

# High-Coded Non-Contact Safety Door Switch D41D


Reduce the possibilities for defeat, simplify machine design and reduce installation efforts with quick and easy automatic pairing for one or more door switches at a time.

- Eliminate safety door switch bypass options
- Automatic pairing for easy installation
- Save space by installing door switch in narrow spaces and corners inside machinery
- Simplify your design by choosing the best option to fit your machine
- Complies with ISO 14119 (Type 4/High Coded), ISO 13849-1 (PLe)



\* The actuator is sold separately.

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

 Refer to *Safety Precautions* on page 17

## Three types of actuators fit in narrow spaces and corners inside machines



**D41D-A1**  
Installation example: swinging door  
• Fits in narrow spaces and corners



**D41D-A2**  
Installation example: acrylic glass door  
• Flat design matches the surroundings



**D41D-A3**  
Installation example: sliding door, narrow space  
• Compact size for acrylic glass doors

For actuator coding purposes, EN ISO 14119 also introduces a coding level classification that is applicable independently of the technology used. A high-coded safety switch is defined as one where a sensor is paired with a high-level coded actuator for which more than 1,000 variations are available.

# D41D

## Model Number Structure

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### Model Number Legend

#### Safety Door Switch Sensor

**D41D** - □ **C** **D** - □ □  
(1) (2) (3) (4) (5) (6)

**(1) Model**

D: Non-Contact

**(2) Coding level / Teaching limitation**

1: High (Individual coding)

2: High (Individual coding, No limitation)

**(3) Connection to controller**

C: Cascade connection

**(4) Diagnosis output**

D: With diagnosis output

**(5) Cable length**

Blank: no cable

025: 25cm

**(6) Connector**

N1: M8

N2: M12

#### Actuator

**D41D** - **A** □  
(1) (2)

**(1) Model**

D: Non-contact

**(2) Actuator type**

A1: Standard

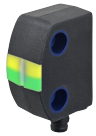

A2: Flat

A3: Miniature




## Ordering Information

### List of Models

#### Sensors



Appearance	Coding level / Teaching limitation	Connection	Cable length	Model
	High (Individual coding)	Connector (M8)	---	<b>D41D-1CD-N1</b>
	High (Individual coding/No limitation)	Connecting cable 0.25-m long with Connector (M12)		<b>D41D-2CD-025N2</b>

#### Actuator (Sold separately)

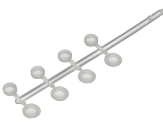

Appearance	Name	Features	Model
	Standard	<ul style="list-style-type: none"> <li>Mounting 2 x M4</li> <li>Dimensions (W x D x H) 39 x 29.5 x 18 (mm)</li> </ul>	<b>D41D-A1</b>
	Flat	<ul style="list-style-type: none"> <li>Mounting 2 x M5 (Countersunk screw)</li> <li>Dimensions (W x D x H) 60 x 16 x 6.8 (mm)</li> </ul>	<b>D41D-A2</b>
	Miniature	<ul style="list-style-type: none"> <li>Mounting 1 x M3 (1.2 dia. hole, plus Twist protection)</li> <li>Dimensions (W x D x H) 22 x 9 x 7 (mm)</li> </ul>	<b>D41D-A3</b>

#### Accessory (Sold separately)

##### Connecting cables

Appearance	Name	Features	Cable length	Model
	Connecting cables with Connector M8	Connecting cables with Connector (M8) (female), 8-pole – 8 x 0.25mm <sup>2</sup> , straight, IP67	2 m	<b>D41D-8P5-CFM8-702M</b>
			5 m	<b>D41D-8P5-CFM8-705M</b>
			10 m	<b>D41D-8P5-CFM8-710M</b>
	Connecting cables with Connector M12	Connecting cables with Connector (M12) (female), 8-pole – 8 x 0.25mm <sup>2</sup> , straight, IP69	5 m	<b>D41L-8P5-CFM12-905M</b>
			10 m	<b>D41L-8P5-CFM12-910M</b>

##### Sealing /Mounting

Appearance	Name	Purpose	Contents	Model
	Sealing Kit	Used to seal the mounting holes	4 flat plugs and 4 plugs with rim for high screw head	<b>D41D-SK</b>
	Mounting Set	Mounting plate: Used to fix to a non-flat surface such as a profile. Ferrule plug: Used for applications with considerable changes in ambient temperature.	2 mounting plates and 4 ferrule plugs	<b>D41D-MS</b>

# D41D

## Standards Certification

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### EU Declaration of Conformity

- Machinery Directive
- RE Directive
- RoHS Directive
- WEEE Directive



Dispose in accordance with applicable regulations.

### Standards

- EN ISO 13849-1: 2015 PL e Category 4
- EN 60947-5-3
- EN 300 330
- EN ISO 14119
- IEC 61508
- EN 62061

### UL Certification

- UL508
- CAN/CSA C22.2 No.14

### Regions where D41D can be used

The product can be used in Japan, the United States of America, Canada, EU member states, the United Kingdom, and People's Republic of China. The use in other countries may conflict with radio laws of the countries.

## Ratings and Specifications

Model		D41D
<b>Technical</b>		
Detection method	RFID	
Frequency band	125 kHz	
Transmitter outputs	-6 dBm max.	
Interlock type (ISO 14119)	Type 4	
Coded level (ISO 14119)	D41D-1: High (individual coding) D41D-2: High (individual coding, No limitation)	
Actuator	D41D-A1, D41D-A2, D41D-A3	
Response time (ON to OFF)	100 ms max.	
Risk time	200 ms max.	
Startup time	2 s max.	
Typical operating distance (Sn) (IEC 60947-5-3)	12 mm (lateral actuation: 9 mm)	
Assured operating distance (Sao) (IEC 60947-5-3)	10 mm (-10 to 60°C) 6 mm (-10 to 60°C, lateral) 8 mm (-25 to 65°C) 4 mm (-25 to 65°C, lateral)	
Assured switch-off distance (Sar)	18 mm (lateral actuation: 15 mm)	
Differential travel	<2.0 mm	
Repeat accuracy (R)	<0.5 mm	
<b>Electrical</b>		
Supply voltage (Ue)	24 VDC (-15%/+10%) (stabilized PELV-power supply)	
Current consumption (Io)	35 mA	
Overvoltage category	III	
Pollution degree	3 (UL certification is 2)	
Conditional short-circuit current	100 A	
External device fuse rating	2 A max.	
Safety input	Accepted test pulse duration on input signal	1.0 ms max.
	Test pulse interval	100 ms min.
	Current consumption per input	5 mA
Safety output (OSSD)	Switching element	PNP type, short-circuit proof
	Utilization category	DC-12: 24 VDC (Ue)/0.25 A (Ie) DC-13: 24 VDC (Ue)/0.25 A (Ie)
	Operating current (Ie1)	0.25 A max.
	Voltage drop (Ud)	<1 V
	Test pulse duration	1.0 ms max.
	Test pulse interval	1,000 ms
Auxiliary output	Switching element	PNP type, short-circuit proof
	Utilization category	DC-12:24 VDC (Ue)/0.05 A (Ie) DC-13:24 VDC (Ue) /0.05 A (Ie)
	Operating current (Ie2)	0.05 A max.
	Voltage drop (Ud)	<2 V
Switching frequency (f)	1 Hz	
Rated insulation voltage (Ui)	32 VDC	
Rated impulse withstand voltage (Uimp)	0.8 kV	
Minimum operating current (Im)	0.5 mA	
OFF-state leakage current (Ir)	<0.5 mA	
<b>Mechanical</b>		
Fixing screws	4 × M4 (Refer to the outline drawing for the actuator)	
Tightening torque of fixing screws	0.8 N·m (Refer to the outline drawing for the actuator)	
Material	Thermoplastic PBT (enclosure)	
Weight	Unit: <50 g, Package: <110 g	

# D41D

Model	D41D
<b>Environmental</b>	
Ambient operating temperature	-25 to 65°C
Ambient storage temperature (including during transportation)	-25 to 85°C
Ambient operating humidity	93% max. (non-condensing, non-icing)
Degree of protection (IEC 60529)	IP65 and IP67
Vibration resistance	10 to 55 Hz, amplitude 1.0 mm
Shock resistance	30 g/11 ms
<b>Connection</b>	
Series connection	31 max. *1
Cable lengths	100m max. (between switch and power supply)
Connection	D41D-1CD-N1: Connector plug M8, 8-pole, A-coded D41D-2CD-025-N2: Connecting cable 0.25-m long with connector M12

\*1. Refer to *Connection* on page 10 for connection specifications with the Safety controller.

## Safety classification information

Standard	ISO 13849-1, IEC 61508, IEC 62061
PL	e
DC	99%
Safety Category	4
PFH (number)	$6.8 \times 10^{-10}/h$
PFD	$1.2 \times 10^{-4}$
SIL	Suitable for SIL3 applications
Mission time	20 years

**Note: 1.** If multiple safety switchgears are involved in the same safety function, the PFH values of the individual components must be added.

## UL

For use in NFPA 79 Applications.

Adapters providing field wiring means are available from the manufacturer.

Refer to manufacturer's information.

For use in Pollution Degree 2 Environment.

## FCC

This device complies with part 15 of the FCC Rules and Industry Canada license-exempt RSS standard(s).

Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

This device complies with the Nerve Stimulation Exposure Limits (ISED RSS-102) for direct touch operations. Changes or modifications not expressly approved by OMRON Corporation could void the user's authority to operate the equipment.

## Engineering Data (Typical Data)

### Detection Range

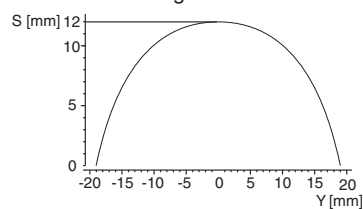
#### Operating distance

The side allows for a maximum height misalignment (X) of sensor and actuator of  $\pm 8$  mm (e.g. mounting tolerance or due to guard door sagging). The axial misalignment (Y) is max.  $\pm 18$  mm.

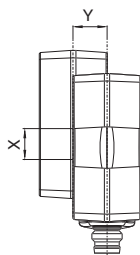
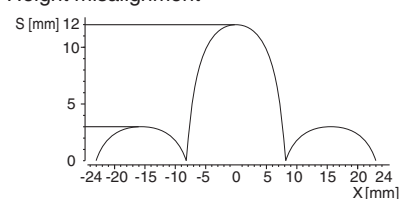
#### Actuating curves

The actuating curves represent the typical operating distance of the safety sensor during the approach of the actuator subject to the actuating direction.

Transverse misalignment



Height misalignment



The continuous signal of the yellow LED signals the actuator detection;  
the flashing of the yellow LED signals that the safety door switch is actuated in the different travel area.

Preferred actuation directions: from front or from side

In case of a lateral actuation, the operating distances are reduced by approx. 3 mm.

#### Recommended Adjustment

Align the safety door switch and actuator at a distance of 0.5 x assured operating distance (Sao).

The correct functionality of both safety channels must be checked by means of the connected safety controller.

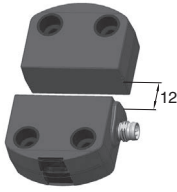
# D41D

## Actuator Mounting Direction

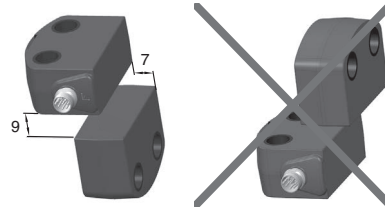
(Unit: mm)

### D41D-A1

Actuation from front



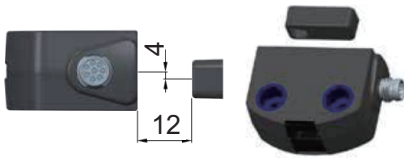
Actuation from side



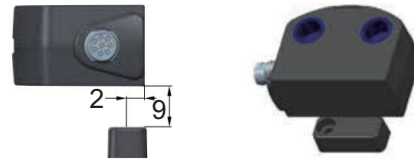
Lateral actuation only from the shown sensor side.

### D41D-A2

Actuation from front



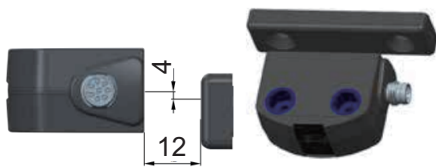
Actuation from side



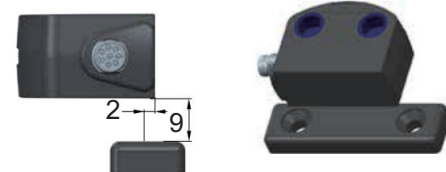
Lateral actuation only from the shown sensor side.

### D41D-A3

Actuation from front



Actuation from side



Lateral actuation only from the shown sensor side.

## Connection

### Pin assignment

Function		Pin assignment of connector plug M8/M12, 8-pole, A-coded	Color code of the OMRON's connector (M8/M12 connector cable) M8: D41D-8P5-CFM8-7□□M M12: D41L-8P5-CFM12-9□□M
A1	U <sub>e</sub>	1	WHITE
X1	Safety input 1	2	BROWN
A2	GND	3	GREEN
Y1	Safety output 1	4	YELLOW
OUT	Auxiliary output	5	GRAY
X2	Safety input 2	6	PINK
Y2	Safety output 2	7	BLUE
IN	without function	8	RED

**Note:** 1. When using an OMRON cable, the tightening torque of the connector is 1 N•m

### Wiring Examples

The application examples shown are suggestions. They however do not exempt the user from carefully checking whether the Safety door switch and its set-up are suitable for the individual application.

The power supply for the safety door switch must provide protection against permanent overvoltage.

To that effect, stabilized PELV supply units must be used. The safety outputs can be directly connected in the safety circuit of the control system. For applications of PL e / safety category 4 in accordance with ISO 13849-1, the safety outputs of the safety door switch or safety door switch of the chain must be connected to a safety controller or safety relay unit of the same Safety Category. If the safety door switch is wired to relays or to non-safety relevant control components, a new risk analysis must be carried out.

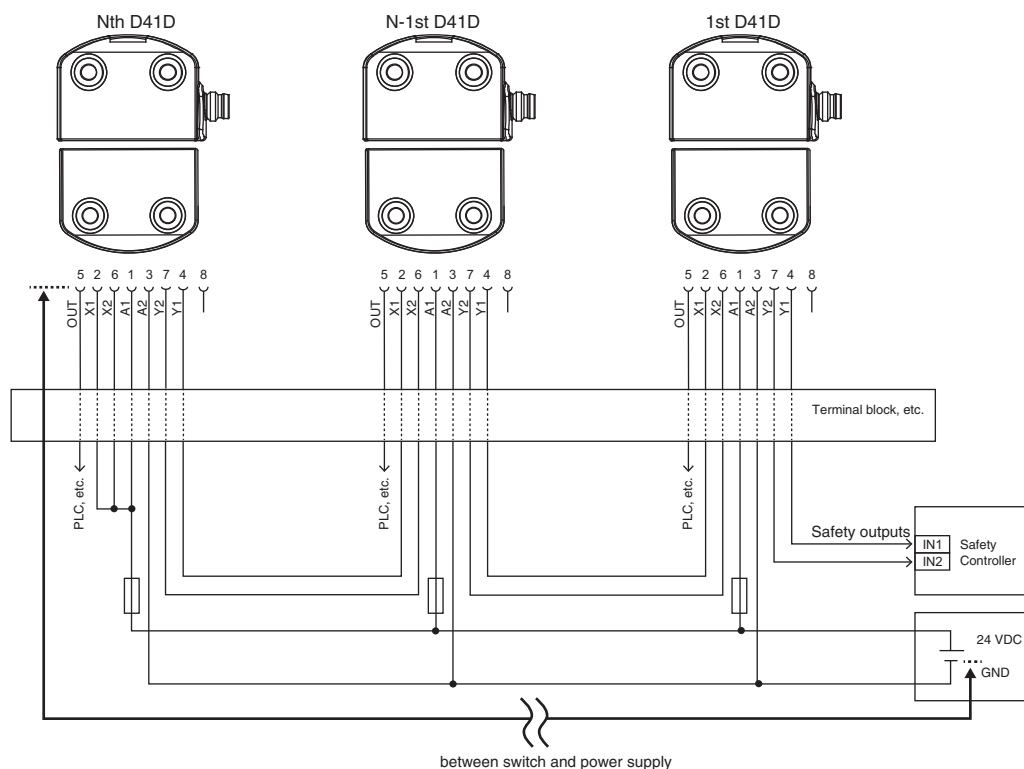
If the safety door switch is connected to the safety input of a safety controller, the controller must have a dual-channel monitoring time of at least 100 ms and the accepted test pulse duration of at least 1 ms. Also, the cross-wire-short monitoring function must be disabled. Typically, a switch-off time of 250 μs is reached with a 30-m connecting cable. The switch-off time of the safety door switch is additionally extended depending on the cable length and the capacity of the cable used.

#### D41D series connection example




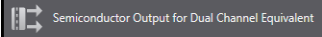
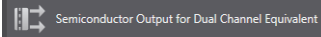
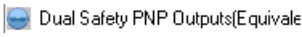
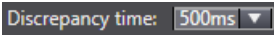
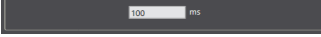
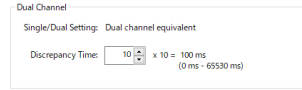
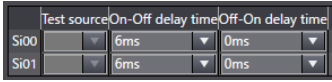
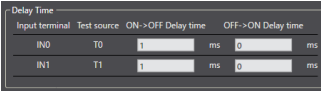
When connecting multiple safety door switches in series, apply 24 VDC to safety inputs X1 and X2 on the Nth unit, as shown in the figure below. Connect safety outputs Y1 and Y2 to safety inputs X1 and X2 of the following safety door switch.

Connect safety outputs Y1 and Y2 of the first unit to the safety controller or safety relay unit.





When connecting a single safety door switch to the safety controller or safety relay unit, apply 24 VDC to safety inputs X1 and X2 in the same manner as the Nth unit shown below, and then connect safety outputs Y1 and Y2 to the safety controller or safety relay unit.



## Safety controller settings

OMRON's safety controller		NX-SL and NX-SI 	GI-SMD/SID 	G9SP 
Input device setting	Input device	Semiconductor Output for Dual Channel Equivalent 	Semiconductor Output for Dual Channel Equivalent 	Dual Safety Semiconductor Output (Equivalent) 
	Discrepancy time	Set discrepancy time to 100 ms or more NX-Series Safety Control Unit User's Manual Refer to the Dual Channel Evaluation in No.Z930. 	Set discrepancy time to 100 ms or more GI-S series Safety I/O Terminal User's Manual Refer to the Dual Channel Evaluation in No.Z400. Example 	Set discrepancy time to 0 (disabled) or 100 ms or more G9SP series Safety Controller User's Manual Refer to the Dual Channel Evaluation in No.Z922. Example 
	Filtering out test pulses	Set input filter ON->OFF delay time to 1 ms or more NX-Series Safety Control Unit User's Manual Refer to the Input Filters in No.Z930. Example 	Set input filter ON->OFF delay time to 1 ms or more GI-S series Safety I/O Terminal User's Manual Refer to the Input Filter Function in No.Z400. Example 	Set input filter OFF delay time to 1 ms or more G9SP series Safety Controller User's Manual Refer to the Input Filters in No.Z922. Example Off On Delay: <input type="text" value="0"/> x 4 = 0 ms (0 ms - 1000 ms) On Off Delay: <input type="text" value="1"/> x 4 = 4 ms (0 ms - 1000 ms)

## Combination with a safety relay unit

OMRON's safety relay unit		G9SA 	G9SE 	G9SB 	G9SX 
Input device Safety-door switch	D41D	Connectable	Not connectable	Connectable	Connectable *1

\*1. The G9SX-NS□ cannot be connected to D41D.

\*2. Refer to the instruction manual or user's manual of each product for how to extend the wiring.