

## Heavy-Duty Safety Limit Switch

## D4B-□N

Positive Action Limit Switches with Snap and Slow Action Contacts for Critical Switching Applications

- All feature direct drive contacts to insure contact opening of double break contacts even with contact welding due to overload currents
- Enclosure rating meets IP67 and NEMA 3, 4, 4X, 6P and 13
- Modular construction with four position turret head
- Three-conduit switch body available for easy wiring
- Approved Standards:



Agency	Standard	File No.	
		Snap-action	Slow-action
TÜV Rheinland	EN60947-5-1 ⊖	With Ⓢ R9850211 Without Ⓢ R9151372	R9151643
BIA	EN60947-5-1 GS-ET-15 Ⓢ	9202158 and 9309655	9202158
UL	UL508	E76675	
CSA	CSA C22.1 No.14	LR45746	






## Ordering Information

### ■ SWITCHES

Description			Part number		
Actuator		Conduit type	1NC ⊖+1NO (Snap action)	1NC ⊖+1NO (Slow action)	2NC ⊖ (Slow action)
Side rotary	Roller lever, nylon, 17.5 mm (0.69 in) dia.		1/2-14NPT (1 conduit)	<b>D4B-3111N</b>	<b>D4B-3511N</b>
			1/2-14NPT (3 conduits)	<b>D4B-7111N</b>	<b>D4B-7A11N</b>
	Adjustable roller lever, rubber, 50.0 mm (1.97 in) dia. *		1/2-14NPT (1 conduit)	<b>D4B-3113N</b>	<b>D4B-3513N</b>
			1/2-14NPT (3 conduits)	<b>D4B-7113N</b>	<b>D4B-7A13N</b>
	Adjustable roller lever, nylon, 17.5 mm (0.69 in) dia. *		1/2-14NPT (1 conduit)	<b>D4B-3116N</b>	<b>D4B-3516N</b>
			1/2-14NPT (3 conduits)	<b>D4B-7116N</b>	<b>D4B-7A16N</b>

(This table continues on the next page.)

Ordering Information Table – continued from previous page

Description			Part number		
Actuator		Conduit type	1NC ⊖+1NO (Snap action)	1NC ⊖+1NO (Slow action)	2NC ⊖ (Slow action)
	Adjustable rod lever, 150 mm (5.91 in) L *		1/2-14NPT (1 conduit)	D4B-3117N	D4B-3517N
			1/2-14NPT (3 conduits)	D4B-7117N	D4B-7517N
Top plunger	Plain		1/2-14NPT (1 conduit)	D4B-3170N	D4B-3570N
			1/2-14NPT (3 conduits)	D4B-7170N	D4B-7570N
	Roller		1/2-14NPT (1 conduit)	D4B-3171N	D4B-3571N
			1/2-14NPT (3 conduits)	D4B-7171N	D4B-7571N
Wobble stick **	Coil spring, 6.5 mm (0.26 in) dia. x 114.4 mm (4.51 in) L		1/2-14NPT (1 conduit)	D4B-3181N	---
			1/2-14NPT (3 conduits)	D4B-7181N	---
	Plastic rod, 6.5 mm (0.26 in) dia. x 114.4 mm (4.51 in) L		1/2-14NPT (1 conduit)	D4B-3187N	---
			1/2-14NPT (3 conduits)	D4B-7187N	---

Note: ⊖ marking indicates the contacts which have positive opening mechanism approved by TÜV Rheinland.

\* The adjustable roller lever models are approved by the TÜV (EN standard) as positive opening, but they do not conform to the BIA (GS-ET-15 standard) and SUVA.

\*\* The models are not approved by TÜV, BIA and SUVA as positive opening.

## MODEL NUMBER LEGEND

D4B - □ □ □ □ N  
1 2 3

### 1. Conduit

- 1: PG13.5 (standard)
- 2: G1/2 (PF1/2) (standard)
- 3: 1/2-14NPT (standard)
- 5: PG13.5 (3-conduit)
- 6: G1/2 (PF1/2) (3-conduit)
- 7: 1/2-14NPT (3-conduit)

### 2. Built-in Switch

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

### 3. Actuator

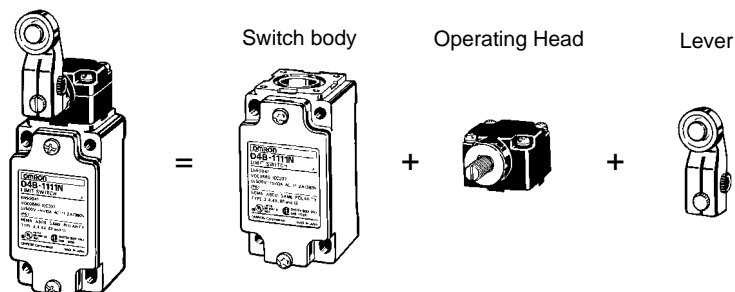
- 11: Roller lever (standard)
- 16: Adjustable roller lever
- 17: Adjustable rod lever
- 70: Top plunger
- 71: Top roller lever
- 81: Coil spring
- 87: Plastic rod
- 00: Switch box (without head)

## Replacement Parts

### ■ BUILDING A PART NUMBER

The D4B-N family of switches features plug-in construction with interchangeable parts for simplified long-term maintenance. The illustration at right shows the parts that make up a whole switch, as well as how to read a part number as the sum of its parts.

Note: The design of D4B-N switches does not share compatible parts with Omron's D4B-5000 series.



ex. D4B-3111N = D4B-3100N + D4B-0010N + D4B-0001N

### ■ SWITCH BODIES

		Standard EN50041 type	3-conduit type
		1/2-14NPT	1/2-14NPT
1NC/1NO (Snap-action)		D4B-3100N	D4B-7100N
1NC/1NO (Slow-action)		D4B-3500N	D4B-7500N
2NC (Slow-action)		D4B-3A00N	D4B-7A00N

### ■ OPERATING HEADS

Actuator	Description	Part number
Side rotary	Standard	D4B-0010N
Top plunger	Plain	D4B-0070N
	Roller, 12.7 mm (0.5 in) dia. stainless steel roller	D4B-0071N
Wobble stick	Coil spring, 6.5 mm (0.26 in) dia. x 114.4 mm (4.51 in) L	D4B-0081N
	Plastic rod, 6.5 mm (0.26 in) dia. x 114.4 mm (4.51 in) L	D4B-0087N

### ■ LEVERS (FOR SIDE ROTARY SWITCHES)

Description		Part number
Roller lever	17.5 mm (0.69 in) dia. nylon roller	D4B-0001N
	50 mm (1.97 in) dia. rubber roller	D4B-0003N
Adjustable lever	Roller, 19 mm (0.75 in) dia. nylon roller	D4B-0006N
	Rod, 145 min/max. (5.71 in)	D4B-0007N

# Specifications

## ■ RATINGS

1. TÜV Rheinland: AC-15, 2 A/400 V

2. UL (UL5081CSA C22.2 No.14) A600

Rated voltage	Current			Switching power	
	Continuous	Make	Break	Make	Break
120 VAC	10 A	60 A	6 A	7,200 VA	720 VA
240 VAC		30 A	3 A		
480 VAC		15 A	1.5 A		
600 VAC		12 A	1.2 A		

## ■ CHARACTERISTICS

Switch type		Snap-action	Slow-action
Operating speed		1 mm/s to 50 cm/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)	25 mΩ max. (initial value)
Dielectric strength			
Between terminals of same polarity		U <sub>imp</sub> 2.5 kV	U <sub>imp</sub> 4 kV
Between terminals of different polarity		---	U <sub>imp</sub> 4 kV
Between current-carrying metal parts and ground		U <sub>imp</sub> 4 kV	U <sub>imp</sub> 4 kV
Between each terminal and non-current-carrying parts		U <sub>imp</sub> 4 kV	U <sub>imp</sub> 4 kV
Rated insulation voltage (U <sub>i</sub> )		600 VAC (EN60947-5-1)	
Counter electromotive voltage at switching		1,500 VAC max. (EN60947-5-1)	
Pollution degree		3 (EN60947-5-1)	
Short-circuit protective device		10-A fuse (type gI or gG) (IEC269)	
Conditional short-circuit current		100 A (EN60947-5-1)	
Conventional enclosed thermal current (I <sub>the</sub> )		20 A (EN60947-5-1)	
Electric shock protection class		Class I (with grounding terminal)	
Vibration resistance		Malfunction: 10 to 55 Hz, 1.5-mm double amplitude	
Shock resistance		Destruction: 1,000 m/s <sup>2</sup> min. {approx. 100G min.} Malfunction: 300 m/s <sup>2</sup> min. {approx. 30G min.}	
Life expectancy (See Note 2.)		Mechanical: 30,000,000 operations min. Electrical: 500,000 operations min.	Mechanical: 10,000,000 operations min. Electrical: 500,000 operations min.
Contact gap		2 x 0.5 mm min.	2 x 2 mm min.
Bounce time		3 ms min.	Same as the operating speed
Ambient temperature		Operating: -40°C to 80°C (-40°F to 176°F) with no icing (See Note 4.)	
Ambient humidity		Operating: 95% max.	
Enclosure rating	UL	3, 4, 4X, 6P and 13	
	NEMA	3, 4, 4X, 6P and 13	
	IEC529	IP67 (EN60947-5-1)	
Weight		Approx. 250 g	

Note: 1. The above values are for initial operation.

- The life expectancy is for an ambient temperature of 5°C to 35°C (41°F to 95°F) and ambient humidity of 40% to 70%. For further conditions, consult your OMRON sales representative.
- The values in this table are for an ambient temperature of 5°C to 35°C (41°F to 95°F) and ambient humidity of 40% to 70%. For further conditions, consult your OMRON sales representative.
- 25°C to 80°C (-40°F to 176°F) for the wobble stick actuator type.

## ■ OPERATING CHARACTERISTICS

**Legend:** OF = Operating Force (max.); RF = Reset Force (min.); OT = Overtravel (min.); PT = Pretravel;  
MD = Movement Differential (max.); PO = Positively Open (max.); TT = Total Travel; OP = Operating Position

Part number	Description	OF	RF	OT	PT	MD*	PO**	TT	OP
D4B-□□11N	Side rotary, nylon roller lever	960 g (2.12 lbs.)	50 g (1.76 oz.)	50°	21±3°	12°	35°	75°	---
D4B-□□13N	Side rotary, adjustable roller lever	740 g (1.63 lbs.)	50 g (1.76 oz.)	50°	21±3°	12°	35°	75°	---
D4B-□□16N	Side rotary, adjustable roller lever	960 g (2.12 lbs.)	50 g (1.76 oz.)	50°	21±3°	12°	35°	75°	---
D4B-□□17N	Side rotary, adjustable rod lever	216 g (7.62 oz.)	11 g (0.39 oz.)	50°	21±3°	12°	35°	75°	---
D4B-□□70N	Plain top plunger	1900 g (4.19 lbs.)	200 g (7.05 oz.)	5 mm (0.20 in)	2 mm (0.08 in)	1 mm (0.04 in)	3.2 mm (0.13 in)	7 mm (0.28 in)	35±1 mm (1.38±0.04 in)
D4B-□□71N	Roller top plunger	1900 g (4.19 lbs.)	200 g (7.05 oz.)	5 mm (0.20 in)	2 mm (0.08 in)	1 mm (0.04 in)	3.2 mm (0.13 in)	7 mm (0.28 in)	48±1 mm (1.89±0.04 in)
D4B-□□81N	Coil spring wobble stick	150 g (5.29 oz.)	---	---	15°	---	---	---	---
D4B-□□87N	Plastic rod wobble stick	150 g (5.29 oz.)	---	---	15°	---	---	---	---

Note: \* Does not apply to DPST-NC (slow action) type switches.

\*\* Actuator travel necessary to assure positive contact opening. Does not apply to SPST (snap-action) type switches.

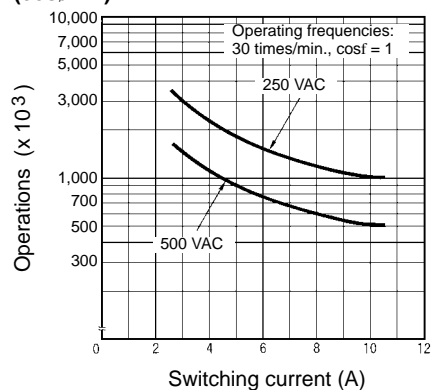
Operating characteristics for D4B-□□16N switches were measured with the roller lever at 31.5 mm.

Operating characteristics for D4B-□□17N switches were measured with the rod lever set at 140 mm.

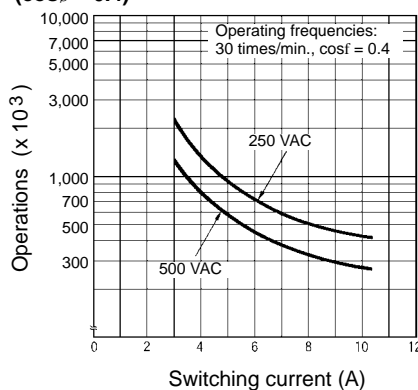
## Engineering Data

### ■ ELECTRICAL LIFE EXPECTANCY (SNAP-ACTION)

(cosφ = 1)



(cosφ = 0.4)



# Construction

## Turret Head

Rotate the head to four 90° positions to fit the application. Just loosen the head mounting screws and rotate.

## Operating Position Mark (arrow)

## Operating Direction Selector

Side rotary heads convert to clockwise, counterclockwise or bidirectional operation in seconds. Just push the button at the base of the head and rotate to desired position indicated by a pointer.

## Conduit Entrance

Standard type is 1/2-14 NPT, but PG13.5 for Europe and PF1/2 for Asia are available on special order.

Push and rotate

**Switch Box Material**  
Aluminum die-cast

## Safety-oriented Lever Setting

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

## Equipped with Operation Display 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)

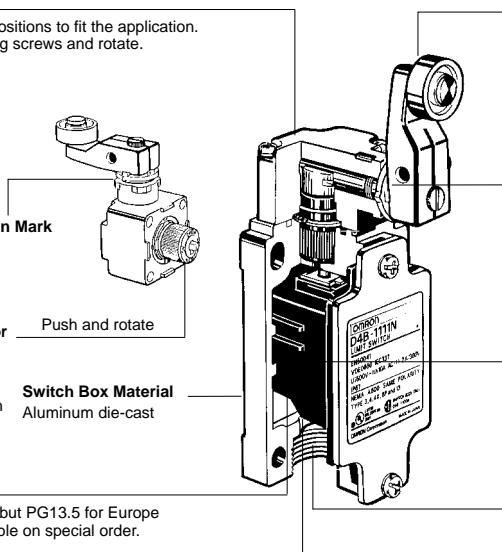
Should any abnormality occur in the contact area, the contacts are positively pulled apart from each other by shearing force.

## Ground Terminal Screw

A ground terminal is provided to improve safety.

## Contact Material

Ag alloy



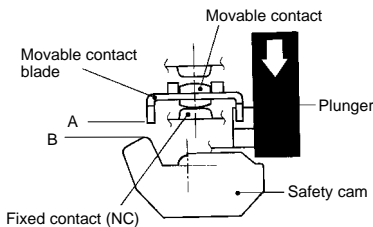
# Operation

## ■ POSITIVE CONTACT OPENING MECHANISM

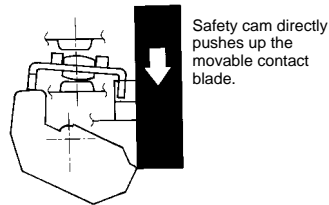
### 1NO/1NC Contact (Snap-action)

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.

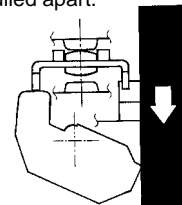
1. When metal deposition occurs.



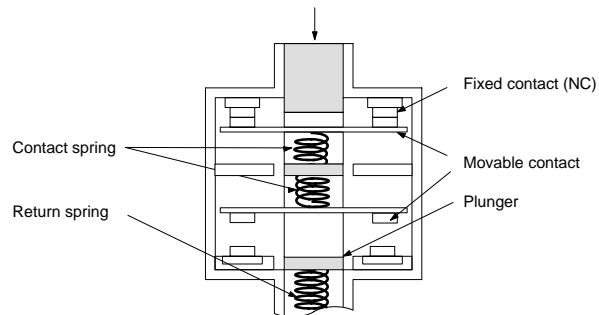
2. When contacts are being pulled apart.



3. When contacts are completely pulled apart.



### 1NC/1NO Contact (Slow-action)

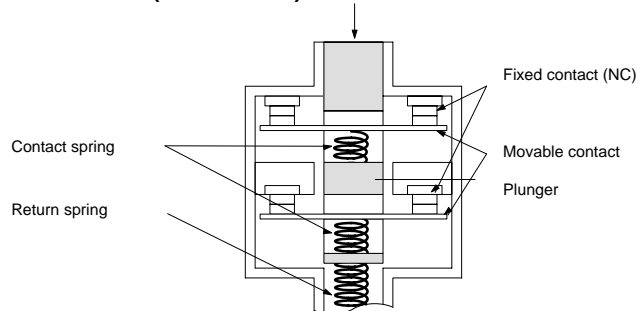


Conforms to IEC 947-5-1 Positive Opening



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



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

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

### Contact Form (EN50013)

Model	Contact	Diagrams (See Note.)
1NC/1NO Contacts (Snap-action)	<p>Only 11 to 12 contacts are positive opening. EN60947-5-1 → conformity</p>	
1NC/1NO Contacts (Slow-action)	<p>Only 11 to 12 contacts are positive opening. EN60947-5-1 → conformity</p>	
2NC Contacts (Slow-action)	<p>Both 11 to 12 and 21 to 22 contacts are positive opening. EN60947-5-1 → conformity</p>	

Note: 1. Contact operation

■ Closed □ Open

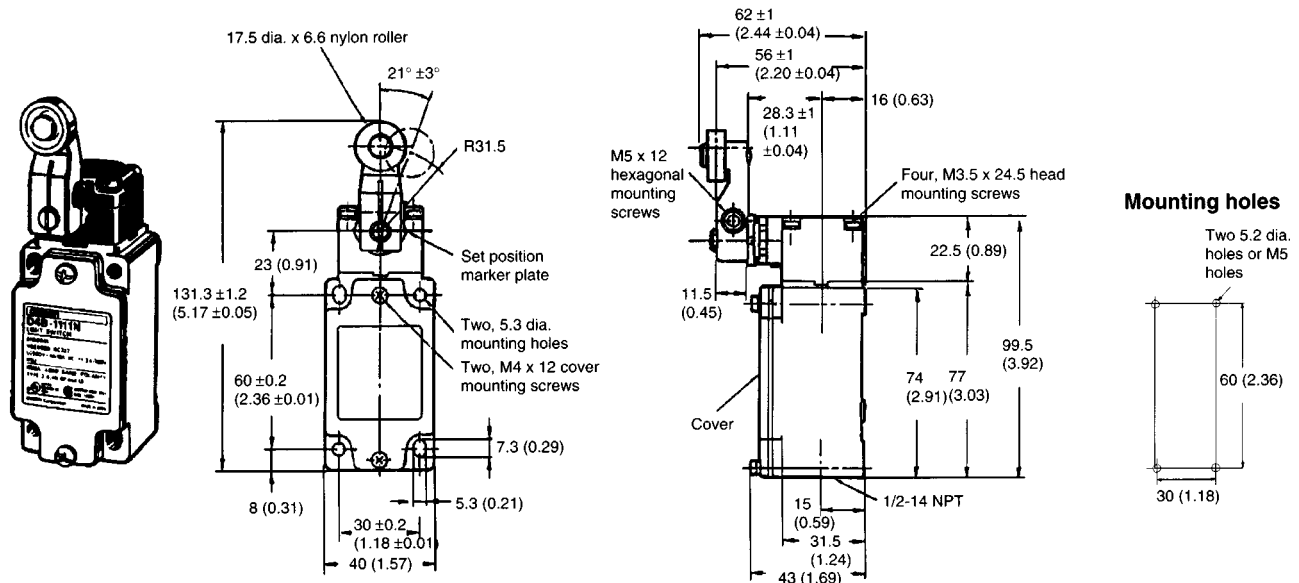
2. The stroke value in parentheses refers to the D4B-□□70N.

# Dimensions

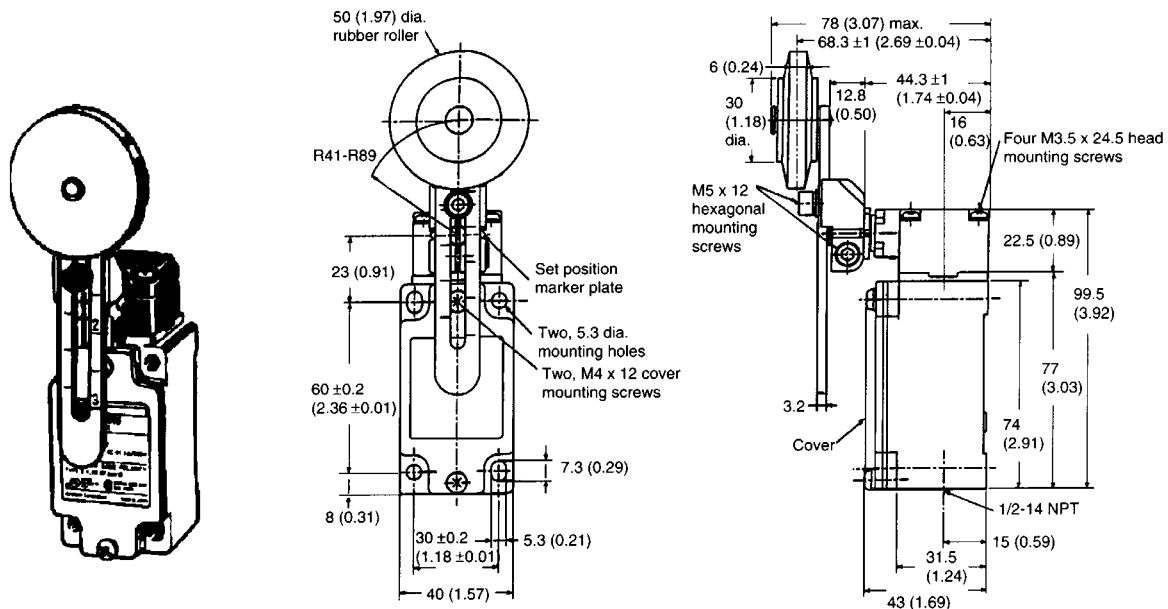
Unit: mm (inch)

## ■ STANDARD SWITCHES

### D4B-3111N, D4B-3511N, D4B-3A11N Roller Lever Switch, Nylon Roller

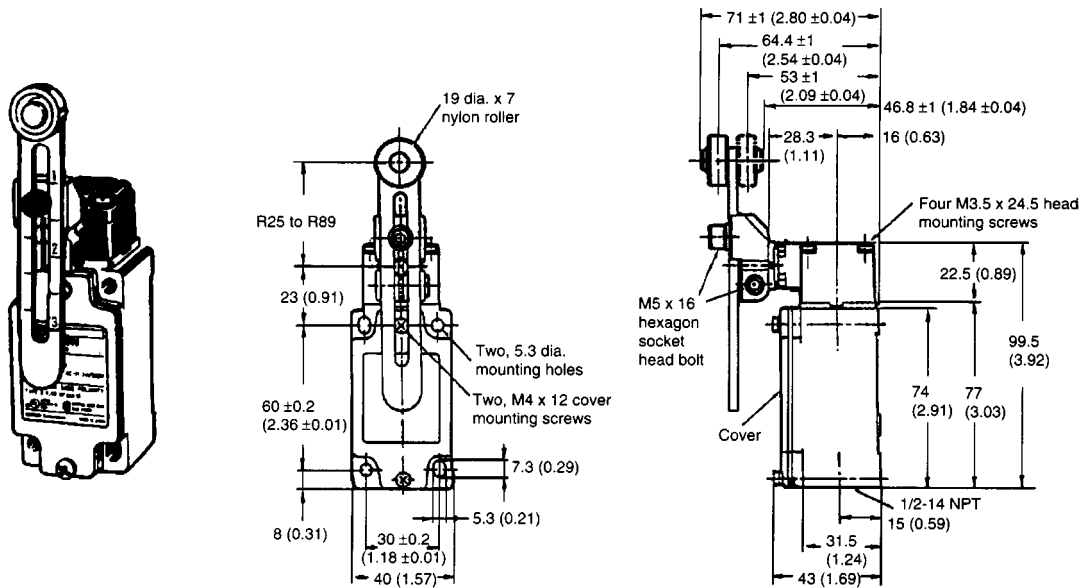


### D4B-3113N, D4B-3513N, D4B-3A13N Adjustable Roller Lever Switch, Rubber Roller

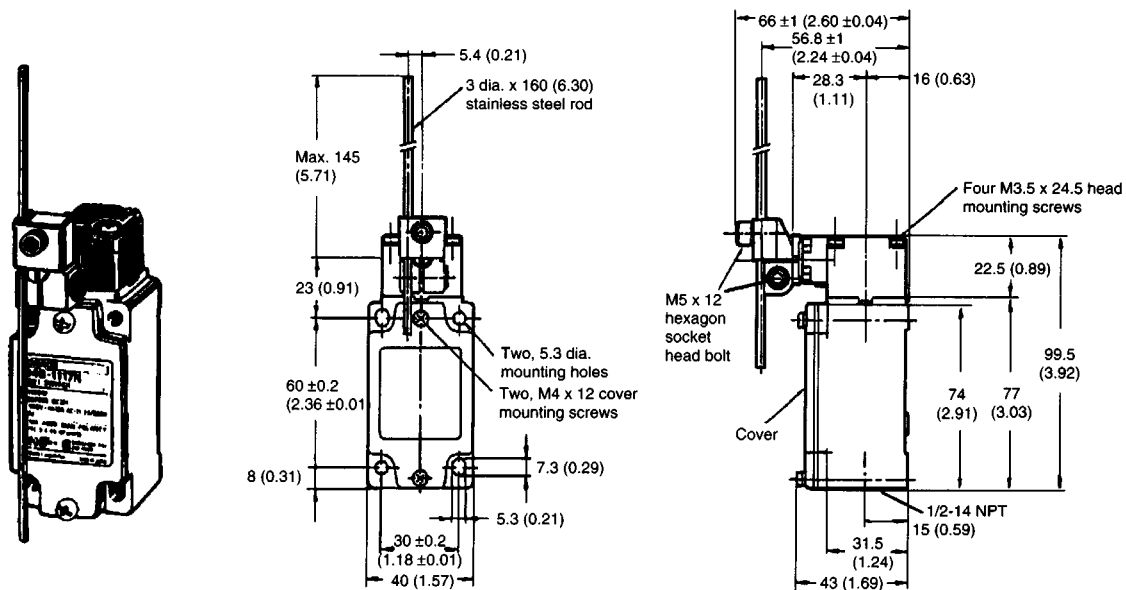




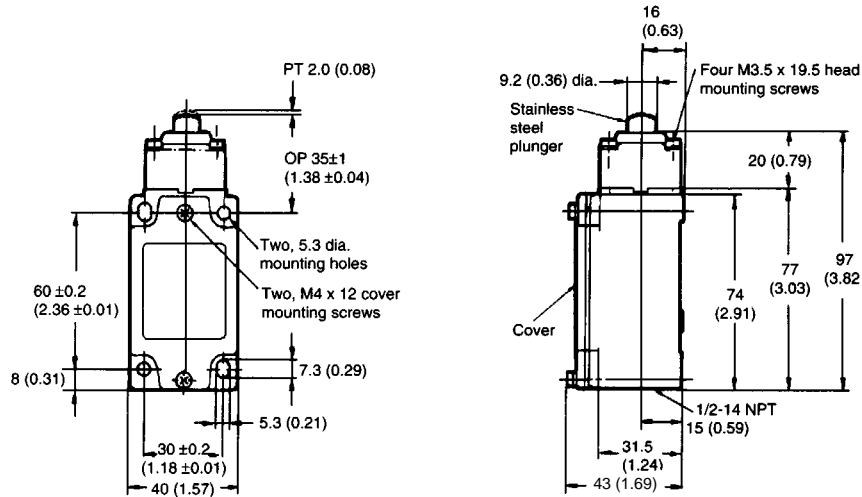
## D4B-3116N, D4B-3516N, D4B-3A16N Adjustable Roller Lever Switch, Nylon Roller



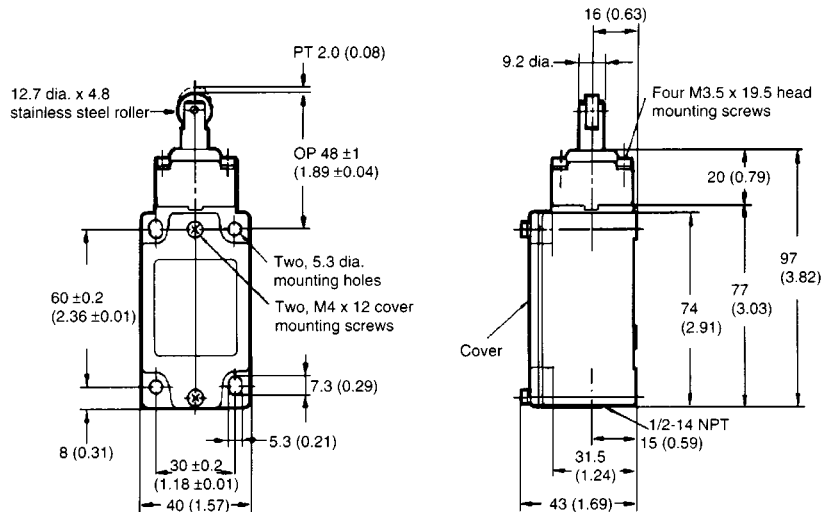
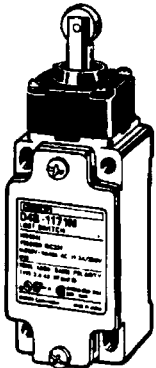
## D4B-3117N, D4B-3517N, D4B-3A17N Adjustable Rod Lever Switch



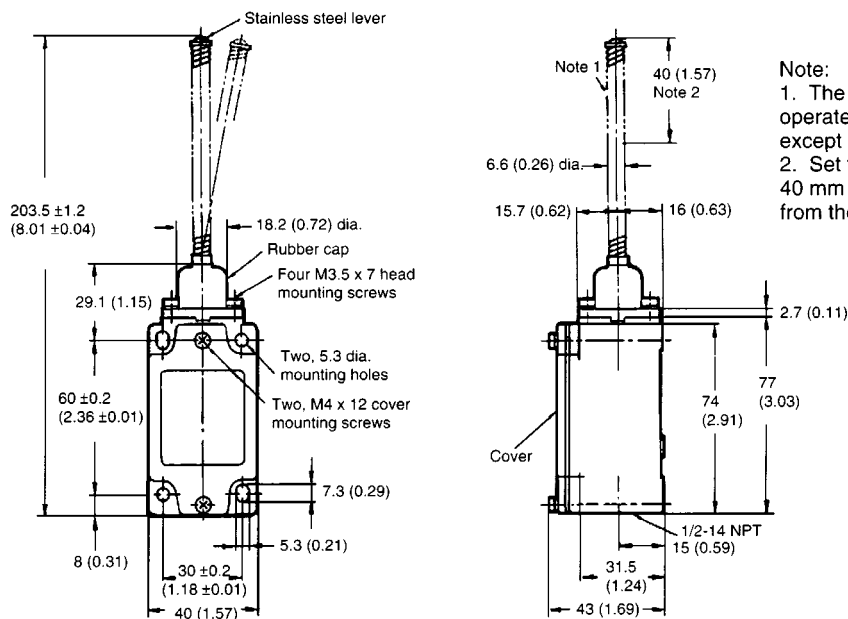
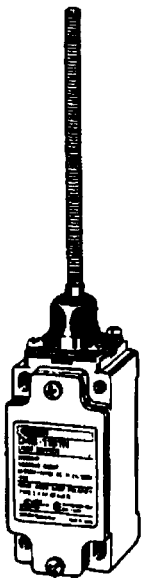
## D4B-3170N, D4B-3570N, D4B-3A70N Plain Top Plunger Switch



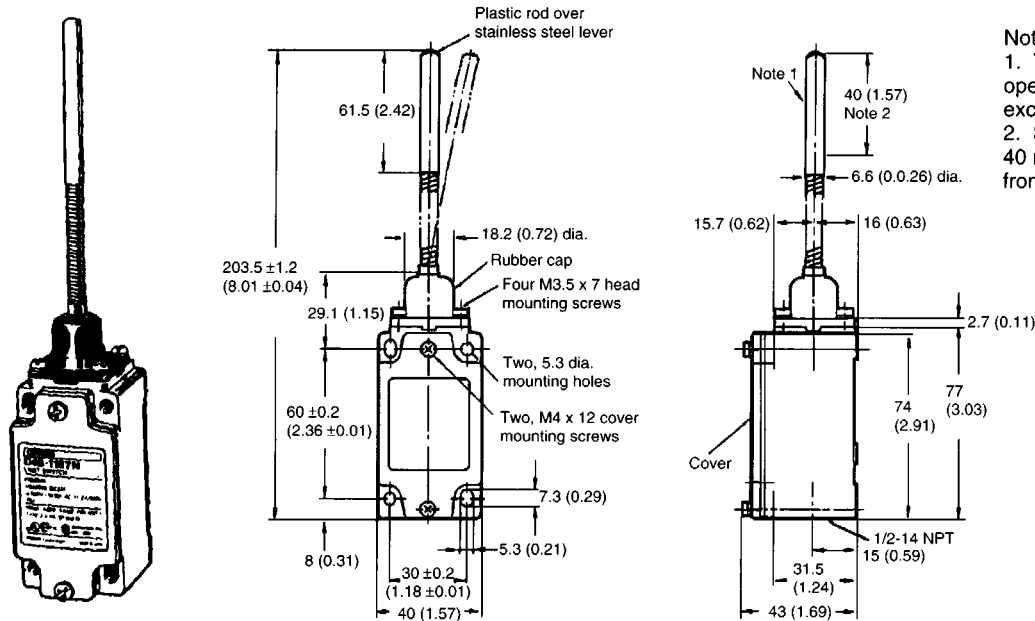
## D4B-3171N, D4B-3571N, D4B-3A71N Roller Top Plunger Switch



## D4B-3181N, D4B-3A81N Coil Spring Wobble Stick Switch

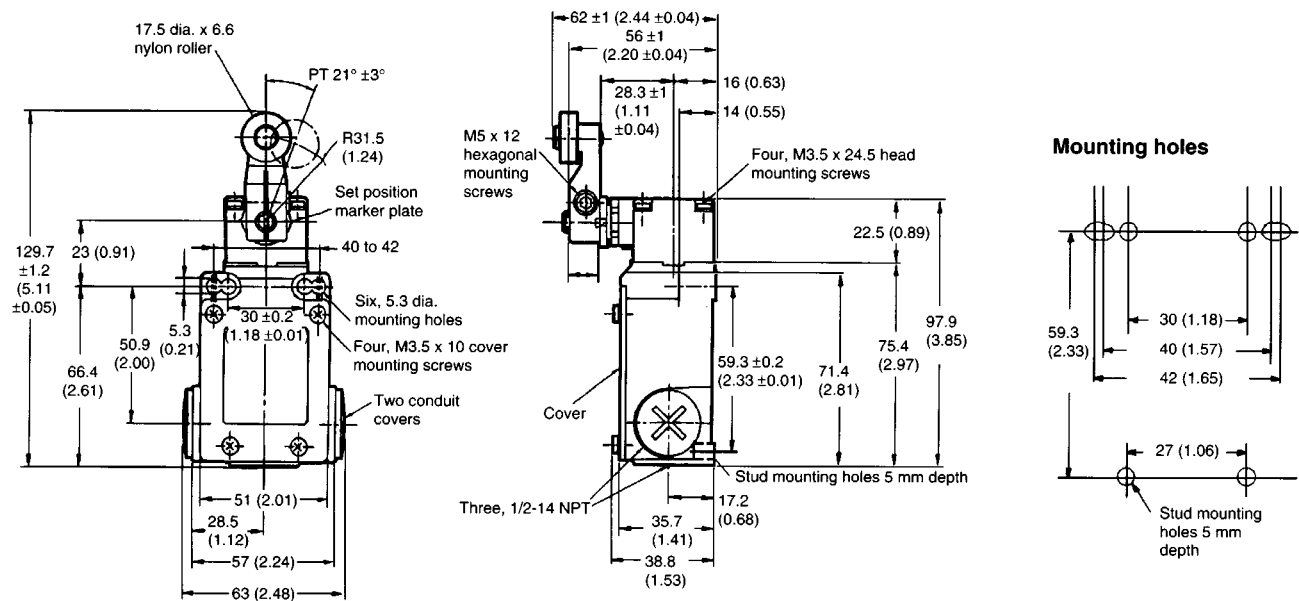


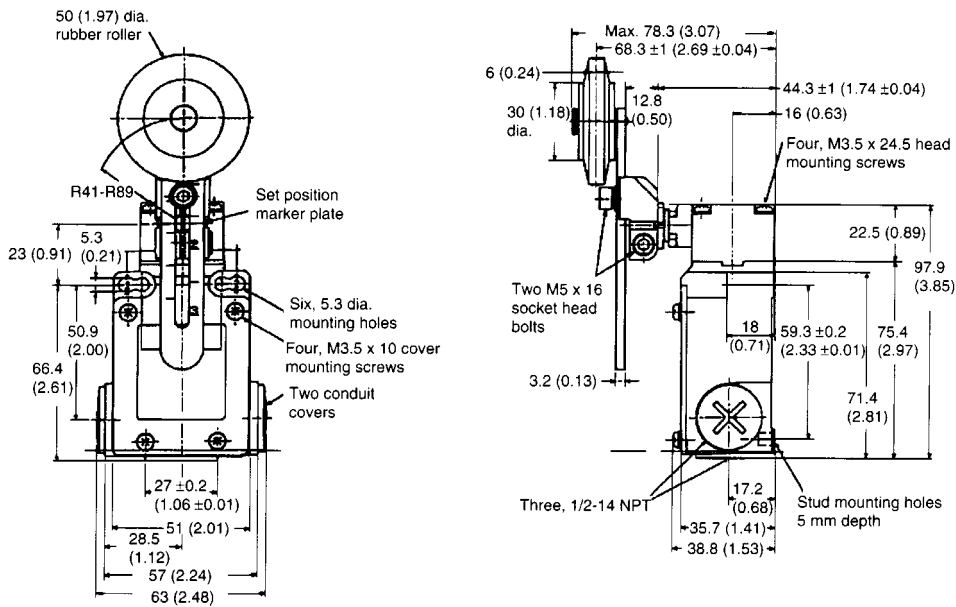
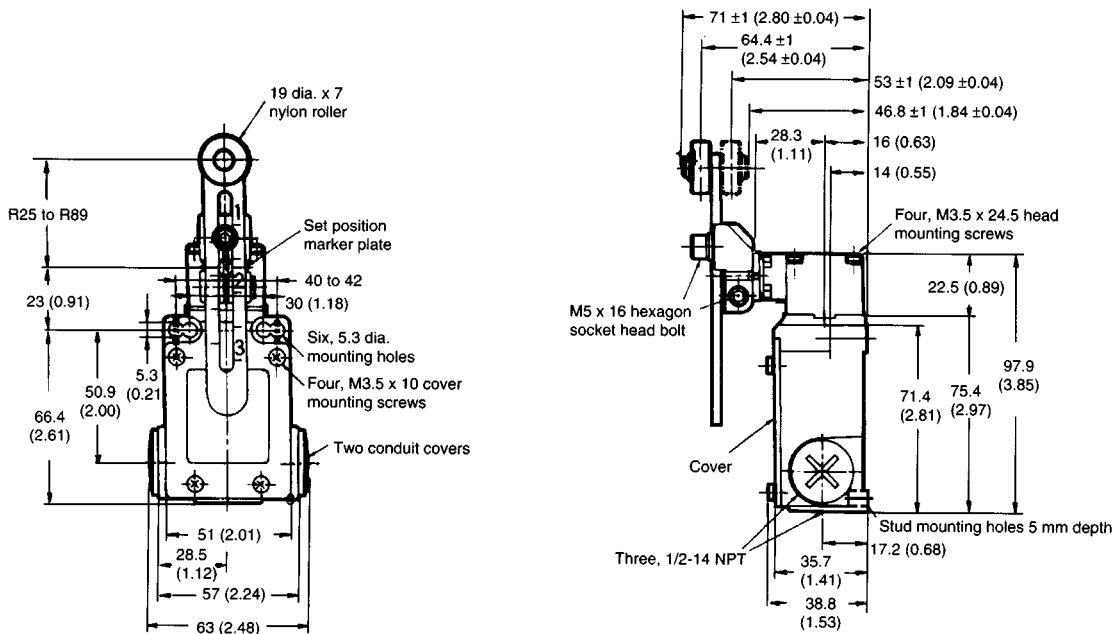
## D4B-3187N, D4B-3A87N Plastic Rod Wobble Stick Switch



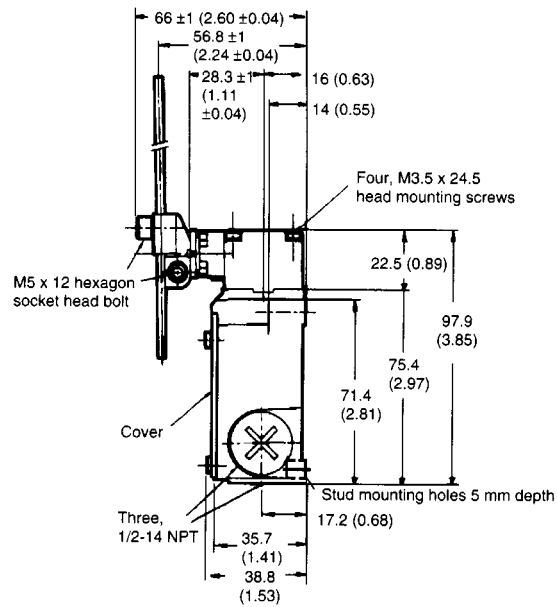
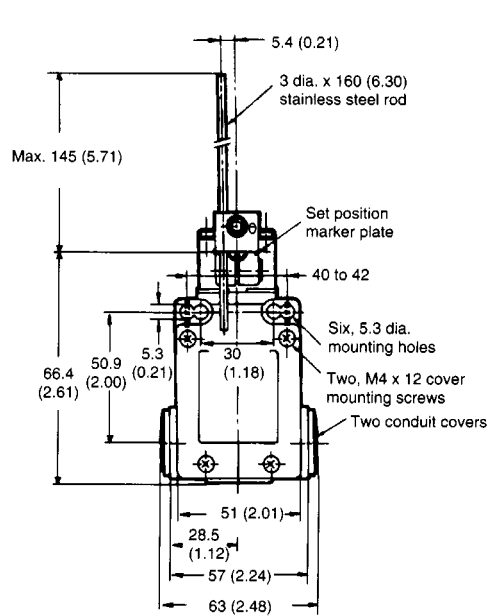
## ■ THREE-CONDUIT SWITCHES

## D4B-7111N, D4B-7511N, D4B-7A11N Roller Lever Switch, Nylon Roller

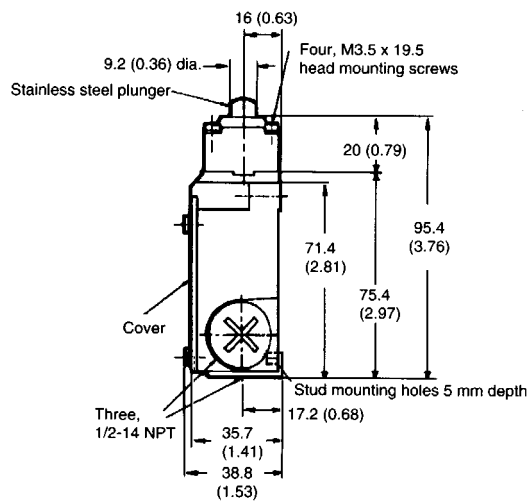
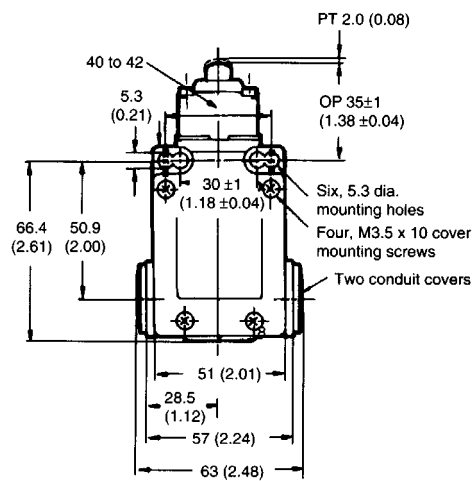


**D4B-7113N, D4B-7513N, D4B-7A13N Adjustable Roller Lever Switch, Rubber Roller**

**D4B-7116N, D4B-7516N, D4B-7A16N Adjustable Roller Lever Switch**


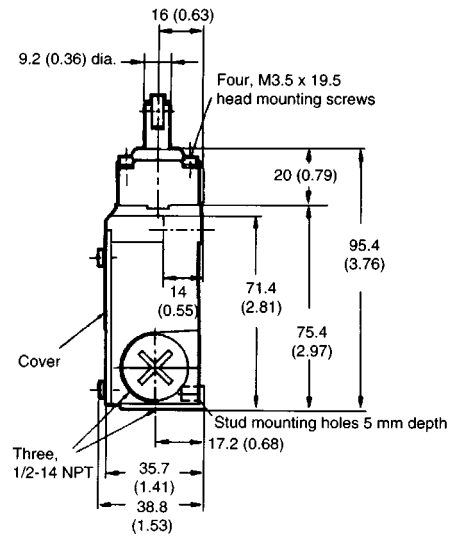
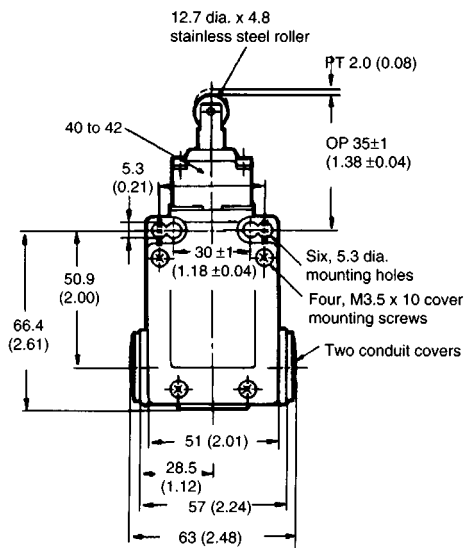
## D4B-7117N, D4B-7517N, D4B-7A17N Adjustable Rod Lever Switch



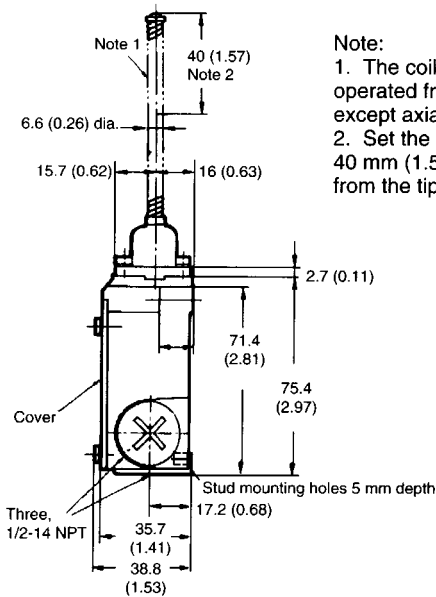
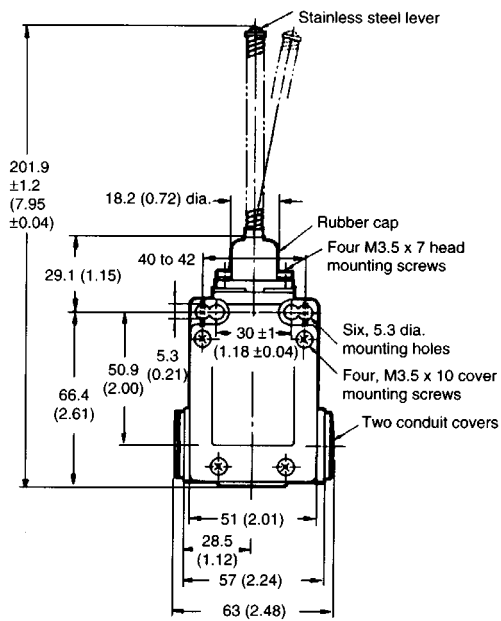
## D4B-7170N, D4B-7570N, D4B-7A70N Plain Top Plunger Switch



## D4B-7171N, D4B-7571N, D4B-7A71N Roller Top Plunger Switch

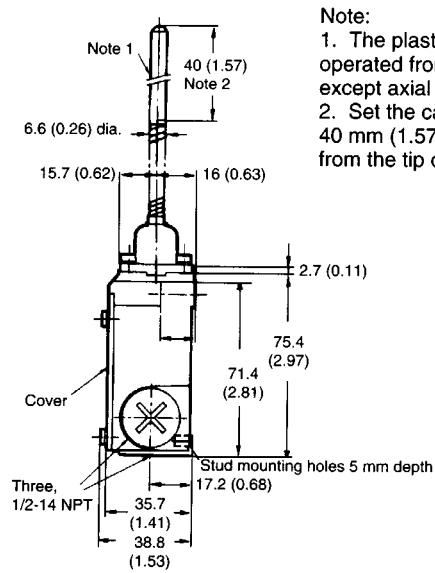
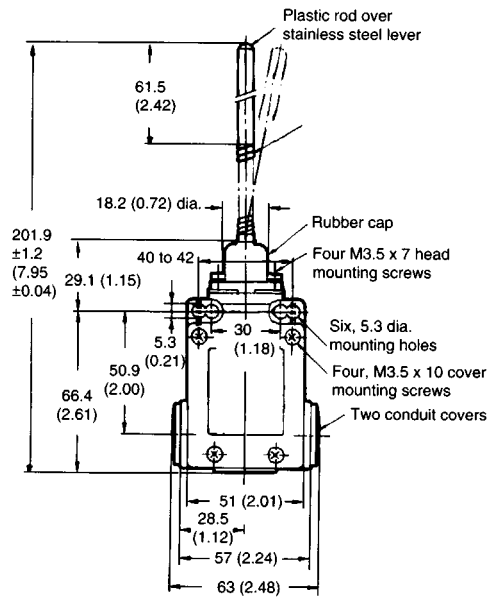


## D4B-7181N, D4B-7A81N Coil Spring Wobble Stick Switch



Note:  
 1. The coil spring may be operated from any direction except axial direction.  
 2. Set the cam or dog at 40 mm (1.57 in) measured from the tip of the plunger.

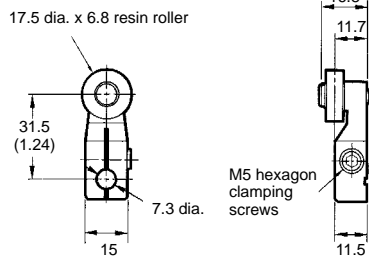
## D4B-7187N, D4B-7A87N Plastic Rod Wobble Stick Switch



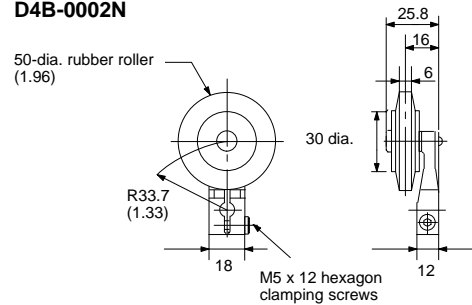
Note:  
 1. The plastic rod may be operated from any direction except axial direction.  
 2. Set the cam or dog at 40 mm (1.57 in) measured from the tip of the plunger.

## ■ ROLLER LEVERS

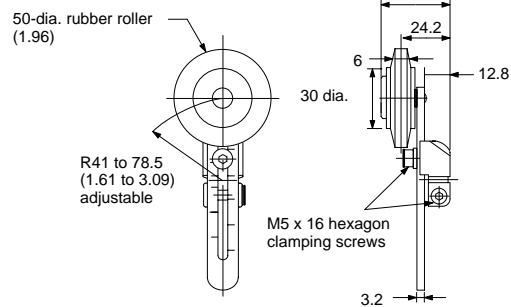
## D4B-0001N



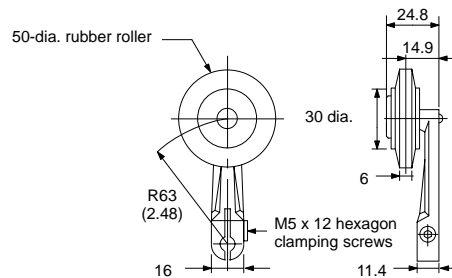
## D4B-0002N

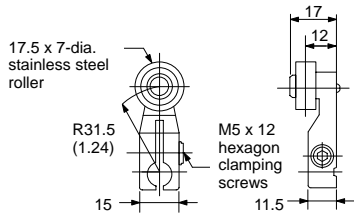
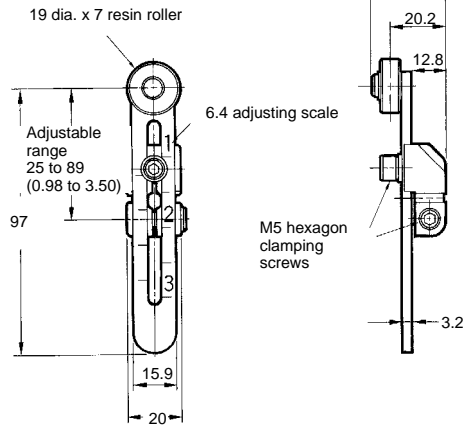
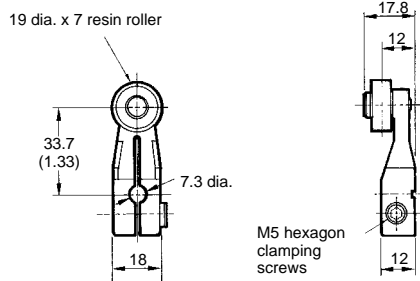
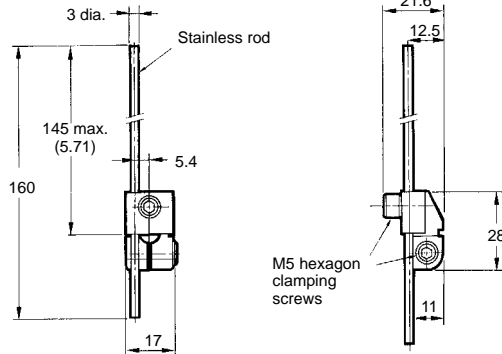


## D4B-0003N



## D4B-0004N



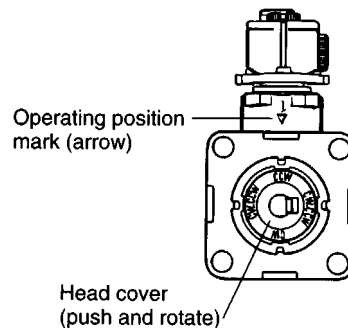
**D4B-0005N****D4B-0006N****D4B-0007N****D4B-0007N**

## Installation

### ■ OPERATION SELECTION

Side rotary models of D4B-N limit switches can be set for clockwise (CW), counterclockwise (CCW) or two-way (CW + CCW) operation to match the application. Use the following procedure:

1. Remove the head by loosening the four screws that secure the head to the switch body.
2. Turn over the head to set the desired operation (CW, CCW, or CW + CCW). The desired operation can be selected by setting the mode selector knob as shown in the figure. This knob is factory set for CW + CCW (two-way) operation.





## 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. Also, secure the D4B-□N with screws or equivalent parts 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 gl 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.

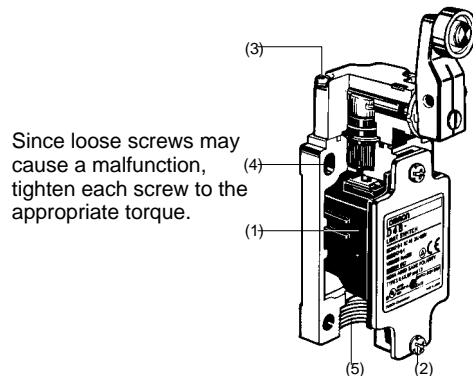
### ■ OPERATING ENVIRONMENT

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.

### ■ TIGHTENING TORQUE



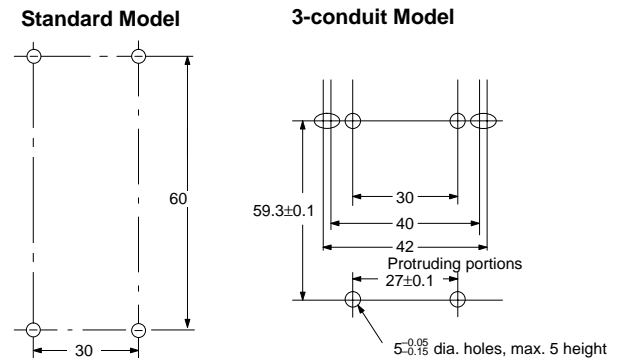
No.	Type	Proper tightening torque
1	Terminal screw	0.59 to 0.78 N • m {6 to 8 kgf • cm}
2	Cover-mounting screw	1.18 to 1.37 N • m {12 to 14 kgf • cm}
3	Head-mounting screw	0.78 to 0.98 N • m {8 to 10 kgf • cm}
4	Switch-mounting screw (M5)	4.90 to 5.88 N • m {50 to 60 kgf • cm}
5	Connector	1.77 to 2.16 N • m {18 to 22 kgf • cm}
6	Cap screw (for three-conduit models)	1.27 to 1.67 N • m {13 to 17 kgf • cm}

Note: Apply a tightening torque of 0.78 to 0.88 N • m {8 to 9 kgf • cm} to conduit models.

### ■ 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<sup>-0.05/-0.15</sup>-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 hexagon-head bolts on the side of the lever.

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

The back of the operation indicator plate has no protruding parts. The lever can be set at any angle by attaching the operation 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 operation indicator plate securely so that the lever will not slip.

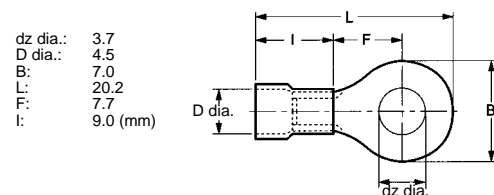
#### Changes in Head Mounting Position

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.

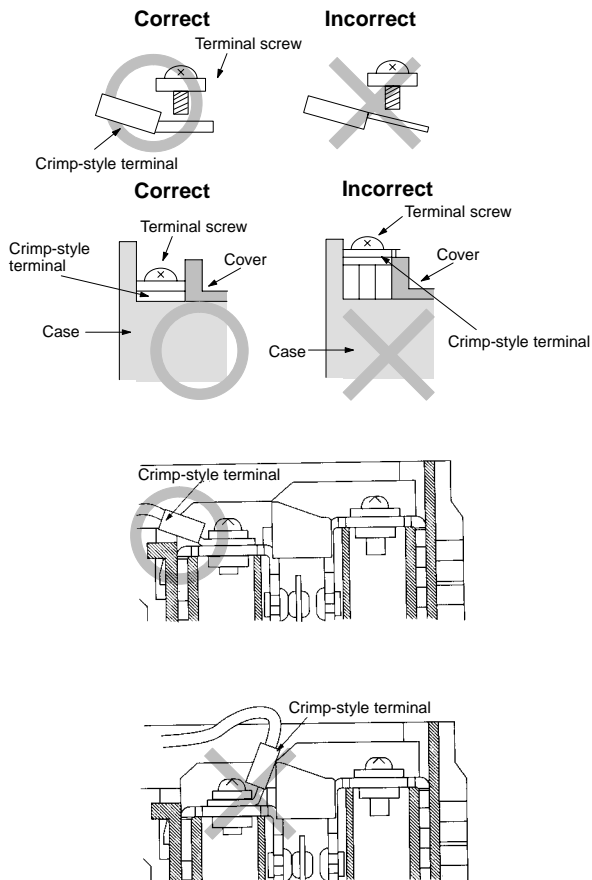
### ■ WIRING

Do not connect the bare lead wires directly to the terminals, but you must 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 mm<sup>2</sup>) 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

Tighten the connector 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.

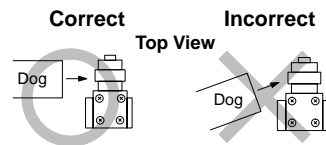
The Pg13.5 connector must be Nippon Flex's ABS-08Pg13.5 or ABS-12 Pg13.5.

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

When wiring the D4B-□N, correctly attach the conduit cap (provided) to the unused conduit opening and securely tighten the cap screw within the specified torque.

### Avoid Damage

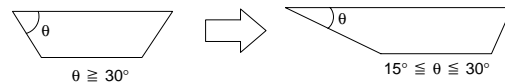
The load for the actuator (roller) of the Switch must be imposed on the actuator in the horizontal direction, or the actuator or the rotating axis may be deformed or damaged.



### When Using a Long-Lever Model

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 page NO TAG, 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.

## CORRECT SELECTION AND USAGE OF SWITCHES

### Snap-action Switch

A snap-action switch takes only a short time to switch electric current, which reduces contact arcing and prevents contacts from wear and tear. For this reason, a snap-action switch is more ideal than a slow-action switch for applications that require high repeat accuracy, high operation frequency, and slow operating speed.

### Slow-action Switch

The electric current switching time of a slow-action switch differs in proportion to the operating speed of the switch. A slow-action switch operates safely via direct drive positive contact opening, even after metal deposition between mating contacts and provides insulation capability after contact separation. Opposite polarity ensures high contact reliability, even when voltages and currents are small and allows switching of voltages of different potential by contacts blocks with several contacts. For example, it is possible to perform a control function with 220 VAC and signalling function with 60 VDC using only one device.

### Safety Switch

The NC contact section of the D4B-□N's built-in switch incorporates a shearing force contact separating mechanism. Based on the above mentioned switching features, the snap-action switch can be mainly applied to positioning control purposes and the slow-action switch can be mainly applied to safety, and protection purposes. Both slow- and snap-action switches conform to BS5304, IEC 204-1, and VDE 0113 safety standard.

NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.

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