

Safety Relay Unit G9SB

CSM_G9SB_DS_E_6_1

Ultra Slim Safety Relay Unit

- Models of width 17.5 mm available with 2 or 3 poles. Models of width 22.5 mm with 3 poles also available.
- Conforms to EN standards. (TÜV approval)
- DIN track mounting possible.



For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

Be sure to read the "Safety Precautions" on page 9.

Model Number Structure

Model Number Legend

Note: Please see "Ordering Information" below for the actual models that can be ordered.

G9SB- -
 1 2 3 4 5 6

1. Function

None: Emergency stop

2. Contact Configuration (Safety Output)

2: DPST-NO

3: 3PST-NO

3. Contact Configuration (OFF-delay Output)

0: None

4. Contact Configuration (Auxiliary Output)

0: None

1: SPST-NC

5. Input Configuration

None: 1-channel or 2-channel input possible

0: None (direct breaking)

2: 2-channel input

6. Miscellaneous

A: Auto-reset, inverse input

B: Auto-reset, + common input

C: Manual reset, inverse input

D: Manual reset, + common input

Ordering Information

Main contacts	Auxiliary contact	Number of input channels	Reset mode	Input type	Rated voltage	Model
DPST-NO	None	2 channels	Auto-reset	Inverse	24 VAC/VDC	G9SB-2002-A
		1 channel or 2 channels		+ common		G9SB-200-B
		2 channels	Manual reset	Inverse		G9SB-2002-C
		1 channel or 2 channels		+ common		G9SB-200-D
3PST-NO	SPST-NC	None (direct breaking)	Auto-reset	---	24 VDC	G9SB-3010 *
		2 channels		Inverse	24 VAC/VDC	G9SB-3012-A
		1 channel or 2 channels	+ common	G9SB-301-B		
		2 channels	Manual reset	Inverse		G9SB-3012-C
		1 channel or 2 channels		+ common		G9SB-301-D

Note: 1. Relays with inverse inputs are used mainly when inputting signals from two mechanical switches.

2. Relays with positive commons are used mainly when inputting signals from a safety sensor or from one mechanical switch.

* The G9SB-3010 can be applied to Safety Category 3 of the EN954-1 if double breaking is used.

Specifications

Ratings

Power Input

Item	Model	G9SB-200□-□	G9SB-3010	G9SB-301□-□
Power supply voltage		24 VAC/VDC: 24 VAC, 50/60 Hz, or 24 VDC 24 VDC: 24 VDC		
Operating voltage range		85% to 110% of rated power supply voltage		
Power consumption		1.6 VA/1.4 W max.	1.7 W max.	2.0 VA/1.7 W max.

Inputs

Item	Model	G9SB-200□-□	G9SB-3010	G9SB-301□-□
Input current		25 mA max.	60 mA max. *	30 mA max.

* Indicates the current between terminals A1 and A2.

Contacts

Item	Model	G9SB-200□-□	G9SB-3010	G9SB-301□-□
	Load	Resistive load		
Rated load		250 VAC, 5 A 30 VDC, 5 A		
Rated carry current		5 A		

Characteristics

Item	Model	G9SB-200□-□	G9SB-3010	G9SB-301□-□
Contact resistance *1		100 mΩ		
Operating time *2		30 ms max.		
Response time *3		10 ms max.		
Insulation resistance *4		100 MΩ min. (at 500 VDC)		
Dielectric strength	Between different outputs	2,500 VAC, 50/60 Hz for 1 min		
	Between inputs and outputs			
	Between power inputs and outputs			
Vibration resistance		10 to 55 to 10 Hz, 0.375-mm single amplitude (0.75-mm double amplitude)		
Shock resistance	Destruction	300 m/s ²		
	Malfunction	100 m/s ²		
Durability *5	Mechanical	5,000,000 operations min. (at approx. 7,200 operations/hr)		
	Electrical	100,000 operations min. (at approx. 1,800 operations/hr)		
Failure rate (P level) (reference value)		5 VDC, 1 mA		
Ambient operating temperature		-25 to 55°C (with no icing or condensation)		
Ambient operating humidity		35% to 85%		
Terminal tightening torque		0.5 N·m		
Weight		Approx. 115 g	Approx. 135 g	Approx. 120 g

*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.

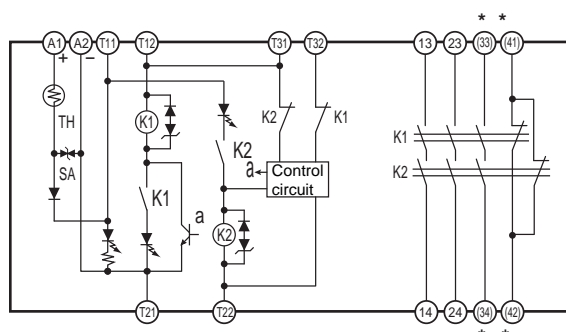
*5. The durability is for an ambient temperature of 15 to 35°C and an ambient humidity of 25% to 75%.

Connections

Internal Connections

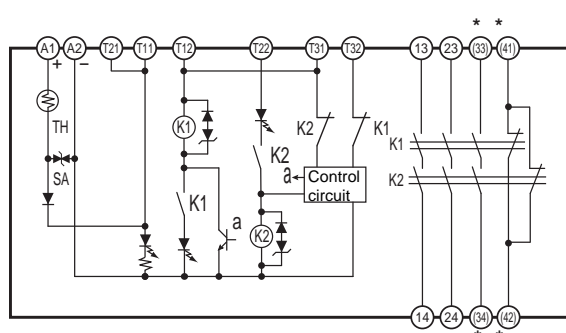
G9SB-2002-A/C (24 VAC/VDC)

G9SB-3012-A/C (24 VAC/VDC)

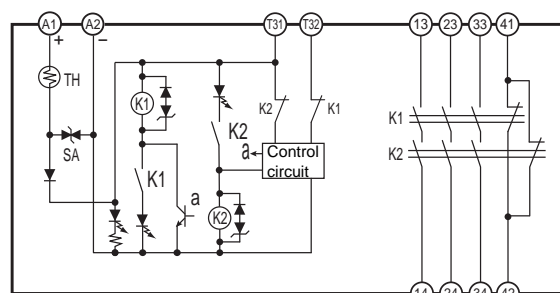


G9SB-200-B/D (24 VAC/VDC)

G9SB-301-B/D (24 VAC/VDC)



G9SB-3010 (24 VDC)



- Note:**
- For 1-channel input with G9SB-□□□-B/D models, short terminals T12 and T22. It is not possible to wire G9SB-□□□2-A/C models for 1-channel input.
 - Always provide a protective ground externally, e.g., on the power supply.

* Only G9SB-301□-□ models have terminals 33-34 and 41-42.

Wiring of Inputs and Outputs

Signal name	Terminal name	Description of operation
Power supply input	A1, A2	The input terminals for power supply. Connect the power source to the A1 and A2 terminals. DC inputs have polarity, so A1 should be connected to the positive side and A2 to the negative side.
Safety input 1 *1	T11, T12	To set the safety outputs in the ON state, the ON state signals must be input to both safety input 1 and safety input 2. Otherwise the safety outputs cannot be in the ON state.
Safety input 2 *1	T21, T22	
Feedback/reset input	T31, T32	To set the safety outputs in the ON state, the ON state signal must be input to T31 - T32. Otherwise the safety outputs cannot be in the ON state.
Instantaneous safety outputs	See below. *2	Turns ON/OFF according to the state of the safety inputs and feedback/reset inputs.
Auxiliary output	See below. *2	Synchronized with Instant Safety Output.

Note: Grounding

Be sure to ground externally, such as at the power supply.

***1. Safety Inputs**

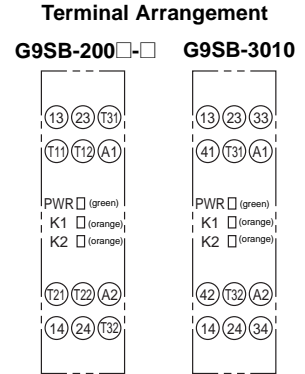
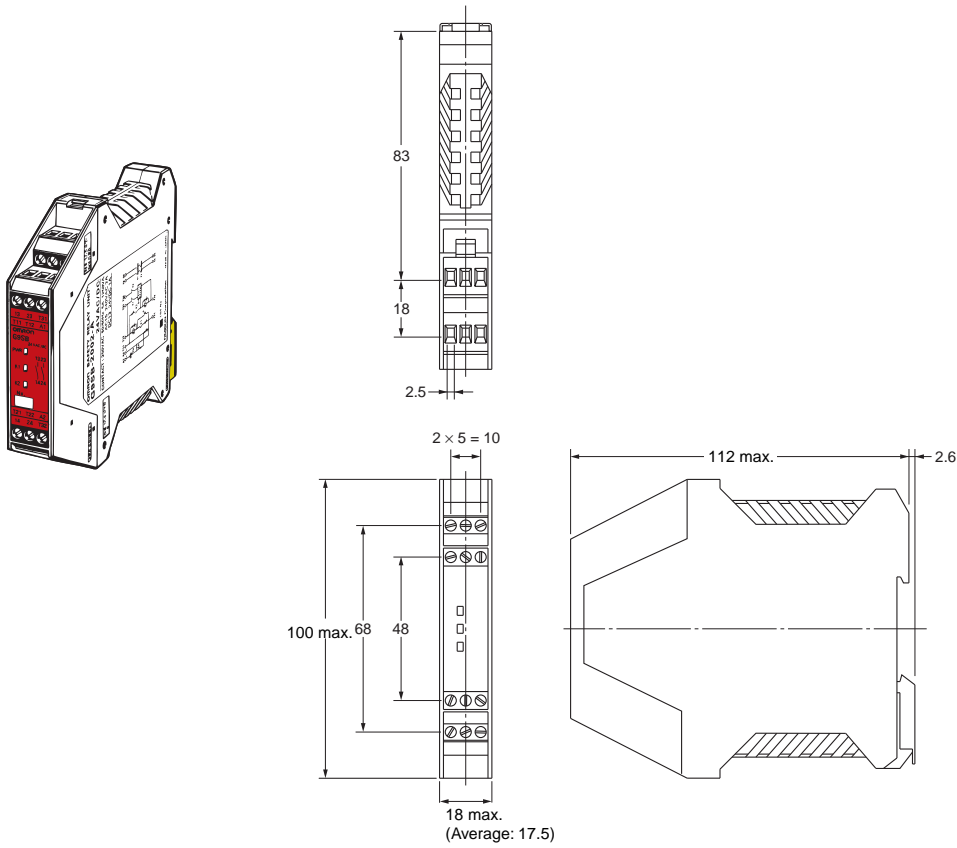
- G9SB-3010 directly cuts off power, and has no Safety Input.
- For 1-channel input with G9SB-□□□-B/D, short circuit T12-T22 and then input.
- With G9SB-□□□2-A/C, 1-channel input wiring is not possible.

***2. Output Contacts**

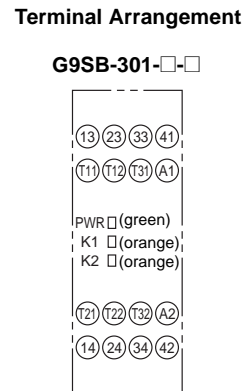
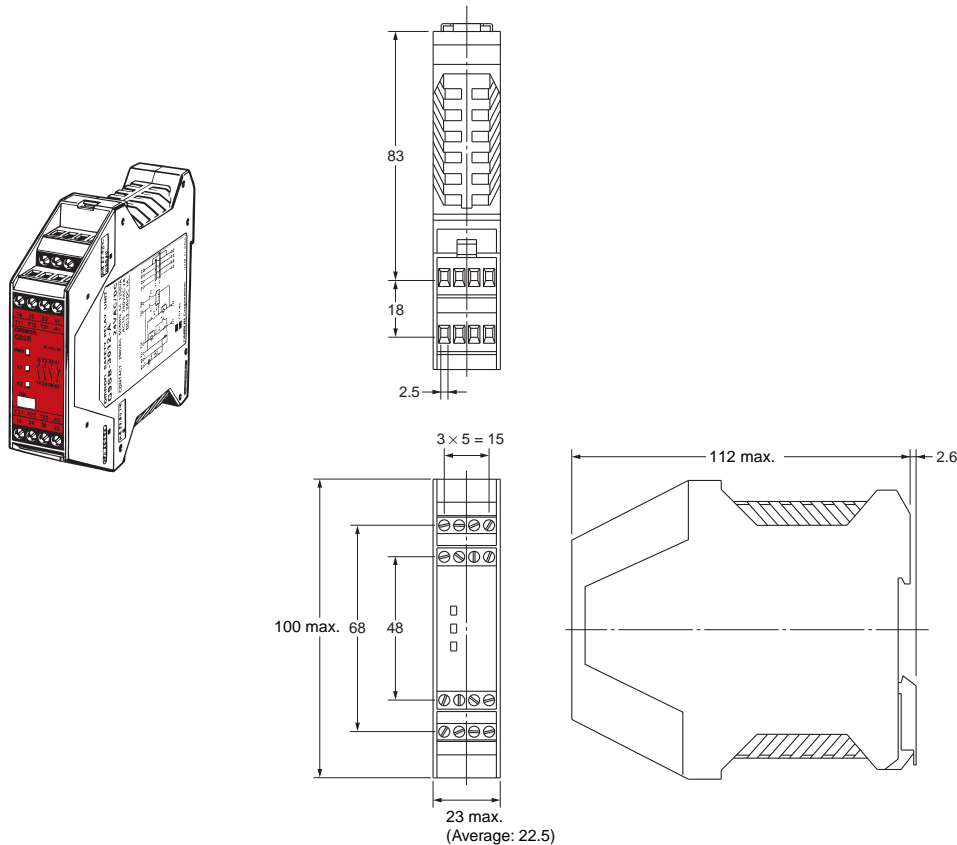
- G9SB-2002-A/C: Safety Output Contacts 13-14, 23-24.
 G9SB-3012-A/C: Safety Output Contacts 13-14, 23-24, 33-34. Auxiliary Contact 41-42.
 G9SB-200-B/D: Safety Output Contacts 13-14, 23-24.
 G9SB-301-B/D: Safety Output Contacts 13-14, 23-24, 33-34. Auxiliary Contact 41-42.
 G9SB-3010: Safety Output Contacts 13-14, 23-24, 33-34. Auxiliary Contact 41-42.

Dimensions and Terminal Arrangement

G9SB-200□-□
G9SB-3010



G9SB-301-□-□



Application Examples

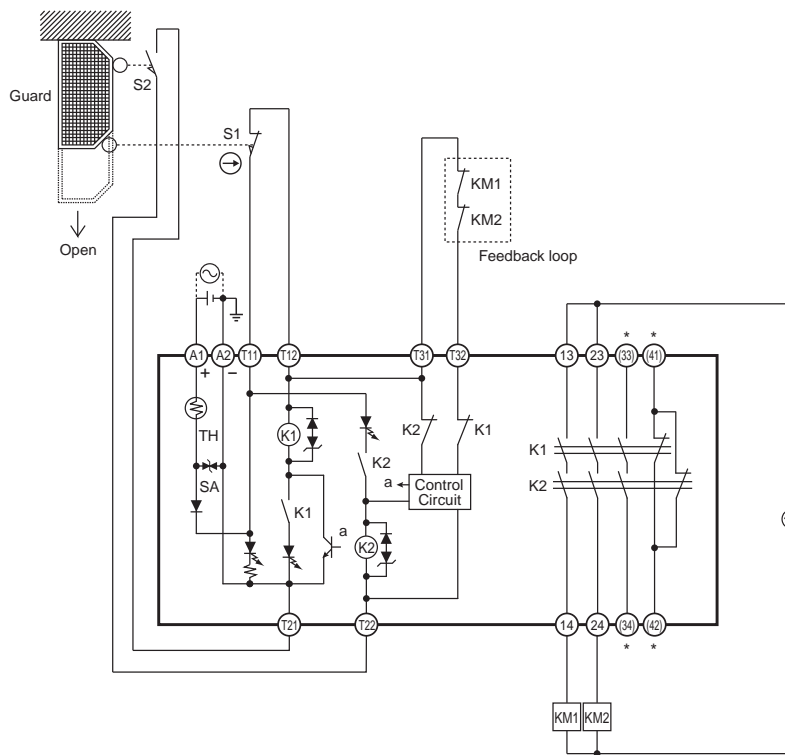
G9SB-2002-A (24 VAC/VDC) or G9SB-3012-A (24 VAC/VDC) with 2-channel Limit Switch Input/Auto-reset

Highest achievable PL/ safety category	Model	Stop category	Reset
PLe/4 equivalent	Safety Limit Switch D4B-N/D4N/D4F Safety Relay Unit G9SB-2002-A/3012-A (24VAC/VDC)	0	Auto

Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

● Application Overview

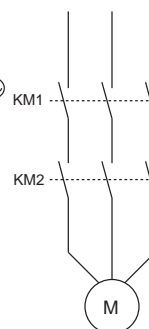
- The power supply to the motor M is turned OFF when the S1 and S2 detect that the guard is opened.
- The power supply to the motor M is kept OFF until the guard is closed.



Timing Chart



S1: Safety limit switch
 S2: Limit switch
 KM1 and KM2: Magnetic contactor
 M: Motor



Note: External connections and timing charts for G9SB-200-B/301-B models are the same as those for G9SB-2002-A/3012-A models.

* Only the G9SB-3012-A model has terminals 33-34 and 41-42.

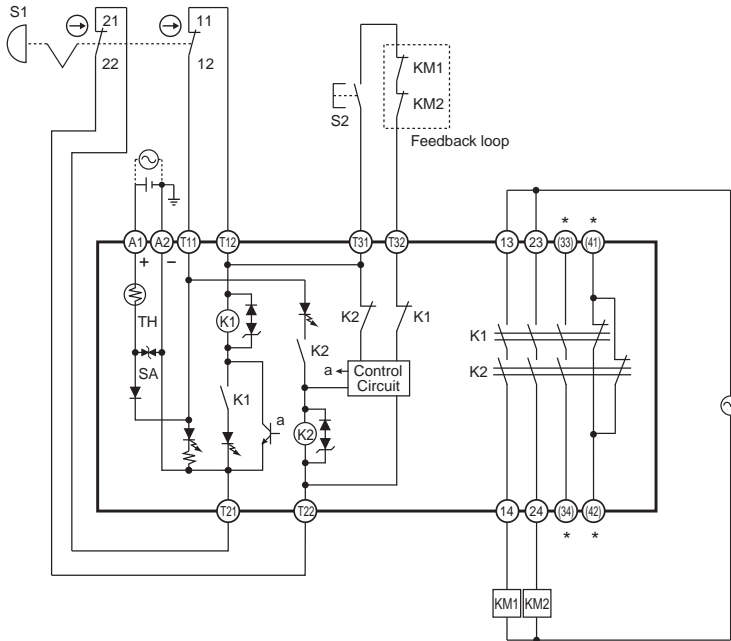
G9SB-2002-C (24 VAC/VDC) or G9SB-3012-C (24 VAC/VDC) with 2-channel Emergency Stop Switch Input/Manual Reset

Highest achievable PL/ safety category	Model	Stop category	Reset
PLe/4 equivalent	Emergency stop switch A165E/A22E Safety Relay Unit G9SB-2002-C/3012-C (24VAC/VC)	0	Manual

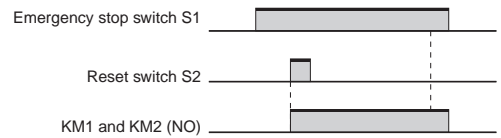
Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

Application Overview

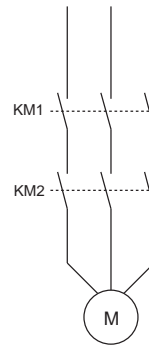
- The power supply to the motor M is turned OFF when the emergency stop switch S1 is pressed.
- The power supply to the motor M is kept OFF until the reset switch S2 is pressed while the emergency stop switch is released.



Timing Chart



Note: Output turns ON with the rising edge of reset switch S2, but will not operate if there is a short breakdown in S2.



- S1: Emergency stop switch
- S2: Reset switch
- KM1 and KM2: Magnetic contactor
- M: Motor

Note: External connections and timing charts for G9SB-200-D/301-D models are the same as those for G9SB-2002-C/3012-C models.

* Only the G9SB-3012-C model has terminals 33-34 and 41-42.

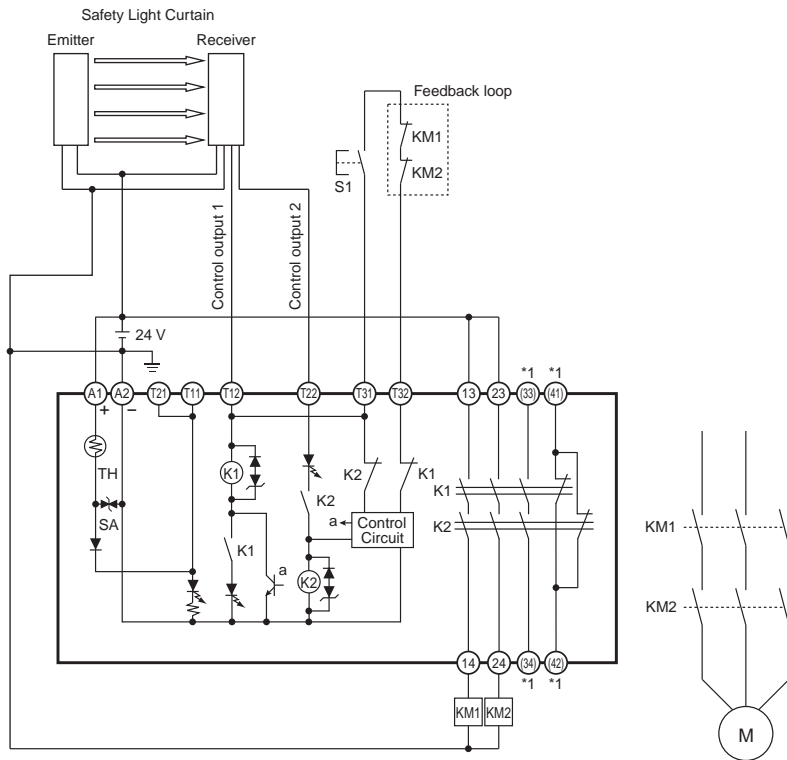
G9SB-200-D (24 VAC/VDC) or G9SB-301-D (24 VAC/VDC) with 2-channel Safety Sensor/Manual Reset (PNP models only)

Highest achievable PL/ safety category	Model	Stop category	Reset
PLe/4 equivalent	Safety Light Curtain F3SJ-A/-B/-E Safety Relay Unit G9SB-2002-D/3012-D (24VAC/VDC)	0	Manual

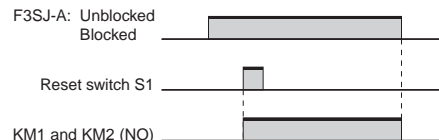
Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

● Application Overview

- The power supply to the motor M is turned OFF when the beam is blocked.
- The power supply to the motor M is kept OFF until the beam is unblocked and the reset switch S1 is pressed.



Timing Chart



Note: Output turns ON with the rising edge of reset switch S1, but will not operate if there is a short breakdown in S1.

S1: Reset switch
KM1 and KM2: Magnetic contactor
M: Motor

*1. Only the G9SB-301-D model has terminals 33-34 and 41-42.

*2. Wiring is shown for when the F3SJ-A auxiliary output turns ON for light interruption.

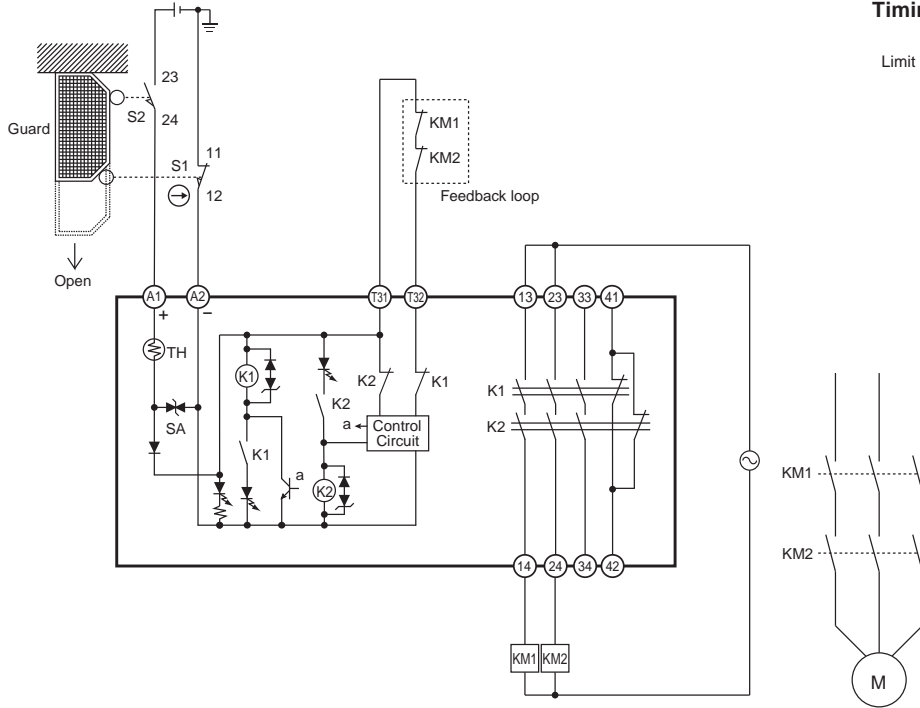
G9SB-3010 (24 VDC) with 2-channel Limit Switch Input/Auto-reset

Highest achievable PL/ safety category	Model	Stop category	Reset
PLd/3 equivalent	Safety Limit Switch D4B-N/D4N/D4F Safety Relay Unit G9SB-3010 (24VDC)	0	Auto

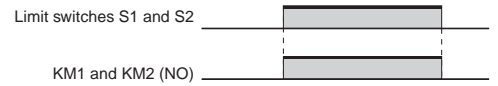
Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

● Application Overview

- The power supply to the motor M is turned OFF when the S1 and S2 detect that the guard is opened.
- The power supply to the motor M is kept OFF until the guard is closed.



Timing Chart



- S1: Safety limit switch
- S2: Limit switch (NO)
- KM1 and KM2: Magnetic contactor
- M: Motor

Safety Precautions

Be sure to read the *Common Precautions for Safety Warning* at the following URL: <http://www.ia.omron.com/>.

CAUTION

Turn OFF the G9SB before wiring the G9SB. Do not touch the terminals of the G9SB while the power is turned ON, because the terminals are charged and may cause an electric shock.



Precautions for Correct Use

Failure Detection for Slow-starting Power Supply

When using a power supply with a long start-up time, if power is switched on while input has been closed the internal circuits will detect a power voltage error and the product will not operate. Apply the voltage to the product once the voltage has reached its rated level.

Installation

The G9SB can be installed in any direction.

Wiring

- Use the following to wire the G9SB.
Stranded wire: 0.2 to 2.5 mm²
Solid wire: 0.2 to 2.5 mm²
- Tighten each screw to a torque of 0.5 to 0.6 N·m, or the G9SB may malfunction or generate heat.
- External inputs connected to T11 and T12 or T21 and T22 of the G9SB must be no-voltage contact inputs.
- Strip the wires by 7 mm max.

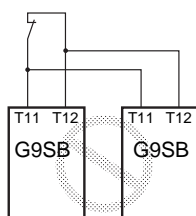
Mounting Multiple Units

When mounting multiple Units close to each other, the rated current will be 3 A. Do not apply a current higher than 3 A.

Connecting Inputs

If using multiple G9SB models, inputs cannot be made using the same switch. This is also true for other input terminals.

Incorrect



Ground Shorts

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-200□-□/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.

Resetting Inputs

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.

Durability of Contact Outputs

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.

Applicable Safety Category (EN ISO13849-1)

G9SB-200□-□/301□-□ Safety Relay Units can be applied to PLe/ Safety Category 4.

G9SB-3010 Safety Relay Units can be applied to Safety Category 3 if double breaking is used. The above is provided according to circuit examples presented by OMRON. Therefore, the above may not apply to all operating environments.

The applicable safety category is determined from the whole safety control system. Make sure that the whole safety control system meets ISO 13849-1 requirements.

Certified Standards

The G9SB-200□-□/3010/301□-□ conforms to the following standards.

- EN standards, certified by TÜV Rheinland:
 - EN60204-1
 - EN60947-1
 - EN60947-5-1
 - EN ISO13849-1
 - EN62061
 - EN61496-1
 - EN 81-20, EN 81-50
- UL standards: UL508 (Industrial Control Equipment)
- CSA standards: CSA C22.2 No. 14 (Industrial Control Equipment)
- CCC Certification: GB14048.5

Terms and Conditions Agreement

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.

Warranties.

(a) Exclusive Warranty. Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.

(b) Limitations. OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE.

Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) Buyer Remedy. Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses 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. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty.

See <http://www.omron.com/global/> or contact your Omron representative for published information.

Limitation on Liability: Etc.

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

Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.

Suitability of 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.

Programmable Products.

Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.

Performance Data.

Data presented in Omron Company websites, catalogs and other materials 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 user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.

Change in Specifications.

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions.

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.