Safety Relay Unit

G9SE

Compact safety relay units for E-Stop, door and safety monitoring applications.

- Simple front side wiring using screw-less terminals.
- 17.5 or 22.5 mm width to save mounting space
- 15 ms max. response time
- Safe OFF delay function up to PLe
- Easy maintenance with status indicators
- Approved standards:
  EN ISO13849-1: 2008 PL e Safety Category 4,
  IEC/EN 60947-5-1, IEC/EN 62061 SIL3, EN 81-1,
  EN81-2, UL508, CAN/CSA C22.2 No.14

Model Number Structure

Model Number Legend

G9SE - ☐☐☐☐ - ☐☐☐
     (1) (2) (3) (4)   (5)

(1) Function
None: Emergency stop

(2) Safety Output Configuration (Instantaneous Outputs)
2: DPST-NO
4: 4PST-NO

(3) Safety Output Configuration (OFF-delayed Output)
0: None
2: DPST-NO

(4) Auxiliary Output Configuration
1: PNP output

(5) Max. OFF-delay Time
None:
T05: 5 seconds
T30: 30 seconds

Ordering Information

Safety outputs		Auxiliary outputs[1]	Max. OFF-delay time[2]	Rated voltage	Model
Instantaneous	OFF-delayed[3]				
DPST-NO	–	1 (Solid-state)	–	24 VDC	**G9SE-201**
4PST-NO					**G9SE-401**
DPST-NO	DPST-NO		5 s		**G9SE-221-T05**
DPST-NO	DPST-NO		30 s		**G9SE-221-T30**

[1] PNP transistor output
[2] The OFF-delay time can be set in 16 steps as follows:
   T05: 0/0.1/0.2/0.3/0.4/0.5/0.6/0.7/0.8/1/1.5/2/2.5/3/4/5 s
   T30: 0/1/2/4/5/6/7/8/9/10/12/14/16/20/25/30 s
[3] The OFF-delayed output becomes an instantaneous output by setting the OFF-delay time to 0 s.

G9SE

Specifications

Ratings
Power Input

Item / Model	G9SE-201	G9SE-401	G9SE-221-T□
Rated supply voltage	24 VDC		
Operating voltage range	−15% to 10% of rated supply voltage		
Rated power consumption [*1]	3 W max.	4 W max.	

[*1] Power consumption of loads not included.

Outputs

Item / Model	G9SE-201	G9SE-401	G9SE-221-T□
Safety output OFF-delayed Safety output	Contact output 250 VAC 5 A 30 VDC 5 A (resistance load)		
Auxiliary output	PNP transistor output Load current: 100 mA DC max.		

Characteristics

Item / Model		G9SE-201	G9SE-401	G9SE-221-T□
Operating time (OFF to ON state)[*1]		100 ms Max.[*2]		
Response time (ON to OFF state)[*3]		15 ms Max.		
Accuracy of OFF-delay time		−		Within plus or minus 10% of the set value
Inputs	Input current	5 mA Min.		
	ON voltage	11 VDC Min.		
	OFF voltage	5 VDC Max.		
	OFF current	1 mA Max.		
	Maximum cable length	100 m Max.		
	Reset input time	250 ms Min.		
Contact outputs	Contact resistance[*4]	100 mΩ		
	Mechanical durability	5,000,000 operations Min.		
	Electrical durability	50,000 operations Min.		
	Switching specification Inductive load (IEC/EN60947-5-1)	AC15: 240 VAC 2 A DC13: 24 VDC 1.5 A		
	Minimum applicable load	24 VDC 4 mA		
	Conditional short-circuit current (IEC/EN60947-5-1)	100 A[*5]		
Pollution degree		2		
Over voltage category (IEC/EN60664-1)		Safety output: Class III, the others: Class II		
Insulation specification	Impulse withstand voltage (IEC/EN60947-5-1) — Between input and output	6 kV		
	Impulse withstand voltage (IEC/EN60947-5-1) — Between different poles of output	6 kV (between 13-14/23-24 and 33-34/43-44 (37-38/47-48)) 4 kV (between 13-14 and 23-24, between 33-34 (37-38) and 43-44 (47-48))		
	Dielectric strength — Between input and output	2,200 VDC		
	Dielectric strength — Between different poles of output	1,500 VAC		
	Insulation resistance	100 MΩ		
Vibration resistance[*6]		Frequency:10 to 55 to 10 Hz Amplitude:0.35 mm half amplitude (0.7 mm double amplitude)		
Mechanical shock resistance[*6]	Destruction	300 m/s^2		
	Malfunction	100 m/s^2		
Surrounding air temperature		−10 to 55°C (No freezing or condensation)		
Ambient humidity		25% to 85%RH		
Degree of protection		IP20		
Weight		approx. 150 g	approx. 180 g	

[*1] The operating time is the time it takes for the safety contact to close after the safety inputs and feedback-reset input are turned ON. Not includes bounce time.
[*2] This is in normal operation. When executing non-regular self-diagnosis for Safety output circuit, G9SE operating time become 500 ms max..
[*3] The response time is the time it takes for the safety main contact to open after the safety input is turned OFF. Includes bouncetime.
[*4] This is initial value using the voltage-drop method with 1 A at 5 VDC.
[*5] Use an 8 A fuse that conforms to IEC 60127 as a short-circuit protection device. This fuse is not included with the G9SE.
[*6] Condition: G9SE is mounted to mounting surface with screw and the screw mounting attachment. In the case of DIN rail mounting, mount DIN rail with G9SE to the place without big vibration.
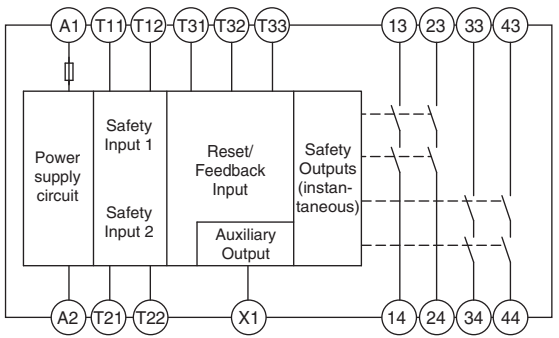(Amplitude guideline: Less than 0.15 mm half amplitude (0.3 mm double amplitude))
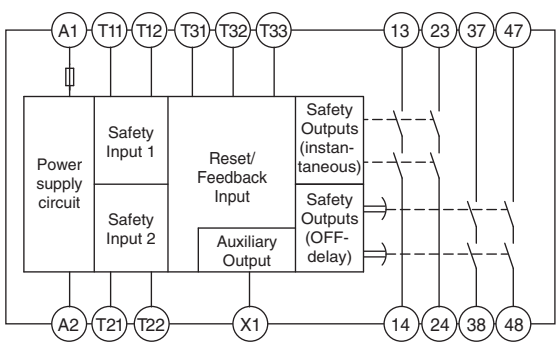
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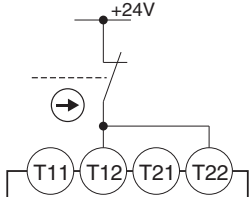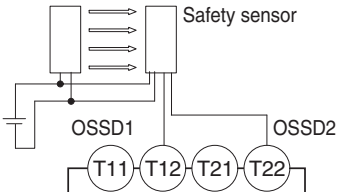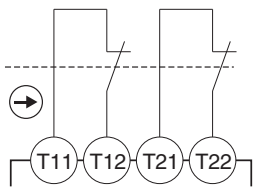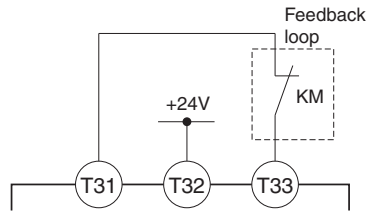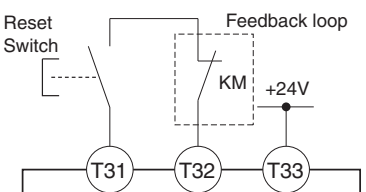# Connection

Internal connection

G9SE-201
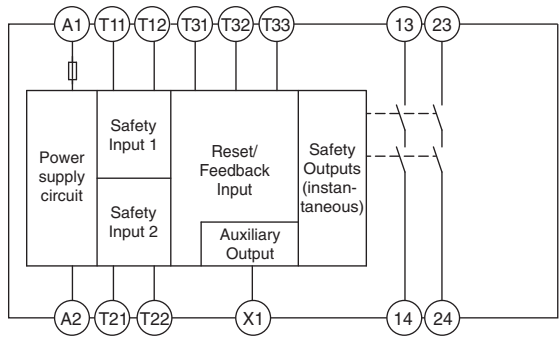
G9SE-401

G9SE-221-T☐

Wiring of inputs and outputs

Signal Name	Terminal Name	Description of operation	Wiring	
Power supply input	A1, A2	The input terminals for power supply. Connect the power source to the A1 and A2 terminals.	Connect the power supply plus to the A1 terminal. Connect the power supply minus to the A2 terminal.	
Safety input 1	T11, T12	To set Safety outputs in ON state, HIGH state signals must be input to both of Safety input 1 and Safety input 2. Otherwise Safety outputs cannot be in ON state.	1-channel Safety input	
Safety input 2	T21, T22		2-channel Safety input	
Reset/ Feedback input	T31, T32, T33	To set Safety outputs in ON state, ON state signal must be input to T33. Otherwise Safety outputs cannot be in ON state.	Auto reset	
		To set Safety outputs in ON state, the signal input to T32 must change from OFF state to ON state, and then to OFF state. Otherwise Safety outputs cannot be in ON state.	Manual reset	
Safety output	13-14, 23-24, 33-34, 43-44	Turns ON/OFF according to the state of safety inputs, Feedback/Reset inputs. During off-delayed state, safety outputs are not able to turn ON.	Keep these outputs Open when NOT used.	
Off-delayed Safety output	37-38, 47-48	Off-delayed safety outputs.[1] Off-delay time is set by off-delay preset switch. When the delay time is set to zero, these outputs can be used as non-delay outputs.		
Auxiliary output	X1	Outputs a signal of the same logic as Safety outputs		

[1] When the inputs of G9SE-221-T□ are restored during off-delay time, G9SE-221-T□ will operate as below. Depending on the reset mode.
  - Auto reset mode: Outputs turn off after off-delay time, then immediately turns on.
  - Manual reset mode: Outputs turn off after off-delay time, then turn on when reset input is given.

Dimensions and Terminal arrangement

(Unit: mm)

Type G9SE-201
Type G9SE-401
Type G9SE-221-T□

Mounting holes
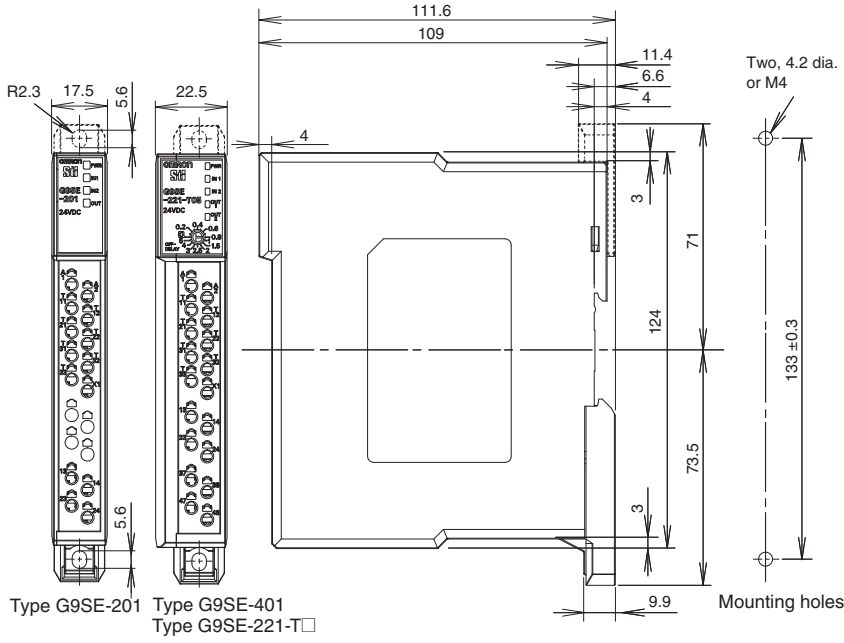
Terminal arrangement and LED indicators

G9SE-201

- PWR
- IN1
- IN2
- OUT

A1	A2
T11	T12
T21	T22
T31	T32
T33	X1
○	○
○	○
13	14
23	24

G9SE-401

- PWR
- IN1
- IN2
- OUT

A1	A2
T11	T12
T21	T22
T31	T32
T33	X1
13	14
23	24
33	34
43	44

G9SE-221-T□

- PWR
- IN1
- IN2
- OUT1
- OUT2

A1	A2
T11	T12
T21	T22
T31	T32
T33	X1
13	14
23	24
37	38
47	48

G9SE

Application Examples
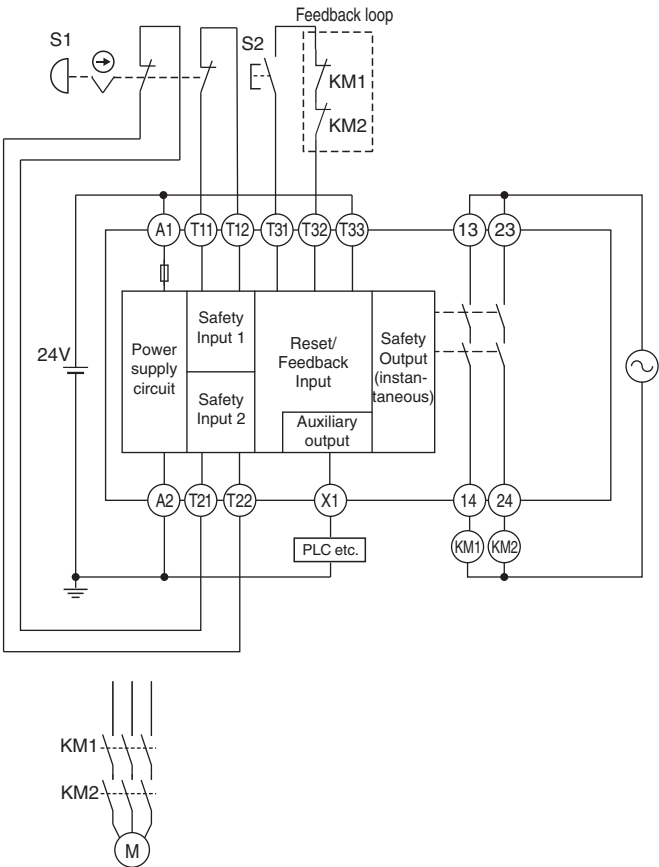
Application Overview
- Immediately removes power to Motor M when Emergency Stop Switch S1 is pressed.
- The power to Motor M is kept removed until Emergency Stop Switch S1 is released and Reset Switch S2 is pressed.

Evaluation example

PL/safety category	Model	Stop category	Reset
PLe/4 equivalent	Emergency stop pushbutton: A22E-M-02 (2NC contact) Push Button Switch (from Annex C of ISO 13849-1) Safety Relay Unit: G9SE-201 Contactor of rated load (from Annex C of ISO 13849-1)	0	Manual

Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

Wiring Example

Timing Chart

Device
S1: Emergency stop switch
S2: Reset switch
KM1, KM2: Contactor
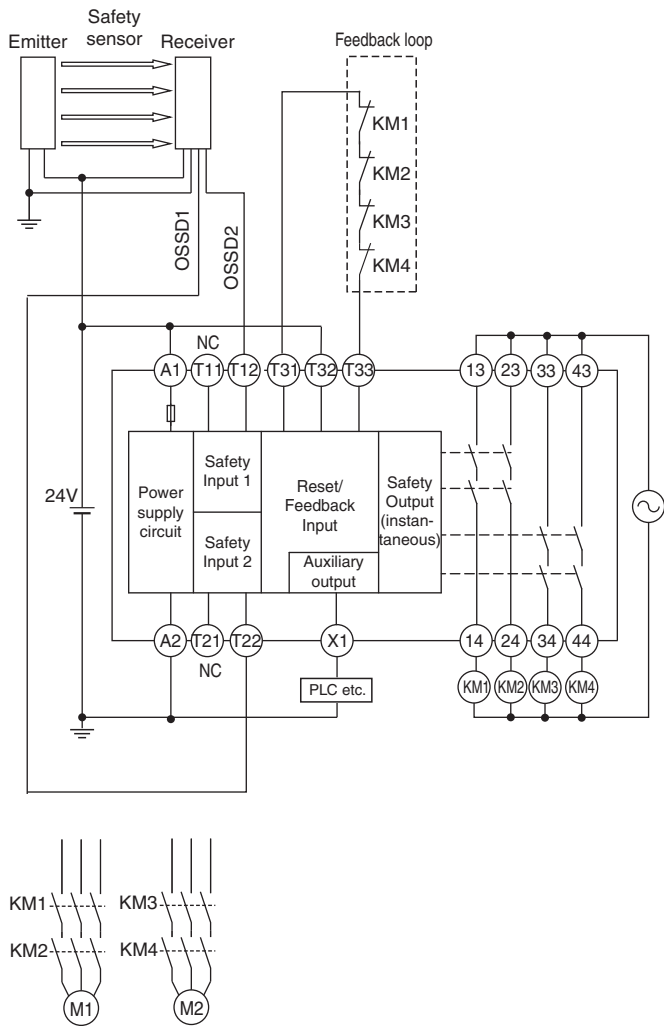M: 3-phase motor

Application Overview

- The machine has the opening of the hazardous source which is small enough to prevent a person from entering.
- The Safety Light Curtain is installed at the safe distance from the hazardous source.
- Immediately removes power to Motor M when the Safety Light Curtain detects a finger entering the area.

Evaluation example

PL/safety category	Model	Stop category	Reset
PLe/4 equivalent	Safety Light Curtain: F3SJ-B Safety Relay Unit: G9SE-401 Contactor of rated load (from Annex C of ISO 13849-1)	0	Auto

Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

Wiring Example

Timing Chart
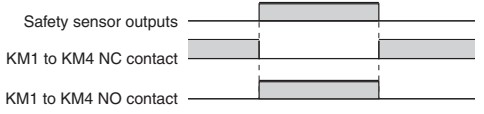
Device

Safety sensor
KM1 to KM4: Contactor
M1, M2: 3-phase motor

G9SE

Application Overview
- Immediately removes power to Motor M when Limit Switch S1 and Guard Lock Safety Door Switch S2 detect the opening of the Guard.
- The power to Motor M is kept removed until Reset Switch S3 is pressed.
- When the NC contacts on both KM1 and KM2 are closed and the lock release signal is input, the Guard can be opened while Lock Release Switch S4 is pressed.
- The power to Motor M is kept removed until the Guard is closed and locked and Reset Switch S3 is pressed.

Evaluation example

PL/safety category	Model	Stop category	Reset
PLe/4 equivalent	Safety Limit Switch :D4N-□□20 Guard Lock Safety Door Switch:D4SL-N□□□A-□(Mechanical lock) Push Button Switch(from Annex C of ISO 13849-1) Safety Relay Unit :G9SE-221-T05 Contactor of rated load (from Annex C of ISO 13849-1)	1	Manual

Note: The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.

Wiring Example
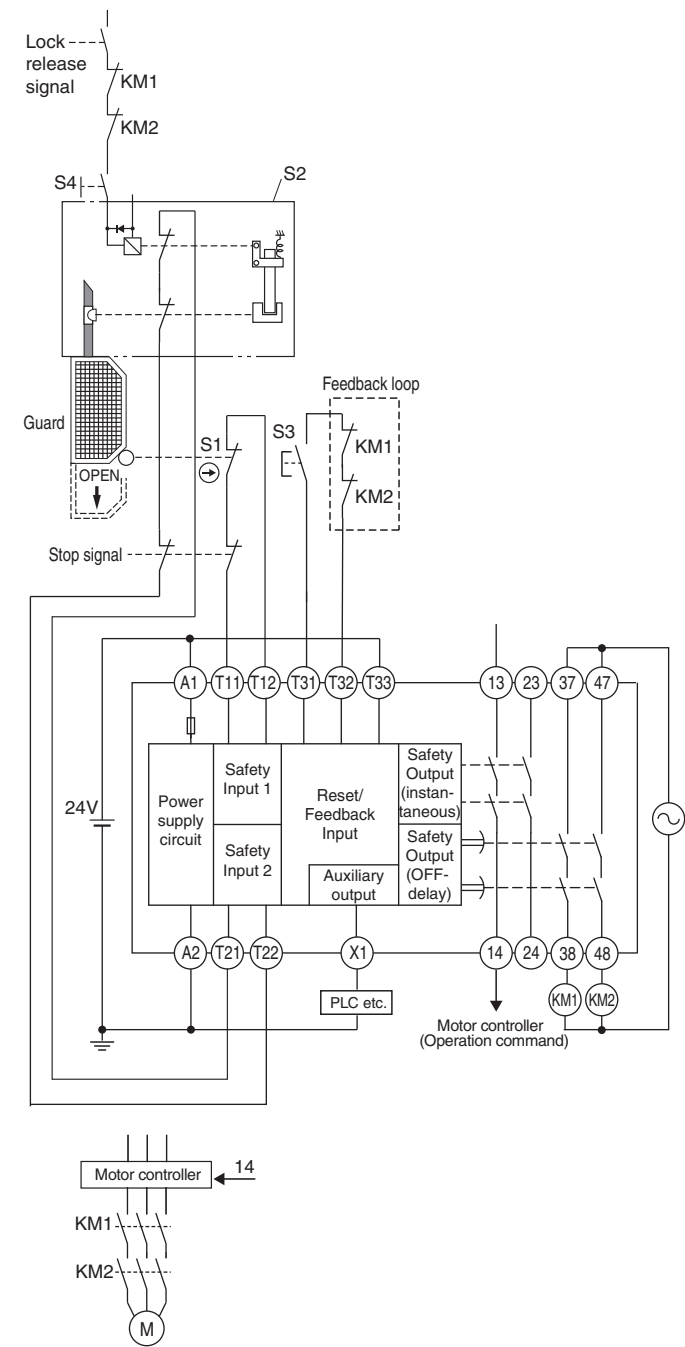
Timing Chart
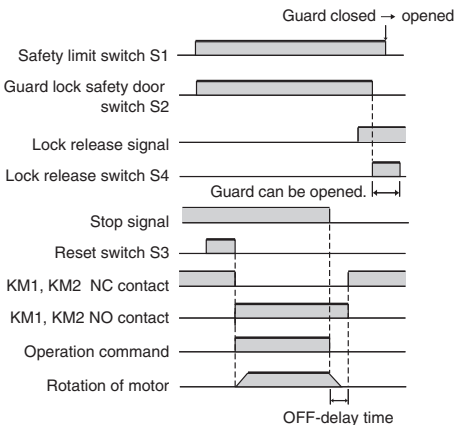
Device
S1: Safety limit switch
S2: Guard lock safety door switch (Mechanical Lock)
S3: Reset switch
KM1, KM2: Contactor
M: 3-phase motor

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