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

Connection is also possible to a G9SP Safety Controller.
-Complies with ISO 13849-1(PLd/Safety Category 3).
-The maximum number of Switches that can be connected to a G9SPseries Controller is given below.
G9SP-N10S: $15 \times 1$ system
G9SP-N10D/20S: $15 \times 2$ system
For details, refer to the G9SP Series Operation Manual (Cat. No.Z922).


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 28 and the "Precautions for All Safety Door Switches".

Features


## Solves Conventional Switch Issues to Provide Stable Detection



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


## 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



## Reduce Costs with these New-Concept Controllers

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



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



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


## Selection of Safety Controllers for D40A

## [Connectable Controllers]

Safety Controller G9SP
Non-contact Door Switch Controller G9SX-NS $\square$


## Model Number Structure

## Model Number Legend <br> Non-Contact Door Switch (Switch/Actuator)

D40A - $\qquad$

1. Type

1: Standard mode
2. Auxiliary outputs

C: 1NO (PNP transistor output)
3. Cable length

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

Non-Contact Door Switch Controller
G9SX

$\square$

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

## Ordering Information

## List of Models

Non-Contact Door Switches (Switch/Actuator)

| Classification | Appearance | Auxiliary outputs | Cable length | Model |
| :---: | :---: | :---: | :---: | :---: |
| Standard models |  |  | 2 m |  |
|  |  |  |  |  |
|  |  |  | Semiconductor <br> outputs $* 1$ | 5 m |

*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 | Connector Type | Cable Length | Model | Packing Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Single-end | 2 m | XS2F-D521-DG0-A | 5 | Double-end | 2 m | XS2W-D521-DG1-A | 5 |
|  | 5 m | XS2F-D521-GG0-A | 5 |  | 5 m | XS2W-D521-GG1-A | 5 |
|  | 10 m | XS2F-D521-JG0-A | 1 |  | 10 m | XS2W-D521-JG1-A | 1 |
|  | 15 m | XS2F-D521-KG0-A | 1 |  | 15 m | XS2W-D521-KG1-A | 1 |
|  | 20 m | XS2F-D521-LG0-A | 1 |  | 20 m | XS2W-D521-LG1-A | 1 |

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 (Semiconductors) |  | $\begin{gathered} 2 \\ \text { (Semi- } \\ \text { conductors) } \end{gathered}$ | 1 | 1 |  | 24 VDC | Screw terminals | G9SX-NS202-RT |
|  | 0 |  |  |  | --- |  | Spring-cage terminals | G9SX-NS202-RC |
|  | 2 <br> (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 |

[^0]*2. The OFF-delay time is synchronized to the OFF-delay time setting in the connected Controller (G9SX-NSA222-T03- $\square$ ).

## Accessories

Terminal Block

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

Ratings and Characteristics

| Item Model |  | D40A-1C $\square$ |
| :---: | :---: | :---: |
| Operating characteristics *1 | Operating distance OFF $\rightarrow$ ON | 5 mm min. *2 |
|  | Operating distance ON $\rightarrow$ OFF | 15 mm max. *2 |
|  | Differential travel | $20 \%$ or less of operating distance at $23^{\circ} \mathrm{C}$ (maximum 2.5 mm ) |
|  | Influence of temperature (max.) | $\pm 20 \%$ of operating distance at $23^{\circ} \mathrm{C}$, within temperature range of -10 to $55^{\circ} \mathrm{C}$ |
|  | Repeat accuracy | $\pm 10 \%$ or less of operating distance at $23^{\circ} \mathrm{C}$ |
| Ambient operating temperature |  | -10 to $55^{\circ} \mathrm{C}$ (no icing or condensation) |
| Ambient operating humidity |  | 25\% to 85\% |
| Insulation resistance (between charged parts and case) |  | $50 \mathrm{M} \Omega$ 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 |  | $300 \mathrm{~m} / \mathrm{s}^{2} \mathrm{~min}$. |
| Degree of protection |  | IP67 |
| Material |  | PBT resin |
| Mounting method |  | M4 screws |
| Terminal screw tightening torque |  | $1 \mathrm{~N} \cdot \mathrm{~m}$ |
| Power supply voltage |  | 24 VDC +10\%/-15\% |
| Power consumption |  | 0.6 W max. |
| Auxiliary outputs *3 |  | $24 \mathrm{VDC}, 10 \mathrm{~mA}$ (PNP open-collector outputs) |
| LED indicators |  | Actuator not detected (red); actuator detected (yellow) |
| Connection cables |  | $2 \mathrm{~m}, 5 \mathrm{~m}, 0.15 \mathrm{~m}$ (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) |

$* 1$. This is the distance where the switch operates from OFF to ON when approaching and the distance where the switch operates from ON to OFF when separating when the switch and actuator target marks are on the same axis, and the sensing surfaces coincide.
*2. For detail, refer to page 13 Engineering Data Guaranteed value and typical data of operating characteristics.
*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 29.

## Non-contact Door Switches

Ratings
Power input

| Item $\quad$ Model | G9SX-NS202- $\square$ | G9SX-NSA222-T03- $\square$ |  |
| :--- | :--- | :--- | :---: |
| 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. |  |  |  |

* Power consumption of loads not included.

Inputs

| Item | Model |
| :--- | :--- |
| Safety input $\boldsymbol{* 1}$ | G9SX-NS202- $\square /$ G9SX-NSA222-T03- $\square$ |
| Feedback/reset input | Operating voltage: 20.4 VDC to 26.4 VDC, internal impedance: approx. $2.8 \mathrm{k} \Omega * 2$ |

*1. Only applies to the G9SX-NSA222-T03- $\square$. 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 $\quad$ Model | G9SX-NS202- $\square /$ G9SX-NSA222-T03- $\square$ |
| :--- | :--- |
| Instantaneous safety output $* 1$ |  |
| OFF-delayed safety output $* 1$ | P channel MOS FET transistor output <br> Load current: 0.8 A DC max. $* 2$ |
| Auxiliary output | PNP transistor output <br> 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- $\square / G 9 S X-N S A 222-T 03-\square: 0.4$ A max. load current

## Expansion Unit

| Item $\quad$ Model | G9SX-EX- $\square$ |
| :--- | :--- |
| 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- $\square$ | G9SX-NSA222-T03- |
| :--- | :--- | :--- | :--- | :--- |
| Over-voltage category <br> (IEC/EN 60664-1) | II | G9SX-EX- |  |

*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.
*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 $\square$ that are connected.
$* 5$. This does not include the operating time or response time of internal relays in the G9SX-EX- $\square$.
*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 .


Cable with connector
Ratings and Characteristics

| Rated current | 3 A |
| :--- | :--- |
| Rated voltage | For DC 125 VDC, for AC 250 VAC |
| Contact resistance (Connector) | $40 \mathrm{~m} \Omega \mathrm{max}$. (20 mV max., 100 mA max.) |
| Insulation resistance | $1,000 \mathrm{M} \Omega$ min. (at 500 VDC ) |
| Dielectric strength (Connector) | $1,500 \mathrm{VAC}$ for 1 min (leakage current: 1 mA max.). |
| Degree of protection | IP67 (IEC529) |
| Insertion tolerance | 200 times min. |
| Assembled fixture strength | Tensile: $98 \mathrm{~N} / 15 \mathrm{~s}$ <br> Torsion: $0.98 \mathrm{~N} \cdot \mathrm{~m} / 15 \mathrm{~s}$ <br> Cable holding strength |
| Cable diameter: $6 \mathrm{~mm} \quad 98 \mathrm{~N} / 15 \mathrm{~s}$ |  |
| Ambient operating temperature range | Operating: $-25^{\circ} \mathrm{C}$ to $70^{\circ} \mathrm{C}$ |

Materials and Finish

| Item |  |  |
| :--- | :--- | :--- |
| Contacts | Materials | Phosphor bronze |
|  | Finish | Nickel base, 0.4- $\mu \mathrm{m}$ gold plating $\mathbf{W}$ |
| 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) |  |

## Logical AND Connection

| Item Model | G9SX-NS202- $\square$ | G9SX-NSA222-T03- $\square$ | G9SX-EX- $\square$ |
| :---: | :---: | :---: | :---: |
| 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- $\square$ Expansion Units or G9SX-EX041-T- $\square$ Expansion Units (OFF-delayed Model) not included.
*2. G9SX-EX401- $\square$ Expansion Units and G9SX-EX041-T- $\square$ Expansion Units (OFF-delayed Model) can be mixed.

## Logical AND Connection Combinations

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

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


Note: The G9SX-NS $\square$ in the above diagram can be replaced by the G9SX-AD $\square$ Advanced Unit.
For details on G9SX-AD $\square$ Advanced Units, refer to the G9SX-series Flexible Safety Unit catalog. (Cat. No. J150).
3. The largest possible system configuration contains a total of 20 G9SX-NS $\square$ Controllers, G9SX-AD $\square$ 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 $\square$



|  | Max. response time <br> (excluding Expansion <br> Units) $* 1$ | Max. operating time <br> (excluding Expansion <br> Units) $* 2$ |
| :--- | :---: | :---: |
| Non-contact Door Switch input | 20 ms | 100 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.

## 2. G9SX-NSA $\square$



|  | Max. response time <br> (excluding Expansion <br> Units) $* 1$ | Max. operating time <br> (excluding Expansion <br> Units) $* 2$ |
| :--- | :---: | :---: |
| Non-contact Door Switch input | 20 ms | 100 ms |
| 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. Multiple G9SX-NS $\square /$ NSA $\square$ 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.)


## Engineering Data

Guaranteed value and typical data of operating characteristics


Note: 1. The operating distance is the distance between the switch and actuator sensing surfaces.
2. Data in the diagram is typical data at an ambient temperature of $23^{\circ} \mathrm{C}$. Actual operating values may vary. The operating distance may be affected by ambient metal, magnet catches, and temperature.

## Connections

## Internal Connection

G9SX-NS202- $\square$ (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- $\square /$ G9SX-EX041-T- $\square$
(Expansion Unit/Expansion Unit OFF-delayed Model)

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

G9SX-NSA222-T03- $\square$
(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.

## Internal Circuit Diagram

D40A-1C $\square$


## Non-contact Door Switch (Switch/Actuator)

D40A-1C2
D40A-1C5

(Actuator)


## Non-contact Door Switch Controller

 G9SX-NS202- $\square$

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- $\square$

## 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- $\square$


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

* Typical dimension


## Accessories (Sold separately)

## 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 D40A and Non-contact Door Switch Controller G9SX-NS $\square$ Wiring Example: Wiring a Single Switch

Example: Wiring Multiple Switches
Connect Up to 30 Non-contact Door Switches


## Wiring of Inputs and Outputs

| Signal name | Wire color | Pin No. | Description of operation |
| :--- | :---: | :---: | :--- |
| Non-contact Door Switch <br> power supply input | Brown | 1 | Supplies power to the D40A. <br> Connect to the D3 and D4 terminal of the G9SX-NS $\square$. |
| Non-contact Door Switch input | Blue | 3 | Inputs signals from the G9SX-NS $\square$. <br> The Non-contact Door Switch input must be ON as a required condition for <br> the Non-contact Door Switch output to be ON. <br> Non-contact Door Switch <br> output <br> White Black |
| Yuxiliary output | Yellow | 5 | Turns ON and OFF according to actuator detection and the status of the <br> Non-contact Door Switch input. |



## Wiring of Inputs and Outputs

G9SX-NS202- $\square$

| 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. <br> Connect the power supply minus (GND) to the A2 terminal. |
| Non-contact Door Switch input | $\begin{aligned} & \text { D1, D2, } \\ & \text { D3, D4 } \end{aligned}$ | All Non-contact Door Switch inputs connected to the G9SX-NS $\square$ 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 | $\begin{aligned} & \text { T31, T32, } \\ & \text { T33 } \end{aligned}$ | 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. |  |
|  |  | 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. <br> 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 T 41 of the subsequent unit. | Next unit (5 layers max.) |
| 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- $\square$

| 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 |  |
| Safety input 2 | T21, T22 |  | Using safety input 2 system (without short-circuit monitoring between systems) |  |
|  |  |  | Using safety input 2 system (with short-circuit monitoring between systems) |  |
| Non-contact Door Switch input | $\begin{array}{\|l} \mathrm{D} 1, \mathrm{D} 2, \\ \mathrm{D} 3, ~ D 4 \end{array}$ | 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 | $\begin{aligned} & \text { T31, T32, } \\ & \text { T33 } \end{aligned}$ | To set the safety outputs in the ON state, the ON state signal must be input to T33. <br> 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. <br> 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. | Next unit (5 layers max.) |  |
| 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. <br> 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. <br> 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. <br> The OFF-delay time is set by the OFF-delay preset switch. <br> 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. |  |

## Connecting Safety Sensors

Safety sensors cannot be connected to safety inputs for the G9SX-NSA222-T03- $\square$

## 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- $\square$ 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- $\square$ must be set to

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

AND (enabled).


## Connecting Expansion Units

- The G9SX-EX and G9SX-EX-T Expansion Units can be connected to a G9SX-NSA222-T3- $\square$ Non-contact Door Switch Controller to increase the number of safety outputs. (They cannot be connected to a G9SX-NS202- $\square$.)
- A maximum of five Expansion Units can be connected to one G9SX-NSA222-T03- $\square$. 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- $\square$ 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- $\square$ )

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- $\square$ /NSA222-T03- $\square$ )

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 .

3. Setting Logical AND Connection (G9SX-NS202- $\square /$ NSA222-T03- $\square$ )
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- $\square$ )

The OFF-delay preset time on G9SX-NSA222-T03- $\square$ 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- $\square$


## LED Indicators

| Marking | Color | Name | G9SX-NS202 | G9SX- <br> NSA222 | G9SX-EX | G9SX-EX-T | Function |
| :---: | :--- | :--- | :---: | :---: | :---: | :---: | :--- | :--- |
| PWR | Green | Power supply <br> indicator | O | Reference |  |  |  |

* 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 | Y 1 = 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 |

## Fault Detection

When the Non-contact Door Switch Controller detects a fault, the ERR indicator and/or other indicators light up or flash to inform the user about the fault
Check and take necessary measures referring to the following table, and then re-supply power to the Non-contact Door Switch Controller.
(G9SX-NS202- $\square /$ NSA222-T03- $\square$ )

| ERR <br> indicator | Other <br> indicator | Fault | Expected causes of the fault | Check points and measures to take |
| :---: | :---: | :--- | :--- | :--- |


| ERR <br> indicator | Other <br> indicator | Fault | Expected causes of the fault | Check points and measures to take |
| :---: | :---: | :---: | :---: | :---: |

When indicators other than the ERR indicator flash, check and take necessary actions referring to the following table.

| ERR indicator | Other indicators |  | Fault | Expected cause of the fault | Check points and measures to take |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{gathered} \text { O } \\ \text { Off } \end{gathered}$ | T1 <br> T2 | flash | Mismatch between input 1 and input 2. | The input status between input 1 and input 2 is different, due to contact failure or a short circuit of safety input device(s) or a wiring fault. | Check the wiring from safety input devices to the G9SX. Or check the input sequence of safety input devices. After removing the fault, turn both safety inputs 1 and 2 to the OFF state. |

(Expansion Unit)

| ERR <br> indicator | Other <br> indicators | Fault | Expected cause of the fault | Check points and measures to take |
| :---: | :---: | :--- | :--- | :--- |
| Lights | --- | Fault involved with safety <br> relay outputs of <br> Expansion Units | 1. Welding of relay contacts <br> 2. Failure of the internal circuit | Replace with a new product. |

## Application Examples

| PL/safety category | Model | Stop category | Reset |
| :---: | :--- | :---: | :---: |
| PLe/3 equivalent | Non-contact Door Switch D40A <br> Non-contact Door Switch Controller G9SX-NSA222-T03- $\square$ (24 VDC) | 1 | Manual |

Note: 1. The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.
2. The above PL is the evaluation result concerning the guard. The PL for emergency stop switch and other safety functions must be separately evaluated.
3. Stopping time is required between when an opening of the guard is detected and when the motor M stops. Use after risk assessment to prevent operators from approaching hazardous areas too closely during this period.

## - Application Overview

- The S2 monitors the guard, and stop command is sent to the motor controller when the guard is opened.
- The power supply to the motor M1 is turned OFF after OFF-delay time.
- The power supply to the motor M1 is kept OFF while the guard is opened.
- The power supply to the motor M1 is turned ON again when the reset switch S3 is pressed while the guard is closed.


| PL/safety category | Model | Stop category | Reset |
| :---: | :--- | :---: | :---: |
| PLe/3 equivalent | Non-contact Door Switch D40A <br> Non-contact Door Switch Controller G9SX-NSA222-T03- $\square$ (24 VDC) | 1 | Auto |

Note: 1. The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.
2. The above PL is the evaluation result concerning the guard 2 . The PL for guard 1 and other safety functions must be separately evaluated.
3. Stopping time is required between when an opening of the guard 2 is detected and when the motor M stops. Use after risk assessment to prevent operators from approaching hazardous areas too closely during this period.

## - Application Overview

- The S3 monitors the guard 2, and stop command is sent to the motor controller when the guard 2 is opened
- The power supply to the motor M1 is turned OFF after OFF-delay time
- The power supply to the motor M1 is kept OFF while the guard 2 is opened.
- The power supply to the motor M1 is turned ON again when the guard 2 is closed.


Note: For details on Non-contact Door Switch wiring, refer to pages 17 and 18 or to the User's Manual.


| PL/safety category | Model | Stop category | Reset |
| :---: | :--- | :---: | :---: |
| PLe/3 equivalent | Non-contact Door Switch D40A <br> Non-contact Door Switch Controller G9SX-NS202- $\square(24$ VDC $)$ | 0 | Auto |

Note: 1. The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.
2. The above PL is the evaluation result concerning the guard. The PL for emergency stop switch and other safety functions must be separately evaluated.

## - Application Overview

- The S3 monitors the guard, and the power supply to the motor M2 is turned OFF immediately when the guard is opened.
- The power supply to the motor M2 is kept OFF while the guard is opened.
- The power supply to the motor M 2 is turned ON again when the guard is closed.


| PL/safety category | Model | Stop category | Reset |
| :---: | :--- | :---: | :---: |
| PLe/3 equivalent | Non-contact Door Switch D40A <br> Non-contact Door Switch Controller G9SP-N20S (24 VDC) | 0 | Manual |

Note: 1. The above PL is only the evaluation result of the example. The PL must be evaluated in an actual application by the customer after confirming the usage conditions.
2. The above PL is the evaluation result concerning the guard. The PL for emergency stop switch and other safety functions must be separately evaluated.

## - Application Overview

- The S2 monitors the guard, and the power supply to the motor M1 is turned OFF immediately when the guard is opened.
- The power supply to the motor M1 is kept OFF while the guard is opened.
- The power supply to the motor M1 is turned ON again when the reset switch S3 is pressed while the guard is closed.


Note: 1. The PL and category that correspond to this circuit example vary depending on the program configured to the G9SP-N20S. For details, refer to "G9SP Series User's Manual (Cat.No.Z922)".
2. For details on terminal arrangement, refer to "G9SP Series User's Manual (Cat.No.Z922)".
3. Wire auxiliary outputs correctly. Incorrect wiring may lead to a failure of the auxiliary output circuit.

## Safety Precautions

Refer to the "Precautions for All Switches" and "Precautions for All Safety Door Switches".

Indication and Meaning for Safe Use

## WARNING

Precautions for Safe Use

## Precautions

 for Correct UseIndicates 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.

Supplementary comments on what to do or avoid doing, to use the product safely.

Supplementary comments on what to do or avoid doing, to prevent failure to operate, or undesirable effect on product performance.

## $\triangle$ 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 the D40A and G9SX-NS properly so that supply voltages or voltages for loads do NOT touch the safety outputs accidentally.

Serious injury may possibly occur due to damage to safety outputs.
Provide protective circuits against counter-electromotive force if inductive loads are connected to safety outputs.

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

The machine may start operating and may result in serious injury or death.
Do not put the actuator close to the switch when the door is open.

| Control device | Requirements |
| :--- | :--- |
| Emergency stop <br> switch | Use approved device with direct opening <br> mechanism complying with IEC/EN 60947-5-1. |
| Safety door switch, <br> Safety limit switch | Use approved device with direct opening <br> mechanism complying with IEC/EN 60947-5-1 <br> and capable of switching micro loads of 24 VDC, <br> 5 mA. |
| Non-contact <br> Door Switch | The G9SX-NS must be used with D40A <br> Non-contact Door Switches. |
| Relay with <br> forcibly guided <br> contacts | Use approved devices with forcibly guided <br> contacts complying with EN 50205. <br> For feedback, use devices with contacts <br> capable of switching micro loads of 24 VDC, <br> 5 mA. |
| Use contactors with forcibly guided mechanism <br> to input the signal to the Feedback/Reset input <br> of the G9SX-NS through the NC contact of the <br> contactor. <br> For feedback, use devices with contacts <br> capable of switching micro loads of 24 VDC, <br> 5 mA. <br> Failure to open contacts of a contactor cannot <br> be detected by connecting NC contact of the <br> contactor without a forcibly guided mechanism <br> to the Feedback/Reset input. |  |
| Other devices | Evaluate whether devices used are appropriate <br> to satisfy the requirements of the safety <br> category level. |

## Precautions for Safe Use

<D40A/G9SX-NS■>

1. Disconnect the G9SX-NS from the power supply when wiring the D40A.
2. Turn OFF the load power supply before wiring. Failure to do so may cause electric shock.
3. Devices connected to the product may operate unexpectedly.
4. Do not operate the product in atmospheres containing flammable or explosive gas. Arcs or heating of relays during switching may cause fire or explosion.
5. Wire conductors correctly and verify the operation of the product before using the system in which the product is incorporated. Incorrect wiring may lead to loss of safety functions.
6. Do not dismantle, repair, or modify the product. Doing so may lead to loss of safety functions.
<D40A>
7. Auxiliary monitoring outputs are NOT safety outputs. Do not use auxiliary monitoring outputs as safety outputs. Such incorrect use will cause loss of safety function of D40A and peripheral devices.
8. After installing the D40A, qualified personnel must confirm the installation, and must conduct test operations and maintenance. The qualified personnel must be qualified and authorized to secure safety at each phases of design, installation, running, maintenance, and disposal of the system.
9. A qualified person in charge, who is familiar with the machine in which the D40A is to be installed, must conduct and verify the installation.
10. Be sure to inspect the D40A daily and every 6 months. Otherwise, serious injury may possibly occur due to system malfunctions.
11. Connect the D40A to only appropriate components or devices complying with relevant safety standards corresponding to the required level of safety category. Conformity to requirements of the safety category must be determined for the entire system. It is recommended to consult an authorized certification body regarding assessment of conformity to the required safety level.
<G9SX-NS $\square>$
12. Use the G9SX within an enclosure with a IP54 degree of protection or higher according to IEC/EN 60529.
13. Do not apply DC voltages exceeding the rated voltages, nor any AC voltages to G9SX-NS $\square$.
14. Use a DC supply satisfying the requirements given below to prevent electric shock.

- A DC power supply with double or reinforced insulation, for example, according to IEC/EN 60950 or EN 50178, or a transformer according to IEC/EN 61558.
- A DC supply satisfying the requirements for class 2 circuits or limited voltage/current circuits stated in UL 508.

13. Properly apply the specified voltages to the inputs. Applying inappropriate voltages may cause the product to fail to perform its specified function, which could lead to the loss of safety functions or damages to the product.
14. Auxiliary error outputs and auxiliary monitoring outputs are NOT safety outputs. Do not use these outputs as safety outputs. Such incorrect use will cause loss of safety functions of the G9SX and its relevant system. Also logical AND connection outputs can only be used for logical AND connections with the G9SX- $\square$.
15. After installing the G9SX-NS $\square$, qualified personnel must confirm the installation, and must conduct test operations and maintenance. The qualified personnel must be qualified and authorized to secure safety at each phases of design, installation, running, maintenance, and disposal of system.
16. A qualified person in charge, who is familiar with the machine in which G9SX-NS $\square$ is to be installed, must conduct and verify the installation.
17. Perform daily and 6-month inspections for the G9SX-NS $\square$. Otherwise, the system may fail to work properly, resulting in serious injury.
18. Connect to the G9SX-NS $\square$ only appropriate components or devices complying with relevant safety standards corresponding to the required level of safety category.
Conformity to requirements of safety category must be determined as an entire system. It is recommended to consult an authorized certification body regarding assessment of conformity to the required safety level
19. OMRON is not responsible for conformity with any safety standards covering the customer's entire system.
20. Be careful not to have your fingers caught when mounting termina blocks
21. The service life will depend on the switching conditions. Be sure to check the actual operating conditions using the actual devices, and make sure that the number of switching operations will not cause performance problems.

## Precautions for Correct Use

<D40A/G9SX-NS $\square>$

1. Handle with Care.

Do not drop the product or expose it to excessive vibration or mechanical shock. The product may be damaged and may not function properly.
2. Storage and Operating Conditions

Do not store or use the products under the following conditions.

1. In direct sunlight
2. At ambient temperatures not between -10 and $55^{\circ} \mathrm{C}$
3. At relative humidity not between $25 \%$ and $85 \%$ or under temperature changes that could causes condensation
4. In corrosive or combustible gases

5 Where subject to vibration or mechanical shock beyond the rated values
6. Where subject to contact with water, oil, or chemicals
7. In an atmosphere containing excessive dust, saline, or metal powder
8. Where iron filings or powder may fall on the product
3. D40A is a class A product.In residential areas D40A may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.
<D40A>
4. Always use the D40A/G9SX-NS together with the special actuator and a G9X-NS $\square$ Controller. If you use any other OMRON Safety Controller, confirm applicability in the manual for the Safety Controller.
5. Use cables with a length of less than 100 m total to connect D40A Switches. The supply voltage to D40A may decrease by the voltage drop depending on the cable or the wiring configuration. Check the power-supply voltage is in the rated range.

6. Disconnect the G9SX-NS $\square$ from the power supply when replacing the D40A. Devices connected to the G9SX-NS $\square$ may operate unexpectedly.
7. Adhesion of solvent such as alcohol, thinner, trichlorobenzene or gasoline on the product should be avoided.
Such solvents make the marking on D40A illegible and cause deterioration of parts.
8. Do not use the D40A in a magnetic field of 1.5 mT or higher. The D40A may not function properly.
9. Do not use the D40A in the water or in an environment continuously exposed to water. Water may penetrate into the D40A. (The IP67 degree of protection for this switch means that it has been checked for penetration of water after having been left in water for a fixed period of time.)
10. Do not use the switch or actuator as a stopper. Protect the switch and the actuator by installing a stopper. Separate the switch and the actuator to a distance of 1 mm or more.
11. Install the actuator and switch at an appropriate distance so that they do not create a gap that provides access to the hazard.

Correct


Incorrect

12. Where two or more Switches are mounted side-by-side, they must be no closer than 25 mm .

13. Check that the machine is stopped whenever the interlocked guard door is open.

14. Do not mount the switch and actuator on magnetic materials, otherwise it may affect the operating distance.

| Distance from surface of <br> magnetic body | Operating distance |
| :--- | :--- |
| 0 to 5 mm | Reduce to approx. $90 \%$ of <br> original value. |
| 5 mm or longer | No influence. |

15. Tighten all screws to the specified torque by using non-magnetic M4 screws with a maximum diameter of 7 mm and washer for the installation of the switch and actuator. After installation and using, the actuator and switch fixing screws must be coated with tamper proof varnish or similar
compound. Using anaerobic locking compounds can have a detrimental effect on the plastic switch case if the compounds come into contact with the switch case.

16. Wiring
17. Use the following to wire to the product.

Stranded wire (flexible wire): 0.2 to $2.5 \mathrm{~mm}^{2}$ (AWG24 to AWG12)
Solid wire (steel wire): 0.2 to $2.5 \mathrm{~mm}^{2}$ (AWG24 to AWG12)
2. When an auxiliary output is not used, cut off the wiring and cover it with tape so that it does not contact other terminals.
3. When you use an additional cable of 20 m or longer, use a multiconductor cable to group the white, black, brown, and blue lines together.
17. Handle cables with care

1. For bending cables, it is recommended to bend them with a radius of bend no less than six times the cable outer diameter.
2. Do not apply a tensile strength of 50 N or greater to the cables.
3. If there is any machine that has a large surge current (e.g., amotor) near D40A, connect a surge absorber to D40A between the blue and the other cables (white, black, brown, and yellow), respectively.
Suggested surge absorber's specification is as follows:

- Peak pulse power: 600W (10/1000 ms) or more (Per IEC61000-4-5(surge immunity))
- Breakdown voltage: 27-33V
<G9SX-NS $\square>$

19. Mounting

Mount the G9SX-NS to a DIN rail using End Plates (PFP-M, not included with the product) so that the G9SX-NS does not fall off of the rails due to vibration or other causes, especially when the length of DIN railing is short compared to the width of the G9SX-NS $\square$.
20. The following space must be provided around the G9SX-NS $\square$ to enable applying the rated current to the outputs of the G9SX-
NS $\square$, to ensure sufficient ventilation, and to enable wiring:

1. At least 25 mm between side surfaces of the G9SX-NS $\square$
2. At least 50 mm above the top surface of the G9SX-NS $\square$ and below the bottom surface of the G9SX-NS $\square$.

3. Wiring
4. G9SX-NS $\square$-RT (with Screw Terminals)

- Use the following to wire the G9SX-NS $\square$-RT.

| Solid wire <br> (steel wire) | 0.2 to $2.5 \mathrm{~mm}^{2}$ (AWG24 to <br> AWG12) |
| :--- | :--- |
| Stranded wire <br> (flexible wire) | 0.2 to $2.5 \mathrm{~mm}^{2}$ (AWG24 to <br> AWG12) |

- Tighten each screw to the specified torque of 0.5 to $0.6 \mathrm{~N} \cdot \mathrm{~m}$, or the G9SX-NS $\square$ may malfunction or generate heat.
- Strip the wire for no longer than 7 mm .

2. G9SX-NS $\square$-RC (with Spring-cage Terminals)

- Use the following to wire the G9SX-NS $\square$-RC.

| Solid wire <br> (steel wire) | 0.2 to $2.5 \mathrm{~mm}^{2}$ (AWG24 to <br> AWG12) |
| :--- | :--- |
| Stranded wire <br> (flexible wire) | 0.2 to $2.5 \mathrm{~mm}^{2}$ (AWG24 to <br> AWG12) |

- Strip the wire for no longer than 7 mm .

3. Logical AND Connections

- Use VCTF cables or shielded cables for logical AND connect ions between Units.

22. Connecting G9SX-EX $\square-\square$ Expansion Units
23. Remove the terminating connector from the connector on the G9SX-NSA222-T03 $\square$. Insert the connector on the connecting cable of Expansion Unit into the connector on the G9SX-NSA222-T03- $\square$.
24. Connect the terminating connector to the connector on the Expansion Unit at the end position.
When the G9SX-NSA222-T03- $\square$ is used without Expansion Units, leave the terminating connector on the G9SX-NSA222-T03- $\square$.
25. Do not remove the terminating connector or connecting cables of Expansion Units while the system is operating.
26. Before applying the supply voltage, confirm that the connectors are locked firmly.
27. All of the Expansion Units must be supplied with its specified voltages within 10 s after the connected G9SX-NSA222-T03- $\square$ is supplied with voltage.
Otherwise, the G9SX-NSA222-T03- $\square$ will detect a power supply error for the Expansion Units.
28. Use cables with a length of less than 100 m total to connect the safety inputs, feedback/reset inputs, and logical AND connection inputs and outputs.
29. Set the time duration of OFF-delay to an appropriate value that does not cause the loss of safety functions of system.
30. Logical AND connections between Units (Refer to "Functions" on page 19.)
31. To use logical AND connection inputs, enable the logical AND connection input for the G9SX-NS $\square$ that will receive the inputs
32. Connect the logical AND connection inputs appropriately to the logical AND connection outputs of the G9SX- $\square$.
33. When configuring the safety system, be sure to consider that the delay of response time caused by logical AND connection does not degrade the safety functions of the system. (Refer to "Response Time and Operating Time" on page 12.)
34. To determine safety distance to hazards, take into account the delay of safety outputs caused by the following time:
35. Response time of safety inputs
36. Response time of D40A Non-contact Door Switch inputs
37. Response time of logical AND connection input (Refer to "Response Time and Operating Time" on page 12.)
38. Preset OFF-delay time
39. Accuracy of OFF-delay time
40. Start the rest of the system after 5 s or longer has passed since applying supply voltage to all G9SX- $\square$ in the system.
41. Be sure to ground the A2 terminal of the power supply to help prevent malfunctions caused by noise. Also, connect a surge absorber to each end of the coil on inductive loads to reduce noise generation. When sharing a power supply with a Light Curtain, use a DC power supply that will not fail for a momentary power interruption of 20 ms or less.
42. Devices connected to the G9SX-NS may operate unexpectedly. When replacing the G9SX-NS, disconnect it from power supply.
43. Adhesion of solvent

Do not allow organic solvents, such as alcohol, thinner, trichloroethane, or gasoline, to come into contact with the product. Such solvents make the markings on G9SX-NS illegible and cause deterioration of parts.
31. Do not mix AC and DC circuits for contact outputs in a single G9SX-EX $\square-\square$. When using AC and DC circuits, connect at least two G9SX-EX $\square-\square$ Units and use them respectively as dedicated DC-circuit and AC-circuit contact outputs.
32. Safety Application Controller's Relay durability depends greatly on the switching condition. Confirm the actual conditions of operation in which the Relay will be used in order to make sure the permissible number of switching operations.
When the accumulated number of operation exceeds its permissible range, it can cause failure of reset of safety control circuit. In such case, please replace the Relay or the Safety Application Controller immediately.
If the Relay or the Safety Application Controller is used continuously without replacing, then it can lead to loss of safety function.

## Switch and Actuator Operation

## Switch and Actuator Mounting Directions



## Safety Categories

You can use the D40A with the G9SX-NS $\square$ for applications in PLd and Safety Category 3 environments defined in the EN ISO13849-1 European standard and the ISO 13849-1 international standard. Compliance was determined using circuit examples specified by OMRON and may not be applicable to all conditions.
Safety categories are determined for the overall safety control system. Confirm compliance sufficiently with your application.

## Requirements for Safety Category 3 (ISO 13849-1)

1. Connect external input D1-D2 and external output D3-D4 to D40A Switches.
2. Input two channels for external inputs T11-T12 and T21-T22.
3. Input external inputs T11-T12 and T21-T22 from switches with direct opening mechanisms. For limit switches, make sure at least one of the switches has a direct opening mechanism.
4. Input the NC signal from the contactor to T31-T32 for a manual reset and to T31-T33 for an auto reset. (Refer to "Application Examples" on page 24)
5. Make sure to connect the A2 terminal to ground.

## Approved Standards

<D40A>

- EN ISO 13849-1 PLd/Safety Category 3 (used with G9SX-NS $\square$ )
- EN 61508 SIL 3 (used with G9SX-NS $\square$ )
- EN 60947-5-3 (PDF-M) (used with G9SX-NS $\square$ )
- EN1088
- UL 508
- CAN/CSA C22.2 No. 14
- KOSHA certification (excluding connector model)


## Warranty and Application Considerations

| Read and Understand this Catalog |
| :--- |
| Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any <br> questions or comments. |

## Warranty and Limitations of Liability

## WARRANTY

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## Application Considerations

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## Disclaimers

## PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

## CHANGE IN SPECIFICATIONS

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DIMENSIONS AND WEIGHTS
Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

## ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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

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# OCEAN CHIPS <br> Океан Электроники <br> Поставка электронных компонентов 

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR». JONHON
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«FORSTAR» (основан в 1998 г.)
ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:
(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).


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[^0]:    *1. PNP transistor output

