

- (1) For malfunctions in case that the power supply picks up gradually. Malfunctions in case that the power supply picks up gradually. In case that the input circuits close before the power supplies, internal logic may malfunction.
- (2) Handling
 1. Do not drop the G9SA or shock or vibrate the G9SA excessively. Doing so may result in damage to the G9SA or cause G9SA to malfunction.
 2. Do not turn the off-delay setting volume switch of G9SA-321-T less than the MIN value or more than the MAX value. Otherwise the G9SA may be failed.
- (3) For adhesion of solvent
 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.
- (4) Operating and Storage Environment
 Do not operate or store the G9SA under the following conditions. Doing so may result in damage to the G9SA or cause the G9SA to malfunction.
 1. The places with direct sunlight.
 2. The places with ambient temperature ranges not within -25 to 55°C.
 3. The places with rapid temperature changes resulting in condensation or relative humidity ranges not within 35 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 G9SA.
 7. The places with water, oil, or chemical sprayed on the G9SA.
 8. The places with atmosphere containing dusts, saline or metal powder.
- (5) Mounting multiple units
 When mounting multiple units close to each other, the rated current will be 3A. Do not apply a current higher than 3A.
- (6) For feedback purpose use devices with contacts capable of switching micro loads of 24VDC, 5mA.
- (7) The safety input OFF signal for T11/T12 (or T23) and T21/T22 terminals must be longer than the response time (10ms). Otherwise, the G9SA will be locked out or will not be able to be started or restarted. Also, a shorter safety input OFF signal might cause the G9SA to be locked. In this case, all safety inputs must be turned off or the power supply for G9SA must be off before restarting the G9SA.
- (8) Wiring
 1. Use the following to wire the G9SA.
 - Stranded wire (Flexible wire): 0.75 to 1.5mm²
 - Solid wire: 1.0 to 1.5mm²
 - Maximum stripping length: 7 to 8mm
 2. The G9SA may malfunction or generate heat.
 - Tighten each screw to a torque of 0.5 to 0.7N·m
 3. External inputs connected to T11 and T12 or T21 and T22 of the G9SA must be no-voltage contact inputs.
 4. PE is a ground terminal. When machine is grounded at the positive, the PE terminal should not be grounded.
- (9) 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.
- (10) Mounting Expansion units
 When an Expansion Unit is being used, remove the connector cover from the G9SA Master Units and insert the connector of the Expansion Unit's connector cable. Make sure that the connector is correctly locked before operating.

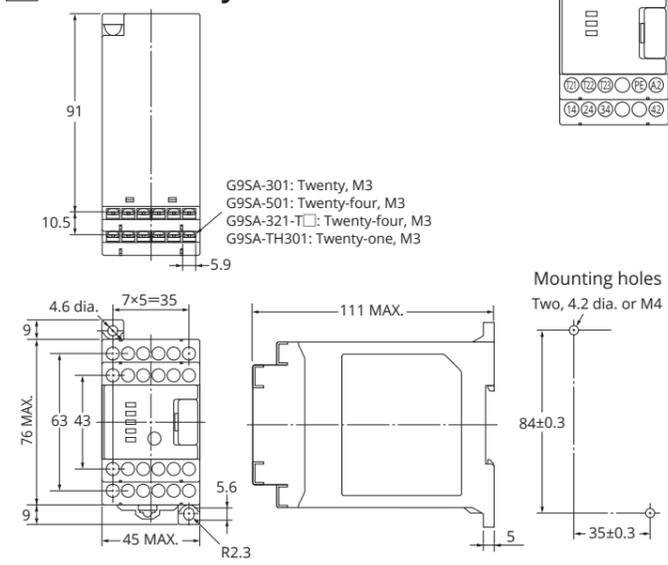
1 Designation



2 Internal connection

Refer to the product marking.

3 External Physical Dimensions



4 Specifications

● Ratings

	G9SA-301/TH301	G9SA-501	G9SA-321-T
Input			
Rated supply voltage	100-240VAC		
Operating voltage range	-15% to +10% of rated supply voltage		
Rated power consumption	9VA MAX.	11VA MAX.	12.5VA MAX.
N.O. contacts *1)	3 N.O. 13/14,23/24,33/34	5 N.O. 13/14,23/24,33/34 43/44,53/54	3 N.O. 13/14,23/24,33/34
Off-delay contacts *1) *3)	---	---	2 N.O. 43/44,53/54
Output			
N.C. contacts *2)	1 N.C.	1 N.C.	1 N.C.
Auxiliary contacts	41/42	61/62	61/62
Rated load	250VAC 5A cosφ=1 30VDC 5A L/R=0ms		
IEC60947-5-1 Table 4	AC15	240VAC 2A cosφ=0.3	
	DC13	24VDC 1A L/R=48ms	
Rated carry current	5A (1 Output)		
Max. switching voltage	250VAC 125VDC		
Rated conditional short-circuit current	1,000A		

- *1) Safety outputs *2) Non-safety outputs
 *3) When the inputs of G9SA-321-T are restored during off-delay time, G9SA-321-T will operate as below, depending on the reset mode.
 - Auto reset mode: Outputs turn off after off-delay time, then immediately turns on.
 - Manual reset mode: Outputs turn off after off-delay time, then turn on when reset input is given.

● Off-delay time

Type for G9SA-321-T	-T015	-T075	-T15	-T30
MAX. Off-delay time / 15 steps	1.5s	7.5s	15s	30s

● Characteristics

Operating time	30ms MAX.
Response time	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 to 55°C
Ambient humidity	35 to 85%RH

● Isolation specification

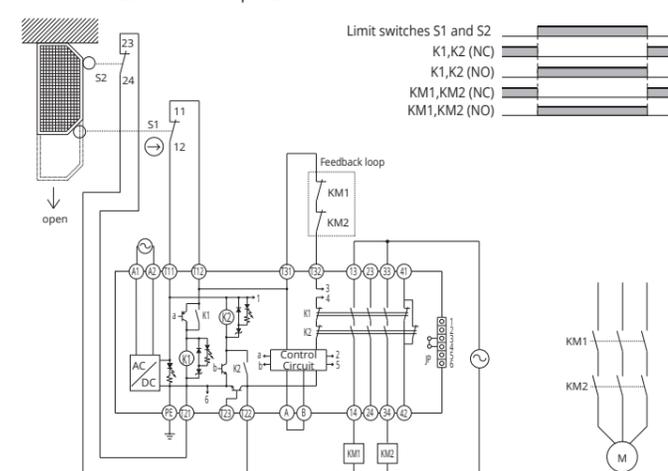
Isolation voltage(Ui)	250VAC	
Impulse withstand voltage(Uimp)	4kV	
Insulation resistance	Between inputs and outputs Between different poles of output	100Mohm MIN. (by 500VDC Megger)
Dielectric strength	Between inputs and outputs Between different poles of output	2,500VAC 1min.

● Life expectancy

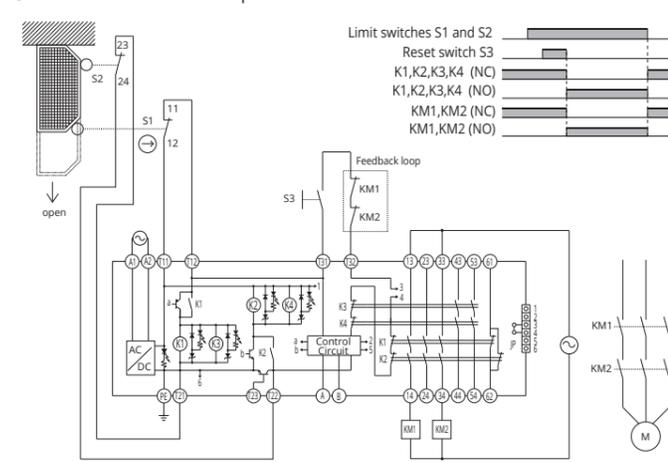
Electrical endurance	100,000 operations MIN. Rated load Switching frequency 1,800 operations/h
Mechanical endurance	5,000,000 operations MIN. Switching frequency 7,200 operations/h

5 Application examples

● G9SA-301 Limit Switch Input 2ch / Auto-reset



● G9SA-501 Limit Switch Input 2ch / Manual-reset



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

Type G9SA can construct the condition conforming to PL=e and category 4 requested with by EN ISO13849-1 European standard. (The part of off-delay output of G9SA-321-T can construct PL=d and category 3.) This category class is recognised and based on the circuits we made, so we would like you to conform the category class with G9SA at your application once. Category is judged by the condition of the whole control system.

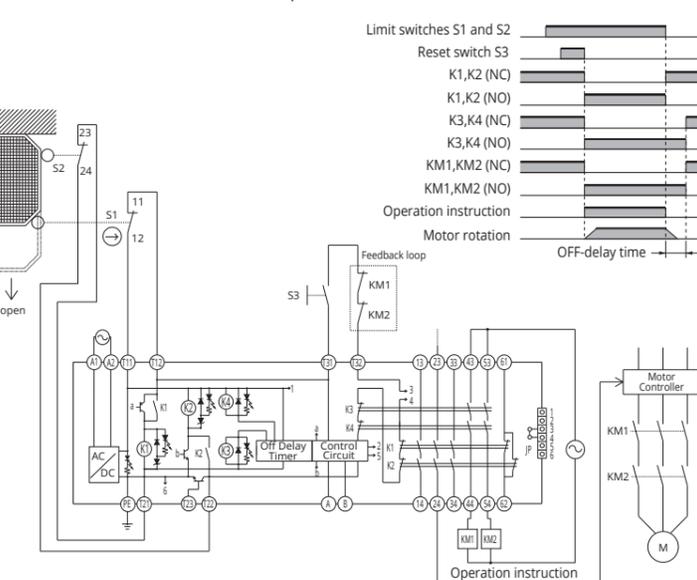
- A condition for performance level calculation (EN ISO13849-1)
 - Category 4 (The part of off-delay output of G9SA-321-T: Category 3)
 - DCavg: High (The part of off-delay output of G9SA-321-T: Low)
 - CCF: Min 65 points
- MTTFd: G9SA-301: 113 year, G9SA-501: 37 year, G9SA-321-T: 32 year, G9SA-TH301: 86 year
- * MTTFd is a value calculated based on the following operation conditions.
 - Nop=31,680 cycles/year (dop=220 days/year, hop=12 hours/day, t cycle=300 seconds/cycles)
- In order to be Category 4 (EN ISO13849-1)
 1. 2 channels are needed to external input at T11-T12, T21-T22.
 2. The switch at T11-T12, T21-T22 should be constructed with positive open form. In case of using limit switch, another one is requested positive open construction type.
 3. The NC contact from a contactor is require to feed back signal T31-T32. (Refer to the application examples.)
 4. PE terminal should be dropped to earth.
 5. Automatically start (Auto-reset mode) must be prevented through the superordinate control.

7 Failure detection

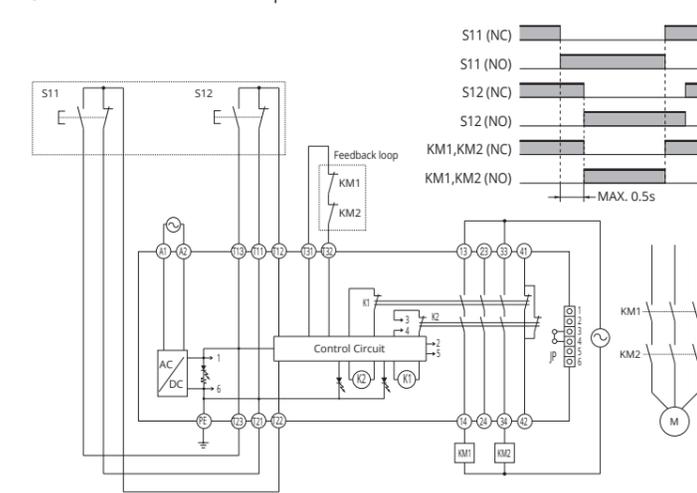
Type G9SA can detect the failure for the safety of internal circuit, parts condition and external wiring.

Failure indication by LED	Failure condition	Checking points and measures to take
K1(K3) and K2(K4) LED does not turn on.	Failures of the parts of the internal circuits	Replace with a new product.
	Failures involving the wiring of External input (input line)	Check the wiring to External input. (input line)
	Failures of the parts of the External devices (Contactor etc)	Replace with a new External devices. (Contactor etc)
K1(K3) or K2(K4) LED does not turn on.	Failures of the parts of the internal circuits	Replace with a new product.
	Failures involving the wiring of External input (input line)	Check the wiring to External input. (input line)
Power LED does not turn on.	Failures of the parts of the internal circuits	Replace with a new product.
	Supply voltage outside the rated value	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)	Check the wiring to External input. (output line)
	Failures of the parts of the Protective device (Fuse etc)	Replace with a new Protective device. (Fuse etc)

● G9SA-321-T Limit Switch Input 2ch / Manual-reset



● G9SA-TH301 with 2-hand Input



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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