

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

- Lineup includes three contact models with 2NC/1NO and 3NC contact forms and MBB models 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 microloads.



 Be sure to read the "Safety Precautions" on page 10 and the "Precautions for All Safety Door Switches".

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

Switches (Operation Keys are sold separately.)

■ : Models with certified direct opening contacts.




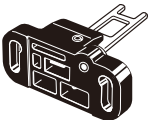
Type	Contact configuration		Conduit opening/Connector	Model
1-Conduit	Slow-action	1NC/1NO	Pg13.5	D4NS-1AF *
			G1/2	D4NS-2AF *
			1/2-14NPT	D4NS-3AF
			M20	D4NS-4AF
		2NC	Pg13.5	D4NS-1BF *
			G1/2	D4NS-2BF *
			1/2-14NPT	D4NS-3BF
			M20	D4NS-4BF
		2NC/1NO	Pg13.5	D4NS-1CF *
			G1/2	D4NS-2CF *
			1/2-14NPT	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: 1. 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.

2. 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.

* Models with Korean S-mark certification.

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
- EN60204-1
- EN1088
- GS-ET-15

Certified Standards

Certification body	Standard	File No.
TÜV Product Service	EN60947-5-1 (certified direct opening)	Consult your OMRON representative for details.
UL *1	UL508, CSA C22.2 No. 14	E76675
CQC (CCC)	GB14048.5	2003010305077330
KOSHA *2	EN60947-5-1	2005-197

*1. Certification for CSA C22.2 No. 14 is authorized by the UL mark.

*2. Only certain models have been certified.

Certified Standard Ratings

TÜV (EN60947-5-1), CCC (GB14048.5)

Item	Utilization category	AC-15	DC-13
Rated operating current (I_e)		3 A	0.27 A
Rated operating voltage (U_e)		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 (A)		Volt-amperes (VA)	
		Make	Break	Make	Break
120 VAC	10 A	60	6	7,200	720
240 VAC		30	3		

Q300

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

Characteristics

Degree of protection *1		IP67 (EN60947-5-1)
Durability *2	Mechanical	1,000,000 operations min.
	Electrical	500,000 operations min. (3 A resistive load at 250 VAC) *3 300,000 operations min. (10 A resistive load at 250 VAC)
Operating speed		0.05 to 0.5 m/s
Operating frequency		30 operations/minute max.
Direct opening force *4		60 N min.
Direct opening travel *4		10 mm min.
Contact resistance		25 mΩ max.
Minimum applicable load *5		1 mA resistive load at 5 VDC (N-level reference value)
Rated insulation voltage (U_i)		300 V
Rated frequency		50/60 Hz
Protection against electric shock		Class II (double insulation)
Pollution degree (operating environment)		3 (EN60947-5-1)
Impulse withstand voltage (EN60947-5-1)	Between terminals of same polarity	2.5 kV
	Between terminals of different polarity	4 kV
	Between each terminal and non-current carrying metallic parts	6 kV
Insulation resistance		100 MΩ min.
Contact gap		2 × 2 mm min.
Vibration resistance	Malfunction	10 to 55 Hz, 0.75 mm single amplitude
Shock resistance	Destruction	1,000 m/s ² min.
	Malfunction	300 m/s ² min.
Conditional short-circuit current		100 A (EN60947-5-1)
Conventional free air thermal current (I_{th})		10 A (EN60947-5-1)
Ambient operating temperature		–30 to 70°C (with no icing)
Ambient operating humidity		95% max.
Weight		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 microloads. 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.

*1. 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.

*2. The durability is for an ambient temperature of 5 to 35°C and an ambient humidity of 40% to 70%. For more details, consult your OMRON representative.

*3. Do not pass the 3 A, 250 VAC load through more than 2 circuits.

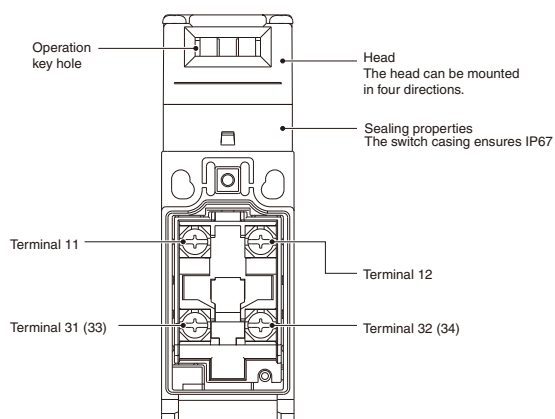
*4. These figures are minimum requirements for safe operation.

*5. This value will vary with the switching frequency, environment, and reliability level. Confirm that correct operation is possible with the actual load beforehand.

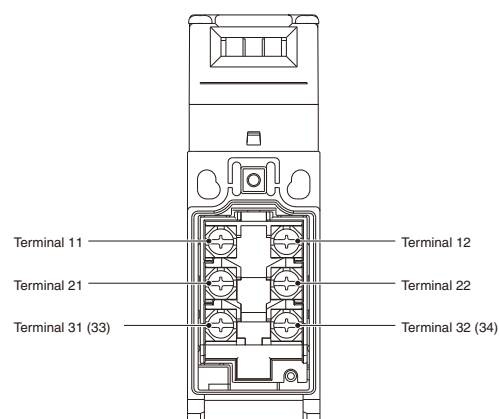
Structure and Nomenclature

Structure

D4NS-□A□, D4NS-□B□, D4NS-□E□



D4NS-□C□, D4NS-□D□, D4NS-□F□



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

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 a certified 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 a certified 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 a certified 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 a certified 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 a certified 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 a certified direct opening mechanism. (→) The terminals 11-12, 21-22 and 33-34 can be used as unlike poles.

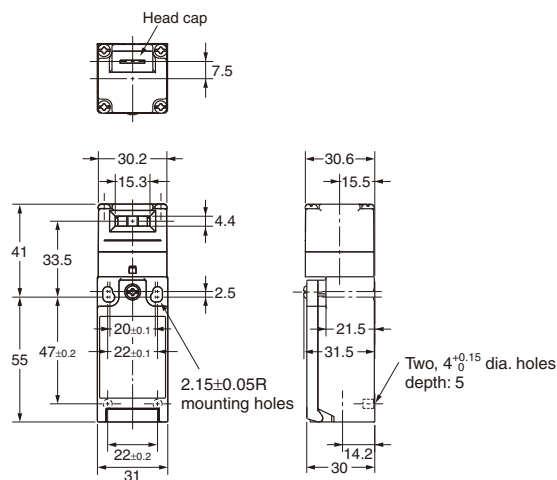
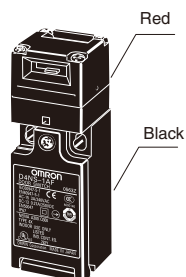
* MBB (Make Before Break) contacts have an overlapping structure, so that before the normally closed contact (NC) opens, the normally open contact (NO) closes.

Dimensions

Dimensions and Operating Characteristics

1-Conduit Models

D4NS-1□F
D4NS-2□F
D4NS-3□F
D4NS-4□F

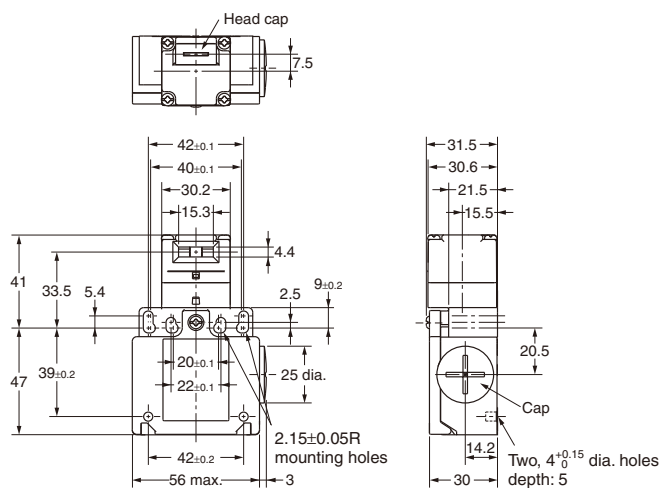
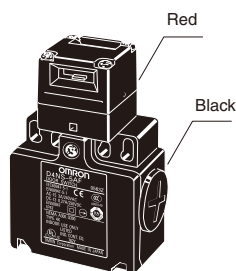


Operating characteristics	Model
Key insertion force Key extraction force	D4NS-1□F D4NS-2□F D4NS-3□F D4NS-4□F
Pretravel (PT)	15 N max. 30 N max.
Total travel (TT)	6±3 mm
Direct opening force* Direct opening stroke*	(28 mm)
	60 N min. 10 mm min.

* Always maintain the above operating characteristics for safe use.

2-Conduit Models

D4NS-5□F
D4NS-6□F
D4NS-7□F
D4NS-8□F

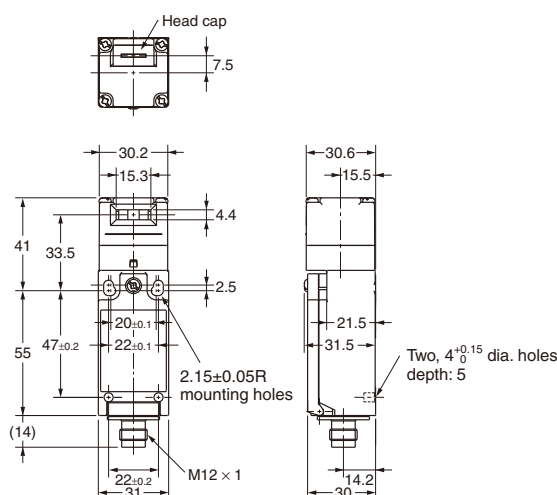
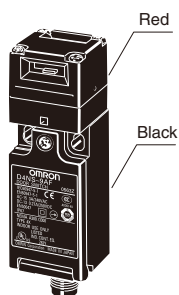


Operating characteristics	Model
Key insertion force Key extraction force	D4NS-5□F D4NS-6□F D4NS-7□F D4NS-8□F
Pretravel (PT)	15 N max. 30 N max.
Total travel (TT)	6±3 mm
Direct opening force* Direct opening stroke*	(28 mm)
	60 N min. 10 mm min.

* Always maintain the above operating characteristics for safe use.

1-Conduit Connector Models

D4NS-9□F



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

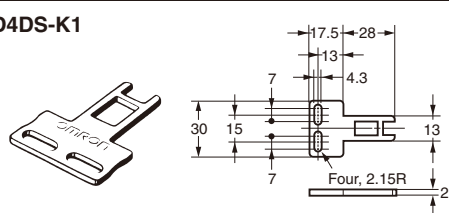
* Always maintain the above operating characteristics for safe use.

Note: 1. Unless otherwise specified, a tolerance of ± 0.4 mm applies to all dimensions.

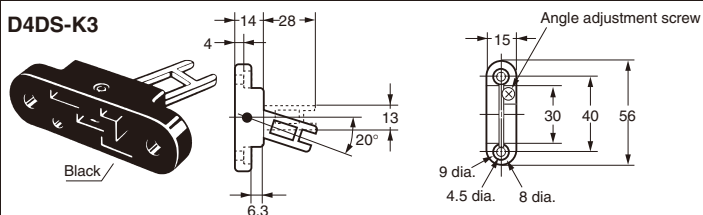
2. There are fluctuations in the contact ON/OFF timing for Switches with multiple poles (2NC, 2NC/1NO, or 3NC). Confirm performance before application.

Operation Keys

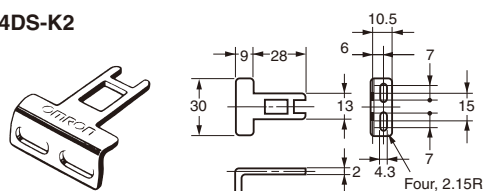
D4DS-K1



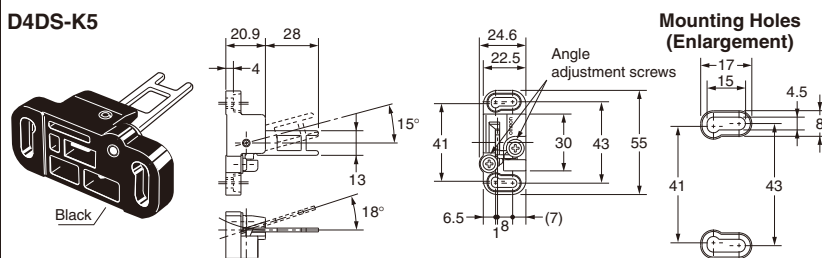
D4DS-K3



D4DS-K2



D4DS-K5

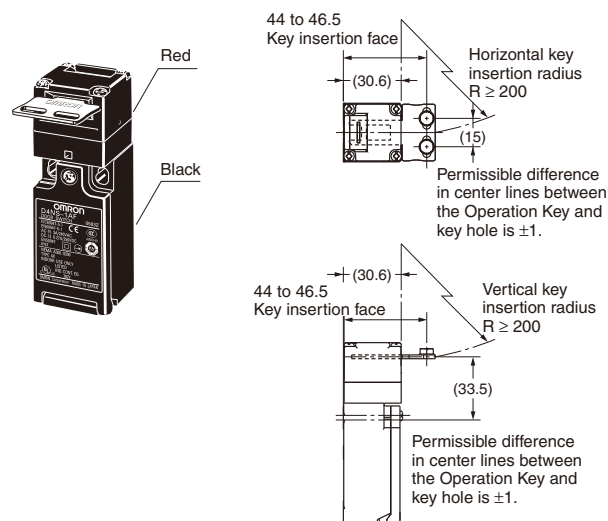


Note: Unless otherwise specified, a tolerance of ± 0.4 mm applies to all dimensions.

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

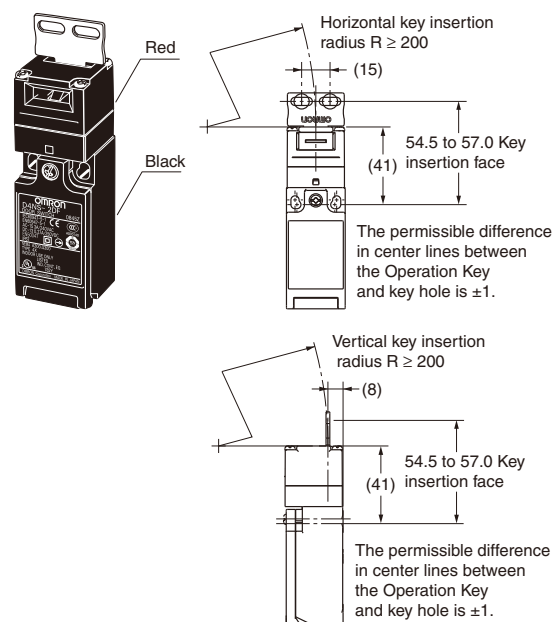
D4NS-1□F + D4DS-K1

(with Front-inserted Operation Key)



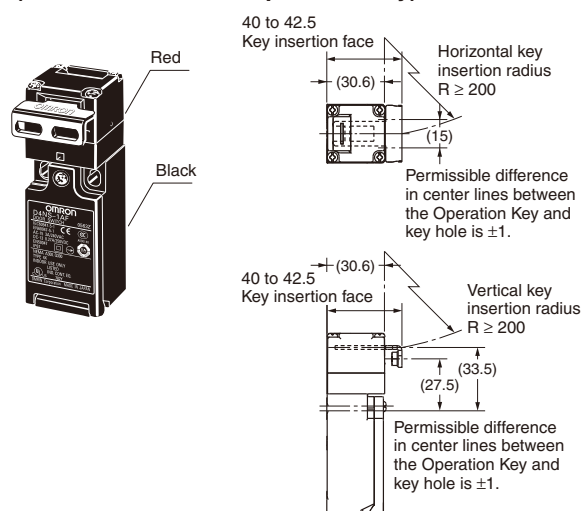
D4NS-1□F + D4DS-K1

(with Top-inserted Operation Key)



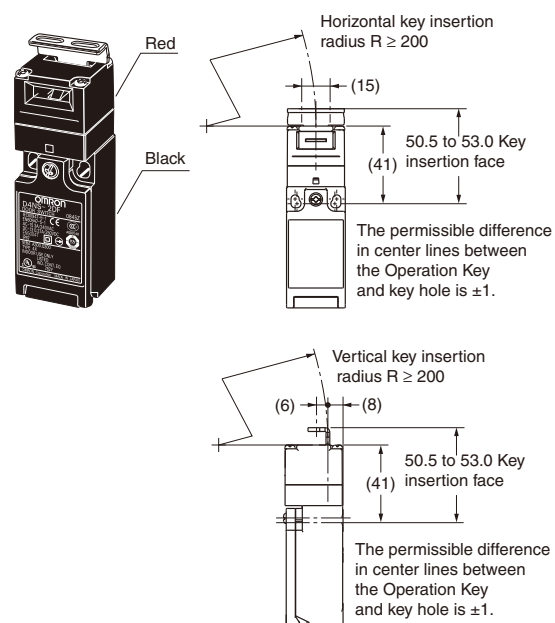
D4NS-1□F + D4DS-K2

(with Front-inserted Operation Key)



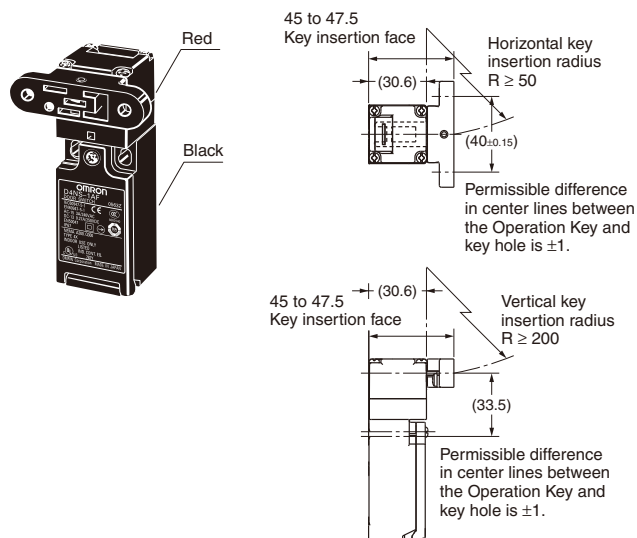
D4NS-1□F + D4DS-K2

(with Top-inserted Operation Key)

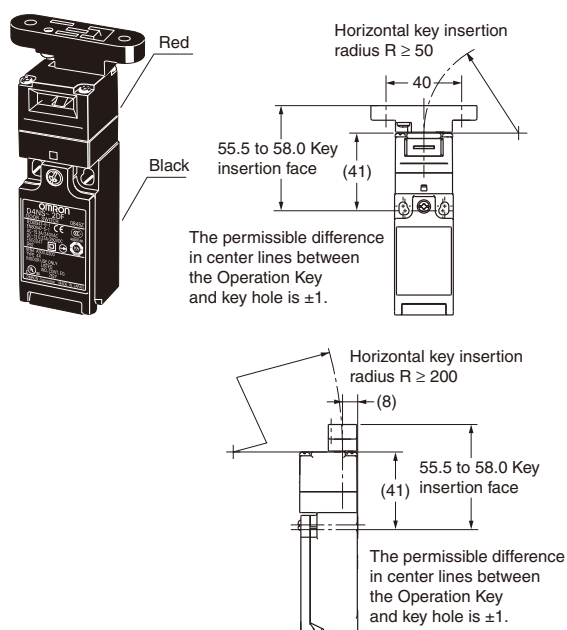


Note: Unless otherwise specified, a tolerance of ± 0.4 mm applies to all dimensions.

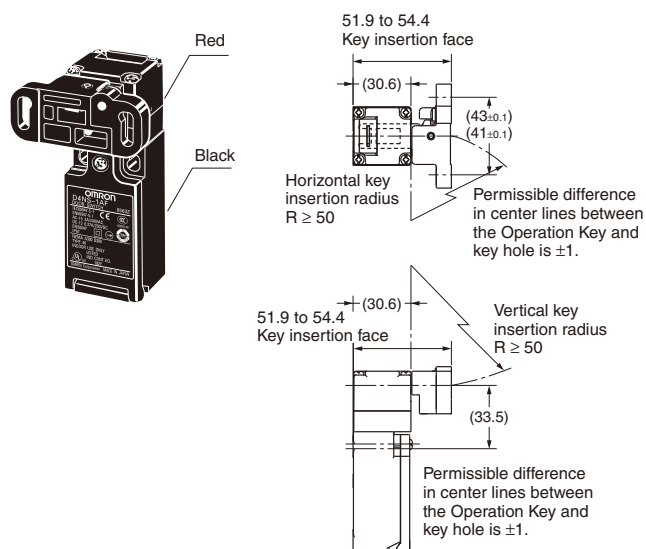
D4NS-1□F + D4DS-K3 (with Front-inserted Operation Key)



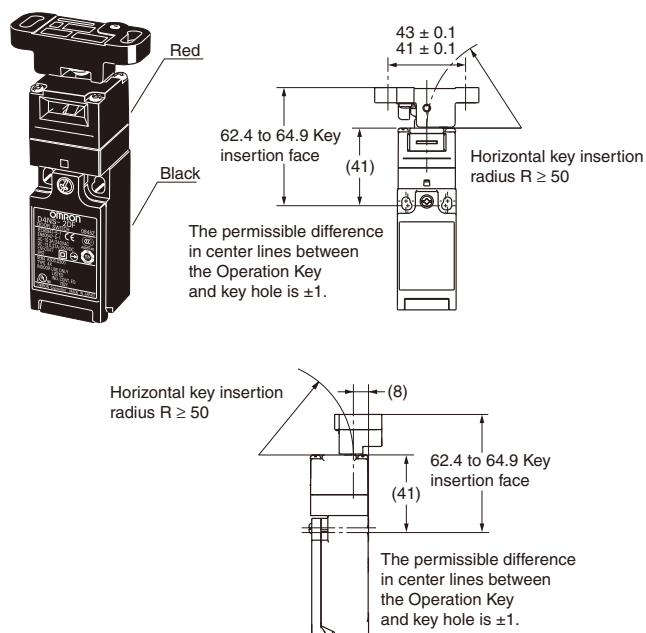
D4NS-1□F + D4DS-K3 (with Top-inserted Operation Key)



D4NS-1□F + D4DS-K5 (with Front-inserted Operation Key)



D4NS-1□F + D4DS-K5 (with Top-inserted Operation Key)



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

Safety Precautions

Refer to the “*Precautions for All Switches*” and “*Precautions for All Safety Door Switches*”.

CAUTION

Electric shock may occasionally occur.
Do not use metal connectors or metal conduits.

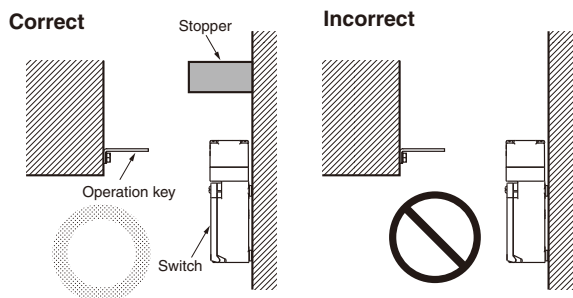


Precautions for Safe Use

- 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.)
- Always attach the cover after completing wiring and before using the Switch. Also, do not turn ON the Switch with the cover open. Doing so may result in electric shock.
- Do not switch circuits for two or more standard loads (250 VAC, 3 A) at the same time. Doing so may adversely affect insulation performance.

Stopper Installation

Do not use a Switch as a stopper. Be sure to install a stopper as shown in the following illustration to ensure that the base of the Operation Key does not strike the Head, and adjust the stopper to be within the setting zone (0.5 to 3 mm) of the base of the Operation Key. Do not subject the Switch to a shock that exceeds the Switch's shock resistance of 1,000 m/s².



Precautions for Correct Use

The Switch contacts can be used with either standard loads or microloads. 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

Appropriate 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 mounting screw	0.5 to 0.7 N·m
Head mounting screw	0.5 to 0.6 N·m
Operation Key mounting screw	2.4 to 2.8 N·m
Body mounting screw	0.5 to 0.7 N·m
Connector 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

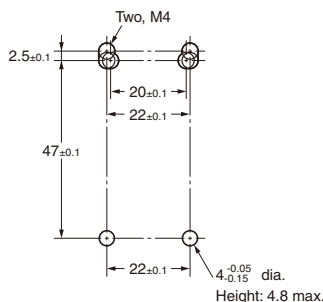
- When loosening a screw with an electrical screwdriver or similar tool while pressing down on the screw head, do not continue turning the screw past the point where the threads disengage. Doing so may strip the end of the threads.

Mounting Holes

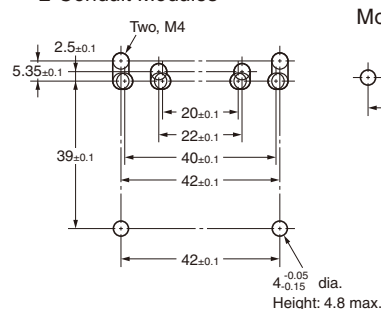
- Use M4 screws and washers to mount the Switch and Operation Key, and tighten the screws to a suitable torque. To ensure safety, use screws that cannot be easily removed or another means to prevent the Switch and Operation Key from easily being removed.
- As shown below, two studs with a maximum height 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.

Switch Mounting Holes and Studs

- 1-Conduit Modules

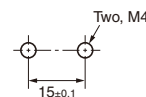


- 2-Conduit Modules

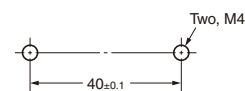


Operation Key Mounting Holes

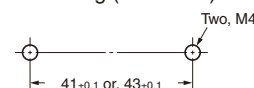
- Horizontal/Vertical Mounting (D4DS-K1/-K2)



- Horizontal Adjustable Mounting (D4DS-K3)



- Horizontal/Vertical Adjustable Mounting (D4DS-K5)



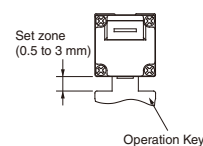
- Set the Operation Key so that it is within 1 mm of the center of the key hole. If the Operation Key is offset or at an angle, accelerated wear or breaking may result.
- Observe the specified insertion radius for the Operation Key and insert it in a direction perpendicular to the key hole.

Head Direction

- The rotation of the Switch head may be adjusted to any of the four directions by loosening the head mounting screws at the four corners of the head. Make sure that no foreign materials enter through the head.
- Do not insert or remove the Operation Key with the Switch head removed. Doing so may make it impossible to insert the Operation Key.

Securing the Door

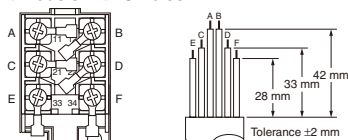
When the door is closed (with the Operation Key inserted), the Operation Key may exceed the set zone because of, for example, the door's own weight, machine vibration, or the door cushion rubber. Secure the door with a stopper so that the Operation Key remains within the set zone.



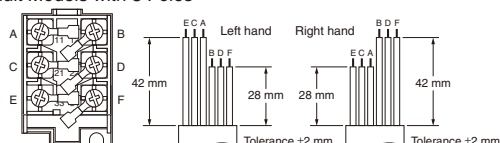
Wiring

- 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 mm²). 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



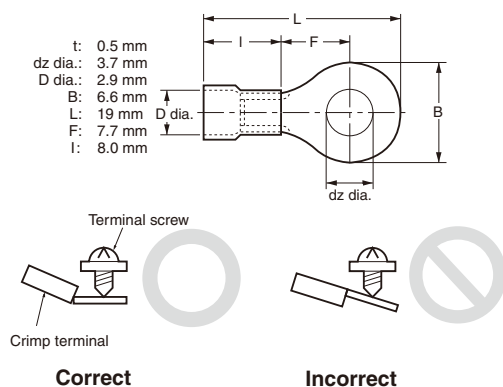
- Do not push the crimp terminal and the likes into the opening between the parts to prevent the case from being broken and deformed.
- Use terminals having the thickness of 0.5 mm or less to avoid the contact between the terminal and the Switch case inside. The terminals listed below have thickness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

<Reference>

The crimp terminals listed below have a thickness of 0.5 mm or less.

Manufacture	Type
J.S.T. Mfg Co.	FN0.5-3.7 (F Type)
	N0.5-3.7 (Straight Type)

J.S.T is a Japanese manufacturer.

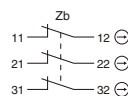


Contact Arrangement

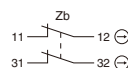
- The contact arrangements are shown below.

(Screw terminal type)

D4NS-□DF (3NC)

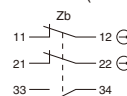


D4NS-□BF (2NC)



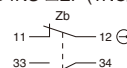
D4NS-□CF (2NC/1NO)

D4NS-□FF (2NC/1NO (MBB))



D4NS-□AF (1NC/1NO)

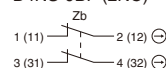
D4NS-□EF (1NC/1NO (MBB))



(Connector type)

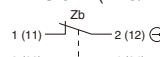


D4NS-9BF (2NC)



D4NS-9AF (1NC/1NO)

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



Pin No. (Terminal No.)

- Suitable socket is XS2F-D421 series (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 that the Socket's connector is tightened securely, otherwise the rated degree of protection (IP67) of the D4NS may not be maintained, or 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. If a connector with a longer thread section is used, the protruding part may interfere with the other parts inside the body. Use the connectors listed below to ensure IP67 degree of protection.

Size	Manufacture	Model	Applicable 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, or GPM20) and tighten with proper tightening torque.

- LAPP is a German manufacturer.
- Before using a 2-conduit type 1/2-14NPT connector, attach the enclosed adapter to the Switch, and used the above connector.

Production Discontinuation

Following the release of the D4NS, production of the D4DS was discontinued.

Date of Production Discontinuation

Production of the D4DS Series was discontinued as of the end of March 2006.

Recommended Substitute Product

Sale of the D4NS Series commenced in July 2003.

Product Substitution

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.

Comparison with Discontinued Products

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

Discontinued Products and Recommended Substitute Products

Switch

Discontinued 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

Operation Key

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

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

Dimensions (Unit: mm)

Discontinued Product (1-Conduit D4DS)	Recommended Substitute Product (1-Conduit D4NS)
Discontinued Product (2-Conduit D4DS)	Recommended Substitute Product (2-Conduit D4NS)

Precautions for All Safety Door Switches

Note: Refer to the *Safety Precautions* section for each Switch for specific precautions applicable to each Switch.

CAUTION

Do not insert the Operation Key when the door is open.
The machine may operate, possibly causing injury.



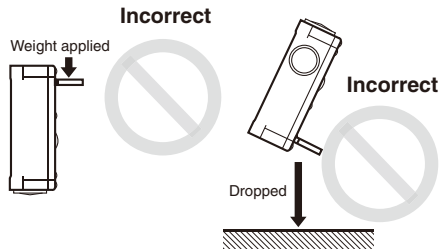
Precautions for Safe Use

- Do not use the Switch in atmospheres containing explosive or flammable gases.
- 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, breaking, or malfunction may result.
- The durability of the Switch varies considerably depending on the switching conditions. Always confirm the usage conditions by using the Switch in an actual application, and use the Switch only for the number of switching operations that its performance allows.
- Do not use the Switch in a starting circuit. (Use the Switch for safety confirmation signal purposes.)
- Connect a fuse in series with the Switch 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 Switch for an EN rating, use a 10 A fuse of type gI or gG that complies with IEC 60269.
- Mount the Operation Key so that it will not come into contact with persons in the area when the door is opened and closed. Injury may result.
- Do not drop the Switch. Doing so may prevent the Switch from functioning to its full capability.
- Do not under any circumstances disassemble or modify the Switch. Doing so may cause malfunction.

Precautions for Correct Use

Operation Key

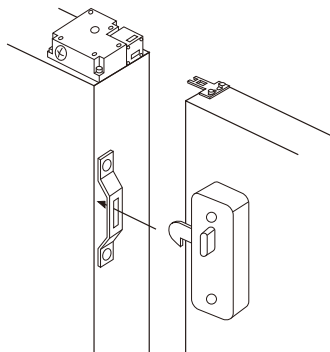
- Use only the designated Operation Key. The Head has been designed so that operation is not possible with a screwdriver or other tools. Using anything other than the designated Operation Key may damage the Switch or affect machine safety.
- Do not operate the Switch with anything other than the special OMRON Operation Key, otherwise the Switch may break or the safety of the system may not be maintained.
- Do not impose excessive force on the Operation Key while the Key is inserted into the Switch or drop the Switch with the Operation Key inserted. Doing either of these may deform the Key or break the Switch.



Securing the Door

If the closed door (with the Operation Key inserted) pulls the Operation Key past the operating/lock position (i.e., the set zone) because of, for example, the door's own weight, machine vibration, or the door cushion rubber, the Switch may be damaged.

Also, with a magnetic lock, it may not be possible to unlock the Switch if there is weight placed on the Operation Key. Secure the door with a stopper so that the Operation Key remains within the set zone.



Operating Environment

- Safety Door Switches are designed for use indoors. Using a Switch outdoors may damage it.
- Do not use the Switch in locations where toxic gases, such as H_2S , SO_2 , NH_3 , HNO_3 , and Cl_2 , may be present, or in locations that are subject to high temperature or high humidity. Doing so may damage the Switch due to contact failure or corrosion.
- Do not use the Switch in the following locations:
 - Locations subject to severe temperature changes
 - Locations subject to high temperatures or condensation
 - Locations subject to severe vibration
 - Locations where the interior of the Protective Door may come into direct contact with cutting chips, metal filings, oil, or chemicals
 - Locations where the Switch may come into contact with thinner or detergents
 - Locations where explosive or flammable gases are present

Storing Switches

Do not store Switches in locations where toxic gases, such as H_2S , SO_2 , NH_3 , HNO_3 , and Cl_2 , may be present, or in locations that are subject to excessive dirt, excessive dust, high temperature, or high humidity.

Other Precautions

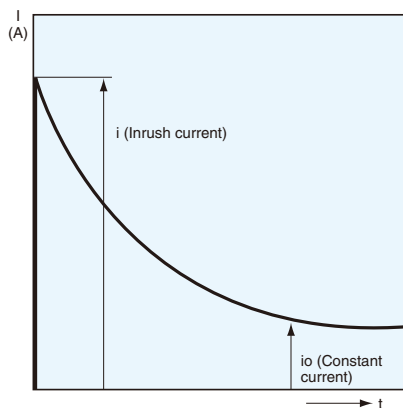
- When attaching a cover, be sure that the seal rubber is in place and that there is no foreign material present. If the cover is attached with the seal rubber out of place or if foreign material is stuck to the rubber, a proper seal will not be obtained.
- Perform maintenance inspections periodically.
- Use the Switch with a load current that does not exceed the rated current.
- Do not use any screws to connect the cover other than the specified ones. The seal characteristics may be reduced.

Precautions for All Switches

Refer to the Safety *Precautions* section for each Switch for specific precautions applicable to each Switch.

Precautions for Safe Use

- If the Switch is to be used as a switch in an emergency stop circuit or in a safety circuit for preventing accidents resulting in injuries or deaths, use a Switch with a direct opening mechanism, use the NC contacts with a forced release mechanism, and set the Switch so that it will operate in direct opening mode.
For safety, install the Switch using one-way rotational screws or other similar means to prevent it from easily being removed. Protect the Switch with an appropriate cover and post a warning sign near the Switch to ensure safety.
- Do not perform wiring while power is being supplied. Wiring while the power is being supplied may result in electric shock.
- Keep the electrical load below the rated value.
- Be sure to evaluate the Switch under actual working conditions after installation.
- Do not touch the charged Switch terminals while the Switch has carry current, otherwise an electric shock may be received.
- If the Switch has a ground terminal, be sure to connect the ground terminal to a ground wire.
- The durability of the Switch greatly varies with switching conditions. Before using the Switch, be sure to test the Switch under actual conditions. Make sure that the number of switching operations is within the permissible range.
If a deteriorated Switch is used continuously, insulation failures, contact welding, contact failures, Switch damage, or Switch burnout may result.
- Maintain an appropriate insulation distance between wires connected to the Switch.
- Some types of load have a great difference between normal current and inrush current. Make sure that the inrush current is within the permissible value. The greater the inrush current in the closed circuit is, the greater the contact abrasion or shift will be. Consequently, contact welding, contact separation failures, or insulation failures may result. Furthermore, the Switch may become broken or damaged.



- The user must not attempt to repair or maintain the Switch and must contact the machine manufacturer for any repairs or maintenance.
- Do not attempt to disassemble or modify the Switch. Doing so may cause the Switch to malfunction.
- Do not drop the Switch. Doing so may result in the Switch not performing to its full capability.

Wiring

Pay the utmost attention so that each terminal is wired correctly. If the terminal is wired incorrectly, the Switch will not function. Furthermore, not only will the Switch have a negative influence on the external circuit, the Switch itself may become damaged or burnt.

Mounting

- Do not modify the Actuator, otherwise the operating characteristics and performance of the Actuator will change.
- Do not enlarge the mounting holes of the Switch or modify the Switch, otherwise insulation failures, housing damage, or human accidents may result.
- Do not apply oil, grease, or other lubricants to the moving parts of the Actuator, otherwise the Actuator may not operate correctly. Furthermore, ingress of oil, grease, or other lubricants inside the Switch may reduce sliding characteristic or cause failures in the Switch.
- Mount the Switch and secure it with the specified screws tightened to the specified torque along with flat and spring washers.
- Be sure to wire the Switch so that the conduit opening is free of metal powder or any other impurities.
- If glue or bonding agent is applied, make sure that it does not adhere to the movable parts or enter the Switch, otherwise the Switch may not work correctly or cause contact failure. Some types of glue or bonding agent may generate a gas that may have a negative influence on the Switch. Pay the utmost attention when selecting the glue or locking agent.
- Some models allow changes in the head direction. When changing the head of such a model, make sure that the head is free of any foreign substance. Tighten each screw of the head to the rated torque.
- Be sure to take measures so that no foreign material, oil, or water will enter the Switch through the conduit opening. Be sure to attach a connector suitable for the cable thickness and tighten the connector securely to the rated torque.
- Do not impose shock or vibration on the Actuator while it is fully pressed. Otherwise, the Actuator will partially abrade and an actuation failure may result.

Precautions for Correct Use

Switch Operation

- The Switch in actual operation may cause accidents that cannot be foreseen from the design stage. Therefore, the Switch must be practically tested before actual use.
- When testing the Switch, be sure to apply the actual load conditions together with the actual operating environment.
- All the performance ratings in this catalog are provided under the following conditions unless otherwise specified.

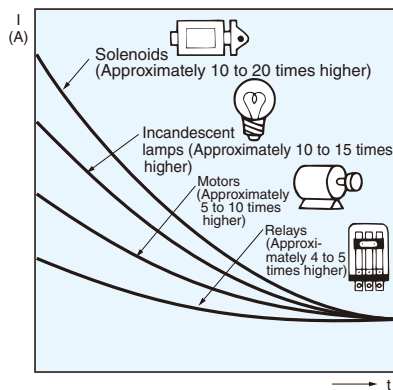
Inductive load: A minimum power factor of 0.4 (AC) or a maximum time constant of 7 ms (DC)

Lamp load: An inrush current 10 times higher than the normal current

Motor load: An inrush current 6 times higher than the normal current

1. Ambient temperature: 5°C to 35°C
2. Ambient humidity: 40% to 70%.

Note: An inductive load causes a problem especially in DC circuitry. Therefore, it is essential to know the time constants (L/R) of the load.



Mechanical Conditions for Switch Selection

- An Actuator suitable for the operating method must be selected. Ask your OMRON representative for details.
- Check the operating speed and switching frequency.
 1. If the operating speed is extremely low, switching of the movable contact will become unstable, thus resulting in incorrect contact or contact welding.
 2. If the operating speed is extremely high, the Switch may break due to shock. If the switching frequency is high, the switching of the contacts cannot keep up with the switching frequency. Make sure that the switching frequency is within the rated switching frequency.
- Do not impose excessive force on the Actuator, otherwise the Actuator may become damaged or not operate correctly.
- Make sure that the stroke is set within the suitable range specified for the model, or otherwise the Switch may break.

Electrical Characteristics for Switch Selection

Electrical Conditions

- The switching load capacity of the Switch greatly varies between AC and DC. Always be sure to apply the rated load. The control capacity will drastically drop if it is a DC load. This is because a DC load has no current zero-cross point, unlike an AC load. Therefore, if an arc is generated, it may continue comparatively for a long time. Furthermore, the current direction is always the same, which results in contact relocation, whereby the contacts easily stick to each other and do not separate when the surfaces of the contacts are uneven.

- If the load is inductive, counter-electromotive voltage will be generated. The higher the voltage is, the higher the generated energy will be, which will increase the abrasion of the contacts and contact relocation load conditions. Be sure to use the Switch within the rated conditions.
- If the load is a minute voltage or current load, use a Switch designed for minute loads. The reliability of silver-plated contacts, which are used by standard Switches, will be insufficient if the load is a minute voltage or current load.

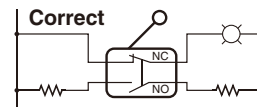
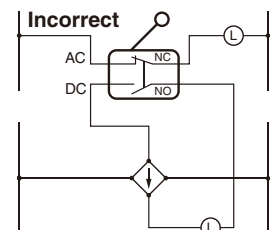
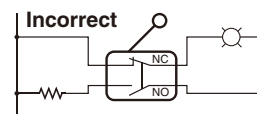
Connections

- With a Za contact form, do not connect a single Switch to two power supplies that are different in polarity or type.

Power Connection Examples (Connection of Different Polarities)

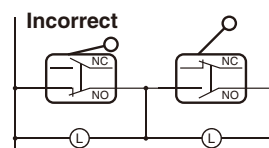
Incorrect Power Connection Example

(Connection of Different Power Supplies)
There is a risk of AC and DC mixing.



Connect the load to the same polarities.

- Do not use a circuit that will short-circuit if a fault occurs, otherwise the charged part may melt and break off.



- Application of Switch to a Low-voltage, Low-current Electronic Circuit.
 1. If bouncing or chattering of the contacts results and causes problems, take the following countermeasures.
 - (a) Insert an integral circuit.
 - (b) Suppress the generation of pulses from the contact bouncing or chattering of the contacts so that it is less than the noise margin of the load.
 2. Conventional silver-plated contacts are not suitable for this application, in which particularly high reliability is required. Use gold-plated contacts, which are ideal for handling minute voltage or current loads.
 3. The contacts of the Switch used for an emergency stop must be normally closed with a positive opening mechanism.
- To protect the Switch from damage due to short-circuits, be sure to connect in series a quick-response fuse with a breaking current 1.5 to 2 times larger than the rated current to the Switch. When complying with EN certified ratings, use a 10-A IEC 60269-compliant gI or gG fuse.

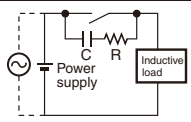
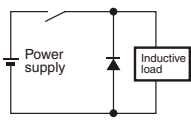
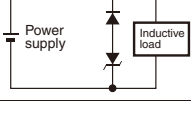
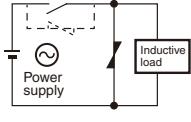
Contact Protection Circuits

Using a contact protection circuit to increase the contact durability, prevent noise, and suppress the generation of carbide or nitric acid. Be sure to apply the contact protection circuit correctly, otherwise adverse results may occur.

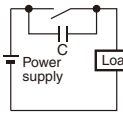
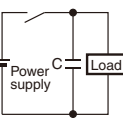
The following tables shows typical examples of contact protection circuits. If the Switch is used in an excessively humid location for

switching a load that easily generates arcs, such as an inductive load, the arcs may generate NO_x, which will change into HNO₃ when it reacts with moisture. Consequently, the internal metal parts may corrode and the Switch may fail. Be sure to select the best contact protection circuit from the following table.

Typical Examples of Contact Protection Circuits

Circuit example	Applicable current		Features and remarks	Element selection
	AC	DC		
 CR	*	Yes	* Load impedance must be much smaller than the CR circuit impedance when using the Switch for an AC voltage.	Use the following as guides for C and R values: C: 1 to 0.5 μF per 1 A of contact current (A) R: 0.5 to 1 Ω per 1 V of contact voltage (V) These values depend on various factors, including the load characteristics. Confirm optimum values experimentally. Capacitor C suppresses the discharge when the contacts are opened, while the resistor R limits the current applied when the contacts are closed the next time. Generally, use a capacitor with a low dielectric strength of 200 to 300 V. For applications in an AC circuit, use an AC capacitor (with no polarity).
	Yes	Yes	The operating time of the contacts will be increased if the load is a Relay or solenoid. Connecting the CR circuit in parallel to the load is effective when the power supply voltage is 24 or 48 V and in parallel to the contacts when the power supply voltage is 100 to 200 V.	
 Diode	No	Yes	The energy stored in the coil reaches the coil as current via the diode connected in parallel, and is dissipated as Joule heat by the resistance of the inductive load. This type of circuit increases the release time more than the CR type.	Use a diode having a reverse breakdown voltage of more than 10 times the circuit voltage, and a forward current rating greater than the load current.
 Diode + Zener diode	No	Yes	This circuit effectively shortens the reset time in applications where the release time of a diode circuit is too slow.	Use a Zener diode with a low breakdown voltage.
 Varistor	Yes	Yes	This circuit prevents a high voltage from being applied across the contacts by using the constant-voltage characteristic of a varistor. This circuit also somewhat increases the reset time. Connecting the varistor across the load is effective when the supply voltage is 24 to 48 V, and across the contacts when the supply voltage is 100 to 200 V.	---

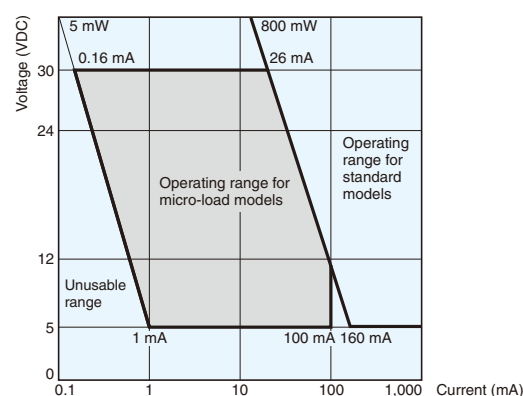
Do not use the following types of contact protection circuit.

 <p>This circuit arrangement is very effective for diminishing arcing at the contacts when breaking the circuit. However, since electrical energy is stored in C (capacitor) when the contacts are open, the current from C flows into the contacts when they close. This may lead to contact welding.</p>	 <p>This circuit arrangement is very useful for diminishing arcing at the contacts when breaking the circuit. However, since the charging current to C flows into the contacts when they are closed, contact welding may occur.</p>
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Although it is thought that switching a DC inductive load is more difficult than a resistive load, an appropriate contact protection circuit can achieve almost the same characteristics.

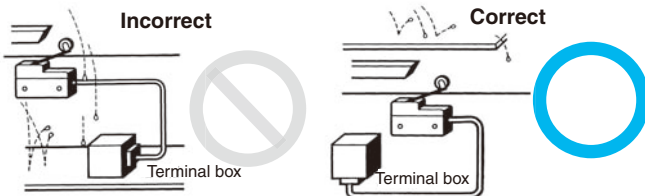
Using Switches for Microloads

Contact failure may occur if a Switch for a general load is used to switch a microload circuit. Use Switches in the ranges shown in the diagram right. However, even when using microload models within the operating range shown here, if inrush current occurs when the contact is opened or closed, it may increase contact wear and so decrease durability. Therefore, insert a contact protection circuit where necessary. The minimum applicable load is the N-level reference value. This value indicates the malfunction reference level for the reliability level of 60% (λ_{60}) (JIS C5003). The equation, $\lambda_{60} = 0.5 \times 10^{-6} / \text{operations}$ indicates that the estimated malfunction rate is less than 1/2,000,000 operations with a reliability level of 60%.

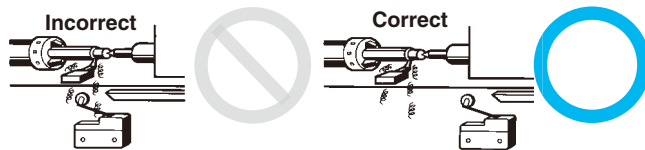


Operating Environment

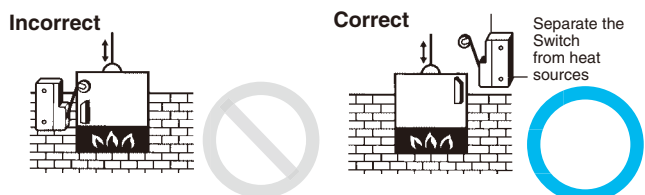
- The Switches are designed for use indoors. Using a Switch outdoors may cause it to malfunction.
- Do not use the Switch submerged in oil or water, or in locations continuously subject to splashes of water. Doing so may result in oil or water entering the Switch interior.
- Confirm suitability (applicability) in advance before using the Switch where it would be subject to oil, water, chemicals, or detergents. Contact with any of these may result in contact failure, insulation failure, earth leakage faults, or burning.
- Do not use the Switch in the following locations:
 - Locations subject to corrosive gases
 - Locations subject to severe temperature changes
 - Locations subject to high humidity, resulting in condensation
 - Locations subject to severe vibration
 - Locations subject to cutting chips, dust, or dirt
 - Locations subject to high humidity or high temperature
- Use protective covers to protect Switches that are not specified as waterproof or airtight whenever they are used in locations subject to splattering or spraying oil or water, or to accumulation of dust or dirt.



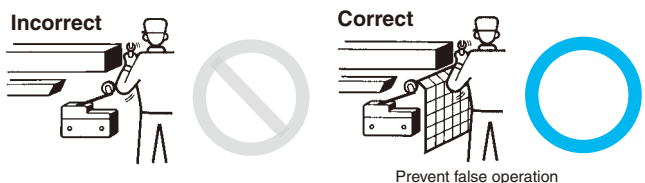
- Be sure to install the Switch so that the Switch is free from dust or metal powder. The Actuator and the Switch casing must be protected from the accumulation of dust or metal powder.



- Do not use the Switch in locations where the Switch is exposed to steam or hot water at a temperature greater than 60°C.
- Do not use the Switch under temperatures or other environmental conditions not within the specified ranges. The rated permissible ambient temperature range varies with the model. Refer to the *Specifications* in this catalog. If the Switch is exposed to radical temperature changes, the thermal shock may deform the Switch and the Switch may malfunction.



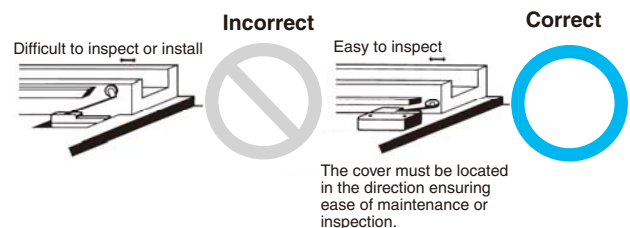
- Be sure to protect the Switch with a cover if the Switch is in a location where the Switch may be actuated by mistake or where the Switch is likely cause an accident.



- Make sure to install the Switch in locations free of vibration or shock. If vibration or shock is continuously imposed on the Switch, contact failure, malfunction, or decrease in service life may be caused by abrasive powder generated from the internal parts. If excessive vibration or shock is imposed on the Switch, the contacts may malfunction or become damaged.
- Do not use the Switch with silver-plated contacts for long periods if the switching frequency of the Switch is comparatively low or the load is minute. Otherwise, sulfuric film will be generated on the contacts and contact failures may result. Use the Switch with gold-plated contacts or use a Switch designed for minute loads instead.
- Do not use the Switch in locations with corrosive gas, such as sulfuric gas (H₂S or SO₂), ammonium gas (NH₃), nitric gas (HNO₃), or chlorine gas (Cl₂), or high temperature and humidity. Otherwise, contact failure or corrosion damage may result.
- If the Switch is used in locations with silicone gas, arc energy may create silicon dioxide (SiO₂) on the contacts and a contact failure may result. If there is silicone oil, silicone sealant, or wire covered with silicone close to the Switch, attach a contact protection circuit to suppress the arcing of the Switch or eliminate the source of silicone gas generation.

Regular Inspection and Replacement

- If the Switch is normally closed with low switching frequency (e.g., once or less per day), a reset failure may result due to the deterioration of the parts of the Switch. Regularly inspect the Switch and make sure that the Switch is in good working order.
- In addition to the mechanical durability or electrical durability of the Switch described previously, the durability of the Switch may decrease due to the deterioration of each part, especially rubber, resin, and metal. Regularly inspect the Switch and replace any part that has deteriorated to prevent accidents from occurring.
- If the Switch is not turned ON and OFF for a long period of time, contact reliability may be reduced due to contact oxidation. Continuity failure may result in accidents (i.e., the switch may not turn ON due to increased contact resistance.)
- Be sure to mount the Switch securely in a clean location to ensure ease of inspection and replacement. The Switch with operation indicator is available, which is ideal if the location is dark or does not allow easy inspection or replacement.



Storage of Switch

- When storing the Switch, make sure that the location is free of corrosive gas, such as H₂S, SO₂, NH₃, HNO₃, or Cl₂, or dust and does not have a high temperature or humidity.
- Be sure to inspect the Switch before use if it has been stored for three months or more.

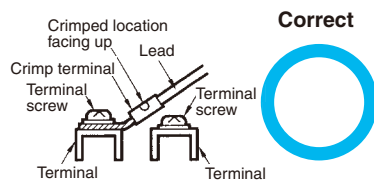
Typical Problems, Probable Causes, and Remedies

Problem		Probable cause	Remedy
Mechanical failure	1. The Actuator does not operate. 2. The Actuator does not return. 3. The Actuator has been deformed. 4. The Actuator is worn. 5. The Actuator has been damaged.	The shape of the dog or cam is incorrect.	<ul style="list-style-type: none"> Change the design of the dog or cam and smooth the contacting surface of the cam. Scrutinize the suitability of the Actuator. (Make sure that the Actuator does not bounce.)
		The contacting surface of the dog or cam is rough.	
		The Actuator in use is not suitable.	<ul style="list-style-type: none"> Attach a decelerating device or change the mounting position of the Switch.
		The operating direction of the Actuator is not correct.	
		The operation speed is excessively high.	<ul style="list-style-type: none"> Change the stroke.
		Excessive stroke.	
		The rubber or grease hardened due to low temperature.	<ul style="list-style-type: none"> Use a cold-resistive Switch.
		The accumulation of sludge, dust, or cuttings.	
	There is a large deviation in operating position (with malfunctioning involved).	Dissolution, expansion, or swelling damage to the rubber parts of the driving mechanism.	<ul style="list-style-type: none"> Use a drip-proof model or one with high degree of protection. Use a protection cover and change the solvent and materials.
		Damage to and wear and tear of the internal movable spring.	
		Wear and tear of the internal mechanism.	
	The terminal part wobbles (The mold part has been deformed).	The loosening of the mounting screws causing the position to be unstable.	<ul style="list-style-type: none"> Regularly inspect the Switch. Use a better quality Switch. Tighten the mounting screws securely. Use a mounting board.
		Overheating due to a long soldering time.	
		The Switch has been connected to and pulled by thick lead wires with excessive force.	
Failures related to chemical or physical characteristics	Contact chattering.	High temperature or thermal shock resulted.	<ul style="list-style-type: none"> Solder the Switch quickly. Change the lead wire according to the carry current and ratings. Use a temperature-resistive Switch or change mounting positions.
		Vibration or shock is beyond the rated value.	
		Shock has been generated from a device other than the Switch.	
	Oil or water penetration.	Too-slow operating speed.	<ul style="list-style-type: none"> Attach an anti-vibration mechanism. Attach a rubber circuit to the solenoid. Increase the operating speed (with an accelerating mechanism).
		The sealing part has not been tightened sufficiently.	
		The wrong connector has been selected and does not conform to the cable.	
		The wrong Switch has been selected.	
		The terminal part is not molded.	
	Deterioration of the rubber part.	The Switch has been burnt or carbonated due to the penetration of dust or oil.	<ul style="list-style-type: none"> Use a drip-proof or waterproof Switch. Use the correct connector and cable.
		The expansion and dissolution of the rubber caused by solvent or lubricating oil.	
		Cracks due to direct sunlight or ozone.	
	Corrosion (rusting or cracks).	Damage to the rubber caused by scattered or heated cuttings.	<ul style="list-style-type: none"> Use an oil-resistant rubber or Teflon bellows. Use a weather-resistant rubber or protective cover. Use a Switch with a metal bellows protective cover.
		The oxidation of metal parts resulted due to corrosive solvent or lubricating oil.	
		The Switch has been operated in a corrosive environment, near the sea, or on board a ship.	
		The electrical deterioration of metal parts of the Switch resulted due to the ionization of cooling water or lubricating oil.	
		The cracking of alloyed copper due to rapid changes in temperature.	
Failures related to electric characteristics	No actuation. No current breakage. Contact welding.		<ul style="list-style-type: none"> Change the lubricating oil or change mounting positions. Use a crack-resistant material.
		Inductive interference in the DC circuit.	
		Carbon generated on the surface of the contacts due to switching operations.	
		A short-circuit or contact welding due to contact migration.	
		Contact welding due to an incorrectly connected power source.	
		Foreign materials or oil penetrated into the contact area.	<ul style="list-style-type: none"> Reduce the switching frequency or use a Switch with a large switching capacity. Change the circuit design.
			<ul style="list-style-type: none"> Use a protective box.

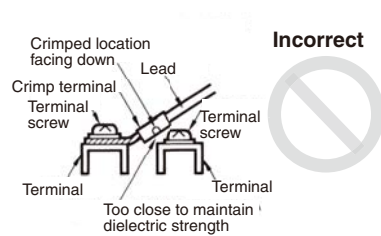
Other

- The standard material for the Switch seal is nitrile rubber (NBR), which has superior resistance to oil. Depending on the type of oil or chemicals in the application environment, however, NBR may deteriorate, e.g., swell or shrink. Confirm performance in advance.
- The correct Switch must be selected for the load to ensure contact reliability. Refer to *Precautions* for microloads in individual product information for details.
- Wire the leads as shown in the following diagram.

Correct Wiring



Incorrect Wiring





WARNING

This catalog is a guide to help customers select the proper safety products. Observe the following items when choosing products, select the right products for your devices or equipment, and develop a safety-related system to fully utilize product functions.

Setting Up a Risk Assessment System

The items listed in this catalog must be used properly in terms of product location as well as product performance and functionality. Part of the process of selecting and using these products should include the introduction and development of a risk assessment system early in the design development stage to help identify potential dangers in your equipment that will optimize safety product selection. A badly designed risk assessment system often results in poor choices when it comes to safety products.

- Related International Standards:
ISO 14121 Principles of Risk Assessment

Safety Policy

When developing a safety system for the devices and equipment that use safety products, make every effort to understand and conform to the entire series of international and industrial standards available, such as the examples given below.

- Related International Standards:
ISO 12100 Basic Concepts, General Principles for Design
IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems

Role of Safety Products

Safety products have functions and mechanisms that ensure safety as defined by standards. These functions and mechanisms are designed to attain their full potential within safety-related systems. Make sure you fully understand all functions and mechanisms, and use that understanding to develop systems that will ensure optimal usage.

- Related International Standards:
ISO 14119 Interlocking Devices Associated with Guards-Principles for Design and Selection

Installing Safety Products

Make sure that properly educated and trained engineers are selected to develop your safety-related system and to install safety products in devices and equipment.

- Related International Standards:
ISO 12100 Basic Concepts, General Principles for Design
IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems

Observing Laws and Regulations

Safety products should conform to pertinent laws, regulations, and standards, but make sure that they are used in accordance with the laws, regulations, and standards of the country where the devices and equipment incorporating these products are distributed.

- Related International Standards:
IEC 60204 Electrical Equipment of Machines

Observing Usage Precautions

Carefully read the specifications and precautions listed in this catalog for your product as well as all items in the Operating Manual packed with the product to learn usage procedures that will optimize your choice. Any deviation from precautions will lead to unexpected device or equipment failure not anticipated by safety-related systems or fire originating from equipment failure.

Transferring Devices and Equipment

When transferring devices and equipment, be sure to keep one copy of the Operating Manual and pack another copy with the device or equipment so the person receiving it will have no problem operating it.

- Related International Standards:
ISO 12100 Basic Concepts, General Principles for Design
IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems

Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

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WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

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Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the product.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

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