

# Safety-door Switch D4NS

## Multi-contact, Labor-saving, Environment-friendly, Next-generation Safety-door Switch

- Lineup includes MBB models and three contact models with 2NC/1NC and 3NC contact forms in addition to the previous contact forms 1NC/1NO, and 2NC.
- M12-connector models are available, saving on labor and simplifying replacement.
- Standardized gold-clad contacts provide high contact reliability.
- Applicable to both standard loads and micro-loads.
- Free of lead, cadmium, and hexavalent chrome, reducing the burden on the environment.

**Note:** Be sure to read the "Safety Precautions" on page 9 and the "Precautions for All Safety Door Switches" in the Safety Components Series Catalog (Y106).



**NEW**

## Model Number Structure

### ■ Model Number Legend

#### Switch

D4NS-□□□  
1 2 3

#### 1. Conduit/Connector size

- 1: Pg13.5 (1-conduit)
- 2: G1/2 (1-conduit)
- 3: 1/2-14NPT (1-conduit)
- 4: M20 (1-conduit)
- 5: Pg13.5 (2-conduit)
- 6: G1/2 (2-conduit)
- 7: 1/2-14NPT compatible (2-conduit model with M20 conduit size includes an M20-to-1/2-14NPT conversion adapter)
- 8: M20 (2-conduit)
- 9: M12 connector (1-conduit)

#### 2. Built-in Switch

- A: 1NC/1NO (slow-action)
- B: 2NC (slow-action)
- C: 2NC/1NO (slow-action)
- D: 3NC (slow-action)
- E: 1NC/1NO (MBB contact)
- F: 2NC/1NO (MBB contact)

#### 3. Head Mounting Direction

- F: Four mounting directions possible (Front-side mounting at shipping)

**Note:** An order for the head part or the switch part alone cannot be accepted. The Operation Key is sold separately.

#### Operation Key

D4DS-K□  
1

#### 1. Operation Key Type

- 1: Horizontal mounting
- 2: Vertical mounting
- 3: Adjustable mounting (Horizontal)
- 5: Adjustable mounting (Horizontal/ Vertical)

# Ordering Information

## ■ List of Models

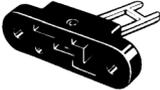
### Switches (Operation Keys are sold separately.)

■: Models with approved direct opening contacts.

Type	Contact configuration	Conduit opening/Connector	Model	
1-Conduit	Slow-action	1NC/1NO	Pg13.5	D4NS-1AF
			G1/2	D4NS-2AF
			1/2-14NPT	D4NS-3AF
			M20	D4NS-4AF
		2NC	Pg13.5	D4NS-1BF
			G1/2	D4NS-2BF
			1/2-14NPT	D4NS-3BF
			M20	D4NS-4BF
		2NC/1NO	Pg13.5	D4NS-1CF
			G1/2	D4NS-2CF
			1/2-14NPT	D4NS-3CF
			M20	D4NS-4CF
	3NC	Pg13.5	D4NS-1DF	
		G1/2	D4NS-2DF	
		1/2-14NPT	D4NS-3DF	
		M20	D4NS-4DF	
	Slow-action MBB contact	1NC/1NO	Pg13.5	D4NS-1EF
			G1/2	D4NS-2EF
			1/2-14NPT	D4NS-3EF
			M20	D4NS-4EF
2NC/1NO		Pg13.5	D4NS-1FF	
		G1/2	D4NS-2FF	
		1/2-14NPT	D4NS-3FF	
		M20	D4NS-4FF	
2-Conduit	Slow-action	1NC/1NO	Pg13.5	D4NS-5AF
			G1/2	D4NS-6AF
			M20, includes M20-to-1/2-14NPT conversion adapter	D4NS-7AF
			M20	D4NS-8AF
		2NC	Pg13.5	D4NS-5BF
			G1/2	D4NS-6BF
			M20, includes M20-to-1/2-14NPT conversion adapter	D4NS-7BF
			M20	D4NS-8BF
		2NC/1NO	Pg13.5	D4NS-5CF
			G1/2	D4NS-6CF
			M20, includes M20-to-1/2-14NPT conversion adapter	D4NS-7CF
			M20	D4NS-8CF
	3NC	Pg13.5	D4NS-5DF	
		G1/2	D4NS-6DF	
		M20, includes M20-to-1/2-14NPT conversion adapter	D4NS-7DF	
		M20	D4NS-8DF	
	Slow-action MBB contact	1NC/1NO	Pg13.5	D4NS-5EF
			G1/2	D4NS-6EF
			M20, includes M20-to-1/2-14NPT conversion adapter	D4NS-7EF
			M20	D4NS-8EF
2NC/1NO		Pg13.5	D4NS-5FF	
		G1/2	D4NS-6FF	
		M20, includes M20-to-1/2-14NPT conversion adapter	D4NS-7FF	
		M20	D4NS-8FF	
1-Conduit, with connector	Slow-action	1NC/1NO	M12 connector	D4NS-9AF
		2NC	D4NS-9BF	
	Slow-action MBB contact	1NC/1NO	D4NS-9EF	

- Note:**
- The recommended models for equipment and machinery being exported to Europe are those with an M20 or Pg13.5 conduit sizes, and for North America, the recommended models are those with a 1/2-14NPT conduit sizes.
  - Resin is used as the material for the D4NS housing and head. Use the metal D4BS Safety-door Switch for applications requiring greater mechanical strength.

**Operation Keys**

Type	Model
Horizontal mounting 	D4DS-K1
Vertical mounting 	D4DS-K2
Adjustable mounting (Horizontal) 	D4DS-K3
Adjustable mounting (Horizontal/Vertical) 	D4DS-K5

**Specifications**

**Standards and EC Directives**

- Conforms to the following EC Directives:  
Machinery Directive  
Low Voltage Directive  
EN50047  
EN1088  
GS-ET-15

**Approved Standards**

Agency	Standard	File No.
TÜV Product Service	EN60947-5-1 (approved direct opening)	(See note 1.)
UL (See note.)	UL508, CSA C22.2 No.14	E76675
CQC (CCC)	GB14048.5	2003010305077 330

- Note:** 1. Consult your OMRON representative for details.  
2. Approval for CSA C22.2 No. 14 is authorized by the UL mark.  
3. Ask your OMRON representative for information on approved models.

**Approved Standard Ratings**

**TÜV (EN60947-5-1), CCC (GB14048.5)**

Item	Utilization category	AC-15	DC-13
Rated operating current ( $I_o$ )		3 A	0.27 A
Rated operating voltage ( $U_o$ )		240 V	250 V

**Note:** Use a 10-A fuse type gI or gG that conforms to IEC60269 as a short-circuit protection device. This fuse is not built into the Switch.

**UL/CSA (UL508, CSA C22.2 No. 14)**

**A300**

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	10 A	60 A	6 A	7,200 VA	720 VA
240 VAC		30 A	3 A		

**Q300**

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
125 VDC	2.5 A	0.55 A	0.55 A	69 VA	69 VA
250 VDC		0.27 A	0.27 A		

## ■ Characteristics

<b>Degree of protection (See note 3.)</b>		IP67 (EN60947-5-1) (This applies for the Switch only. The degree of protection for the key hole is IP00.)	
<b>Durability (See note 4.)</b>	<b>Mechanical</b>	1,000,000 operations min.	
	<b>Electrical</b>	500,000 operations min. for a resistive load of 3 A at 250 VAC (See note 5.) 300,000 operations min. for a resistive load of 10 A at 250 VAC	
<b>Operating speed</b>		0.05 to 0.5 m/s	
<b>Operating frequency</b>		30 operations/minute max.	
<b>Direct opening force (See note 6.)</b>		60 N min.	
<b>Direct opening travel (See note 6.)</b>		10 mm min.	
<b>Contact resistance</b>		25 mΩ max. (initial value)	
<b>Minimum applicable load (See note 7.)</b>		Resistive load of 1 mA at 5 VDC (N-level reference value)	
<b>Rated insulation voltage (U<sub>i</sub>)</b>		300 V	
<b>Protection against electric shock</b>		Class II (double insulation)	
<b>Pollution degree (operating environment)</b>		3 (EN60947-5-1)	
<b>Impulse withstand voltage (EN60947-5-1)</b>		Between terminals of the same polarity	2.5 kV
		Between terminals of different polarities	4 kV
		Between other terminals and uncharged metallic parts	6 kV
<b>Insulation resistance</b>		100 MΩ min.	
<b>Contact gap</b>		2 x 2 mm min	
<b>Vibration resistance</b>	<b>Malfunction</b>	10 to 55 Hz, 0.75-mm single amplitude	
<b>Shock resistance</b>	<b>Destruction</b>	1,000 m/s <sup>2</sup> min.	
	<b>Malfunction</b>	300 m/s <sup>2</sup> min.	
<b>Conditional short-circuit current</b>		100 A (EN60947-5-1)	
<b>Rated open thermal current (I<sub>th</sub>)</b>		10 A (EN60947-5-1)	
<b>Ambient temperature</b>		Operating: -30°C to 70°C with no icing	
<b>Ambient humidity</b>		Operating: 95% max.	
<b>Weight</b>		Approx. 96 g (D4NS-1CF)	

**Note:** 1. The above values are initial values.

2. The Switch contacts can be used with either standard loads or micro-loads. Once the contacts have been used to switch a load, however, they cannot be used to switch smaller loads. The contact surfaces will become rough once they have been used and contact reliability for smaller loads may be reduced.
3. The degree of protection is tested using the method specified by the standard (EN60947-5-1). Confirm that sealing properties are sufficient for the operating conditions and environment beforehand. Although the switch box is protected from dust or water penetration, do not use the D4NS in places where foreign material may enter through the key hole on the head, otherwise Switch damage or malfunctioning may occur.
4. The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40% to 70%. For more details, consult your OMRON representative.
5. If the ambient temperature is greater than 35°C, do not pass the 3-A, 250-VAC load through more than 2 circuits.
6. These figures are minimum requirements for safe operation.
7. This value will vary with the switching frequency, environment, and reliability level. Confirm that correct operation is possible with the actual load beforehand.

# Connections

## ■ Contact Form (Diagrams Show State with Key Inserted)

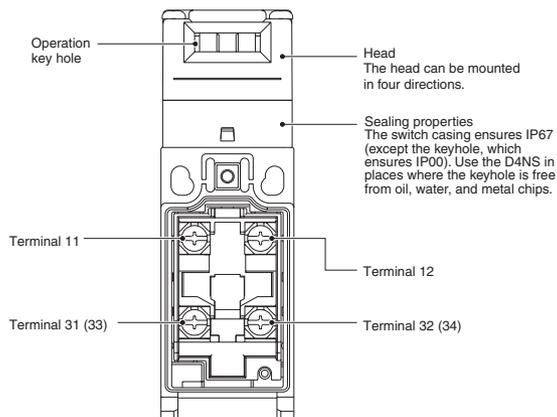
Model	Contact	Contact form	Operating pattern	Remarks
D4NS-□A□	1NC/1NO			Only NC contacts 11-12 have an approved direct opening mechanism. (→) The terminals 11-12 and 33-34 can be used as unlike poles.
D4NS-□B□	2NC			Only NC contacts 11-12 and 31-32 have an approved direct opening mechanism. (→) The terminals 11-12 and 31-32 can be used as unlike poles.
D4NS-□C□	2NC/1NO			Only NC contacts 11-12 and 21-22 have an approved direct opening mechanism. (→) The terminals 11-12, 21-22, and 33-34 can be used as unlike poles.
D4NS-□D□	3NC			Only NC contacts 11-12, 21-22, and 31-32 have an approved direct opening mechanism. (→) The terminals 11-12, 21-22, and 31-32 can be used as unlike poles.
D4NS-□E□	1NC/1NO MBB			Only NC contacts 11-12 have an approved direct opening mechanism. (→) The terminals 11-12 and 33-34 can be used as unlike poles.
D4NS-□F□	2NC/1NO MBB			Only NC contacts 11-12 and 21-22 have an approved direct opening mechanism. (→) The terminals 11-12, 21-22 and 33-34 can be used as unlike poles.

**Note:** MBB (Make Before Break) contacts have an overlapping structure, so that before the normally closed contact (NC) opens, the normally open contact (NO) closes.

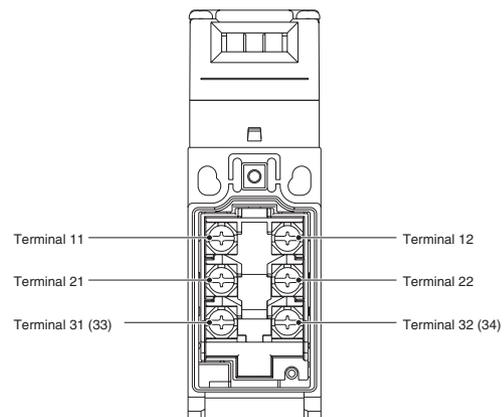
## Nomenclature

### ■ Structure

D4NS-□A□, D4NS-□B□, D4NS-□E□



D4NS-□C□, D4NS-□D□, D4NS-□F□



**Note:** The 2-conduit models have the same terminal arrangement.

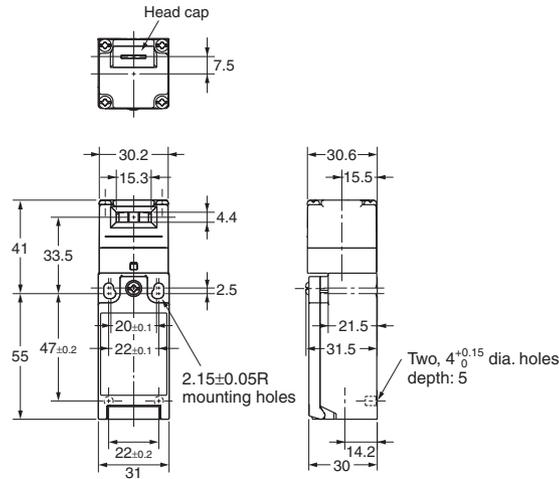
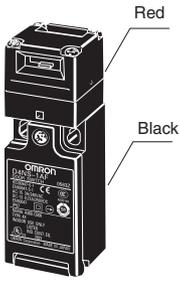
# Dimensions/Operating Characteristics

Note: All units are in millimeters unless otherwise indicated.

## Switches

### 1-Conduit Models

- D4NS-1□F
- D4NS-2□F
- D4NS-3□F
- D4NS-4□F

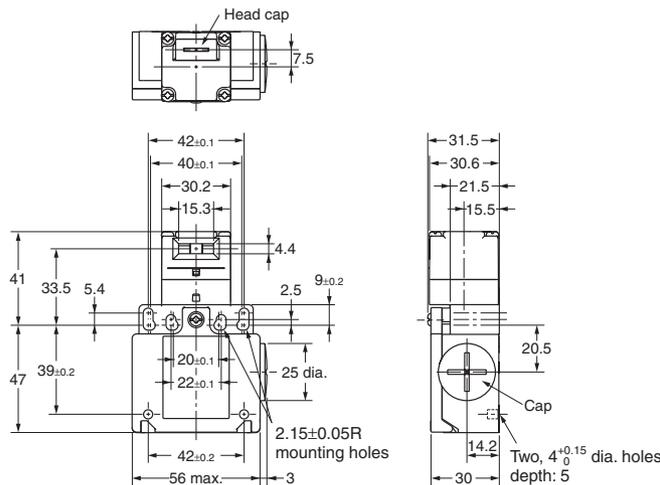
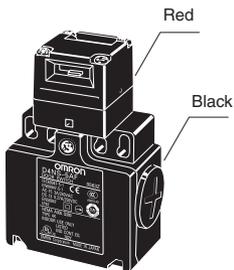


Operating characteristics	D4NS-1□F D4NS-2□F D4NS-3□F D4NS-4□F
Key insertion force	15 N max.
Key extraction force	30 N max.
Pretravel (PT)	6±3 mm
Total travel (TT)	(28 mm)
Direct opening force*	60 N min.
Direct opening stroke*	10 mm min.

\* Always maintain the above operating characteristics for safe use.

### 2-Conduit Models

- D4NS-5□F
- D4NS-6□F
- D4NS-7□F
- D4NS-8□F

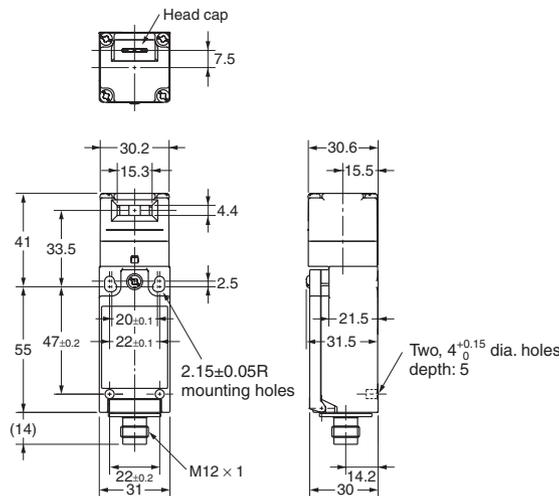
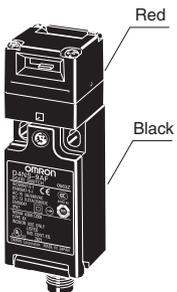


Operating characteristics	D4NS-5□F D4NS-6□F D4NS-7□F D4NS-8□F
Key insertion force	15 N max.
Key extraction force	30 N max.
Pretravel (PT)	6±3 mm
Total travel (TT)	(28 mm)
Direct opening force*	60 N min.
Direct opening stroke*	10 mm min.

\* Always maintain the above operating characteristics for safe use.

### 1-Conduit Connector Models

- D4NS-9□F



Operating characteristics	D4NS-9□F
Key insertion force	15 N max.
Key extraction force	30 N max.
Pretravel (PT)	6±3 mm
Total travel (TT)	(28 mm)
Direct opening force*	60 N min.
Direct opening stroke*	10 mm min.

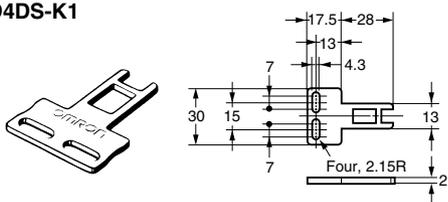
\* Always maintain the above operating characteristics for safe use.

Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.  
 2. There are fluctuations in the contact ON/OFF timing for Switches with multiple poles (2NC, 2NC/1NO, or 3NC). Confirm performance before application.

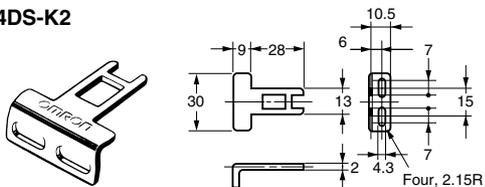
## ■ Operation Keys

**Note:** Unless otherwise specified, a tolerance of  $\pm 0.4$  mm applies to all dimensions.

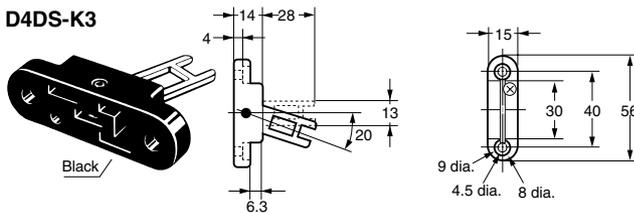
**D4DS-K1**



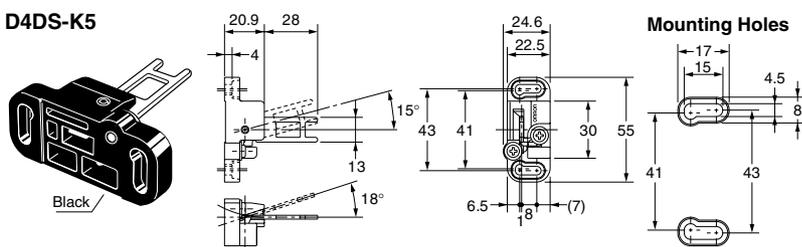
**D4DS-K2**



**D4DS-K3**



**D4DS-K5**

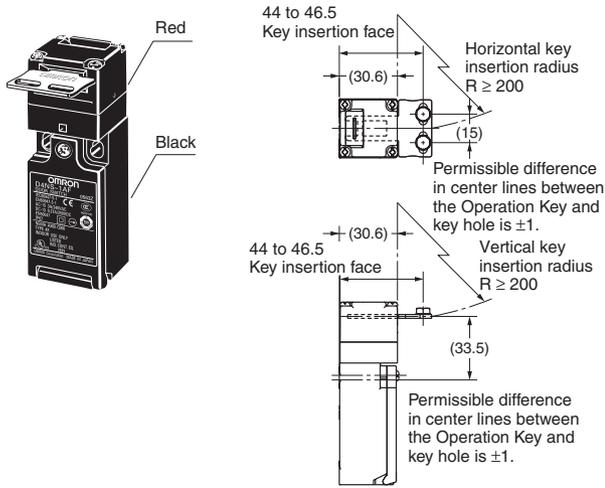


**Mounting Holes**

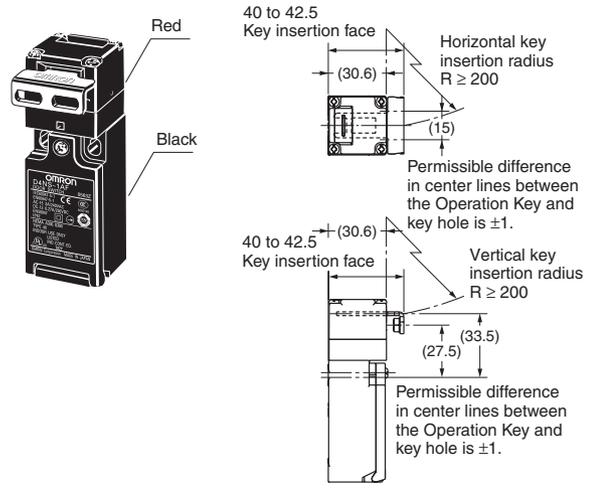
# ■ With Operation Key Inserted (Relationship between Insertion Radius and Key Hole)

Note: Unless otherwise specified, a tolerance of  $\pm 0.4$  mm applies to all dimensions.

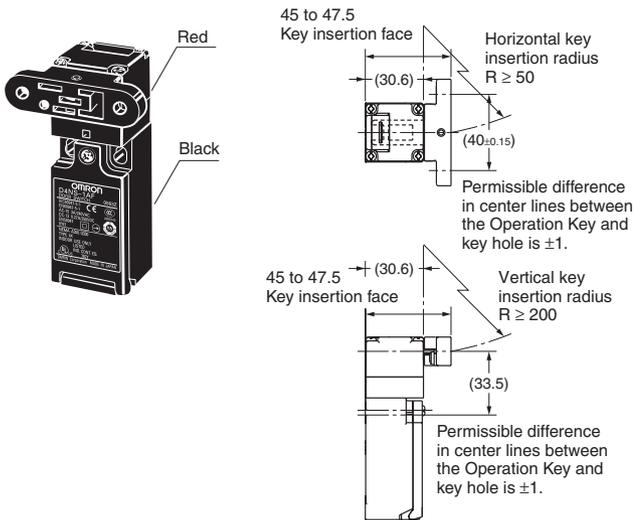
**D4NS-1□F + D4DS-K1**



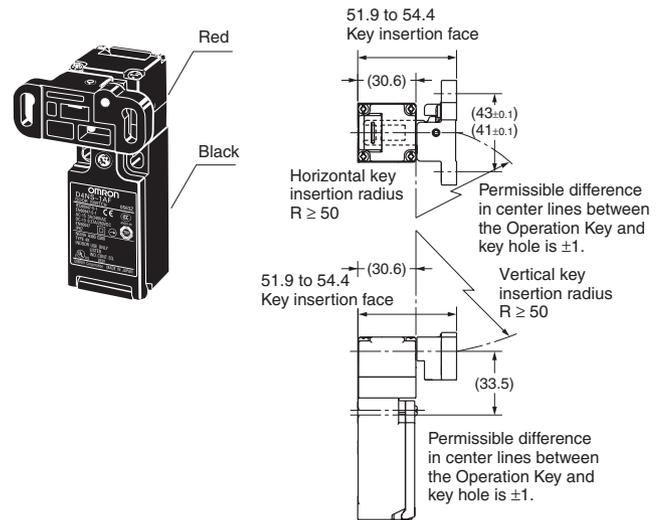
**D4NS-1□F + D4DS-K2**



**D4NS-1□F + D4DS-K3**

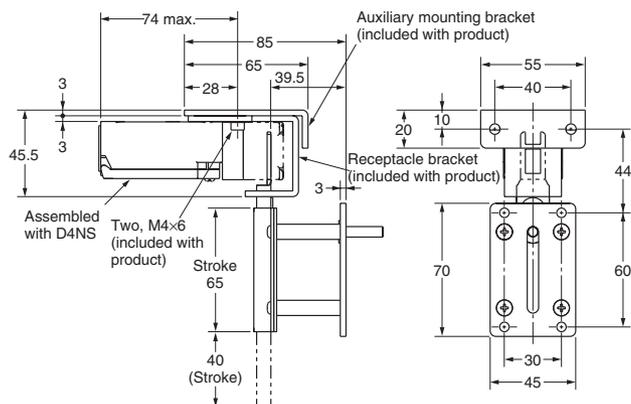


**D4NS-1□F + D4DS-K5**

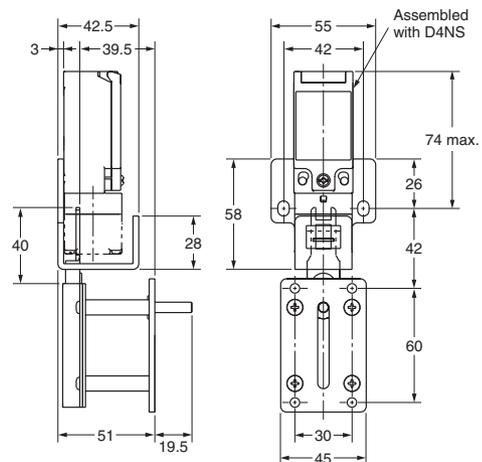


**D4NS-1□F + D4NS-SK01**

Switch Mounting Pattern 1



Switch Mounting Pattern 2



# Safety Precautions

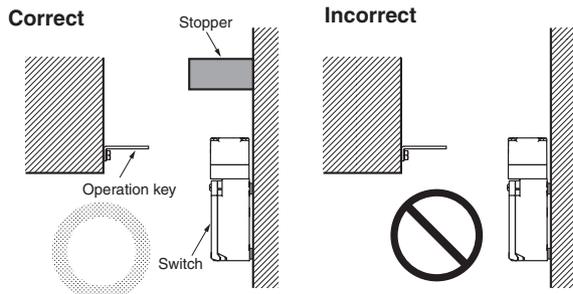
Refer to the "Precautions for All Switches" and "Precautions for All Safety Door Switches" in the Safety Components Series Catalog (Y106).

## Precautions for Safe Use

- Never disassemble or modify your D4NS in any way, or the D4NS will not operate normally.
- Do not use the Switch submersed in oil or water or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch. (The IP67 degree of protection of the Switch specifies the amount of water penetration after the Switch is submerged in water for a certain period of time.)
- Although the switch body is protected from the ingress of dust or water, avoid the ingress of foreign substance through the key hole on the head. Otherwise, accelerated wear or breaking may result.
- Always be sure that the power supply is turned OFF while wiring the Switch.
- Always attach the cover after completing wiring and before using the Switch. Electric shock may occur if the Switch is used without the cover attached.
- Connect a fuse in series with the D4NS to protect it from short-circuit damage. The value of the breaking current of the fuse must be calculated by multiplying the rated current by 150% to 200%. When using the D4NS for an EN rating, use a 10-A fuse of type gI or gG that complies with IEC 60269.
- When switching general loads (250 VAC/3 A), do not operate two circuits or more at the same time. Otherwise, insulation performance may be degraded.

## Stopper Installation

Do not use a Switch as a stopper. Be sure to install a stopper as shown in the following illustration when mounting the Switch so that the base of the Operation Key does not strike the Head.



## Precautions for Correct Use

The Switch contacts can be used with either standard loads or micro-loads. Once the contacts have been used to switch a load, however, they cannot be used to switch smaller loads. The contact surfaces will become rough once they have been used and contact reliability for smaller loads may be reduced.

## Mounting Method

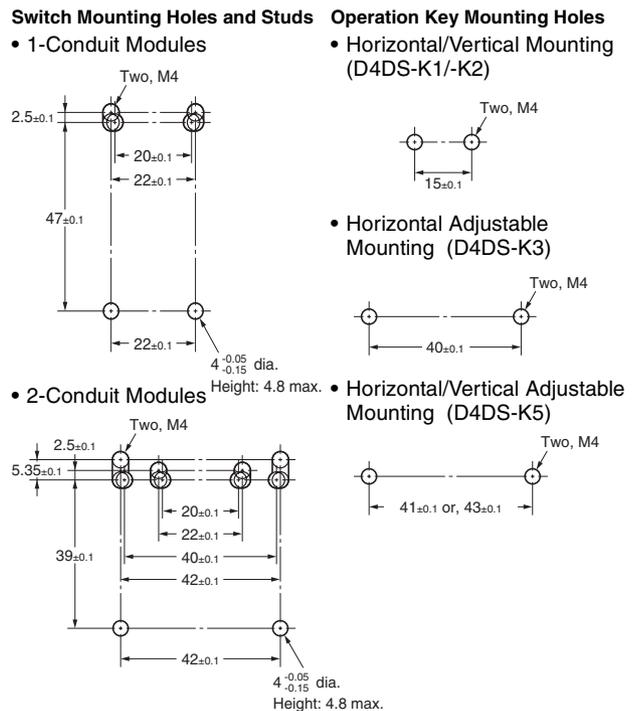
### Tightening Torque

Loose screws may result in malfunction. Tighten the screws to the specified torques.

Terminal screw	0.6 to 0.8 N-m
Cover clamping screw	0.5 to 0.7 N-m
Head clamping screw	0.5 to 0.6 N-m
Operation Key clamping screw	2.4 to 2.8 N-m
Body clamping screw	0.5 to 0.7 N-m
Conduit mounting connection and M12 adaptor	1.8 to 2.2 N-m (except 1/2-14NPT) 1.4 to 1.8 N-m (1/2-14NPT)
Cap screw	1.3 to 1.7 N-m

### Mounting Holes

- Use M4 screws and washers to mount the Switch and Operation Key, and tighten the screws to the proper tightening torque. For safety, use screws that cannot be easily removed or a similar means to prevent the Switch and Operation Key from being easily removed.
- As shown below, two studs with a maximum height of 4.8 mm and a diameter of  $4^{-0.05/-0.15}$  mm can be provided, the studs inserted into the holes on the bottom of the Switch, and the Switch secured at four locations to increase the mounting strength.



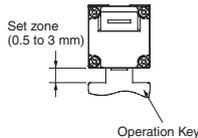
- Use the designated OMRON Operation Key with the Switch. Using another Operation Key may result in Switch damage.
- Set the Operation Key so that it is within 1 mm of the center of the key hole. If the Operation Key is offset or at an angle, accelerated wear or breaking may result.
- Observe the specified insertion radius for the Operation Key and insert it in a direction perpendicular to the key hole.

## Head Direction

- The rotation of the Switch head may be adjusted to any of the four directions by loosening the head clamping screws at the four corners of the head. Make sure that no foreign materials enter through the head.
- When changing the direction of the head, do so while the Operation Key is inserted.

## Securing the Door

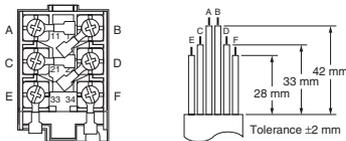
When the door is closed (with the Operation Key inserted), it may be pulled beyond the set zone because of, for example, the door's weight, or the door cushion rubber. Also, if a load is applied to the Operation Key, the door may fail to unlock properly. Use hooks to ensure that the door stays within the set zone.



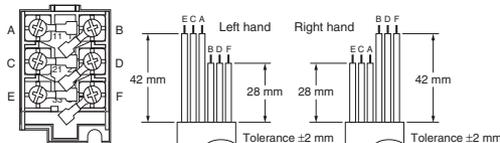
## Wiring

- When connecting with insulation tubes and M3.5 crimp terminals, connect the terminals as shown in the following figure and wire without overriding to the case and the cover. Adequate conductor size is AWG 20 to AWG18 (0.5 to 0.75 mm<sup>2</sup>). Prepare lead wires using the lengths given in the following diagrams. If lead wires are too long, they will press against the cover causing the cover to not close properly.

1-Conduit Models with 3 Poles



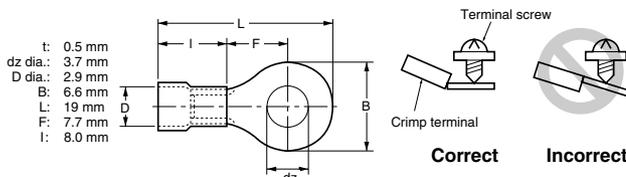
2-Conduit Models with 3 Poles



- Do not push the crimp terminal and the likes into the opening between the parts to prevent the case from being broken and deformed.
  - Use terminals having the thickness of 0.5 mm or less to avoid the contact between the terminal and the Switch case inside.
- The terminals listed below have thickness of 0.5 mm or less.

Manufacture	Type	Applicable lead wire size
J.S.T. Mfg Co.	FV0.5-3.7 (F type) V0.5-3.7 (straight type)	AWG20 (0.5 mm <sup>2</sup> )

J.S.T is a Japanese manufacturer.

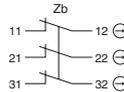


## Contact Arrangement

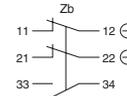
- The following show a safety contact and an auxiliary contact for 3 contacts and 2 contacts types.

(Screw terminal type)

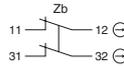
D4NS-□DF (3NC)



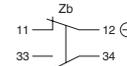
D4NS-□CF (2NC/1NO)  
D4NS-□FF (2NC/1NO (MBB))



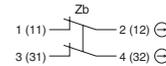
D4NS-□BF (2NC)



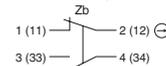
D4NS-□AF (1NC/1NO)  
D4NS-□FF (1NC/1NO (MBB))



D4NS-9BF (2NC)



D4NS-9AF (1NC/1NO)  
D4NS-9EF (1NC/1NO (MBB))



Pin No. (Terminal No.)

(Connector type)



Suitable socket is Type XS2F (OMRON).

- Refer to the Connector Catalog for corresponding Socket pin numbers and lead wire colors.

## Socket Tightening (Models with Connectors)

- Turn the tightening screws on the Socket by hand and tighten them until the gap between the Socket and Plug essentially disappears.
- Make sure, however, that the Socket's connector is tightened securely, otherwise the rated degree of protection (IP67) of the D4NS may not be maintained. Furthermore, the Socket connector may be loosened by vibration.

## Conduit Opening

- When using 1/2-14NPT conduits, apply sealing tape between the connector and conduit opening to maintain the degree of protection (IP67) of the Switch.
- Use cables with suitable diameters for the connector being used.
- When wiring, place the enclosed cap screw on unused conduit openings (for 2-Conduit Switches) and tighten them to the suitable tightening torque.

## Recommended Connectors

Use the connector with thread section of 9 mm long or less. In the case of the connector with longer thread section, protruded part may interfere with the other parts inside the body. Use below listed connector to secure IP67.

Size	Manufacture	Type	Adequate cable diameter
G1/2	LAPP	ST-PF1/2 5380-1002	6.0 to 12.0 mm
Pg13.5	LAPP	S-13.5 5301-5030	6.0 to 12.0 mm
M20	LAPP	ST-M20 × 1.5 5311-1020	7.0 to 13.0 mm
1/2-14NPT	LAPP	ST-NPT1/2 5301-6030	6.0 to 12.0 mm

When use LAPP's products, use together with a Seal Packing which is sold separately (Type names, JPK-16, GP-13.5, GPM20. GPM12 is for M12 connector) and tighten with proper tightening torque.

LAPP is a German manufacturer.

Before using the 2 conduit type 1/2-14NPT connector, attach the appended changing adapter to the Switch, and wind the seal tape about the joint of the adapter and Switch.

When use M12 conduit type, connect the above listed connector, after tightened the M12 changing adaptor to the Switch.

# Production Discontinuation

Following the release of the D4NS, production of the D4DS will be discontinued.

## Date of Production Discontinuation

Production of the D4DS Series will be discontinued in March 2006.

## Date of Substitute Product Release

Sale of the D4NS Series commenced in July 2003.

## Product Replacement

### 1. Dimensions

The D4DS and D4NS have basically the same structure, and use the same mounting method, Operation Keys, mounting hole and Operation Key insertion positions. The multi-contact structure and the extra 4 mm in length, however, are different.

### 2. Terminal Numbers

For the 2-contact model, the terminals 21, 22, 23, and 24 on the D4DS are 31, 32, 33, and 34 on the D4NS.

### 3. Recommended Terminals

If the recommended terminals are not used, the Switch may not be compatible. Make sure that the Switch is compatible with the terminals.

## **Operation Key**

- D4DS-K1
- D4DS-K2
- D4DS-K3
- D4DS-K5

All of the above Operation Keys can be used with the D4NS.

## Comparison of the D4DS and Substitute Products

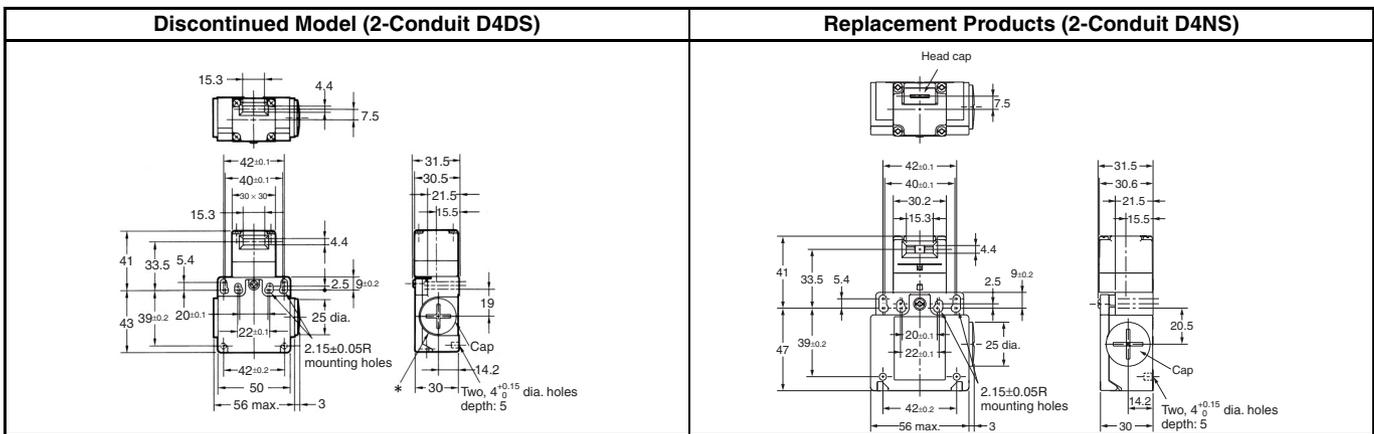
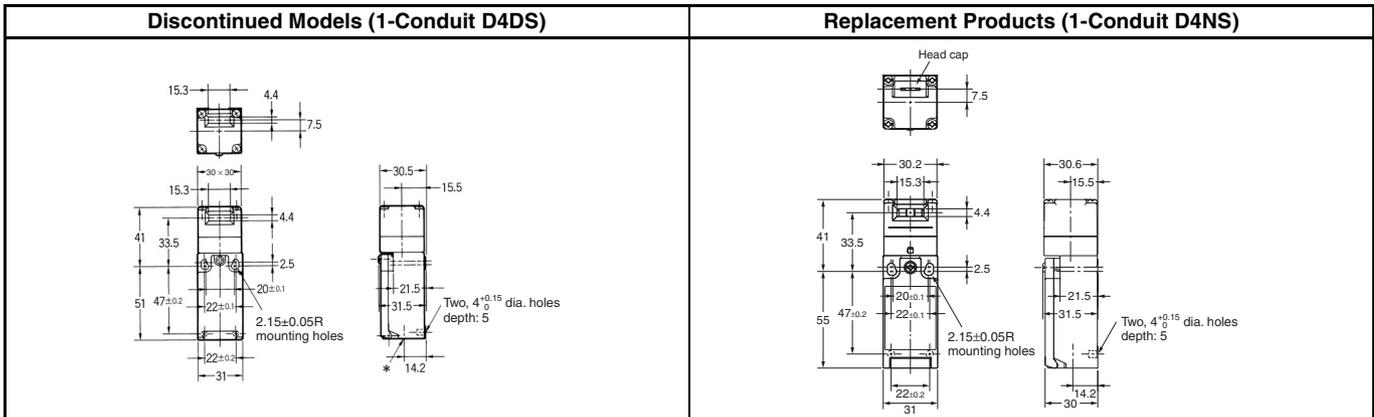
<b>Model</b>	D4NS-□
<b>Switch color</b>	Very similar
<b>Dimensions</b>	Very similar
<b>Wiring/connection</b>	Significantly different
<b>Mounting method</b>	Completely compatible
<b>Ratings/performance</b>	Very similar
<b>Operating characteristics</b>	Very similar
<b>Operating method</b>	Completely compatible

## List of Recommended Substitute Products

### Switch

D4DS product	Recommended substitute product
D4DS-15FS	D4NS-1AF
D4DS-25FS	D4NS-2AF
D4DS-35FS	D4NS-3AF
D4DS-55FS	D4NS-5AF
D4DS-65FS	D4NS-6AF
D4DS-1AFS	D4NS-1BF
D4DS-2AFS	D4NS-2BF
D4DS-3AFS	D4NS-3BF
D4DS-5AFS	D4NS-5BF
D4DS-6AFS	D4NS-6BF

**Dimensions (Unit: mm)**



**ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.**  
 To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C128-E1-03 **In the interest of product improvement, specifications are subject to change without notice.**

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