

# Safety Relay Unit G9SB

CSM\_G9SB\_DS\_E\_4\_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.



Be sure to read the "Safety Precautions" on page 8.

## 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
		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.

**Note 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 24VDC 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	<b>Resistive load</b>		
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 <sup>2</sup>		
	Malfunction	100 m/s <sup>2</sup>		
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.

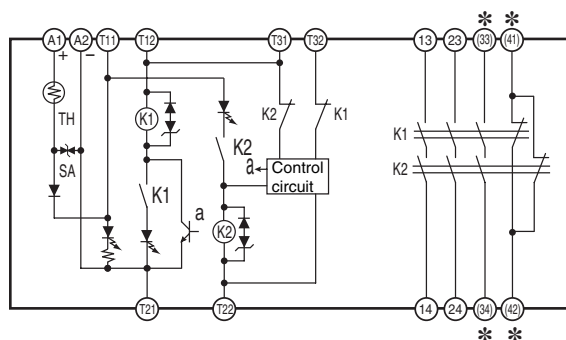
\*5. The durability is for an ambient temperature of 15 to 35°C and an ambient humidity of 25% to 75%.

## Connections

### Internal Connections

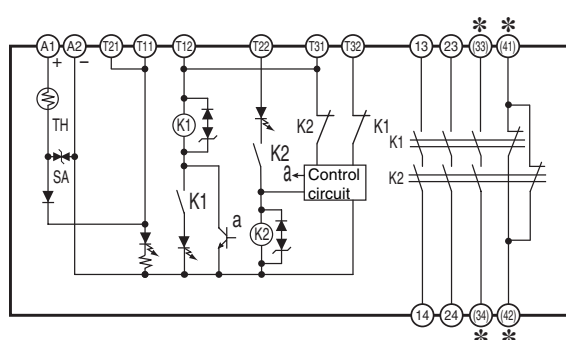
G9SB-2002-A/C (24 VAC/VDC)

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

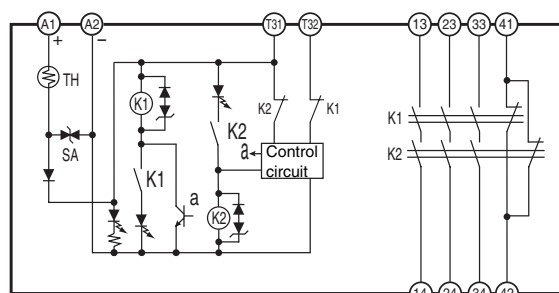


G9SB-200-B/D (24 VAC/VDC)

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



G9SB-3010 (24 VDC)



- Note: 1.** 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.  
**2.** 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**

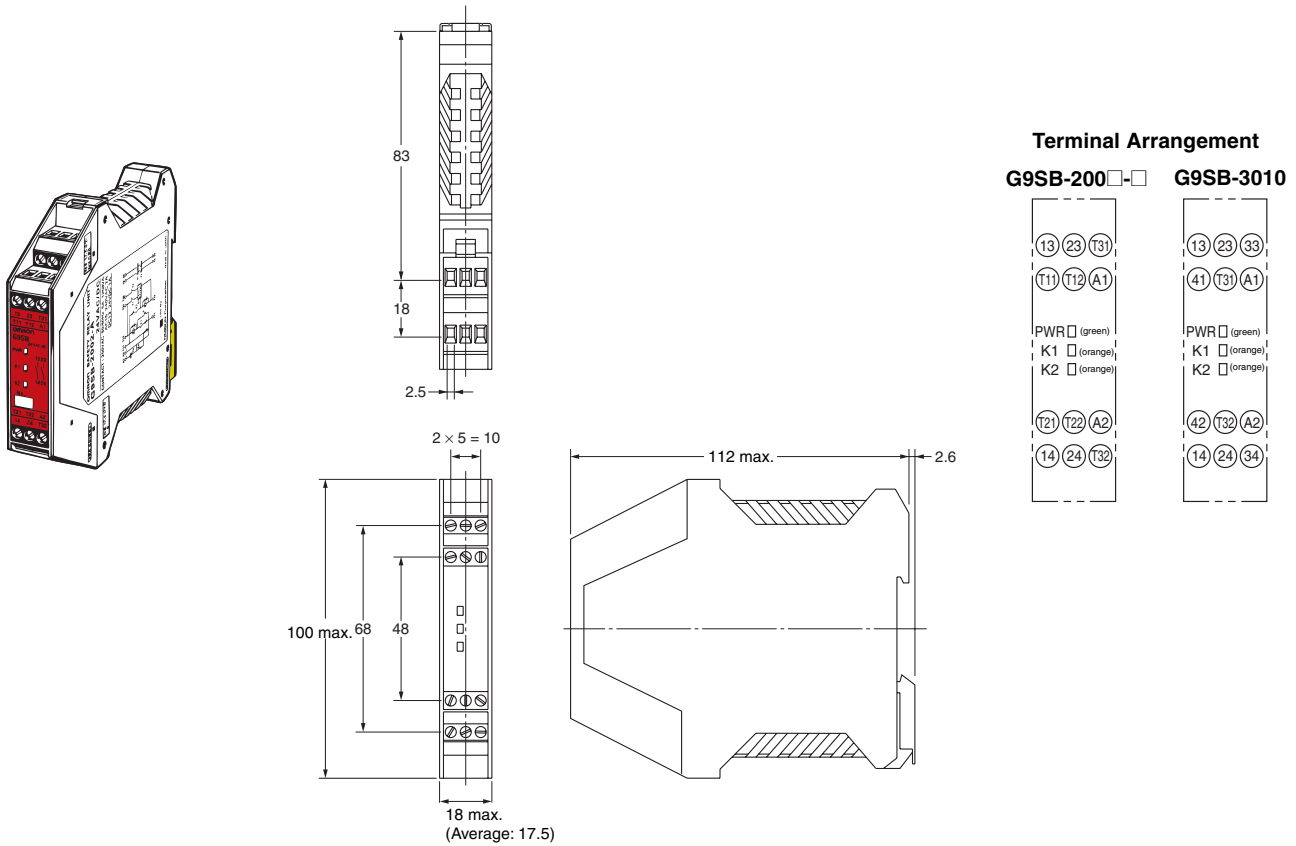
- (1) G9SB-3010 directly cuts off power, and has no Safety Input.
- (2) For 1-channel input with G9SB-□□□-B/D, short circuit T12-T22 and then input.
- (3) With G9SB-□□□2-A/C, 1-channel input wiring is not possible.

**\*2. Output Contacts**

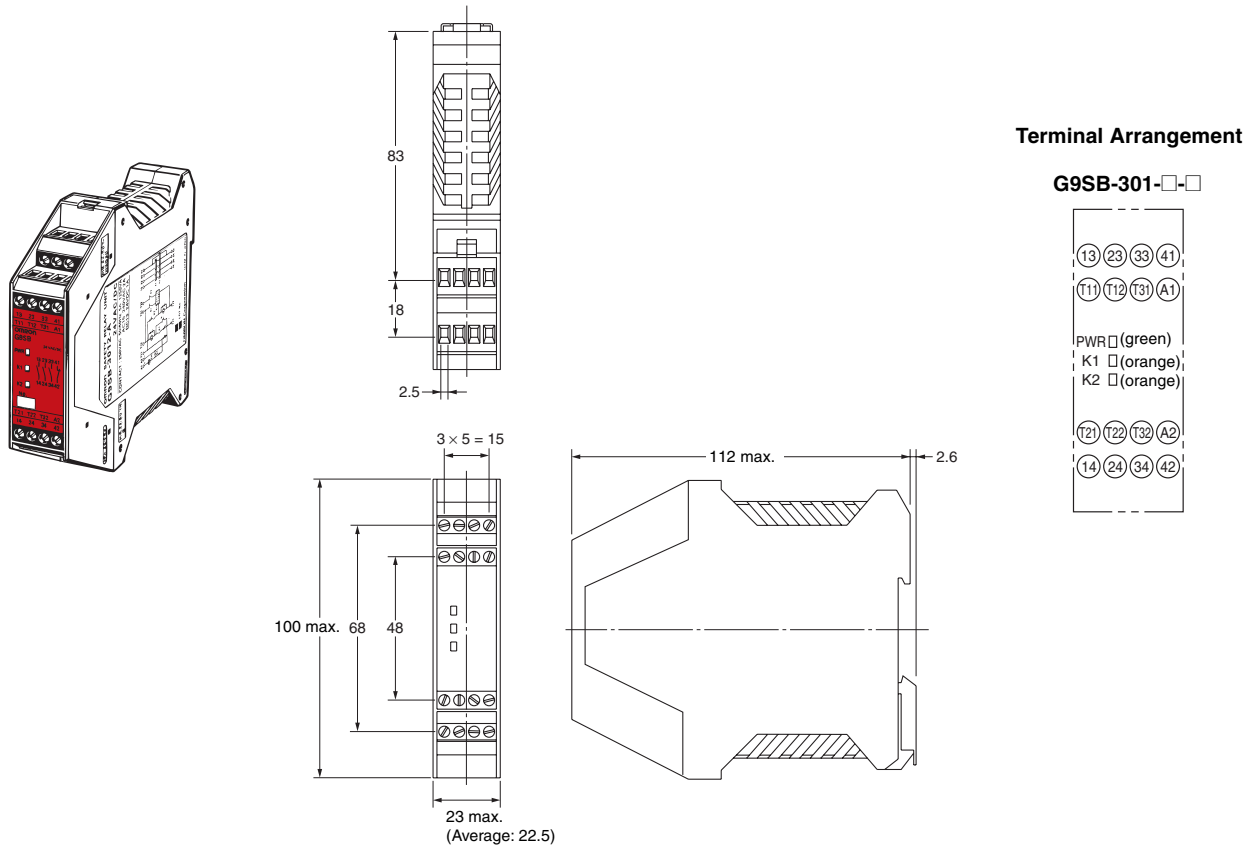
- G9SB-2002-A/C: Safety Output Contacts 13-14, 23-24.  
 G9SB-3012-A/C: Safety Output Contacts 13-14, 23-24, 33-34. Auxiliary Contact 41-42.  
 G9SB-200-B/D: Safety Output Contacts 13-14, 23-24.  
 G9SB-301-B/D: Safety Output Contacts 13-14, 23-24, 33-34. Auxiliary Contact 41-42.  
 G9SB-3010: Safety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

# Dimensions and Terminal Arrangement

G9SB-200□-□  
G9SB-3010

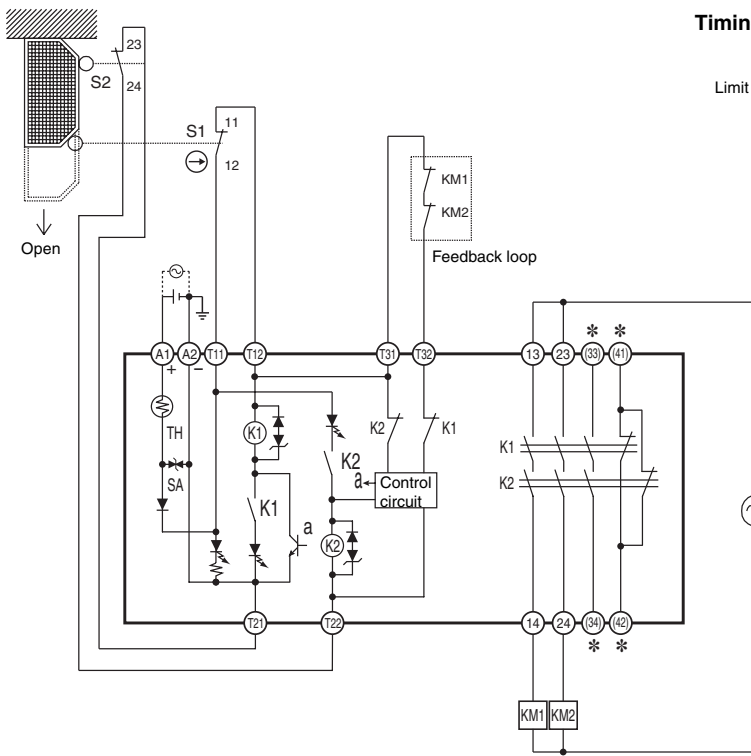


G9SB-301-□-□

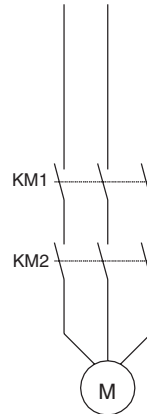
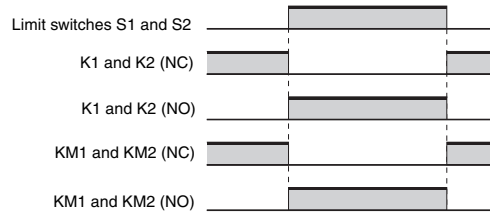


# Application Examples

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



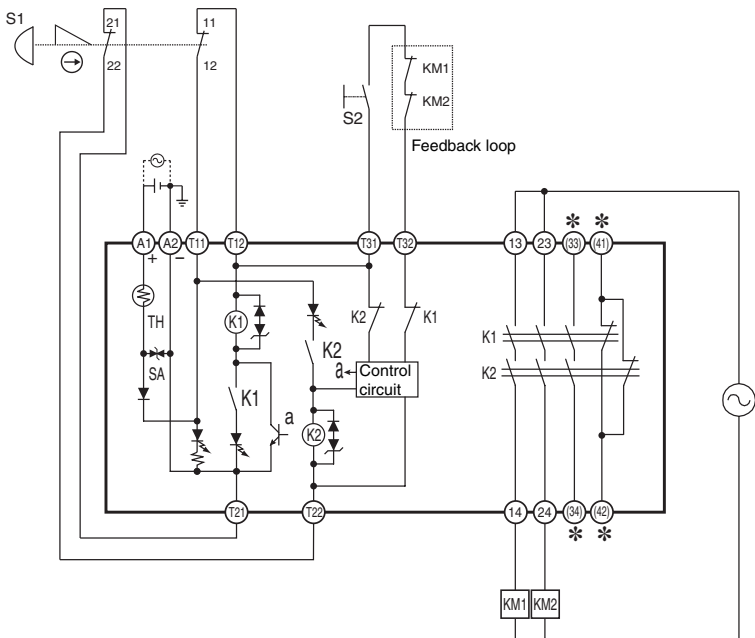
Timing Chart



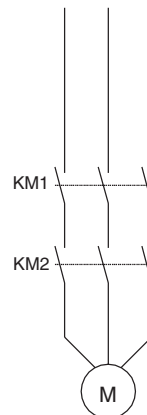
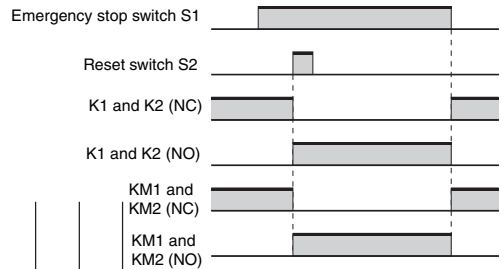
S1: Safety limit switch with direct opening mechanism (NC) (D4B-N, D4N, D4F)  $\ominus$   
 S2: Limit switch (NO)  
 KM1 and KM2: Magnetic Contactor  
 M: 3-phase motor

- Note: 1.** External connections and timing charts for G9SB-200-B/301-B models are the same as those for G9SB-2002-A/3012-A models.
- 2.** This circuit conforms to Safety Category 4.
- \* 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



Timing Chart

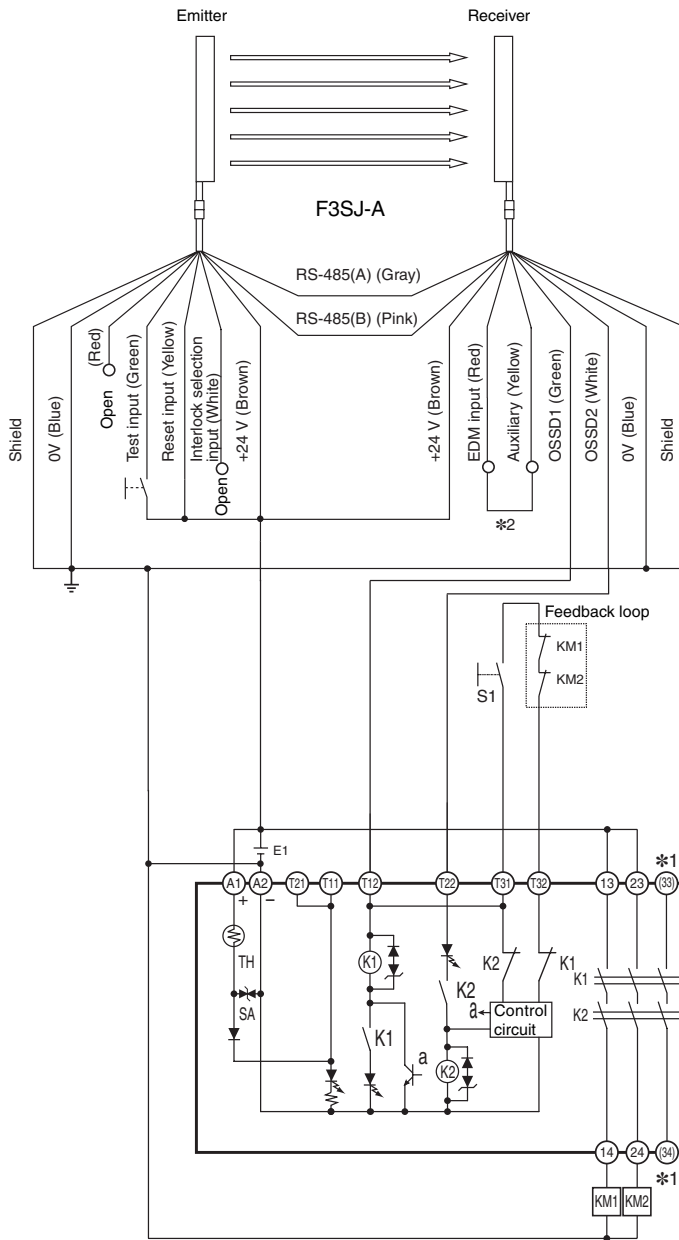


**Note:** Output turns ON with the rising edge of reset switch S2, but will not operate if there is a short breakdown in S2.

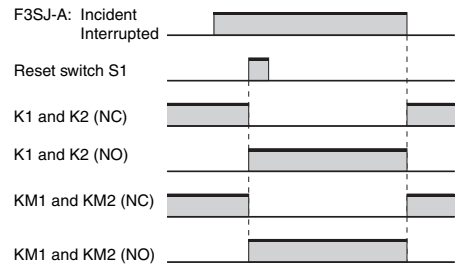
S1: Emergency stop switch with direct opening mechanism (A165E, A22E)  $\ominus$   
 S2: Reset switch  
 KM1 and KM2: Magnetic Contactor  
 M: 3-phase motor

- Note: 1.** External connections and timing charts for G9SB-200-D/301-D models are the same as those for G9SB-2002-C/3012-C models.
- 2.** This circuit conforms to Safety Category 4.
- \* 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)

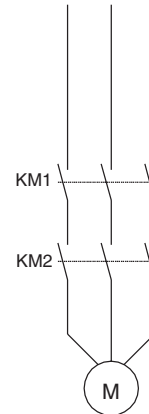


Timing Chart



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

- F3SJ-A: Safety Sensor
- S1: Reset switch
- KM1 and KM2: Magnetic Contactor
- M: 3-phase motor
- E1: 24-VDC power supply (S82K)

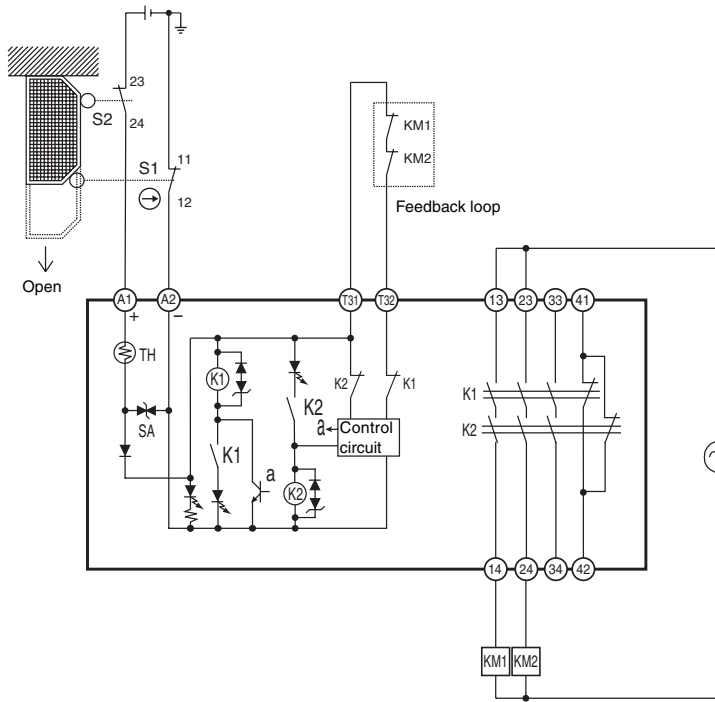


**Note:** This circuit conforms to Safety Category 4.

\*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



Timing Chart

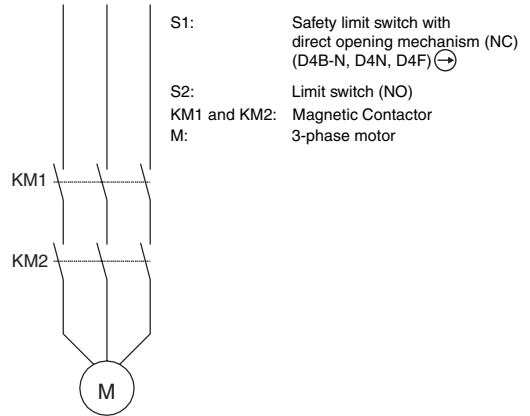
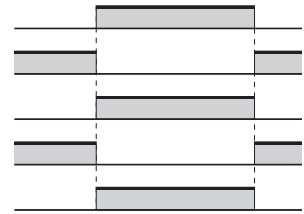
Limit switches S1 and S2

K1 and K2 (NC)

K1 and K2 (NO)

KM1 and KM2 (NC)

KM1 and KM2 (NO)



Note: This circuit conforms to Safety Category 3.

## Safety Precautions

Refer to the “*Precautions for All Relays*” and “*Precautions for All Relays with Forcibly Guided Contacts*”.

### 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 mm<sup>2</sup>  
Solid wire: 0.2 to 2.5 mm<sup>2</sup>
- 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.

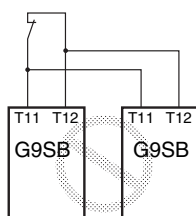
#### Mounting Multiple Units

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



### Applicable Safety Category (EN954-1)

G9SB-200□-□/301□-□ meet the requirements of Safety Category 4 of the EN954-1 standards when they are used as shown in the examples provided by OMRON. Relays may not meet the standards in some operating conditions. The G9SB-3010 can be applied to Safety Category 3 of the EN954-1 using double breaking.

The applicable safety category is determined from the whole safety control system. Make sure that the whole safety control system meets EN954-1 requirements.

### 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-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.

### 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.

### Certified Standards

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

- EN standards, certified by TÜV Rheinland:  
EN60204-1: 2006
- Conformance to EMC (Electromagnetic Compatibility), certified by TÜV Rheinland  
EMI (Emission): EN55011 Group 1 Class A  
EMS (Immunity): EN61000-6-2
- UL standards: UL508 (Industrial Control Equipment)
- CSA standards: CSA C22.2 No. 14 (Industrial Control Equipment)
- CCC Certification: GB14048.5



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