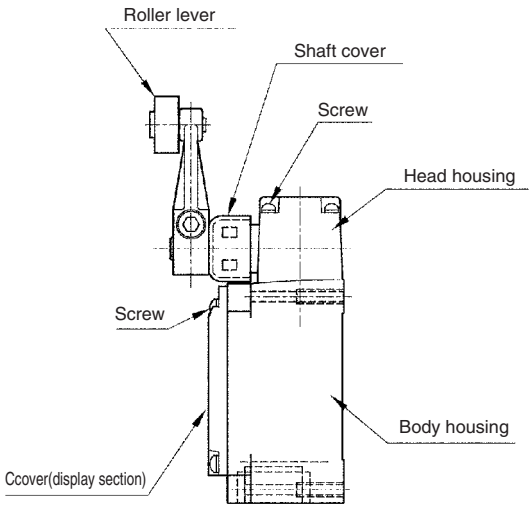
SPATTER-GUARDED SWITCHES

- Effective countermeasures against the adhesion of spatter.
- Setting position indication facilitates initial setup.
- Indicator lamp is easily visible from a distance.
- UL/CSA-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	• 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.

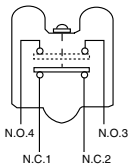
PERFORMANCE

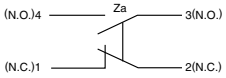
Catalog listing					
			1LS61-J□□, 1LS71-J□□, 1LS74-J□□, 5LS7-J□□		
Standards	**Compliance**		JIS C 4508/JIS C 8201-5-1		
	Certification		UL/CSA		
Structure	**Contact form**		2-circuit double break		
	Terminal shape		M4 screw (switch terminal screw)		
	Contact type		Rivet		
	Protective structure		IP67 (IEC 529)		
Electrical performance	**Electrical rating**		See Table 1.		
	Dielectric strength	**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		
	Insulation resistance		100MΩmin. (by 500Vdc megger)		
	Initial contact resistance		Silver: max. 50mΩ(6 to 8Vdc, thermal current 1A, voltage drop method) Gold-plated: max. 100mΩ(6 to 8Vdc, thermal current 0.1A, voltage drop method)		
	Recommended min. contact operating voltage/current		Silver: 24V 10mA, 12V 20mA Gold-plated: 5V 10mA		
Mechanical performance	**Actuator strength**		Withstands load 5 times O.F. (operating direction for 1 minute)		
	Terminal strength		Withstand tightening torque of 1.5N·m for 1 minute		
	Impact resistance		Contact opening for 1ms max. at 300m/s^2 in free position and total travel positions		
	Vibration resistance		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		
	Allowable operating speed		1LS type: 1.7mm/s to 0.5m/s 5LS7-J□□: 0.2mm/s to 0.5m/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	Low current load double seal internal switch
		Life (at rated load)	Min. 500,000 operations	Min. 200,000 operations	Min. 2 million 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 6N·m (M5 hexagon socket head bolt)		
	Cover		1.3 to 1.7N·m (M4 screw)		
	Head		0.8 to 1.2N·m (M3.5 screw)		
	Lever		4 to 5.2N·m (M5 hexagon socket head bolt)		
	Terminal		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** **5LS1-JW2**	125, 250, 480Vac 10A 125Vac 1/2HP 250Vac 1HP 125Vdc 0.8A 250Vdc 0.4A	**1LS61-JW** **5LS1-JW**	125, 250Vac 5A	**1LS61-JWC** **5LS1-JWC**	125Vac 5A 125Vdc 0.8A
Standard, with double seal	**5LS1-JSW2**	125, 250, 480Vac 5A 125Vac 1/8HP 250Vac 1/4HP 125Vdc 0.8A 250Vdc 0.4A	**5LS1-JSW**	125, 250Vac 5A	**5LS1-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	**1LS7□-JSW2**	125, 250 480Vac 5A 125Vac 1/8HP 250Vac 1/4HP	**1LS7□-JSW**	125, 250Vac 5A	**1LS7□-JSWC**	125Vac 5A

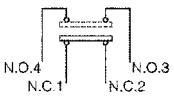
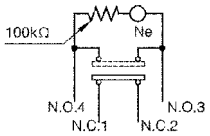
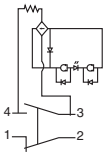
● **Circuit diagram**





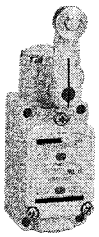
EN60947-5-1

INDICATOR LAMPS

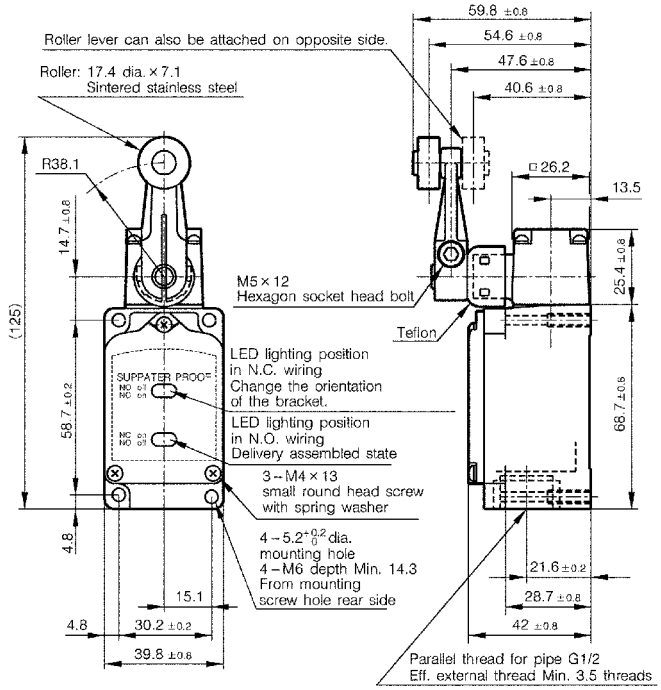
Option	**Without indicator lamp**	**With 100/200Vac neon lamp**	**With 12 to 125V AC-DC LED lamp**
Catalog listing	**□LS□□-JW2**	**□LS□□-JW**	**□LS□□-JWC**
Lamp cover front side	—		
Circuit diagrams			
Notes	—	To ensure lighting of the neon lamp, use at a minimum of 75Vac.	The power for the indicator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

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

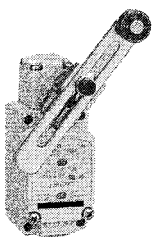
Roller lever type

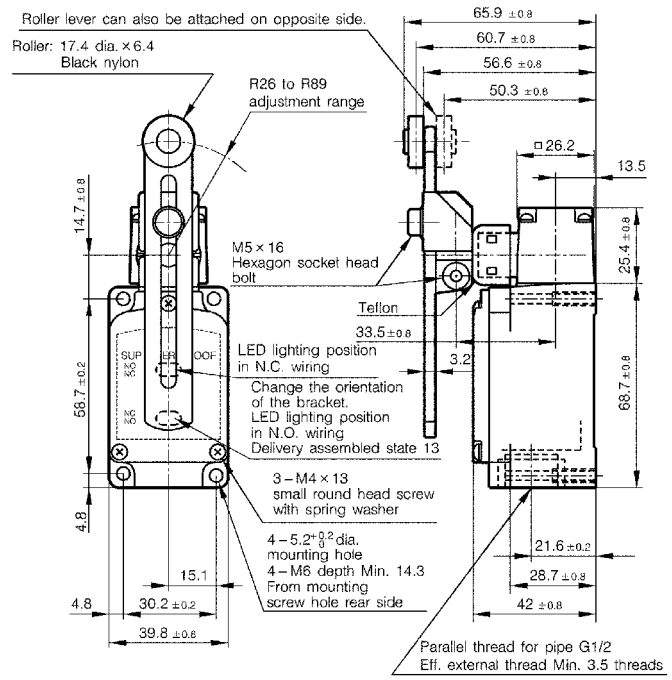


Standard roller lever type



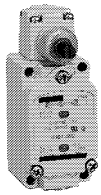
Adjustable roller lever type

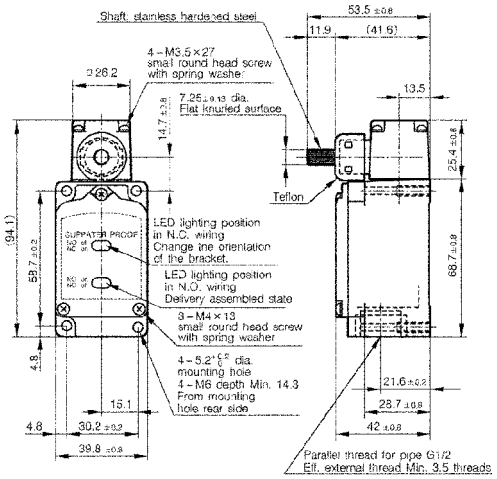




Side rotary type (without lever)

(unit: mm)



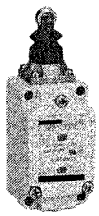


Item		Side rotary type	
		High overtravel standard type	High overtravel high sensitivity type
Catalog listing	No indicator lamp	1LS6□-JW2	1LS7□-JW2
	100/200Vac	1LS6□-JW	1LS7□-JW
	With neon lamps		
	12 to 125Vac/dc	1LS6□-JWC	1LS7□-JWC
	With LED lamp		
Certification		UL/CSA	
O.F.	(Max. N)	8.9	
R.F.	(Min.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

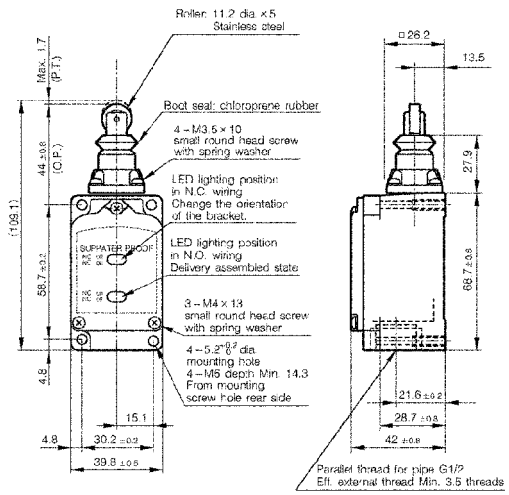
Note: The above values for side rotary switches are for a lever length of 38.1mm.

Boot seal roller plunger type

(unit: mm)



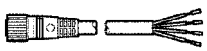
Catalog listing		
	No indicator lamp	5LS7-JW2
	100/200Vac	5LS7-JW
	With neon lamps	
	12 to 125Vac/dc	5LS7-JWC
	With LED lamp	
Certification		UL/CSA
O.F.	(Max. N)	15.7
R.F.	(Min. N)	4.4
P.T.	(Max. mm)	1.7
O.T.	(Min. mm)	5.6
M.D.	(Max. mm)	0.51
R.T.	(Min. mm)	0.38

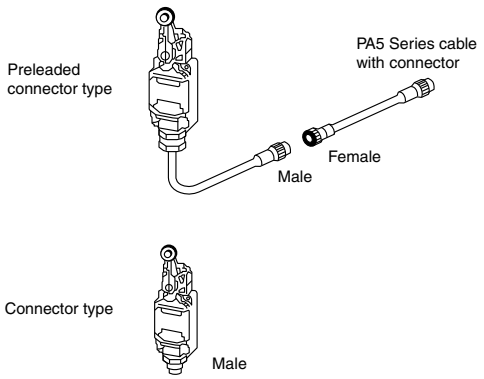


CABLE WITH CONNECTOR

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

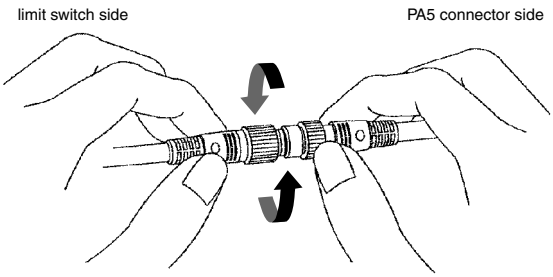
● PA5 Series cable with connector

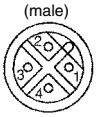
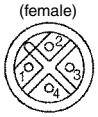
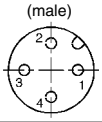
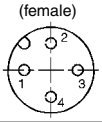
Shape	Power supply	Cable properties	Cable length	Catalog listing	Lead colors
	DC	Oil-resistant, flexible; UL2464; flame-resistant; EN-compliant	2m	**PA5-4ISX2MK-E**	1: brown, 2: white, 3: blue, 4: black
			5m	**PA5-4ISX5MK-E**	1: brown, 2: white, 3: blue, 4: black
	AC		2m	**PA5-4JSX2MK-E**	1: brown,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

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*2
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^2, 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		95%RH以下
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

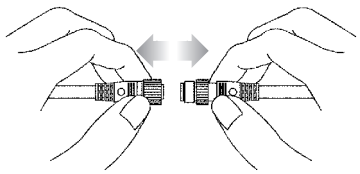
The leakage current when the limit switch is not operating is a maximum of 0.6mA. The PC will not malfunction due to dim lighting of the LED. Moreover, a fixed-current diode is built in to ensure a fixed LED brightness regardless of the power voltage.

2. Handling of connector and 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 0.6N·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.

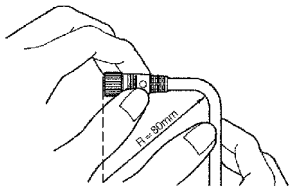


2.2 Inserting and removing connectors

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

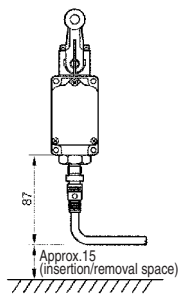
2.3 Cautions when bending cables

The minimum bend radius (R) of the cable is 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.