

Safety Relay Unit

The G9SA Series Offers a Complete Line of Compact Units

- Several types of 45-mm wide Units are available: a 3-pole model, a 5-pole model, models with 3 poles and 2 OFF-delay poles
- 17.5-mm wide Expansion Units with 3 poles and 3 OFF-delay poles are also available
- Simple expansion connection
- OFF-delay models have 15-step OFF-delay settings
- Conforms to EN standards (BG approval)
- Approved by UL and CSA
- DIN-rail mounting or screw mounting



Ordering Information

EMERGENCY-STOP UNITS

Main contacts	Auxiliary contact	Number of input channels	Rated voltage	Category	Part number
3PST-NO	SPST-NC	1 channel or 2 channels possible	24 VAC/VDC 100 to 240 VAC	4	G9SA-301
5PST-NO	SPST-NC	1 channel or 2 channels possible	24 VAC/VDC 100 to 240 VAC		G9SA-501

EMERGENCY-STOP OFF-DELAY UNITS

Main contacts	OFF-delay contacts	Auxiliary contact	Number of input channels	OFF-delay time	Rated voltage	Category	Part number
3PST-NO	DPST-NO	SPST-NC	1 channel or 2 channels possible	7.5 s	24 VAC/VDC 100 to 240 VAC	Main contacts: 4 OFF-delay contacts: 3	G9SA-321-T075
				15 s	24 VAC/VDC 100 to 240 VAC		G9SA-321-T15
				30 s	24 VAC/VDC 100 to 240 VAC		G9SA-321-T30

Note: The following 15-step OFF-delay time settings are available:

T075: 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, and 7.5 s

T15: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15 s

T30: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, and 30 s

EXPANSION UNIT

The Expansion Unit connects to a G9SA-301, G9SA-501, or G9SA-321.

Main contacts	Auxiliary contact	Category	Part number
3PST-NO	SPST-NC	4	G9SA-EX301

■ EXPANSION UNITS WITH OFF-DELAY OUTPUTS

The Expansion Unit connects to a G9SA-301, G9SA-501, or G9SA-321.

Main contact form	Auxiliary contact	OFF-delay time	Category	Part number
3PST-NO	SPST-NC	7.5 s	3	G9SA-EX031-T075
		15 s		G9SA-EX031-T15
		30 s		G9SA-EX031-T30

Note: The following 15-step OFF-delay time settings are available:

T075: 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, and 7.5 s

T15: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15 s

T30: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, and 30 s

■ MODEL NUMBER LEGEND

G9SA-□□□□□□-□□□□□□

1 2 3 4 5 6

1. Function

None: Emergency stop

EX: Expansion Unit

2. Contact Configuration (Safety Output)

0: None

3: 3PST-NO

5: 5PST-NO

3. Contact Configuration (OFF-Delay Output)

0: None

2: DPST-NO

3: 3PST-NO

4. Contact Configuration (Auxiliary Output)

0: None

1: SPST-NC

5. Input Configuration (for G9SA-301/501/321)

None: 1-channel or 2-channel input possible

6. OFF-Delay Time (Max. Setting Time)

None: No OFF-delay

T075: 7.5 seconds

T15: 15 seconds

T30: 30 seconds

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Specifications

■ RATINGS

Power Input

Item	G9SA-501	G9SA-321-T□
Power supply voltage	24 VAC/VDC: 24 VAC, 50/60 Hz, or 24 VDC 100 to 240 VAC: 100 to 240 VAC, 50/60 Hz	
Operating voltage range	85% to 110% of rated power supply voltage	
Power consumption (See Note)	24 VAC/VDC: 2.8 VA/2.6 W max. 100 to 240 VAC: 11 VA max.	24 VAC/VDC: 3.5 VA/3.3 W max. 100 to 240 VAC: 12.5 VA max.

Note: When an Expansion Unit is connected, the power consumption is increased by 2 VA/2 W max.

Inputs

Item	G9SA-501
Input current (See Note)	60 mA max.

Note: When an Expansion Unit is connected, the input current is increased by 30 mA max.

Contacts

Item	G9SA-301/501/321-T□/EX301/EX031-T□
	Resistive load ($\cos \phi = 1$)
Rated load	250 VAC, 5 A
Rated carry current	5 A

■ CHARACTERISTICS

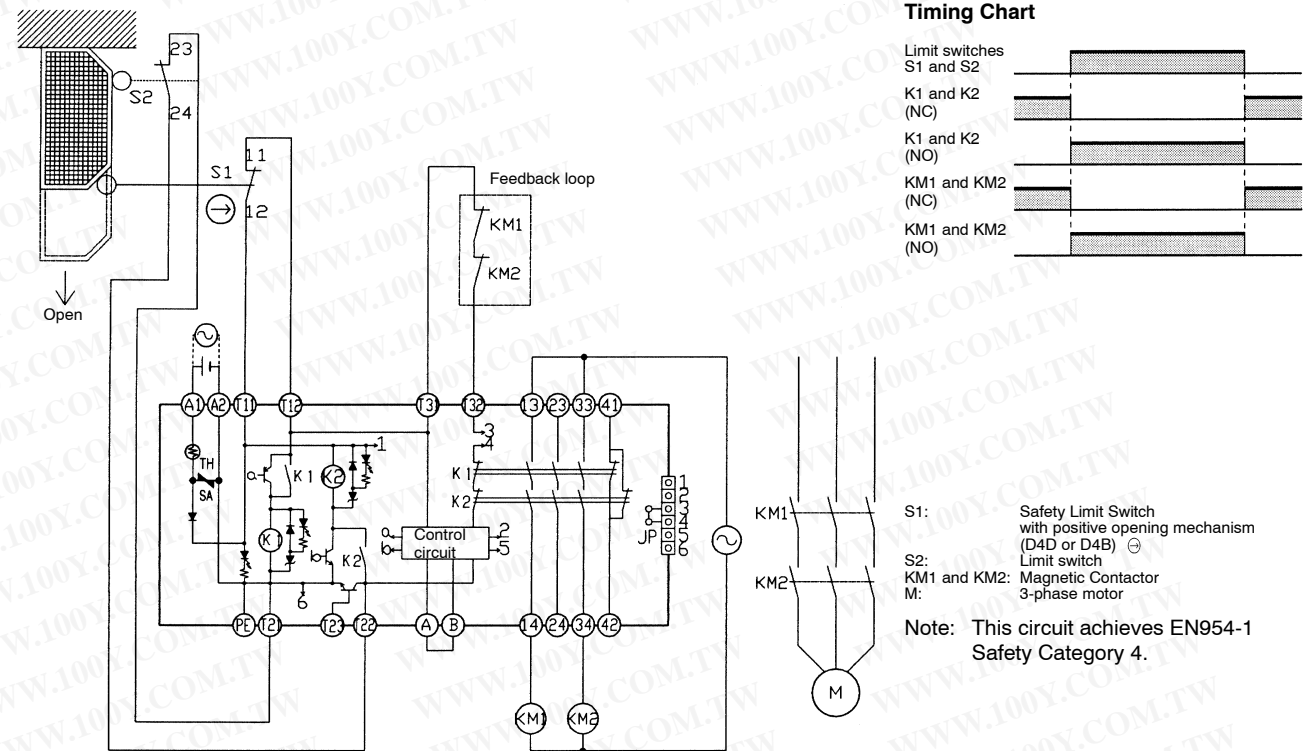
Item		G9SA-301	G9SA-501/321-T□	G9SA-EX301/EX031-T□
Contact resistance (See Note 1)		100 mΩ		
Operating time		30 ms max. (not including bounce time)		
Response time (See Note 2)		10 ms max. (not including bounce time)		
Insulation resistance (See Note 3)		100 MΩ min. (at 500 VDC)		
Dielectric strength	Between different outputs	2,500 VAC, 50/60 Hz for 1 min		
	Between inputs and outputs			
	Between power inputs and outputs			
	Between power inputs and other inputs (only for 100 to 240-V models)			
Vibration resistance		10 to 55 Hz, 0.75-mm double amplitude		
Shock resistance	Destruction	300 m/s ²		
	Malfunction	100 m/s ²		
Life expectancy	Mechanical	5,000,000 operations min. (at approx. 7,200 operations/hr)		
	Electrical	100,000 operations min. (at approx. 1,800 operations/hr)		
Minimum permissible load (reference value)		5 VDC, 1 mA		
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%		
Terminal tightening torque		0.98 N•m		
Weight (See Note 4)		Approx. 210 g	Approx. 270 g	Approx. 130 g
Approved standards		EN954-1, EN60204-1, UL508, CSA C22.2 No. 14		
EMC		EMI: EN55011 group 1 class A EMS: EN50082-2 group 1		

- Note: 1. The contact resistance was measured with 1 A at 5 VDC using the voltage-drop method.
 2. The response time is the time it takes for the main contact to open after the input is turned OFF.
 3. The insulation resistance was measured with 500 VDC at the same places that the dielectric strength was checked.
 4. Weight shown is for 24-VAC/VDC type. For 100 to 240-VAC type, add approximately 20 g.

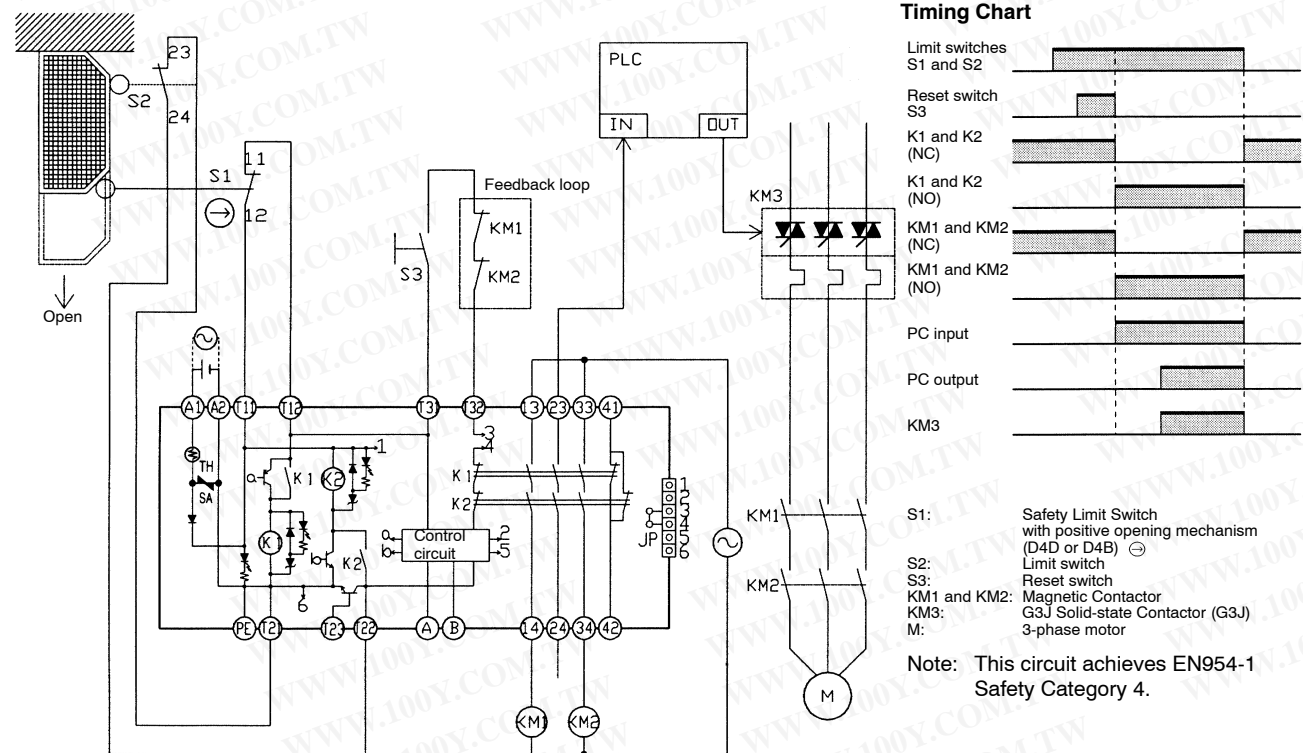
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Application Examples

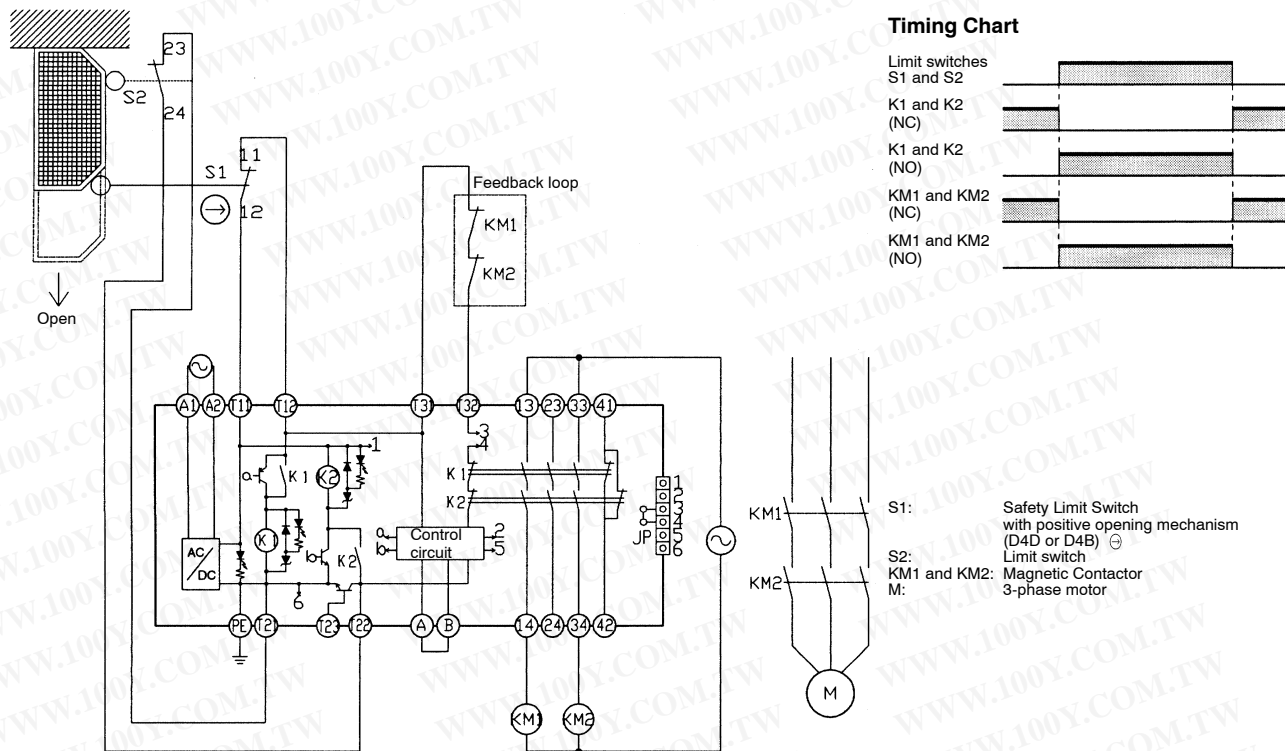
■ G9SA-301 (24 VAC/VDC) WITH 2-CHANNEL LIMIT SWITCH INPUT/AUTO-RESET



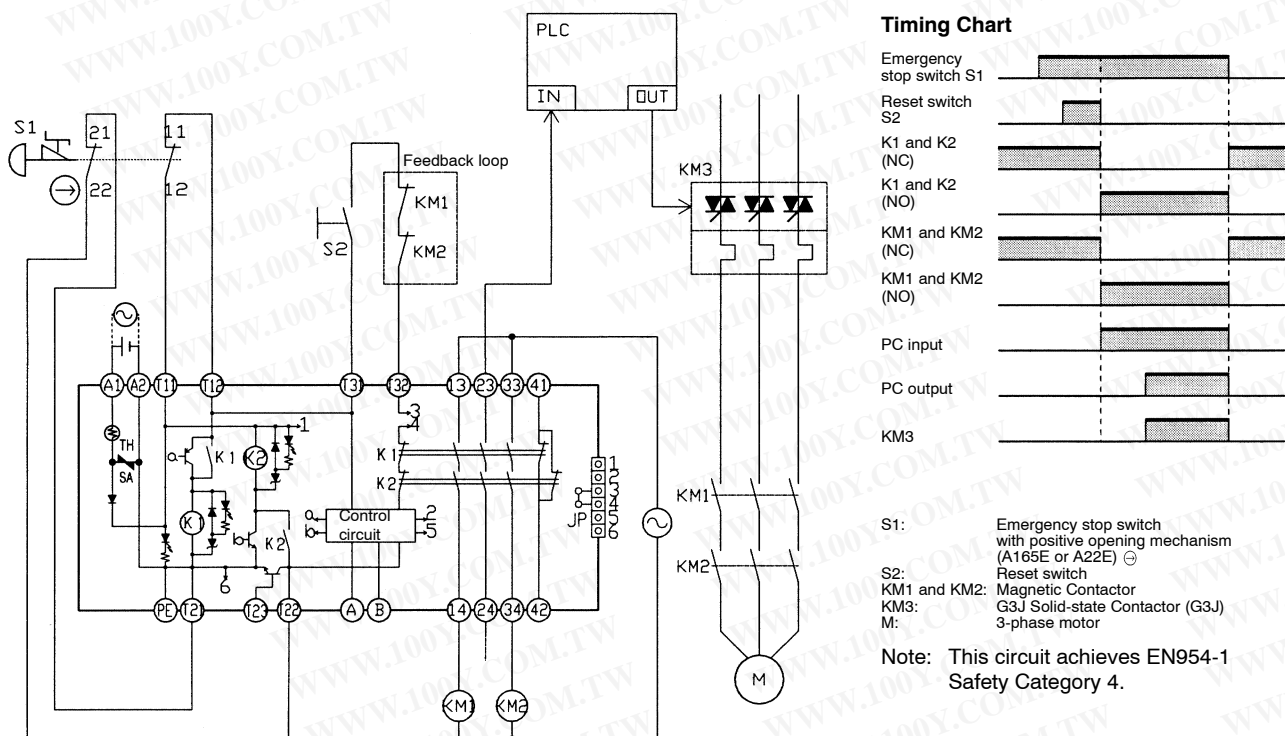
■ G9SA-301 (24 VAC/VDC) WITH 2-CHANNEL LIMIT SWITCH INPUT/MANUAL-RESET



■ G9SA-301 (100 TO 240 VAC) WITH 2-CHANNEL LIMIT SWITCH INPUT/AUTO-RESET

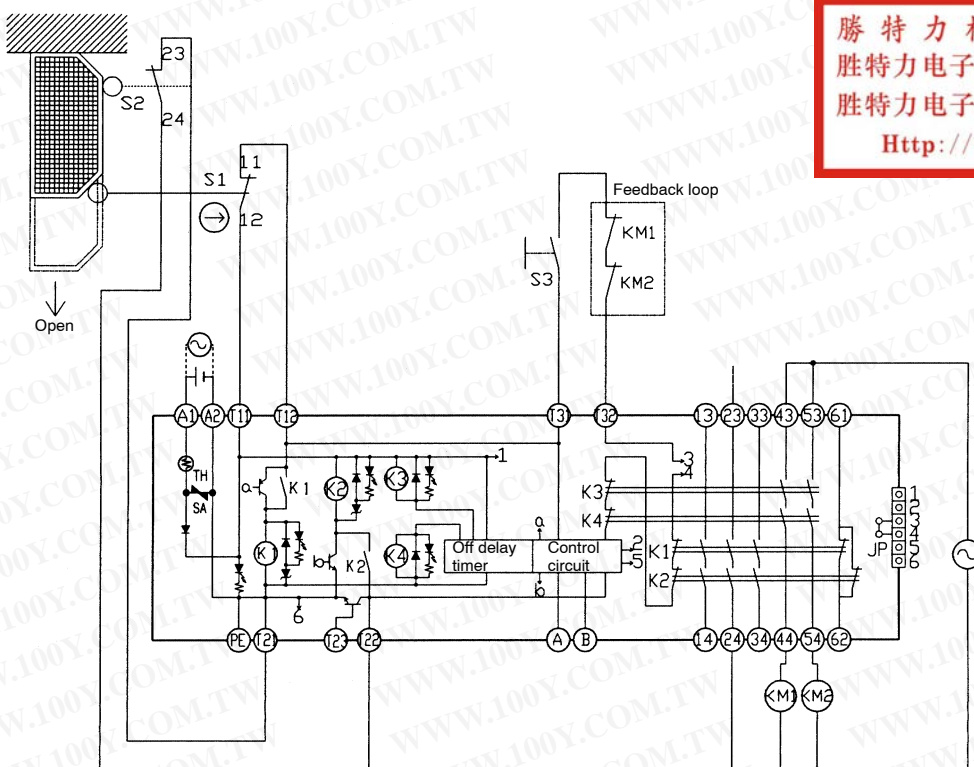


■ G9SA-301 (24 VAC/VDC) WITH 2-CHANNEL EMERGENCY STOP SWITCH INPUT/MANUAL-RESET



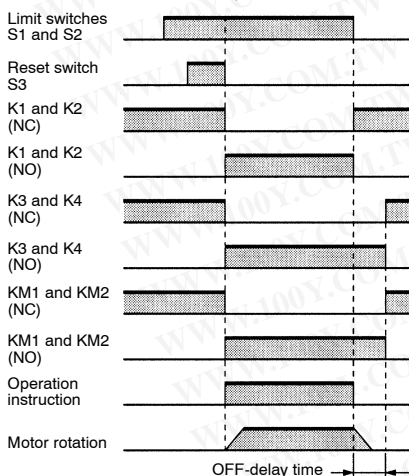
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■ G9SA-321-T□ (24 VAC/VDC) WITH 2-CHANNEL LIMIT SWITCH INPUT/MANUAL-RESET



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

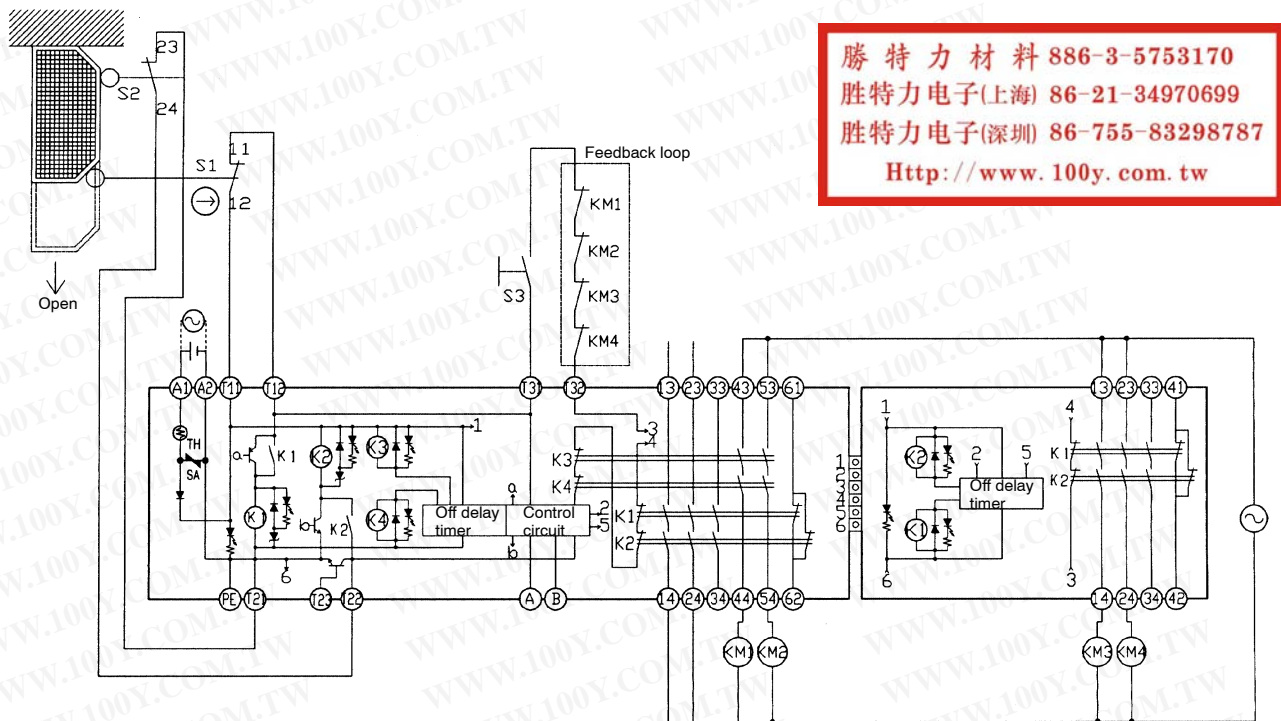
Timing Chart



Note: This circuit achieves EN954-1 Safety Category 4.
 The OFF-delay output, however, achieves EN954-1 Safety Category 3.

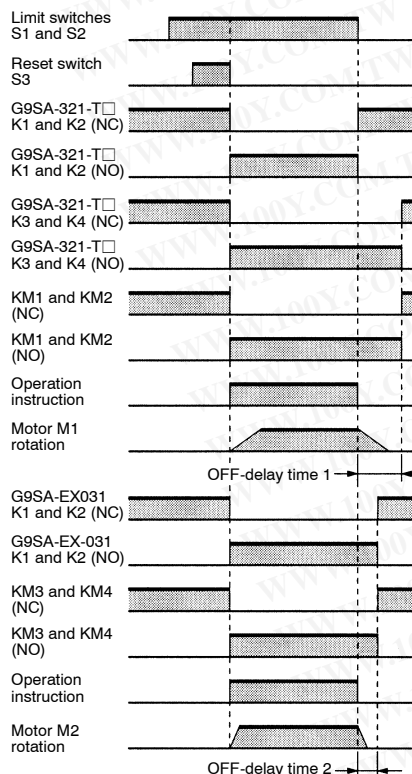
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■ G9SA-321-T□ (24 VAC/VDC) + G9SA-EX031-T□ WITH 2-CHANNEL LIMIT SWITCH INPUT/ MANUAL-RESET



- S1: Safety Limit Switch with positive opening mechanism (D4D or D4B) ⊖
 S2: Limit switch
 S3: Reset switch
 KM1, KM2, KM3, and KM4: Magnetic Contactor
 M1, M2: 3-phase motor

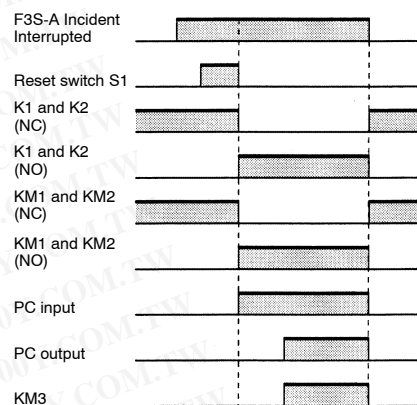
Timing Chart



Note: This circuit achieves EN954-1 Safety Category 4.
 The OFF-delay output, however, achieves EN954-1 Safety Category 3.

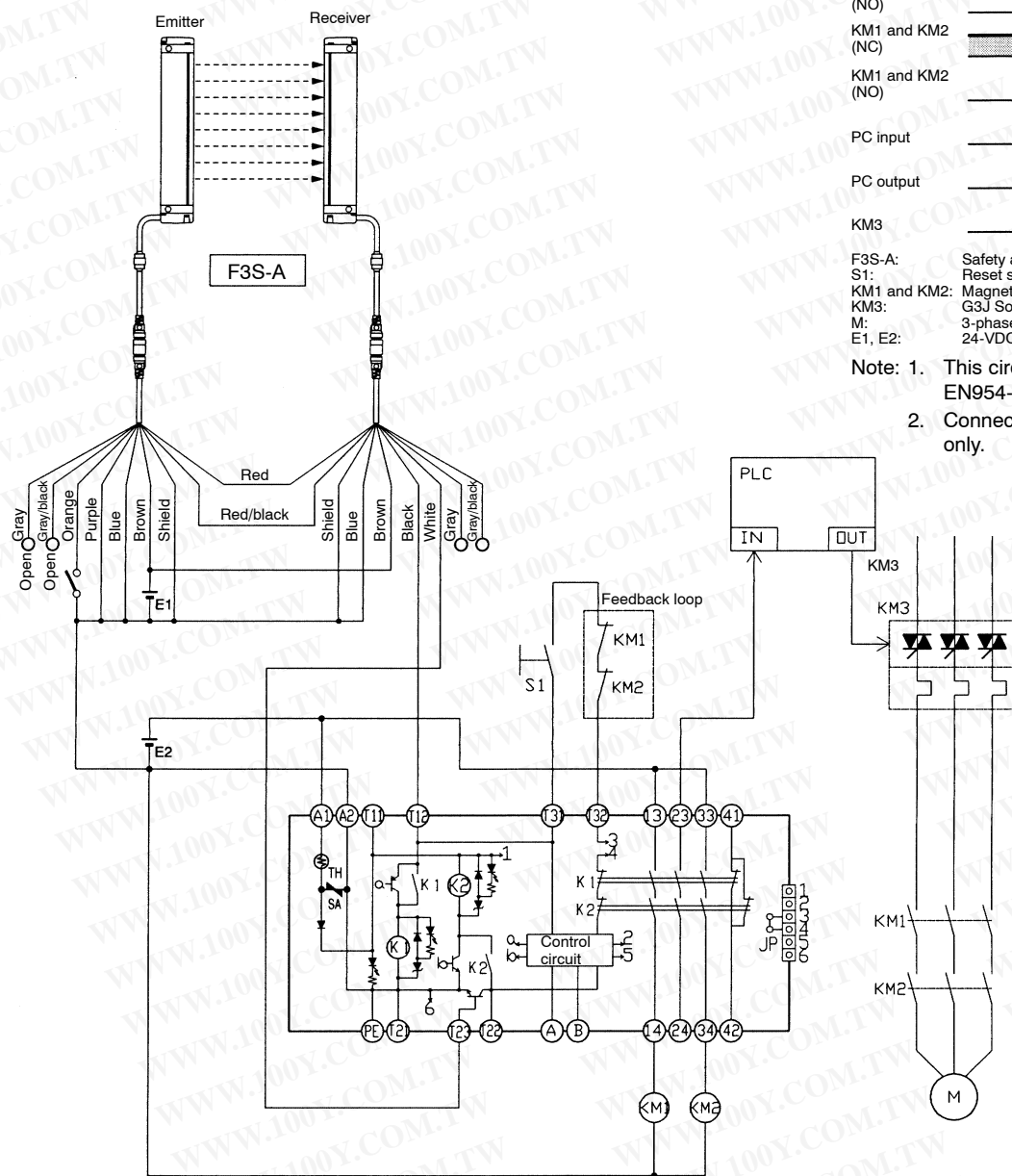
■ G9SA-301 (24 VAC/VDC) WITH 2-CHANNEL SAFETY AREA SENSOR/MANUAL-RESET

Timing Chart



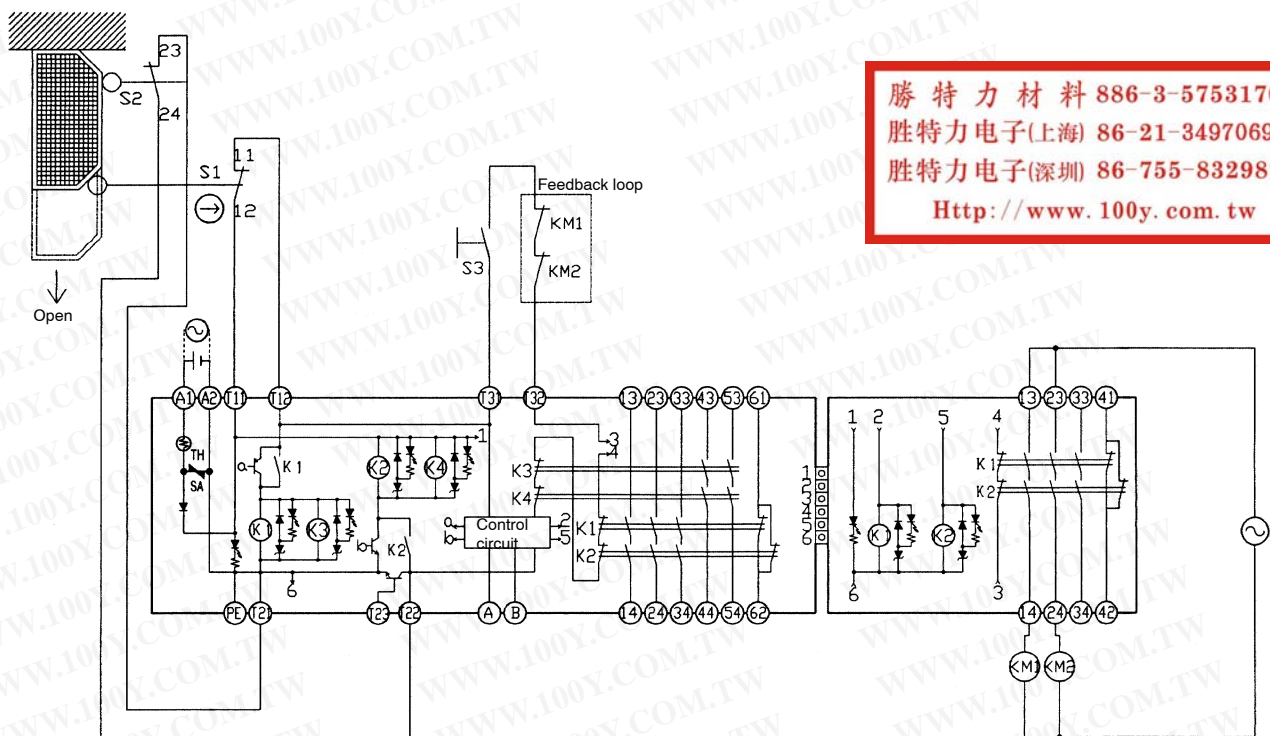
F3S-A: Safety area sensor
 S1: Reset switch
 K1 and K2: Magnetic Contactor
 KM3: G3J Solid-state Contactor (G3J)
 M: 3-phase motor
 E1, E2: 24-VDC Power Supply (S82K)

- Note: 1. This circuit achieves EN954-1 Safety Category 4.
 2. Connect E1 to model F3S-A only.



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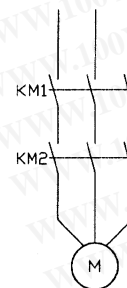
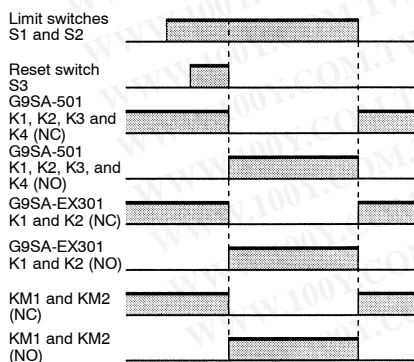
■ G9SA-501 (24 VAC/VDC) AND G9SA-EX031 WITH 2-CHANNEL LIMIT SWITCH INPUT/ MANUAL-RESET



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- S1: Safety Limit Switch
with positive opening mechanism
(D4D or D4B) ⊖
 S2: Limit switch
 S3: Reset switch
 KM1 and KM2: Magnetic Contactor
 M: 3-phase motor

Timing Chart



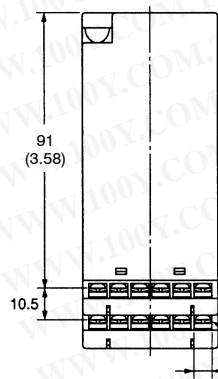
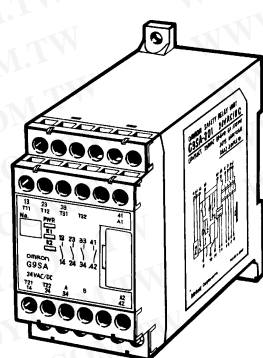
Note: This circuit achieves EN954-1 Safety Category 4.

Dimensions

Unit: mm (inch)

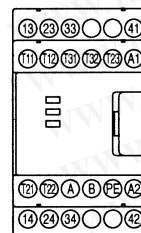
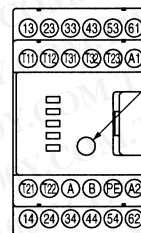
■ G9SA-301
 G9SA-501
 G9SA-321-T□

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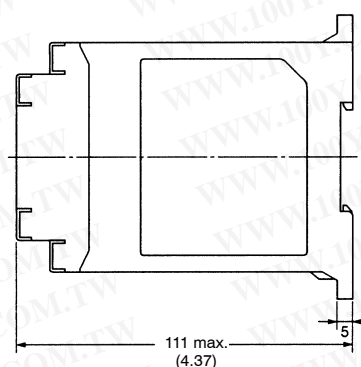
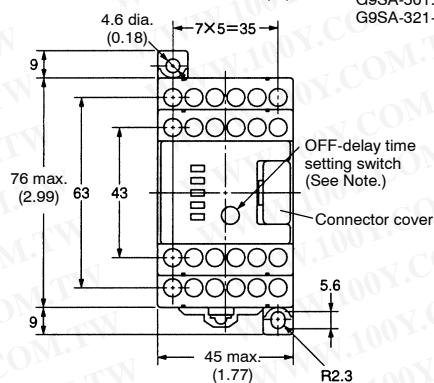
Terminal Arrangement

G9SA-301

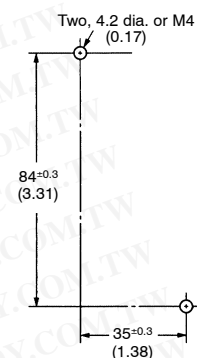
G9SA-501
G9SA-321-T□

OFF-
delay
time
setting
switch
(See
Note.)

G9SA-301: Twenty, M3
 G9SA-501: Twenty-four, M3
 G9SA-321-T□: Twenty-four, M3

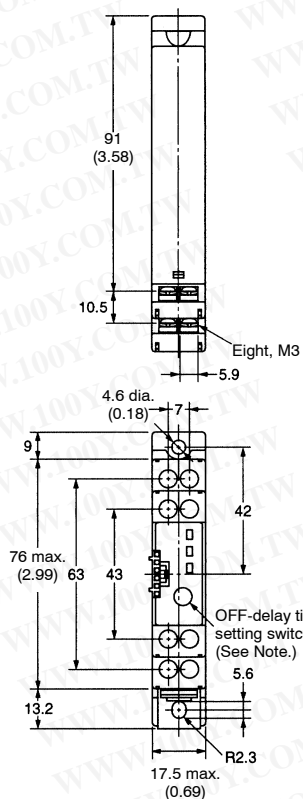
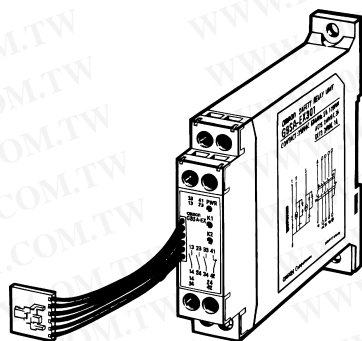


Mounting Holes



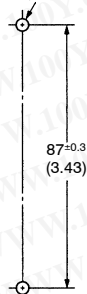
Note: The OFF-delay time setting switch is found on the G9SA-321-T□ only.

■ G9SA-EX301
G9SA-EX031-T□



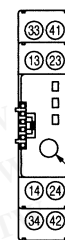
Mounting Holes

Two, 4.2 dia. or M4

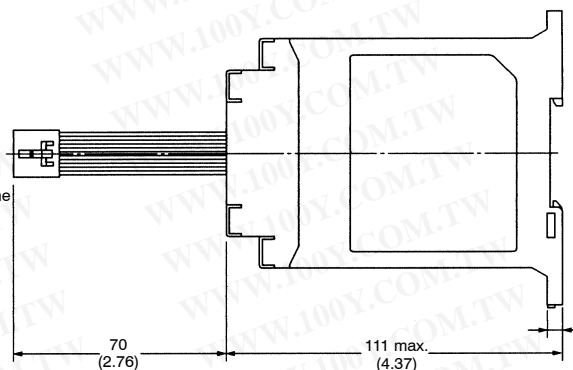


Terminal Arrangement

G9SA-EX301
G9SA-EX031-T□



OFF-delay time
setting switch
(See Note.)



Note: The OFF-delay time setting switch is found on the G9SA-EX031-T□ only.

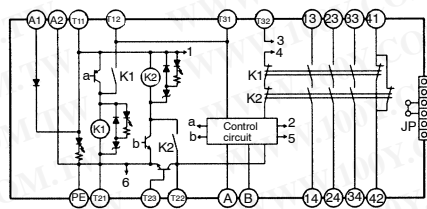
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Installation

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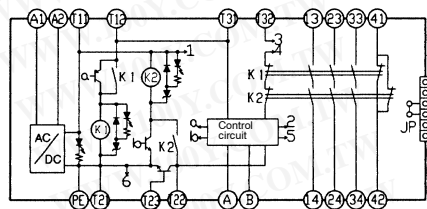
■ INTERNAL CONNECTIONS

G9SA-301 (24 VAC/VDC)



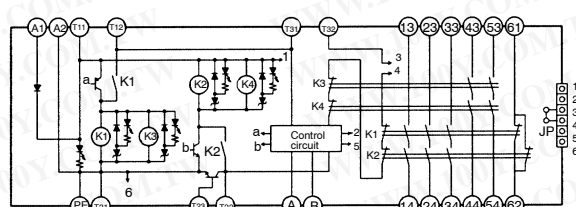
(See note 2.) (See note 1.)

G9SA-301 (100 to 240 VAC)



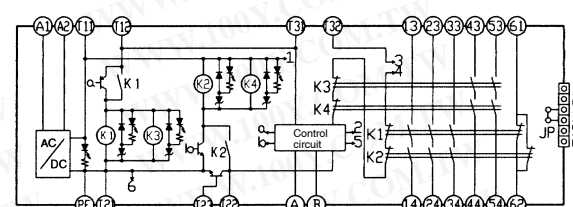
(See note 2.) (See note 1.)

G9SA-501 (24 VAC/VDC)



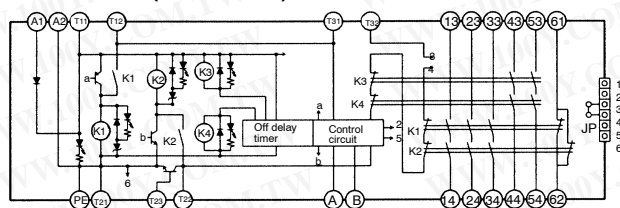
(See note 2.) (See note 1.)

G9SA-501 (100 to 240 VAC)



(See note 2.) (See note 1.)

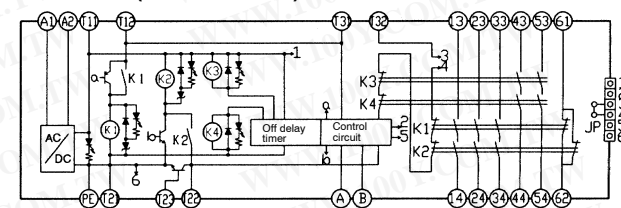
G9SA-321-T (24 VAC/VDC)



(See note 2.)

(See note 1.)

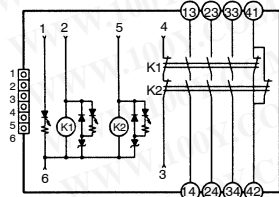
G9SA-321-T (100 to 240 VAC)



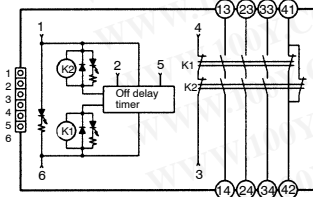
(See note 2.)

(See note 1.)

G9SA-EX301



G9SA-EX031-T



Note: 1. Use terminals A and B to switch reset mode.

A to B open: Manual reset

A to B closed: Auto-reset

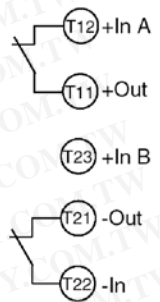
2. Use terminal T23 with + common 2-channel input. When using T23, make sure that T21 and T22 are open. For 1-channel input, make sure T12 and T23 are closed.

3. With 100 to 240-VAC type, be sure to connect PE to a protective ground. With 24-VAC/VDC type, if the power supply is not connected to a protective ground, be sure to connect PE to a protective ground.

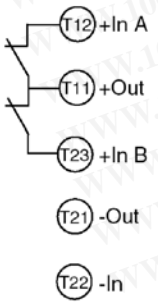
4. With 24-VAC/VDC type, the power supply terminals A1 and A2 have polarities. A2 is the negative pole.

EXTERNAL CONNECTIONS

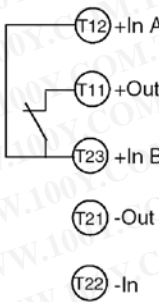
**2 Channel Input
(1+ve and 1 -ve)**



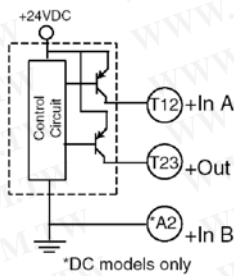
**2 Channel Input
(2+ve)**



**1 Channel Input
(1 +ve)**



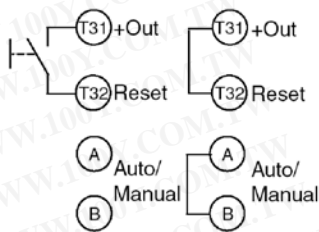
**2 Channel Input
(2 PNP, Solid State)**



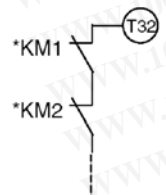
*DC models only

Manual Reset

Auto Reset



**External Device
Monitoring**



*Add N.C. contacts of external devices in series with T32

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Precautions

■ WIRING

Turn OFF the G9SA before wiring the G9SA to avoid electrical shock. Do not touch the terminals of the G9SA while the power is turned ON because the terminals are charged.

Use the following to wire the G9SA.

Stranded wire: 0.75 to 1.5 mm² 16 to 18 AWG

Solid wire: 1.0 to 1.5 mm² 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 G9SA may malfunction or generate heat.

External inputs connected to T11 and T12 or T21 and T22 of the G9SA-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 EXPANSION UNITS

Turn OFF the G9SA before connecting the Expansion Unit.

When an Expansion Unit is being used, remove the connector cover from the G9SA Safety Relay Unit (G9SA-301, G9SA-501, or G9SA-321□), and insert the connector of the Expansion Unit's connector cable.

■ APPLICABLE SAFETY CATEGORY (EN954-1)

All G9SA-series Relays meet the requirements of Safety Category 4 of the EN954-1 standards when they are used as shown in the examples provided by OMRON. The Relays may not meet the standards in some operating conditions. The OFF-delay output of models G9SA-321-T□ and EX031-T□, however, conform to Safety Category 3.

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

■ MANUAL RESTART MODE

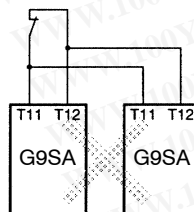
Always use NO (normally open) contacts for your reset switch, as shown in the application examples.

■ 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 G9SA models, inputs cannot be made using the same switch. This is also true for other input terminals.



■ EARTH SHORT

A positive thermistor is built into the G9SA circuits, so you can detect earth short breakdowns and breakdown shorts between channel 1 and channel 2. If the short breakdown is canceled, reset is automatic.

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