

# SPATTER-GUARDED SWITCHES



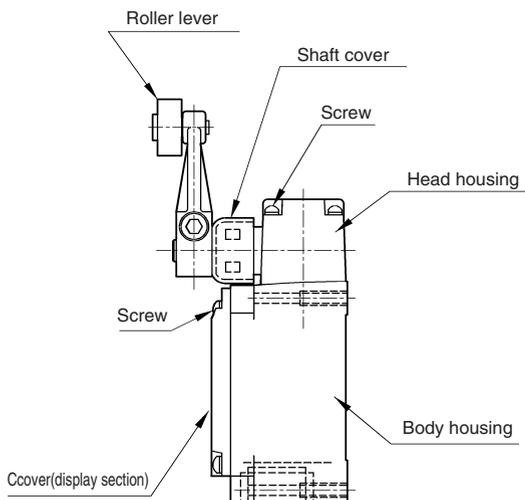
- Effective countermeasures against the adhesion of spatter.
- UL/CSA/CCC-approved.



## 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 125Vac/dc WC	With neon lamp, 100/200Vac W	Double seal SW2	Double seal + LED SWC
Roller lever type		8.9N	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		15.7N	1.7mm	7.3mm	—	5LS7-JWC	5LS7-JW	—	5LS7-JSWC

## COUNTERMEASURES FOR PREVENTING ADHESION OF SPATTER



Location	Countermeasures
Cover	<ul style="list-style-type: none"> <li>• Heat-resistant resin is used in the cover screen to scatter spatter.</li> <li>• Heat-resistant paint is used.</li> </ul>
Head	<ul style="list-style-type: none"> <li>• Spatter-resistant Teflon is used as the shaft coating material.</li> <li>• The gap between the housing and lever on the head has been eliminated.</li> </ul>
Screw roller	<ul style="list-style-type: none"> <li>• Spatter-resistant stainless steel is used on screws and roller, and slotted</li> <li>• Phillips head +- screws are used for easy removal of spatter.</li> </ul>
Paint	<ul style="list-style-type: none"> <li>• Paint is heat-resistant to 120°C.</li> </ul>

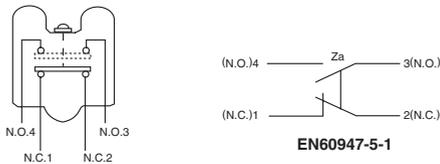
## PERFORMANCE

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

● Table 1. Electrical rating

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

● Circuit diagram

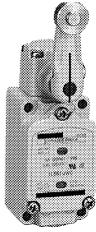
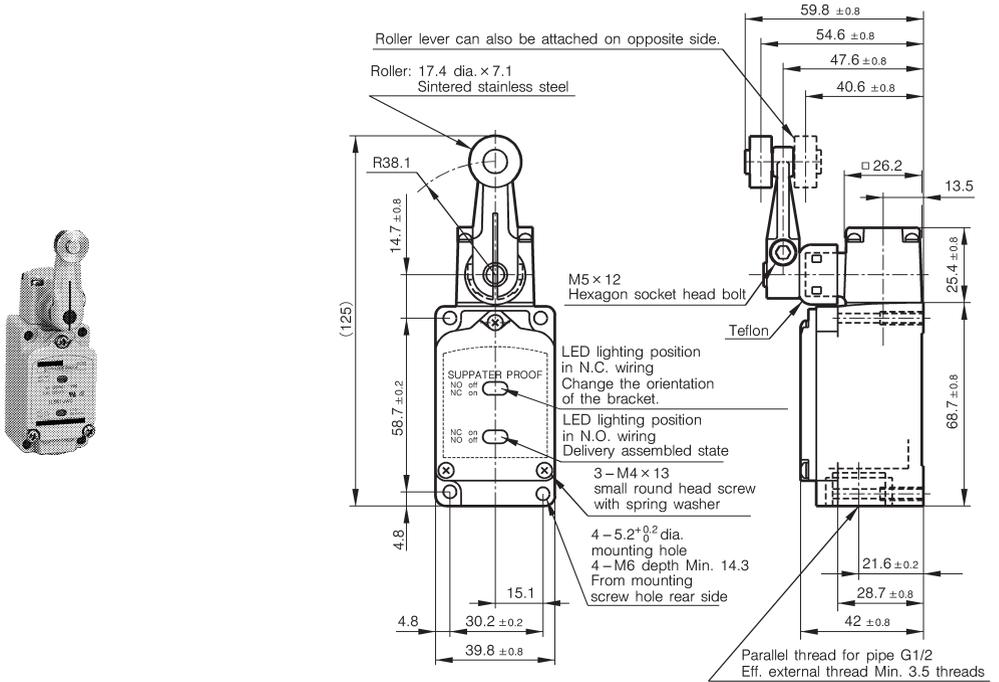


INDICATOR LAMPS

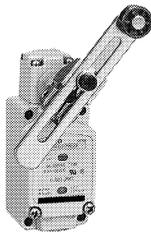
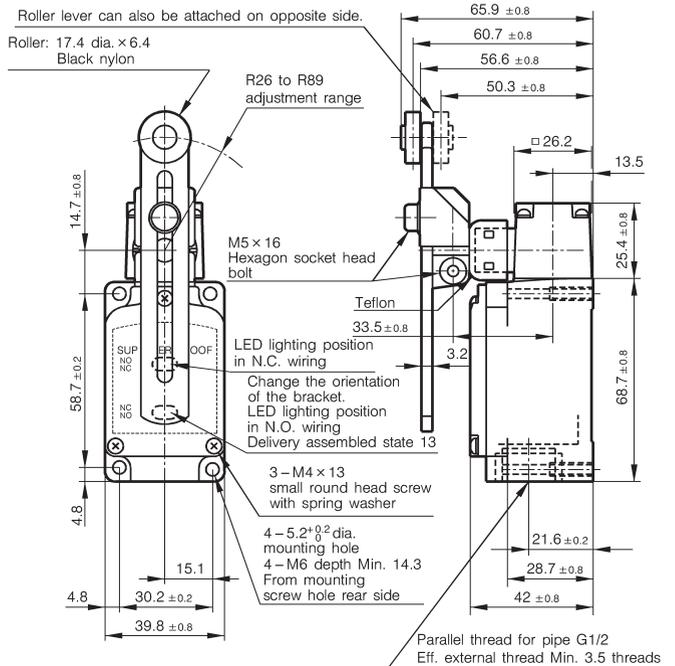
Option	Without indicator lamp	With 100/200Vac neon lamp	With 12 to 125V AC-DC LED lamp
Catalog listing	□LS□□-JW2	□LS□□-JW	□LS□□-JWC
Lamp cover front side	—		
Circuit diagrams			
Notes	—	To ensure lighting of the neon lamp, use at a minimum of 75Vac.	The power for the indicator lamp (red LED) is 12 to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

Roller lever type

Standard roller lever type

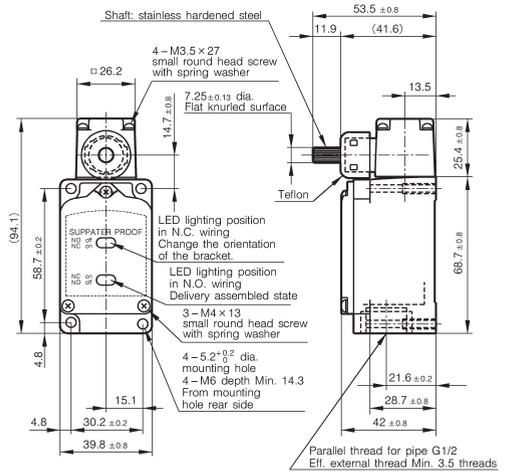


Adjustable roller lever type



## Side rotary type (without lever)

(unit: mm)

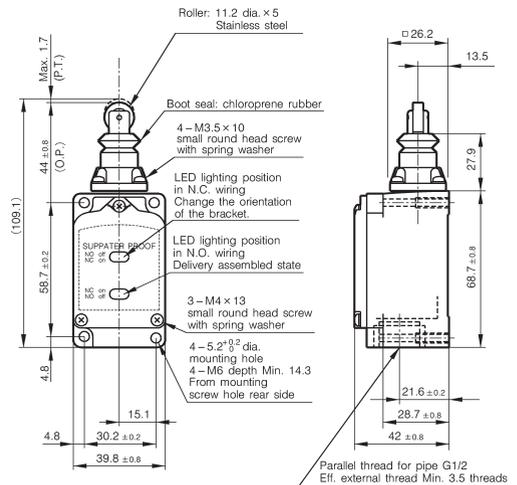
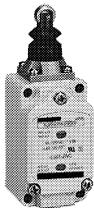


Item		Side rotary type	
		High overtravel standard type	High overtravel high sensitivity type
Catalog listing	No indicator lamp	1LS6□-JW2	1LS7□-JW2
	100/200Vac	1LS6□-JW	1LS7□-JW
	With neon lamps		
	12 to 125Vac/dc	1LS6□-JWC	1LS7□-JWC
With LED lamp			
Certification		UL/CSA/GB	
O.F.	(Max. N)	8.9	
R.F.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

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

## Boot seal roller plunger type

(unit: mm)

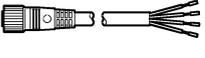


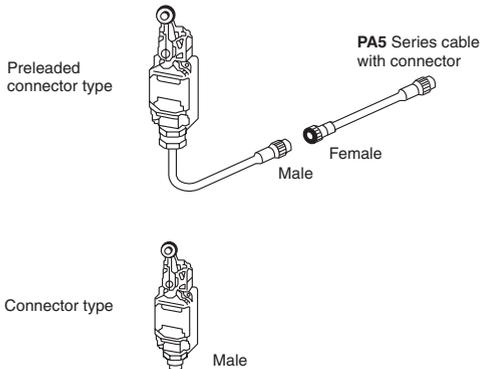
Catalog listing	No indicator lamp	5LS7-JW2
	100/200Vac	5LS7-JW
	With neon lamps	
	12 to 125Vac/dc	5LS7-JWC
With LED lamp		
Certification		UL/CSA/GB
O.F.	(Max. N)	15.7
R.F.	(Min. N)	4.4
P.T.	(Max. mm)	1.7
O.T.	(Min. mm)	5.6
M.D.	(Max. mm)	0.51
R.T.	(Min. mm)	0.38

## CABLE WITH CONNECTOR

Be sure to use PA5 Series cables with connector to connect preleaded type connectors and connector type limit switches.

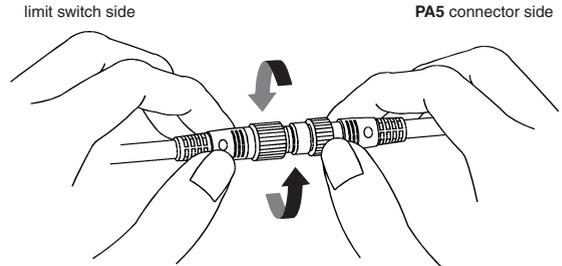
### PA5 Series cable with connector

Shape	Power supply	Cable properties	Cable length	Catalog listing	Lead colors
	DC	Oil-resistant, flexible; UL2464; flame-resistant; EN-compliant	2m	PA5-4ISX2MK-E	1: brown, 2: white, 3: blue, 4: black
			5m	PA5-4ISX5MK-E	1: brown, 2: white, 3: blue, 4: black
	AC		2m	PA5-4JSX2MK-E	1: brown, 2: white, 3: blue, 4: black
			5m	PA5-4JSX5MK-E	1: brown, 2: white, 3: blue, 4: black



### 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 limit switch side.



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

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

## CONNECTOR SPECIFICATIONS<sup>\*1</sup>

Item	Specification details	
Operating voltage/current	For AC: min. 5V 5mA, max. 250V 3A For DC: min. 5V 5mA, max. 125V 3A	
Insulation resistance	Max. 100MΩ (by 500Vdc megger)	
Dielectric strength	1,500Vac for 1 minute (between contacts, and between contact and connector housing)	
Initial contact resistance	Max. 40mΩ (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. 0.8N·m <sup>*2</sup>	
Cable pullout strength	Min. 100 N	
Vibration resistance	10 to 55Hz, 1.5mm peak-to-peak amplitude, for 2 hours each in X, Y and Z directions	
Impact resistance	300m/s <sup>2</sup> , 3 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. Specifications assume the use of a Yamatake connector (PA5 Series).

\*2. The recommended tightening torque is 0.4 to 0.6N·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

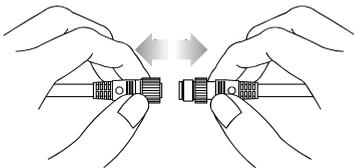
The leakage current when the limit switch is not operating is a maximum of 0.6mA. The PC will not malfunction due to dim lighting of the LED. Moreover, a fixed-current diode is built in to ensure a fixed LED brightness regardless of the power voltage.

### 2. Handling of connector and prelead 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 0.6N·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.

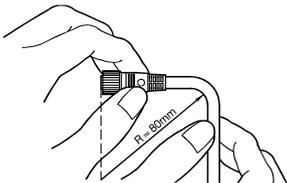


#### 2.2 Inserting and removing connectors

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

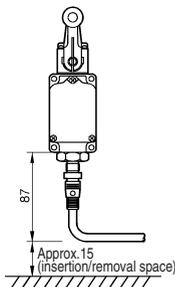
#### 2.3 Cautions when bending cables

The minimum bend radius (R) of the cable is 80mm. 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 1.7N·m (M4 screw)  
Head: 0.8 to 1.2N·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.