Safety Relay Unit

Ideal for Safety Door and Emergency Stop Switch Circuits

- Three-pole models are only 67.5 mm wide; five-pole models only 90 mm wide are available
- OFF-delay feature models available
- Incorporates LED indicators for monitoring built-in relays
- Finger-protection construction
- DIN-track mounting
- Conforms to EN60204-1 (IEC60204-1), EN954-1, and approved by BIA

Note: Be sure to refer to the *Precautions Section*.

Ordering Information

■ BASIC MODELS

Number of poles	Main contact form	Number of input channels	Category	Rated voltage	**Part number**
3 (See Note)	3PST-NO	1 channel or 2 channels possible	4	24 VDC	**G9S-301**
				24 VAC	
				100 VAC	
				120 VAC	
				200 VAC	
				240 VAC	
5 (See Note)	5PST-NO			24 VDC	**G9S-501**
				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	Category	OFF-delay time	Rated voltage	**Part number**
3	3PST-NO	DPST-NO	1 channel or 2 channels possible	3	1 s, 1.5 s, 3 s, 4 s, 5 s, **6 s, 10 s, 30 s**	24 VDC	**G9S-321-T01, -T015, -T03, -T04, -T05, -T06, -T10, -T30**
						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-301 24 VDC
Rated voltage

■ MODEL NUMBER LEGEND

G9S-□□□-□□□
1 2 3 4

1. **Contact Configuration (Safety Output)**
   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. **OFF-Delay Time**
   None: No OFF-delay
   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-301	24 VDC	62.5 mA±20%	Approx. 1.5 W
	24 VAC	125 mA±20%	Approx. 3 VA (60 Hz)
	100 VAC	30 mA±20%	
	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%	Approx. 5.5 VA (60 Hz)
	100 VAC	55 mA±20%	
	120 VAC	45.8 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%	Approx. 6.1 VA (60 Hz)
	100 VAC	61 mA±20%	
	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□
Rated load		3 A at 240 VAC; (see note) 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

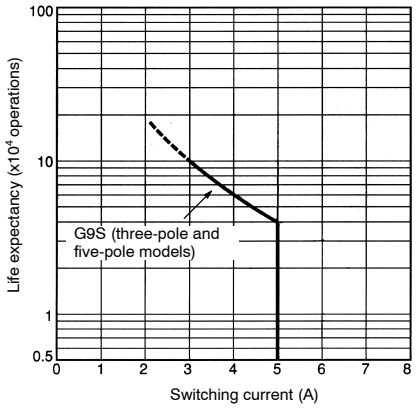
Item		G9S-301	G9S-501	G9S-321-T□
Input voltage/frequency		24 VDC; 24 VAC, 50/60 Hz; 100 VAC, 50/60 Hz; 120 VAC, 50/60 Hz; 200 VAC, 50/60 Hz; 240 VAC, 50/60 Hz		
Supply voltage range		85% to 110% of rated input voltage		
Fuse protection		0.4 A		
Contact form of safety circuit		3PST-NO	5PST-NO	3PST-NO
Contact form of auxiliary circuit		SPST-NC	SPST-NC	SPST-NC
Contact form of safety OFF-delay circuit		—		DPST-NO
Contact resistance (see note1)		300 mΩ max.		
Operate time	(Rated voltage operation, does not include bounce time)	300 ms max.		300 ms
Release time		100 ms max.		100 ms (except OFF-delay output)
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		
Min. permissible load (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 85°C (with no icing or condensation)		
Ambient humidity		Operating: 35% to 85% Storage: 35% to 85%		
Degree of protection (IEC529)	Terminals	IP20		
	Enclosure	IP40		
Terminal tightening torque		0.98 N • m		
Weight (see note 2)		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: 1. Measurement conditions: 10 mA at 5 VDC using the fall-of-potential method.
2. These weights are for DC models. AC models are 200 g heavier.

■ LIFE EXPECTANCY

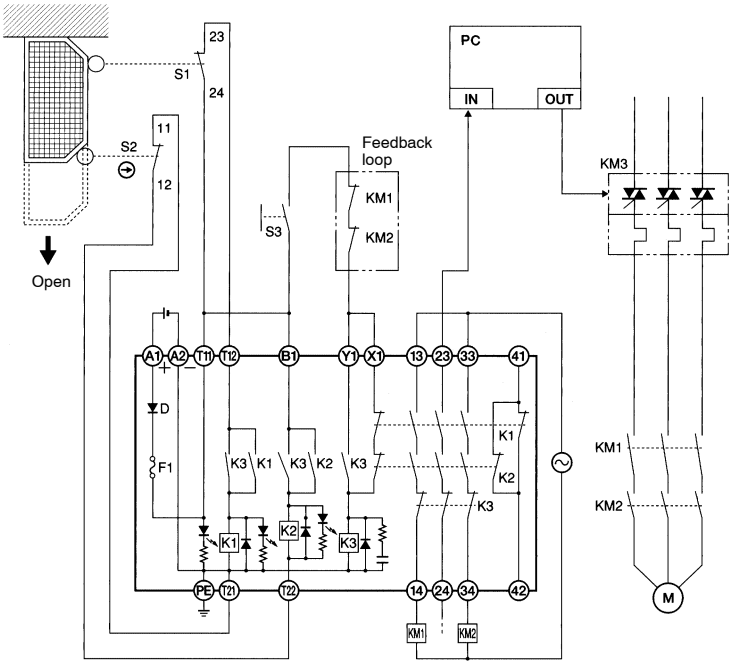
Mechanical life	1,000,000 operations min. with a switching frequency of approx. 1,800 operations/h
Electrical life	100,000 operations min. at the rated load with a switching frequency of approx. 1,800 operations/h

Life Expectancy Curve
(240 VAC, cosϕ = 0.4)

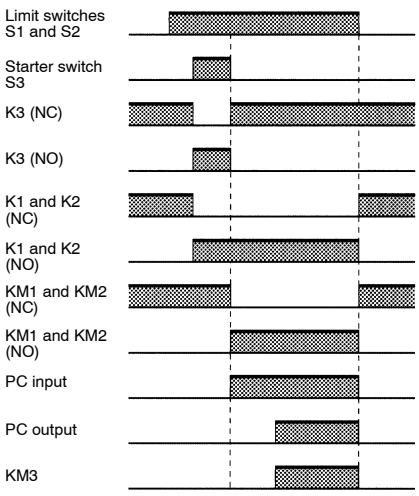


Application Examples

■ G9S-301 (24 VDC) WITH 2-CHANNEL LIMIT SWITCH INPUT

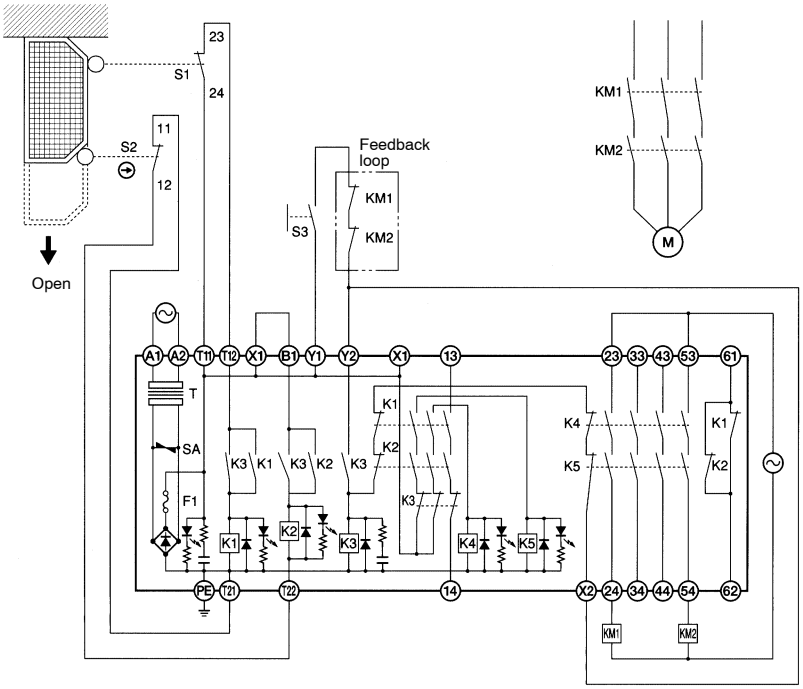


Timing Chart

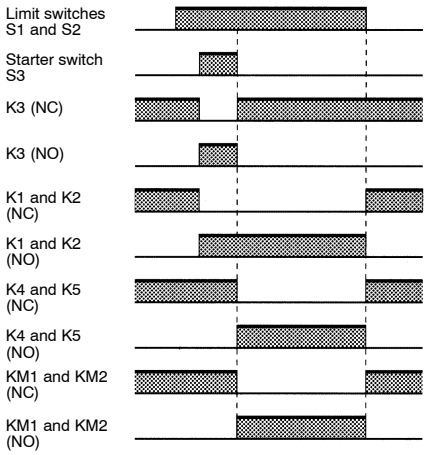


S1:	Limit switch
S2:	Safety Limit Switch with positive opening mechanism ⊕ (D4D and D4B)
S3:	Starter switch
KM1 and KM2:	Magnet Contactor
KM3:	G3J Solid-state Contactor
M:	3-phase motor

■ G9S-501 (AC MODEL) WITH 2-CHANNEL LIMIT SWITCH INPUT

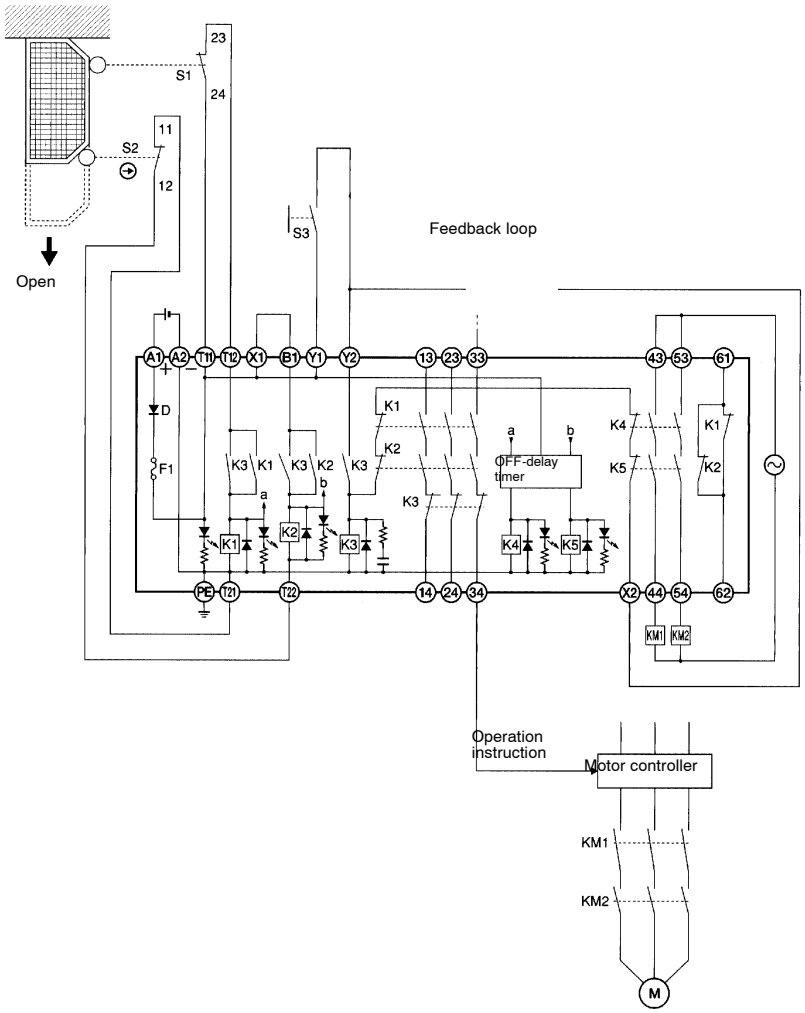


Timing Chart

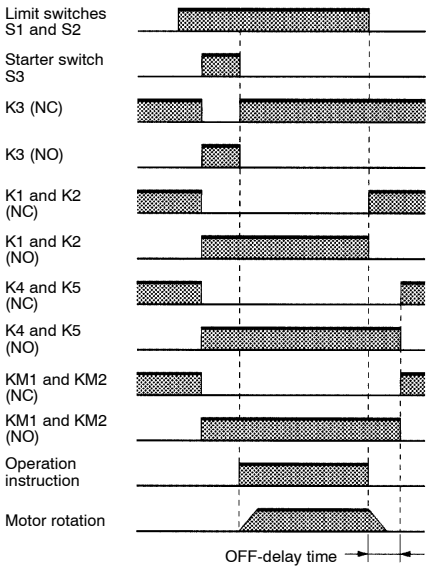


S1: Limit switch
S2: Safety Limit Switch with positive opening mechanism ⊕ (D4D and D4B)
S3: Starter switch
KM1 and KM2: Magnet Contactor
M: 3-phase motor

■ G9S-321-T□ (24 VDC) WITH 2-CHANNEL LIMIT SWITCH INPUT

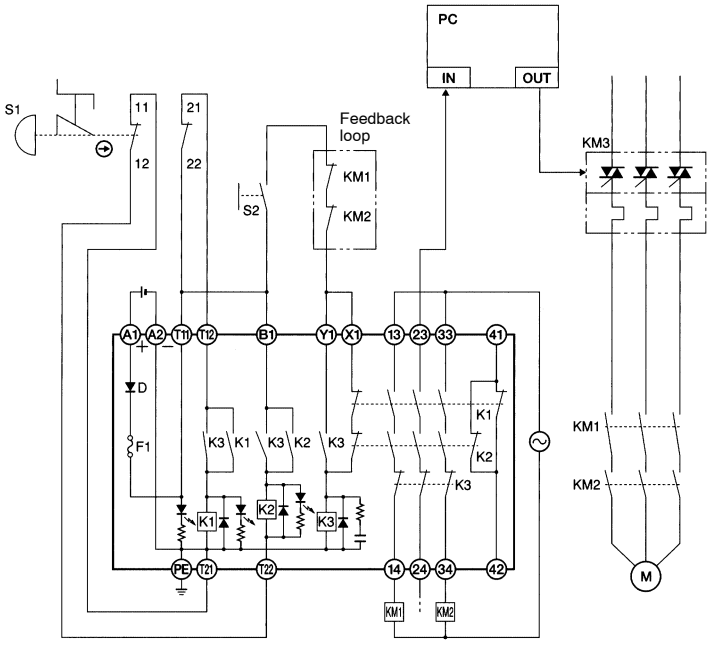


Timing Chart

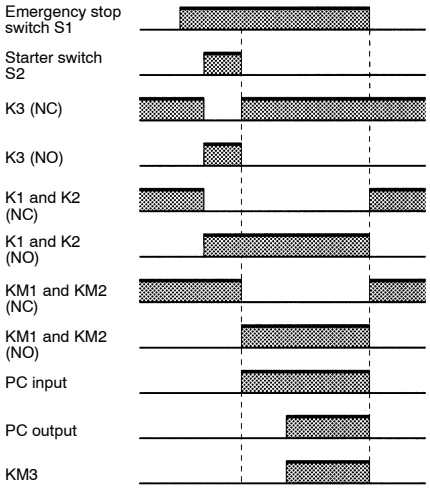


S1: Limit switch
S2: Safety Limit Switch with positive opening mechanism ⊕ (D4D and D4B)
S3: Starter switch
KM1 and KM2: Magnet Contactor
M: 3-phase motor

■ G9S-301 (24 VDC) WITH 2-CHANNEL EMERGENCY STOP SWITCH INPUT

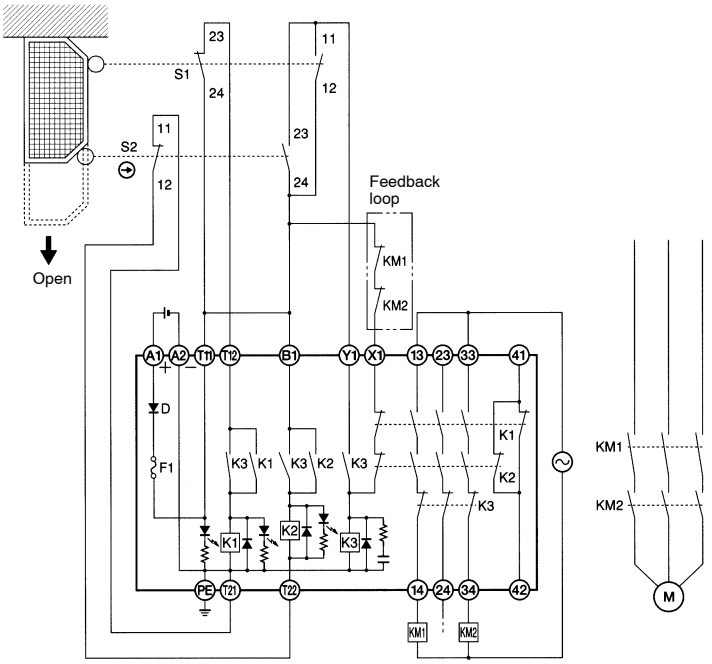


Timing Chart

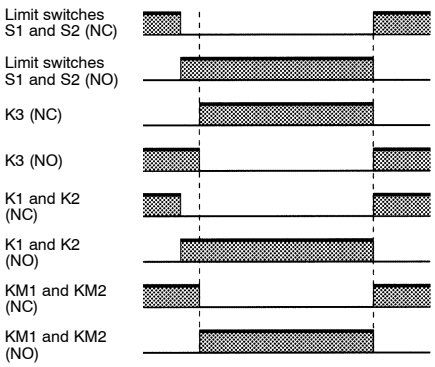


S1: Emergency stop switch
S2: Starter switch
KM1 and KM2: Magnet Contactor
KM3: G3J Solid-state Contactor
M: 3-phase motor

■ G9S-301 (24 VDC) WITH 2-CHANNEL AUTO-RESET LIMIT SWITCH INPUT



Timing Chart

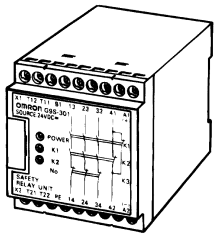


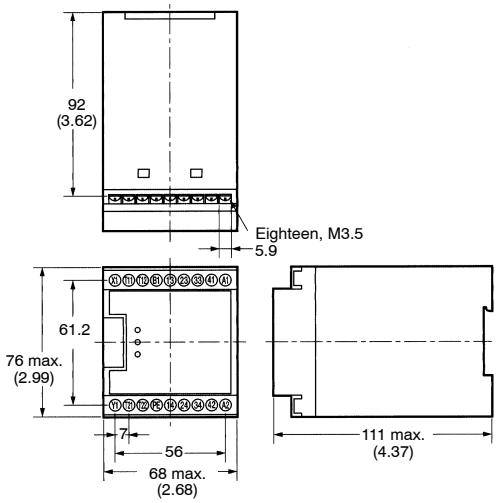
S1: Limit switch
S2: Safety Limit Switch with positive opening mechanism ⊖ (D4D and D4B)
KM1 and KM2: Magnet Contactor
M: 3-phase motor

Dimensions

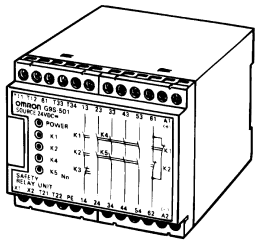
Unit: mm (inch)

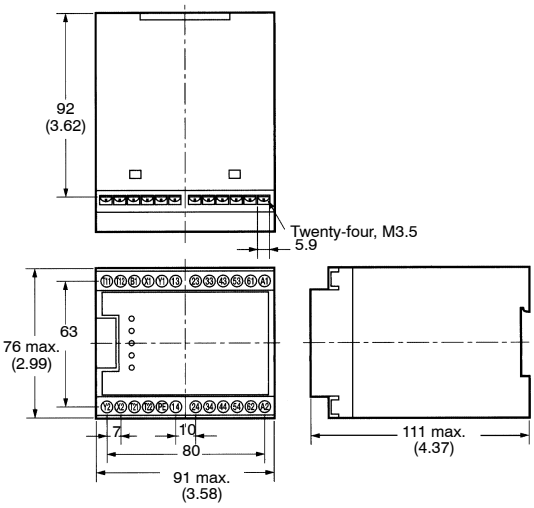
■ G9S-301





■ G9S-321-T□
G9S-501

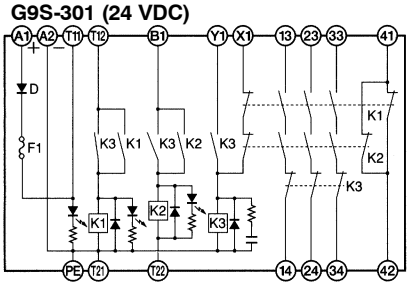




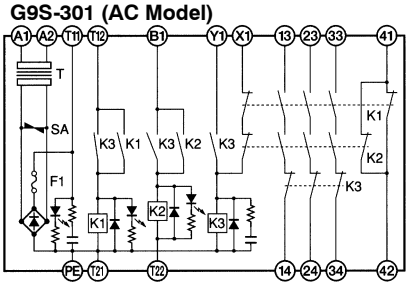
Installation

■ INTERNAL CONNECTIONS

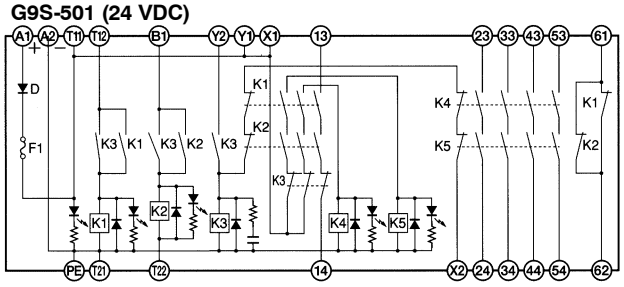
G9S-301 (24 VDC)



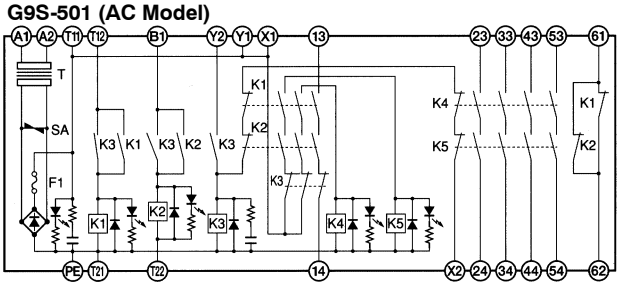
G9S-301 (AC Model)



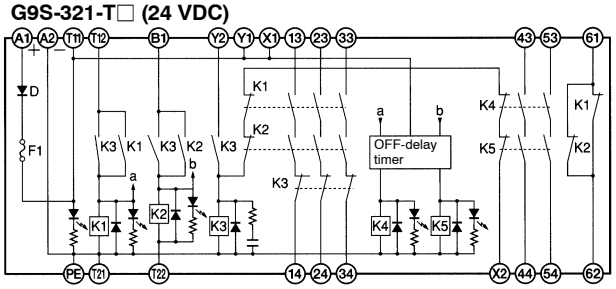
G9S-501 (24 VDC)



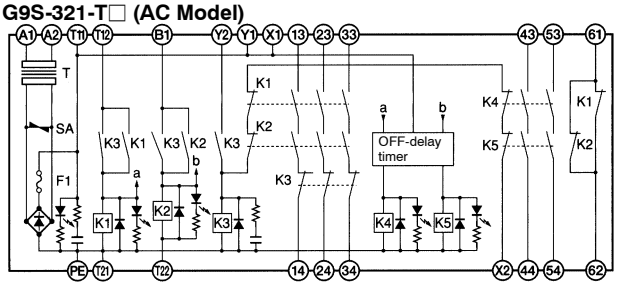
G9S-501 (AC Model)



G9S-321-T□ (24 VDC)

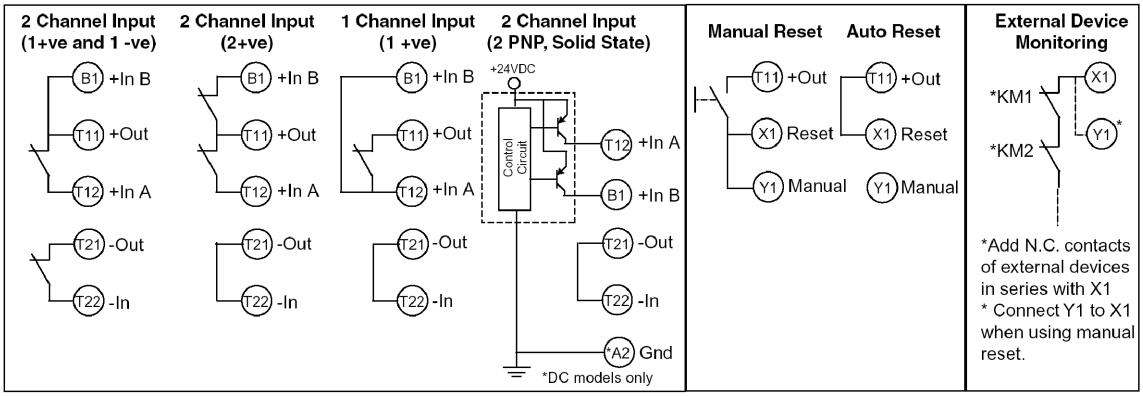


G9S-321-T□ (AC Model)

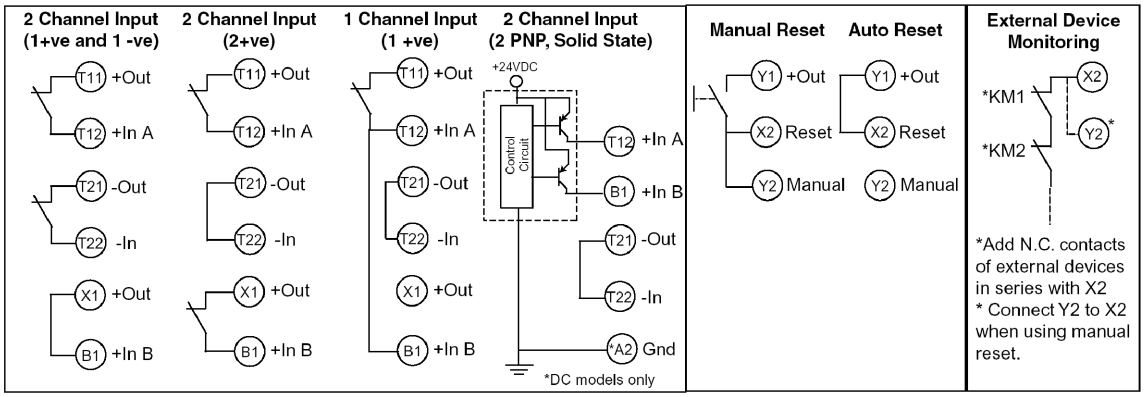


■ EXTERNAL CONNECTIONS

G9S-301 Models



G9S-321 and G9S-501 Models



Precautions

■ WIRING

Be sure to turn off the G9S before wiring. Do not touch its terminals while the power is turned on because the terminals are charged and may cause an electric shock.

Use the following to wire the G9S.
Strand wire: 0.75 to 1.5 mm^2 16 to 18 AWG
Steel wire: 1.0 to 1.5 mm^2 16 to 18 AWG

Tighten each screw to a torque of 0.78 to 1.18 N•m (8 to 12 kgf•cm), or the G9S may malfunction or generate heat.

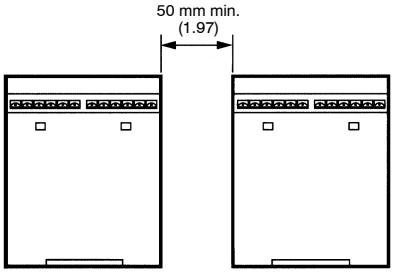
External inputs connected to T11 and T12 or T21 and T22 of the G9S-301 must be no-voltage contact inputs.

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 (1.97 in) each between all adjacent G9S Units. (24-VDC models do not require this spacing.)



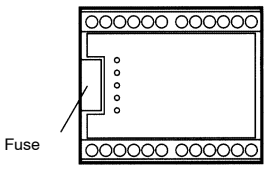
■ FUSE REPLACEMENT

Three- and Five-Pole Models

The power input circuit of the G9S includes a fuse to protect the it 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. The G9S-321-T has an OFF-delay output block falling under Safety Category 3.

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.

Safety Category 4 of EN954-1

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, divide by 25.4

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