

Safety Relay Unit

G9S

Ideal for Safety Door and Emergency Stop Switch Circuits for Machines in European Countries

- Two-pole slim models that are only 22.5 mm wide, three-pole models that are only 67.5 mm wide, and five-pole models that are only 90 mm wide are available.
- OFF-delay models are available
- Incorporates LED indicators for monitoring built-in relays.
- Finger-protection construction.
- Both DIN track mounting and screw mounting possible (two-pole models)
- Conforms to EN60204-1 (IEC204-1), EN954-1, and approved by BIA.



Note: Be sure to refer to the *Precautions* on page 235.

Ordering Information

Basic Models

Number of poles	Main contact form	Number of input channels	Model	Rated voltage
2	DPST-NO	1 channel	G9S-2001	24 VDC
		2 channels	G9S-2002	
3 (see note)	3PST-NO	1 channel or 2 channels possible	G9S-301	24 VDC
				24 VAC
				100 VAC
				120 VAC
				200 VAC
5 (see note)	5PST-NO		G9S-501	240 VAC
				24 VDC
				24 VAC
				100 VAC
				120 VAC
				200 VAC
				240 VAC

Note: Auxiliary contact is SPST-NC.

OFF-delay Models

Number of poles	Main contact form	OFF-delay form	Number of input channels	Model	OFF-delay time	Rated voltage
3	3PST-NO	DPST-NO	1 channel or 2 channels possible	G9S-321-T008, T01, T015, T03, T04, T05, T06, T10, T30	0.8 s, 1 s, 1.5 s, 3 s, 4 s, 5 s, 6 s, 10 s, 30 s	24 VDC
						24 VAC
						100 VAC
						120 VAC
						200 VAC
					240 VAC	

Note: Each model has an SPST-NC auxiliary contact. When ordering specify the voltage.

Example: G9S-2001 24 VDC

Rated voltage

Model Number Legend

G9S-

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1 2 3 4 5

1. Contact Configuration (Safety Output)

- 2: DPST-ND
- 3: 3PST-NO
- 5: 5PST-NO

2. Contact Configuration (OFF-delay Output)

- 0: None
- 2: DPST-ND

3. Contact Configuration (Auxiliary Output)

- 0: None
- 1: SPST-NC

4. Input Configuration

- None: 1-channel or 2-channel input possible
- 1: 1-channel input
- 2: 2-channel input

5. OFF-delay Time

- None: No OFF-delay
- T008: 0.8 seconds
- T01: 1 second
- T015: 1.5 seconds
- T03: 3 seconds
- T04: 4 seconds
- T05: 5 seconds
- T06: 6 seconds
- T10: 10 seconds
- T30: 30 seconds

Specifications

■ Ratings

Controller Block

Model	Rated voltage	Rated current	Rated power consumption
G9S-2001 G9S-2002	24 VDC	66 mA±20%	Approx. 1.6 W
G9S-301	24 VDC	62.5 mA±20%	Approx. 1.5 W
	24 VAC	125 mA±20%	
	100 VAC	30 mA±20%	Approx. 3 VA (60 Hz)
	120 VAC	25.0 mA±20%	
	200 VAC	15 mA±20%	
240 VAC	12.5 mA±20%		
G9S-501	24 VDC	127 mA±20%	Approx. 3 W
	24 VAC	229 mA±20%	
	100 VAC	55 mA±20%	Approx. 5.5 VA (60 Hz)
	120 VAC	45 mA±20%	
	200 VAC	27.5 mA±20%	
240 VAC	22.9 mA±20%		
G9S-321-T□	24 VDC	150 mA±20%	Approx. 3.6 W
	24 VAC	254 mA±20%	
	100 VAC	61 mA±20%	Approx. 6.1 VA (60 Hz)
	120 VAC	50.8 mA±20%	
	200 VAC	30.5 mA±20%	
240 VAC	25.4 mA±20%		

Note: The above ratings are at an ambient temperature of 23°C.

Contact

Item	G9S-301 G9S-501 G9S-321-T□	G9S-2001 G9S-2002
Rated load	3 A at 240 VAC; (see note) cosφ = 0.4	5 A at 240 VAC; cosφ = 0.4
AC15 (IEC-947-5-1/ Table 4)	3 A at 240 VAC; cosφ = 0.3; 6,050 operations	
DC13 (IEC-947-5-1/ Table 4)	1 A at 24 VDC; L/R=100 ms; 6,050 operations	
Rated carry current	5 A	
Max. switching voltage	250 VAC, 24 VDC	
Max. switching power	AC: 1,250 VA; DC: 120 W	
Min. permissible load	50 mA at 24 VDC (operating frequency: 60 operations/min.)	

Note: If the load is 5 A at 240 VAC, the service life will be 40,000 operations.

■ Characteristics

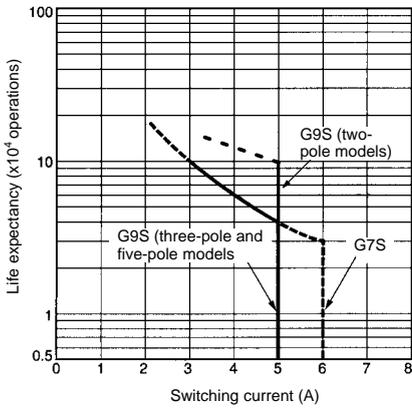
Item		G9S-2001 G9S-2002	G9S-301	G9S-501	G9S-321-T□
Input voltage/frequency		24 VDC	24 VDC; 24 VAC, 50/60 Hz; 100 VAC, 50/60 Hz; 120 VAC, 50/60 Hz; 200 VAC, 50/60 Hz; 240 VAC, 50/60 Hz		
Supply voltage range		85% to 110% of rated input voltage			
Fuse protection		---	0.4 A		
Contact form of safety circuit		DPST-NO	3PST-NO	5PST-NO	3PST-NO
Contact form of auxiliary circuit		---	SPST-NC	SPST-NC	SPST-NC
Contact form of safety OFF-delay circuit		---			DPST-NO
Contact resistance		200 mΩ	300 mΩ max. (measurement conditions: 10 mA at 5 VDC using the fall-of-potential method)		
Operate time	(Rated voltage operation, does not include bounce time)	50 ms	300 ms max.		300 ms
Release time		50 ms	100 ms max.		100 ms; OFF-delay: 1 s, 10 s, 30 s
Max. switching frequency	Mechanical	1,800 operations/hr			
	Rated load	1,800 operations/hr			
Insulation resistance (at 500 VDC)		100 MΩ min. between control circuit and the safety and auxiliary circuits, between the safety circuits and auxiliary circuits, and between safety circuits			
Rated insulation voltage P.D. 3 (outside), P.D. 2 (inside) (IEC664-1, DIN VDE 0110/89)		250 V			
Rated impulse withstand voltage Overvoltage category 3 (IEC664-1, DIN VDE 0110/89)		4 kV			
Dielectric strength		2,500 VAC (50/60 Hz for 1 min.) between control circuit and the safety and auxiliary circuits, between the safety circuits and auxiliary circuits, and between safety circuits			
Vibration resistance (IEC68-2-6)	Destruction	10 to 55 Hz, 0.75-mm double amplitude			
	Malfunction	10 to 55 Hz, 0.5-mm double amplitude			
Shock resistance (IEC68-2-27)	Destruction	300 m/s ² for 11 ms			
	Malfunction	50 m/s ² for 11 ms			
Minimum applicable load (P standard reference value)		24 VDC, 50 mA (24 VDC, 4 mA photocoupler load)			
Ambient temperature		Operating: -25°C to 55°C (with no icing or condensation) Storage: -25°C to 55°C (with no icing or condensation)			
Ambient humidity		Operating: 38% to 85% Storage: 38% to 85%			
Enclosure rating (IEC529)	Terminals	IP20			
	Enclosure	IP40			
Terminal tightening torque		0.98 N • m			
Weight (see note)		Approx. 180 g	Approx. 365 g	Approx. 550 g	Approx. 580 g
Approved standards		UL508, CSA22.2 No. 14, EN954-1, EN60204-1			
EMC		EMI: EN55011 group 1 class A EMS: EN50082-2			

Note: These weights are for DC models. AC models are 200 g heavier.

■ Life Expectancy

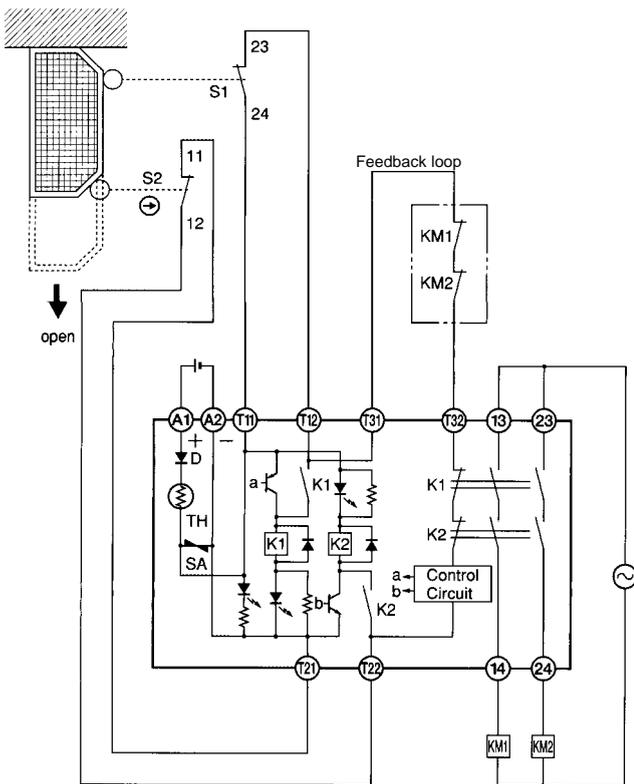
Mechanical life	1,000,000 operations min. with a switching frequency of approx. 1,800 operations/h
Electrical life	100,000 operations min. at the rated load with a switching frequency of approx. 1,800 operations/h

Life Expectancy Curve
(240 VAC, $\cos\phi = 0.4$, $\cos\phi = 1$)

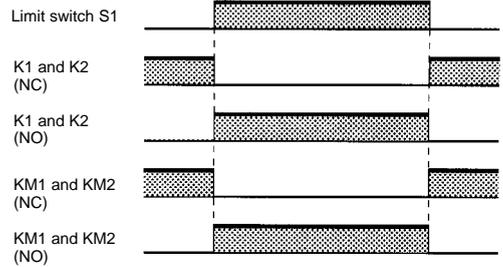


Application Examples

G9S-2002 with 2-channel Auto-reset Limit Switch Input

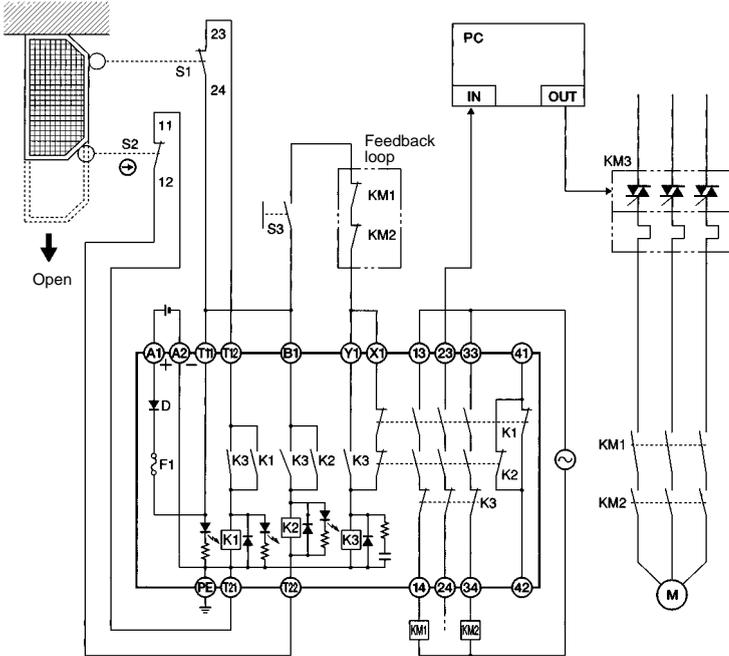


Timing Chart

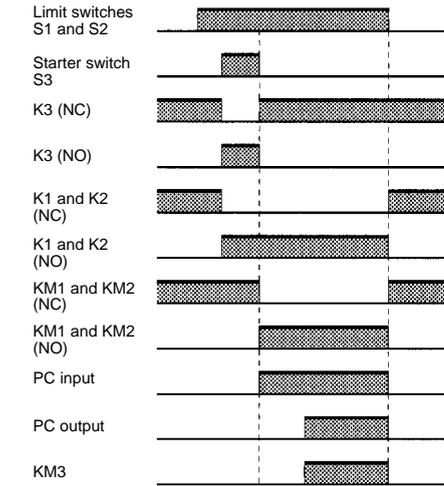


- S1: Limit switch
- S2: Safety Limit Switch with positive opening mechanism ⊕
- KM1 and KM2: Magnet Contactor
- M: 3-phase motor

G9S-301 (24 VDC) with 2-channel Limit Switch Input

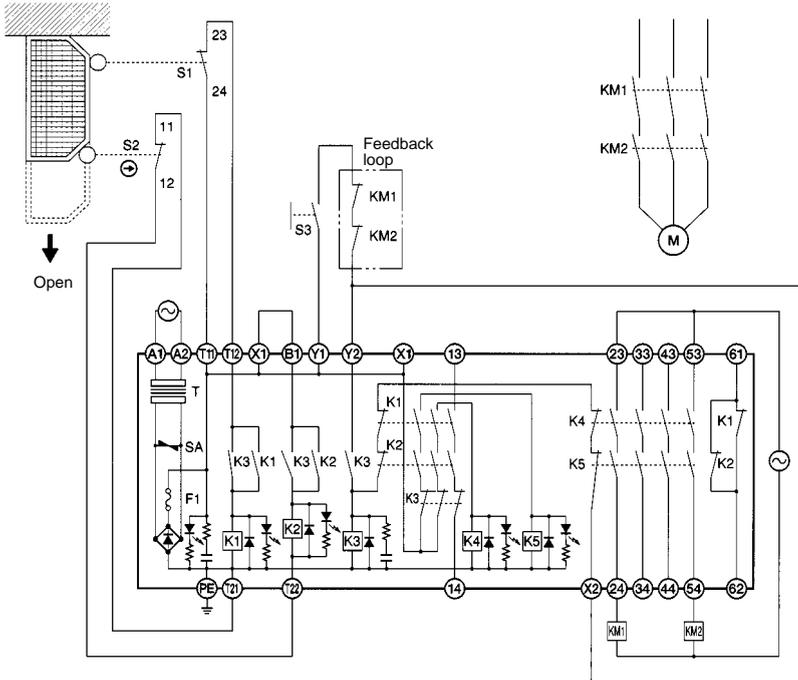


Timing Chart

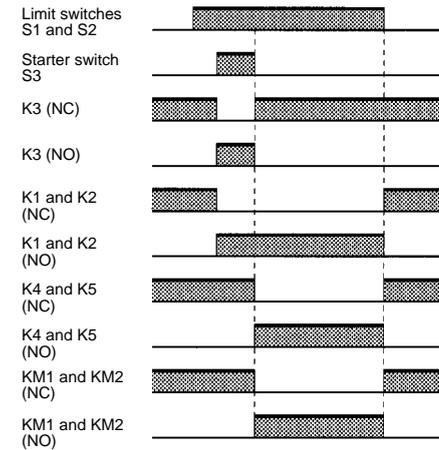


- S1: Limit switch
- S2: Safety Limit Switch with positive opening mechanism ⊕ (D4D and D4B)
- S3: Starter switch
- KM1 and KM2: Magnet Contactor
- KM3: G3J Solid-state Contactor
- M: 3-phase motor

G9S-501 (AC Model) with 2-channel Limit Switch Input

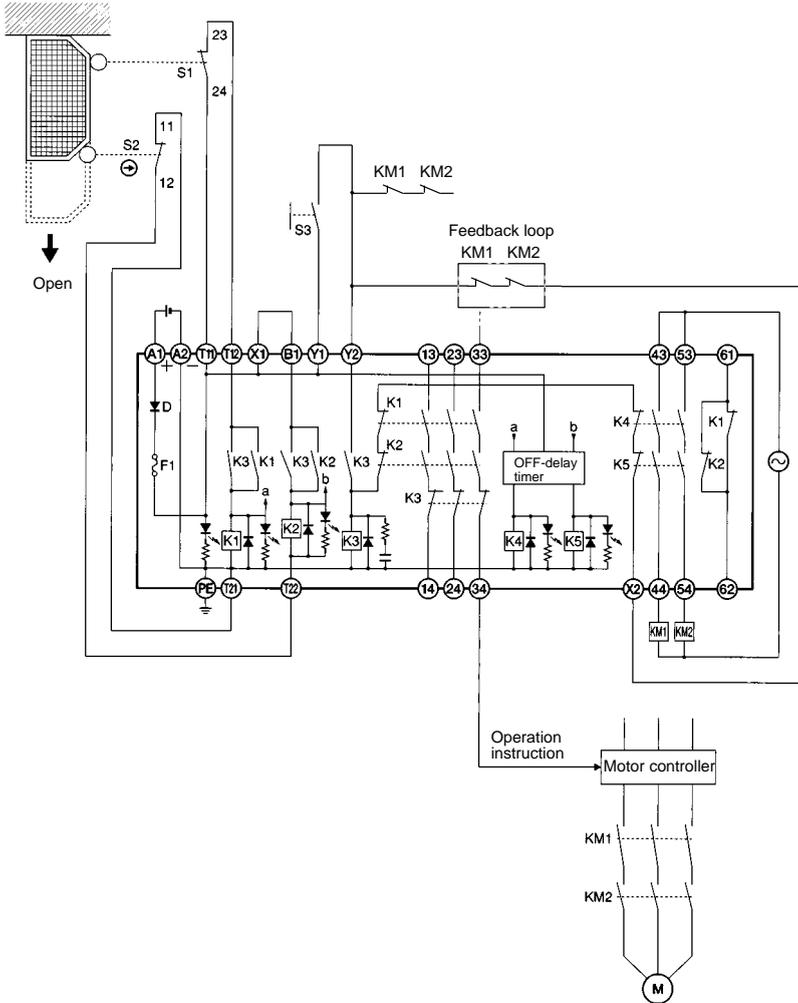


Timing Chart

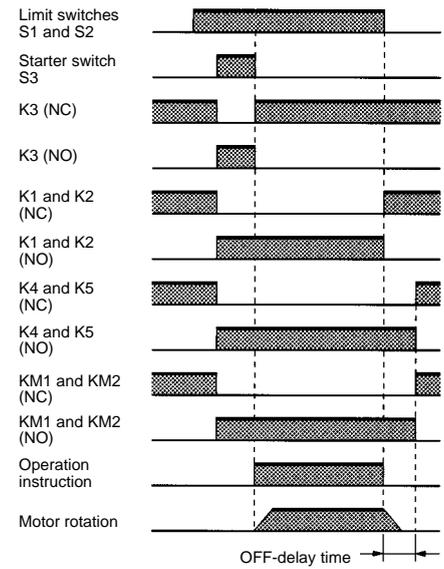


- S1: Limit switch
- S2: Safety Limit Switch with positive opening mechanism ⊕ (D4D and D4B)
- S3: Starter switch
- KM1 and KM2: Magnet Contactor
- M: 3-phase motor

G9S-321-T□ (24 VDC) with 2-channel Limit Switch Input

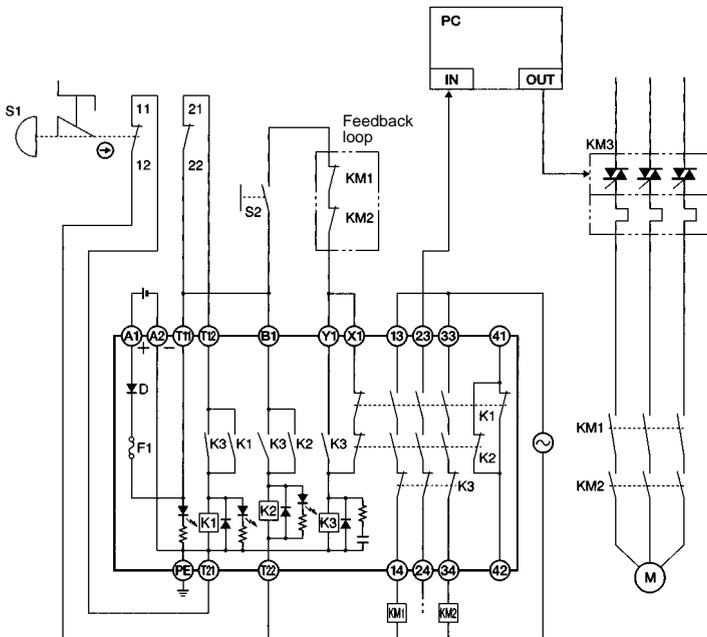


Timing Chart

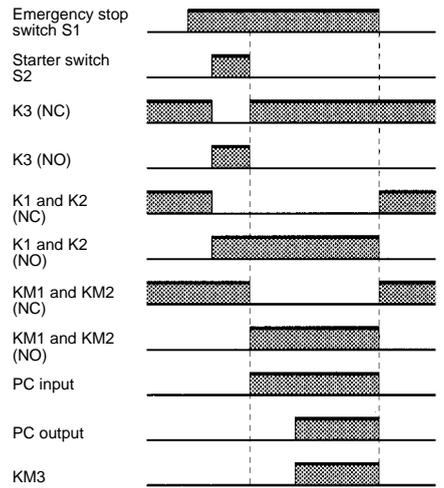


- S1: Limit switch
- S2: Safety Limit Switch with positive opening mechanism ⊕
- S3: Starter switch
- KM1 and KM2: Magnet Contactor
- M: 3-phase motor

G9S-301 (24 VDC) with 2-channel Emergency Stop Switch Input

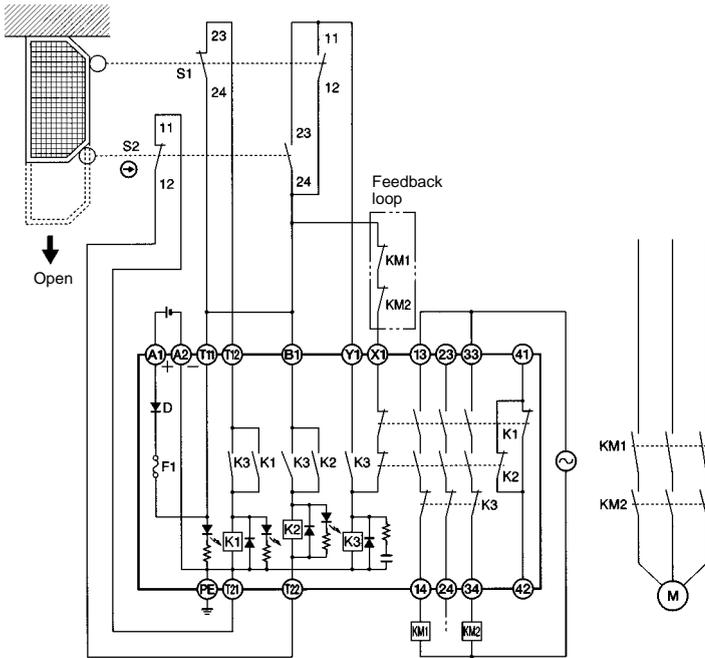


Timing Chart

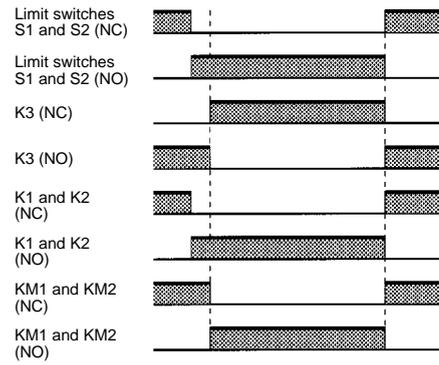


- S1: Emergency stop switch
- S2: Starter switch
- KM1 and KM2: Magnet Contactor
- KM3: G3J Solid-state Contactor
- M: 3-phase motor

G9S-301 (24 VDC) with 2-channel Auto-reset Limit Switch Input



Timing Chart

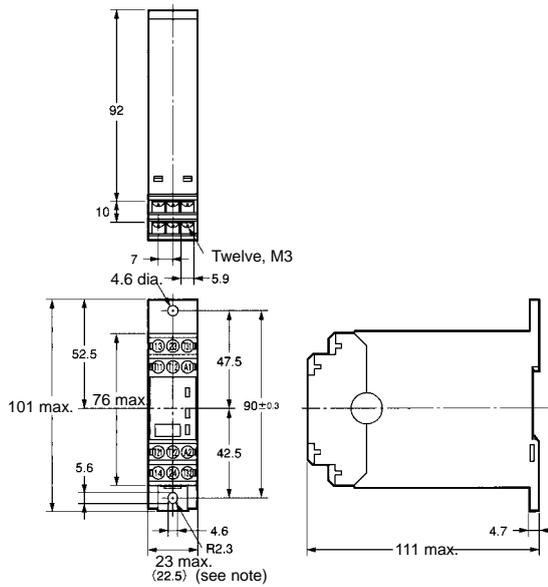
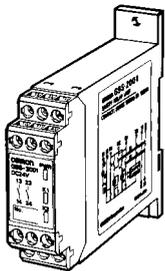


S1: Limit switch
 S2: Safety Limit Switch with positive opening mechanism ⊕ (D4D and D4B)
 KM1 and KM2: Magnet Contactor
 M: 3-phase motor

Dimensions

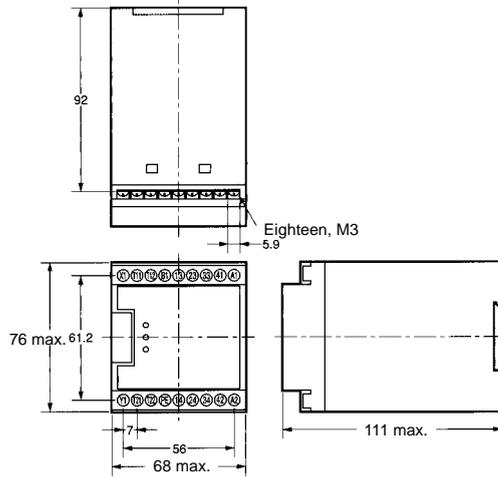
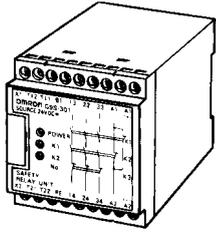
Note: All units are in millimeters unless otherwise indicated.

G9S-2001
 G9S-2002

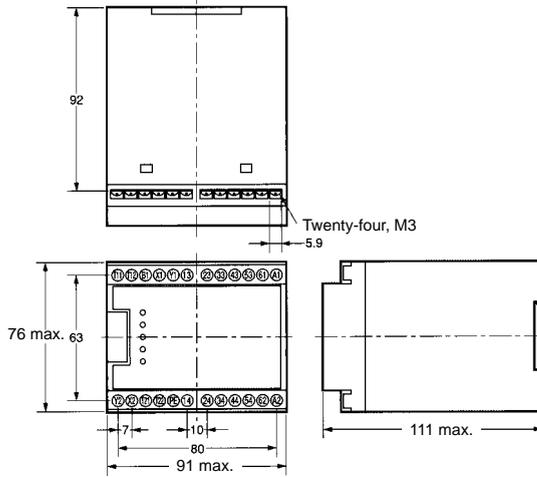
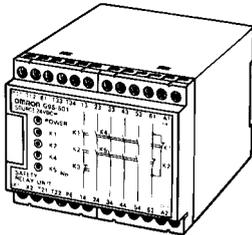


Note: This is an average value.

G9S-301



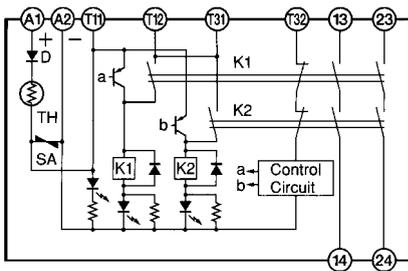
G9S-321-T□
G9S-501



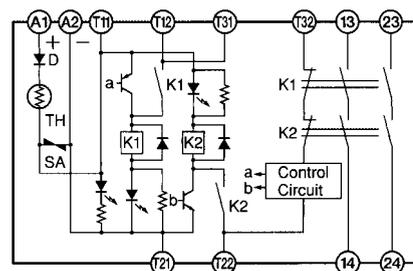
Installation

Internal Connections

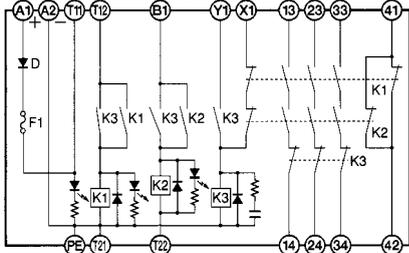
G9S-2001



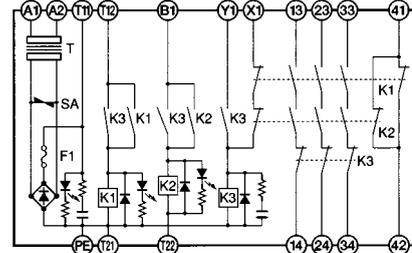
G9S-2002



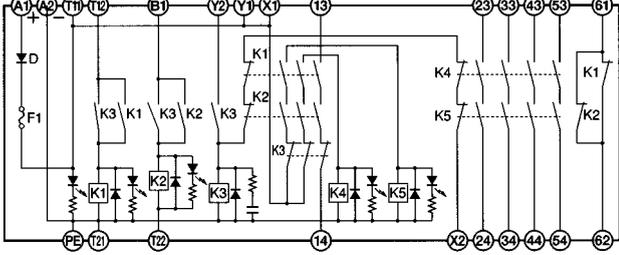
G9S-301 (24 VDC)



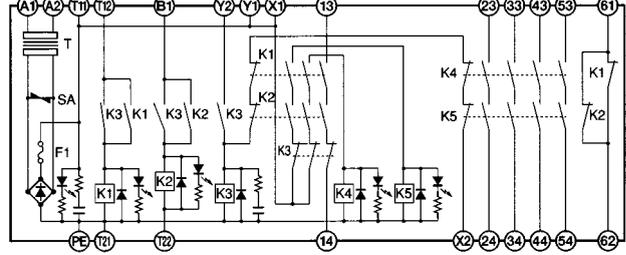
G9S-301 (AC Model)



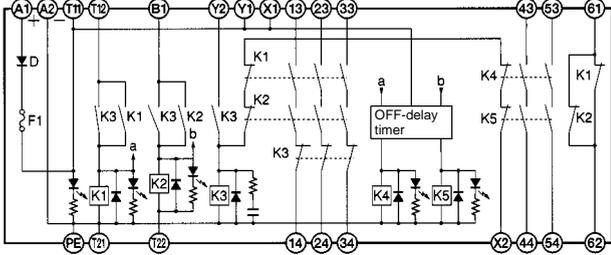
G9S-501 (24 VDC)



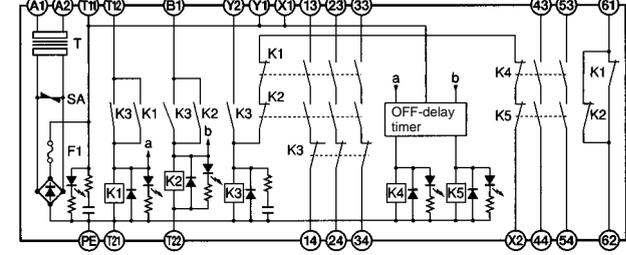
G9S-501 (AC Model)



G9S-321-T (24 VDC)



G9S-321-T (AC Model)



Precautions

Wiring

Be sure to turn OFF the G9S before wiring the G9S. Do not touch the terminals of the G9S while the power is turned ON, because the terminals are charged and may cause an electric shock.

Use the following to wire the G9S.

Stranded wire: 0.75 to 1.5 mm²

Steel wire: 1.0 to 1.5 mm²

Make sure that each screw is tightened to a torque of 0.78 to 1.18 N•m, or the G9S may malfunction or generate heat.

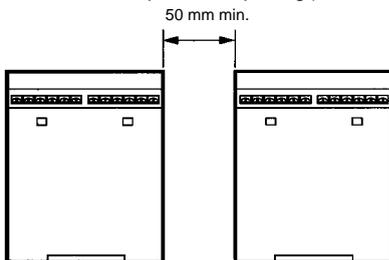
External inputs connected to T11 and T12 or T21 and T22 of the G9S-301 must be no-voltage contact inputs.

PE is a ground terminal.

When a machine is grounded at the positive, the PE terminal should not be grounded.

Mounting Multiple Units

If the output current is 3 A or more, make sure that there is a minimum distance of 50 mm each between all adjacent G9S Units. (24-VDC models do not require this spacing.)



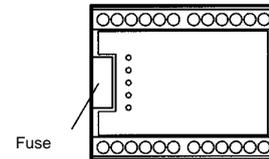
Fuse Replacement (Three- and Five-pole Models)

The power input circuit of the G9S includes a fuse to protect the G9S from damage that may be caused by short-circuiting. The fuse is mounted to the side panel. Use the following type of fuse as a replacement.

Littel Fuse 218.4 (rated current 0.4 A), IEC127 approval.

Use a flat-blade screwdriver to remove the fuse cover.

Be sure to turn OFF the G9S before replacing the fuse.



Applicable Safety Category (EN954-1)

All G9S-series Relays fall under Safety Category 4 of EN954-1 except the G9S-321-T and G9S-2001. The G9S-321-T has an OFF-delay output block falling under Safety Category 3 and G9S-2001 falls under Safety Category 1.

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 EN954-1 requirements.

Wire the G9S-2001 or G9S-2002 for auto-reset. If either one of them is connected to a manual-reset switch, EN954-1 requirements will not apply.

Safety Category 4 of EN954-1

Wire the G9S-2001 or G9S-2002 for auto-reset. If either one of them is connected to a manual-reset switch, EN954-1 requirements will not apply.

Apply 2-channel external input to the T11 and T12 terminals and T21 and T22 terminals through switches each incorporating a force-separation mechanism. If limit switches are used, make sure that at least one of them incorporates a force-separation mechanism.

Refer to *Application Examples* and input a signal for the normally-closed contact of the contactor (i.e., input to X1 of the G9S-301, X2 of the G9S-501, or X2 of the G9S-321-T).

Be sure to ground the PE terminal. If the relay is operating with DC, the power supply may be grounded instead.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.