

Safety Limit Switch

Positive Action Limit Switches with Direct Drive Contacts for Critical Switching Applications

- Snap-action contact for accurate switching with safe operation via direct drive positive opening mechanism
- Two sets of contacts: one (NC) for safety circuit and the other (NO) for control circuit
- Safety of lever settings ensured as a mechanism engages a gear between the operating position indicator plate and the lever
- Conforms to EN (TÜV) standards corresponding to the CE marking
- 3-conduit switches are available for easy wiring
- Conforms to these standards and EC Directives:

Machinery Directive
 Low Voltage Directive
 EN1088
 EN50041

- Approved Standards

Snap-Action Models

Agency	Standard	File No.
TÜV Rheinland	EN60947-5-1	R9851083
		(Positive opening: approved)
		R9151372 (Positive opening: approval pending) (See note 1.)
UL	UL508	E76675
CSA	C22.2 No. 14	LR45746
BIA (See note 2.)	GS-ET-15	1-conduit: 9202158 3-conduit: 9309655

- Note: 1. Adjustable roller lever, adjustable rod lever, coil spring, and plastic rod models only.
2. Not including adjustable roller lever, adjustable rod lever, coil spring, and plastic rod models.



Slow-Action Models

Agency	Standard	File No.
TÜV Rheinland	EN60947-5-1	R9151643
		(Positive opening: approved) (See note)
UL	UL508	E76675
CSA	C22.2 No. 14	LR45746
BIA (See note.)	GS-ET-15	1-conduit: 9202158 3-conduit: 9309655
SUVA (See note.)	SUVA	1-conduit: E6188.d 3-conduit: E6189.d

Note: Not including adjustable roller lever, adjustable rod lever, coil spring, and plastic rod models.

Ordering Information

MODEL NUMBER LEGEND

D4B-□□□□N

1 2 3

1. Conduit

- 1: PG13.5 (1-conduit) European type
- 2: G1/2 (PF1/2) (1-conduit) Japanese type
- 3: 1/2-14NPT (1-conduit) North American type
- 5: PG13.5 (3-conduit) European type
- 6: G1/2 (PF1/2) (3-conduit) Japanese type
- 7: 1/2-14NPT (3-conduit) North American type

2. Built-in Switch




- 1: 1NC/1NO (Snap-action)
- A: 2NC (Slow-action)
- 5: 1NC/1NO (Slow-action) (See Note)

3. Actuator

- 00: Switch box (without head)
- 11: Roller lever (standard)
- 13: Adjustable rubber roller lever
- 16: Adjustable roller lever
- 17: Adjustable rod lever
- 1R: Roller lever (conventional D4B-compatible)
- 70: Top plunger
- 71: Top roller plunger
- 81: Coil spring
- 87: Plastic rod




Note: Excluding D4B-□□81N and D4B-□□87N models.

SWITCHES (EN50041)

Description		Part number								
Actuator		Conduit size/type								
		PG13.5 (European)			G1/2 (Japanese)			1/2-14NPT (North American)		
		1NC/1NO (Snap-action)	1NC/1NO (Slow-action)	2NC (Slow-action)	1NC/1NO (Snap-action)	1NC/1NO (Slow-action)	2NC (Slow-action)	1NC/1NO (Snap-action)	1NC/1NO (Slow-action)	2NC (Slow-action)
Side rotary	Roller lever (form A)	D4B-1111N	D4B-1511N	D4B-1A11N	D4B-2111N	D4B-2511N	D4B-2A11N	D4B-3111N	D4B-3511N	D4B-3A11N
	Adjustable roller lever, rubber, 50.0 mm (1.97 in) dia. 1/2-14NPT	D4B-3113N	D4B-3513N	D4B-3A13N	—			—		
	Adjustable roller lever (See Note 1)	D4B-1116N	D4B-1516N	D4B-1A16N	D4B-2116N	D4B-2516N	D4B-2A16N	D4B-3116N	D4B-3516N	D4B-3A16N
	Adjustable rod lever (form D) (See Note 1)	D4B-1117N	D4B-1517N	D4B-1A17N	D4B-2117N	D4B-2517N	D4B-2A17N	D4B-3117N	D4B-3517N	D4B-3A17N
Top plunger	Plain (form B)	D4B-1170N	D4B-1570N	D4B-1A70N	D4B-2170N	D4B-2570N	D4B-2A70N	D4B-3170N	D4B-3570N	D4B-3A70N
	Roller (form C)	D4B-1171N	D4B-1571N	D4B-1A71N	D4B-2171N	D4B-2571N	D4B-2A71N	D4B-3171N	D4B-3571N	D4B-3A71N
Wobble lever (See Note 2)	Coil spring	D4B-1181N	---	D4B-1A81N	D4B-2181N	---	D4B-2A81N	D4B-3181N	---	D4B-3A81N
	Plastic rod	D4B-1187N	---	D4B-1A87N	D4B-2187N	---	D4B-2A87N	D4B-3187N	---	D4B-3A87N
Standards		EN60947-5-1 			EN60947-5-1 			EN60947-5-1 		

- Note: 1. The slow-action models with adjustable roller levers or adjustable rod levers are approved under the Forced Opening Certificate (TÜV) of the EN standard, but they do not conform to the GS-ET-15 Standard (BIA) and SUVA. The snap-action models with adjustable roller levers or adjustable rod levers are not approved under the Forced Opening Certificate (TÜV) of the EN standard.
2. The wobble lever models are ordinary limit switches and are not approved under EN, GS, and SUVA's Forced Opening Certificate.

3-Conduit Switch

Description		Part number								
Actuator		Conduit size								
		PG13.5 (European) See Note 2			G1/2 (Japanese)			1/2-14NPT North American		
		1NC/1NO (Snap-action)	1NC/1NO (Slow-action)	2NC (Slow-action)	1NC/1NO (Snap-action)	1NC/1NO (Slow-action)	2NC (Slow-action)	1NC/1NO (Snap-action)	1NC/1NO (Slow-action)	2NC (Slow-action)
Side rotary	Roller lever (form A)	D4B-5111N	D4B-5511N	D4B-5A11N	D4B-6111N	D4B-6511N	D4B-6A11N	D4B-7111N	D4B-7511N	D4B-7A11N
	Adjustable roller lever, rubber, 50.0 mm (1.97 in) dia.	D4B-7113N	D4B-7513N	D4B-7A13N	---					
	Adjustable roller lever (See Note 1)	D4B-5116N	D4B-5516N	D4B-5A16N	D4B-6116N	D4B-6516N	D4B-6A16N	D4B-7116N	D4B-7516N	D4B-7A16N
	Adjustable rod lever (form D) (See Note 1)	D4B-5117N	D4B-5517N	D4B-5A17N	D4B-6117N	D4B-6517N	D4B-6A17N	D4B-7117N	D4B-7517N	D4B-7A17N
Top plunger	Plain (form B)	D4B-5170N	D4B-5570N	D4B-5A70N	D4B-6170N	D4B-6570N	D4B-6A70N	D4B-7170N	D4B-7570N	D4B-7A70N
	Roller (form C)	D4B-5171N	D4B-5571N	D4B-5A71N	D4B-6171N	D4B-6571N	D4B-6A71N	D4B-7171N	D4B-7571N	D4B-7A71N
Wobble lever (See Note 2)	Coil spring	D4B-5181N	---	D4B-5A81N	D4B-6181N	---	D4B-6A81N	D4B-7181N	---	D4B-7A81N
	Plastic rod	D4B-5187N	---	D4B-5A87N	D4B-6187N	---	D4B-6A87N	D4B-7187N	---	D4B-7A87N
Standards		EN60947-5-1 			EN60947-5-1 			EN60947-5-1 		

- Note: 1. The slow-action models with adjustable roller levers or adjustable rod levers are approved under the Forced Opening Certificate (TÜV) of the EN standard, but they do not conform to the GS-ET-15 Standard (BIA) and SUVA. The snap-action models with adjustable roller levers or adjustable rod levers are not approved under the Forced Opening Certificate (TÜV) of the EN standard.
2. The D4B-□N is a Limit Switch conforming to European standards, and PG13.5 is commonly used in Europe.
3. The wobble lever models are ordinary limit switches and are not approved under EN, GS, and SUVA's Forced Opening Certificate.

LEVERS (FOR SIDE ROTARY SWITCHES)

Description			Part number
Actuator	Length	Diameter of roller	D4B-0001N D4B-0006N D4B-0007N D4B-000RN
Standard	31.5	17.5 dia.	
Adjustable roller lever	25 to 89	19 dia.	
Adjustable rod lever	145 max.	---	
Interchangeable with D4B-0001	33.7	19 dia.	

Note: Other lever types are also available.

Specifications

APPROVED STANDARD RATINGS

TÜV Rheinland: EN60947-5-1

Utilization category	AC-15
Rated operating current (I_e)	2 A
Rated operating voltage (U_e)	400 V

Note: As protection against short-circuiting, use either a gI-type or gG-type 10-A fuse that conforms to IEC269.

■ UL/CSA: (UL508, CSA C22.2 NO. 14)

A600

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC 240 VAC 480 VAC 600 VAC	10 A	60 A 30 A 15 A 12 A	6 A 3 A 1.5 A 1.2 A	7,200 VA	720 VA

Q150

Rating Codes for DC Control-Circuit Contacts

Thermal continuous test current, amperes	Maximum make or break current, amperes			Maximum make or break volt-amperes at 300 volts or less
	125 Volt	250 Volt	301 to 600 Volt	
2.5	0.55	—	—	69

■ CHARACTERISTICS

Item		Snap-action	Slow-action
Life expectancy (see note 2)	Mechanical	30,000,000 operations min.	10,000,000 operations min.
	Electrical	500,000 operations min. (at a 250 VAC, 10-A resistive load)	
Operating speed		1 mm/s to 0.5 m/s	
Operating frequency		Mechanical: 120 operations/min Electrical: 30 operations/min	
Rated frequency		50/60 Hz	
Insulation resistance		100 MΩ min. (at 500 VDC) between terminals of the same polarity and between each terminal and non-current-carrying part	
Contact resistance		25 mΩ max. (initial value)	
Dielectric strength			
Between terminals of same polarity		U _{imp} 2.5 kV	U _{imp} 4 kV
Between terminals of different polarity		---	U _{imp} 4 kV
Between current-carrying metal parts and ground		U _{imp} 4 kV	U _{imp} 4 kV
Between each terminal and non-current-carrying parts		U _{imp} 4 kV	U _{imp} 4 kV
Rated insulation voltage (U _i)		600 VAC (EN60947-5-1)	
Counter electromotive voltage at switching		1,500 VAC max. (EN60947-5-1)	
Operating environmental pollution level		3 (EN60947-5-1)	
Conditional short-circuit current		100 A (EN60947-5-1)	
Conventional enclosed thermal current (I _{the})		20 A (EN60947-5-1)	
Electric shock protection class		Class I (with grounding terminal)	
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.	
Ambient temperature		Operating: -40°C to 80°C, with no icing (-25°C to 80°C for the flexible-rod type)	
Ambient humidity		Operating: 95% max.	
Degree of protection		IP67 (EN60947-5-1)	
Weight		Approx. 250 g	

- Note: 1. The above values are for initial operation.
 2. The life expectancy is for an ambient temperature of 5°C to 35°C and ambient humidity of 40% to 70%. For further conditions, consult your OMRON sales representative.
 3. The values in this table are for an ambient temperature of 5°C to 35°C and ambient humidity of 40% to 70%. For further conditions, consult your OMRON sales representative.

■ OPERATING CHARACTERISTICS

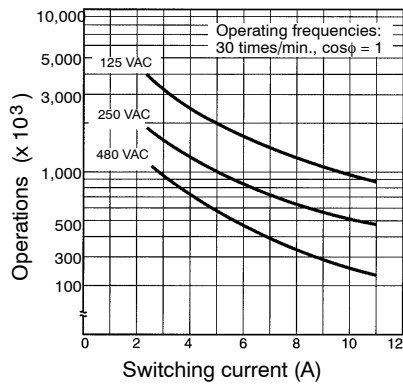
Model	D4B-□□11N	D4B-□□16N (see note 1)	D4B-□□17N (see note 2)	D4B-□□70N	D4B-□□71N	D4B-□□81N	D4B-□□87N
OF max.	9.41 N		2.12 N	18.63 N		1.47 N	
RF min.	1.47 N		0.29 N	1.96 N		---	
PT	21±3°			2.0 mm max.		15° max.	
PT (2nd) (see note 3)	45°			3.0 mm		---	
OT min.	50°			5.0 mm		---	
MD max. (see note 4)	12°			1.0 mm		---	
POT min.	35° (Slow-action models)			3.2 mm		---	
	55° (Snap-action models)						
POF min.	19.61 N			49.03 N		---	
TT	75°			7.0 mm		---	
FP max.	---			38 mm	51 mm	---	
OP	---			35±1 mm	48±1 mm	---	

- Note: 1. The operating characteristics of these Switches were measured with the roller lever set at 31.5 mm.
 2. The operating characteristics of these Switches were measured with the rod lever set at 140 mm.
 3. Only for slow-action models.
 4. Only for snap-action models.

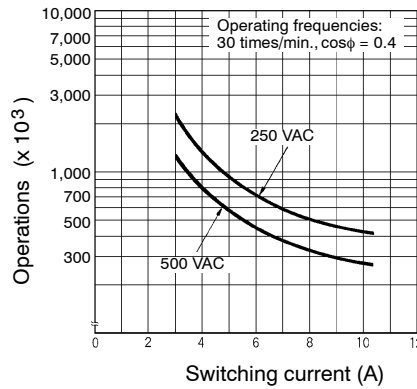
Engineering Data

■ ELECTRICAL LIFE EXPECTANCY
 SNAP-ACTION MODELS

(cosφ = 1)



(cosφ = 0.4)



Nomenclature

Head

With roller lever models, the direction of the switch head can be varied to any of the four directions by loosening the roller lever switch screws at the four corners of the head.

Operating Position Mark
(arrow)

The roller lever switch employs a system which allows selection of operation on only one side (left or right) or both sides without the use of any tools.

Push and rotate

Switch Box Material
Aluminum die-cast

Conduit Opening

Available in three different types of conduit threads:
Pg 13.5, G1/2 or 1/2-14NPT

Safety-Oriented Lever Setting

Grooves which engage the lever every 90° are cut in the operating position indicator plate to prevent the lever from slipping against the rotary shaft.

Equipped with Operating Position Indicator Plate

An optimum overtravel (OT) value may be secured by setting a desired OT value with a projection.

Shearing Force Contact Separating Mechanism (NC Contact Section Only)

Should any abnormality occur in the contact area, the contacts are positively pulled apart from each other by shearing force.

Ground Terminal Screw

A ground terminal is provided to improve safety.

Contact Material

Ag alloy

Operation

CONTACT FORM (EN50013)

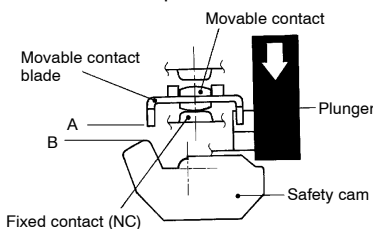
Model	Contact	Diagrams	Explanation
D4B-□1□N	1NC/1NO (Snap-action)		<p>Only NC contact 11-12 has an approved positive opening mechanism. (→)</p> <p>Terminal numbers 11-12 and 13-14 cannot be used as unlike poles.</p>
D4B-□5□N	1NC/1NO (Slow-action)		<p>Only NC contact 11-12 has an approved positive opening mechanism. (→)</p> <p>Terminal numbers 11-12 or 23-24 can be used as unlike poles.</p>
D4B-□A□N	2NC (Slow-action)		<p>Both NC contacts 11-12 and 21-22 have an approved positive opening mechanism. (→)</p> <p>Terminal numbers 11-12 and 21-22 can be used as unlike poles.</p>

POSITIVE CONTACT OPENING MECHANISM

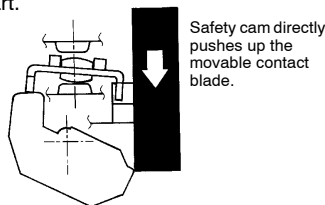
1NO/1NC Contact (Snap-action)

If metal deposition between mating contacts occurs on the NC contact side, they can be pulled apart by the shearing force and tensile force generated when part B of the safety cam or plunger engages part A of the movable contact blade. When the safety cam or plunger is moved in the direction of the arrow, the Limit Switch releases.

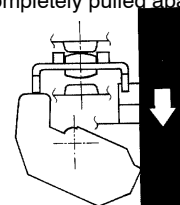
1. When metal deposition occurs.



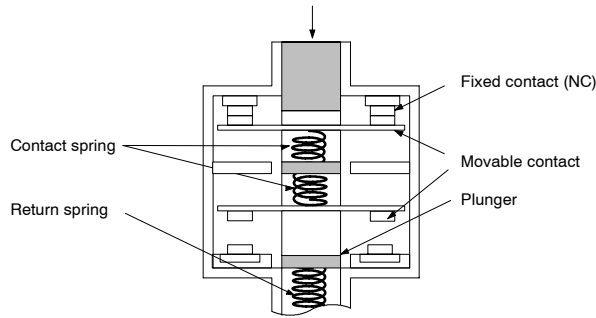
2. When contacts are being pulled apart.



3. When contacts are completely pulled apart.



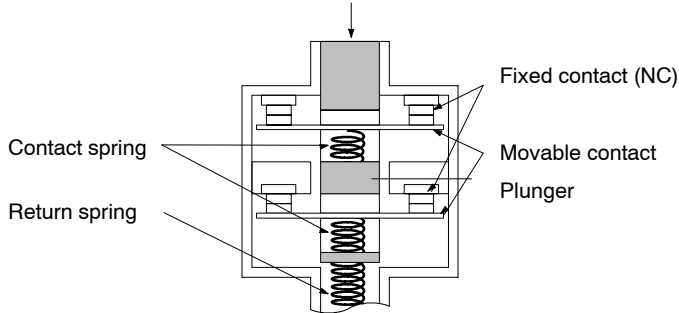
1NC/1NO Contact (Slow-Action)



Conforms to IEC 947-5-1 Positive Opening \rightarrow

When metal deposition occurs, the contacts are separated from each other by the plunger being pushed in.

2NC Contact (Slow-Action)



Conforms to EN60947-5-1 \rightarrow

When metal deposition occurs, the contacts are separated from each other by the plunger being pushed in.

\rightarrow is marked on the product to indicate approval of positive opening.

Dimensions

Unit: mm (inch)

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

2. When placing your order, specify the conduit type by adding a code (see below) to the first blank box in the model number of the selected switch. (For more ordering information, refer to the Model Number Legend, found in the *Ordering Information* of this data sheet.)

Key for Part No. Code:

Conduit type for standard switches

1: PG 13.5 (European)

2: G 1/2 (Japanese)

3: 1/2-14NPT (North American)

Conduit type for 3-conduit switches

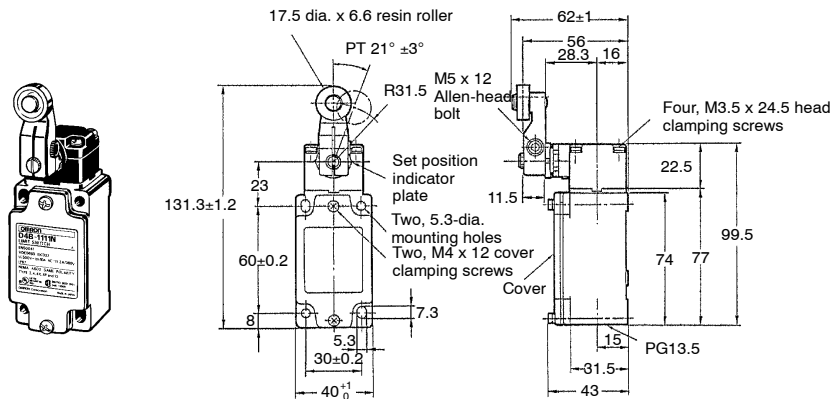
5: PG 13.5 (European)

6: G 1/2 (Japanese)

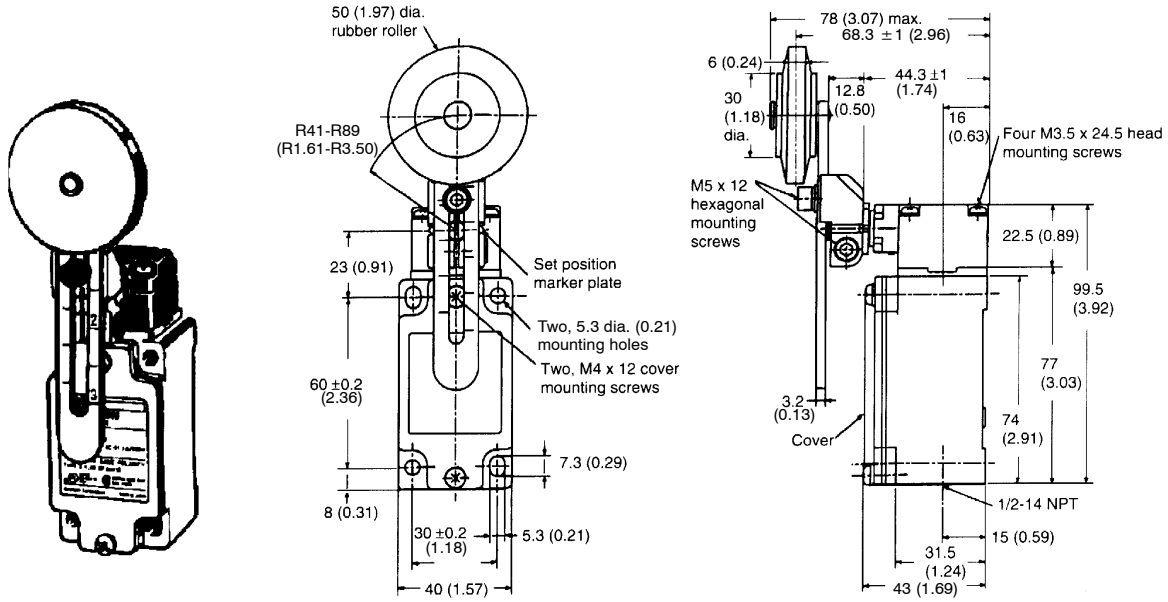
7: 1/2-14NPT (North American)

SWITCHES

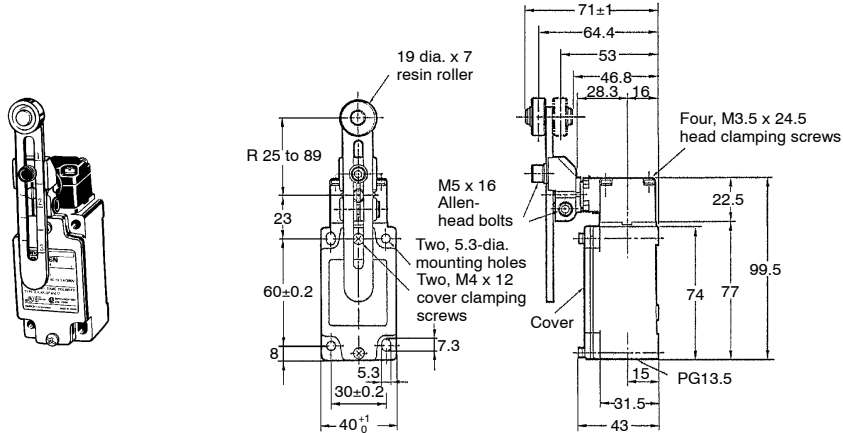
Roller Lever
D4B-□□11N



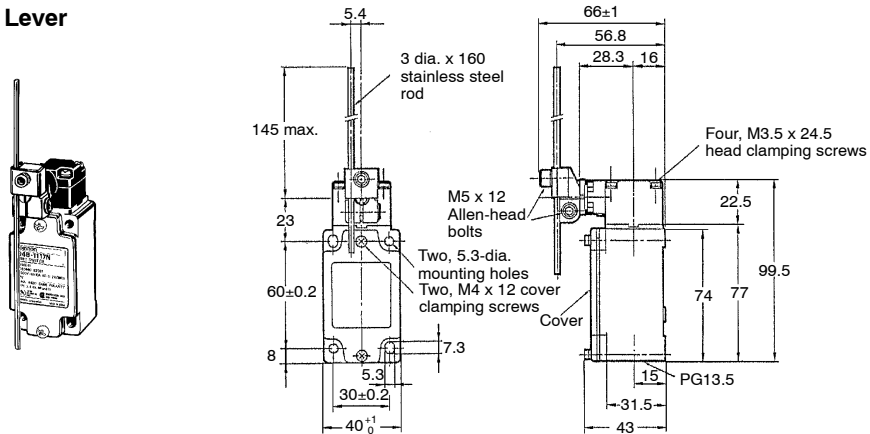
Adjustable Roller Lever Switch, Rubber Roller
D4B-3113N, D4B-3513N, D4B-3A13N



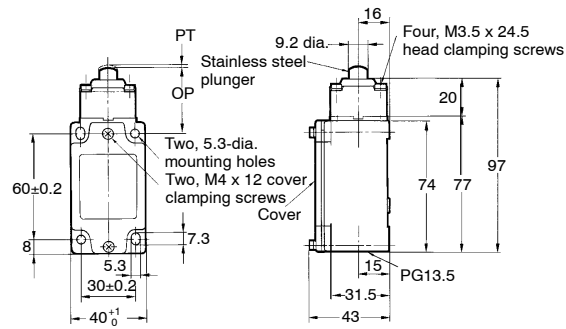
Adjustable Roller Lever
D4B-□□16N



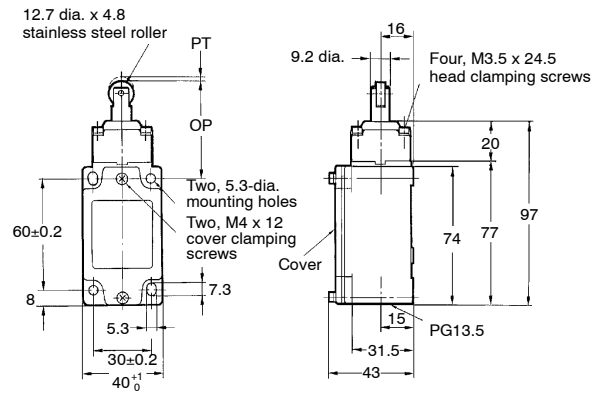
Adjustable Rod Lever
D4B-□□17N



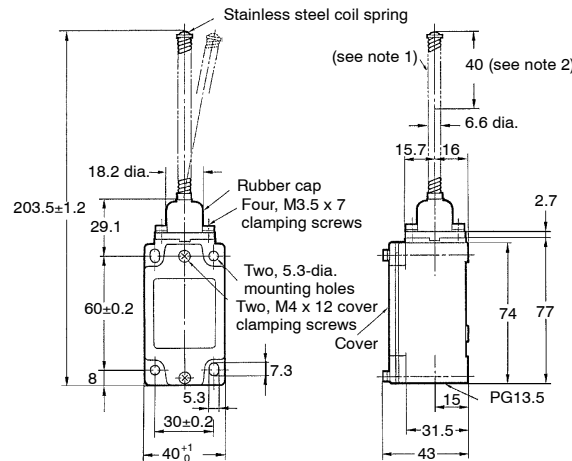
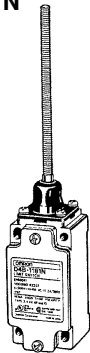
Top Plunger
D4B-□□70N



Top Roller Plunger
D4B-□□71N

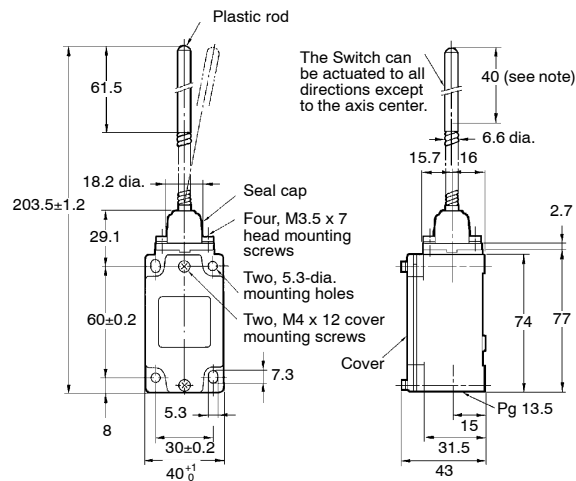
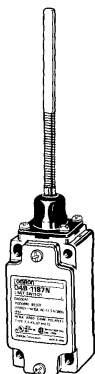


Coil Spring
D4B-□□81N



- Note:
1. The coil spring may be operated from any directions except axial directions (↓).
 2. Be sure to adjust the dog to within 40 mm from the top end of the coil spring.

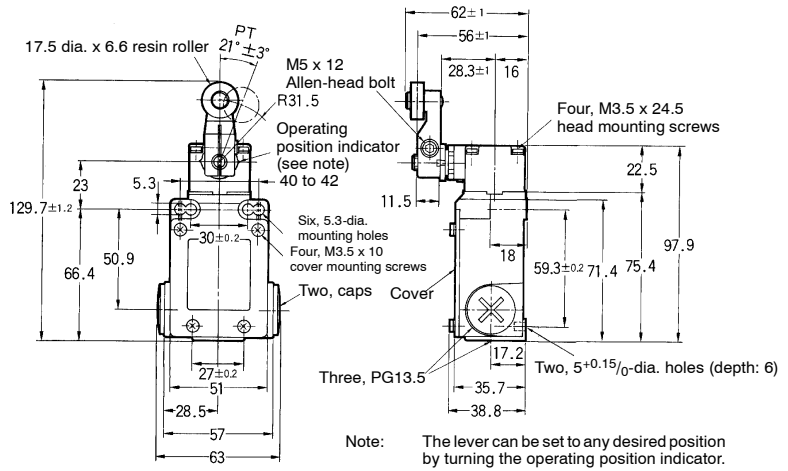
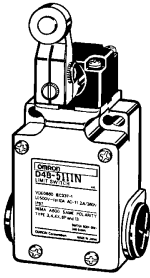
Plastic Rod
D4B-□□87N



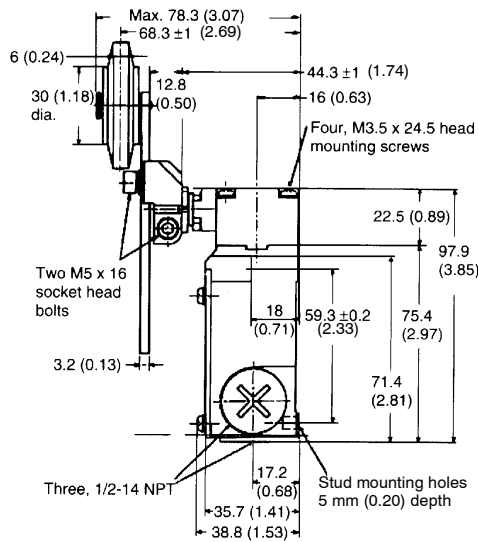
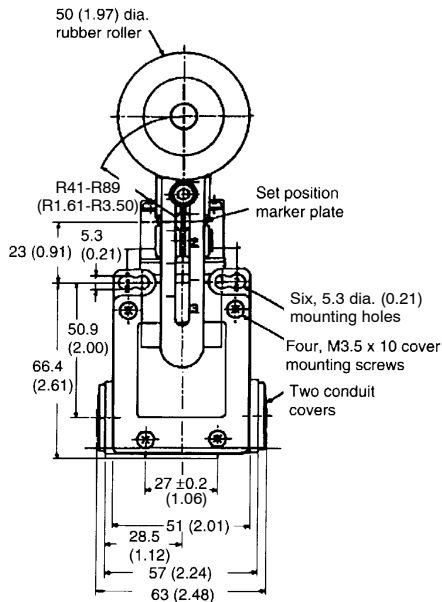
- Note:
- Be sure to adjust the dog to within 40 mm from the top end of the plastic rod.

3-Conduit Switches

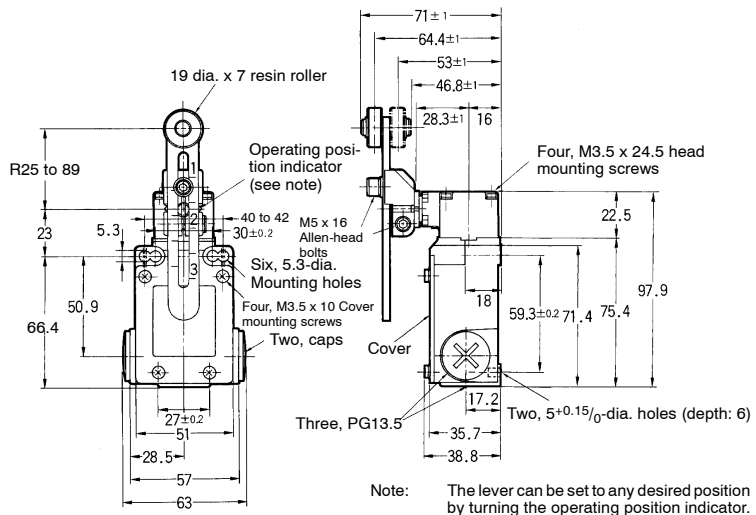
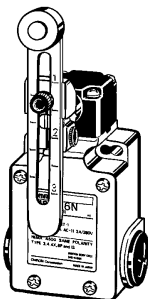
Roller Lever
D4B-□□11N



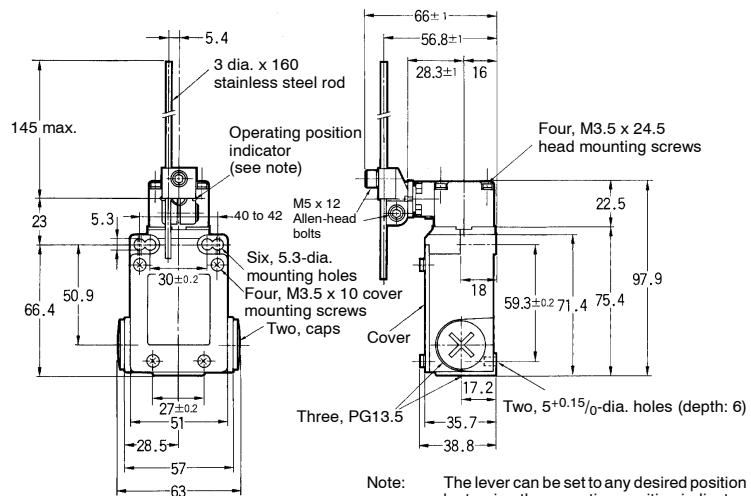
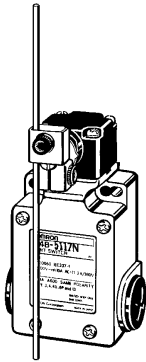
Adjustable Roller Lever Switch, Rubber Roller
D4B-7113N, D4B-7513N, D4B-7A13N



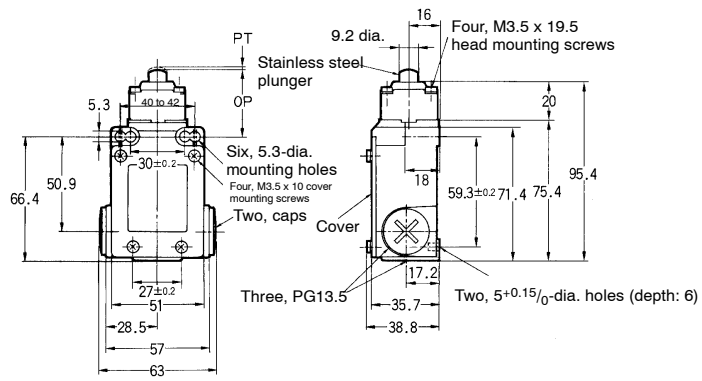
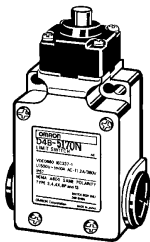
Adjustable Roller Lever
D4B-□□16N



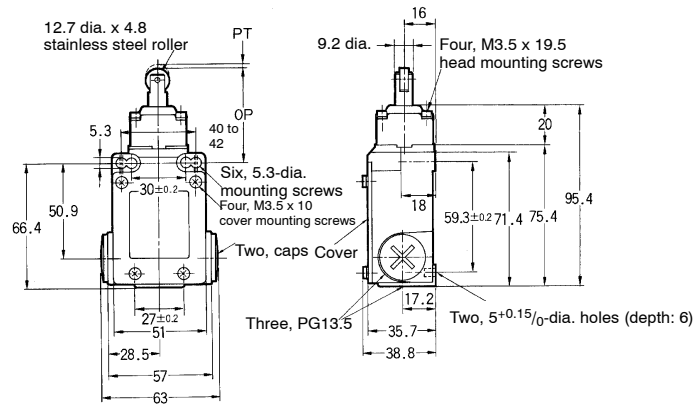
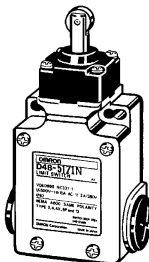
Adjustable Rod Lever
D4B-□□17N



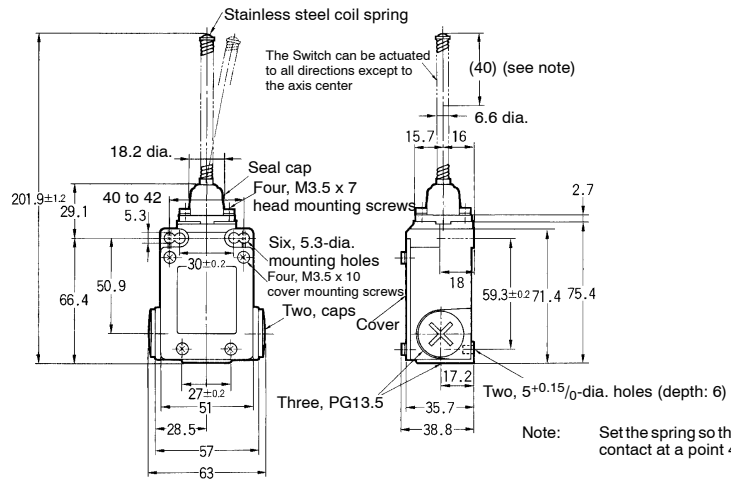
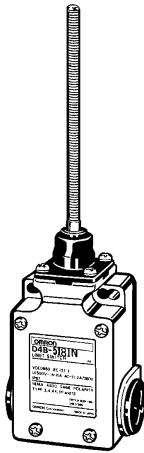
Top Plunger
D4B-□□70N



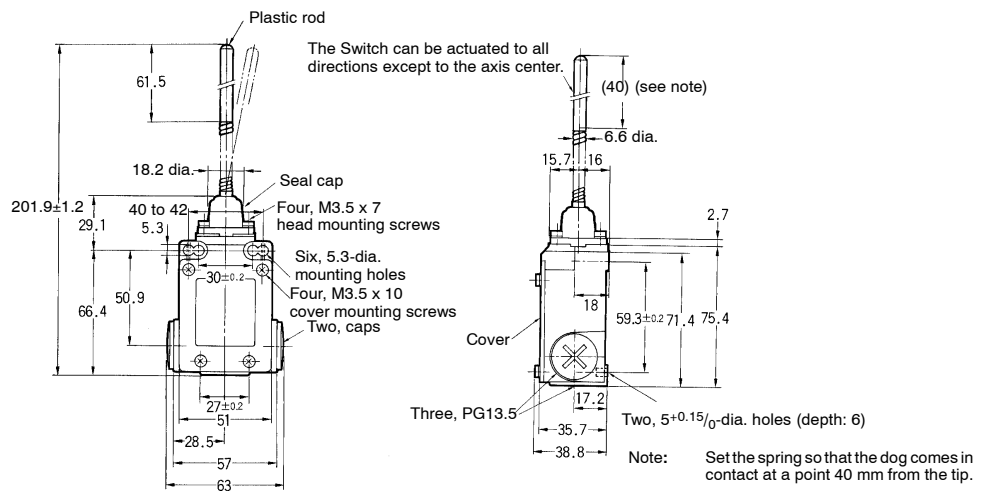
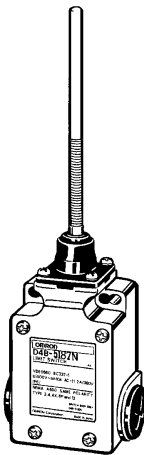
Top Roller Plunger
D4B-□□71N



Coil Spring
D4B-□□81N

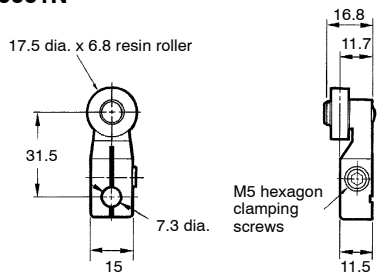


Plastic Rod
D4B-□□87N

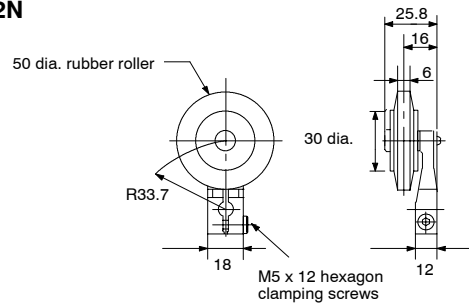


ROLLER LEVERS

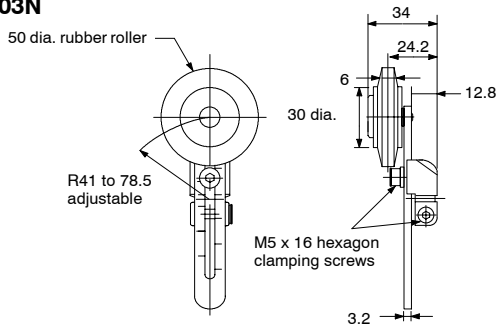
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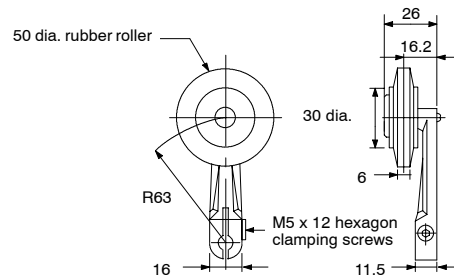
D4B-0002N



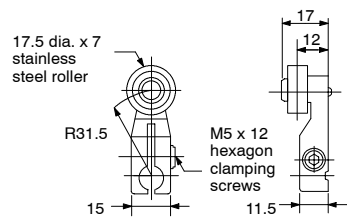
D4B-0003N



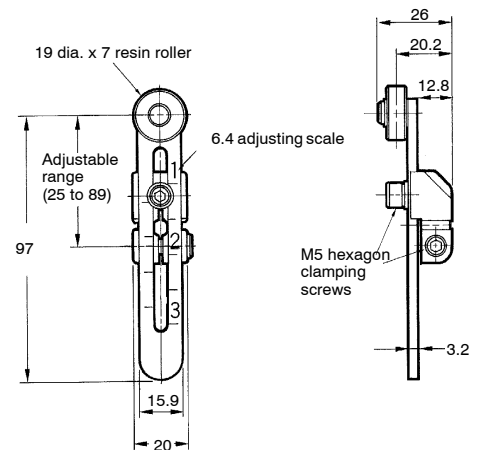
D4B-0004N



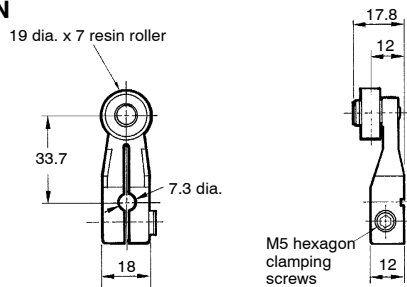
D4B-0005N



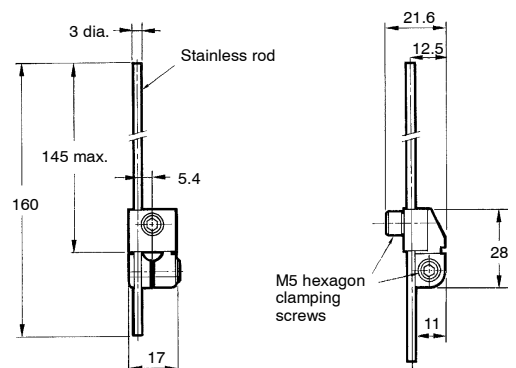
D4B-0006N



D4B-000RN

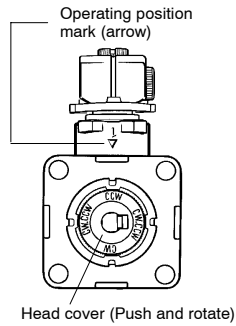


D4B-0007N



CW, CCW or Two-way Operation

The head of Side Rotary Switches can be converted in seconds to CW, CCW, or two-way operation. The conversion procedure follows.



Procedure

1. Remove the head by loosening the four screws that secure it.
2. Turn over the head to set the desired operation (CW, CCW, or both). The desired operation can be selected by setting the mode selector knob shown in the figure. This knob is factory set to the "CW + CCW" (two-way operation) position.
3. Set the CW hole on the head at the operation position mark (arrow) for clockwise operation or set the CCW hole right at the arrow for counterclockwise operation. In either case, be sure to set the hole position exactly at the arrow point.

Precautions

If the D4B-□N is applied to an emergency stop circuit or safety circuit for prevention of injury, use the D4B-□N model that has an NC contact equipped with a force-separation mechanism, and make sure that the D4B-□N operates in the positive mode. In addition, secure the D4B-□N with screws that are tightened in a single direction so that the D4B-□N cannot be easily removed. Then provide a protection cover for the D4B-□N and post a warning label near the D4B-□N.

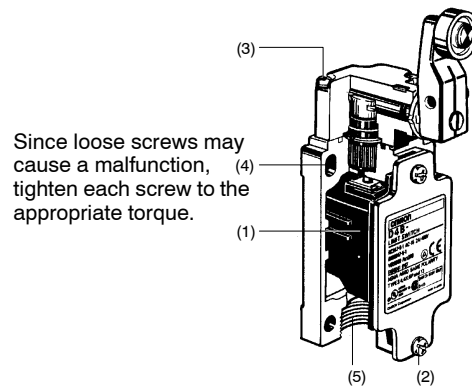
In order to protect the D4B-□N from damage due to short-circuiting, connect a fuse breaking a current 1.5 to 2 times higher than the rated current in parallel with the D4B-□N.

If an application satisfying EN standards is to employ the D4BL, apply the 10-A gI or gG fuse approved by IEC269.

Do not apply the D4B-□N to the door without applying a stopper to the door.

If the D4B-□N is used with the actuator normally pressed, the D4B-□N may malfunction or may soon have reset failures. Be sure to check and replace the D4B-□N regularly.

Tightening Torque



Type	Proper tightening torque
1 Terminal screw (M3.5)	0.59 to 0.78 N • m
2 Cover-mounting screw (see note)	1.18 to 1.37 N • m
3 Head-mounting screw	0.78 to 0.98 N • m
4 Switch-mounting screw (M5)	4.90 to 5.88 N • m
5 Connector	1.77 to 2.16 N • m
6 Cap screw (for three-conduit models)	1.27 to 1.67 N • m

Note: Apply a tightening torque of 0.78 to 0.88 N • m to conduit models.

■ CORRECT USE

Operating Environment

The D4B-□N is for indoor use. The D4B-□N may malfunction if the D4B-□N is used outdoors. Be sure to use a model with a lever-type actuator for outdoor use instead.

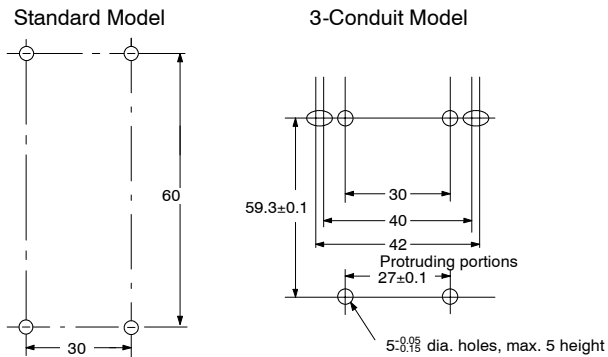
Do not use the D4B-□N in the following places:

- Places with radical temperature changes.
- Places with excessive humidity that may cause condensation.
- Places with excessive vibration.
- Places where metal dust, oil, or chemical may be sprayed to the D4B-□N.

Mounting

Use four M5 screws with washers to mount the standard model. Be sure to apply the proper torque to tighten each screw. The D4B-□N can be mounted more securely by using the four screws plus two 5^{-0.05/-0.15}-mm protruding parts, each of which has a maximum height of 4.8 mm as shown below.

Mounting Dimensions (M5)



Changes in Actuator Mounting Position

To change the angle of the lever, loosen the Allen-head bolts on the side of the lever.

The operating position indicator plate has protruding parts which engage with the lever, thus allowing changes to the lever position by 90°.

The back of the operating position indicator plate has no protruding parts. The lever can be set at any angle by attaching the operating position indicator plate to the Switch so that this side will face the lever. In this case, however, the D4B-□N will not be approved by SUVA or BIA. Make sure that the lever engages with the operating position indicator plate securely so that the lever will not slip.

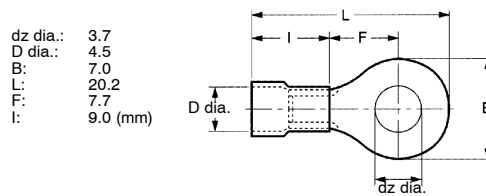
Changes in Head Mounting Position

By removing the screws on the four corners of the head, the head can be reset in any of four directions. Make sure that no foreign materials will penetrate through the head.

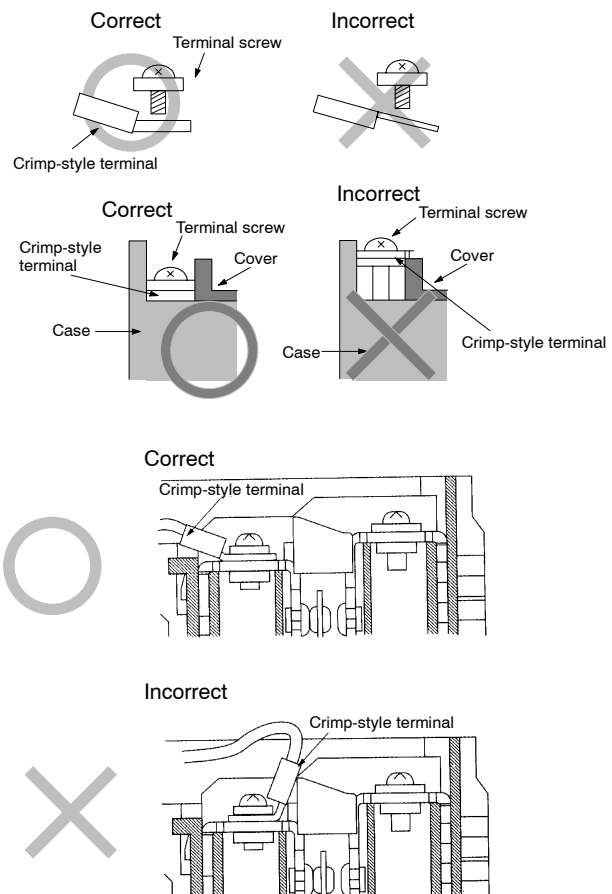
Wiring

Do not connect the bare lead wires directly to the terminals but be sure to connect each of them by using an insulation tube and M3.5 round solderless terminals and tighten each terminal screw within the specified torque range.

The proper lead wire is 20 to 14 AWG (0.5 to 2.5 mm²) in size.



Make sure that all solderless terminals come into contact with the casing or cover as shown below, or the cover may not be mounted properly or the D4B-□N may malfunction.



Connector

Make sure that each connector is tightened within the specified torque range. The casing may be damaged if the connector is tightened excessively.

If the 1/2-14NPT is used, cover the cable and conduit end with sealing tape in order to ensure IP67.

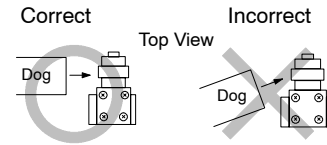
The Pg13.5 connector must be Nippon Flex's ABS-08Pg13.5 or ABS-12 Pg13.5.

Use OMRON's SC-series connector which is suited to the cable in diameter.

Properly attach the provided conduit cap to the unused conduit opening and securely tighten the cap screw within the specified torque when wiring the D4B-□N.

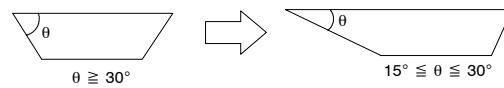
Actuator Load

The load for the actuator (roller) of the Switch must be imposed on the actuator in the horizontal direction, or the actuator or the rotating axis may be deformed or damaged.



When using a long lever model like the D4B-□□16N or D4B-□□17N, the Switch may telegraph. To avoid telegraphing, take the following precautions.

1. Set the lever to operate in one direction. (For details, see the data sheet section: *CW, CCW or Two-way Operation.*)
2. Modify the rear end of the dog to an angle of 15° to 30° as shown below or to a secondary-degree curve.



3. Modify the circuit so as not to detect the wrong operating signals.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters into inches, divide by 25.4

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