SPATTER-GUARDED SWITCHES Model □LS□□

c UL us LISTED

- Effective countermeasures against the adhesion of spatter.
- UL/CSA/GB(CCC marking)-approved. (excluding some models)

ORDER GUIDE

Actuator		Operating characteristics			Basic catalog listing W2	Options			
Name	Shape	Max. O.F. (operating force)	Max. P.T. (pretravel)	Min. T.T. (total travel)		With LED lamp, 12 to 125 Vac/dc WC	With neon lamp, 100/200 Vac W	Double seal SW2	Double seal + LED SWC
Roller lever type		8.9 N	Standard type, 20˚	High overtravel 75˚	1LS61-JW2	1LS61-JWC	1LS61-JW	—	—
			High sensitivity type, 10˚	High overtravel 72˚	1LS71-JW2	1LS71-JWC	1LS71-JW	1LS71-JSW2	1LS71-JSWC
			High sensitivity type, 10˚	High overtravel 72˚ and lever with double nut	1LS74-JW2	1LS74-JWC	1LS74-JW	—	—
Boot seal roller plunger type		15.7 N	1.7 mm	7.3 mm	—	5LS7-JWC	5LS7-JW	—	5LS7-JSWC

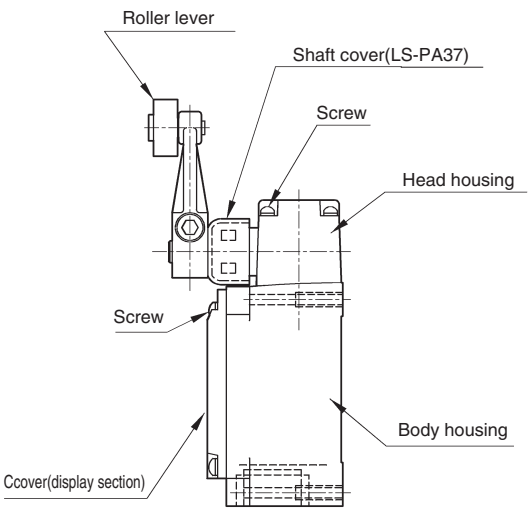
UL/CSA/GB(CCC marking) approved.

Quick Lock type

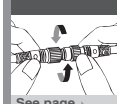
Actuator		Operating characteristics			catalog listing
Name	Shape	Max. O.F. (operating force)	Max. P.T. (pretravel)	Min. T.T. (total travel)	with LED lamp
Roller lever type		8.9N	Standard type, 20˚	High overtravel 80˚	1LS61-JWC-SD03
			High sensitivity type, 10˚		1LS71-JWC-SD03
Double-nut roller lever type			High sensitivity type, 10˚		1LS74-JWC-SD03
Boot seal roller plunger type		15.7N	1.7 mm	7.3mm	5LS7-JWC-SD03

Compatible with OMRON Smartclick connectors.
Smartclick Smartclick is a registered trademark of OMRON Corporation.

COUNTERMEASURES FOR PREVENTING ADHESION OF SPATTER



Location	Countermeasures
Cover	• Heat-resistant resin is used in the cover screen to scatter spatter. • Heat-resistant paint is used.
Head	• Spatter-resistant Teflon is used as the shaft coating material. • The gap between the housing and lever on the head has been eliminated.
Screw roller	• Spatter-resistant stainless steel is used on screws and roller, and slotted • Phillips head +- screws are used for easy removal of spatter.
Paint	• Paint is heat-resistant to 120˚C.

Connector with cable

See page F-001

PERFORMANCE

Catalog listing					
			1LS61-J□□, 1LS71-J□□, 1LS74-J□□, 5LS7-J□□		
Standards	**Compliance**		NECA C 4508/JIS C 8201-5-1		
	Certification		UL/CSA/GB140485, 2001		
Structure	**Contact form**		2-circuit double break		
	Terminal shape		M4 screw (switch terminal screw)		
	Contact type		Rivet		
	Protective structure		IP67 (IEC 60529, JIS C 0920)		
Electrical performance	**Electrical rating**		See Table 1.		
	Dielectric strength	**Between each terminal and non-live metal part**	1,000 Vac, 50/60 Hz for 1 minute		
		Between non-continuous terminals	2,000 Vac, 50/60 Hz for 1 minute		
	Insulation resistance		100 MΩ min. (by 500 Vdc megger)		
	Initial contact resistance		Silver: max. 50 mΩ(6 to 8 Vdc, thermal current 1A, voltage drop method) Gold-plated: max. 100 mΩ(6 to 8 Vdc, thermal current 0.1A, voltage drop method)		
	Recommended min. contact operating voltage/current		Silver: 24V 10 mA, 12V 20 mA Gold-plated: 5V 10 mA		
Mechanical performance	**Actuator strength**		Withstands load 5 times O.F. (operating direction for 1 minute)		
	Terminal strength		Withstand tightening torque of 1.5 N·m for 1 minute		
	Impact resistance		Contact opening for 1 ms max. at 300 m/s^2 in free position and total travel positions		
	Vibration resistance		1.5 mm peak-to-peak amplitude, frequency 10 to 55 Hz, for 2 continuous hours, contact opening for 1 ms max. in free position and total travel positions		
	Allowable operating speed		**1LS** type: 1.7 mm/s to 0.5 m/s **5LS7-J□□**: 0.2 mm/s to 0.5 m/s		
	Operating frequency		Max. 120 operations/minute		
Life	**Mechanical**		Min. 10 million operations		
	Electrical	**Model**	Standard load internal switch	Standard load double seal internal switch	
		Life (at rated load)	Min. 500,000 operations	Min. 200,000 operations	
			Above conditions must be satisfied at 20 operations/minute.		
Ambient operating conditions	**Temperature**		Standard type: –10 to +70˚C(freezing not allowed) Double seal type: -5 to +70˚C		
	Humidity		Max. 98% RH		
Recommende tightening torque	**Body**		5 to 6 N·m (M5 hexagon socket head bolt)		
	Cover		1.3 to 1.7 N·m (M4 screw)		
	Head		0.8 to 1.2 N·m (M3.5 screw)		
	Lever		4 to 5.2 N·m (M5 hexagon socket head bolt)		
	Terminal		1.0 to 1.4 N·m (M4 binding head machine screw)		

● Table 1. Electrical rating

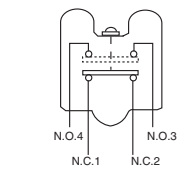
Type of indicator lamp	None		100/200 Vac neon lamp		12 to 125 Vac/dc LED lamp	
Switch type	Catalog listing	Electrical rating	Catalog listing	Electrical rating	Catalog listing	Electrical rating
Standard	1LS61-JW2	125, 250, 480 Vac 10A 125 Vac 1/2HP 250 Vac 1HP 125 Vdc 0.8A 250 Vdc 0.4A	1LS61-JW 5LS7-JW	125, 250 Vac 5A	1LS61-JWC 5LS7-JWC	125 Vac 5A 125 Vdc 0.8A
Standard, with double seal	—	—	—	—	5LS7-JSWC	125 Vac 5A 125 Vdc 0.8A
High sensitivity	1LS7□-JW2	125, 250, 480 Vac 10A 125 Vac 1/8HP 250 Vac 1/4HP 125 Vdc 0.4A 250 Vdc 0.2A	1LS7□-JW	125, 250 Vac 5A	1LS7□-JWC	125 Vac 5A
High sensitivity with double seal	1LS71-JSW2	125, 250 480 Vac 5A 125 Vac 1/8HP 250 Vac 1/4HP	—	—	1LS71-JSWC	125 Vac 5A

● UL electrical ratings

		Electrical rating	Load	No. of cycles
1LS1-J No indicator lamp	Ag	A300	Pilot Duty	6,000
		3 A, DC 30 V	DC General	6,000
		0.4 A, DC 125 V	DC General	6,000
	Au	0.1 A, AC 125 V	AC General	6,000
		0.1 A, DC 30 V	DC General	6,000
1LS1-JEC With a neon lamp	Ag	A300	Pilot Duty	6,000
	Au	0.1 A, AC 125 V	AC General	6,000
1LS1-JEC With an LED	Ag	B150	Pilot Duty	6,000
		3 A, DC 30 V	DC General	6,000
		0.4 A, DC 125 V	DC General	6,000
	Au	0.1 A, AC 125 V	AC General	6,000
		0.1 A, DC 30 V	DC General	6,000

Enclosure: Type 1
Maximum allowable ambient temperature: 40 °C

● Circuit diagram

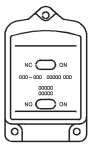
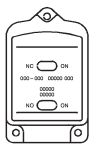
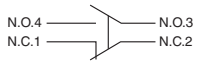
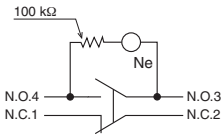
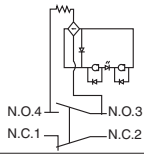


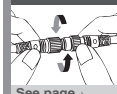
EN60947-5-1

● Electrical rating of products conforming to GB standards

	Application category	Rating			Rated operational current (Ith)
		Without indicator	With LED lamp	With neon lamp	
Standard load type	AC-15	3.0A-240V AC	3.0A-125V AC	3.0A-240V AC	10A
	DC-12	0.4A-30V DC	0.4A-30V DC	–	10A

INDICATOR LAMPS

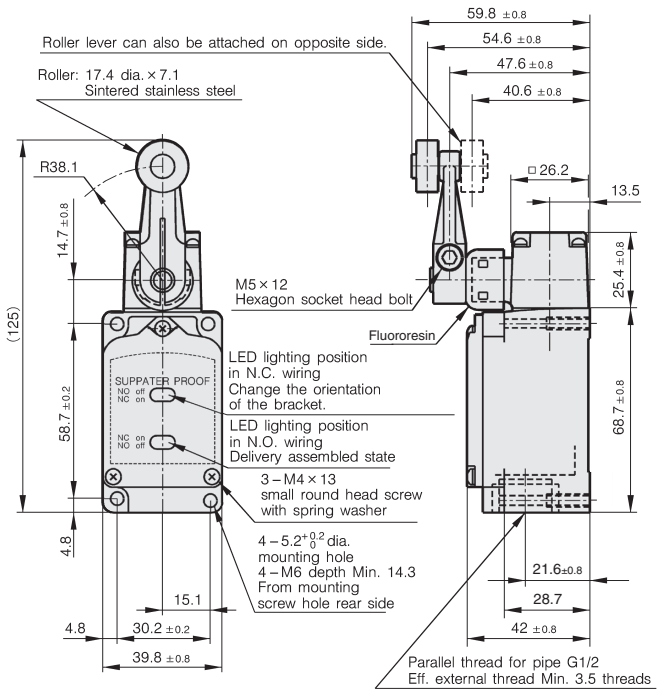
Option	Without indicator lamp	With 100/200 Vac neon lamp	With 12 to 125V AC-DC LED lamp
Catalog listing	□LS□□-JW2	□LS□□-JW	□LS□□-JWC
Lamp cover front side	—		
Circuit diagrams			
Notes	—	To ensure lighting of the neon lamp, use at a minimum of 75 Vac.	The power for the indicator lamp (red LED) is 12 to 125V. The indicator lamp operates on either AC or DC power.
Lamp cover catalog listing (replacement part)		LS-9PAW	LS-9PAWC
Specifications — Operating voltage		100 to 200 Vac	12 to 125V, AC/DC
		100 Vac / 200 Vac	12V to 125V
Thermal current		Approx. 0.5 mA / Approx. 1.5 mA	0.6 mA max
Resistance		100 kΩ	33 kΩ

Connector with cable

See page F-001

APPEARANCE, OPERATING CHARACTERISTICS AND EXTERNAL DIMENSIONS (unit: mm)

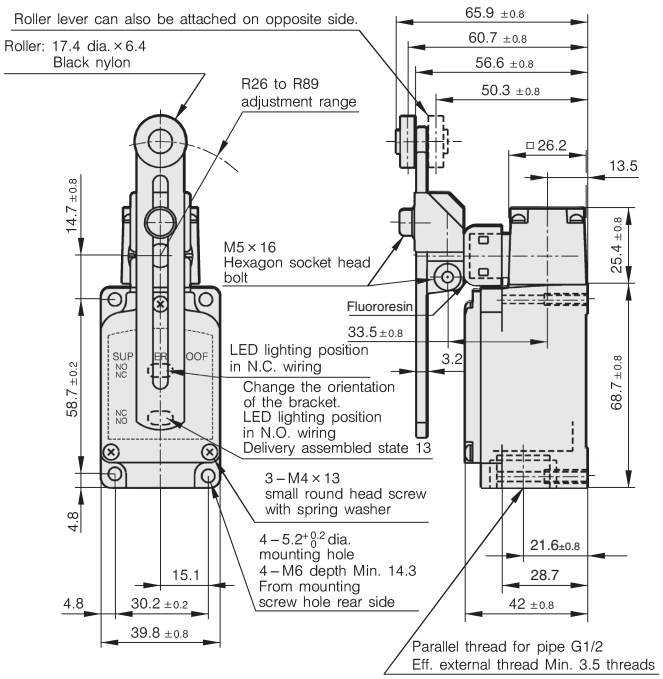
Roller lever type

Standard roller lever type



*Dimensional tolerance is ±0.4 unless otherwise specified.

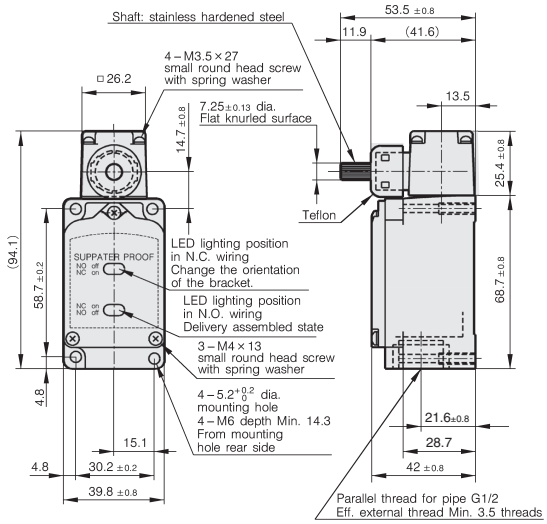
Adjustable roller lever type



*Dimensional tolerance is ±0.4 unless otherwise specified.

Side rotary type (without lever)

(unit: mm)



*Dimensional tolerance is ±0.4 unless otherwise specified.

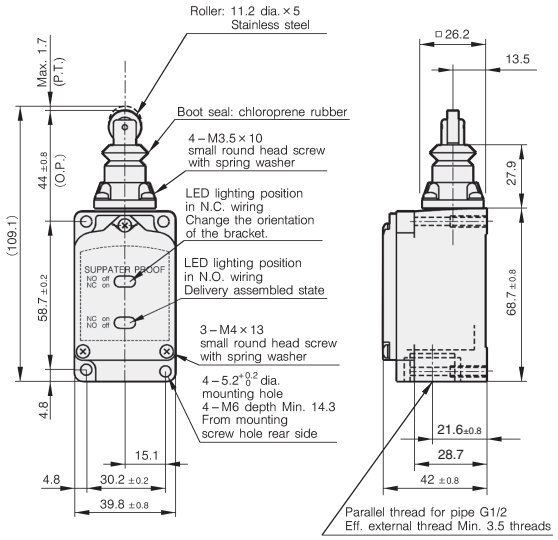
Item		Side rotary type	
		High overtravel standard type	High overtravel high sensitivity type
Catalog listing	No indicator lamp	1LS6□-JW2	1LS7□-JW2
	100/200 Vac With neon lamps	1LS6□-JW	1LS7□-JW
	12 to 125 Vac/dc With LED lamp	1LS6□-JWC	1LS7□-JWC
UL/CSA/GB		○	
O.F.	(Max. N)	8.9	
R.F.	(Min. N)	0.98	
P.T.	(Max. ˚)	20	10^{+2}_{-1}
O.T.	(Min. ˚)	55	62
M.D.	(Max. ˚)	12	5

Note: The above values for side rotary switches are for a lever length of 38.1 mm.

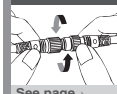
Boot seal roller plunger type

(unit: mm)

Catalog listing		
	No indicator lamp	5LS7-JW2
	100/200 Vac With neon lamps	5LS7-JW
	12 to 125 Vac/dc With LED lamp	5LS7-JWC
UL/CSA/GB		○
O.F.	(Max. N)	15.7
R.F.	(Min. N)	4.4
P.T.	(Max. mm)	1.7
O.T.	(Min. mm)	5.6
M.D.	(Max. mm)	0.51
R.T.	(Min. mm)	0.38



*Dimensional tolerance is ±0.4 unless otherwise specified.

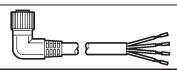


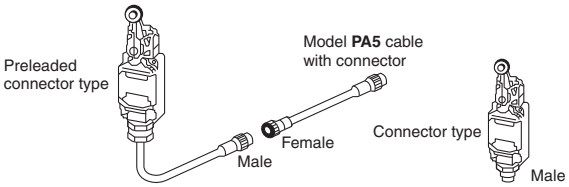
See page F-001

CONNECTOR WITH CABLE

Be sure to use a Model **PA5** connector with cable when connecting a preleaded connector or connector-type switch.

● Model PA5 connector with cable

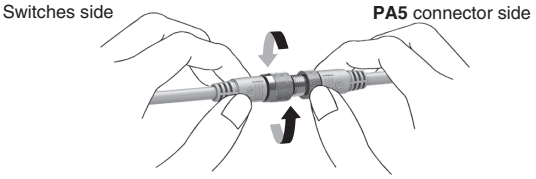
Shape	Power supply	Cord properties	Cord length	Catalog listing	Lead colors
	DC	Vinyl-insulated cord with high resistance to oil and vibration (UL/NFPA79 CM, CL3)	2 m	**PA5-4ISX2SK**	1: brown, 2: white, 3: blue, 4: black
			5 m	**PA5-4ISX5SK**	1: brown, 2: white, 3: blue, 4: black
	AC		2 m	**PA5-4JSX2SK**	1: brown, 2: white, 3: blue, 4: black
			5 m	**PA5-4JSX5SK**	1: brown, 2: white, 3: blue, 4: black



For AC		For DC	
Switch side (male)	Connector side (female)	Switch side (male)	Connector side (female)
			

● Tightening the connector

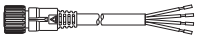
Align the grooves and rotate the fastening nut on the **PA5** connector by hand until it fits tightly with the connector on the switches side.

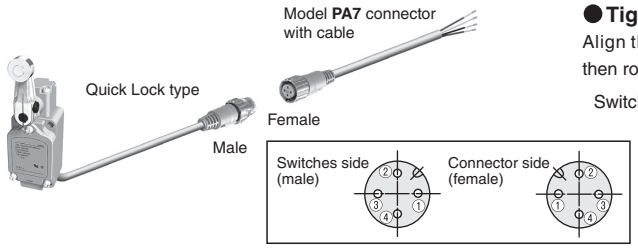


Note: The shape of the connector plugs and sockets is different for AC and DC cables, which are not mutually compatible.

Be sure to use a Model **PA7** connector with cable when connecting Quick Lock type switch.

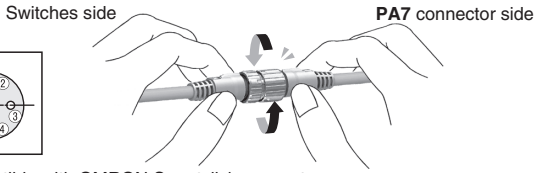
● Model PA7 connector with cable

Shape	Power supply	Cord properties	Cord length	Catalog listing	Lead colors
	DC	Vinyl-insulated cord with high resistance to oil and vibration (UL/NFPA79 CM)	2 m	**PA7-4ISX2SK**	1: brown, 2: white, 3: blue, 4: black
			5 m	**PA7-4ISX5SK**	1: brown, 2: white, 3: blue, 4: black



● Tightening the connector

Align the triangle mark and mate the male and female connector then rotate 45 degree to match the keys on the rings by hand.



Compatible with OMRON Smartclick connectors.
Smartclick Smartclick is a registered trademark of OMRON Corporation.

CONNECTOR SPECIFICATIONS*1

Item		Preleaded connector type	Quick Lock connector type
Operating voltage/current		For AC: min. 5V 5 mA, max. 250V 3A For DC: min. 5V 5 mA, max. 125V 3A	
Insulation resistance		Max. 100 MΩ(by 500 Vdc megger)	Max. 50 MΩ(by 500 Vdc megger)
Dielectric strength		1,500 Vac for 1 minute (between contacts, and between contact and connector housing)	
Initial contact resistance		Max. 40 mΩ(with 3A current to connected male and female connectors. Semiconductor lead-specific resistance not included.)	
Mating/unmating force		0.4 to 4.0 N per contact	
Mating cycles		50	
Connector nut tightening torque		Min. 0.8 N·m*1	
Cable pullout strength		Min. 100 N	
Vibration resistance		10 to 55 Hz, 1.5 mm peak-to-peak amplitude, for 2 hours each in X, Y and Z directions	
Impact resistance		300 m/s^2, 3 times each in X, Y and Z directions	980 m/s^2, 10 times each in X, Y and Z directions
Protective structure		IP67	
Ambient operating temperature		–10 to +70˚C	
Ambient storage temperature		–20 to +80˚C	
Ambient operating humidity		Max. 95% RH	
Material	**Contacts**	Gold-plated brass	
	Contact holder	Glass-lined polyester resin	
	Housing	Polyester elastomer	
	Coupling	Brass (DC type: Ni-plated. AC type: orange-colored)	
	O-ring	NBR	

*1. The recommended tightening torque is 0.4 to 0.6 N·m. If the connector is not tightened firmly, IP67 protection may be lost, or the connector may come loose. Tighten firmly by hand.

PRECAUTIONS FOR USE

1. Connecting switches that have indicator lamps

1.1 Series connection

Up to six switches can be connected in series when the power is 100V. The brightness of the LED lamp is fixed regardless of the power, since light is generated by a built-in fixed-current diode.

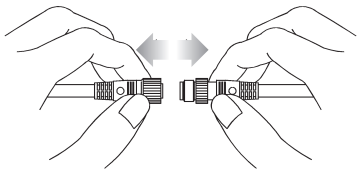
1.2 PC connection possible

The leakage current when the limit switch is not operating is a maximum of 0.6 mA. The PC will not malfunction due to dim lighting of the LED. Moreover, a fixed-current diode is built in to ensure a fixed LED brightness regardless of the power voltage.

2. Handling of connector and preleaded connector switches

2.1 Tightening the fixing cap ring and outside screw lock ring

If the screw of the mating part is made of resin, the threads can easily be damaged when the connector is first tightened. When assembling the connector, align the center of the cores, push in as far as possible, and then turn to tighten.
Be sure to tighten fully by hand. The recommended tightening torque is 0.4 to 0.6 N·m. Use of a tightening tool may damage the connector. If the connector is not tightened firmly, IP67 protection may be lost, or the connector may come loose.

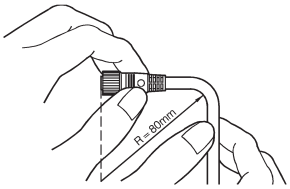


2.2 Inserting and removing connectors

Before inserting or removing connectors, be sure to the turn the power OFF. When removing, hold the connector itself–do not pull by the cable.

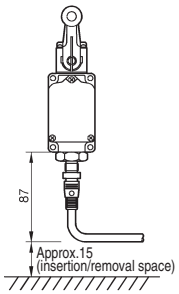
2.3 Cautions when bending cables

The minimum bend radius (R) of the cable is 80 mm.
Allow sufficient cable for bends.



2.4 Installation of connector type switches

(unit: mm)



2.5 Cautions when replacing connectors

When removing connectors to replace the switch or cable, wipe the connector and the surrounding area thoroughly to remove any water. After removing the connector, do not allow it to be immersed in chemicals or powder, or to be dropped. If the connector is immersed in a fluid, allow it to fully dry before connecting again. If the connector is dropped in powder, wipe it off completely before connecting again. Failure to observe these precautions may result in a short circuit or a failed connection.

3. Other

3.1 Protective structure

- IP67 protection does not assure complete waterproofing. Switch should not be in constant contact with water.
- Avoid use where external force is applied at all times on the connecting section of the connector.
- Do not use the body as a step or place heavy objects on top of it.

3.2 Ensuring a good seal

- When general-purpose limit switches are used in locations subject to splashing by water, oil, dirt and dust, or chips, water or oil sometimes enters the switch from the conduit due to capillary action. For this reason, be sure to use a sealed connector compatible with the cable.
- When the screws in the head or covers are loosened to change the operating direction of the switch, or the relationship between switch operation and the indicator lamp (lamp ON during switch standby / during switch operation), tighten the screws to the recommended tightening torque to ensure a good seal.

Recommended tightening torque
Cover: 1.3 to 1.7 N·m (M4 screw)
Head: 0.8 to 1.2 N·m (M3.5 screw)

3.3 Attaching switches

- Tighten each of the parts on the limit switch according to the appropriate tightening torques listed in the performance tables. Overtightening damages screws and other parts. On the other hand, insufficient tightening of screws lowers the effectiveness of the seal and reduces various performance characteristics.
- Do not leave or use covers and conduit parts open. Water, dirt, or dust may enter, which causing malfunction.
- Prevent impact to the lever body and head. Failure to do so might deform the actuator or cause defective switch return.
- Do not use silicone rubber electrical lead insulation, silicone adhesive or grease containing silicone. Doing so might result in defective electrical conductivity.

3.4 Wiring

- Do not perform wiring with the power ON. Doing so might cause electric shock, or the machine may start unexpectedly, causing an accident.
- Use crimp-type terminal lugs with covered insulation for electrical leads to prevent contact with covers and housings. If a crimp-type terminal lug contacts a cover, the cover may no longer shut or a ground fault may occur.
- Use sealed connectors (**PA1** Series, etc. sold separately) or flexible tubing (**PA3** Series) with IP67 or equivalent seal for conduits.
- Firmly tighten covers and conduits. If covers and conduits are not sufficiently tightened, the seal will be impaired and switch performance will no longer be assured.

3.5 Adjusting switches

- Do not apply excessive force (5 times O.F.) to the actuator beyond the total travel position. Doing so might damage the switch.
- Keep overtravel between 1/3 to 2/3 of the rated value. Small overtravel might cause the contacts to rattle due to vibration and impact, or may result in defective contact.

4. Environment

- Do not use the product in an environment where the cover may directly come into contact with any strong volatile solvent.
- Do not use the switch in an environment where strong acid or alkali is directly splashed onto it.

Connector with cable

See page F-001

6. Other cautions

- Do not apply a lubricant to the sliding part of the actuator or any other component. Application of an inappropriate lubricant may degrade sliding performance or impair the protective structure.
- Remove any foreign substances adhering to the sliding part. Dust or any other foreign substance attached to the sliding part may cause a malfunction.
- Check the actual load.
  To increase reliability, confirm that the switch has no problems in actual use before using the switch.

Before use, thoroughly read the “Precautions for use” and “Precautions for handling” in the Technical Guide on pages **D-101** to **D-112** as well as the instruction manual and product specification for this switch.

Please read “Terms and Conditions” from the following URL before ordering and use.

https://www.azbil.com/products/factory/order.html

Azbil Corporation
Advanced Automation Company

Yamatake Corporation changed its name to Azbil Corporation on April 1, 2012.

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