Original instructions

OMRON

Type G9SX-GS226-T□-□

Safety Guard Switching Unit

English **USER'S MANUAL**

Thank you for purchasing G9SX Flexible Safety Unit.
Please read and understand this manual before using the products.
Keep this manual ready to use whenever needed.
Only qualified person trained in professional electrical technique should handle G9SX.
Please consult your OMRON representative if you have any questions or comments.
For details, refer to the G9SX User's Guide (No.Z255).
Make sure that information written in this document are delivered to the final user of the product.

OMRON Corporation

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EU Declaration of Conformity

OMRON declares that G9SX-GS□ is in conformity with the requirements of the following EU Directives:

EMC Directive 2014/30/EU
Machinery Directive 2006/42/EC

Standards

G9SX-GS□ is designed and manufactured in accordance with the following standards:

EN ISO13849-1:2015 Category 4 PL e,
IEC/EN61508 SIL3, IEC/EN62061 SIL3,
IEC/EN61000-6-2, IEC/EN61000-6-4,
UL508, UL1998,
CAN/CSA C22.2 No.142

Safety Precautions

Meanings of Signal Words

The following signal words are used in this manual.

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

Meaning of Alert Symbols

The following alert symbols are used in this manual.

⊘	Indicates prohibited actions.
❗	Indicates mandatory actions.

Alert Statements

⚠WARNING

Serious injury may possibly occur due to breakdown of safety outputs.
Do not connect loads beyond the rated value to the safety outputs. ⊘

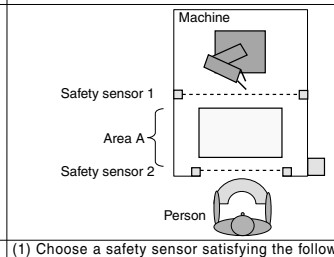
Serious injury may possibly occur due to loss of required safety functions.
Wire G9SX properly so that supply voltages or voltages for loads do NOT touch the safety inputs accidentally or unintentionally. ❗

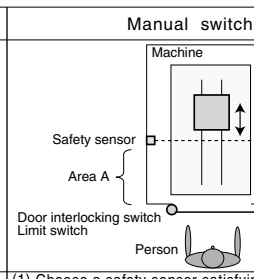
Serious injury may possibly occur due to damages of safety inputs.
Apply protection circuitry against back electromotive force in case connecting inductive loads to safety outputs. ❗

Serious injury may possibly occur due to loss of safety functions.
Use appropriate devices referring to the information provided below. ❗

Controlling Devices	Requirements
Door interlocking switch Limit switch	Use approved devices with Direct Opening Mechanism complying with IEC/EN 60947-5-1 and capable of switching micro loads of 24VDC, 5mA.
Safety Sensor	Use certified devices complying with the relevant product standards, regulations and rules in the country where it is used. Consult a certification body to assess that the entire system satisfies the required safety category level.
Relay with forcibly guided contacts	Use approved devices with forcibly guided contacts complying with IEC 61810-3 (EN 50205). For feedback purpose use devices with contacts capable of switching micro loads of 24VDC, 5mA.
Contactor	Use a standard certified product that meets the requirements for the auxiliary contact (mirror contact) linked to the main contact of IEC/EN60947-4-1. Use feedback contacts that can be applied to minute loads (24 VDC, 5 mA).
Emergency stop switch	Do not connect an Emergency stop switch to G9SX-GS.
Other devices	Evaluate whether devices used are appropriate to satisfy the requirements of safety category level.

Serious injury may possibly occur due to loss of safety functions.
Construct safety system appropriate for the application and condition where G9SX is used. ❗

Switching	Auto switching
Example of safety system construction	
Precautions for safe use	(1) Choose a safety sensor satisfying the following. 1) Detection capability < Detection object (2) Install a safety sensor to satisfy the followings. 1) Safety sensor 1 is for intrusion detection to area A of a machine, and safety sensor 2 is for intrusion detection to area A of a person. 2) A person can reach area A only by passing through the detection zone of the safety sensor 2. A machine can reach area A only by passing through the detection zone of the safety sensor 1. (3) Install a protective structure to ensure that a person cannot completely pass through the safety sensor's detection zone and get inside area A. If this cannot be satisfied, install a presence sensing device to detect a person in area A, and prevent a machine to restart when a person is in area A. (4) Make sure to secure safety distance (S1) considering approach speed of a person and safety distance (S2) considering approach speed of a machine. For details, see following "Safety Distance".

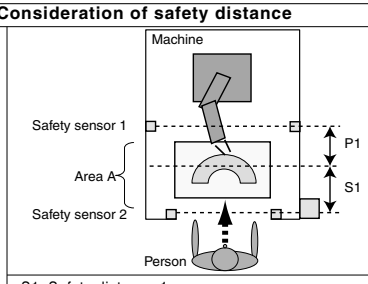
Switching	Manual switching
Example of safety system construction	
Precautions for safe use	(1) Choose a safety sensor satisfying the following. 1) Detection capability < Detection object (2) Install a safety sensor to satisfy the followings. 1) Safety sensor is for intrusion detection to area A of a machine. 2) A machine can reach area A only by passing through the detection zone of the safety sensor. (3) Install a protective structure to ensure that a person cannot completely get inside area A while the door is open. If this cannot be satisfied, install a presence sensing device to detect a person in area A, and prevent a machine to restart when a person is in area A. (4) Make sure to secure safety distance (S2) considering approach speed of a machine. For details, see following "Safety Distance". (5) Install a mode selector switch in the position that it cannot be operated from area A.

Safety Distance

The safety distance is the distance that must be set between the safety input device and a machine's hazardous part to stop the hazardous part before a person or a object reaches it. The safety distance varies according to the standards of each country and the individual specifications of each machine. In addition, the calculation of the safety distance differs if the direction of approach is not perpendicular to the detection zone of the safety input device. Always refer to relevant standards.

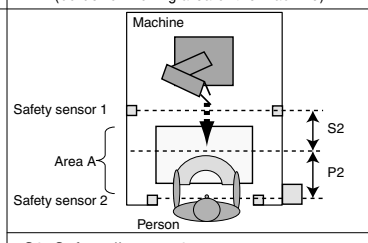
Consideration of safety distance

When a person approaches for a hazardous part (Machine)



·S1: Safety distance 1
·P1: The distance where the machine comes nearest to the person during operation. (border of moving area of the machine)

When a hazardous part(Machine) approaches for a person



·S2: Safety distance 2
·P2: The distance where the person comes nearest to the machine.

Calculation of safety distance (reference)

A calculation of the safety distance referring to international standard ISO 13855-2002 (European standard EN999-1999)	When the detection object approaches the detection area perpendicularly, ·S1=K1×T+C ·S2=K2×T+C S1: Safety Distance1 S2: Safety Distance2 K1: Approach speed of a person to the detection area(area A) K2: Maximum approach speed of a machine to the detection area(area A) T: Total response time of the machine and G9SX system. C: Additional distance calculated by the detection capability of the safety sensor.
A calculation of the safety distance referring to U.S. standard ANSI B11.19	When the detection object approaches the detection area perpendicularly, ·S1=K1×(Ts+Tc+Tr+Tbm)+Dpf ·S2=K2×(Ts+Tc+Tr+Tbm)+Dpf S1: Safety distance 1 S2: Safety distance 2 K1: Approach speed of a person to the detection area(area A) K2: Maximum approach speed of a machine to the detection area(area A) Ts: Machine's stopping time Tr: Response time of the G9SX system from ON to OFF Tc: Machine control circuit's maximum response time required to activate its brake Tbm: Additional time Dpf: Additional distance

1) For approach speed K1, consider every factor including physical ability of an operator.
2) Consult a certification body regarding approach speed K2.
3) The response time of a machine is the time period from when the machine receives a stop signal to when the machine's hazardous part stops. Measure the response time on the actual system. Also, periodically check that the response time of the machine has not changed.
4) For the response time of G9SX system, see 'Precautions for correct use'

Precautions for Safe Use

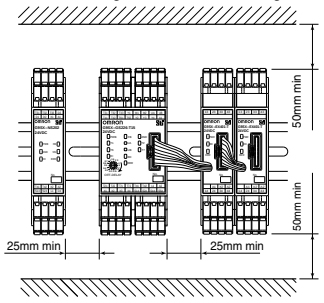
(1) Use G9SX-GS□ within an enclosure with IP54 protection or higher according to IEC/EN60529
(2) Incorrect wiring may lead to loss of safety function. Wire conductors correctly and verify the operation of G9SX-GS□ before using the system in which G9SX-GS□ is incorporated.
(3) Do not apply DC voltages exceeding the rated voltages, nor any AC voltages to G9SX-GS□. Do not connect to DC distribution network.
(4) Use DC supply satisfying requirements below to prevent electric shock.
- DC power supply with double or reinforced insulation, for example, according to IED/EN60950 or EN50178 or a transformer according to IEC/EN61558.
- DC supply satisfies the requirement for class 2 circuits or limited voltage/current circuit stated in UL 508.

(5) Apply properly specified voltages to G9SX-GS□ inputs. Applying inappropriate voltages cause G9SX-GS□ to fail to perform its specified function, which leads to the loss of safety functions or damages to G9SX-GS□.
(6) Each of the safety input A and safety input B has to be connected to safety device correctly to secure the safety function.
(7) Auxiliary error outputs and auxiliary monitoring outputs are NOT safety outputs. Do not use auxiliary outputs as any safety output. Such incorrect use causes loss of safety function of G9SX-GS□ and its relevant system. Also Logical connection outputs can only be used for logical connections between G9SXs.
(8) When setting the switching function, be sure to consider safety control requirements, safety level and safety category of the entire system.
(9) After installation of G9SX-GS□, qualified personnel should confirm the installation, and should conduct test operations and maintenance. The qualified personnel should be qualified and authorized to secure the safety on each phases of design, installation, running, maintenance and disposal of system.
(10) A person in charge, who is familiar to the machine in which G9SX-GS□ is to be installed, should conduct and verify the installation.
(11) Mode selector switch should be operated only by qualified personnel who is familiar to the machine. For example to avoid unauthorized personnel's unexpected operation of mode selector switch, use a selector switch with locking-key.
(12) Perform daily and 6-month inspections for the G9SX-GS□. Otherwise, the system may fail to work properly, resulting in serious injury.
(13) Do not dismantle, repair, or modify G9SX-GS□. It may lead to loss of its safety functions.
(14) Use only appropriate components or devices complying with relevant safety standards corresponding to the required level of safety categories. Conformity to requirements of safety category is determined as an entire system. It is recommended to consult a certification body regarding assessment of conformity to the required safety level.
(15) OMRON shall not be responsible for conformity with any safety standards regarding to customer's entire system.
(16) Disconnect G9SX-GS□ from power supply when wiring. Devices connected to G9SX-GS□ may operate unexpectedly.
(17) Be cautious not to have your fingers caught when attaching terminal sockets to the plugs on G9SX-GS□.
(18) Do not use in combustible gases or explosive gases.

Precautions for Correct Use

(1) Handle with care
Do not drop G9SX-GS□ to the ground or expose to excessive vibration or mechanical shocks. G9SX-GS□ may be damaged and may not function properly.
(2) Conditions of storage and usage
Do not store or use in such conditions stated below.
1) In direct sunlight
2) At ambient temperatures out of the range of -10 to 55 °C
3) At relative humidity out of the range of 25% to 85% or under such temperature change that causes condensation.
4) In corrosive or combustible gases
5) With vibration or mechanical shocks out of the rated values.
6) Under splashing of water, oil, chemicals
7) In the atmosphere containing dust, saline or metal powder. G9SX-GS□ may be damaged and may not function properly.
(3) Mounting
Mount G9SX to DIN rails with attachments (TYPE PFP-M, not incorporated to this product), not to drop out of rails by vibration etc. especially when the length of DIN railing is short compared to the widths of G9SX.
(4) Following spacing around G9SX should be available to apply rated current to outputs of G9SX and for enough ventilation and wiring:

a) At least 25 mm beside side faces of G9SX.
b) At least 50 mm above top face of G9SX and below bottom face of G9SX.

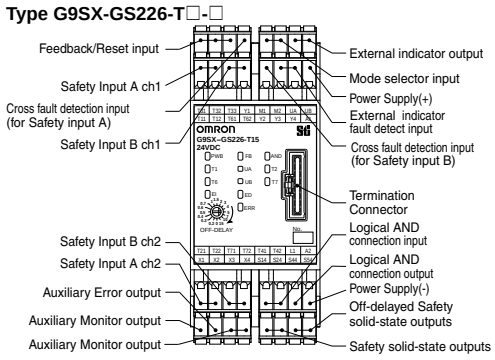


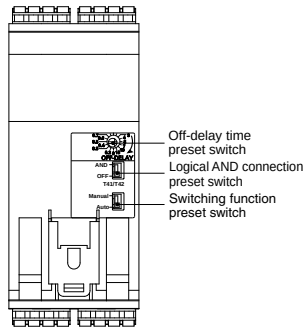
(5) Wiring
1) For model G9SX-GS□
Use the following to wire to G9SX-GS□.
-Solid wire: 0.2 to 2.5mm² AWG24 to AWG12
-Stranded wire (Flexible wire): 0.2 to 2.5mm² AWG24 to AWG12
Strip the cover of wire no longer than 7mm.
2) For model G9SX-GS□-RT (with screw terminals)
Tighten each screw with a specified torque of 0.5 to 0.6N·m, or the G9SX-GS□ may malfunction or generate heat.
3) For Logical AND Connection
Use VCTF cable or shielded cable for Logical AND connection between units.

(6) When connecting Expansion Units (G9SX-EX□-□) to G9SX-GS226-T□-□:
1) Follow the procedure below:
a) Remove the termination connector from the receptacle on G9SX-GS226-T□-□.
b) Insert the head of the connecting cable of Expansion Unit to the receptacle on the G9SX-GS226-T□-□.
c) Set the termination connector to the receptacle on the Expansion Unit at the end position. When G9SX-GS226-T□-□ is used without expansion units, leave the termination connector set on the G9SX-GS226-T□-□.
2) Do not remove the termination connector while the system is operating.
3) Before applying supply voltage, confirm that the connecting sockets and plugs are locked firmly.
4) All of the Expansion Units should be supplied with its specified voltages within 10s after the connected G9SX-GS226-T□-□ is supplied with voltage. Otherwise,G9SX-GS226-T□-□ detects the power-supply error for the Expansion Units.
(7) Use 1NO1NC contact switch as a mode selector switch.
(8) Use cables with length less than 100m to connect to Safety Inputs, Mode selector input, Feed-back/Reset inputs, or between Logical AND connection inputs and Logical connection outputs, respectively.
(9) Set the time duration of OFF-delay to an appropriate value that does not cause the loss of safety function of system.
(10) Logical connection between Units:
1) When using Logical AND connection inputs, set the Logical connection preset switch to 'AND' position for the units which the logical connection signal are input to.
2) Connect Logical connection outputs appropriately to Logical AND connection inputs of the relevant unit. Verify the operation of G9SX-GS□ before commissioning the system.
3) When configuring the safety related system, be sure to consider that the delay of response time caused by logical connections do not degrade the safety function of the system.
(11) To determine safety distance to hazards, take into account the delay of Safety outputs caused by the following time:
1) Response time of Safety inputs
2) Response time of Logical AND connection input (See also "Ratings and specifications, note5")
3) Preset off-delay time
4) Accuracy of off-delay time
(12) Start entire system after more than 5s have passed since applying supply voltage to all G9SXs in the system.
(13) G9SX-GS□ may malfunction due to electro-magnetic disturbances.
1) Be sure to connect the terminal A2 to ground.
2) When using a DC power supply with light curtains, use DC power supply which has no interruption by a power failure of 20ms.
(14) Devices connected to G9SX-GS□ may operate unexpectedly. When replacing G9SX-GS□, disconnect it from power supply.
(15) Adhesion of solvent such as alcohol, thinner, trichloroethane or gasoline on the product should be avoided. Such solvents make the marking on G9SX-GS□ illegible and cause deterioration of parts.
(16) Operate the reset input more than 0.4 seconds immediately after the safety outputs are OFF.
G9SX does not accept the reset input from when the outputs are turned ON and until 0.4 seconds passes after the outputs are turned OFF.
(17) This is a class A product. In residential areas it may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.

1 Appearance and Explanation of Each Parts

Type G9SX-GS226-T□-□





Settings indication (at power on)

Settings for G9SX-GS□ can be checked by indicators for approx. 3 seconds after power on. During the settings indication term, ERR indicator will light up, however the auxiliary error output will remain off.

Indicator	Items	Setting position	indicator status	Setting	Setting status
T1	Cross fault detection (Safety Input A)	Y1 terminal	light up	detection	Y1 = open
			not lit	non-detection	Y1 = 24VDC
T6	Cross fault detection (Safety Input B)	Y2 terminal	light up	detection	Y2 = open
			not lit	non-detection	Y2 = 24VDC
FB	Reset	T32 or T33 terminal	light up	manual reset	T33 = 24VDC
			not lit	auto reset	T32 = 24VDC
AND	Logical AND connection input	Logical AND connection preset switch	light up	enable Logical AND input	'AND'
			not lit	disable Logical AND input	'OFF'
UA UB	Switching function	Switching function preset switch	light up	manual switching function	'Manual'
			not lit	auto switching function	'Auto'

Preset Switches

Change the value of the preset switches only when G9SX-GS□ is disconnected from power supply.
The states of the preset switches come into effect when the power supply to G9SX-GS□ turns on.

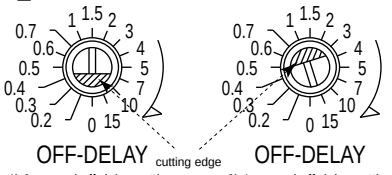
Name	Function	State/Value (position of switch)
Logical AND Connection Preset Switch	Sets Logical AND Connection Inputs to valid or invalid. (*1)	OFF (Invalid: default setting)/ AND (valid)
Switching function Preset Switch	Selects Switching function of Safety Guard Switching (*2)	Auto(Auto switching function : default setting value)/Manual (Manual switching function)
Off-delay Time Preset Switch	Presets Off-delay time (duplicate) (*3), (*4)	0 (default setting value) /0.2/0.3/0.4/0.5/0.6/0.7/1/1.5/2/3/4 /5/7/10/15 (s) (*5)

Note:
(*1) When operating G9SX-GS□ using Logical AND Connection function, be sure to set the preset switch to AND (valid) position for the units which the logical input signal is input to. When the switch is set to OFF (invalid) position, it is detected as a fault.
(*2) Mode selector inputs, M1 and M2, must be set as follows depending on switching mode preset switch. Incorrect wiring may lead to error of G9SX-GS.
Auto switching function ··· M1 and M2 must be open
Manual switching function ··· M1 and M2 must be set
refer 5.Application Examples in detail.
(*3) Set both of the two Off-delay Time Preset Switches, one each on the front and back, to the same value.
(*4) Off-delay time duration of Expansion Unit (OFF-delay model) synchronize with the OFF-delay time duration set by Off-delay Time Preset Switch of G9SX-GS□.
(*5) See illustration to the right for setting position of Off-delay Time Preset Switch. Make sure that the direction of cutting edge of preset switch is correctly pointed to the off-delay time value which must be set.

LED Indicators

Marking	Color	Name	Function
PWR	Green	Power Supply Indicator	- Lights up while power is supplied.
ERR	Red	Error Indicator	- Lights up or blinks corresponding to the occurring error (*1)
T1	Orange	Safety input A ch1 Indicator	- Lights up while high signal is input to T12 - Blinks when error relating to Safety input A ch1 occurs. (*1)
T2	Orange	Safety input A ch2 Indicator	- Lights up while high signal is input to T22 - Blinks when error relating to Safety input A ch2 occurs. (*1)
T6	Orange	Safety input B ch1 Indicator	- Lights up while high signal is input to T62 - Blinks when error relating to Safety input B ch1 occurs. (*1)
T7	Orange	Safety input B ch2 Indicator	- Lights up while high signal is input to T72 - Blinks when error relating to Safety input B ch2 occurs. (*1)
FB	Orange	Feedback/Reset input Indicator	- Lights up in the following cases: -- With automatic reset while high signal is input to T33 -- With manual reset while high signal is input to T32. - Blinks when an error relating to Feedback/Reset input occurs. (*1)
EI	Orange	Safety output indicator	- Lights up while Safety solid-state outputs (S14, S24) are in ON-state. - Blinks when an error relating to Safety solid-state output occurs. (*1)
ED	Orange	Off-delayed Safety output Indicator	- Lights up while Safety off-delayed solid-state outputs (S44, S54) are in ON-state. - Blinks when an error relating to Safety off-delayed solid-state output occurs.(*1)
UA	Orange	Safety input A invalid state Indicator	- Lights up while inputs of Safety input A (T12, T22) are invalid state. - Blinks when an error relating to external indicator output A(UA) occurs.(*1)
UB	Orange	Safety input B invalid state Indicator	- Lights up while inputs of Safety input A (T62,T72) are invalid state. - Blinks when an error relating to external indicator output B(UB) occurs.(*1)

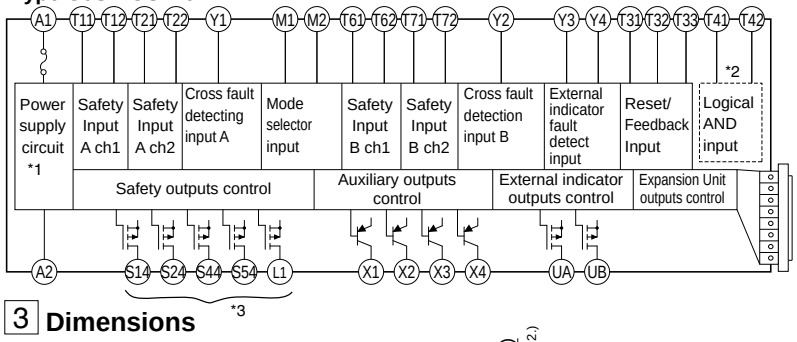
Note:
(*1) See 7 Fault Detection for details.



ex.1) 0 second off-delay setting ex.2) 1 second off-delay setting

2 Internal Connection

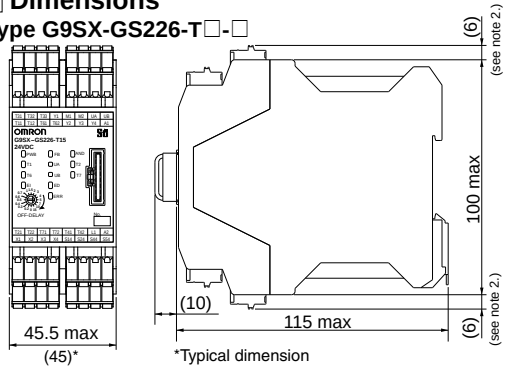
Type G9SX-GS226-T□-□



*1 Internal power supply circuit is not isolated.
*2 Logical AND input is isolated.
*3 The Safety solide-state outputs, S14 - S54 and L1, are internally redundant respectively.

3 Dimensions

Type G9SX-GS226-T□-□



*Typical dimension

Note 1. Left outline drawing is for -RC terminal type.
2. For -RC terminal type only.

4 Ratings and Specifications

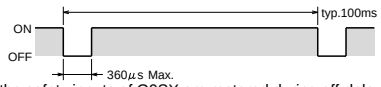
Ratings

Item		TYPE G9SX-GS226-T□-□
Power input	Rated supply voltage	24VDC
	Operating voltage range	-15% to +10% of rated supply voltage
	Rated power consumption (See Note1)	5 W Max.
Inputs	Safety input Feedback/reset input Mode selector input	Operating voltage: 20.4VDC to 26.4VDC, Internal impedance : approx. 2.8kohm (see note2)
Outputs	Safety solid-state output Off-delayed safety solid-state output (See Note3, 4)	P channel MOS FET output Load current: 0.8A DC max.(see note5,6)
	Auxiliary output	PNP transistor output Load current: 100mA DC Max.
	External indicator output	P channel MOS FET output Connectable indicator Incandescent lamp : 24VDC , 3~7W LED lamp : Load current 10 ~ 300mA DC

Isolation specifications

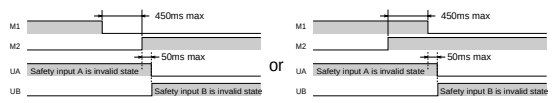
Item		TYPE G9SX-GS226-T□-□
Insulation resistance	- Between Logical AND input terminals, and Power supply input terminals and other input and output terminals connected together.	20Mohm Min. (by 100VDC megger)
	- Between all terminals connected together and DIN rail.	20Mohm Min. (by 100VDC megger)
Dielectric strength	- Between Logical AND connection terminals, and Power supply input terminals and other input and output terminals connected together.	500VAC for 1min
	- Between all terminals connected together and DIN rail.	500VAC for 1min

Note:
(1) Power consumption of loads not included.
(2) Ensure that the current exceeds the minimum applicable load of the device connected.
(3) While safety outputs are at its ON state, signal sequence shown below is output continuously for diagnosis.
When using the safety outputs as input signals to control devices (e.i. programmable controller), consider the off pulse below.



(4) When the safety inputs of G9SX are restored during off-delay time, G9SX 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.
(5) The following derating is required when Units are mounted side-by-side.
- 0.4 A max. load current
(6) The following derating is required when inductive load is connected to safety outputs.
- IEC/EN60947-5-1 DC-13: 0.8A
- UL508 Pilot Duty: 0.5A

Note:
(7) When multiple units are connected by logical connection, the total operating/response time is an accumulation of the operating/response time connected.
(8) Required time for safety solid-state output to turn ON, after necessary inputs turn ON.
(9) Permissible time period from when the mode selector switch starts its changeover action to completing it. Incorrect inputs lead to the error of the G9SX-GS.
(10) Response time from selector switch inputs are enabled to safety input enabling status is changed.

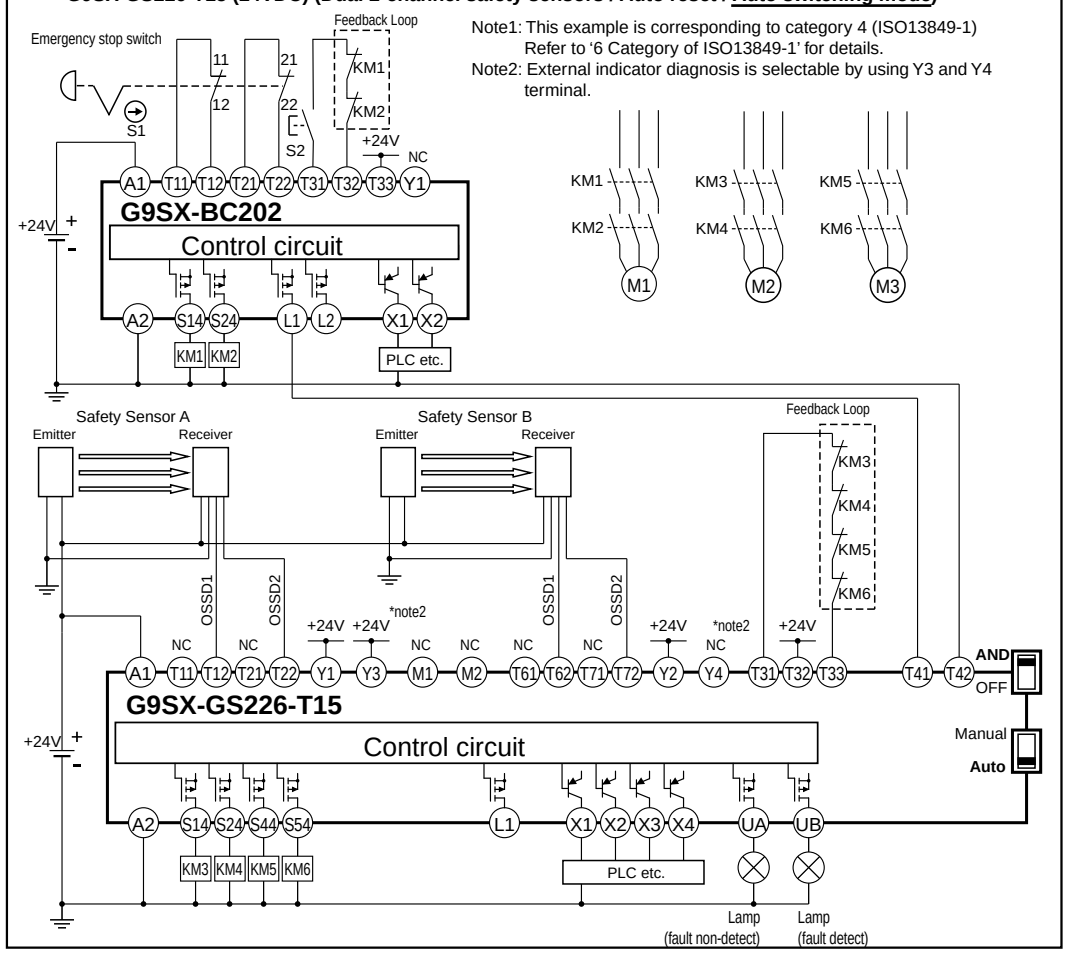


(11) Only applied for manual switching function.
(12) The number of TYPE G9SX-EX401-□ (Expansion Unit) and TYPE G9SX-EX041-T-□ (Expansion Unit, Off-delayed model) not included.

5 Application Examples

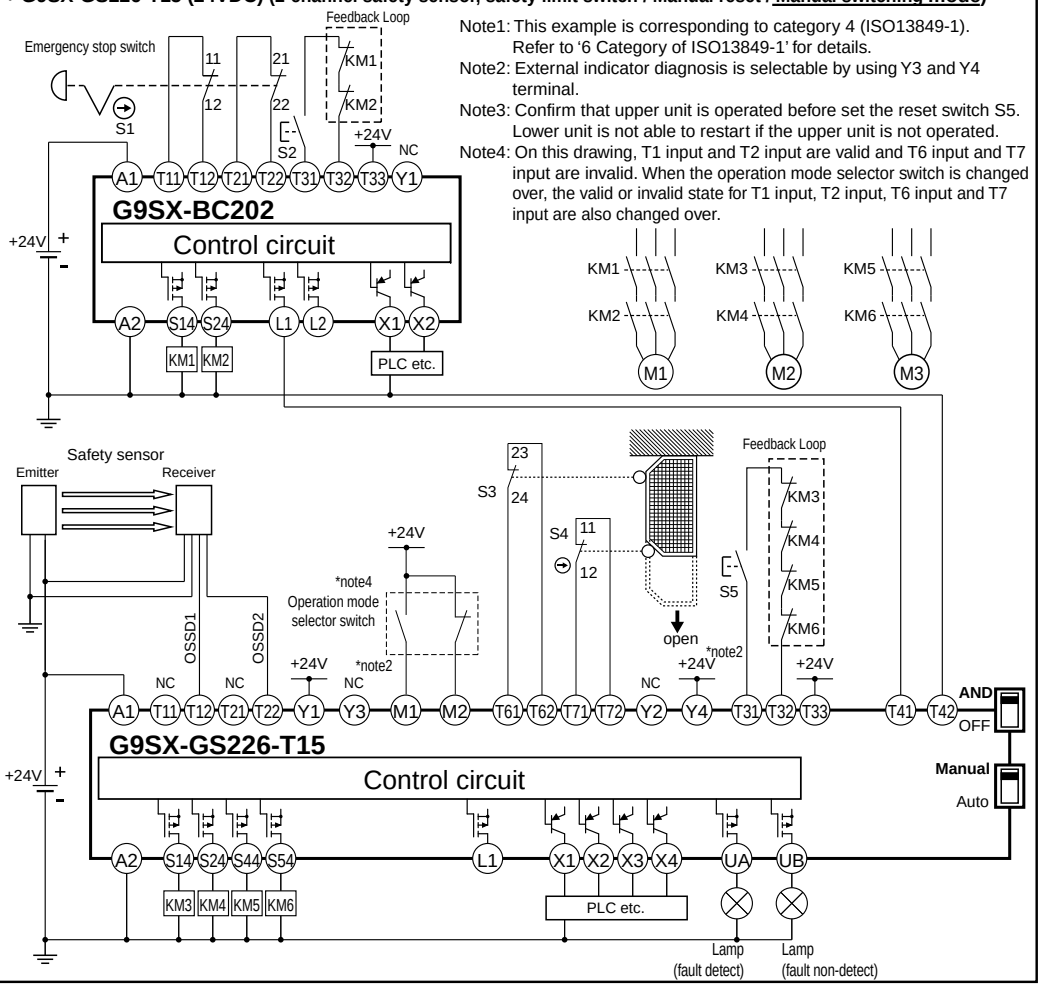
G9SX-BC202(DC24V) (2-channel emergency stop switch input / Manual reset)
+ G9SX-GS226-T15 (24VDC) (Dual 2-channel safety sensors / Auto reset / Auto switching mode)

Note1: This example is corresponding to category 4 (ISO13849-1) Refer to '6 Category of ISO13849-1' for details.
Note2: External indicator diagnosis is selectable by using Y3 and Y4 terminal.



G9SX-BC202(DC24V) (2-channel emergency stop switch input / Manual reset)
+ G9SX-GS226-T15 (24VDC) (2-channel safety sensor, safety limit switch / Manual reset / Manual switching mode)

Note1: This example is corresponding to category 4 (ISO13849-1). Refer to '6 Category of ISO13849-1' for details.
Note2: External indicator diagnosis is selectable by using Y3 and Y4 terminal.
Note3: Confirm that upper unit is operated before set the reset switch S5. Lower unit is not able to restart if the upper unit is not operated.
Note4: On this drawing, T1 input and T2 input are valid and T6 input and T7 input are invalid. When the operation mode selector switch is changed over, the valid or invalid state for T1 input, T2 input, T6 input and T7 input are also changed over.

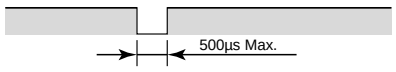


Specifications and Performance

Item	TYPE G9SX-GS226-T□-□
Over voltage category (IEC/EN 60664-1)	II
Operating time (OFF to ON state) (see note7,8)	50ms Max. (Safety input) 100ms Max. (Logical AND connection input)
Response time (ON to OFF state) (see note7)	15 ms Max.
Permissive time for mode selector inputs (see note 9,11)	450 ms Max.
Mode selector input response time (see note 10,11)	50 ms Max.
ON-state residual voltage	3.0 V Max.
OFF-state Leakage current	0.1 mA Max.
Maximum cable length for logical connection inputs and Safety inputs	100m Max. (Permissible impedance : 100ohm Max. and 10nF Max.)
Number of units connected per one Logical connection output.	4 units Max.
Total number of units connected with Logical connection (see note 11)	20 units Max.
Number of units connected in series with Logical connection	5 units Max.
Accuracy of Off-delay time	Within plus or minus 5% of the set value
Reset input time	100ms Min.
Vibration resistance	Frequency: 10 to 55 to 10Hz, Amplitude: 0.375mm half amplitude (0.75mm double amplitude)
Mechanical shock resistance	300 m/s² (destruction), 100 m/s² (malfunction)
Ambient temperature	-10 to +55 ℃ (No freezing or condensation)
Ambient humidity	25 to 85%RH
Terminal tightening torque	0.5Nm (Applicable only to TYPE G9SX-□-RT: screw terminal model)
Weight	Approx. 240 g

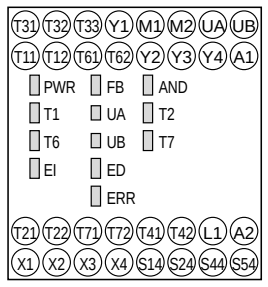
●Connecting Safety Sensors and G9SX-GS

1) When connecting Safety sensors with G9SX-GS, Y1 terminal must be connected to 24VDC as Safety input channel A, also Y2 terminal must be connected to 24VDC as Safety input channel B. G9SX-GS will detect the connection error, if Y1 or Y2 terminal is open.
2) In many case, Safety Sensor outputs include the off-shot pulse for its self test.
The following condition of test pulse is applicable as safety inputs for G9SX.
- Off-shot pulse width of the sensor, during the ON-state : 500μs Max.



● Terminal arrangement and LED indicators

TYPE G9SX-GS226-T15-□



6 Performance Level and Safety Category of ISO13849-1

The G9SX-GS can be used up to PL=d and Category 4 required by EN ISO13849-1 European standard.
Refer to the following link for the Safety-related characteristic data:
http://www.fa.omron.co.jp/safety_6en/
This does NOT mean that G9SX-GS can always be used for required category under all the similar conditions and situations.
Conformity to the categories must be assessed as a whole system.
When using G9SX-GS for safety categories, make sure the conformity of the whole system.

1) Input the signals to both of the Safety inputs (T11-T12, T21-T22, T61-T62 and T71-T72)
2) Input a signal to the Safety inputs (T11-T12, T21-T22, T61-T62 and T71-T72) through switches with Direct Opening Mechanism. When using limit switches, at least one of them must have Direct Opening Mechanism.
3) When connecting Safety sensor with G9SX, use TYPE 4 safety sensor.
4) Input the signal through a NC contact of the contactor to Feedback/Reset input (T31-T32 for manual reset or T31-T32 for auto reset). (Refer to '5.Examples of Application')
5) Keep Cross fault detection mode input (Y1, Y2) open. However, when connecting devices with self-diagnosis function, such as safety sensors, apply 24VDC to Y1 or Y2.
6) Be sure to connect A2 to ground.

7 Fault Detection

When G9SX-GS detects a fault, ERR indicator and/or other indicators light up or blink to show the information of the fault.
Check and take needed measures referring to the following table, and then apply supply voltage to G9SX-GS.

ERR indicator	Other indicators	Faults	Expected causes of the faults	Checking points and measures to take
◐ Blink	–	Faults by electro-magnetic disturbance or of internal circuits.	1) By excessive electro-magnetic disturbance 2) Failures of the parts of internal circuits	1) Check the disturbance level around G9SX-GS and its related system. 2) Replace with a new product.
● Light up	◐ T1 Blink	Faults involved with Safety input A ch1	1) Failures involving the wiring of Safety input A ch1 2) Incorrect setting of Cross fault detection mode. 3) Failures of the parts of the circuits of Safety input A ch1.	1) Check the wiring to T11 and T12. 2) Check the wiring to Y1. 3) Replace with a new product.
	◐ T2 Blink	Faults involved with Safety input A ch2	1) Failures involving the wiring of Safety input A ch2 2) Incorrect setting of Cross fault detection mode. 3) Failures of the parts of the circuits of Safety input A ch2.	1) Check the wiring to T21 and T22. 2) Check the wiring to Y1. 3) Replace with a new product.
	◐ T6 Blink	Faults involved with Safety input B ch1	1) Failures involving the wiring of Safety input B ch1 2) Incorrect setting of Cross fault detection mode. 3) Failures of the parts of the circuits of Safety input B ch1.	1) Check the wiring to T61 and T62. 2) Check the wiring to Y2. 3) Replace with a new product.
	◐ T7 Blink	Faults involved with Safety input B ch2	1) Failures involving the wiring of Safety input B ch2 2) Incorrect setting of Cross fault detection mode. 3) Failures of the parts of the circuits of Safety input B ch2.	1) Check the wiring to T71 and T72. 2) Check the wiring to Y2. 3) Replace with a new product.
	◐ FB Blink	Faults involved with Feedback/Reset input	1) Failures involving the wiring of Feedback/Reset input. 2) Failures of the parts of the circuits of Feedback/Reset input	1) Check the wiring to T31, T32, and T33 2) Replace with a new product.
		Faults of Expansion units	1) Improper feedback signals from Expansion units 2) Abnormal supply voltage to Expansion units 3) Failures of the parts of the circuits of Safety relay contact outputs	1) Check the connecting cable of Expansion units and the connection of the termination socket. 2) Check the supply voltage to Expansion units. * Make sure that all Expansion units' PWR indicators are lighting. 3) Replace the Expansion unit with a new one.
	◐ EI Blink	Faults involved with Safety solid-state outputs or Logical connection outputs	1) Failures involving the wiring of Safety solid-state outputs 2) Failures of the parts of the circuits of Safety solid-state outputs 3) Failures involving the wiring of Logical connection output 4) Failures of the parts of the circuits of Logical connection output 5) Impermissible high ambient temperature	1) Check the wiring to S14 and S24 2) Replace with a new product. 3) Check the wiring to L1. 4) Replace with a new product. 5) Check the ambient temperature and spacing around G9SX-GS.
	◐ ED Blink	Faults involved with Off-delayed Safety solid-state outputs	1) Failures involving the wiring of Off-delayed Safety relay contact outputs 2) Incorrect set values of Off-delay time 3) Failures of the parts of the circuits of Off-delayed Safety relay contact outputs 4) Impermissible high ambient temperature	1) Check the wiring to S44 and S54 2) Confirm the set values of the two of Off-delay time preset switches. 3) Replace with a new product. 4) Check the ambient temperature and spacing around G9SX-GS226-T□-□.
	◐ AND Blink	Faults involved with Logic AND connection input	1) Failures involving the wiring of Logic AND connection input 2) Incorrect setting for Logic AND connection input 3) Failures of the parts of the circuits of Logical AND connection input	1) Check the wiring to T41 and T42 * Make sure that the wiring length for T41 or T42 terminals is less than 100 meters,respectively. * Make sure that the Logical AND connection signal is branched for less than 4 units. 2) Confirm the set value of the Logical AND connection preset switch. 3) Replace with a new product.
	◐ UA Blink	Faults involved with External Indicator output UA.	1) Failures involving the wiring of External indicator output UA 2) Failures involving the wiring of External indicator fault detect input Y3 3) Failures of the parts of the circuits of External indicator output UA 4) Failures of the External indicator	1) Check the wiring to UA 2) Check the wiring to Y3 *In case external indicator is not connected to UA terminal or LED indicator is connected to UA terminal, Y3 terminal must be connected to 24VDC. 3) Replace with a new product. 4) Replace with a External indicator.
	◐ UB Blink	Faults involved with External Indicator output UB.	1) Failures involving the wiring of External indicator output UB 2) Failures involving the wiring of External indicator fault detect input Y4 3) Failures of the parts of the circuits of External indicator output UB 4) Failures of the External indicator	1) Check the wiring to UB 2) Check the wiring to Y4 *In case external indicator is not connected to UB terminal or LED indicator is connected to UB terminal, Y4 terminal must be connected to 24VDC. 3) Replace with a new product. 4) Replace with a External indicator.
	◐ UA and UB Blink	Faults of switching mode	1) Failures involving switching mode preset switch or the wiring of mode input M1 and M2 2) Failures of mode select input 3) Failures of the parts of the circuits of mode select input	1) Check the switching mode preset switch and the wiring to M1 and M2. 2) Check the wiring to M1 and M2. 3) Replace with a new product.
	◐ The All (without PWR) indicators Blink	Supply voltage outside the rated value	1) Supply voltage outside the rated value	1) Check the supply voltage to Expansion units.

When some indicators blink except ERR indicator, check and take needed actions referring to the following table.

ERR indicator	The other indicators	Conditions	Expected causes of the faults	Expected causes of the faults
○ Light off	◐ T1 Blink or / and T2 Blink	Mismatch between input A ch1 and input A ch2.	1) Input status between input A ch1 and input A ch2 is different, cause of contact failure or short circuit of safety input device(s) or any wiring fault.	1) Check the wiring from safety input devices to G9SX-GS. Or check the inputs sequence of safety input devices. After removing the fault, turn both safety inputs to OFF state.
○ Light off	◐ T6 Blink or / and T7 Blink	Mismatch between input B ch1 and input B ch2.	1) Input status between input B ch1 and input B ch2 is different, cause of contact failure or short circuit of safety input device(s) or any wiring fault.	1) Check the wiring from safety input devices to G9SX-GS. Or check the inputs sequence of safety input devices. After removing the fault, turn both safety inputs to OFF state.

Suitability for Use

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