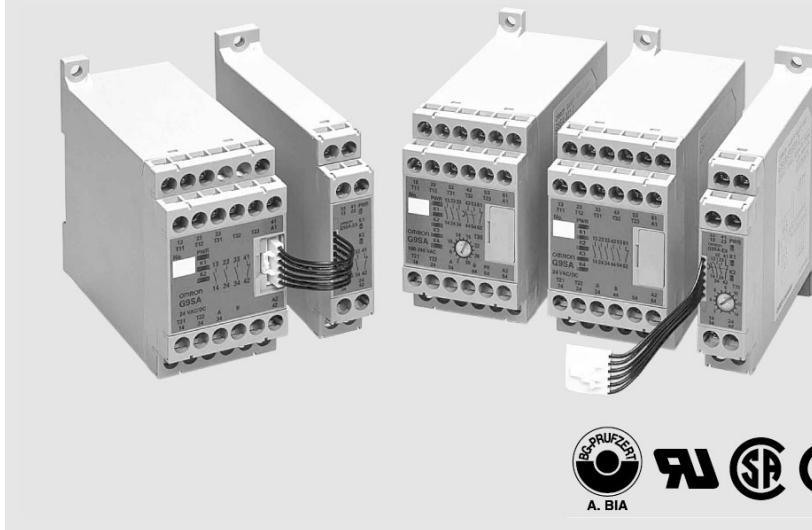


Safety Relay Unit

G9SA

- Four kinds of 45-mm wide Units are available:
A 3-safety contact model, a 5-safety contact model, and models with 3 safety contacts and 2 OFF-delay safety contacts.
Also available are 17.5-mm wide Expansion Units with 3 safety contacts and 3 OFF-delay safety contacts.
- Two hand controller (type III C, EN 574)
- Simple expansion connection.
- OFF-delay models have 15-step OFF-delay settings.
- Conforms to EN standards. (BG approval)
- Approved by UL and CSA.
- Both DIN track mounting and screw mounting are possible.
- Suitable for PNP OSSD outputs of safety sensors, F3SN, F3SH, F3S-B, F3S-TGR, F3SL

The G9SA Series Offers a Complete Line-up of Compact Units.



Ordering Information

Emergency-stop Units

Main contacts	Auxiliary contact	Number of input channels	Rated voltage	Model	Category
3PST-NO	SPST-NC	1 channel or 2 channels possible	24 VAC/VDC 100 to 240 VAC	G9SA-301	4
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	Model	Category	
3PST-NO	DPST-NO	SPST-NC	1 channel or 2 channels possible	7.5 s	24 VAC/VDC	G9SA-321-T075	Main contacts: 4 OFF-delay contacts: 3	
					100 to 240 VAC			
				15 s	24 VAC/VDC	G9SA-321-T15		
					100 to 240 VAC			
				30 s	24 VAC/VDC	G9SA-321-T30		
					100 to 240 VAC			

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

Two-hand Controller

Main contacts	Auxiliary contact	Number of input channels	Rated voltage	Model	Category
3PST-NO	SPST-NC	2 channels	24 VAC/VDC	G9SA-TH301	4 (IIIc, EN574)
			100 to 240 VAC		

Expansion Unit

321, or G9SA-TH301.

The Expansion Unit connects to a G9SA-301, G9SA-501, G9SA-

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

Expansion Units with OFF-delay Outputs

The Expansion Unit connects to a G9SA-301, G9SA-501, G9SA-321, or G9SA-TH301.

Main contact form	Auxiliary contact	OFF-delay time	Model	Category
3PST-NO	SPST-NC	7.5 s	G9SA-EX031-T075	3
		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

TH: Two-hand Controller

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

Specifications

Ratings

Power Input

Item	G9SA-301/TH301	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: 1.8 VA/1.7 W max. 100 to 240 VAC: 9 VA max.	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-301/321-T□/TH301	G9SA-501
Input current (See note.)	40 mA max.	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□/TH301/EX301/EX031-T□
Resistive load ($\cos \phi = 1$)	
Rated load	250 VAC, 5 A
Rated carry current	5 A

Characteristics

Item	G9SA-301/TH301	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 Between inputs and outputs Between power inputs and outputs Between power inputs and other inputs (only for 100 to 240-V models)	2,500 VAC, 50/60 Hz for 1 min	
Vibration resistance	10 to 55 Hz, 0.75-mm double amplitude		
Shock resistance	Destruction Malfunction	300 m/s ² 100 m/s ²	
Durability	Mechanical Electrical	5,000,000 operations min. (at approx. 7,200 operations/hr) 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, EN574 (-TH301), 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.

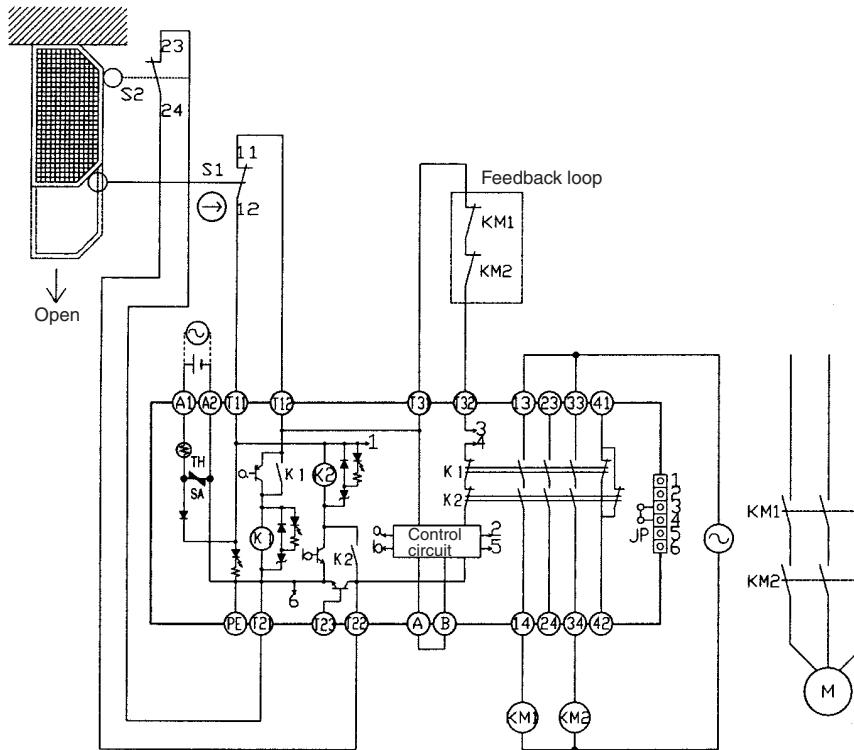
2. The response time is the time it takes for the main contact to open after the input is turned OFF.

3. The insulation resistance was measured with 500 VDC at the same places that the dielectric strength was checked.

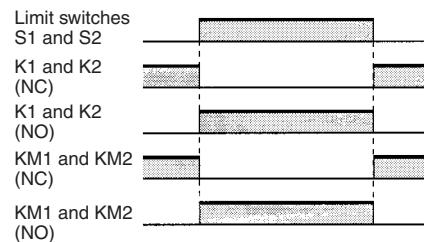
4. Weight shown is for 24-VAC/VDC type. For 100 to 240-VAC type, add approximately 20 g.

Application Examples

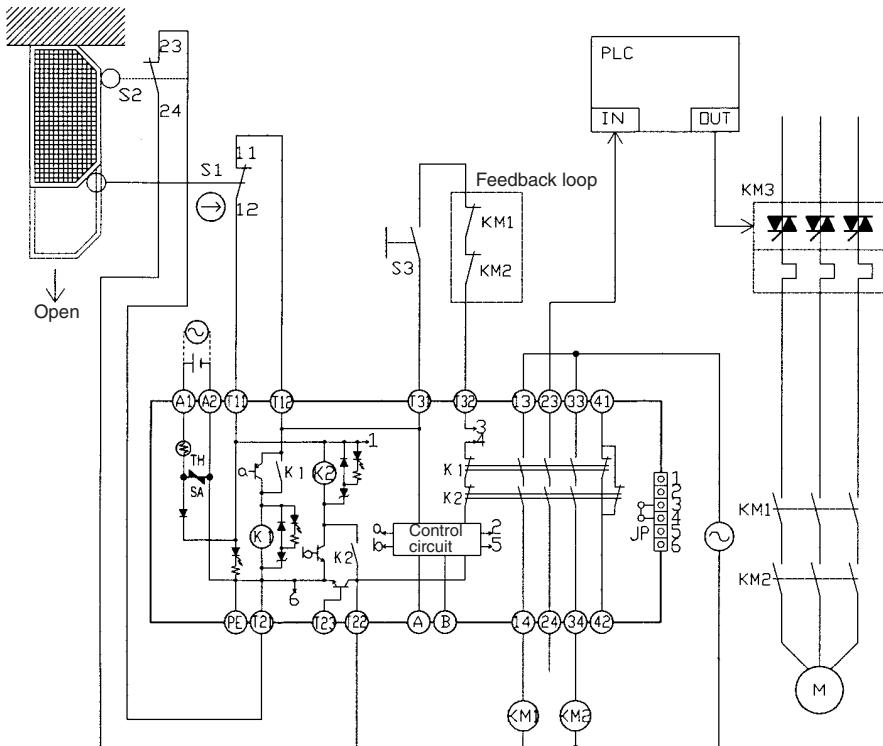
G9SA-301 (24 VAC/VDC) with 2-channel Limit Switch Input/Auto-reset



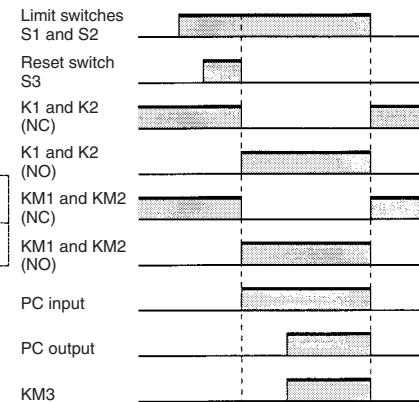
Timing Chart



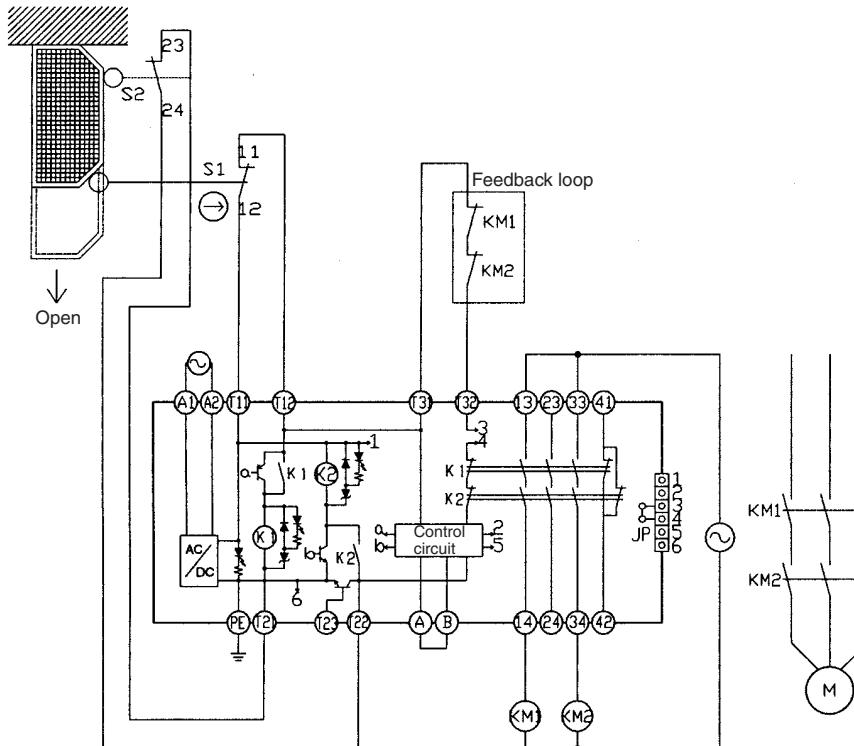
G9SA-301 (24 VAC/VDC) with 2-channel Limit Switch Input/Manual-reset



Timing Chart



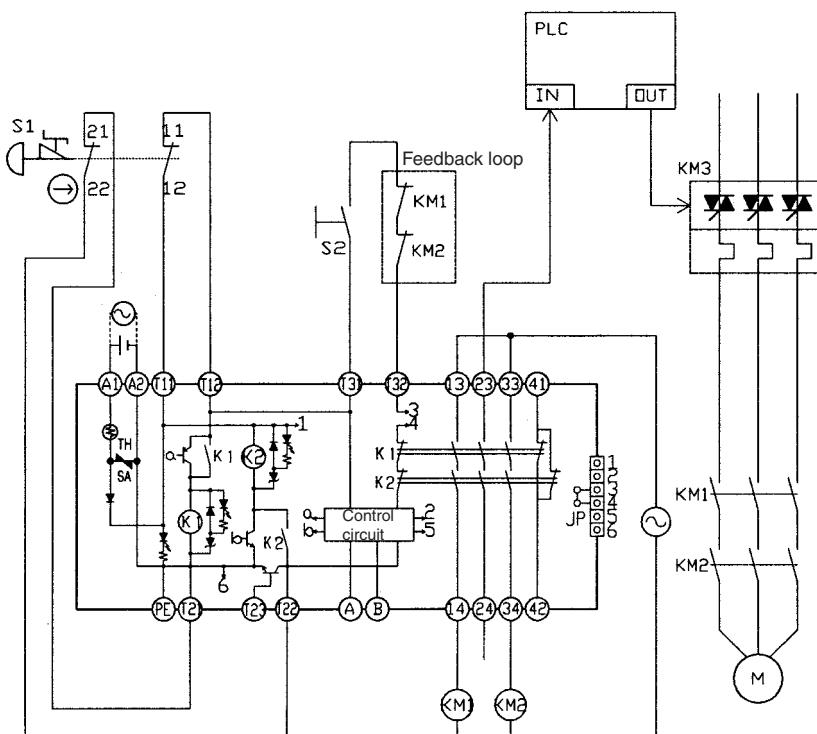
G9SA-301 (100 to 240 VAC) with 2-channel Limit Switch Input/Auto-reset



S1: Safety Limit Switch
with direct opening mechanism
(D4N or D4B) ⊕
S2: Limit switch
KM1 and KM2: Magnetic Contactor
M: 3-phase motor

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

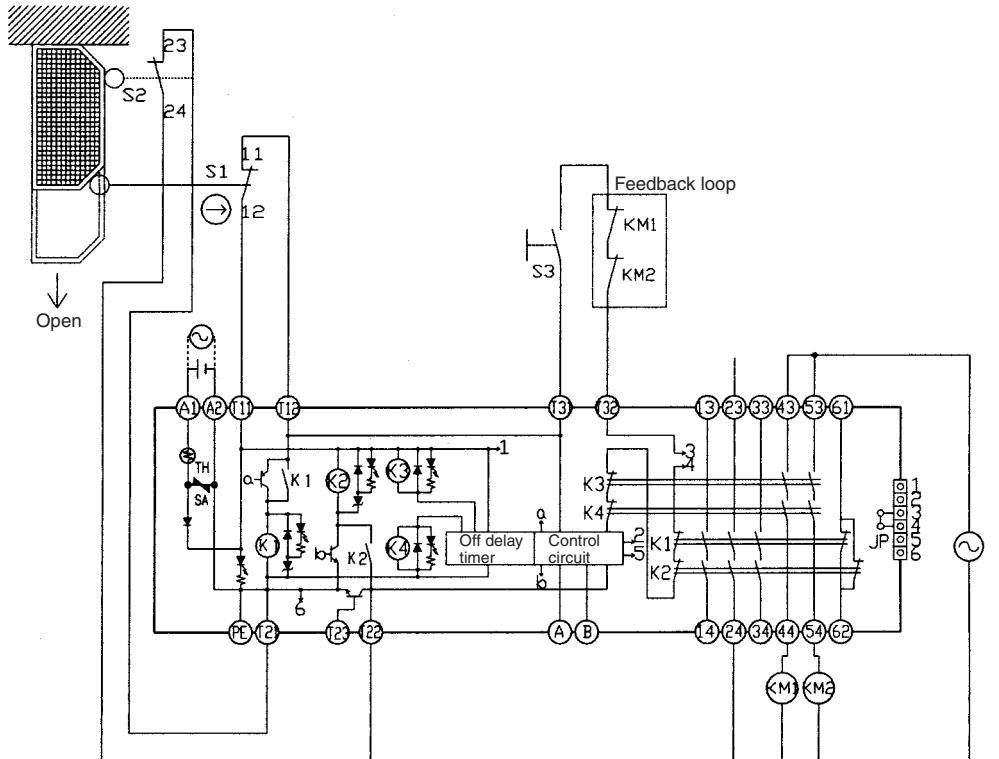
G9SA-301 (24 VAC/VDC) with 2-channel Emergency Stop Switch Input/Manual-reset



S1: Emergency stop switch
with direct opening mechanism
(A165E or A22E) ⊕
S2: Reset switch
KM1 and KM2: Magnetic Contactor
KM3: Solid-state Contactor
M: 3-phase motor

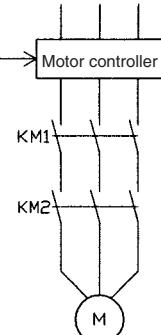
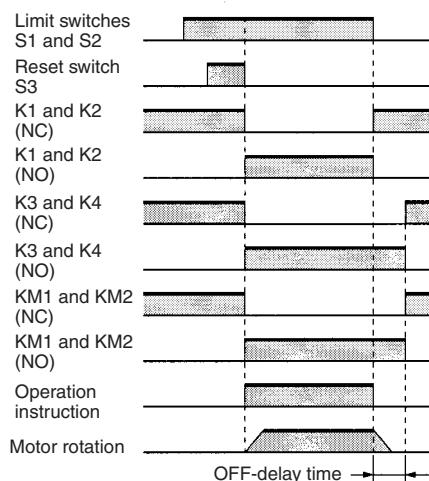
Note: This circuit achieves EN954-1 Safety Category 4.

G9SA-321-T□ (24 VAC/VDC) with 2-channel Limit Switch Input/Manual-reset



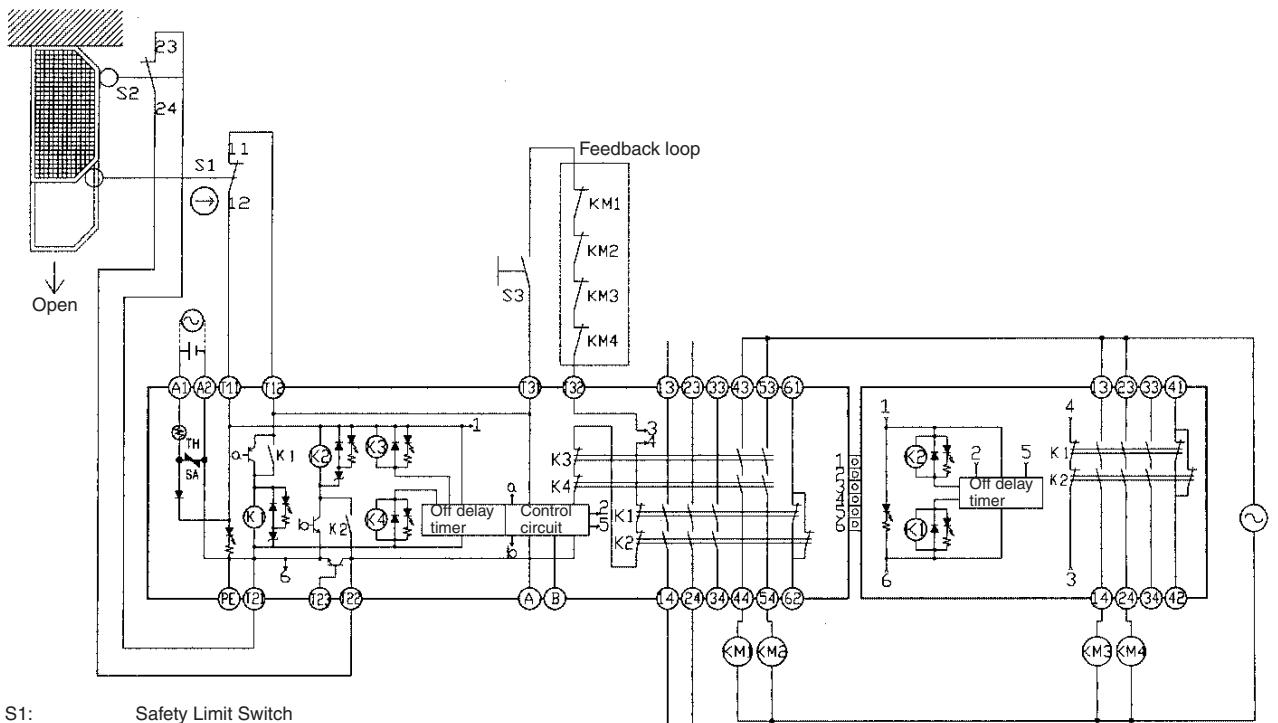
S1: Safety Limit Switch
 with direct opening mechanism
 (D4N or D4B) ⊖
 S2: Limit switch
 S3: Reset switch
 KM1 and KM2: Magnetic Contactor
 M: 3-phase motor

Timing Chart



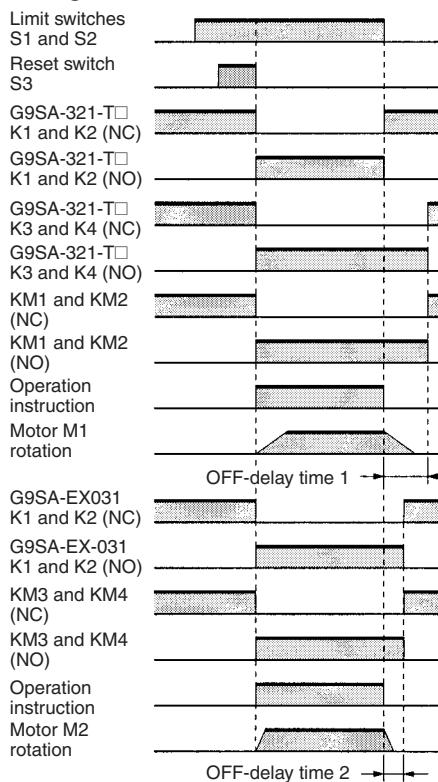
Note: This circuit achieves EN954-1 Safety Category 4.
 The OFF-delay output, however, achieves EN954-1 Safety Category 3.

G9SA-321-T□ (24 VAC/VDC) + G9SA-EX031-T□ with 2-channel Limit Switch Input/Manual-reset

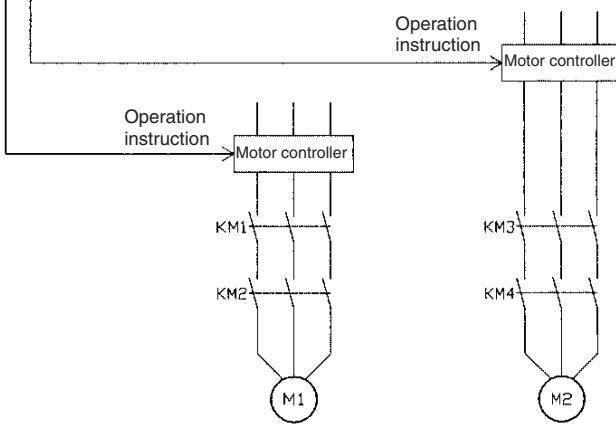


S1: Safety Limit Switch with direct opening mechanism (D4N or D4B) ⊖
 S2: Limit switch
 S3: Reset switch
 KM1, KM2,
 KM3, and KM4: Magnetic Contactor
 M1, M2: 3-phase motor

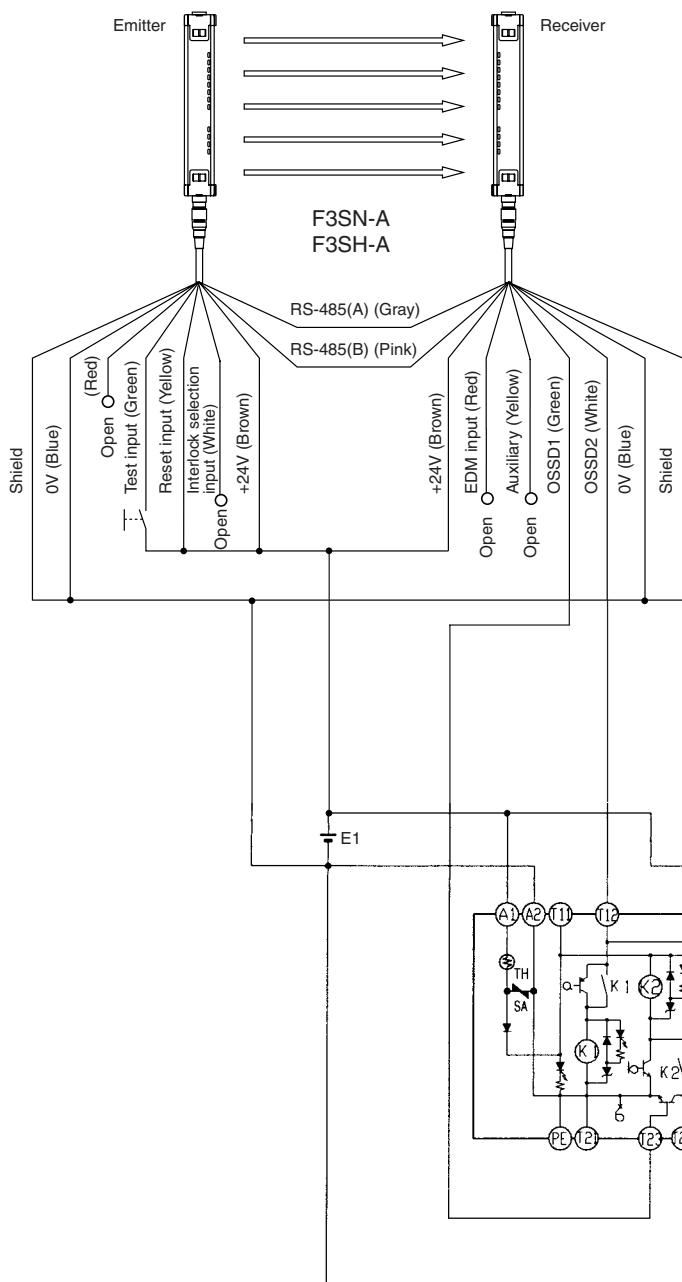
Timing Chart



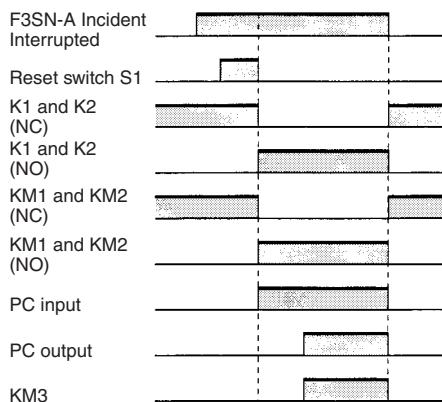
Note: This circuit achieves EN954-1 Safety Category 4. The OFF-delay output, however, achieves EN954-1 Safety Category 3.



G9SA-301 (24 VAC/VDC) with 2-channel Safety Area Sensor/Manual-reset

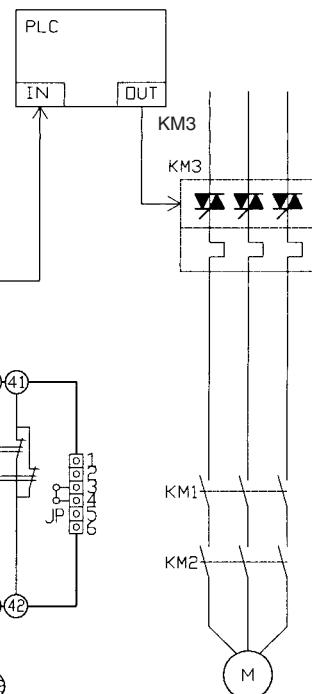


Timing Chart

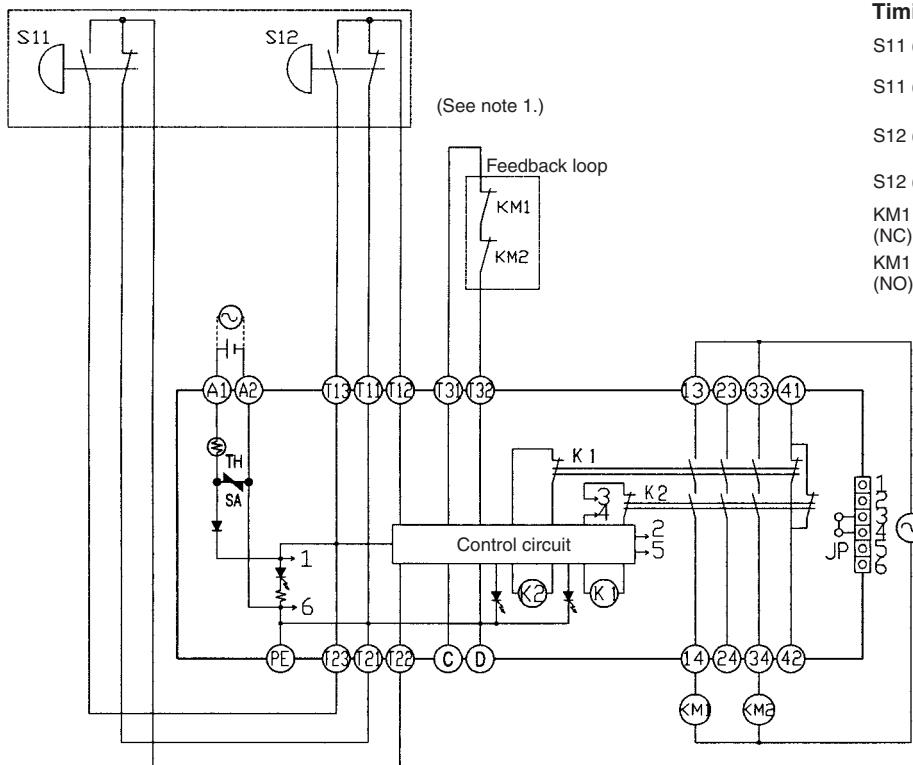


F3SN-A: Safety area sensor
S1: Reset switch
KM1 and KM2: Magnetic Contactor
KM3: Solid-state Contactor
M: 3-phase motor
E1: 24-VDC Power Supply

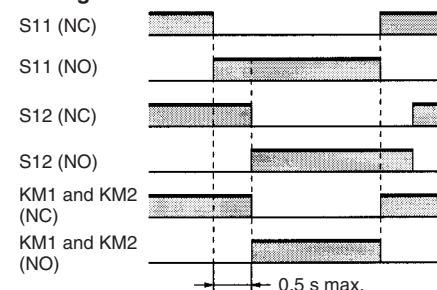
Note: This circuit achieves EN954-1 Safety Category 4.



G9SA-TH301 (24 VDC) with 2-hand Inputs/Auto-reset



Timing Chart



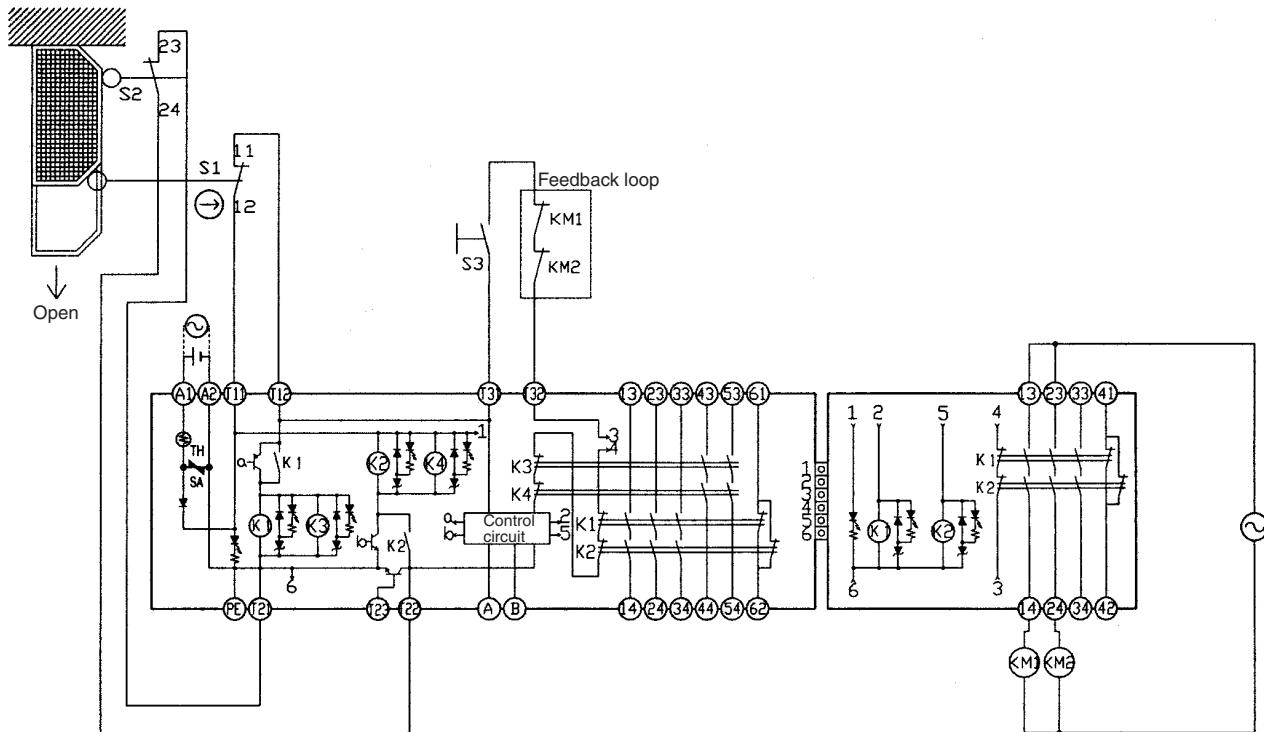
Input time difference operates only
when the difference is 0.5 s max.

S11, S12: Two-hand pushbutton switches
KM1 and KM2: Magnetic Contactor

Note:

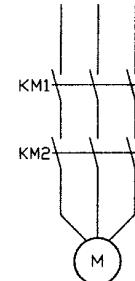
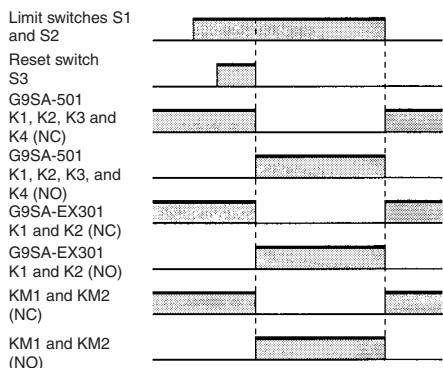
1. Use a 1NC+1NO switch for S11 and S12.
2. This circuit achieves EN954-1 Safety Category 4.
Typ III C (EN 574)

G9SA-501 (24 VAC/VDC) and G9SA-EX301 with 2-channel Limit Switch Input/Manual-reset



S1: Safety Limit Switch
 with direct opening mechanism
 (D4N or D4B) \ominus
 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

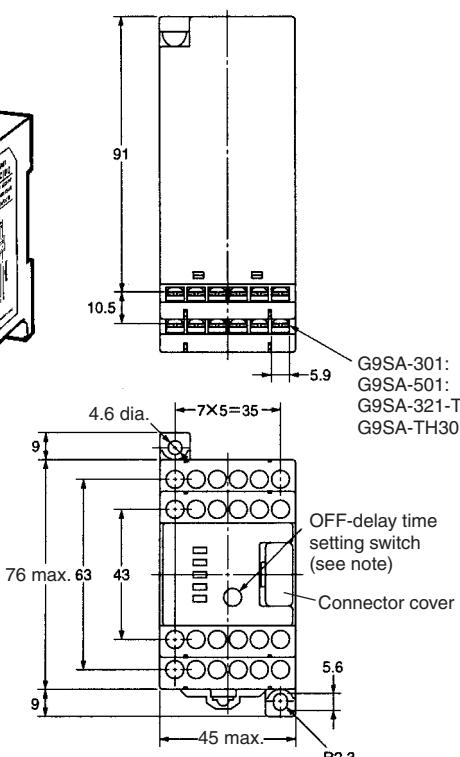
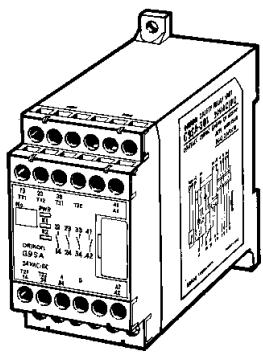
Note: All units are in millimeters unless otherwise indicated. The diagrams are drawn in perspective.

G9SA-301

G9SA-501

G9SA-321-T□

G9SA-TH301

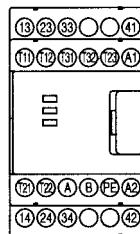


Note: The OFF-delay time setting switch is found on the G9SA-321-T□ only.

Terminal Arrangement

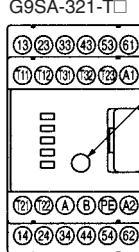
G9SA-301

G9SA-501
G9SA-321-T□

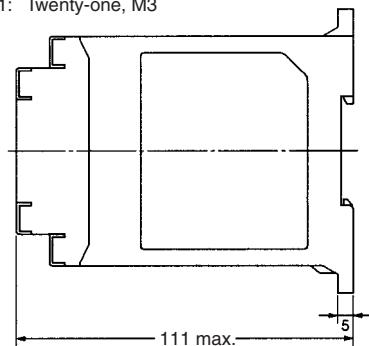


G9SA-TH301

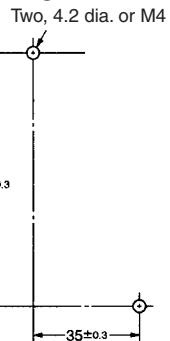
OFF-delay time setting switch (see note)



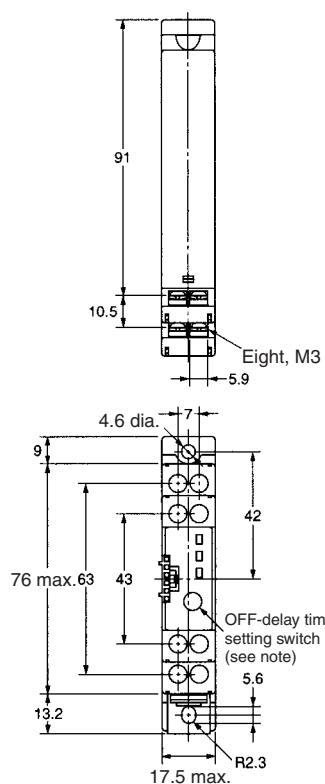
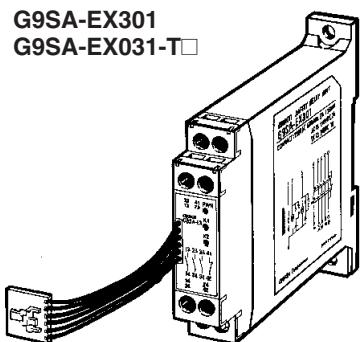
Mounting Holes



Mounting Holes



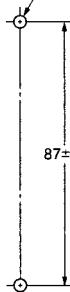
G9SA-EX301
G9SA-EX031-T□



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

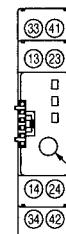
Mounting Holes

Two, 4.2 dia. or M4

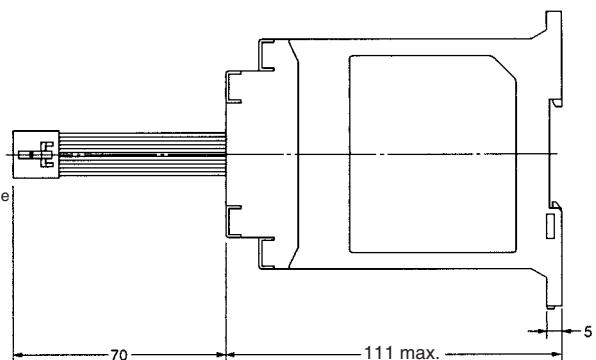


Terminal Arrangement

G9SA-EX301
G9SA-EX031-T□



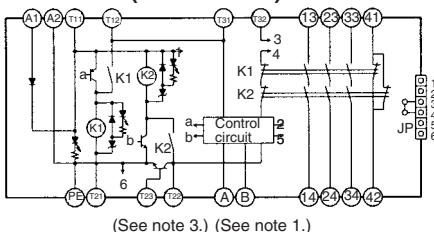
OFF-delay time setting switch (see note)



Installation

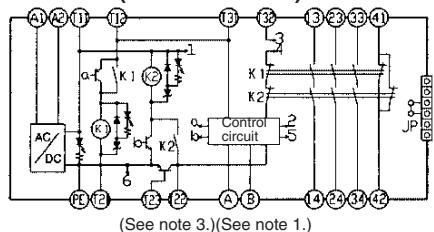
Internal Connections

G9SA-301 (24 VAC/VDC)



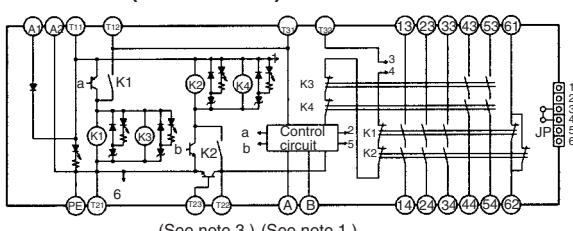
(See note 3.) (See note 1.)

G9SA-301 (100 to 240 VAC)



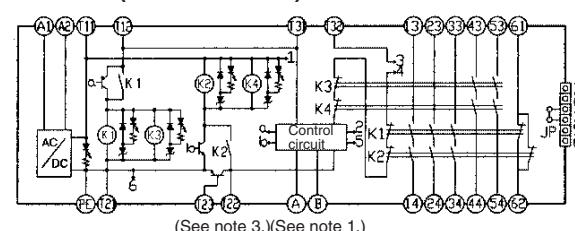
(See note 3.) (See note 1.)

G9SA-501 (24 VAC/VDC)



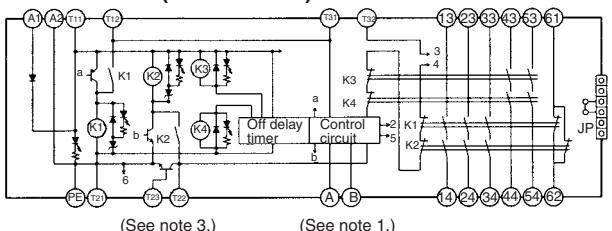
(See note 3.) (See note 1.)

G9SA-501 (100 to 240 VAC)



(See note 3.) (See note 1.)

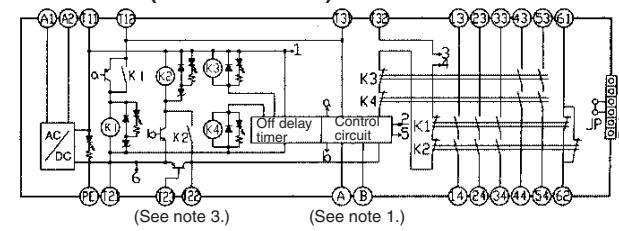
G9SA-321-T□ (24 VAC/VDC)



(See note 3.)

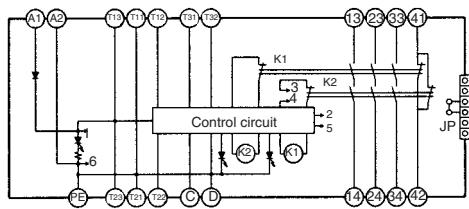
(See note 1.)

G9SA-321-T□ (100 to 240 VAC)



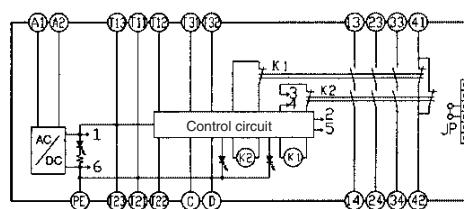
(See note 3.) (See note 1.)

G9SA-TH301 (24 VAC/VDC)



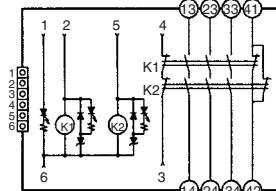
(See note 2.)

G9SA-TH301 (100 to 240 VAC)



(See note 2.)

G9SA-EX301

**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 terminals C and D to switch input conditions.

C to D open: DPDT input.
C to D closed: DPST-NC input. (Make sure T11 and T21 are open.)

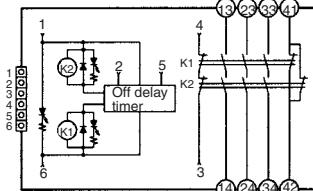
3. Use terminal T23 with + common 2-channel input.

When using T23, make sure that T21 and T22 are open. For 1-channel input, make sure T12 and T23 are closed.

4. 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.

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

G9SA-EX031-T□



Precautions

Do not touch the terminal area of the Relays or the socket terminal area (charged area) while power is ON. Electric shock will result.

Wiring

Turn OFF the G9SA before wiring the G9SA. Do not touch the terminals of the G9SA while the power is turned ON, because the terminals are charged and may cause an electric shock.

Use the following to wire the G9SA.

Stranded wire: 0.75 to 1.5 mm²

Solid wire: 1.0 to 1.5 mm²

Tighten each screw to a torque of 0.78 to 1.18 N·m, 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, G9SA-321□, or G9SA-TH301) and insert the connector of the Expansion Unit's connector cable.

Applicable Safety Category (EN954-1)

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.

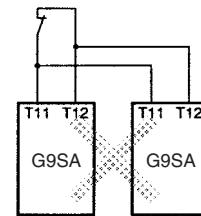
The applicable safety category is determined from the whole safety control system. Make sure that the whole safety control system meets EN954-1 requirements.

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.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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