Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

Compact Non-Contact Door Switch/Non-Contact Door Switch Controller

D40A/G9SX-NS

Electronic Detection Mechanism for Better Stability in Non-contact Door Switch Operation

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

⚠ Be sure to read the *"Safety Precautions"* on page 32.

Features

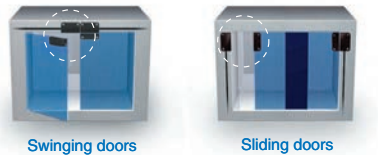
Easy-to-see 2-Color Indicators

Switch status is easy to see at a glance with these red/yellow LED indicators.

Red: Open door detected. | Yellow: Closed door detected. | Not lit: Power OFF or failure

Mount from Either Side

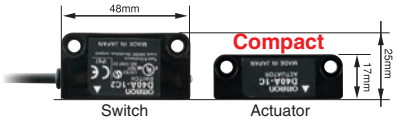
Mount from whichever side provides the easiest wiring path to enable mounting to all types of doors.



Swinging doors | Sliding doors

Small Actuator

An actuator that is smaller than the switch saves space, even inside the door.
Even when mounted with an L-bracket, the actuator's height will not hinder installation or operation.

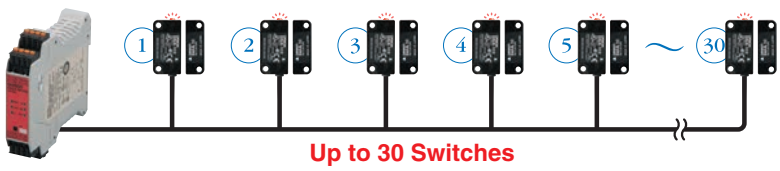


Save Labor with Connector and Reduce Inventory

Wiring time can be reduced with the connector.
Cable lengths can be selected, and only cables of required lengths can be purchased.
Switches can be integrated into a single Switch with a connector when installing in a machine with multiple doors or various types of machines, which can reduce inventory.

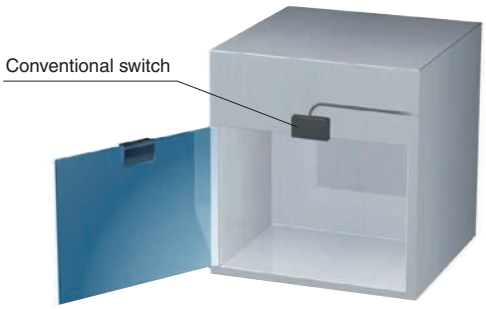
Connect Up to 30 Switches to a Single Controller

Reduce costs by connecting up to 30 Switches to a single Controller.



Solves Conventional Switch Issues to Provide Stable Detection

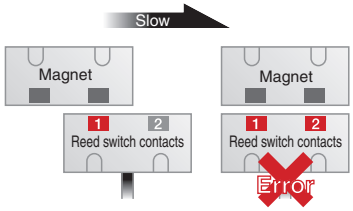
Issue 1 The Switch does not accurately detect the door when it is closed slowly, resulting in an error.



Door closed slowly.

An error can occur if the door is closed slowly with conventional switches.

Solution 1 Conventional Switches

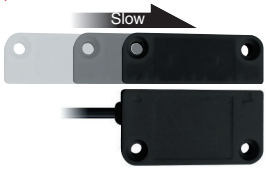


If the switching timing of reed switch contacts 1 and 2 varies too much, the Controller detects an error and turns OFF the output to maintain safety.

Note: The figure is intended only as an illustration.

Stable Detection with the D40A's New System

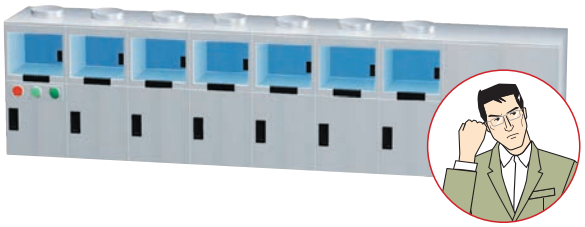
The D40A does not use reed switches and provides stable detection with electronic switches.



Detects slow lateral operation.

Detects slow rotating operation.

Issue 2 It is nearly impossible to tell which door is open in a multi-door application.



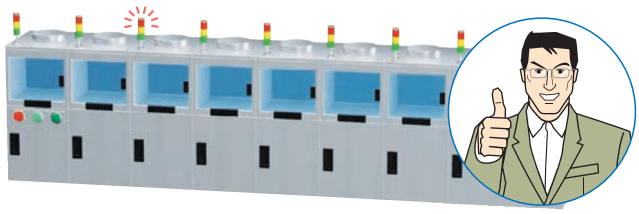
If an error occurs...

The system cannot be started because the Controller has turned OFF the output even though all doors appear to be closed.

It's impossible to tell if there is a door open or if an error has occurred.

All doors must be opened and closed before operation can be started.

Solution 2



With the D40A...

The auxiliary outputs can be used to easily indicate which door is open.
And with two-color indicators, mounting adjustments are also easy.
The D40A is the first Non-contact Door Switch to combine 2-color indicators, auxiliary outputs, and 30-switch connection capacity, allowing you to create a better safety environment.

Issue 3 Various cable lengths and complex wiring are required for multiple doors.

Solution 3

The model with a connector allows you to select the cable lengths that are connected and purchase the cables of required lengths. Switches can be integrated into a single Switch with a connector.
Downtime can be reduced by replacing the cable and switch partially at maintenance time.

Two Types of Controller to Solve Productivity, Expandability, and Maintenance Issues

The G9SX-NS and G9SX-NSA are designed specifically for use with Non-contact door switch, and with the G9SX-NSA you can also connect mechanical safety door switches. Among other features, these Controllers support logical AND connections that enable partial stops. These Controllers make the most of D40A Switches.

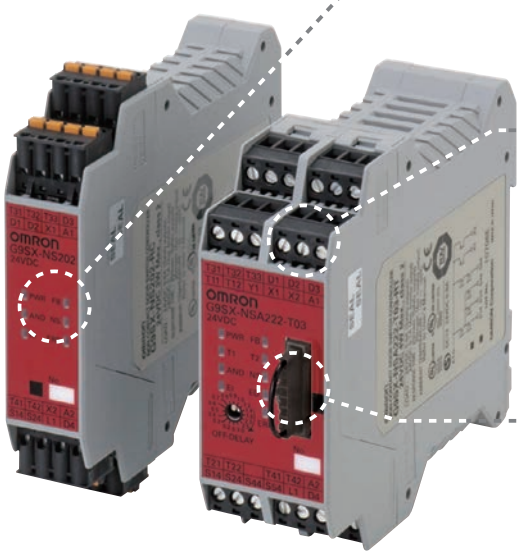
Two Different Controllers

G9SX-NS

- ☐Logical AND connection input
- ☐D40A input
- ☐Two instantaneous safety outputs
- ☐Logical AND connection output

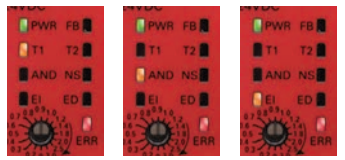
G9SX-NSA

- ☐Logical AND connection input
- ☐D40A plus mechanical safety door switch input, channel 1 or 2
- ☐Two instantaneous safety outputs
- ☐Two OFF-delay safety outputs
- ☐Logical AND connection output



Indicators That Make Maintenance Easier

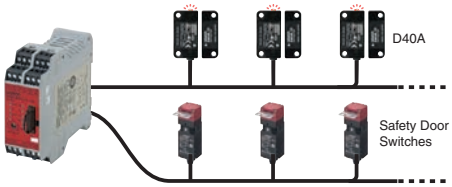
The indicators show the location and cause of wiring errors and any other errors that are detected. Auxiliary outputs for errors also contribute to reducing down time.



Input error | Logical AND connection error | Output error

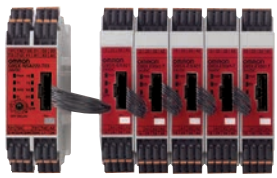
Mechanical Safety Door Switches Can Also Be Connected with the G9SX-NSA

Inputs can be accepted from both D40A Switches and mechanical switches to reduce the number of Controllers and costs.



Expansion Units to Easily Increase the Number of Outputs with the G9SX-NSA

The number of outputs can be easily increased using connectors.
Up to 25 outputs can be configured.



G9SX-EX Expansion Unit

Up to 25 Outputs

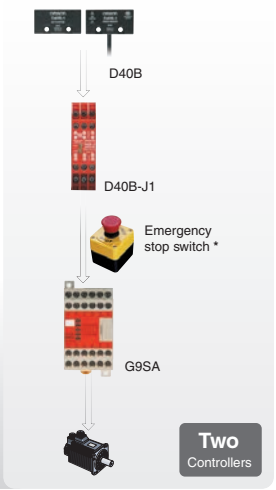
Reduce Costs with these New-Concept Controllers

Issue 1 Two Controllers are required for emergency stop switches and non-contact door switches.

Application

- One hazard.
- The system must be stopped when either a door is opened or an emergency stop switch is pressed.

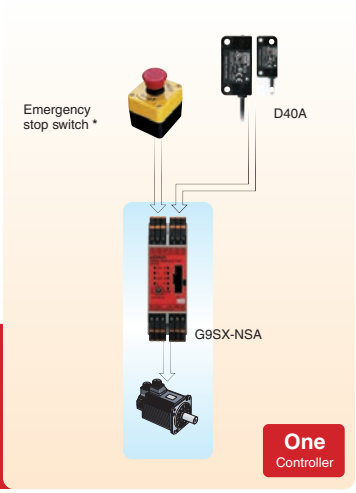
The G9SA must be added to connect the emergency stop switch.



Solution 1

The D40A Simplifies the Configuration

With only one G9SX-NSA222-T03□ Controller, both a Non-contact Door Switch and an emergency stop switch can be connected.

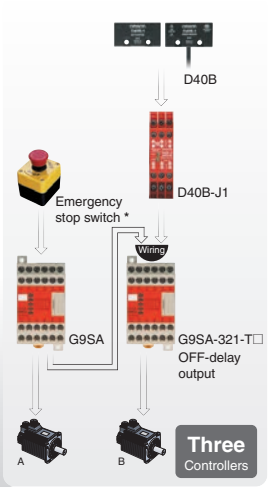


Issue 2 Another Controller has to be added to use an OFF-delay timer.

Application

- Two hazards.
- The power supply must be turned OFF immediately when the emergency stop switch is pressed.
- When a door is opened, a stop signal is sent to only servomotor B and then the power supply is turned OFF.

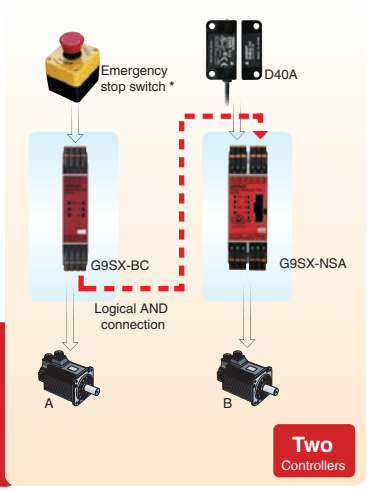
The G9SA must be added to use an OFF-delay timer.



Solution 2

The D40A Simplifies the Configuration

A Controller can be eliminated because the G9SX-NSA222-T03□ provides an OFF-delay output.



* Always use a manual reset when using an emergency stop.

Refer to G9SX for the features of the G9SX Series.

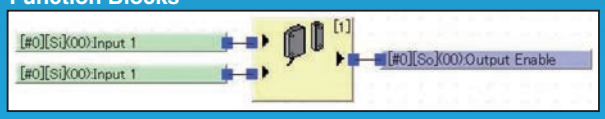
Selection of Safety Controllers for D40A

[Connectable Controllers]
Safety Controller G9SP
Non-contact Door Switch Controller G9SX-NS□

Safety Controller G9SP

- Flexible programming by combining function blocks
- Extensive system configurations
- Decreased work hours by convenient configurator

Function Blocks



* G9SP Series Catalog
Catalog No.: F090

Non-contact Door Switch Controller G9SX-NS□

- Easy expansion of output points by an expansion unit
- Improved maintainability by LED display
- No special programming required

* For details on G9SX-NS□, refer to page 12 and the subsequent pages.

Note: For product information, refer to your OMRON website.

Compact Non-Contact Door Switch
D40A

Electronic Detection Mechanism for Better Stability

- Up to 30 units can be connected to a G9SX-NS□ or G9SP. (The G9SP supports 2 channels and up to 15 units per channel.)
- Compact Non-contact Door Switch can be mounted from both sides.
- The cable length can be selected, reducing wiring restrictions, and Switches can be integrated into a single Switch with a connector, reducing inventory.
- Easy maintenance with color LEDs identifying opening/closing of the door and breaking of cable.
- Complies with ISO 13849-1 (PLd/Safety Category 3).

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

⚠ Be sure to read the *"Safety Precautions"* on page 32.

Model Number Structure

Model Number Legend

Non-Contact Door Switch (Switch/Actuator)

D40A - □□□
1 2 3

1. Type
1: Standard model

2. Auxiliary outputs
C: 1NO (PNP transistor output)

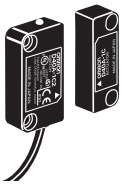
3. Cable length
2: 2 m
5: 5 m
015-F: Connector type
(Cable length :15cm)

Note: The Switch must be used in combination with a Non-Contact Door Switch Controller (G9SX-NS□) or Safety Controller (G9SP). For details on G9SX-NS□, refer to page 14 or subsequent pages, and for details on G9SP series, refer to "G9SP Series Catalog" (Cat. No. F090).

Ordering Information

List of Models

Non-Contact Door Switches (Switch/Actuator)

Classification	Appearance	Auxiliary outputs	Cable length	Model
Standard models		Semiconductor outputs ***1**	2 m	**D40A-1C2**
			5 m	**D40A-1C5**
Connector model			0.15 m	**D40A-1C015-F *2**

Note: The Switch must be used in combination with a Non-Contact Door Switch Controller (G9SX-NS□) or Safety Controller (G9SP).
***1.** PNP open-collector semiconductor output.
***2.** The model with a connector is not KOSHA certified.

Cable with connector

Connector Type	Cable Length	Model	Packing Unit
Single-end	2 m	**XS2F-D521-DG0-A**	5
	5 m	**XS2F-D521-GG0-A**	5
	10 m	**XS2F-D521-JG0-A**	1
	15 m	**XS2F-D521-KG0-A**	1
	20 m	**XS2F-D521-LG0-A**	1

Connector Type	Cable Length	Model	Packing Unit
Double-end	2 m	**XS2W-D521-DG1-A**	5
	5 m	**XS2W-D521-GG1-A**	5
	10 m	**XS2W-D521-JG1-A**	1
	15 m	**XS2W-D521-KG1-A**	1
	20 m	**XS2W-D521-LG1-A**	1

Controllers

Non-Contact Door Switch Controllers G9SX-NS□

Safety outputs *1		Auxiliary outputs *3	Logical AND connection input	Logical AND connection output	Max. OFF delay time *4	Rated voltage	Terminal block type	Model
Instantaneous	OFF-delayed *2							
2 (Semi-conductors)	0	2 (Semi-conductors)	1	1	---	24 VDC	Screw terminals	**G9SX-NS202-RT**
							Spring-cage terminals	**G9SX-NS202-RC**
	2 (Semiconductors)				3.0 s		Screw terminals	**G9SX-NSA222-T03-RT**
							Spring-cage terminals	**G9SX-NSA222-T03-RC**

Note: For details, refer to page 12 or subsequent pages.
***1.** P channel MOS FET transistor output
***2.** The OFF-delayed output becomes an instantaneous output by setting the OFF-delay time to 0 s.
***3.** PNP transistor output
***4.** The OFF-delay time can be set in 16 steps as follows:
0/0.2/0.3/0.4/0.5/0.6/0.7/0.8/0.9/1.0/1.2/1.4/1.8/2.0/2.5/3.0 s

Safety Controller G9SP Series

Name	No. of I/O points				Unit version	Model
	Safety inputs	Test outputs	Safety outputs	Standard outputs		
Safety Controller	10	4	Semiconductor outputs: 4	4	Ver.2.0	**G9SP-N10S**
	10	6	Semiconductor outputs: 16	--		**G9SP-N10D**
	20	6	Semiconductor outputs: 8	--		**G9SP-N20S**

Note: For details, refer to the G9SP Series Catalog (Catalog No. F090).

Specifications

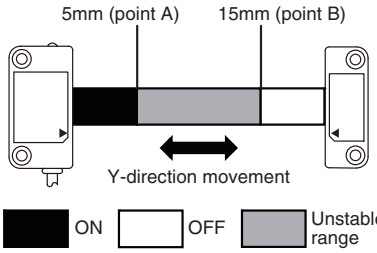
Non-contact Door Switches

Ratings and Characteristics

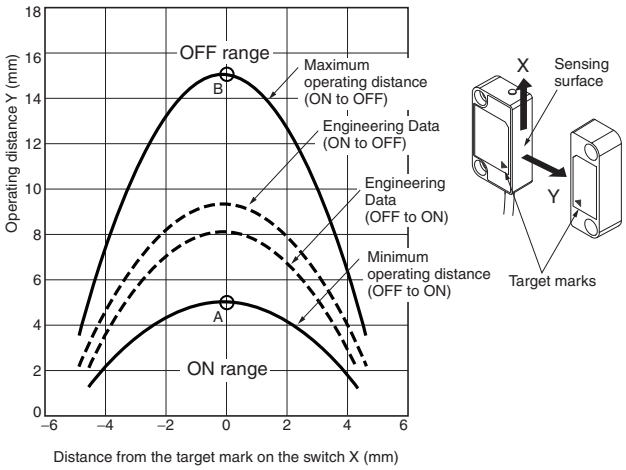
Item		Model	D40A-1C□
Interlock type			Type 4 (EN ISO 14119)
Coding level			Low level coded (EN ISO 14119)
Operating characteristics *2	Operating distance OFF→ON		5 mm min. *1
	Operating distance ON→OFF		15 mm max. *1
	Differential travel		20% or less of operating distance at 23°C (maximum 2.5 mm)
	Influence of temperature (max.)		±20% of operating distance at 23°C, within temperature range of −10 to 55°C
	Repeat accuracy		±10% or less of operating distance at 23°C
Ambient operating temperature			−10 to 55°C (no icing or condensation)
Ambient operating humidity			25% to 85%
Insulation resistance (between charged parts and case)			50 MΩ max. (at 500 VDC)
Dielectric strength (between charged parts and case)			1,000 VAC for 1 min
Pollution degree			3
Electromagnetic compatibility			IEC/EN 60497-5-3 compliant
Vibration resistance			10 to 55 to 10 Hz (single amplitude: 0.75 mm, double amplitude: 1.5 mm)
Shock resistance			300 m/s^2 min.
Degree of protection			IP67
Material			PBT resin
Mounting method			M4 screws
Terminal screw tightening torque			1 N·m
Power supply voltage			24 VDC +10%/−15%
Power consumption			0.6 W max.
Auxiliary outputs *3			24 VDC, 10 mA (PNP open-collector outputs)
LED indicators			Actuator not detected (red); actuator detected (yellow)
Connection cables			2 m, 5 m, 0.15m (Connector type)
Number of connectable switches			30 max. (wiring length: 100 m max.) *4
Weight			Switch: approx. 145 g, actuator: approx. 20 g (D40A-1C2)

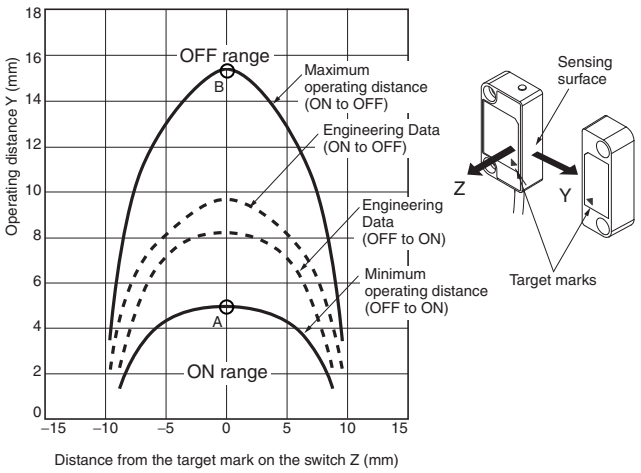
***1.** The condition of this distance are that the switch and actuator target marks are on the same axis and the sensing surfaces are exactly parallel condition. OFF to ON distance shows the switch approaching (Point A in the engineering data graph) and ON to OFF distance shows the switch separating away (Point B in the engineering data graph).
***2.** For details on response time and operating time, refer to the catalog or manual of a safety controller to be connected.
***3.** Turns ON when the actuator is approaching. The G3R series of the SSR can be driven at an auxiliary output of 10 mA. Contact your OMRON representative for details.
***4.** For details, refer to item 5 on page 33.

Engineering Data



Note: 1. The operating distance is the distance between the switch and actuator sensing surfaces.
2. The graph indicates shifting to X or Z direction from following condition that the switch and actuator target marks are on the same axis and the sensing surfaces are exactly parallel condition.
Dashed lines indate reference value for maximum and minimun oprating distance at abient temperature +23°C. The solid line indicates reference values of the maximum and minimum operating distances.
3. The operating distance may be affected by ambient metal, magnet catches, and temperature.





Cable with connector

Ratings and Characteristics

Rated current	4 A
Rated voltage	250 VAC/VDC
Contact resistance (Connector)	40 mΩ max. (20 mV max., 100 mA max.)
Insulation resistance	1,000 MΩ min. (at 500 VDC)
Dielectric strength (Connector)	1,500 VAC for 1 min (leakage current: 1 mA max.).
Degree of protection	IP67 (IEC60529)
Insertion tolerance	200 times min.
Cable holding strength	Cable diameter: 6 mm 98 N/15 s
Ambient operating temperature range	Operating: – 25°C to 70°C
Ambient humidity range	20% to 85%

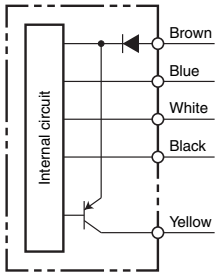
Materials and Finish

Item		XS2F/H/W
Contacts	**Materials**	Phosphor bronze
	Finish	Nickel base, 0.4-μm gold plating
Thread bracket	**Materials**	Brass
	Finish	Nickel plated
Pin block	**Materials**	PBT resin (UL94V-0)
	Finish	For DC: light gray; for AC: dark gray
O-ring/rubber bushing		Rubber
Cover		PBT resin (UL94V-0)

Connections

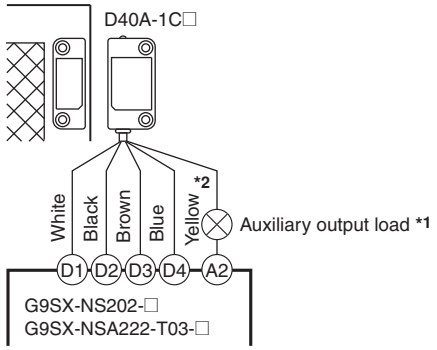
Internal Circuit Diagram

D40A-1C□



D40A and G9SX-NS□ Wiring

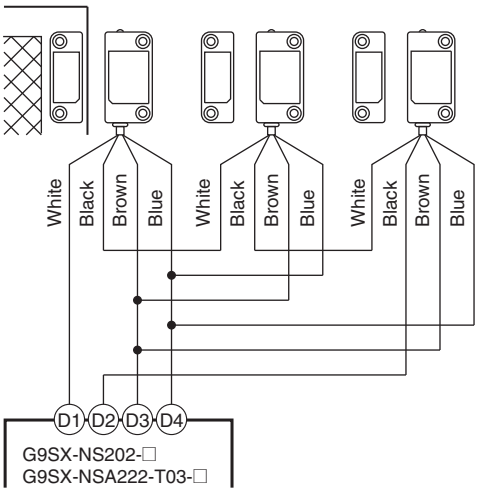
Example: Wiring a Single Switch



✻1. The auxiliary output load current must be 10 mA max.
✻2. When connecting a XS2F series connector with cable to a connector type, the color of the auxiliary output cable is gray.

Example: Wiring Multiple Switches

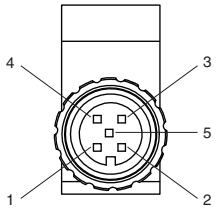
Connect Up to 30 Non-contact Door Switches



Wiring of Inputs and Outputs

Signal name		Wire color	Pin No. of connector type	Description of operation
Non-contact Door Switch power supply input	+	Brown	1	Supplies power to the D40A. Connect to the D3 and D4 terminal of the G9SX-NS□.
	-	Blue	3	
Non-contact Door Switch input		White	2	Inputs signals from the G9SX-NS□. The Non-contact Door Switch input must be ON as a required condition for the Non-contact Door Switch output to be ON.
Non-contact Door Switch output		Black	4	Turns ON and OFF according to actuator detection and the status of the Non-contact Door Switch input.
Auxiliary output (PNP open-collector output)		Yellow	5	Turns ON when actuator is detected.

Note: When connecting a XS2F series connector with cable to a connector type, the color of the auxiliary output cable is gray.



Pin arrangement of connector type

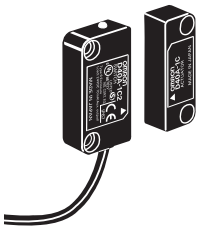
For more information on connection terminal and wiring of G9SP, refer to G9SP Series Safety Controller OPERATION MANUAL (Man. No. Z922).

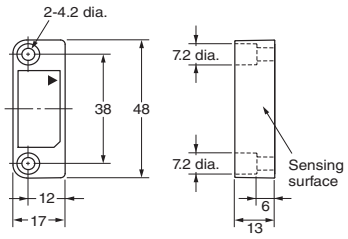
Dimensions and Terminal Arrangement

(Unit: mm)

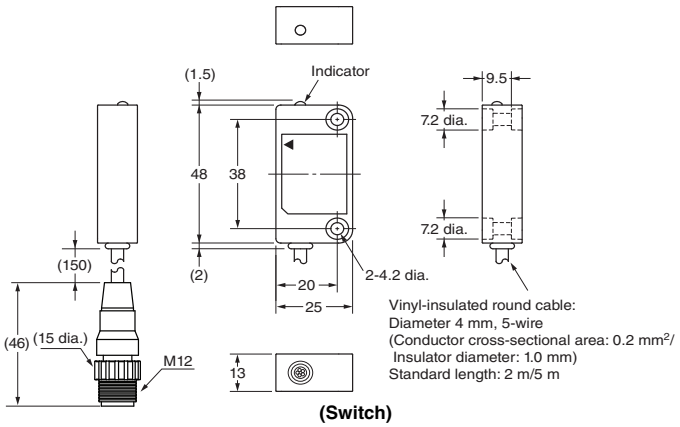
Non-contact Door Switch (Switch/Actuator)

D40A-1C2
D40A-1C5
D40A-1C015-F





(Actuator)



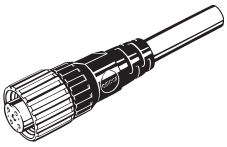
(Switch)

Accessories (Sold separately)

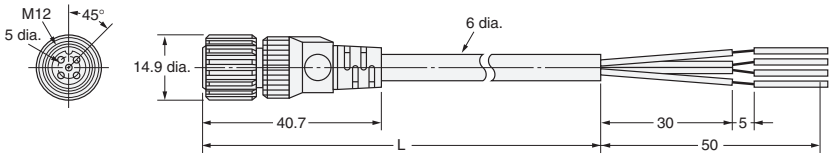
(Unit: mm)

Socket on One Cable End (5-pole Connectors)

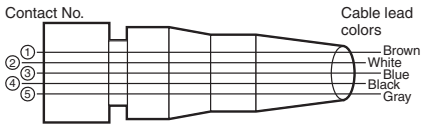
XS2F-D521-DG0-A (L=2m)
XS2F-D521-GG0-A (L=5m)
XS2F-D521-JG0-A (L=10m)
XS2F-D521-KG0-A (L=15m)
XS2F-D521-LG0-A (L=20m)



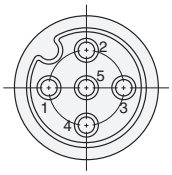
Straight Connectors



Wiring Diagram

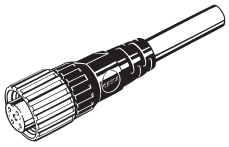


Pin Arrangements (Engagement Side)

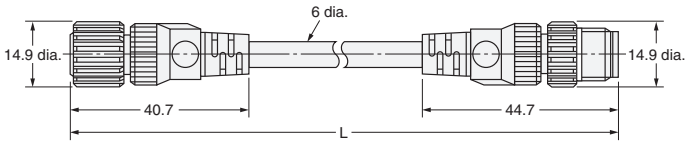


Sockets and Plugs on Cable Ends (5-pole Connectors)

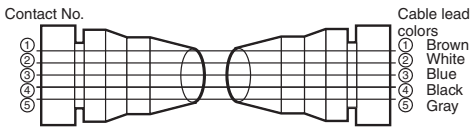
XS2W-D521-DG1-A (L=2m)
XS2W-D521-GG1-A (L=5m)
XS2W-D521-JG1-A (L=10m)
XS2W-D521-KG1-A (L=15m)
XS2W-D521-LG1-A (L=20m)



Straight/Straight Connectors



Wiring Diagram for 5 Cores



Non-Contact Door Switch Controller
G9SX-NS

Dedicated controller for Non-Contact Door Switch with programless and safety circuit configuration

- Up to 30 units of D40A/D40Z Compact Non-Contact Door Switch can be connected to a single Controller.
- Logical AND connection function provides easy system configuration for partial stop and complete stop.
- Programless.
- G9SX-NSA provides simultaneous inputs of a Non-Contact Door Switch and a conventional key-insertion type Safety Door Switch.

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

⚠ Be sure to read the *"Safety Precautions"* on page 32.

Model Number Structure

Model Number Legend

Non-Contact Door Switch Controller

G9SX - □□□□□□ - □□□ - □□

1 2 3 4 5 6

1. Functions
NS/NSA: Controller
EX: Expansion Unit

2. Output Configuration (Instantaneous Safety Outputs)
2: 2 outputs
4: 4 outputs

3. Output Configuration (OFF-delayed Safety Outputs)
0: None
2: 2 outputs

4. Output Configuration (Auxiliary Outputs)
1: 1 output
2: 2 outputs

5. Max. OFF-delay Time
Controller
T03: 3 s (Variable)
Expansion Unit
Blank: No OFF delay
T: OFF delay

6. Terminal Block Type
RT: Screw terminals
RC: Spring-cage terminals

Ordering Information

List of Models

Non-Contact Door Switch Controllers

Safety outputs *1		Auxiliary outputs *3	Logical AND connection input	Logical AND connection output	Max. OFF delay time *4	Rated voltage	Terminal block type	Model
Instantaneous	OFF-delayed *2							
2 (Semi-conductors)	0	2 (Semi-conductors)	1	1	---	24 VDC	Screw terminals	**G9SX-NS202-RT**
							Spring-cage terminals	**G9SX-NS202-RC**
	2 (Semiconductors)				3.0 s		Screw terminals	**G9SX-NSA222-T03-RT**
							Spring-cage terminals	**G9SX-NSA222-T03-RC**

***1.** P channel MOS FET transistor output
***2.** The OFF-delayed output becomes an instantaneous output by setting the OFF-delay time to 0 s.
***3.** PNP transistor output
***4.** The OFF-delay time can be set in 16 steps as follows:
0/0.2/0.3/0.4/0.5/0.6/0.7/0.8/0.9/1.0/1.2/1.4/1.8/2.0/2.5/3.0 s

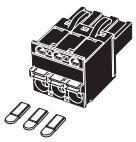
Expansion Units

Safety outputs		Auxiliary outputs	OFF-delay time	Rated voltage	Terminal block type	Model
Instantaneous	OFF-delayed					
4PST-NO	---	1 (Semiconductor) *1	---	24 VDC	Screw terminals	**G9SX-EX401-RT**
					Spring-cage terminals	**G9SX-EX401-RC**
---	4PST-NO		*2		Screw terminals	**G9SX-EX041-T-RT**
					Spring-cage terminals	**G9SX-EX041-T-RC**

***1.** PNP transistor output
***2.** The OFF-delay time is synchronized to the OFF-delay time setting in the connected Controller (G9SX-NSA222-T03-□).

Accessories

Terminal Block

Appearance *	Specifications	Applicable units	Model	Remarks
	Terminal Block with screw terminals (3-pin)	G9SX-NSA	**Y9S-03T1B-02A**	Two Terminal Blocks (black) with screw terminals, and a set of six code marks to prevent erroneous insertion.
	Terminal Block with screw terminals (4-pin)	G9SX-NS G9SX-EX-□	**Y9S-04T1B-02A**	Two Terminal Blocks (black) with screw terminals, and a set of six code marks to prevent erroneous insertion.
	Terminal Block with spring-cage terminals (3-pin)	G9SX-NSA	**Y9S-03C1B-02A**	Two Terminal Blocks (black) with spring-cage terminals, and a set of six code marks to prevent erroneous insertion.
	Terminal Block with spring-cage terminals (4-pin)	G9SX-NS G9SX-EX-□	**Y9S-04C1B-02A**	Two Terminal Blocks (black) with spring-cage terminals, and a set of six code marks to prevent erroneous insertion.

Note: The G9SX main unit comes with a terminal block as standard equipment. The accessories shown here can be ordered as a replacement.
* The illustrations show 3-pin types

Specifications

Non-contact Door Switch Controllers

Ratings

Power input

Item / Model	G9SX-NS202-□	G9SX-NSA222-T03-□	G9SX-EX-□
Rated supply voltage	24 V DC		
Operating voltage range	–15% to 10% of rated supply voltage		
Rated power consumption *	3 W max.	4 W max.	2 W max.

* Power consumption of loads not included.

Inputs

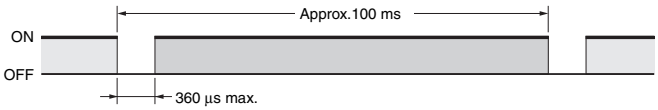
Item / Model	G9SX-NS202-□/G9SX-NSA222-T03-□
Safety input *1	Operating voltage: 20.4 VDC to 26.4 VDC, internal impedance: approx. 2.8 kΩ *2
Feedback/reset input	

***1.** Only applies to the G9SX-NSA222-T03-□. Refers to input other than that from the Non-contact Door Switch.
***2.** Provide a current equal to or higher than that of the minimum applicable load of the connected input control device.

Outputs

Item / Model	G9SX-NS202-□/G9SX-NSA222-T03-□
Instantaneous safety output *1 **OFF-delayed safety output *1**	P channel MOS FET transistor output Load current: 0.8 A DC max. *2
Auxiliary output	PNP transistor output Load current: 100 mA max.

***1.** While safety outputs are in the ON state, the following signal sequence is output continuously for diagnosis.
When using the safety outputs as input signals to control devices (i.e. Programmable Controllers), consider the OFF pulse shown below.



***2.** The following derating is required when Units are mounted side-by-side.
G9SX-NS202-□/G9SX-NSA222-T03-□: 0.4 A max. load current

Expansion Unit

Item / Model	G9SX-EX-□
Rated load	250 VAC, 3 A/30 VDC, 3 A (resistive load)
Rated carry current	3 A
Maximum switching voltage	250 VAC, 125 VDC

Characteristics

Item / Model		G9SX-NS202-□	G9SX-NSA222-T03-□	G9SX-EX-□
Over-voltage category (IEC/EN 60664-1)		II		II (Relay outputs 13 to 43 and 14 to 44: III)
Operating time (OFF to ON state) *1		Logical AND connection input: 100 ms max. D40A connected: 100 ms max. D40Z connected: 200 ms max.	Safety input: 50 ms max. *2 Logical AND connection input: 100 ms max. *3 D40A connected: 100 ms max. *3 D40Z connected: 200 ms max. *3	30 ms max. *4
Response time (ON to OFF state) *1		15 ms max. (Logical AND connection input: OFF) Logical AND connection input: 15 ms max. D40A connected: 20 ms max. *6 D40Z connected: 45 ms max.	15 ms max. (Logical AND connection input: OFF) Safety input: 15 ms max. Logical AND connection input: 15 ms max. D40A connected: 20 ms max. *6 D40Z connected: 45 ms max.	10 ms max. *4
ON-state residual voltage		3.0 V max. (safety output, auxiliary output)		
OFF-state leakage current		0.1 mA max. (safety output, auxiliary output)		
Maximum wiring length of safety input, logical AND connection input, and Non-contact Door Switch input		100 m max. (External connection impedance: 100 Ω max. and 10 nF max.)		
Reset input time (Reset button pressing time)		100 ms min.		
Accuracy of OFF-delay time *5		---	Within ±5% of the set value	Within ±5% of the set value
Insulation resistance	Between logical AND connection terminals, and power supply input terminals and other input and output terminals connected together	20 MΩ min. (at 100 VDC)		---
	Between all terminals connected together and DIN rail			100 MΩ min. (at 500 VDC)
Dielectric strength	Between logical AND connection terminals, and power supply input terminals and other input and output terminals connected together	500 VAC for 1 min.		---
	Between all terminals connected together and DIN rail			1,200 VAC for 1 min
	Between different poles of outputs	---		
	Between relay outputs connected together and other terminals connected together			2,200 VAC for 1 min
Vibration resistance		10 to 55 to 10 Hz, 0.375 mm single amplitude (0.75 mm double amplitude)		
Shock resistance	Destruction	300 m/s²		
	Malfunction	100 m/s²		
Durability	Electrical	---		100,000 cycles min. rated load, switching frequency: 1,800 cycles/hour)
	Mechanical	---		5,000,000 cycles min. (switching frequency: 7,200 cycles/hour)
Ambient operating temperature		–10 to 55°C (no icing or condensation)		
Ambient operating humidity		25% to 85%		
Terminal tightening torque		0.5 N·m (For the G9SX-NS□-RT (with screw terminals) only)		
Weight		Approx. 125 g	Approx. 200 g	Approx. 165 g

***1.** When two or more Units are connected by logical AND, the operating time and response time are the sum total of the operating times and response times, respectively, of all the Units connected by logical AND.
The operating time/response time of the Non-contact Door Switch are included of the time with the D40A/D40Z.
***2.** Represents the operating time when the safety input turns ON with all other conditions set.
***3.** Represents the operating time when the logical AND input and the Non-contact Door Switch input turn ON with all other conditions set.
***4.** This does not include the operating time or response time of G9SX-NS□ that are connected.
***5.** This does not include the operating time or response time of internal relays in the G9SX-EX-□.
***6.** The failure detection time for 24 V short-circuit failure on the input to Non-contact Door Switches is 35 ms max.
If using the Switch for an application other than as a Door Switch, calculate the safe distance using a failure detection time of 35 ms.

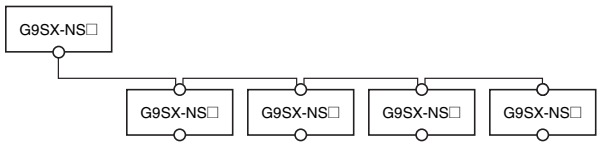
Logical AND Connection

Item / Model	G9SX-NS202-□	G9SX-NSA222-T03-□	G9SX-EX-□
Number of Units connected per logical AND output	4 Units max.		---
Total number of Units connected by logical AND *1	20 Units max.		---
Number of Units connected in series by logical AND	5 Units max.		---
Max. number of Expansion Units connected *2	---		5 Units max.
Maximum cable length for logical AND input	100 m max.		---

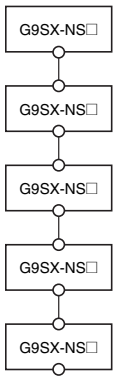
Note: See Logical AND Connection Combinations below for details.
***1.** The number of G9SX-EX401-□ Expansion Units or G9SX-EX041-T-□ Expansion Units (OFF-delayed Model) not included.
***2.** G9SX-EX401-□ Expansion Units and G9SX-EX041-T-□ Expansion Units (OFF-delayed Model) can be mixed.

Logical AND Connection Combinations

1. One logical AND connection output from a G9SX-NS□ Controller can be logical AND connected to up to four Controllers.

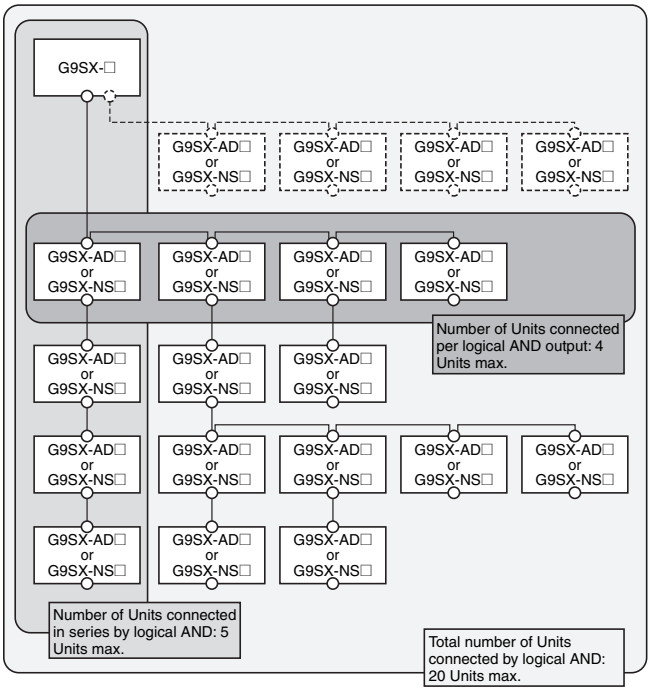


2. Any G9SX-NS□ Controller that receives a logical AND connection input can be logically connected to other Controllers on up to five layers.



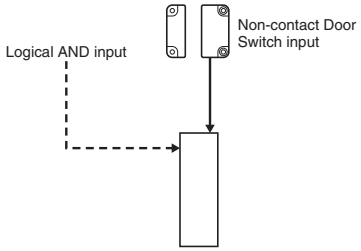
Note: The G9SX-NS□ in the above diagram can be replaced by the G9SX-AD□ Advanced Unit.
For details on G9SX-AD□ advanced unit, refer to G9SX Flexible Safety Unit on your OMRON website.

3. The largest possible system configuration contains a total of 20 G9SX-NS□ Controllers, G9SX-AD□ Advanced Units, and G9SX-BC Basic Units. In this configuration, each Controller or Advanced Unit can have up to five Expansion Units.



Response Time and Operating Time

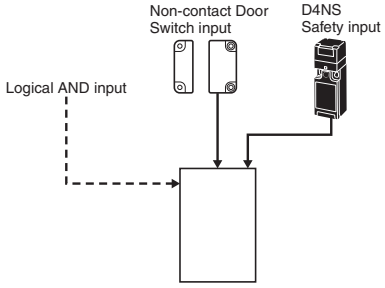
1. G9SX-NS□



	Max. response time (excluding Expansion Units) *1	Max. operating time (excluding Expansion Units) *2
Non-contact Door Switch input	D40A connected: 20 ms max. *3 D40Z connected: 45 ms max. *3	D40A connected: 100 ms max. *4 D40Z connected: 200 ms max. *4
Logical AND input	15 ms	100 ms

***1.** The maximum response time is the time it takes the output to switch from ON to OFF after the input switches from ON to OFF.
***2.** The maximum operating time is the time it takes the output to switch from OFF to ON after the input switches from OFF to ON.
***3.** Represents the response time of Non-contact Door Switch (1 to 30 units connected) and the response time of G9SX-NS added.
***4.** Represents the operating time of Non-contact Door Switch (1 to 30 units connected) and the operating time of G9SX-NS added.

2. G9SX-NSA□

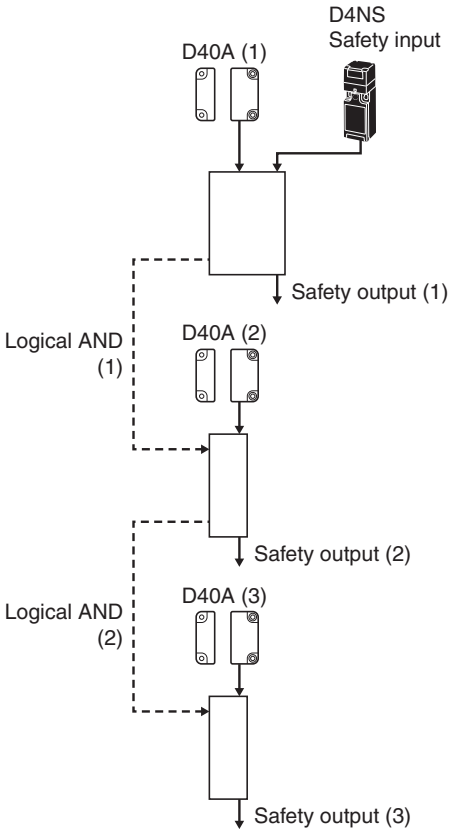


	Max. response time (excluding Expansion Units) *1	Max. operating time (excluding Expansion Units) *2
Non-contact Door Switch input	D40A connected: 20 ms max. *3 D40Z connected: 45 ms max. *3	D40A connected: 100 ms max. *4 D40Z connected: 200 ms max. *4
Safety input	15 ms	50 ms
Logical AND input	15 ms	100 ms

***1.** The maximum response time is the time it takes the output to switch from ON to OFF after the input switches from ON to OFF.
***2.** The maximum operating time is the time it takes the output to switch from OFF to ON after the input switches from OFF to ON.
***3.** Represents the response time of Non-contact Door Switch (1 to 30 units connected) and the response time of G9SX-NS added.
***4.** Represents the operating time of Non-contact Door Switch (1 to 30 units connected) and the operating time of G9SX-NS added.

3. Multiple G9SX-NS□/NSA□ Non-contact Door Switch Controllers

When multiple Controllers are logically connected with AND connections, the response time is the sum of the response times given in 1 and 2 above. (It is the same for the operating time.)



Case (a)
Response Time from When D40A (1) Turns from ON to OFF until Safety Output (2) Turns from ON to OFF

20 ms (D40A (1))	+	15 ms (Logical AND connection (1))	=	35 ms

Note: 45 ms + 15 ms = 60 ms when D40Z is connected.

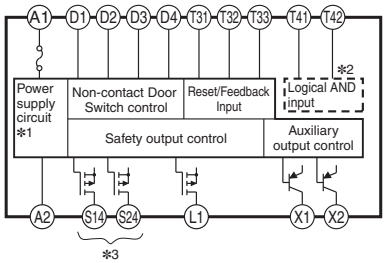
Case (b)
Response Time from When D4NS Turns from ON to OFF until Safety Output (3) Turns from ON to OFF

15 ms (D4NS)	+	15 ms (Logical AND connection (1))	+	15 ms (Logical AND connection (2))	=	45 ms

Connections

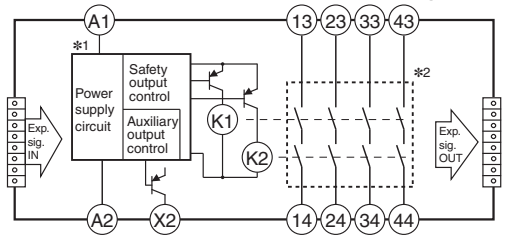
Internal Connection

G9SX-NS202-□ (Non-contact Door Switch Controller)



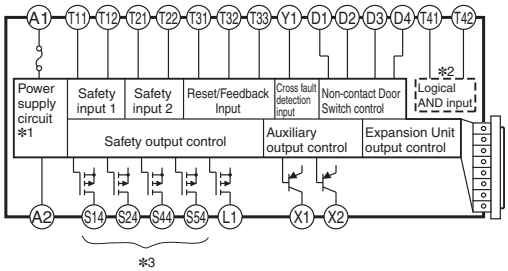
***1.** Internal power supply circuit is not isolated.
***2.** Logical AND input is isolated.
***3.** Outputs S14 to S24 are internally redundant.

G9SX-EX401-□/G9SX-EX041-T-□ (Expansion Unit/Expansion Unit OFF-delayed Model)



***1.** Internal power supply circuit is not isolated.
***2.** Relay outputs are isolated.

G9SX-NSA222-T03-□ (Non-contact Door Switch Controller)

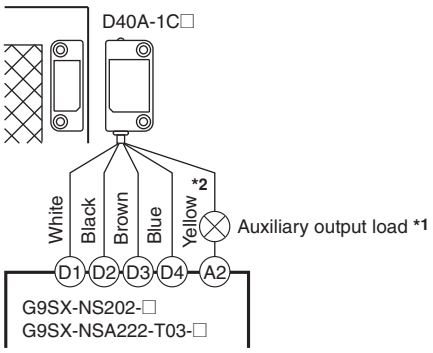


***1.** Internal power supply circuit is not isolated.
***2.** Logical AND input is isolated.
***3.** Outputs S14 to S54 are internally redundant.

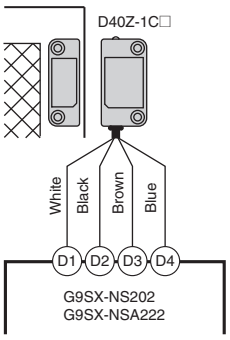
D40A, D40Z and G9SX-NS□ Wiring

Example: Wiring a Single Switch

D40A



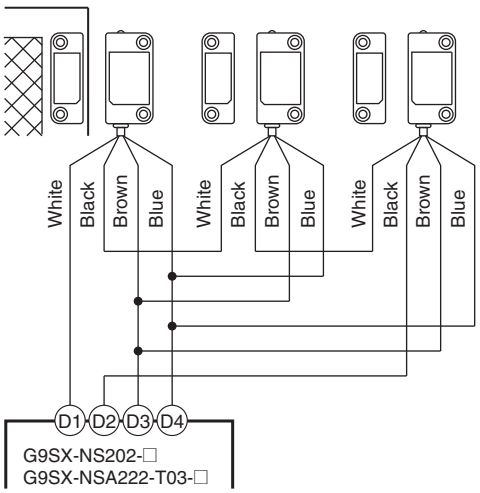
D40Z



✻1. The auxiliary output load current must be 10 mA max.
✻2. When connecting a XS2F series connector with cable to a connector type, the color of the auxiliary output cable is gray.

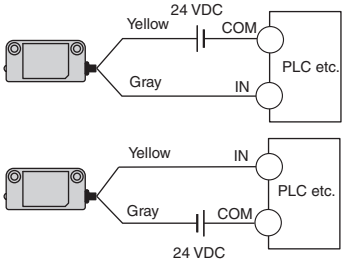
Example: Wiring Multiple Switches

Connect Up to 30 Non-contact Door Switches



Example of auxiliary outputs of the D40Z

The auxiliary output of the D40Z supports the input polarities of both PNP and NPN.

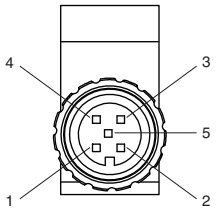


Note: The auxiliary output load current must be 10 mA max. Wrong connection may lead to a failure of the auxiliary output circuit.

Wiring of Inputs and Outputs

Signal name		Cable color of D40A/D40Z	Pin No. of D40A connector type	Description of operation
Non-contact Door Switch power supply input	+	Brown	1	Supplies power to the D40A or D40Z. Connect to the D3 and D4 terminal of the G9SX-NS□.
	-	Blue	3	
Non-contact Door Switch input		White	2	Inputs signals from the G9SX-NS□. The Non-contact Door Switch input must be ON as a required condition for the Non-contact Door Switch output to be ON.
Non-contact Door Switch output		Black	4	Turns ON and OFF according to actuator detection and the status of the Non-contact Door Switch input.
Auxiliary output		Yellow	---	Turns ON when actuator is detected. When a fault is detected, turns into OFF state regardless of actuator status. *3
		Gray	5	

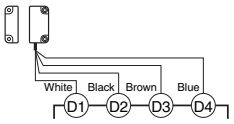
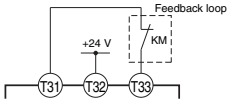
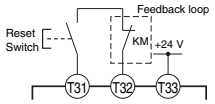
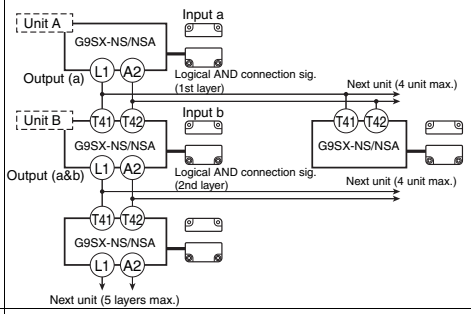
Note: 1. When connecting a XS2F series connector with cable to a D40A connector type, the cable color of the auxiliary output is gray.
2. For details, refer to the data sheet of each Non-contact Door Switch.
✻3. Only D40Z turns into OFF state when a fault is detected by the actuator.



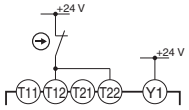
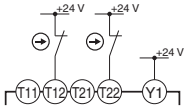
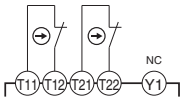
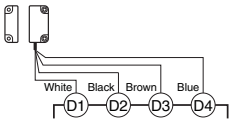
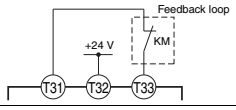
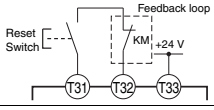
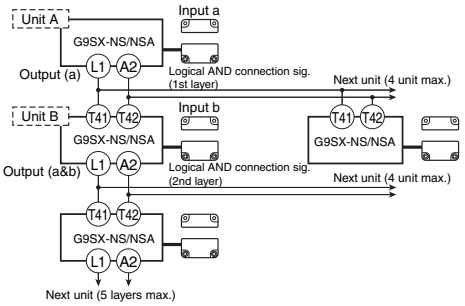
Pin arrangement of D40A connector type

Wiring of Inputs and Outputs

G9SX-NS202-□

Signal name	Terminal name	Description of operation	Wiring
Power supply input	A1, A2	Connect the power source to the A1 and A2 terminals.	Connect the power supply plus (24 VDC) to the A1 terminal. Connect the power supply minus (GND) to the A2 terminal.
Non-contact Door Switch input	D1, D2, D3, D4	All Non-contact Door Switch inputs connected to the G9SX-NS□ must be ON as a required condition for the safety outputs to be ON. Otherwise the safety outputs cannot be in the ON state.	
Feedback/reset input	T31, T32, T33	To set the safety outputs in the ON state, the ON state signal must be input to T33. Otherwise the safety outputs cannot be in the ON state.	Auto reset 
		To set the safety outputs in the ON state, the signal input to T32 must change from the OFF state to the ON state, and then to the OFF state. Otherwise the safety outputs cannot be in the ON state.	Manual reset 
Logical AND connection input	T41, T42	A logical AND connection means that one unit (Unit A) outputs a safety signal “a” to a subsequent unit (Unit B) and Unit B calculates the logical AND (i.e., outputs the AND) of the signal “a” and safety signal “b”, which is input to Unit B. Thereby the logic of the safety output of Unit B is (AND). (An AND of inputs “a” and “b” is output.) To set the safety outputs of the subsequent Unit in the ON state, its logical AND connection preset switch must be set to AND (enable) and the high signal must be input to T41 of the subsequent unit.	
Instantaneous safety output	S14, S24	Turns ON/OFF according to the state of the safety inputs, Non-contact Door Switch inputs, feedback/reset inputs, and logical AND connection inputs. During OFF-delay state, the Instantaneous safety outputs are not able to turn ON.	Keep these outputs open when not used.
Logical AND connection output	L1	Outputs a signal of the same logic and at the same time as the instantaneous safety outputs.	Keep these outputs open when not used.
Auxiliary monitor output	X1	Outputs a signal of the same logic and at the same time as the instantaneous safety outputs.	Keep these outputs open when not used.
Auxiliary error output	X2	Outputs when the error indicator is lit or flashing.	Keep these outputs open when not used.

G9SX-NSA222-T03-□

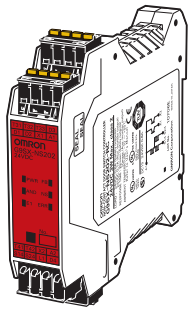
Signal name	Terminal name	Description of operation	Wiring	
Power supply input	A1, A2	Connect the power source to the A1 and A2 terminals.	Connect the power supply plus (24 VDC) to the A1 terminal. Connect the power supply minus (GND) to the A2 terminal.	
Safety input 1	T11, T12	To set the safety outputs in the ON state, the high state signals must be input to both safety input 1 and safety input 2. Otherwise the safety outputs cannot be in the ON state.	Using safety input 1 system	
			Using safety input 2 system (without short-circuit monitoring between systems)	
Safety input 2	T21, T22		Using safety input 2 system (with short-circuit monitoring between systems)	
Non-contact Door Switch input	D1, D2, D3, D4	All Non-contact Door Switch inputs connected to the G9SX-NS must be ON as a required condition for the safety outputs to be ON. Otherwise the safety outputs cannot be in the ON state.		
Feedback/reset input	T31, T32, T33	To set the safety outputs in the ON state, the ON state signal must be input to T33. Otherwise the safety outputs cannot be in the ON state.	Auto reset	
		To set the safety outputs in the ON state, the signal input to T32 must change from the OFF state to the ON state, and then to the OFF state. Otherwise the safety outputs cannot be in the ON state.	Manual reset	
Logical AND connection input	T41, T42	A logical AND connection means that one unit (Unit A) outputs a safety signal “a” to a subsequent unit (Unit B) and Unit B calculates the logical AND (i.e., outputs the AND) of the signal “a” and safety signal “b”, which is input to Unit B. Thereby the logic of the safety output “b” is output.) To set the safety outputs of the subsequent Unit in the ON state, its logical AND connection preset switch must be set to AND (enable) and the high signal must be input to T41 of the subsequent unit.		
Cross fault detection input	Y1	Selects the mode for the failure detecting (cross fault detecting) function for the safety inputs of G9SX corresponding to the connection of the cross fault detection input.	Whether Y1 is connected depends on whether the T11 and T21 terminals are used. Refer to wiring information for safety inputs 1 and 2.	
Instantaneous safety output	S14, S24	Turns ON/OFF according to the state of the safety inputs, feedback/reset inputs, and logical AND connection inputs. During OFF-delay state, the Instantaneous safety outputs are not able to turn ON.	Keep these outputs open when not used.	
OFF-delayed safety output	S44, S54	OFF-delayed safety outputs. The OFF-delay time is set by the OFF-delay preset switch. When the delay time is set to zero, these outputs can be used as non-delay outputs.	Keep these outputs open when not used.	
Logical AND connection output	L1	Outputs a signal of the same logic and at the same time as the instantaneous safety outputs.	Keep these outputs open when not used.	
Auxiliary monitor output	X1	Outputs a signal of the same logic and at the same time as the instantaneous safety outputs.	Keep these outputs open when not used.	
Auxiliary error output	X2	Outputs when the error indicator is lit or flashing.	Keep these outputs open when not used.	

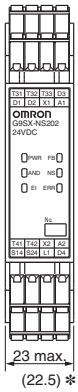
Dimensions and Terminal Arrangement

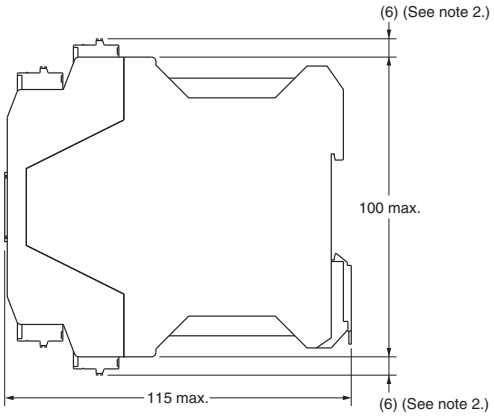
(Unit: mm)

Non-contact Door Switch Controller

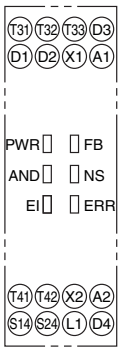
G9SX-NS202-□







Terminal arrangement

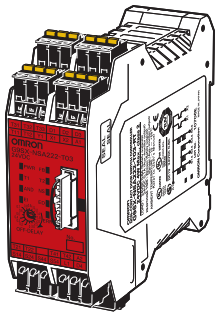


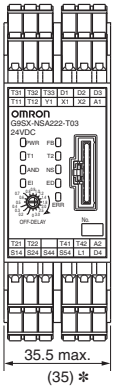
Note: 1. Above outline drawing is for models with spring-cage terminals (-RC).
2. For models with spring-cage terminals (-RC) only.

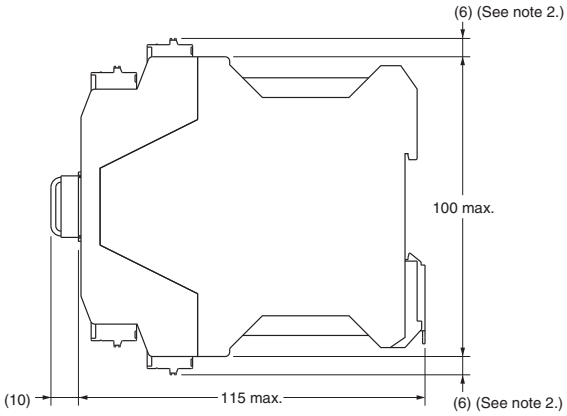
* Typical dimension

Non-contact Door Switch Controller

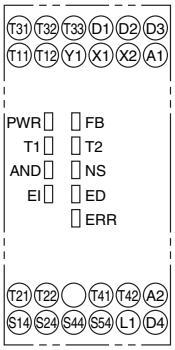
G9SX-NSA222-T03-□







Terminal arrangement



Note: 1. Above outline drawing is for models with spring-cage terminals (-RC).
2. For models with spring-cage terminals (-RC) only.

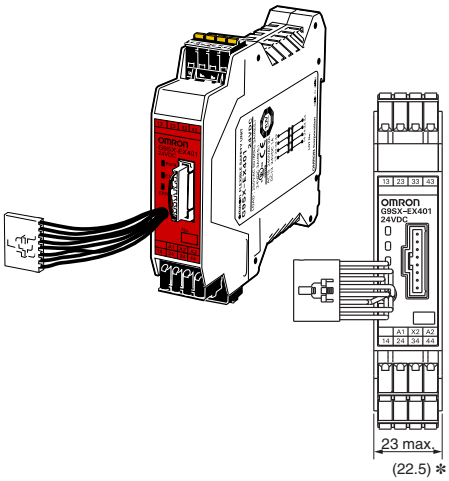
* Typical dimension

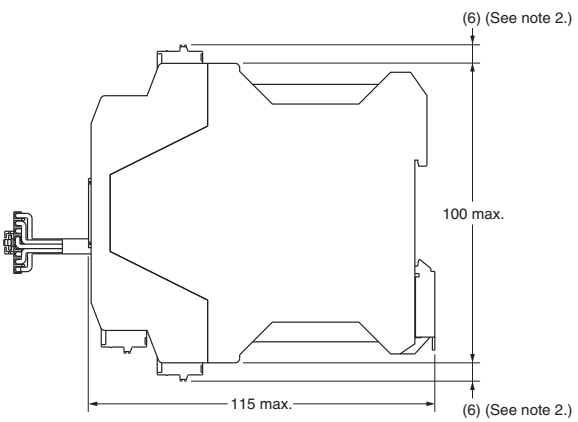
Expansion Unit

G9SX-EX401-□

Expansion Unit (OFF-delayed Model)

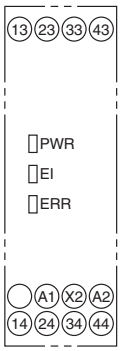
G9SX-EX041-T-□



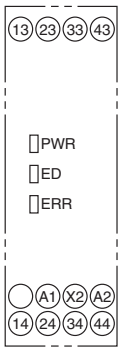


Terminal arrangement

G9SX-EX401-□ (Expansion Unit)



G9SX-EX041-T-□ (Expansion Unit with OFF Delay)



Note: 1. Above outline drawing is for models with spring-cage terminals (-RC).
2. For models with spring-cage terminals (-RC) only.

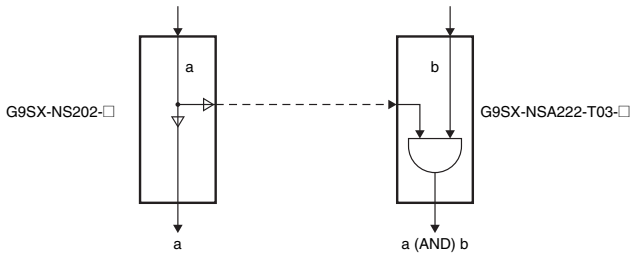
* Typical dimension

Operation

Functions

Logical AND Connection

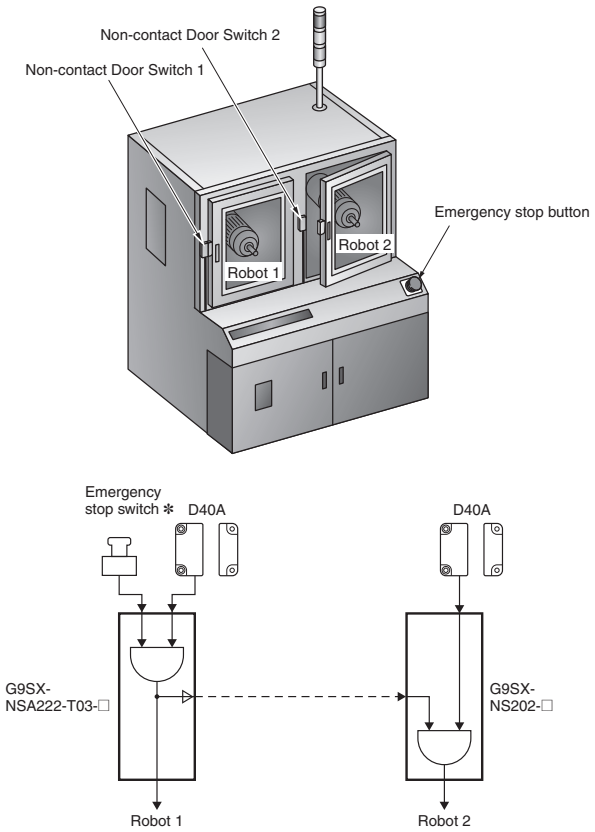
A logical AND connection means that the G9SX outputs a safety signal “a” to another G9SX, and that G9SX creates the logical AND of safety signal “a” and safety signal “b.” The safety output of the G9SX-NSA222-T03-□ with the logical AND connection shown in the following diagram is “a” AND “b.”



This is illustrated using the application in the following diagram as an example. The equipment here has two hazards identified as Robot 1 and Robot 2, and it is equipped with Non-contact Door Switches and an emergency stop button as safety measures. If the door to Robot 2 is opened, only Robot 2 is stopped (i.e., a partial stop). If the door to Robot 1 is opened or the emergency stop button is pressed, both Robot 1 and Robot 2 stop (i.e., a complete stop).

The actual situation using a G9SX for this application is shown in this example.

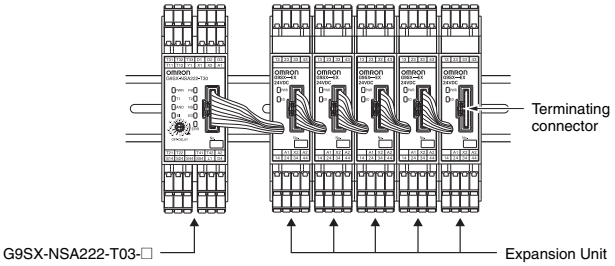
Note: The logical AND setting on the G9SX-NS202-□ must be set to AND (enabled).



* A manual reset is required when an emergency stop is used.

Connecting Expansion Units

- The G9SX-EX and G9SX-EX-T Expansion Units can be connected to a G9SX-NSA222-T3-□ Non-contact Door Switch Controller to increase the number of safety outputs. (They cannot be connected to a G9SX-NS202-□.)
- A maximum of five Expansion Units can be connected to one G9SX-NSA222-T03-□. This may be a combination of G9SX-EX instantaneous models and G9SX-EX-T OFF-delayed models.
- Remove the terminating connector from the receptacle on G9SX-NSA222-T03-□ and insert the Expansion Unit cable connector into the receptacle. Insert the terminating connector into the receptacle on the Expansion Unit at the very end (rightmost).
- When Expansion Units are connected to a Controller, make sure that power is supplied to every Expansion Unit. (Refer to the following diagram for actual Expansion Unit connection.)



Setting Procedure

1. Cross Fault Detection (G9SX-NSA222-T03-□)

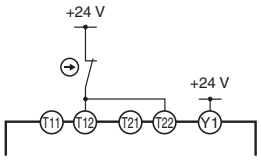
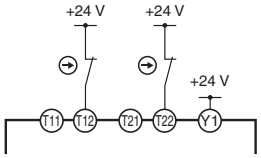
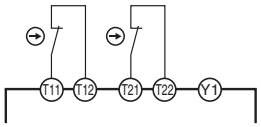
Set the cross fault detection mode for safety inputs by shorting Y1 to 24 V or leaving it open.

When cross fault detection is set to ON, short-circuit failures are detected between safety inputs T11-T12 and T21-22. When a cross fault is detected, the following will occur.

(1) The safety outputs and logical AND outputs lock out.

(2) The LED error indicator is lit.

(3) The error output (auxiliary output) turns ON.

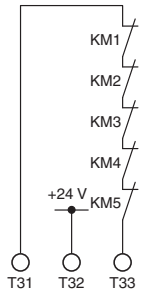
Cross fault detection	Wiring	
OFF	Using safety input 1 system	
	Using safety input 2 system	
ON		

2. Reset Mode (G9SX-NS202-□/NSA222-T03-□)

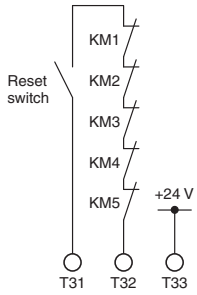
Set the reset mode using feedback/reset input terminals T31, T32, and T33.

Auto reset mode is selected when terminal T32 is shorted to 24 V and manual reset mode is selected when terminal T33 is shorted to 24 V.

Auto reset mode

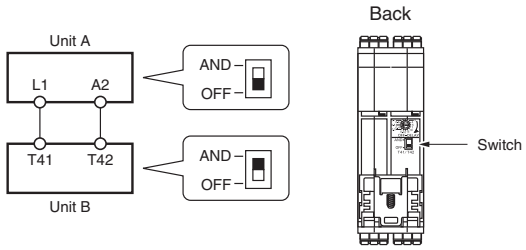


Manual reset mode



3. Setting Logical AND Connection (G9SX-NS202-□/NSA222-T03-□)

When connecting two or more Non-contact Door Switch Controllers by logical AND connection, set the logical AND connection preset switch on the Controller that is on the input side (Unit B in the following diagram) to AND. The default setting of the logical AND connection preset switch is set to OFF.

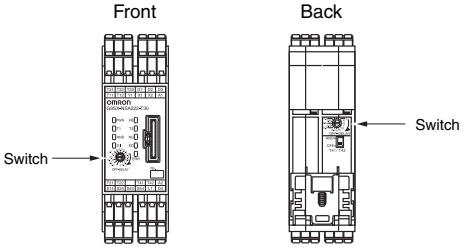


Note: A setting error will occur and Unit B will lock out if the logical AND setting switch on the Unit B is set to OFF.

4. Setting the OFF-delay Time (G9SX-NSA222-T03-□)

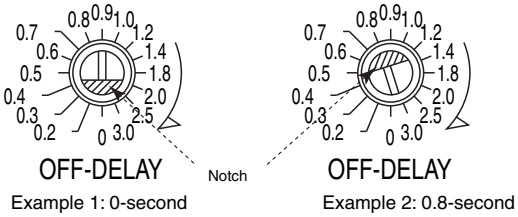
The OFF-delay preset time on G9SX-NSA222-T03-□ is set from the OFF-delay time preset switch (1 each on the front and back of the Unit).

Normal operation will only occur if both switches are identically set. An error will occur if the switches are not identically set. The default setting of the OFF-delay time preset switch is set to 0 s.



Refer to the following illustration for details on setting switch positions.

G9SX-NSA222-T03-□



Example 1: 0-second

Example 2: 0.8-second

LED Indicators

Marking	Color	Name	G9SX-NS202	G9SX-NSA222	G9SX-EX	G9SX-EX-T	Function	Reference
PWR	**Green**	**Power supply indicator**	❍	❍	❍	❍	Lights while power is supplied.	---
T1	**Orange**	**Safety input #1 indicator**	---	❍	---	---	Lights while a high signal is input to T12. Flashes when an error relating to safety input #1 occurs.	
T2	**Orange**	**Safety input #2 indicator**	---	❍	---	---	Lights while a high signal is input to T22. Flashes when an error relating to safety input #2 occurs.	
NS	**Orange**	**Non-contact Door Switch input indicator**	❍	❍	---	---	Lights when the Non-contact Door Switch input turns ON. Flashes when an error relating to the Non-contact Door Switch input occurs.	
FB	**Orange**	**Feedback/reset input indicator**	❍	❍	---	---	Lights in the following cases: With automatic reset while a high signal is input to T33. With manual reset while a high signal is input to T32. Flashes when an error relating to feedback/ reset input occurs.	*
AND	**Orange**	**Logical AND input indicator**	❍	❍	---	---	Lights while a high signal is input to T41. Flashes when an error relating to logical AND connection input occurs.	
EI	**Orange**	**Instantaneous safety output indicator**	❍	❍	❍	---	Lights while the Instantaneous safety outputs (S14, S24, S34) are in the ON state. Flashes when an error relating to the instantaneous safety output occurs.	
ED	**Orange**	**OFF-delayed safety output indicator**	---	❍	---	❍	Lights while OFF-delayed safety outputs (S44, S54) are in the ON-state. Flashes when an error relating to OFF-delayed safety output occurs.	
ERR	**Red**	**Error indicator**	❍	❍	❍	❍	Lights or flashes when an error occurs.	

***** Refer to *"Fault Detection"* on the next page for details.

Settings Indication (at Power ON)

Settings for the G9SX can be checked by the orange indicators for approx. 3 seconds after the power is turned ON. During this settings indication period, the ERR indicator will light, however the auxiliary error output will remain OFF.

Indicator	Item	Setting position	Indicator status	Setting mode	Setting status
T1	**Cross fault detection mode**	Y1 terminal	Lit	Detection mode	Y1 = open
			Not lit	Non-detection mode	Y1 = 24 VDC
FB	**Reset mode**	T32 or T33 terminal	Lit	Manual reset mode	T33 = 24 VDC
			Not lit	Auto reset mode	T32 = 24 VDC
AND	**Logical AND connection input mode**	Logical AND connection preset switch	Lit	Enable logical AND input	AND
			Not lit	Disable logical AND input	OFF