

LS Series General Purpose Compact Type Limit Switches







FEATURES

General Purpose Type Limit Switches with Robust Structure in an Extensive Range of Models for Use in a Wide Range of Applications.

- EN standard approval acquired.
- 2-circuit double break type basic switch built into robust aluminum die-cast case.
- Oil-, water- and dust-proof structure. (protection class IP67)
- Wide range of options available.
With neon lamp, with LED lamp, built-in gold-plated contacts, double seal type, corrosion-resistant type, heat-resistant type, cold-resistant type, spatter-guarded type, connector type, etc..
- With operation position setting indication. (roller lever and roller plunger types)
- UL/CSA approved product.



LIST OF MODELS

Appearance		Roller lever	Plunger	Side roller plunger	Roller plunger	Fork lever lock	Non-directional operating rod lever	Reference page for individual specifications
								
Model		1LS Series	2LS Series	3LS Series	5LS Series	6LS Series	8LS Series	
General purpose type	□LS□-J	○	○	○	○	○	○	2
Spatter-guarded type	□LS□□-JW□	○	-	-	○	-	-	28
Ultra long life type	1LS-J7□□	○	-	-	-	-	-	35
Harsh environment resistance for outdoor	1LS-J8□□	○	-	-	-	-	-	44

STANDARD, GENERAL PURPOSE COMPACT TYPE




Most General Model of **LS** Compact Type Limit Switches Used in a Wide Range of Applications.

- Wide range of models includes standard, high sensitivity, high overtravel, T.T.90°, light operation and lock operation types.
- Wide range of actuator types.
- Various international standards acquired.
(UL/CSA, EN 60947-5-1, etc.)
- CE marking compatible product with ground lead.



ORDER GUIDE (basic catalog listing)

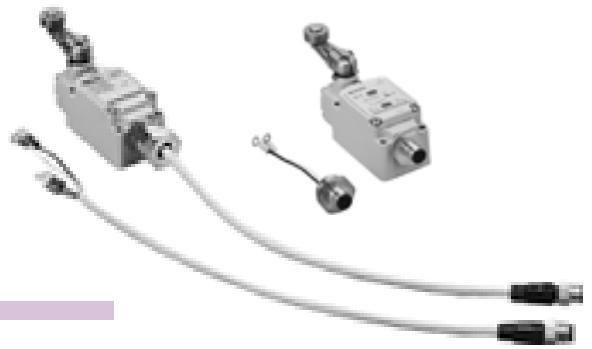
- Switch body (Contact your agent for model Nos. not listed in the following table:)

Actuator		Operating characteristics			Options			
		O.F.(max.) (operating force)	P.T.(max.) (pretravel)	T.T.(min.) (total travel)	Basic catalog listing	With LED lamp 12 to 125Vac/dc EC	With neon lamp 100/ 200Vac E	Double seal S
Name	Shape							
Roller lever		13.4N	Standard 20°	Standard 50°	1LS1-J	1LS1-JEC	1LS1-JE	1LS1-JS
			High sensitivity model 5°	Standard 35°	1LS19-J	1LS19-JEC	1LS19-JE	1LS19-JS
		8.9N	Standard 20°	High over-travel 75°	1LS-J500	1LS-J500EC	1LS-J500E	1LS-J500S
			High sensitivity model 10°	High over-travel 72°	1LS-J550	1LS-J550EC	1LS-J550E	1LS-J550S
			Standard 30°	High over-travel 90°	1LS-J50	1LS-J50EC	1LS-J50E	1LS-J50S
Adjustable roller lever: Note 1		13.4N	Standard 20°	Standard 50°	1LS3-J	1LS3-JEC	1LS3-JE	1LS3-JS
			High sensitivity model 10°	High over-travel 72°	1LS-J553	1LS-J553EC	1LS-J553E	1LS-J553S
		8.9N	Standard 20°	High over-travel 75°	1LS-J503	1LS-J503EC	1LS-J503E	1LS-J503S
Light operation rod lever Note 2		1.4N	Standard 20°	Standard 50°	1LS10-J	1LS10-JEC	1LS10-JE	1LS10-JS
Lever-less type		13.4N	Standard 20°	Standard 50°	1LS2-J	1LS2-JEC	1LS2-JE	1LS2-JS
			High sensitivity model 5°	Standard 35°	1LS9-J	1LS9-JEC	-	-
		8.9N	Standard 20°	High over-travel 75°	1LS-J501	1LS-J501EC	1LS-J501E	1LS-J501S
			High sensitivity model 10°	High over-travel 72°	1LS-J551	1LS-J551EC	1LS-J551E	1LS-J551S
			Standard 30°	High over-travel 90°	1LS-J51	1LS-J51EC	1LS-J51E	1LS-J51S
		1.4N	Standard 20°	Standard 50°	1LS23-J	-	1LS23-JE	-

Note 1: Operation characteristics are values when the lever length is adjusted to 38.1mm.

Note 2: Operation characteristics are values when the lever length is adjusted to 141.2mm.

- Connector/pre-leaded connector also available.
- With LED lamp. (12 to 125Vac/dc)
Type with neon lamp (100/200Vac) also available.
- Wide range of models includes double-seal, corrosion-resistant, heat-resistant and cold-resistant types.
- Low current load type also available in addition to standard load type.









EXTERNAL STANDARDS

	Approval Body	Approval Standard	File No.
International approval standards	UL	UL 1054	E 37559
	CSA	CSA C 22.2 No.55	LR 61643
	TÜV	EN 60947-5-1	R 9451261
Domestic compliant standards	-	JIS C 4508 JIS C 8201-5-1	-




⚠ See “When Using **LS** Series Limit Switches” page 25 and “Precautions When Using Limit Switches” page .

Options						
Double seal + LED SEC	Double seal + neon lamp SE	Low current load K	EN standard approved product with ground terminal G	Corrosion-resistant type M	Heat-resistant type H	Cold-resistant type L
1LS1-JSEC	1LS1-JSE	1LS1-JK	1LS1-JG	1LS1-JM	1LS1-JH	1LS1-JL
1LS19-JSEC	1LS19-JSE	1LS19-JK	1LS19-JG	1LS19-JM	1LS19-JH	1LS19-JL
1LS-J500SEC	1LS-J500SE	1LS-J500K	1LS-J500G	1LS-J500M	1LS-J500H	1LS-J500L
1LS-J550SEC	1LS-J550SE	1LS-J550K	1LS-J550G	1LS-J550M	1LS-J550H	-
1LS-J50SEC	-	1LS-J50K	1LS-J50G	-	1LS-J50H	-
1LS3-JSEC	1LS3-JSE	1LS3-JK	1LS3-JG	1LS3-JM	1LS3-JH	1LS3-JL
1LS-J503SEC	1LS-J503SE	1LS-J503K	1LS-J503G	1LS-J503M	1LS-J503H	1LS-J503L
1LS-J553SEC	-	1LS-J553K	1LS-J553G	-	-	-
1LS10-JSEC	1LS10-JSE	1LS10-JK	1LS10-JG	-	-	-
-	-	-	-	1LS2-JM	1LS2-JH	-
-	-	1LS9-JK	-	-	-	-
-	-	1LS-J501K	-	-	-	1LS-J501L
1LS-J551SEC	-	-	-	-	-	-
-	-	1LS-J51K	-	-	-	1LS-J51L
-	-	-	-	-	-	-

(continued from previous page)

Actuator		Operating characteristics			Options			
		O.F.(max.) (operating force)	P.T.(max.) (pretravel)	T.T.(min.) (total travel)	Basic catalog listing	With LED lamp 12 to 125Vac/dc EC	With neon lamp 100/ 200Vac E	Double seal S
Name	Shape							
Plunger		26.7N	1.65mm	8.05mm	2LS1-J	2LS1-JEC	2LS1-JE	2LS1-JS
Ball plunger		26.7N	1.7 mm	5.7 mm	2LS-J6	2LS-J6EC	2LS-J6E	–
Side roller plunger		40.1N	2.77mm	8.37mm	3LS1-J	3LS1-JEC	3LS1-JE	3LS1-JS
Roller plunger		26.7N	1.7 mm	7.3 mm	5LS1-J	5LS1-JEC	5LS1-JE	5LS1-JS
Boot seal roller plunger		15.7N	1.7 mm	7.3 mm	5LS7-J	5LS7-JEC	5LS7-JE	5LS7-JS
Fork lever lock		8.9N	60°	90°	6LS1-J	6LS1-JEC	6LS1-JE	6LS1-JS
		8.9N	60°	90°	6LS3-J	6LS3-JEC	6LS3-JE	6LS3-JS
Non-directional operation type	Spring rod	1.4N	28.6mm	–	8LS3-J	8LS3-JEC	8LS3-JE	8LS3-JS
	Steel wire light operation	0.28N	55 mm	–	8LS125-J	8LS125-JEC	8LS125-JE	8LS125-JS
	Coil spring	1.4N	28.6mm	–	8LS152-J	8LS152-JEC	8LS152-JE	8LS152-JS

● Connector type switch body

Actuator		Operating characteristics			Options			
		O.F.(max.) (operating force)	P.T.(max.) (pretravel)	T.T.(min.) (total travel)	Connector + LED EC-PD	Pre-leaded Connector + LED EC-PD03	Connector + Double seal + LED SEC-PD	Pre-leaded connector + Double seal + LED SEC-PD03
Name	Shape							
Roller lever		13.4N	Standard 20°	Standard 50° travel	1LS1-JEC-PD	1LS1-JEC-PD03	1LS1-JSEC-PD	1LS1-JSEC-PD03
			High sensi- tivity model 5°	Standard 35° travel	1LS19-JEC-PD	1LS19-JEC-PD03	1LS19-JSEC-PD	1LS19-JSEC-PD03
		8.9N	Standard 20°	High over- travel 75°	1LS-J500EC-PD	–	1LS-J500SEC-PD	1LS-J500SEC-PD03
			High sensi- tivity model 10°	High over- travel 75°	1LS-J550EC-PD	1LS-J550EC-PD03	1LS-J550SEC-PD	1LS-J550SEC-PD03
Adjustable roller lever		26.7N	1.7 mm	7.3 mm	5LS1-JEC-PD	5LS1-JEC-PD03	5LS1-JSEC-PD	5LS1-JSEC-PD03
Light operation rod lever		15.7N	1.7 mm	7.3 mm	5LS7-JEC-PD	5LS7-JEC-PD03	5LS7-JSEC-PD	5LS7-JSEC-PD03

Options						
Double seal + LED SEC	Double seal + neon lamp SE	Low current load K	EN standard ap- proved product with ground terminal G	Corrosion- resistant type M	Heat-resistant type H	Cold-resistant type L
2LS1-JSEC	2LS1-JSE	2LS1-JK	2LS1-JG	2LS1-JM	2LS1-JH	–
2LS-J6SEC	2LS-J6SE	2LS-J6K	2LS-J6G	–	–	–
3LS1-JSEC	3LS1-JSE	3LS1-JK	3LS1-JG	–	–	–
5LS1-JSEC	5LS1-JSE	5LS1-JK	5LS1-JG	–	5LS1-JH	5LS1-JL
5LS7-JSEC	5LS7-JSE	5LS7-JK	5LS7-JG	–	–	–
6LS1-JSEC	6LS1-JSE	6LS1-JK	6LS1-JG	–	–	–
6LS3-JSEC	–	6LS3-JK	6LS3-JG	–	–	–
8LS3-JSEC	–	8LS3-JK	8LS3-JG	–	8LS3-JH	–
8LS125-JSEC	8LS125-JSE	8LS125-JK	–	–	–	–
8LS152-JSEC	8LS152-JSE	8LS152-JK	–	–	–	8LS152-JL

PERFORMANCE

Item	Model		Roller lever	Plunger	Side roller plunger	Roller plunger	Fork lever lock	Non-directional operation type			
	Catalog listing		1LS□-J□□□	2LS□-J□	3LS1-J	5LS□-J	6LS□-J	8LS□-J			
External standard	Conformed standards		JIS C 4508/JIS C 8201-5-1								
	Approval standards Note 2		UL/CSA, EN 60947-5-1								
Structure	Contact type		2-circuit double break								
	Contact shape	Standard load	Silver, rivet								
		Low current load	Gold-plated silver, rivet								
	Terminal shape		M4 screw (binding head machine screw with toothed washer), DIN 4-pin connector (M12 size), pre-leaded								
	Protective structure		IP67 (IEC 529)								
	Operating environment pollution level		3 (EN 60947-5-1) Note 3								
Electrical performance (1) General characteristics	Electrical rating		See page 7.								
	Dielectric strength		Between non-continuous terminal: 1,000Vac, 50/60Hz for 1 minute (standard operating characteristics type) : 600Vac, 50/60Hz for 1 minute (roller lever, high sensitivity characteristics type) Between each terminal and non-conducting metal part: 2,000Vac, 50/60Hz for 1 minute								
	Insulating resistance		Min. 100MΩ (by 500Vdc megger)								
	Initial contact resistance	Standard load	Max. 50mΩ (6 to 8Vdc, energizing current 1A, voltage drop method)								
		Low current load	Max. 100mΩ (6 to 8Vdc, energizing current 0.1A, voltage drop method)								
	Connector		Max. 40mΩ (excluding fixed resistance such as cord)								
Contact voltage/min. current		24V-10mA, 12V-20mA (standard load), 5V-10mA (low current load)									
Electrical performance (2) EN 60947-5-1	Operating rated voltage		240Vac, 30Vdc								
	Rated energizing current (Ith)		10A								
	Rated frequency		45 to 65Hz and "d.c"								
	Short-circuit protection mechanism		Instant blowing fuse 15A								
	Rated insulating voltage (Ui)		250Vac								
	Conditional rated short-circuit current		100A (at resistive load)								
	Switching overvoltage		Category 3 (IEC 204-1)								
	Rated impulse dielectric strength (Uimp)		2,500V								
	Mechanical performance	Actuator strength		Withstand load 5 times O.F. for 1 minute (operating direction)							
Terminal strength		Withstand tightening torque strength of 1.5N-m for 1 minute									
Impact resistance		High sensitivity characteristics roller lever type		200m/s ² free position and operating limit positions							
		Light operation roller lever type, non-directional operation type		200m/s ² operating limit position							
		Non-directional operation type		300m/s ² operating limit position							
		Models other than the above		300m/s ² free position and operating limit positions							
Contact release of 1ms max. at free position and operating limit positions or operating limit position											
Vibration resistance		1.5mm peak-to-peak amplitude, frequency 10 to 55Hz, for 2 continuous hours									
		High sensitivity characteristics roller lever type, non-directional operation type		Operating limit position							
		Models other than the above		Free position and operating limit positions							
Contact release of 1ms max. at free position and operating limit positions or operating limit position											
Allowable operating speed	Model	Other than on the right	1LS19-J	2LS1-J	2LS-J6	3LS1-J	5LS1-J 5LS7-J	8LS3-J	8LS125-J	8LS152-J	
	Max.	0.5m/s	0.5m/s	0.5m/s	0.2m/s	0.3m/s	0.5m/s	0.5m/s	0.3m/s	0.3m/s	
	Min.	1.7mm/s	0.4mm/s	1.0mm/s	1.0mm/s	0.5mm/s	0.2mm/s	10mm/s	50mm/s	20mm/s	
Max. speed: Actuator damage not allowed. Min. speed: Unstable state of contacts 0.1s max.											
Mechanical operating frequency		Light operation roller lever: Max. 60 operations/minute Models other than the above: Max. 120 operations/minute									
Pulling force for cord		Min. 100N									
Life	Mechanical life	Model	Other than on the right	1LS-J50, 2LS-J6			3LS1-J		6LS□-J		
		Life	Min. 10 million operations	Min. 1 million operations			Min. 5 million operations		Min. 2 million operations		
	Function after operation is 70 to 100% of standard value.										
	Electrical life	Model	Standard load built-in switch	Standard load double seal type built-in switch				Low current load built-in switch			
Life		Min. 500,000 operations at rated load	Min. 200,000 operations at rated load				Min. 2 million operations at rated load				
Operating frequency: Above conditions must be satisfied at 20 operations/minute.											
Environmental conditions	Operating temperature range		Standard model (standard load and low current load): -10 to +70°C (freezing not allowed)								
			Double seal type (1LS19-JS): 0 to +70°C (freezing not allowed) (2LS, 3LS, 5LS, 8LS125-JS): +5 to +70°C (freezing not allowed) (double seal type other than above): -5 to +70°C (freezing not allowed)								
			Heat-resistant type: -10 to +120°C (freezing not allowed)								
			Cold-resistant type: -40 to +70°C (freezing not allowed)								
Operating humidity range		Max. 98%RH Note 4									
Recommended tightening torque	Body		5 to 6N-m (M5 hexagon socket head bolt)								
	Lever		4 to 5.2N-m (M5 hexagon socket head bolt)								
	Terminal		1.0 to 1.4N-m (M4 binding head machine screw)								
	Cover		1.3 to 1.7N-m (M4 small round head screw)								
	Head		0.8 to 1.2N-m (M3.5 small round head screw)								
	Cap nut		2 to 3N-m (M22 screw for 3LS)								
	Piano wire lever		0.6 to 0.8N-m (M3 hexagon head set screw)								
	Terminal block		5 to 6N-m (M5 hexagon socket head bolt)								
Connector tightening torque		0.4 to 0.6N-m (M12 ring)									

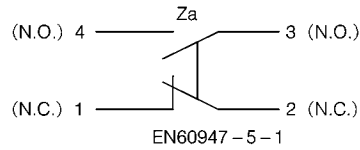
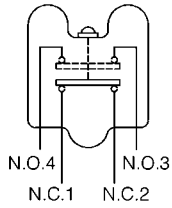
Note: Mechanical performance values for the roller lever type are values when the lever length is adjusted to 38.1mm.

Note 2: Some models do not fall under this category.

Note 3: Items listed in EN 60947-5-1 apply only to EN standard approved products.

Note 4: Max. 95%RH for connector and pre-leaded connector types

● Contact type
2-circuit double break



ELECTRICAL RATING

● 2-circuit double break

Indicator type	None		100/200Vac with neon lamp		12 to 125Vac/dc with LED lamp		
	Model	Catalog listing	Electrical rating	Catalog listing	Electrical rating	Catalog listing	Electrical rating
General-purpose type	<input type="checkbox"/> LS <input type="checkbox"/> -J		125, 250, 480Vac -10A 125Vac-1/2HP 250Vac-1HP 125Vdc-0.8A 250Vdc-0.4A	<input type="checkbox"/> LS <input type="checkbox"/> -JE	125, 250Vac-5A	<input type="checkbox"/> LS <input type="checkbox"/> -JEC	125Vac-5A 125Vdc-0.8A
General-purpose type, double seal	<input type="checkbox"/> LS <input type="checkbox"/> -JS		125, 250Vac-5A 125Vac-1/2HP 250Vac-1HP 125Vdc-0.8A 250Vdc-0.4A	<input type="checkbox"/> LS <input type="checkbox"/> -JSE	125, 250Vac-5A	<input type="checkbox"/> LS <input type="checkbox"/> -JSEC	125Vac-5A 125Vdc-0.8A
General-purpose type, gold plated contact point	<input type="checkbox"/> LS <input type="checkbox"/> -JK		125Vac-0.1A 30Vdc-0.1A	<input type="checkbox"/> LS <input type="checkbox"/> -JKE	125Vac-0.1A	<input type="checkbox"/> LS <input type="checkbox"/> -JKEC	125Vac-0.1A 30Vdc-0.1A
General-purpose type (high sensitivity type)	1LS19-J 1LS-J55 <input type="checkbox"/>		125, 250V, 480Vc -10A 125Vac-1/2HP 250Vac-1HP 125Vdc-0.4A 250Vdc-0.2A	1LS19-JE 1LS-J55 <input type="checkbox"/> E	125, 250Vac-5A	1LS19-JEC 1LS-J55 <input type="checkbox"/> EC	125Vac-5A
General-purpose type (high sensitivity type), double seal	1LS19-JS 1LS-J55 <input type="checkbox"/> S		125, 250Vac-5A 125Vac-1/2HP 250Vac-1HP	1LS19-JSE 1LS-J55 <input type="checkbox"/> SE	125, 250Vac-5A	1LS19-JSEC 1LS-J55 <input type="checkbox"/> SEC	125Vac-5A
General-purpose type, DC pre-leaded connector	-	-	-	-	-	<input type="checkbox"/> LS <input type="checkbox"/> -JEC-PD <input type="checkbox"/> LS <input type="checkbox"/> -JEC-PD03	125Vac-3A 30Vdc-3A
General-purpose type, AC pre-leaded connector	-	-	-	-	-	<input type="checkbox"/> LS <input type="checkbox"/> -JEC-PA <input type="checkbox"/> LS <input type="checkbox"/> -JEC-PA03	125Vac-3A 30Vdc-3A

● EN standard compliant rating (G type, type with ground terminal)

	Application category	Rating	Rated energizing current (Ith)
Standard load type	AC-15	3.0A-240Vac	10A
	DC-12	0.4A-30Vdc	10A
Low current load type	AC-12	0.1A-125Vac	1A
	DC-12	0.1A-30Vdc	1A

● Reference rating

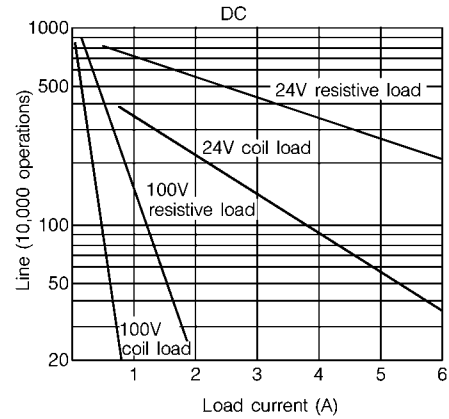
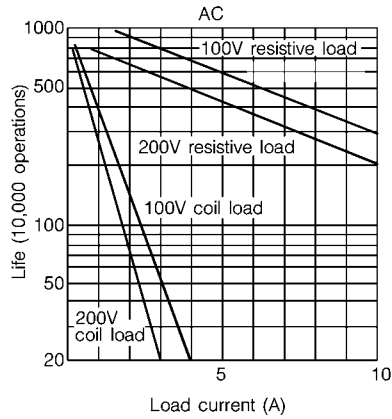
(Ratings fluctuate according to the operating environment and type of load. Check values on an actual operating unit.)

AC rating	125Vac				250Vac				480Vac	
	Resistance	Induction	Electric motor		Resistance	Induction	Electric motor		Resistance	Induction
N.C.			N.O.	N.C.			N.O.			
Typical model: 1LS1-J	10	6	4	2	10	6	3	1.5	6	4
DC rating	8Vdc		14Vdc		30Vdc		115Vdc		230Vdc	
Typical model: 1LS1-J	Resistance	Induction	Resistance	Induction	Resistance	Induction	Resistance	Induction	Resistance	Induction
	10	6	10	6	6	4	0.8	0.2	0.4	0.1

Note: "Inductive load" refers to a load having a power factor of 0.4 and time constant 7ms (DC).
"Electric motor load" refers to a load having an inrush current value of six times.

LIFE VS. LOAD CURRENT CHARACTERISTICS

• 1LS□-J/5LS□-J





Operating frequency 1,800 operations/h

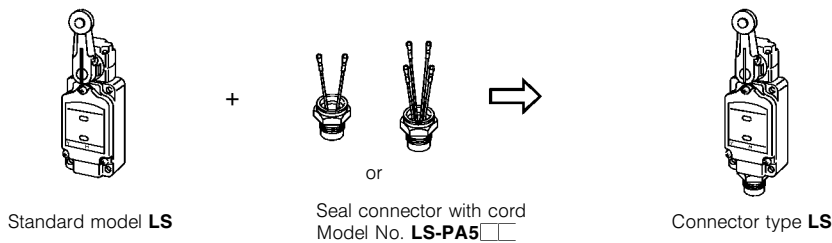
CONNECTORS

• LS Series connectors

Models (e.g. **2LS□-J□**, **8LS□-J□**) for which a set model No. is not set can be modified into a pre-leaded connector type by assembling the following separate parts on a standard type **LS** Series body:

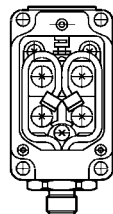
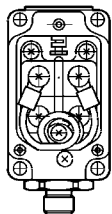
Catalog listing	Name	Appearance	Power supply	Number of lead	
				2-lead	4-lead
LS-PA5A2	PA5 Series seal connector with cord	 	AC	○	—
LS-PA5A4				—	○
LS-PA5D2			DC	○	—
LS-PA5D4				—	○

Assembly method

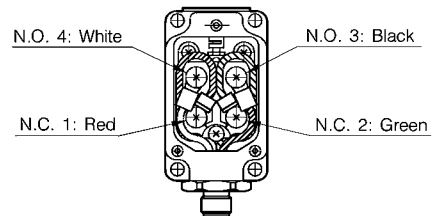


Wiring method

2-lead type Catalog listing **LS-PA5□2**



4-lead type Catalog listing **LS-PA5□4**



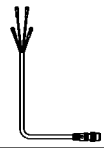

Connector		Internal switch
Contact No.	Lead color	Terminal No.
1	—	—
2	—	—
3	Black	No.3
4	White	No.4

Note:
Even in an N.C. wiring connection, contact assignments become (3) - N.C. and (4) - N.C.

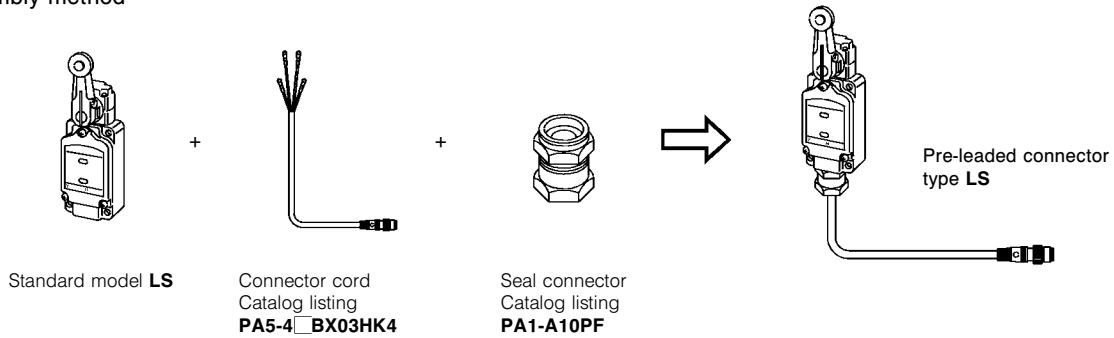
Connector		Internal switch
Contact No.	Lead color	Terminal No.
1	Red	No.1 (N.C.)
2	Green	No.2 (N.C.)
3	Black	No.3 (N.O.)
4	White	No.4 (N.O.)

● **Pre-leaded connector for LS Series**

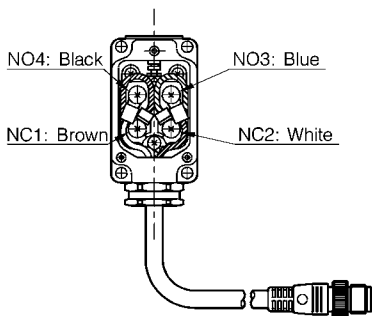
Models (e.g. **2LS**□-**J**□, **8LS**□-**J**) for which a set model No. is not set can be modified into a pre-leaded connector type by assembling the following separate parts on a standard type **LS** Series body:

Catalog listing	Name	Appearance	Power supply	Cord length	Number of leads
PA5-4IBXO3HK4	PA5 Series connector cord		DC	30cm	4-lead
PA5-4JBXO3HK4			AC		
PA1-A10PF	Seal connector		-	-	-

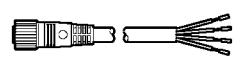
Assembly method



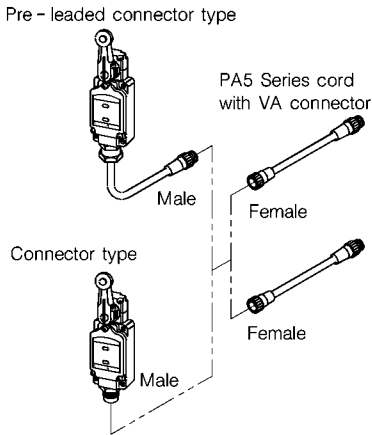
Wiring method



● **VA connector cord for connector type limit switches**

Switch body catalog listing	Shape	Power supply	Cord length	Catalog listing	Lead color
□ LS □- J □□□□- PD □ LS □- J □□□□- PD03		DC	2m	PA5-4ISX2HK	1-Brown, 2-White 3-Blue, 4-Black
			5m	PA5-4ISX5HK	
□ LS □- J □□□□- PA □ LS □- J □□□□- PA03		AC	2m	PA5-4JSX2HK	
			5m	PA5-4JSX5HK	

● Connector pin layout and lead color



Connector code	Connector shape		Pin layout			
			Without indicator lamp	With LED lamp indicator	With neon lamp indicator	Lead color
AC cord: -PA -PA03	Switch side (male)	VA connector side (female)				1: Brown (N.C.) 2: White (N.C.) 3: Blue (N.O.) 4: Black (N.O.)
DC cord: -PD -PD03	Switch side (male)	VA connector side (female)				1: Brown (N.C.) 2: White (N.C.) 3: Blue (N.O.) 4: Black (N.O.)

Note 1: The shape of the key differs on plugs and sockets for AC and DC, and is not mutually compatible.

The contact assignments of limit switches comply with Japan Electric Control Equipment Industrial Association Standard (NECA 4202).

● Connector section specifications Note 1

Item		Details
Operating voltage /current range	For AC	For AC: Min. 5V-5mA, Max. 250Vac-3A
	For DC	For DC: Min. 5V-5mA, Max. 125Vdc-3A
Insulating resistance		Min. 100MΩ (by 500Vdc megger)
Dielectric strength		1,500Vac for 1 minute (between contacts, and between contacts and connector housing)
Initial contact resistance		Max. 40mΩ (when 3A current is supplied to combined male and female connectors. Lead semiconductor specific resistance not included)
Connector withstand stress		0.4 to 4.0N per contact
Number of connector insertions		50 times
Connector tightening strength		Min. 0.8N-m Note 2
Cord pullout strength		Min. 100N
Vibration resistance		10 to 55Hz, 1.5mm peak-to-peak amplitude, 2 hours in X, Y and Z directions
Impact resistance		300m/s ² , 3 times in each X, Y and Z directions
Protective structure		IP67 (IEC 529)
Operating temperature range		-10 to +70°C (freezing not allowed)
Storage temperature range		-20 to +80°C
Operating humidity range		Max. 95%RH
Material	Contact	Gold-plated brass
	Contact holder	Glass-lined polyester resin
	Housing	Polyester elastomer
	Coupling	Brass (For DC: Ni-plated, For AC: orange-coated)
	O-ring	NBR (nitrile rubber)
Recommended tightening torque		0.4 to 0.6N-m
Connector cord	Catalog listing: for DC	PA5-4ISX □ HK Note 3
	Catalog listing: for AC	PA5-4JSX □ HK Note 3
	Nominal cross-sectional area, Number of leads	0.5mm ² , 4-lead

Note 1: Specifications according to combined use with a Yamatake VA connector (model No. PA5 Series). 2-circuit double break (general-purpose type and ultra long-life type) are supported.

Note 2: Firmly tighten by hand.

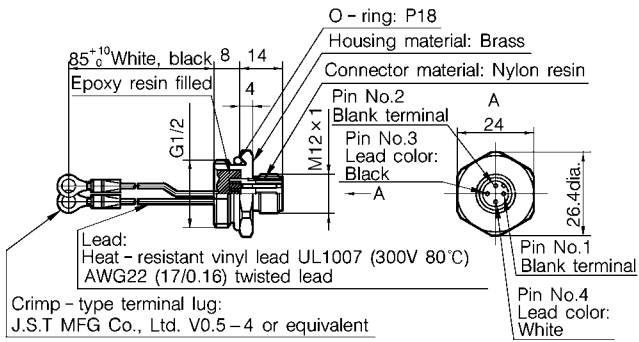
If the connector is not tightened firmly, IP67 protection may be insufficient, or may result in the connector becoming loose.

Note 3: The number in □ in the catalog listing indicates the cord length (2: 2m, 3: 3m, and 5: 5m).

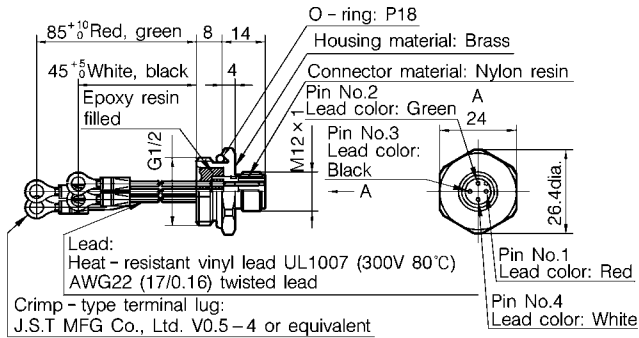
● Connector dimensions

Seal connector with 2-lead type cord **LS-PA5□2**

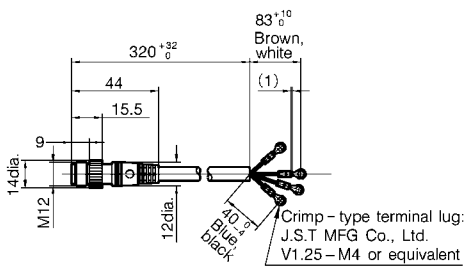
(unit: mm)



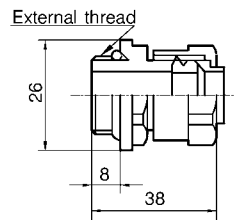
Seal connector with 4-lead type cord **LS-PA5□4**



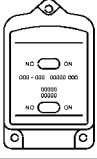
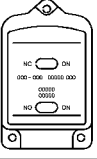
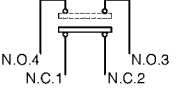
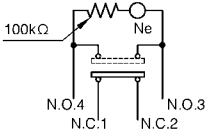
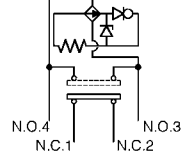
Connector cord **PA5-4□BX03HK4**



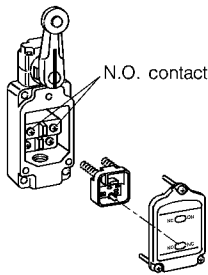
Seal connector **PA1-A10PF**



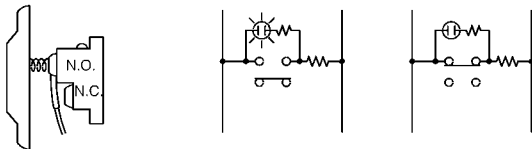
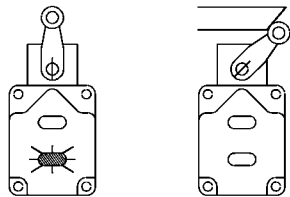
INDICATOR LAMP

Option	Without indicator lamp	With neon lamp 100/200Vac	With LED lamp 12 to 125V, common to AC and DC			
Catalog listing	□LS□-J	□LS□-JE	□LS□-JEC			
Lamp cover front side	-					
Circuit diagrams						
Note	-	Note: To confirm lighting of the neon lamp, use at voltage min. 75Vac.	Note 1: The power voltage of the indicator lamp (red LED) is 12 to 125V. The indicator lamp operates by either AC or DC power. Note 2: When the power voltage of the indicator lamp is 100V, the max. energizing current of 1.4mA, and 2.0mA at 125V.			
Lamp cover catalog listing (repair part)		LS-29PA1	LS-29PAEC			
Specifications	Operating voltage	100 to 200Vac	12 to 125V, common to AC and DC			
		100Vac	200Vac			
			12V	24V	48V	100V
	Energizing current	Approx. 0.5mA	Approx. 1.5mA	Approx. 0.2mA	Approx. 0.6mA	Approx. 0.7mA
Resistance value		100kΩ		33kΩ		

- Connection/operation of lamp cover
- When set to light at free position (FREE)



- FREE (free position) - PUSH (operating position)



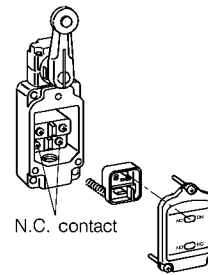
- Series connection:

Up to six switches can be connected in series when the power voltage is 100V. Programmable controllers can also be connected in series.

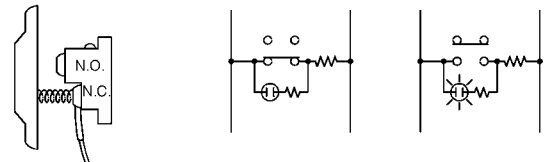
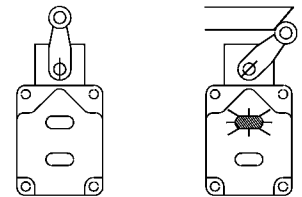
The brightness of the LED lamp is a fixed brightness regardless of the power voltage as light is generated by a built-in fixed-current diode.

(Neon lamp type "E" Series switches cannot be connected in series at 100V.)

- When set to light at operating position (PUSH)



- FREE (free position) - PUSH (operating position)



- PC connection possible:

The leakage current when the limit switch is not operating is a maximum 1.3mA. The PC does not malfunction due to dark lighting of the LED. Moreover, a fixed-current diode is built in to ensure a fixed LED brightness regardless of the power voltage.

APPEARANCE, OPERATING CHARACTERISTICS AND EXTERNAL DIMENSIONS

Roller lever type

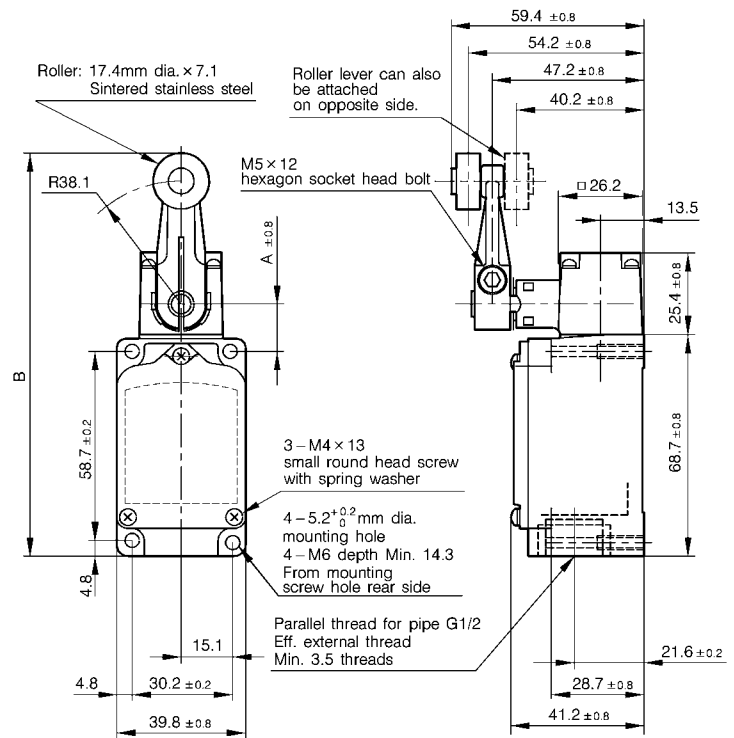
(unit: mm)



Standard type
Heat-resistant type
Cold-resistant type



Corrosion-resistant type



Catalog listing	2-circuit double break	Standard type (- 10 to + 70°C)	1LS1-J	1LS19-J	1LS-J500	1LS-J550	1LS-J50	
		Heat-resistant type (- 10 to + 120°C)	1LS1-JH	1LS19-JH	1LS-J500H	1LS-J550H	1LS-J50H	
		Cold-resistant type (- 40 to + 70°C)	1LS1-JL	1LS19-JL	1LS-J500L	-	-	
		Corrosion-resistant type (- 10 to + 70°C) Note 1	1LS1-JM	1LS19-JM	1LS-J500M	-	-	
Operating characteristics		Standard travel, standard characteristics type	Standard travel, high sensitivity type	High overtravel, standard characteristics type	High overtravel, high sensitivity type	High overtravel T.T. 90° type		
Approval standards		UL/CSA (excluding H, L, M)					-	
O.F.	(N max.)	13.4			8.9			
R.F.	(N min.)	2.2			0.98			
P.T.	(° max.)	20	5 ⁺² ₀	20	10 ⁺² ₋₁	30		
O.T.	(° min.)	30	30	55	62	60		
M.D.	(° max.)	12	3	12	5	15		
T.F.	(N max.)	17.9			-			
Section A dimensions		14.7 ± 0.8					17.2 ± 0.8	
Section B dimensions		125 ^{REF}					127.5 ^{REF}	

Note 1: Exactly the same as **1LS1-J** except different lever shape.
For details on the lever shape, see **6PA78-JM** (page 24).

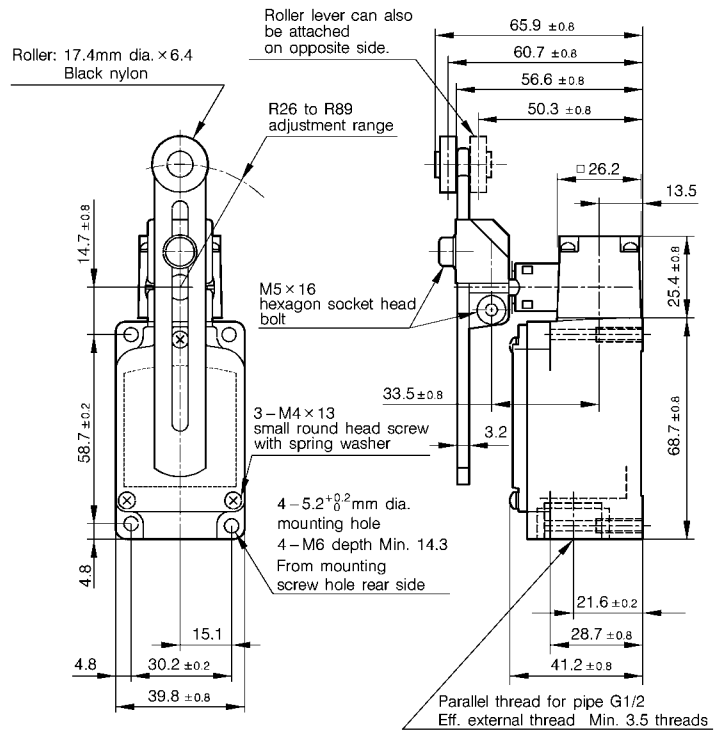
Adjustable roller lever type

(unit: mm)



Catalog listing	Standard type	1LS3-J	1LS-J503	1LS-J553
	Heat-resistant type (-10 to +120°C)	-	1LS-J503H	-
	Cold-resistant type (-40 to +70°C)	1LS3-JL	1LS-J503L	-
	Corrosion-resistant type	1LS3-JM	1LS-J503M	-
Operating characteristics	Standard travel, standard characteristics type	High overtravel, standard type	High overtravel, high sensitivity type	
UL/CSA	○(excluding H, L, M type)			
*O.F. (N max.)	13.4	8.9	8.9	
*R.F. (N min.)	2.2	0.98	0.98	
P.T. (° max.)	20	20	10 ⁺² ₋₁	
O.T. (° min.)	30	55	62	
M.D. (° max.)	12	12	5	
*T.F. (N max.)	17.9	-	-	

Note: Items marked by * are for when the lever length is adjusted to 38.1mm.
The length of the roller lever can be adjusted to 26 to 89mm.

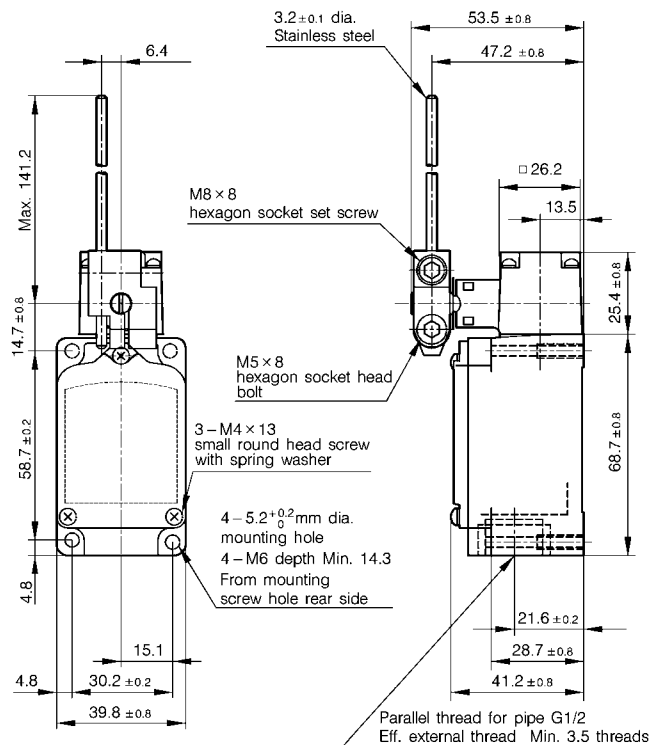


Light operation rod lever type



Catalog listing	1LS10-J	
Operating characteristics	Standard travel, Standard characteristics type	
UL/CSA	○	
*O.F. (N max.)	1.4	
*R.F. (N min.)	0.27	
P.T. (° max.)	20	
O.T. (° min.)	30	
M.D. (° max.)	12	
*T.F. (N max.)	2.0	

Note: Items marked by * are for when the lever length is adjusted to 141.2mm.



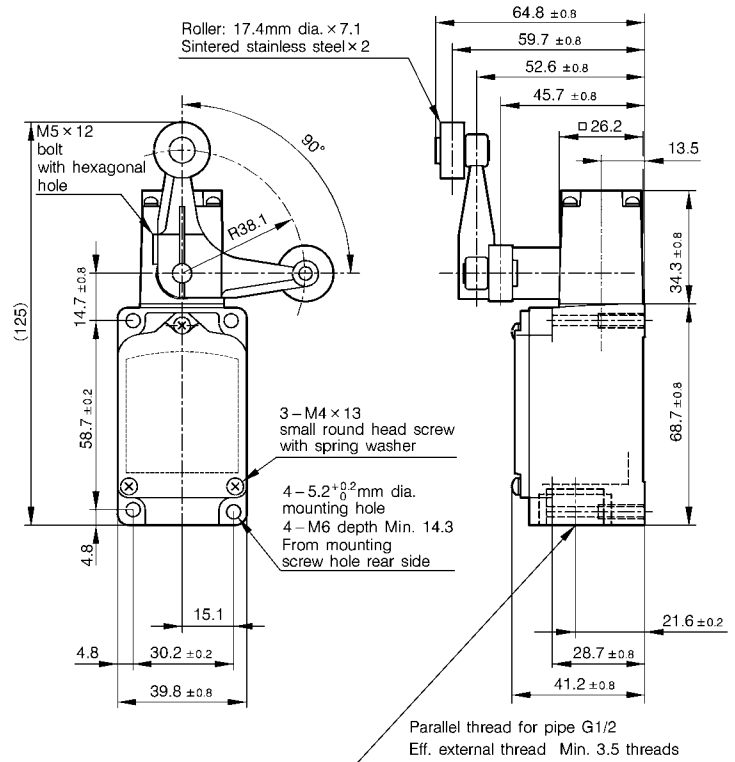
Fork lever lock operation type

(unit: mm)



Actuator shape	Fork lever lock operation type		
	Roller opposite side	Roller same side	No roller lever
Catalog listing	6LS1-J	6LS3-J	6LS2-J
UL/CSA		○	
O.F. (N max.)		13.4	
P.T. (° max.)		60	
O.T. (° min.)		30	
T.T. (°)		90 ± 10	
Mechanical reverse angle (° max)		55	

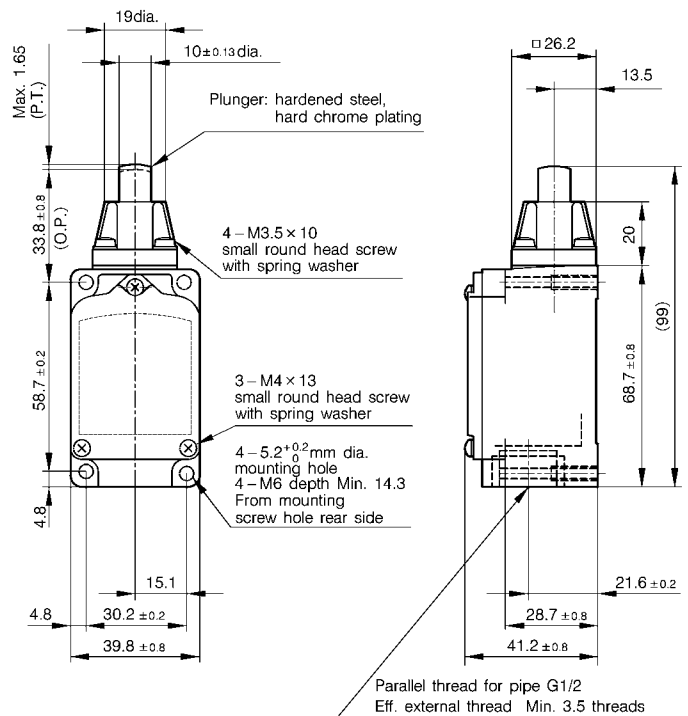
Note: Values for the lever-less type are for when the lever length is adjusted to 38.1mm.



Plunger type

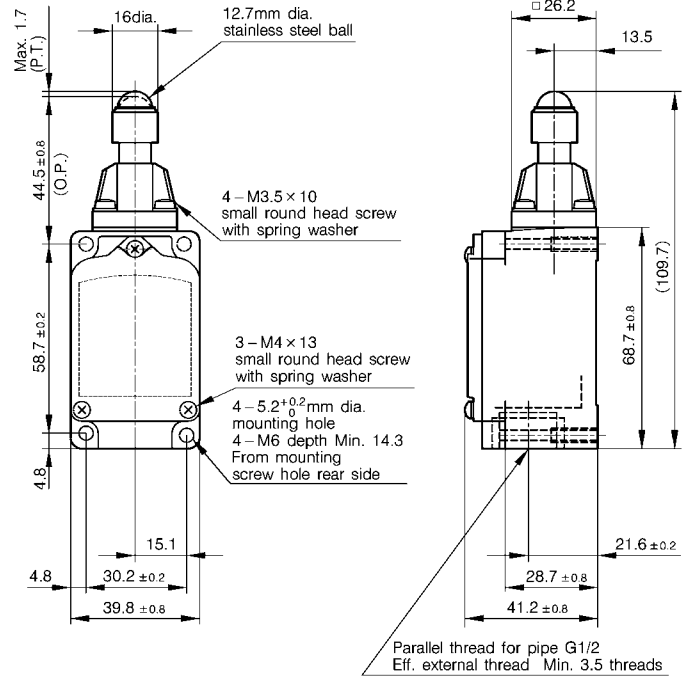


Catalog listing	Standard type	2LS1-J
	Heat-resistant type	2LS1-JH
UL/CSA		○(excluding H type)
O.F. (N max.)		26.7
R.F. (N min.)		8.9
P.T. (mm max.)		1.65
O.T. (mm min.)		6.4
M.D. (mm max.)		0.51



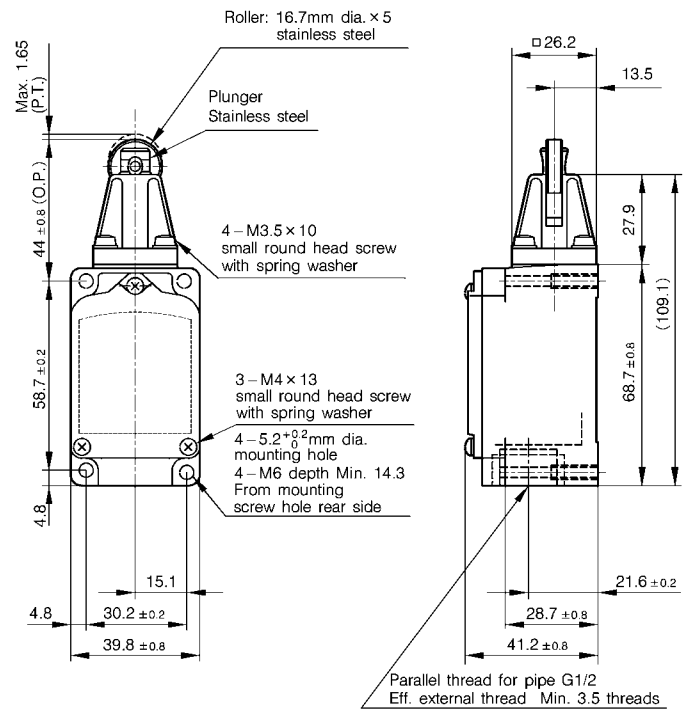
Ball plunger type

(unit: mm)



Catalog listing		2LS-J6
UL/CSA		○
O.F.	(N max.)	26.7
R.F.	(N min.)	8.9
P.T.	(mm max.)	1.7
O.T.	(mm min.)	4.0
M.D.	(mm max.)	0.51

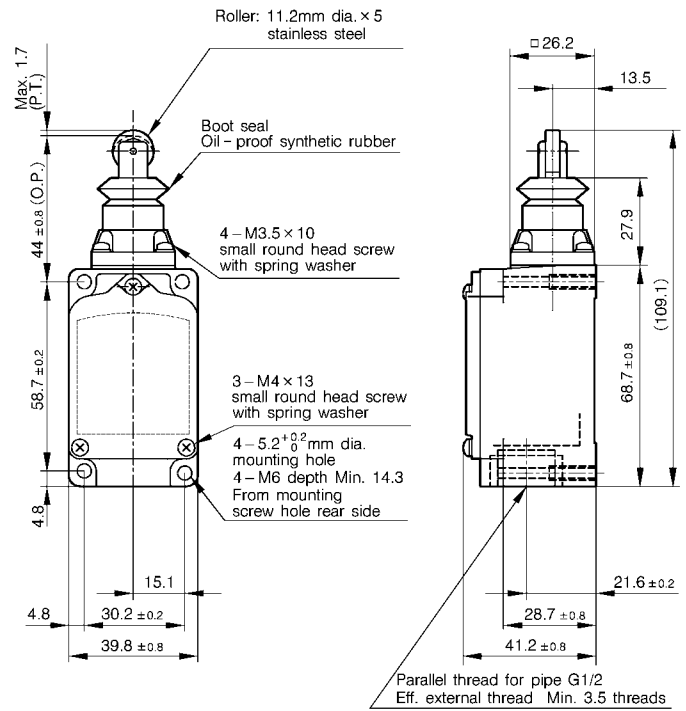
Roller plunger type



Catalog listing	Standard type	5LS1-J
	Heat-resistant type	5LS1-JH
	Cold-resistant type	5LS1-JL
UL/CSA		○(excluding H, L type)
O.F.	(N max.)	26.7
R.F.	(N min.)	8.9
P.T.	(mm max.)	1.7
O.T.	(mm min.)	5.6
M.D.	(mm max.)	0.51

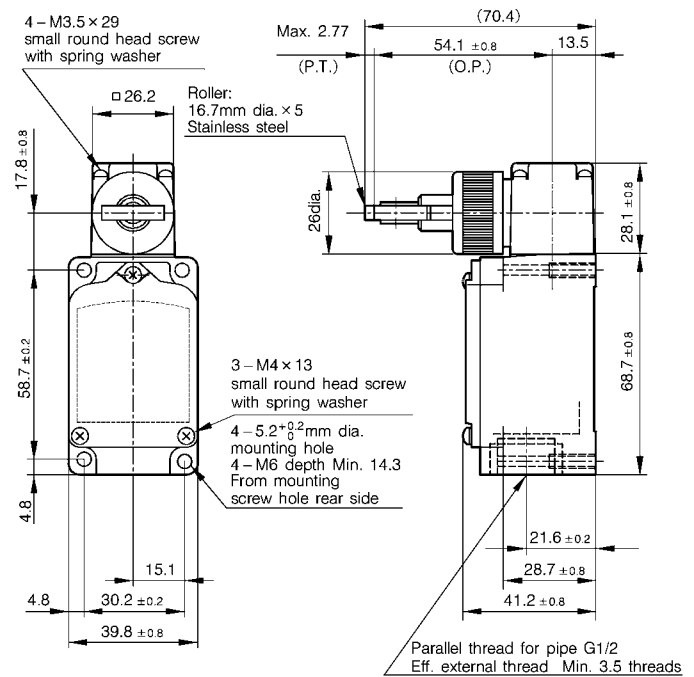
Boot seal roller plunger type

(unit: mm)



Catalog listing	5LS7-J	
UL/CSA	○	
O.F. (N max.)		15.7
R.F. (N min.)		4.4
P.T. (mm max.)		1.7
O.T. (mm min.)		5.6
M.D. (mm max.)		0.51
R.T. (mm min.)		0.38

Side roller plunger



Catalog listing	3LS1-J	
UL/CSA	○	
O.F. (N max.)		40.1
R.F. (N min.)		8.9
P.T. (mm max.)		2.77
O.T. (mm min.)		5.6
M.D. (mm max.)		1.02

Non-directional operation type



8LS3-J

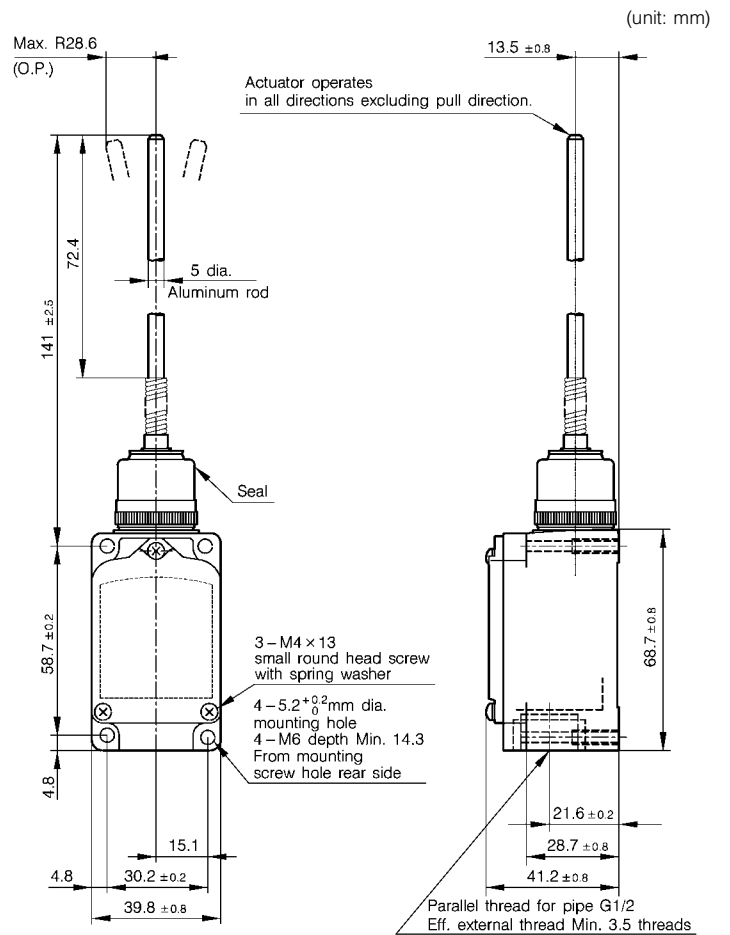


8LS152-J



8LS125-J

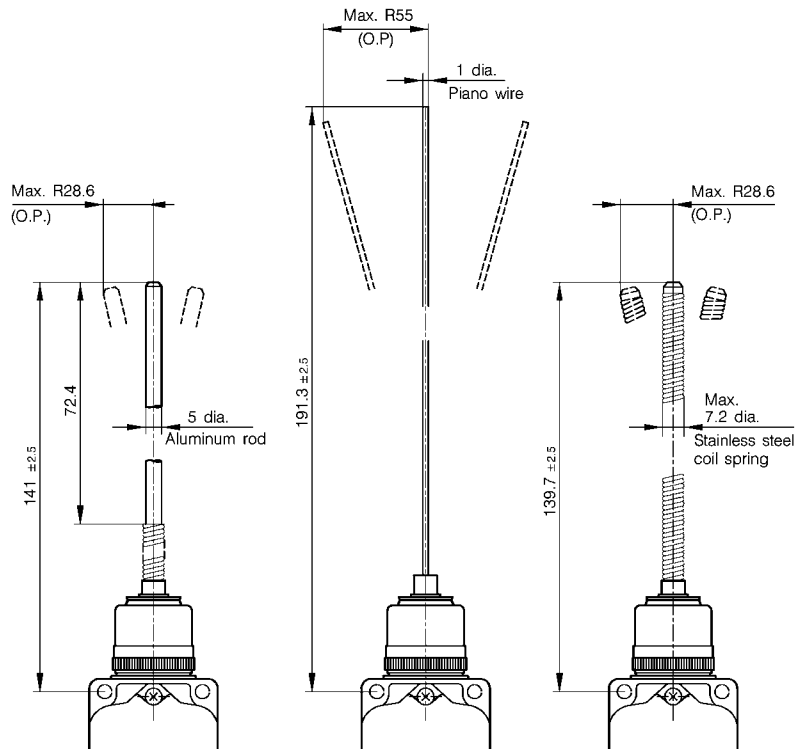
Actuator shape		Non-directional operation type		
		Spring rod	Coil spring	Steel wire
Catalog listing	Standard types	8LS3-J	8LS152-J	8LS125-J
	Heat-resistant type	8LS3-JH	-	-
	Cold-resistant type	-	8LS152-JL	-
UL/CSA		○(excluding H and L types)		
O.F.	(N max.)	1.4	0.28	
P.T.	(mm max.)	28.6	55	



8LS3-J

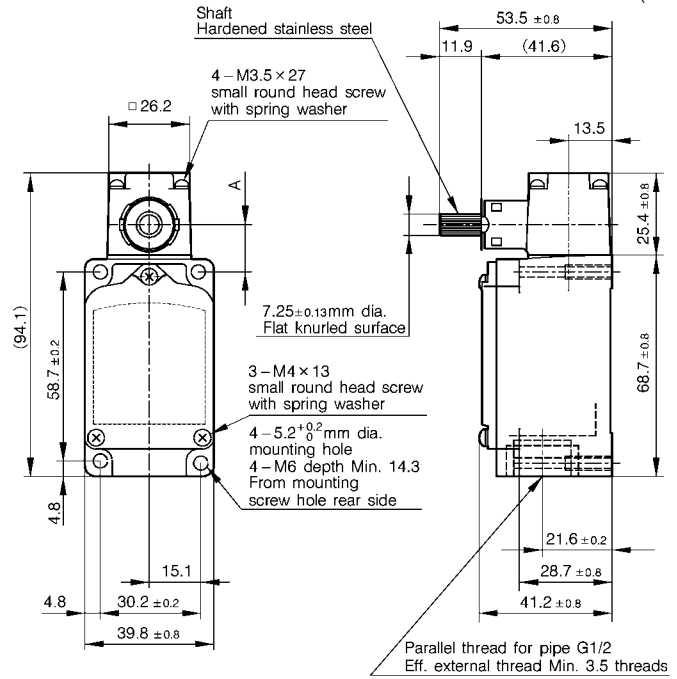
8LS125-J

8LS152-J



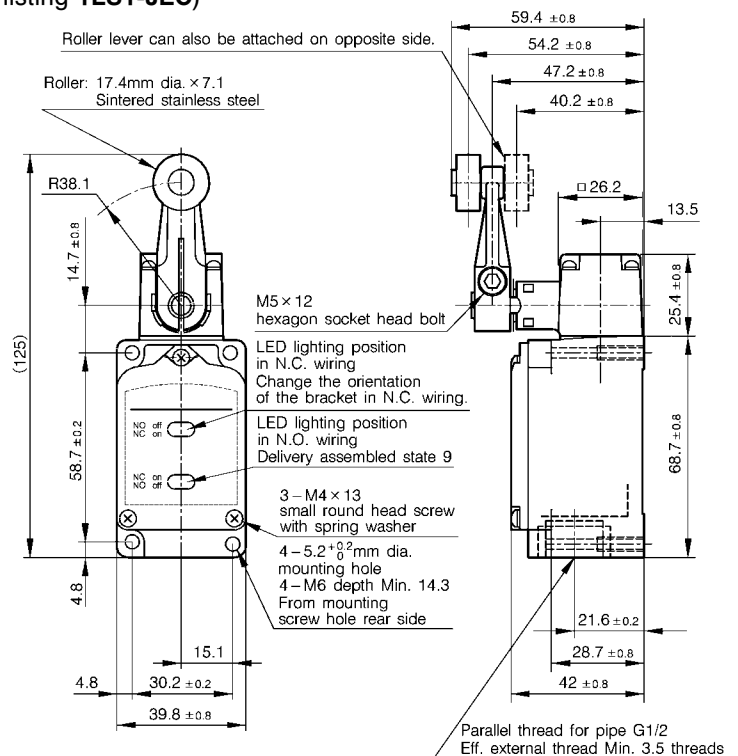
Side rotary type without lever

(unit: mm)



Catalog listing	Standard type	1LS2-J	1LS9-J	1LS-J501	1LS-J551	1LS23-J	1LS-J51
	Heat-resistant type	1LS2-JH	–	–	–	–	–
	Cold-resistant type	–	–	1LS-J501L	–	–	1LS-J51L
	Corrosion-resistant type	1LS2-JM	–	–	–	–	–
Operating characteristics	Standard travel, standard characteristics type	Standard travel, high sensitivity type	High overtravel, standard type	High overtravel, high sensitivity type	Standard travel, light operation standard characteristics type	High overtravel T.T. 90° type	
Approval standards	UL/CSA (excluding H , L and M types)						
O.F. (N-m max.)	0.52		0.34		0.22	0.34	
R.F. (N-m min.)	0.086		0.038		0.029	0.019	
P.T. (° max.)	20	5 ⁺² ₀	20	10 ⁺² ₀	20	30	
O.T. (° min.)	30	30	55	62	30	60	
M.D. (° max.)	12	3	12	5	12	15	
T.F. (N-m max.)	0.69		–		0.29	–	
Catalog listing with lever	1LS1-J	1LS19-J	1LS-J500	1LS-J550	1LS10-J	1LS-J50	
Section A dimensions	14.7 ± 0.8					17.2 ± 0.8	

Roller lever type with lamp indicator (typical catalog listing **1LS1-JEC**)

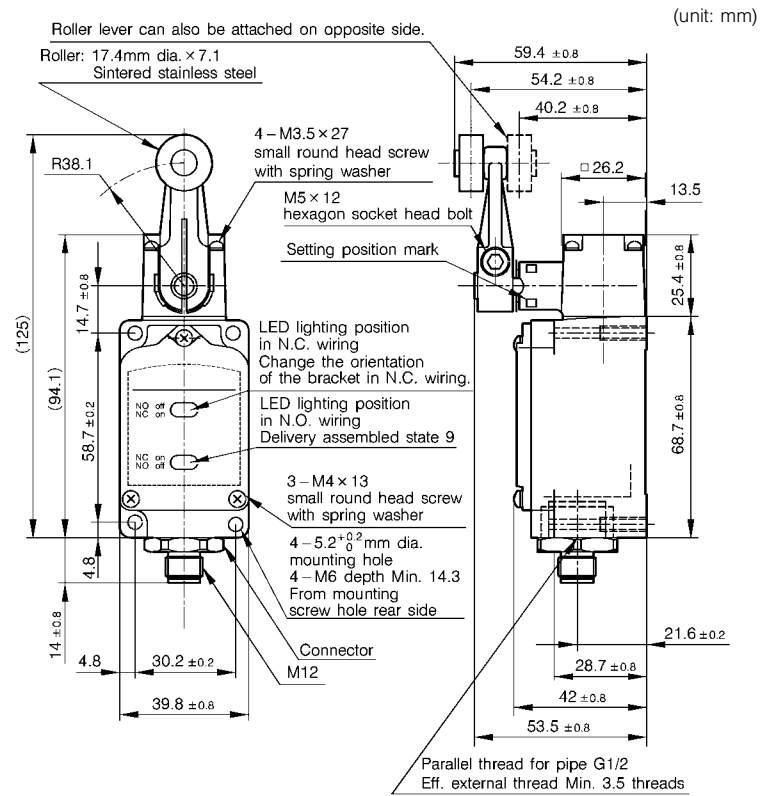


Catalog listing	1LS1-JEC
UL/CSA	○
O.F. (N max.)	13.4
R.F. (N min.)	2.2
P.T. (° max.)	20
O.T. (° min.)	30
M.D. (° max.)	12
T.F. (N max.)	17.9

Note: Dimensions other than the actuator of catalog listing other than **1LS1-JEC** are completely the same.

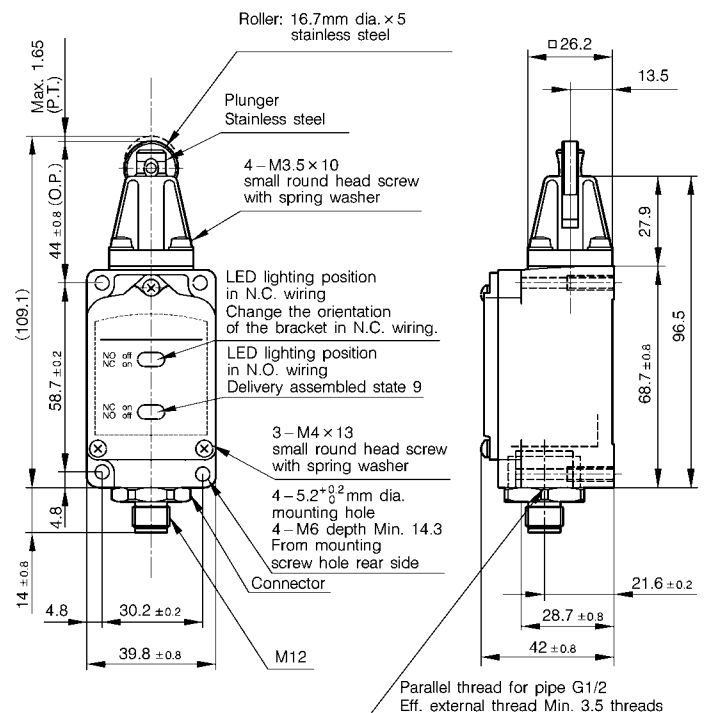
CONNECTOR TYPE APPEARANCE, OPERATING CHARACTERISTICS AND EXTERNAL DIMENSIONS

- Connector type
- Roller lever type



Basic catalog listing		1LS1-J	1LS19-J	1LS-J550
Quick removal connector	For DC	1LS1-JEC-PD	1LS19-JEC-PD	1LS-J550EC-PD
Operating characteristics		Standard travel, standard characteristics	Standard travel, high sensitivity characteristics	High overtravel, high sensitivity characteristics
O.F.	(N max.)		13.4	8.9
R.F.	(N min.)		2.2	0.98
P.T.	(° max.)	20	5^{+2}_0	10^{+2}_1
O.T.	(° min.)	30	30	62
M.D.	(° max.)	12	3	5

- Roller plunger type

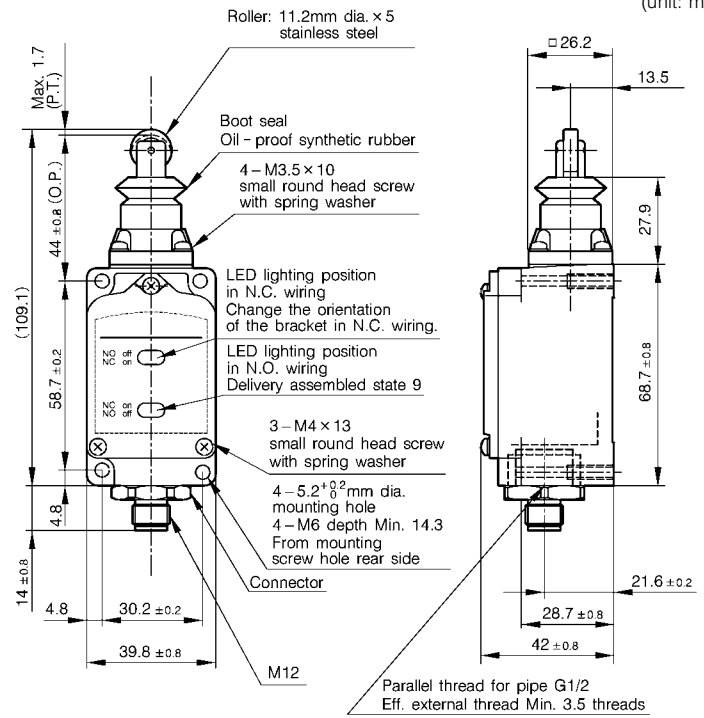


Basic catalog listing		5LS1-J
Quick removal connector	For DC	5LS1-JEC-PD
O.F.	(N max.)	26.7
R.F.	(N min.)	8.9
P.T.	(mm max.)	1.65
O.T.	(mm min.)	5.6
M.D.	(mm max.)	0.51

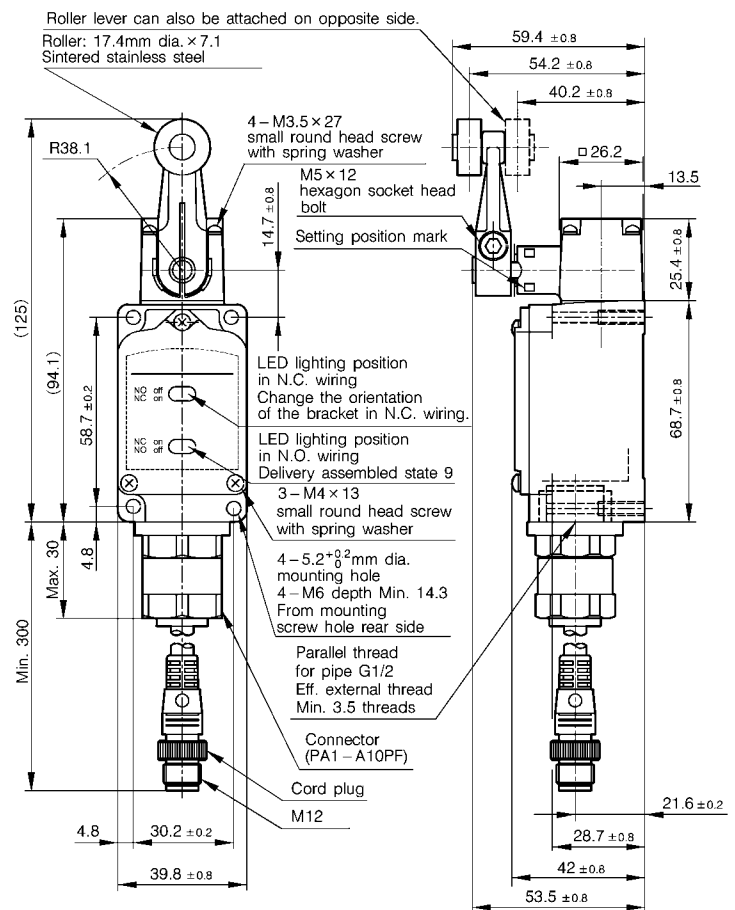
Boot seal roller plunger type

(unit: mm)

Basic catalog listing		5LS7-J
Quick removal connector	For DC	5LS7-JEC-PD
O.F.	(N max.)	15.7
R.F.	(N min.)	4.4
P.T.	(mm max.)	1.7
O.T.	(mm min.)	5.6
M.D.	(mm max.)	0.51



● Pre-leaded connector type
Roller lever type

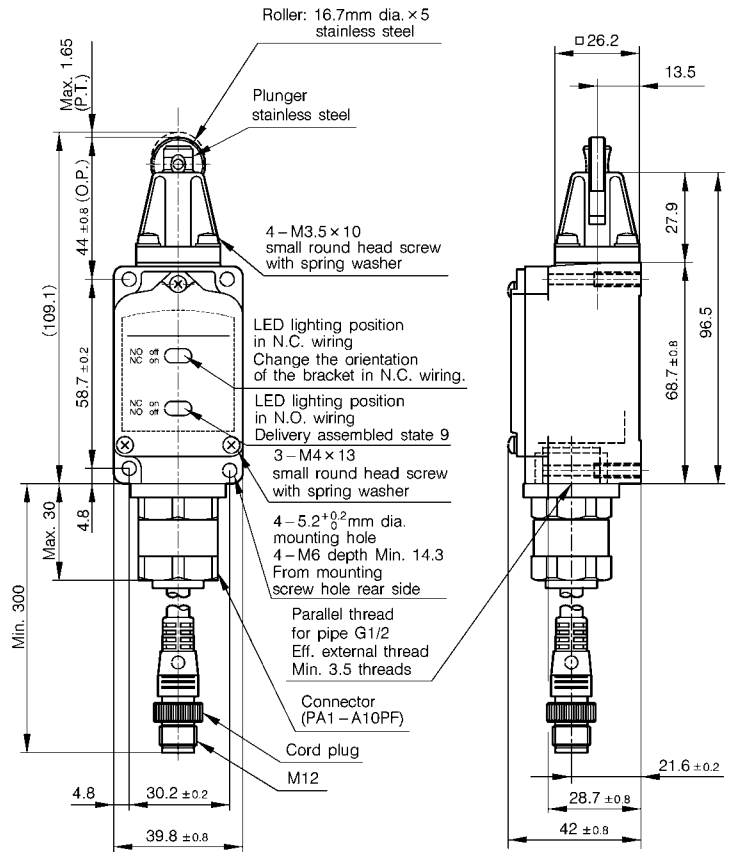


Basic catalog listing		1LS1-J	1LS19-J	1LS-J550
Pre-leaded connector cord length 0.3m	For DC	1LS1-JEC-PD03	1LS19-JEC-PD03	1LS-J550EC-PD03
Operating characteristics		Standard travel, standard characteristics	Standard travel, high sensitivity characteristics	High overtravel, high sensitivity characteristics
O.F.	(N max.)		13.4	8.9
R.F.	(N min.)		2.2	0.98
P.T.	(° max.)	20	5 ⁺² ₀	10 ⁺² ₋₁
O.T.	(° min.)	30	30	62
M.D.	(° max.)	12	3	5

Roller plunger type

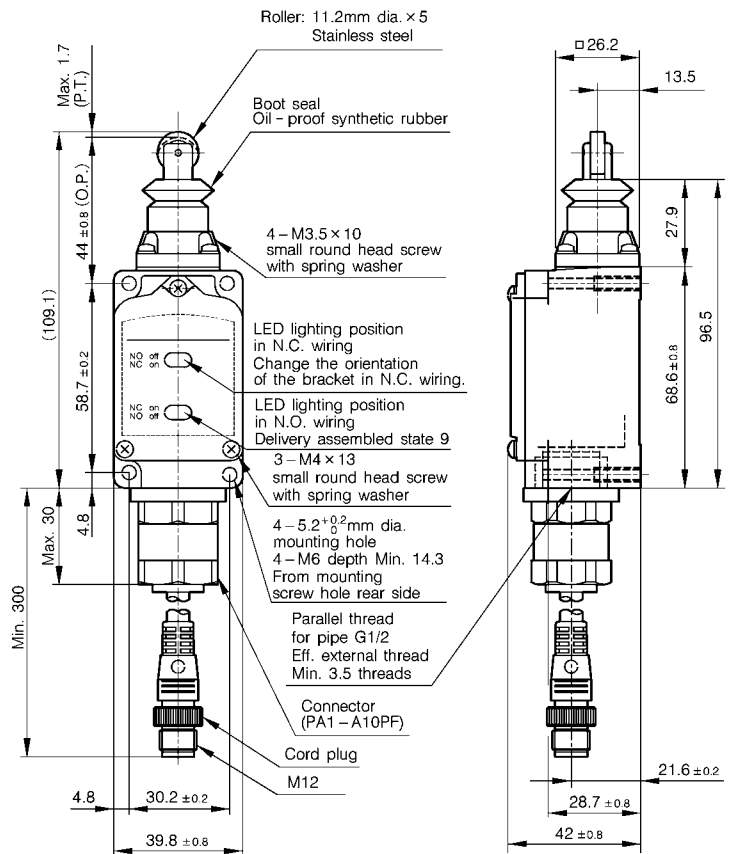
(unit: mm)

Basic catalog listing		5LS1-J
Pre-leaded connector cord length 0.3m	For DC	5LS1-JEC-PD03
O.F.	(N max.)	26.7
R.F.	(N min.)	8.9
P.T.	(mm max.)	1.65
O.T.	(mm min.)	5.6
M.D.	(mm max.)	0.51



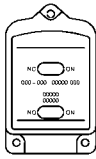
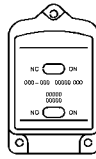
Boot seal roller plunger type

Basic catalog listing		5LS7-J
Pre-leaded connector cord length 0.3m	For DC	5LS7-JEC-PD03
O.F.	(N max.)	15.7
R.F.	(N min.)	4.4
P.T.	(mm max.)	1.7
O.T.	(mm min.)	5.6
M.D.	(mm max.)	0.51

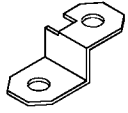


• Options


• Lamp cover

Catalog listing	LS-29PA1 (standard type)	LS-9PAW (spatter-guarded type)	LS-29PAEC (standard type)	LS-9PAWC (spatter-guarded type)
Specifications	Neon lamp for 100/200Vac		LED lamp for 12 to 125Vac/dc	
Appearance				






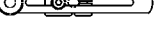



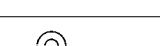


• Switch terminal shorting plate

Catalog listing	Shape
PA-J238 (100 pieces per set)	

• Shaft cover

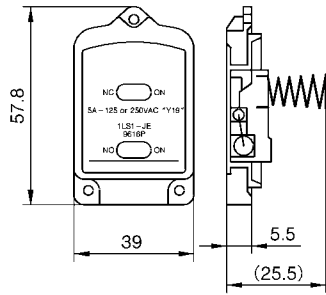
Catalog listing	Material	Shape
PA-J206	NBR	 (10 pieces per set)
PA-J252	Silicon	

• Auxiliary actuators

Catalog listing	Shape	Applicable switch	Lever length	Lever tightening method and material
6PA78-J		1LS Series	38.1	M5 hexagon socket head bolt. Chrome molybdenum steel.
6PA-J148				M5 hexagon socket head bolt. Stainless steel.
6PA78-JW (spatter-guarded type)				M5 hexagon socket head bolt. Stainless steel.
6PA78-JM (stainless type)		1LS Series	38.1	M5 lock nut. Distance across flats 8mm. Stainless steel.
6PA-J45		1LS Series	38.1	M5 double lock nut Distance across flats 8mm. Stainless steel.
6PA-J45W (spatter-guarded type)				M5 double lock nut Distance across flats 8mm. Stainless steel.
LS-6PA79-201		1LS Series	50	M5 hexagon socket head bolt. Stainless steel.
PA-J11		1LS Series	60	M5 hexagon socket head bolt. Chrome molybdenum steel.
6PA44-J		1LS Series	26 to 89	M5 hexagon socket head bolt. Chrome molybdenum steel.
LS-6PA58				M5 hexagon socket head bolt. Chrome molybdenum steel.
6PA-J54		1LS Series	26 to 89	M5 double lock nut. Distance across flats 8mm. Stainless steel.
6PA63-J		1LS Series	604.6	M5 hexagon socket head bolt. Chrome molybdenum steel.
6PA-J40		1LS Series	255	M5 lock nut. Distance across flats 8mm.
6PA43-J		1LS10-J Series	141.2 Max.	M5 hexagon socket head bolt. Chrome molybdenum steel.
6PA-J176				M5 hexagon socket head bolt. Stainless steel.
6PA74-J (same side on roller)		6LS Series	38.1	M5 hexagon socket head bolt. Chrome molybdenum steel.
6PA80-J (both sides of roller)		6LS Series	38.1	M5 hexagon socket head bolt. Chrome molybdenum steel.

EXTERNAL DIMENSIONS OF AUXILIARY PARTS

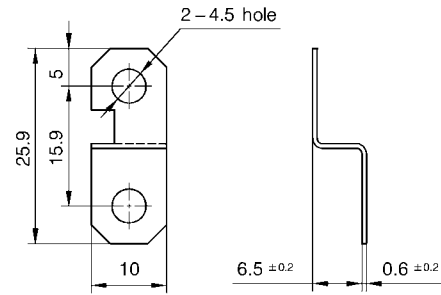
Lamp cover



**LS-29PA1, LS-9PAW
LS-29PAEC, LS-9PAWC**

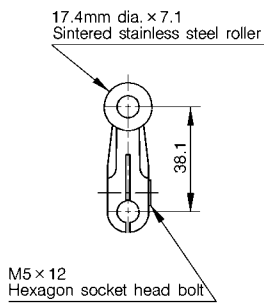
Switch terminal shorting plate

(unit: mm)

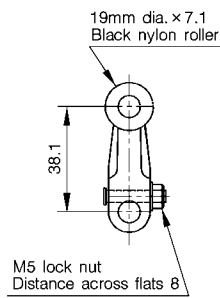


PA-J238

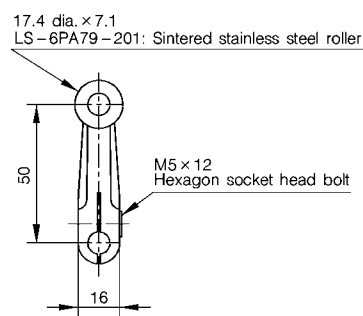
Auxiliary actuators



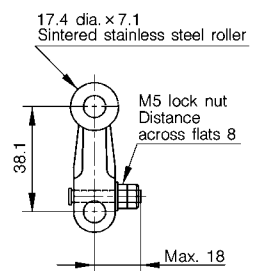
**6PA-J148, 6PA78-J
6PA78-JW**



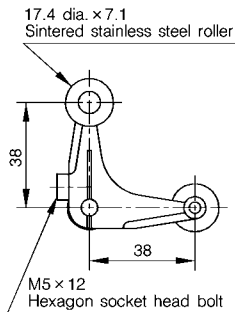
6PA78-JM



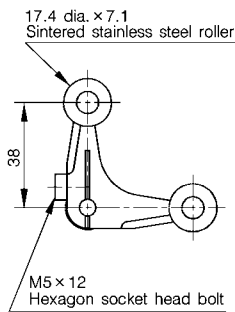
LS-6PA79-201



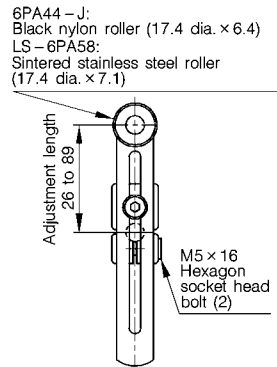
**6PA-J45
6PA-J45W**



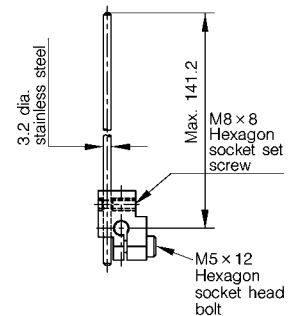
6PA80-J



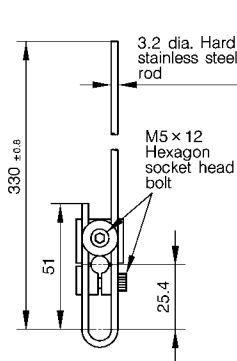
6PA74-J



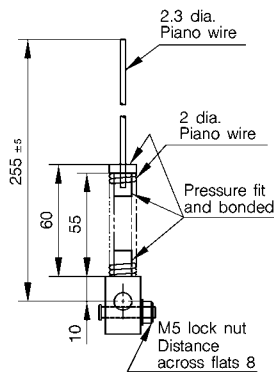
**6PA44-J
LS-6PA58**



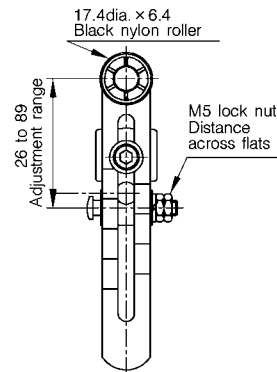
**6PA43-J
6PA-J176**



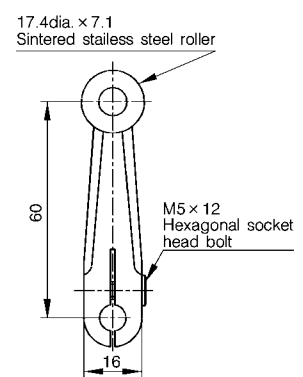
6PA63-J



6PA-J40



6PA-J54



6PA-J11

WHEN USING LS SERIES LIMIT SWITCHES

1. Changing the position of the operation head

The operation head can be set to four positions.

To set to the desired position, remove the four head tightening screws, and rotate the head to one of the four different 90° positions.

When the direction of the operation head has been changed, also change the direction of the internal plunger at the same time.

The roller plunger can be set to one of two different 90° positions.

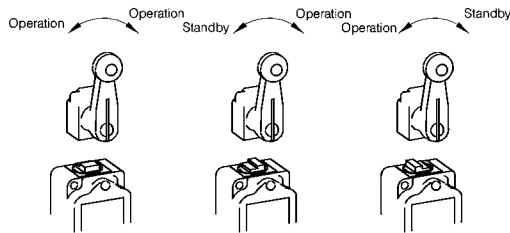


2. Changing the operating direction of roller lever type

The operation direction can be set to three sequences.

(excluding **1LS-J500**, **1LS-J550** and **1LS-J50**)

Lever type limit switches can be set electrically to move in both directions, clockwise or counterclockwise by changing the direction of the internal stepped plunger.

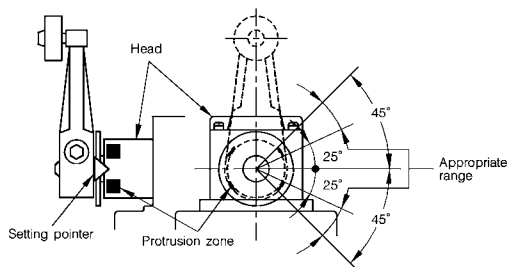


3. Indicating the operation set position on the roller lever type

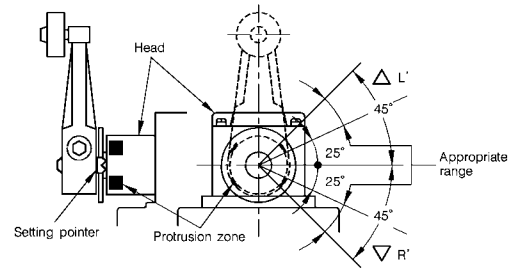
Excessive or insufficient pushing of the lever can be eliminated to ensure stable prolonged use by setting so that the setting pointer that rotates together with lever movement enters the head's protrusion zone.

The position of the protrusion zone varies according to differences in catalog listing, for example, standard, high sensitivity and T.T.90° types.

3.1 Standard type (1LS1-J□, 1LS-J50□ Series)

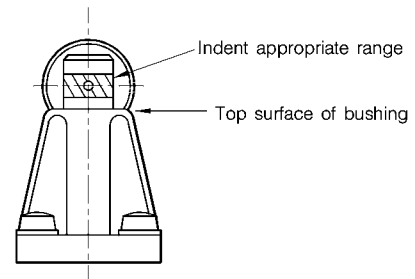


3.2 High sensitivity type (1LS19-J□, 1LS-J55□ Series)



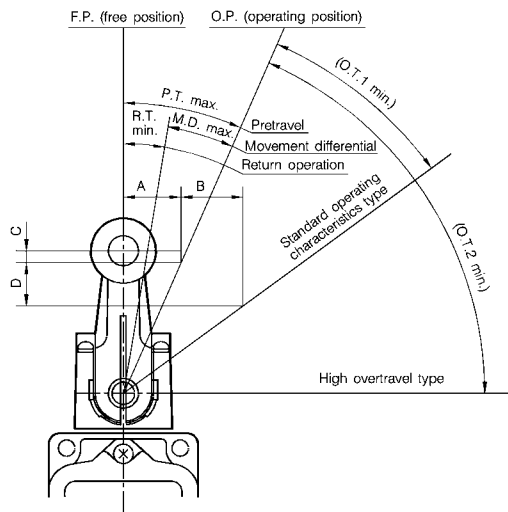
4. Indicating the operation set position of roller plunger type (5LS1-J□)

The indent on the roller plunger is for preventing excessive or insufficient plunger operation. Determine the position of the actuating element so that the indent on the plunger fits into the top surface of the bushing.



5. How to Set the Actuating element

5.1 Roller lever type



Symbol Model	Operating angle (°)				
	P.T.	O.T.1	O.T.2	R.T.	M.D.
1LS1-J□	20	30	–	5	12
1LS19-J□	5 ⁺² ₀	30	–	1.5	3
1LS-J500□	20	–	55	5	12
1LS-J550□	10 ⁺² ₋₁	–	62	5	5

Symbol Model	Operating force (N)			Operating distance (mm)			
	O.F.	R.F.	T.T.F.	A	B	C	D
1LS1-J□	13.4	2.2	17.9	13.0	16.1	2.3	11.3
1LS19-J□	13.4	2.2	17.9	3.3	18.5	0.1	6.7
1LS-J500□	8.9	0.98	–	13.0	23.8	2.3	25.9
1LS-J550□	8.9	0.98	–	6.6	29.6	0.6	25.7

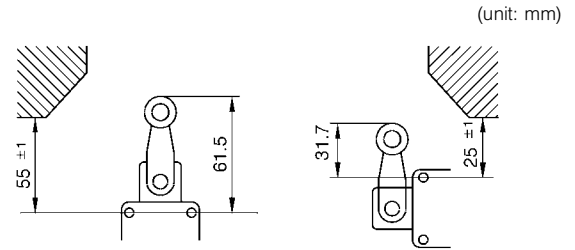
Note: The meaning of symbols in the above table is as follows:
P.T. : Pretravel
O.T.1 : Overtravel (standard operating characteristics switch)
O.T.2 : Overtravel (high overtravel type switch)
R.T. : Return operation
M.D. : Movement differential
O.F. : Operating force
R.F. : Release force
T.T.F. : Total travel force

5.2 Height from switch mounting hole to actuating element

• Roller lever type

We recommend the following values as the height from the switch mounting hole to the actuating element on roller lever type switches:

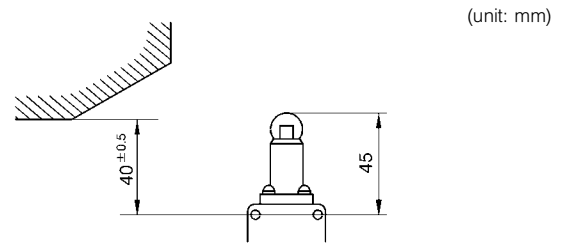
(Example: **1LS1-J**)



• Roller plunger type

We recommend the following values as the height from the switch mounting hole to the actuating element on roller plunger type switches:

(Example: model No. **5LS1-J**)



6. Handling Connector and Pre-leaded Connector

6.1 Tightening the fixing cap ring and outside screw lock ring

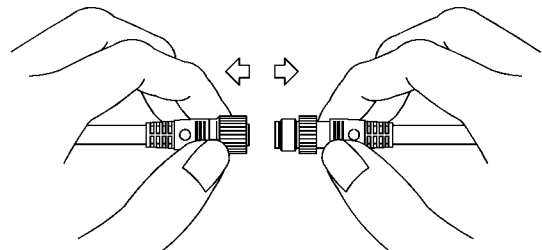
When the screw of the mating part is made of resin, the threads may be damaged when the connector is first tightened.

When assembling the connector, align the center of the cores, push in as far as possible, and 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.

Also, if the connector is not tightened firmly, IP67 protection may become insufficient, or may result in the connector becoming loose.

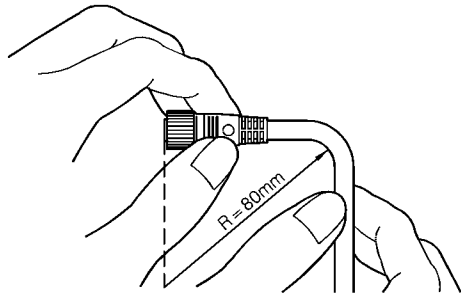


6.2 Inserting and Removing Connectors

Before inserting or removing connectors, be sure to turn the power OFF. When removing connectors, do not pull the cord. Be sure to hold the connector by its body when removing.

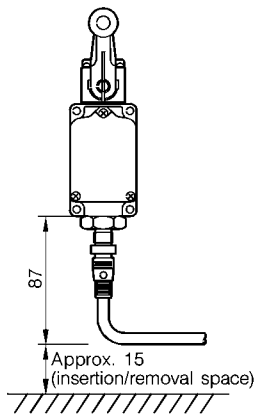
6.3 Cautions when folding and bending cords

The minimum bending radius (R) of the cord is 80mm.
Provide sufficient margin when bending cords.



6.4 Connector type assembly method

(unit: mm)



6.5 Cautions when replacing connectors

When removing connectors to replace the switch or cord, fully wipe the connector and the surrounding area to remove any water. After removing the connector, prevent the connector from being immersed in chemicals or in powder, or being dropped. If the connector is immersed in a fluid, allow the connector to fully dry before connecting again. If the connector is dropped in powder, fully wipe off any powder before connecting again. Failure to observe the above may result in short circuits or prevent the connector from being connected.

7. Other

7.1 Protective structure

- IP67 protection does not assure watertightness (complete waterproofing).
Avoid use accompanied by constant contact with water.
- Avoid use in a state where external force is applied at all times on the connector connecting section.
- Do not use the body as a step or place heavy objects on the body.

7.2 Ensuring sealability

- 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 the seal connector compatible with the cord in use when wiring.

- When the screws in the head or covers are loosened to change the operating direction of the switch, or the relationship between the switch operation indication and lamp indication (during switch standby: lamp ON → during switch operation: lamp ON), tighten the screws at the recommended tightening torque to ensure sealability.

<Recommended tightening torque>

Cover: 1.3 to 1.7N-m (M4 screw)

Head: 0.8 to 1.2N-m (M3.5 screw)

7.3 Attaching switches

- Tighten each of the parts on limit switches according to the appropriate tightening torques listed in the performance tables.
Overtightening screws leads to damage to screws and other parts. Alternately, insufficient tightening of screws results in a drop in switch sealability and performance such as various characteristics.
- Do not leave or use covers and conduit parts opened.
Water or dirt and dust may enter, which causes malfunction.
- Prevent from contacts the lever body or head. Failure to do so might deform the actuator or cause defective switch return.
- Do not use silicon rubber electrical lead, silicon adhesive or grease containing silicon. Doing so might result in defective electrical conduction.

7.4 Wiring

- Do not perform wiring with the power ON.
Doing so might cause electric shock, or the machine may start suddenly causing unexpected accidents.
- 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 seal connectors (**PA1** Series, etc. sold separately) or flexible piping (**PA3** Series) that have IP67 or equivalent sealability on conduits.
- Firmly tighten covers and conduits. If covers and conduits are not sufficiently tightened, not only sealability will be impaired and cause defective insulation, but also switch performance may no longer be ensured.

7.5 Adjusting switches



- Do not apply excessive force (5 times of O.F.) to the actuator beyond the operating limit position. Doing so might damage the switch.
- Limit overtravel to 70 to 100% of the specified characteristic values.
Small overtravel might cause the contacts to rattle due to vibration and impact, or may result in defective contact.

SPATTER-GUARDED TYPE

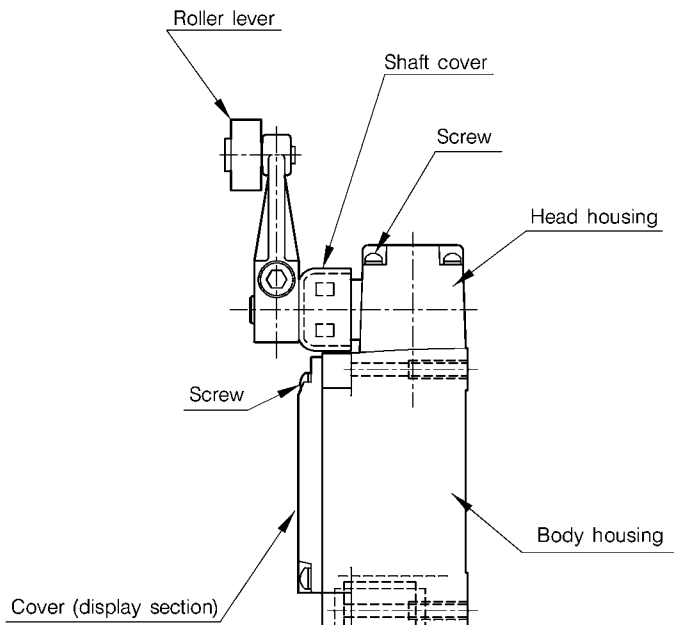
- Countermeasures for preventing adhesion of spatter have been adopted.
- With setting position indication function for facilitating initial setup.
- The lamp indication cover can be confirmed by lighting over a wide range.



ORDER GUIDE

Actuator		Operating characteristics			Basic catalog listing W2	Options			
Name	Shape	O.F. (max.) operating force	P.T. (max.) (pretravel)	T.T. (min.) (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 over-travel 75°	1LS61-JW2	1LS61-JWC	1LS61-JW	–	–
		High sensitivity type	10°	High over-travel 72°	1LS71-JW2	1LS71-JWC	1LS71-JW	1LS71-JSW2	1LS71-JSWC
		High sensitivity type	10°	High overtravel 72° double nut tightening lever	–	1LS74-JWC	–	–	–
Boot seal roller plunger type		15.7N	1.7mm	7.3mm	–	5LS7-JWC	5LS7-JW	–	5LS7-JSWC

COUNTERMEASURES FOR PREVENTING ADHESION OF SPATTER



Location	Description of countermeasure
Cover	<ul style="list-style-type: none"> • Heat-resistant resin (210°C) is used in the cover screen to scatter spatter. • Heat-resistant paint is used.
Head	<ul style="list-style-type: none"> • Spatter-resistant Teflon is used as the shaft cover material. • The gap between the housing and lever of the head has been eliminated.
Screw roller	<ul style="list-style-type: none"> • Spatter-resistant stainless steel is used on screws and roller, and ± screws are used for easy removal of spatter.
Paint	<ul style="list-style-type: none"> • Paint is treated to be heat-resistant (120°C).

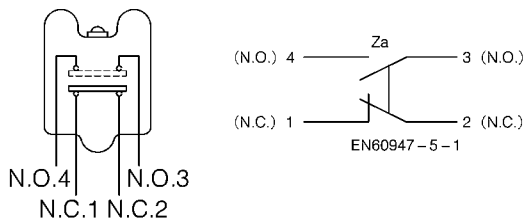
PERFORMANCE

Catalog listing		1LS61-J□□, 1LS71-J□□, 1LS74-J□□, 5LS7-J□□			
External standard	Conformed standards		JIS C 4508/JIS C 8201-5-1		
	Approval standards		UL/CSA		
Structure	Contact type		2-circuit double break		
	Terminal shape		M4 screw (switch terminal screw)		
	Contact shape		Rivet		
	Protective structure		IP67 (IEC 529)		
Electrical performance	Electrical rating		See Table 1.		
	Dielectric strength	Between non-continuous terminals		1,000Vac, 50/60Hz for 1 minute	
		Between each terminal and non-conducting metal part:		2,000Vac, 50/60Hz for 1 minute	
	Insulating resistance		Min. 100M Ω (by 500Vdc megger)		
	Initial contact resistance		Silver: Max. 50m Ω (6 to 8Vdc, energizing current 1A, voltage drop method) Gold-plated: Max. 100m Ω (6 to 8Vdc, energizing 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		Withstand load 5 times O.F. (operating direction for 1 minute)		
	Terminal strength		Withstand tightening torque strength of 1.5N-m for 1 minute		
	Impact resistance		Contact release of 1ms max. at 300m/s ² free position and operating limit positions		
	Vibration resistance		1.5mm peak-to-peak amplitude, frequency 10 to 55Hz, for 2 continuous hours, contact release of 1ms max. at free position and operating limit positions		
	Allowable operating speed		1LS type: 1.7mm/s to 0.5m/s 5LS7-J□□ : 0.2mm/s to 0.5m/s		
	Mechanical operating frequency		Max. 120 operations/minute		
Life	Mechanical life		Min. 10 million operations		
	Electrical life	Model	Standard load built-in switch	Standard load double seal type built-in switch	Low current load built-in switch
		Life	Min. 500,000 operations (rated load)	Min. 200,000 operations (rated load)	Min. 2 million operations (rated load)
	Operating frequency: Above conditions must be satisfied at 20 operations/minute.				
Environmental conditions	Operating temperature range		Standard type: -10 to +70°C (freezing not allowed) Double Seal type: -5 to +70°C		
	Operating humidity range		Max. 98%RH		
Recommended 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 with neon lamp		12 to 125Vac/dc with LED lamp	
Type	Catalog listing	Electrical rating	Catalog listing	Electrical rating	Catalog listing	Electrical rating
Standard characteristics type	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 characteristics double seal type	5LS1-JSW2	125, 250, 480Vac -5A 125Vac-1/2HP 250Vac-1/4HP 125Vdc-0.8A 250Vdc-0.4A	5LS1-JSW	125, 250Vac-5A	5LS1-JSWC	125Vac-5A 125Vdc-0.8A
High sensitivity characteristics type	1LS7□-JW2	125, 250, 480Vac -10A 125Vac-1/2HP 250Vac-1/4HP 125Vdc-0.4A 250Vdc-0.2A	1LS7□-JW	125, 250Vac-5A	1LS7□-JWC	125Vac-5A
High sensitivity characteristics double seal type	1LS7□-JSW2	125, 250, 480Vac -5A 125Vac-1/2HP 250Vac-1/4HP	1LS7□-JSW	125, 250Vac-5A	1LS7□-JSWC	125Vac-5A

● Circuit diagram



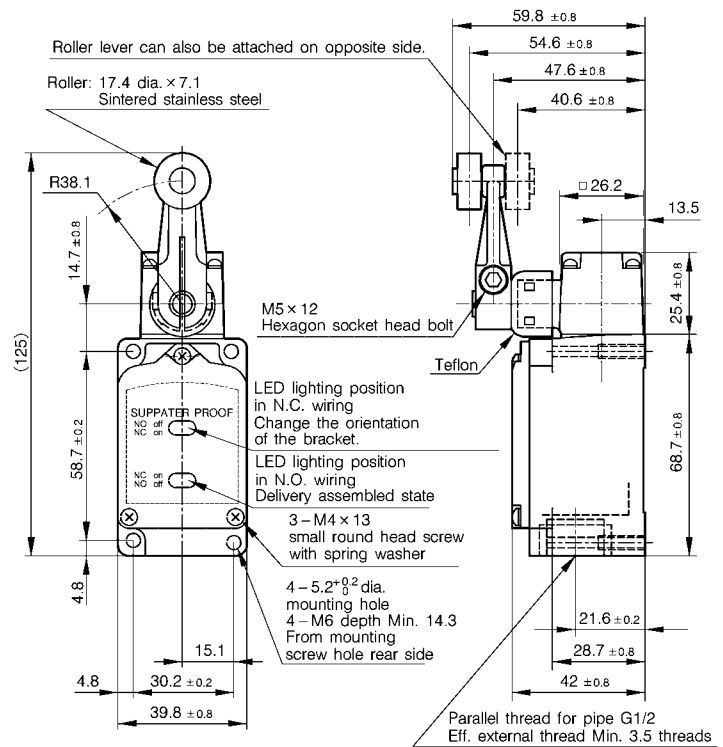
INDICATOR LAMPS

Option	Without indicator lamp	With neon lamp 100/200Vac	With LED lamp 12 to 125V, common to AC and DC				
Catalog listing	□LS□□-JW2	□LS□□-JW	□LS□□-JWC				
Lamp cover front side	-						
Circuit diagrams							
Note	-	Note: To confirm lighting of the neon lamp, use at voltage min. 75Vac.	Note 1: The power voltage of the indicator lamp (red LED) is 12 to 125V. The indicator lamp operates by either AC or DC power. Note 2: When the power voltage of the indicator lamp is 100V, the max. energizing current of 1.4mA, and 2.0mA at 125V.				
Lamp cover catalog listing (repair part)		LS-9PAW	LS-9PAWC				
Specifications	Operating voltage	100 to 200Vac		12 to 125V, common to AC and DC			
		100Vac	200Vac	12V	24V	48V	100V
	Energizing current	Approx. 0.5mA	Approx. 1.5mA	Approx. 0.2mA	Approx. 0.6mA	Approx. 0.7mA	Approx. 0.9mA
	Resistance value	100kΩ		33kΩ			

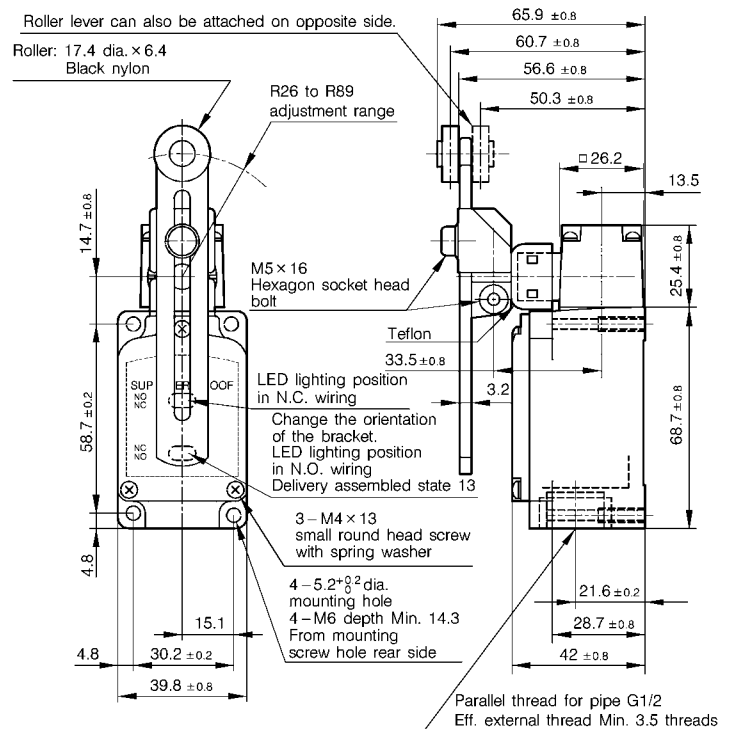
APPEARANCE, OPERATING CHARACTERISTICS AND EXTERNAL DIMENSIONS

Side rotary type

(unit: mm)



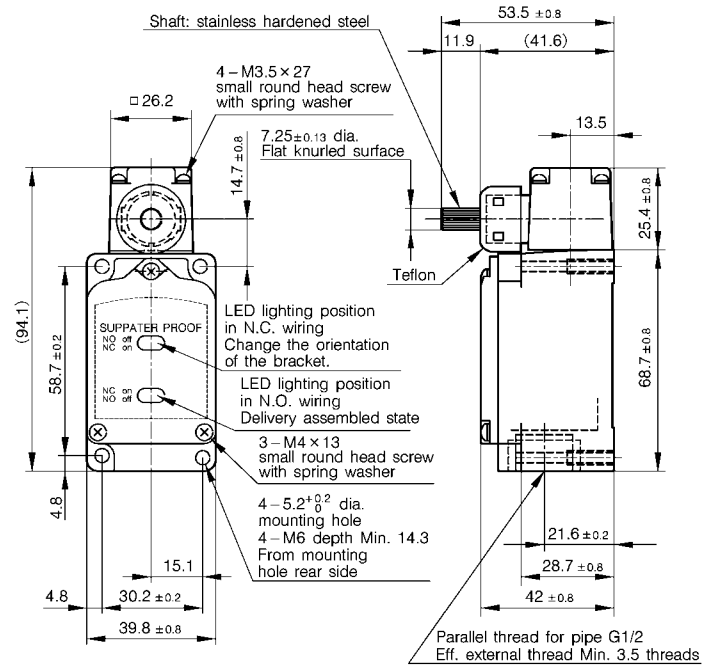
Standard roller lever type



Adjustable roller lever type

Side rotary type (continued)

(unit: mm)

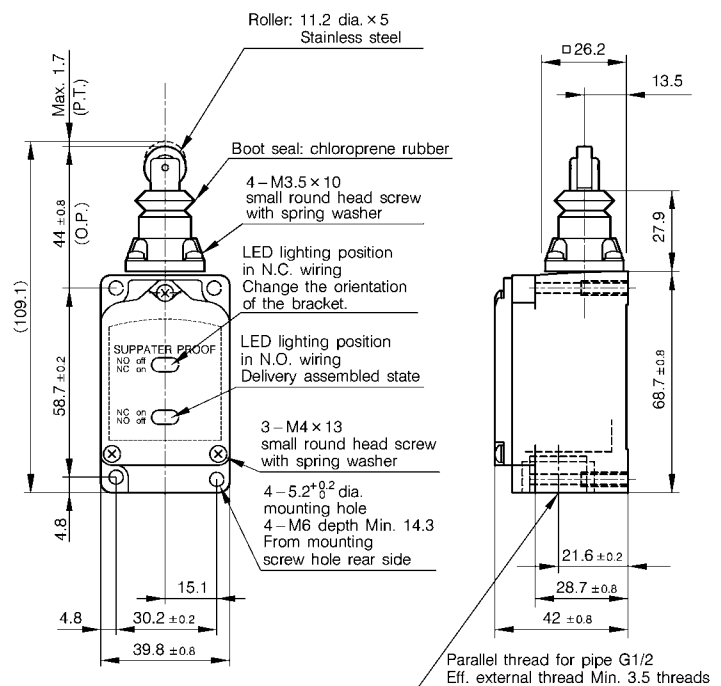


Lever-less type

Item		Side rotary type	
		High overtravel standard characteristics type	High overtravel high sensitivity characteristics type
Catalog listing	Without indicator lamp	1LS6□-JW2	1LS7□-JW2
	100/200Vac with neon lamps	1LS6□-JW	1LS7□-JW
	12 to 125Vac/dc with LED lamp	1LS6□-JWC	1LS7□-JWC
Approval standards		UL/CSA	
O.F.	(N max.)	8.9	
R.F.	(N min.)	0.98	
P.T.	(° max.)	20	10 ⁺² ₋₁
O.T.	(° min.)	55	62
M.D.	(° max.)	12	5

Note: All operation characteristic values of side rotary type are values when the lever length is 38.1mm.

Boot seal roller plunger type

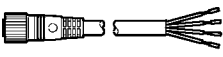


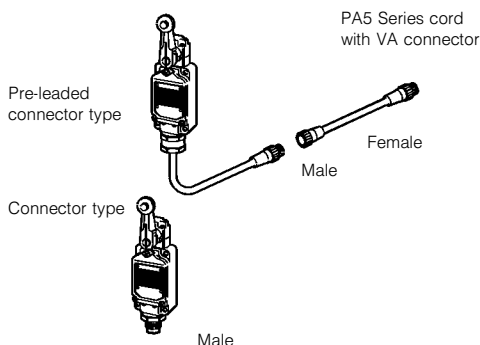
Catalog listing	Without lamp indicator	5LS7-JW2
	100/200Vac with neon lamp	5LS7-JW
	12 to 125Vac/dc with LED lamp	5LS7-JWC
Approval standards		UL/CSA
O.F.	(N max.)	15.7
R.F.	(N min.)	4.4
P.T.	(mm max.)	1.7
O.T.	(mm min.)	5.6
M.D.	(mm max.)	0.51
R.T.	(mm min.)	0.38

CORD WITH CONNECTOR

Be sure to use **PA5** Series cords with **VA** connector for connecting pre-leaded type connectors and connector type limit switches.

● PA5 Series cord with VA connector

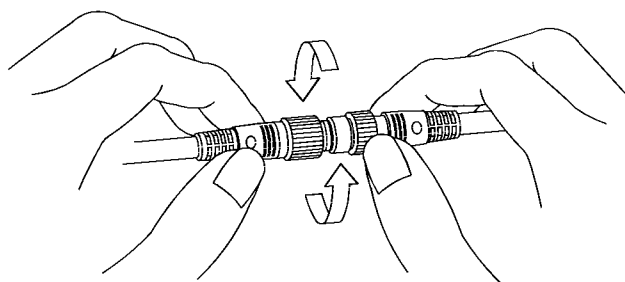
Shape	Cord characteristics	Power supply	Cord length	Catalog listing	Lead color
	Spatter-resistant	AC	2m	PA5-4JSX2WK	1-Brown, 2-White 3-Blue, 4-Black
			5m	PA5-4JSX5WK	
		DC	2m	PA5-4ISX2WK	
			5m	PA5-4ISX5WK	







● Tightening the connector

Align both of the grooves, rotate the tightening screw on the **PA5** cord with the **VA** connector, and firmly tighten the screw on the limit switch by hand.

Limit switch side PA5 cord with VA connector



For AC		For DC	
Switch side (male)	VA connector side (female)	Switch side (male)	VA connector side (female)
			

Note: The shape of the key differs on plugs and sockets for AC and DC connectors and is not mutually compatible.

CONNECTOR SPECIFICATIONS Note 1

Item	Specification details	
Operating voltage/ current range	For AC: Min. 5V-5mA, max. 250V-3A For DC: Min. 5V-5mA, max. 125V-3A	
Insulating 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 (when 3A current is supplied to combined male and female connectors. Lead semiconductor specific resistance not included.)	
Connector withstand stress	0.4 to 4.0N per contact	
Number of connector insertions	50 times	
Connector tightening strength	Min. 0.8N-m Note 2	
Cord pullout strength	Min. 100N	
Vibration resistance	10 to 55Hz, 1.5mm peak-to-peak amplitude, for 2 hours in X, Y and Z directions	
Impact resistance	300m/s ² , 3 times in each X, Y and Z directions	
Protective structure	IP67	
Operating ambient temperature	- 10 to +70°C	
Storage ambient temperature	- 20 to +80°C	
Operating ambient humidity	Max. 95%RH	
Material	Contact	Gold-plated brass
	Contact holder	Glass-lined polyester resin
	Housing	Polyester elastomer
	Coupling	Brass (DC type: Ni-plated, AC type: orange-coated)
	O-ring	NBR

Note 1: Specifications according to combined use with a Yamatake **VA** connector **PA5** Series.

Note 2: The recommended tightening torque is 0.4 to 0.6N-m. If the connector is not tightened firmly, IP67 protection may become insufficient, or may result in loosening of the connector. Tighten firmly by hand.

PRECAUTIONS UPON USE

● Connecting switches with lamp indicators

• Series connection:

Up to six switches can be connected in series when the power voltage is 100V. Programmable controllers can also be connected in series.

The brightness of the LED lamp is a fixed brightness regardless of the power voltage as light is generated by a built-in fixed-current diode.

• PC connection possible:

The leakage current when the limit switch is not operating is a maximum 1.3mA. The PC does not malfunction due to dark lighting of the LED. Moreover, a fixed-current diode is built in to ensure a fixed LED brightness regardless of the power voltage.

● Handling of connector/pre-leaded connector type switches

• Tightening the fixing cap ring and outside screw lock ring

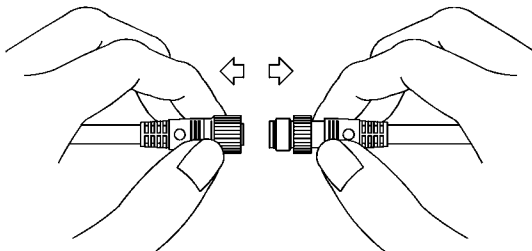
When the screw of the mating part is made of resin, the threads may be damaged when the connector is first tightened.

When assembling the connector, align the center of the cores, push in as far as possible, and tighten.

Be sure to tighten firmly by hand. The recommended tightening torque is 0.4 to 0.6N·m.

Use of a tightening tool may damage the connector.

Also, if the connector is not tightened firmly, IP67 protection may become insufficient, or may result in the connector becoming loose.



• Inserting and removing connectors

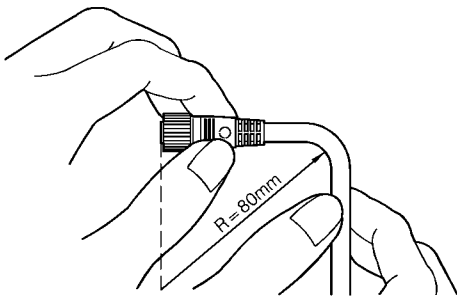
Before inserting or removing connectors, be sure to turn the power OFF.

When removing connectors, do not pull the cord. Be sure to hold the connector by its body when removing.

• Cautions when folding and bending cords

The minimum bending radius (R) of the cord is 80mm.

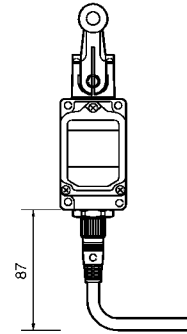
Provide sufficient margin when bending cords.



● Assembly method with connector type switches

(The below dimension is the dimension when the connector is assembled. Add the insertion/removal (approx. 15mm) space during actual fitting.)

• In the case of a connector type limit switch/straight type PA5 (unit: mm)



● Protective structure

- IP67 protection does not assure watertightness (complete waterproofing). Avoid use accompanied by constant contact with water.
- Avoid use in a state where external force is applied at all times on the connector connecting section.
- The body is a resin integrated formed part. Do not use the body as a step or place heavy objects on the body.

● Cautions during replacement

- When removing connectors to replace the switch or cord, fully wipe the connector and the surrounding area to remove any water. After removing the connector, prevent the connector from being immersed in chemicals or in powder, or being dropped.

If the connector is immersed in a fluid, allow the connector to fully dry before connecting again.

If the connector is dropped in powder, fully wipe off any powder before connecting again.

Failure to observe the above may result in short circuits or prevent the connector from being connected.

● Ensuring sealability

With □LS□-JW Series spatter-graduated limit switches, the connector type is used as the standard model to ensure sealability.

When the screws in the head or covers are loosened to change:

- the operating direction of the switch (both directions ⇔ one direction)
- the relationship between the switch operation indication and lamp indication (during switch standby: lamp ON ⇔ during switch operation: lamp ON)

tighten the screws at the recommended tightening torque to ensure sealability. If the screws are insufficiently tightened, the performance of this switch cannot be fully demonstrated.

<Recommended tightening torque>

- Cover: 1.3 to 1.7N·m (M4)
- Head: 0.8 to 1.2N·m (M3.5)

1LS-J700 SERIES ULTRA LONG LIFE, GENERAL PURPOSE COMPACT LIMIT SWITCHES

On-site Mechanical Life 3 Times That of Conventional Models Improved
Reliability Drastically Reduces Minor Line Interruptions.


- Mechanical life: min. 30 million operations.
- Improving slidability and corrosion resistance prevents the defective return of actuators.
- Wiring to the switch is performed by connectors to prevent defective sealing. (Conventional G½ conduit/switch terminal wiring type is also available.)
- The setting indication function that uses an at-a-glance fluorescent indication prevents faulty initial setup.



APPLICATIONS

- Automobile production facilities and related equipment
 - Special-purpose machine tools
 - Conveyors
 - Automatic assembly machines
- General industrial machinery

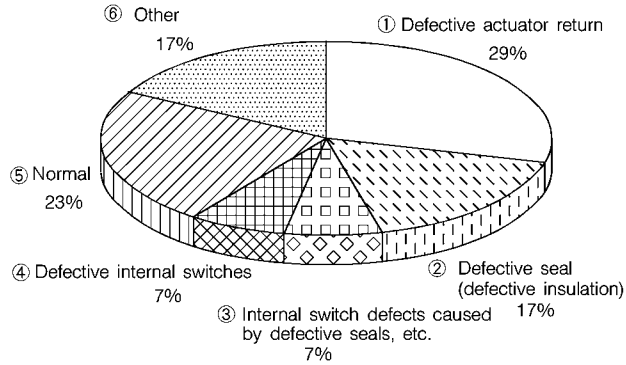
ORDER GUIDE

Actuator		Operating characteristics			Basic catalog listing	Options			
		O.F. (max.) (operating force)	P.T. (max.) (pretravel)	T.T. (min.) (total travel)		With LED lamp 12 to 125Vac/dc EC	Double seal + LED SEC	Connector + LED EC-PD	Pre-leaded connector + LED EC-PD03
Name	Shape								
Roller lever type		13.4N	Standard type 20°	Standard travel 50°	1LS-J700	1LS-J700EC	1LS-J700SEC	1LS-J700EC-PD	1LS-J700EC-PD03
			High sensitivity type 5°	Standard travel 35°	1LS-J710	1LS-J710EC	1LS-J710SEC	1LS-J710EC-PD	1LS-J710EC-PD03
		8.9N	Standard type 20°	High over-travel 75°	1LS-J720	1LS-J720EC	1LS-J720SEC	1LS-J720EC-PD	—
			High sensitivity type 10°	High over-travel 72°	1LS-J730	1LS-J730EC	1LS-J730SEC	1LS-J730EC-PD	1LS-J730EC-PD03

Differences in the 1LS-J700 Series

1. Breakdown of trouble in conventional limit switches

The following shows the result of investigating and analyzing the cause of trouble on products returned to Yamatake from the field as repair products:



The ultra long life limit switch **1LS-J700** Series adopts countermeasures for the following five of these causes:

- ① Defective actuator return
- ② Defective seal (defective insulation)
- ③ Internal switch defects caused by defective seals, etc.
- ④ Defective internal switches
- ⑤ Normal (trouble not reproduced)

This has resulted in an ultra long-life that could not be achieved with conventional limit switches.

2. Countermeasures

The following table summarizes the points to evaluate with respect to the above causes, and outlines the countermeasures that have been adopted:

Cause of trouble	Points to evaluate	Implemented countermeasure
① Defective actuator return	Improvement of slidability of operation head components, improvement of corrosion resistance, grease quality and quantity improvement	Moving parts on the operation head were SUS-nitrided and treated with special coating. Specially coated O-ring was used. Grease was changed.
②, ③ Defective seals	Improvement of sealability at shaft Improvement of switch body cover and conduit sealability	Shaft seal was double-sealed (V-ring + O-ring). Terminal connections with open covers were eliminated, and an internal loaded connector was used. Note 2
④ Defective internal switches	Improvement of internal switch life	Two internal moving springs were used.
⑤ Normal (trouble not reproduced)	Modification of setting indication function Note 1	The root of the shaft was capped with a rubber cap with indication slit, and fluorescent coloring is indicated at the indication slit.

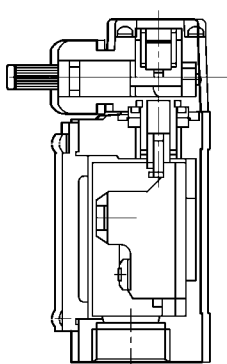
Note 1: Conventional limit switches are equipped with an operation pointer for indicating the appropriate O.T. (overtravel). However, as this pointer is difficult to see when actually setting operation, generally setting is performed by an operation indicator lamp. For this reason, a phenomenon occurs where there is little margin in the initial setup during mounting for with respect to O.P. (operating position), and the switch does not turn ON even though as a result the dog arrives at the switch operation position and presses the lever. As a result of investigating the above, we found that a large number of normal limit switches were returned for repair for this reason. As a countermeasure against this, the appropriate O.T. (overtravel) indication was changed to an easy-to-view fluorescent type.

Note 2: Conventional terminal connection type and G1/2 conduit types where the cover is opened for wiring to the switch terminal are also available.

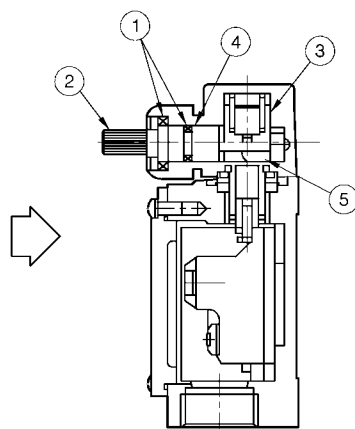
3. Structure of Ultra Long Life Limit Switches

• Overall switch

Current limit switch



Ultra long life

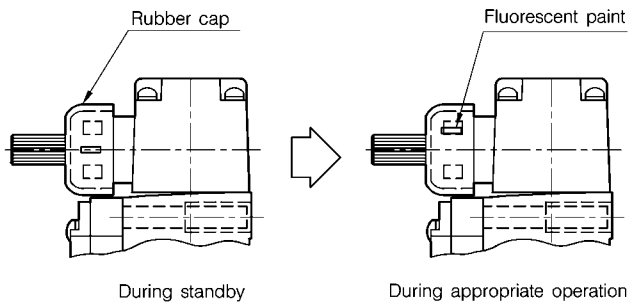


The slidability and corrosion resistance of moving parts inside the operation head were improved.

- ① The sealability of the moving head was improved by double-sealing (V-ring and O-ring) the operation shaft.
- ②, ③ Slidability was improved and corrosion when immersed in water was prevented by treating the operation shaft and other moving parts with SUS nitriding and special coating.
- ④ Slidability was improved by coating the shaft O-ring with special coating.
- ⑤ Grease was changed to one that has high fluidity and that resists extreme pressure.

The life of moving parts was made longer by the above modifications.

• Setting indicator pointer



With this structure, the shaft root is capped with a slitted black rubber cap. When the lever is flipped down and reaches the appropriate O.T. (overtravel), the fluorescent coloring can be seen from that slat. This modification enables confirmation from far distances and facilitates initial setup.

4. Evaluation Results

Mechanical life was improved as follows by modifying the following types:

Results of proprietary acceleration mechanical life test		Estimated life under actual operating conditions	
		Minimum life	Period at 3,000 operations/day
Current LS Example: 1LS1-J	Approx. 3 million operations	2 million operations	2 to 3 years
Ultra long life LS Example: 1LS-J700	Approx. 13 million operations	Min. 6 million operations	8 to 9 years

PERFORMANCE

Catalog listing		1LS-J70□	1LS-J71□	1LS-J72□	1LS-J73□	
External standards	Conformed standards	JIS C 4508				
	Approval standards	UL/CSA Note 1				
Structure	Contact type	2-circuit double break				
	Terminal shape	M4 screw (switch terminal screw)				
	Contact shape	Silver rivet				
	Protective structure	IP67 (IEC 529)				
Electrical performance	Electrical rating	See Table 1.				
	Dielectric strength	Between non-continuous terminals (same pole): 1,000V, 50/60Hz for 1 minute Between each terminal and non-conducting metal part: 2,000V, 50/60Hz for 1 minute				
	Insulation resistance	Max. 100MΩ (by 500Vdc megger)				
	Initial contact resistance	Contact	Max. 50mΩ (6 to 8Vdc, energizing current 1A, voltage drop method)			
		Connector	Max. 40mΩ (excluding fixed resistance of cord, etc.)			
Recommended min. contact operating voltage/current	24Vdc-10mA					
Mechanical performance	Actuator strength	Withstand load 5 times O.F. (operating direction for 1 minute)				
	Impact resistance	300m/s ²	200m/s ²	300m/s ²		
		Contact release of 1ms max. at free position and operating limit positions or operating limit position				
	Vibration resistance	1.5mm peak-to-peak amplitude, frequency 10 to 55Hz, for 2 continuous hours Contact release of 1ms max. at free position and operating limit positions or operating limit position				
	Allowable operating speed	1.7mm/s to 0.5m/s Min. speed: Unstable state of contacts 0.1s max. Max. speed: Actuator damage not allowed.				
	Mechanical operating frequency	Max. 120 operations/minute				
Cord pullout strength	Min. 100N					
Life	Mechanical life	Min. 30 million operations. Function after operation is 70 to 100% of standard value.				
	Electrical life	See Table 2.				
Environmental conditions	Operating temperature range	- 10 to +70°C (freezing not allowed Note 2)				
	Operating humidity range	Max. 98%RH Note 3				
Recommended 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 screw)				
	Terminal	1.3 to 1.7N-m (M4 binding head machine screw with toothed washer)				

Note 1: Some models do not fall under this category.

Note 2: With the double seal type (S type), 0 to +70°C on **1LS-J71□**, and -5 to +70°C on other models

Note 3: Max. 95%RH for connector and pre-leaded connector types

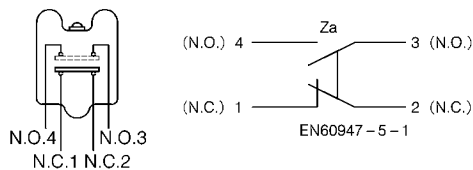
Table 1. Electrical rating

Type of indicator lamp	None		12 to 125Vac/dc with LED lamp	
Type	Catalog listing	Electrical rating	Catalog listing	Electrical rating
Standard characteristics type	1LS-J700 1LS-J720	125, 250, 480Vac-10A 125Vac-1/2HP 250Vac-1HP 125Vdc-0.8A 250Vdc-0.4A	1LS-J700EC 1LS-J720EC	125Vac-5A 125Vdc-0.8A
Standard characteristics type double seal	—	—	1LS-J700SEC 1LS-J720SEC	125Vac-5A 125Vdc-0.8A
High sensitivity characteristics type	1LS-J710 1LS-J730	125, 250, 480Vac-10A 125Vac-1/2HP 250Vac-1HP 125Vdc-0.8A 250Vdc-0.4A	1LS-J710EC 1LS-J730EC	125Vac-5A
High sensitivity characteristics type double seal	—	—	1LS-J710SEC 1LS-J730SEC	125Vac-5A
For DC connector Pre-leaded connector	—	—	1LS-J7□DEC-PD 1LS-J7□DEC-PD03	125Vac-3A 30Vdc-3A

Table 2. Electrical life

Internal switch	Load condition	Life	Life
Standard load type	Rated load	Min. 500,000 operations	125Vac-10mA 30Vdc-10mA Min. 30 million operations
Low current load type	Rated load	Min. 2 million operations	

● Circuit diagram



INDICATOR LAMP SPECIFICATIONS

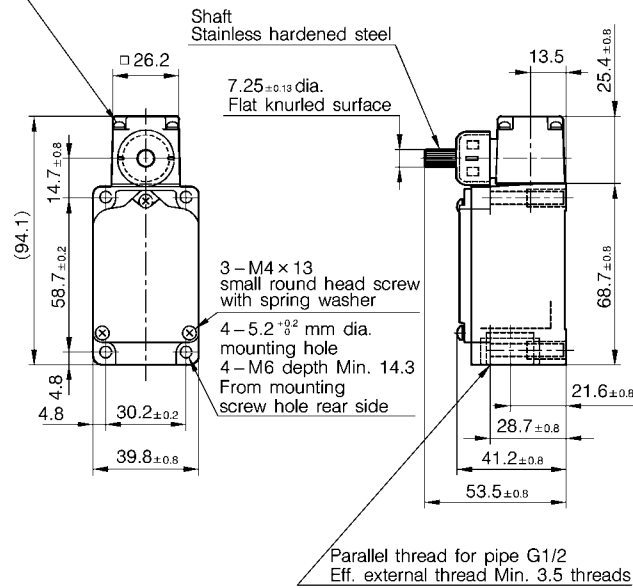
Option	Without indicator lamp	With neon lamp 100/200Vac	With LED lamp 12 to 125V, common to AC and DC				
Catalog listing	1LS-J7□□□	1LS-J7□□□E	1LS-J7□□□EC				
Lamp cover front side	—						
Circuit diagrams							
Note	—	Note: To confirm lighting of the neon lamp, use at voltage min. 75Vac.	Note 1: The power voltage of the indicator lamp (red LED) is 12 to 125V. The indicator lamp operates by either AC or DC power. Note 2: When the power voltage of the indicator lamp is 100V, the max. energizing current of 1.4mA, and 2.0mA at 125V.				
Lamp cover catalog listing (repair part)		LS-29PA1	LS-29PAEC				
Specifications	Operating voltage	100 to 200Vac		12 to 125V, common to AC and DC			
		100Vac	200Vac	12V	24V	48V	100V
	Energizing current	Approx. 0.5mA	Approx. 1.5mA	Approx. 0.2mA	Approx. 0.6mA	Approx. 0.7mA	Approx. 0.9mA
	Resistance value	100kΩ		33kΩ			

EXTERNAL DIMENSIONS

Basic dimensions

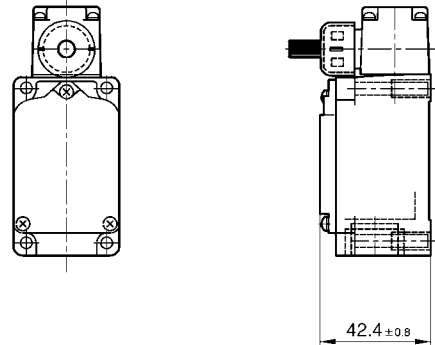
Without indicator lamp **1LS-J7**□□□□

4 – M3.5 × 27 small round head screw with spring washer



With indicator lamp **1LS-J7**□□□□**EC**

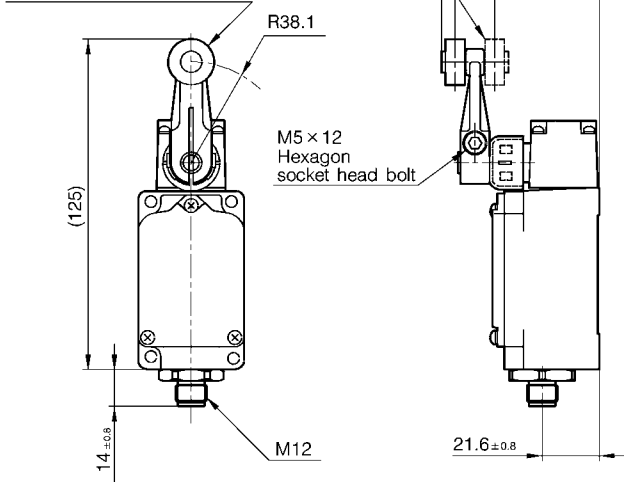
(unit: mm)



Actuator mounting dimensions and connector dimensions

Roller lever can also be attached on opposite side.

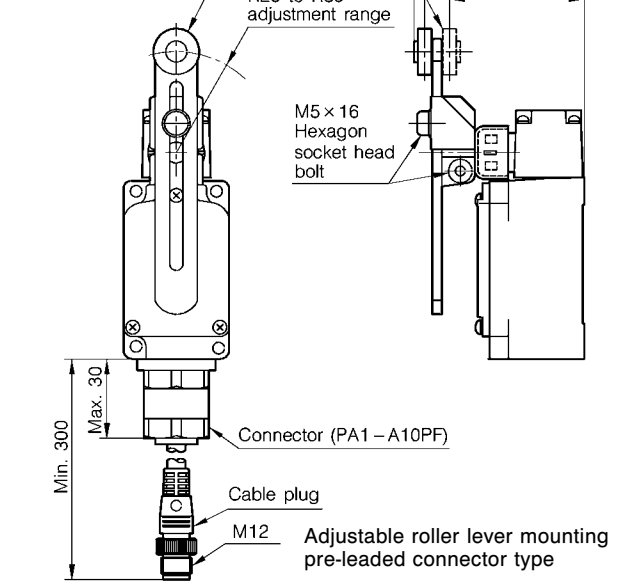
Roller: 17.4 dia. × 7.1 Sintered stainless steel



Standard roller lever mounting connector (quick removal) type

Roller lever can also be attached on opposite side.

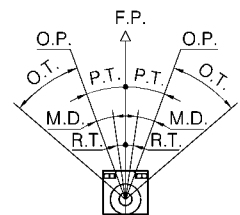
Roller: 17.4 dia. × 6.4 Nylon



Adjustable roller lever mounting pre-leaded connector type

OPERATING CHARACTERISTICS

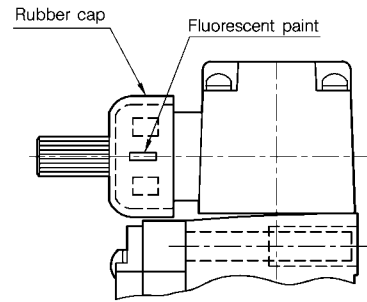
Catalog listing		1LS-J70	1LS-J71	1LS-J72	1LS-J73
Characteristics		Standard travel general characteristics	Standard travel high sensitivity characteristics	High overtravel general characteristics	High overtravel high sensitivity characteristics
Operating characteristics Note	O.F. (operating force) max.	13.4N	13.4N	8.9 N	8.9 N
	R.F. (release force) min.	2.2N	2.2N	0.98N	0.98N
	P.T. (pretravel)	Max. 20°	5° ⁺²	Max. 20°	10° ⁺³
	M.D. (movement differential) max.	12°	3°	12°	5°
	O.T. (overtravel) min.	30°	30°	55°	62°
	R.T. (return operation)	Min. 5°	–	Min. 5°	–
Pointer position angle		25° to 45°	16 to 36°	25° to 45°	16° to 36°



Note: Operation characteristics, and O.F. and R.F. values are the values obtained when the standard roller lever (length 38.1mm) is used.

ABOUT OPERATION SETTINGS

A slit window is provided on the rubber cap mounted on the operation shaft. When the shaft rotates and reaches the appropriate operation range, a fluorescent paint indication appears in this window to indicate that the switch is in a stable operation state.



During appropriate operation

CONNECTOR PIN LAYOUT

- 1LS-J7□□□□-P□□

Catalog listing code	Pin layout	Circuit diagrams		Note (applied only on types with indicator lamp)
		Without indicator lamp	With indicator lamp	
		-	EC	
PD PD03				<p>The switch is assembled so that lamps light when the actuator is at the FREE position. The lamps can be made to light at the PUSH position by attaching the bracket on the rear side of the cover in the opposite direction.</p>

Connector		Internal switch
Contact No.	Lead color	Terminal No.
1	-	-
2	-	-
3	Black	No.3
4	White	No.4

Note:
Even in an N.C. wiring connection, contact assignments become (3) - N.C. and (4) - N.C.

● 4-lead type

Connector		Internal switch
Contact No.	Lead color	Terminal No.
1	Red	No.1 (N.C.)
2	Green	No.2 (N.C.)
3	Black	No.3 (N.O.)
4	White	No.4 (N.O.)

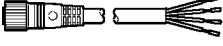
● 2-lead type

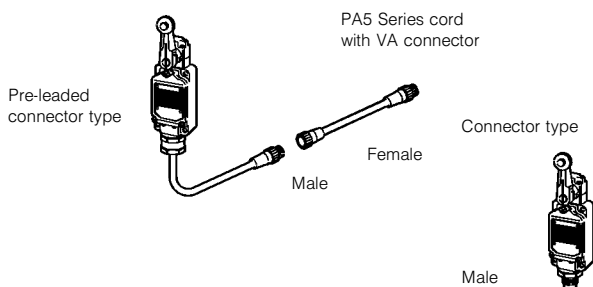
The contact assignments of limit switches comply with Japan Electric Control Equipment Industrial Association Standard (NECA 4202).

CORD WITH CONNECTOR

Be sure to use **PA5** Series cords with **VA** connector for connecting pre-leaded connector type and connector type limit switches.

● PA5 Series cord with VA connector

Shape	Cord characteristics	Power supply	Cord length	Catalog listing	Lead color
	Oil-resistant	DC	2m	PA5-4ISX2HK	1-Brown, 2-White 3-Blue, 4-Black
			5m	PA5-4ISX5HK	
		AC	2m	PA5-4JSX2HK	
			5m	PA5-4JSX5HK	

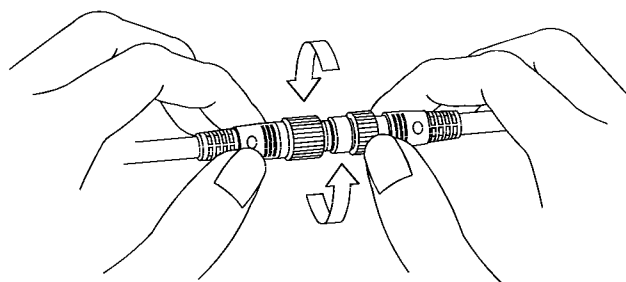






● Connector tightening torque

Align both of the grooves, rotate the tightening screw on the PA5 cord with the VA connector, and firmly tighten the screw on the limit switch by hand.

Limit switch side

PA5 cord with VA connector



For AC		For DC	
Switch side (male)	VA connector side (female)	Switch side (male)	VA connector side (female)
			

Note: The shape of the key differs on plugs and sockets for AC and DC connectors and is not mutually compatible.

CONNECTOR SPECIFICATIONS Note 1

Item	Specification details	
Operating voltage/current range	For AC: Min. 5V-5mA, max. 250V-3A For DC: Min. 5V-5mA, max. 125V-3A	
Insulating resistance	Max. 100M Ω (by 500Vdc megger)	
Dielectric strength	1,500Vac for 1 minute (between contacts, and between contact and connector housing)	
Initial contact resistance	Max. 40m Ω (when 3A current is supplied to combined male and female connectors. Lead semiconductor specific resistance not included.)	
Connector withstand stress	0.4 to 4.0N per contact	
Number of connector insertions	50 times	
Connector tightening strength	Min. 0.8N-m Note 2	
Cord pullout strength	Min. 100N	
Vibration resistance	10 to 55Hz, 1.5mm peak-to-peak amplitude, for 2 hours in X, Y and Z directions	
Impact resistance	300m/s ² , 3 times in each X, Y and Z directions	
Protective structure	IP67	
Operating ambient temperature	-10 to +70°C	
Storage ambient temperature	-20 to +80°C	
Operating ambient humidity	Max. 95%RH	
Material	Contact	Gold-plated brass
	Contact holder	Glass-lined polyester resin
	Housing	Polyester elastomer
	Coupling	Brass Ni-plated, orange-coated (AC type only)
	O-ring	NBR

Note 1: Specifications according to combined use with a Yamatake **VA** connector **PA5** Series.

Note 2: The recommended tightening torque is 0.4 to 0.6N-m. If the connector is not tightened firmly, IP67 protection may become insufficient, or may result in loosening of the connector. Tighten firmly by hand.

PRECAUTIONS UPON USE

● Connecting switches with lamp indicators

• Series connection:

Up to six switches can be connected in Series when the power voltage is 100V. Programmable controllers can also be connected in series.

The brightness of the LED lamp is a fixed brightness regardless of the power voltage as light is generated by a built-in fixed-current diode.

(Neon lamp type "E" Series switches cannot be connected in series at 100V.)

• PC connection possible:

The leakage current when the limit switch is not operating is a maximum 1.3mA. The PC does not malfunction due to dark lighting of the LED. Moreover, a fixed-current diode is built in to ensure a fixed LED brightness regardless of the power voltage.

● Handling of connector/pre-leaded connector type switches

• Tightening the fixing cap ring and outside screw lock ring

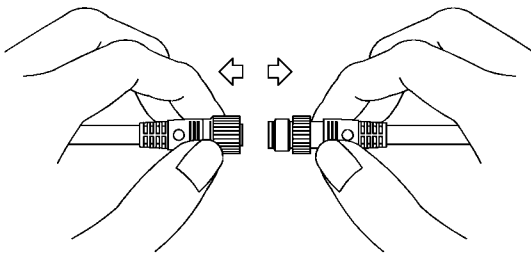
When the screw of the mating part is made of resin, the threads may be damaged when the connector is first tightened.

When assembling the connector, align the center of the cores, push in as far as possible, and tighten.

Be sure to tighten firmly 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 become insufficient, or may result in the connector becoming loose.



• Inserting and removing connectors

Before inserting and removing connectors, be sure to turn the power OFF.

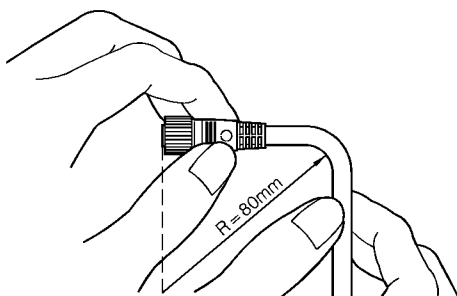
When removing connectors, do not pull the cord.

Be sure to hold the connector by its body when removing.

• Cautions when folding and bending cords

The minimum bending radius (R) of the cord is 80mm.

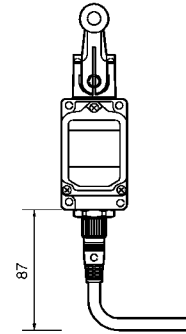
Provide sufficient margin when bending cords.



● Assembly method with connector type switches

(The below dimension is the dimension when the connector is assembled. Add the insertion/removal (approx. 15mm) space during actual fitting.)

• In the case of a connector type limit switch/straight type PA5 (unit: mm)



● Protective structure

• IP67 protection does not assure watertightness (complete waterproofing).

Avoid use accompanied by constant contact with water.

• Avoid use in a state where external force is applied at all times on the connector connecting section.

• The body is a resin integrated formed part. Do not use the body as a step or place heavy objects on the body.

● Cautions during replacement

• When removing connectors to replace the switch or cord, fully wipe the connector and the surrounding area to remove any water. After removing the connector, prevent the connector from being immersed in chemicals or in powder, or being dropped.

If the connector is immersed in a fluid, allow the connector to fully dry before connecting again.

If the connector is dropped in powder, fully wipe off any powder before connecting again.

Failure to observe the above may result in short circuits or prevent the connector from being connected.

● Ensuring sealability

With **1LS-J700** Series ultra long life and general-purpose switches, the connector type is used as the standard model to ensure sealability.

When the screws in the head or covers are loosened to change:

• the operating direction of the switch (both directions ⇔ one direction)

• the relationship between the switch operation indication and lamp indication (during switch standby: lamp ON ⇔ during switch operation: lamp ON)

tighten the screws at the recommended tightening torque to ensure sealability. If the screws are insufficiently tightened, the performance of this switch cannot be fully demonstrated.

<Recommended tightening torque>

- Cover: 1.3 to 1.7N·m (M4)

- Head: 0.8 to 1.2N·m (M3.5)

1LS-J800 SERIES OUTDOOR USE LIMIT SWITCHES

Highly Durable Switch That Withstands Heat from Direct Sunlight and Intense Air Temperature Changes in Outdoor Applications.



- Wide range of models.
- A wide range of actuators is available. Select the actuator to suit your particular work requirements and operating conditions.
- Mechanical life: 10 million operations.



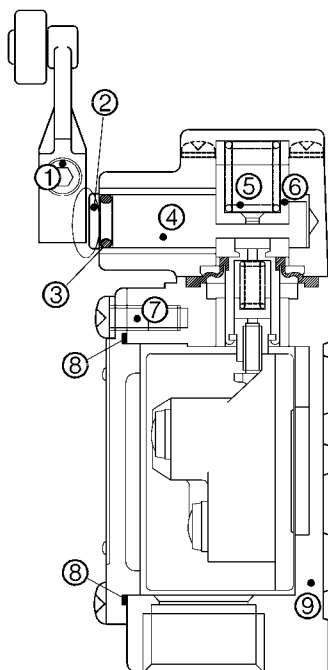
APPLICATIONS

- Sky parking stations
- Ski lifts
- High location work vehicles
- Other various industrial machinery in harsh environments and cold places
(Use the corrosion-proof type when switch is splashed by strong acidic or alkaline fluids.)

ORDER GUIDE

Actuator		Operating characteristics			Basic catalog listing	Double seal S catalog listing
Name	Shape	O.F. (max.) (operating force)	P.T. (max.) (pretravel)	T.T. (min.) (total travel)		
Roller lever type		13.4N	Standard type 20°	Standard travel 50°	1LS-J800	1LS-J800S
			Standard type 20°	High overtravel 75°	1LS-J820	1LS-J820S
			High sensitivity type 10°	High overtravel 72°	–	1LS-J830S
Adjustable roller lever type		8.9N	Standard type 20°	High overtravel 75°	1LS-J823	–
			High sensitivity type 10°	High overtravel 72°	–	1LS-J833S
No lever	–	8.9N	Standard type 20°	High overtravel 75°	–	1LS-J821S

1LS-J800 Features



- ① The lever fixing bolt is made out of SUS and is fluorine-coated to improve removability.
- ② The gap between the lever body and head has been increased to improve corrosion resistance, dust resistance and freeze resistance performance.
- ③ Lever return defects have been remedied by a head structure that prevents corrosion of the housing and use of SUS as the shaft material.
- ④ Special hardening has been performed on shaft internal moving parts to improve wear and corrosion resistance performance.
- ⑤ The grease on operating mechanisms has been changed to one that can be used in a wide operating temperature range (−60°C to +160°C) to improve temperature characteristics.
- ⑥ Special coating has been performed on the head's internal plunger to maintain smooth operation performance.
- ⑦ SUS has been used for all external screws as a countermeasure against removal defects caused by rust.
- ⑧ Silicon rubber is used entirely for the seal rubber to improve low temperature characteristics.
- ⑨ The body and head housing have undergone special rust resistance treatment to improve corrosion resistance.

PERFORMANCE

Catalog listing		1LS-J80□	1LS-J82□	1LS-J83□
External standards	Conformed standards	JIS C 4508/JIS C 8201-5-1		
	Approval standards	UL/CSA		
Structure	Contact type	2-circuit double break		
	Terminal shape	M4 screw (switch terminal screw)		
	Contact shape	Silver rivet		
	Protective structure	IP67 (IEC 529)		
Electrical performance	Electrical rating	See Table 1.		
	Dielectric strength	Between non-continuous terminals	1,000Vac, 50/60Hz for 1 minute	
		Between each terminal and non-conducting metal part:	2,000Vac, 50/60Hz for 1 minute	
	Insulation resistance	Min. 100MΩ (by 500Vdc megger)		
	Initial contact resistance	Silver: Max. 50mΩ (6 to 8Vdc, energizing current 1A, voltage drop method) Gold-plated: Max. 100mΩ (6 to 8Vdc, energizing current 0.1A, voltage drop method)		
	Recommended min. contact operating voltage/current	24V-10mA, 12V-20mA		
Mechanical performance	Actuator strength	Withstand load 5 times O.F. (operating direction for 1 minute)		
	Terminal strength	Withstand tightening strength of 1.5N-m for 1 minute		
	Impact resistance	Contact release of 1ms max. at 300m/s ² free position and operating limit positions		
	Vibration resistance	1.5mm peak-to-peak amplitude, frequency 10 to 55Hz, for 2 continuous hours Contact release of 1ms max. at free position and operating limit positions or operating limit position		
	Allowable operating speed	1.7mm/s to 0.5m/s		
	Mechanical operating frequency	Max. 60 operations/minute		
Life	Mechanical life	Min. 10 million operations.		
	Electrical life	See Table 2.		
Environmental conditions	Operating temperature range	- 10 to +70°C (freezing not allowed) - 5 to +70°C for double seal type (S type)		
	Operating humidity range	Max. 98%RH		
Recommended 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

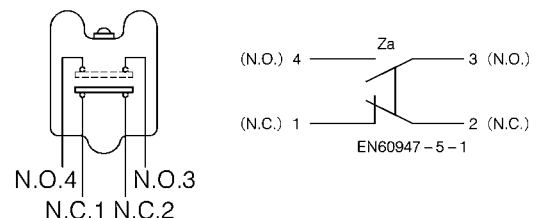
Internal switch	Standard type		Double seal type	
	Type	Catalog listing	Catalog listing	Electrical rating
Standard characteristics type		1LS-J80□ 1LS-J82□	1LS-J80□S 1LS-J82□S	125, 250, 480Vac-5A 125Vac-1/8HP 250Vac-1/4HP 125Vdc-0.8A 250Vdc-0.4A
	High sensitivity characteristics type	1LS-J83□	1LS-J83□S	125, 250, 480Vac-5A 125Vac-1/8HP 250Vac-1/4HP

Table 2 Electrical life

Internal switch	Load condition	Life
Standard load type	Rated load	Min. 500,000 operations
Standard load double seal type	Rated load	Min. 200,000 operations
Low current load type	Rated load	Min. 2 million operations

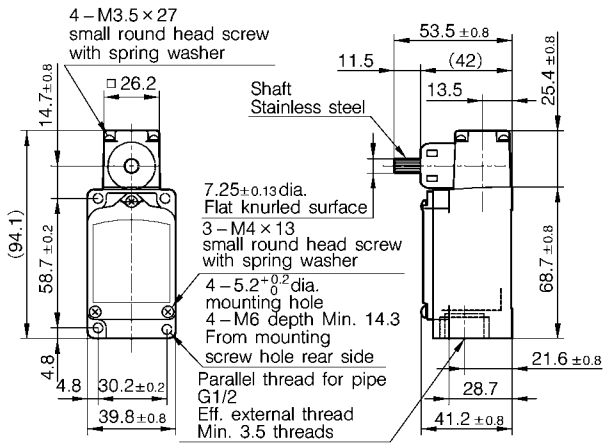
Note: Under condition of operating frequency of 20 operations/minute

● Circuit diagram



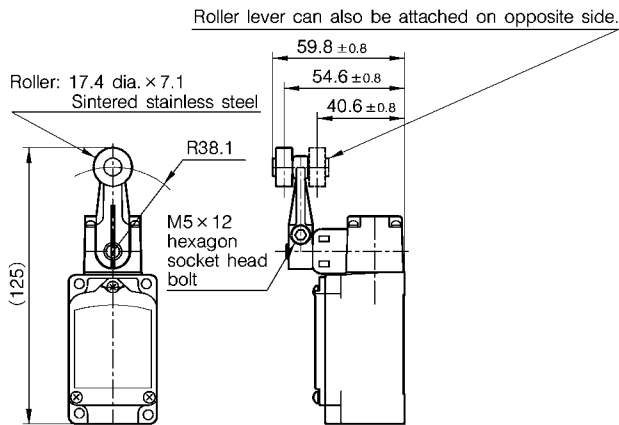
EXTERNAL DIMENSIONS

• Basic dimensions

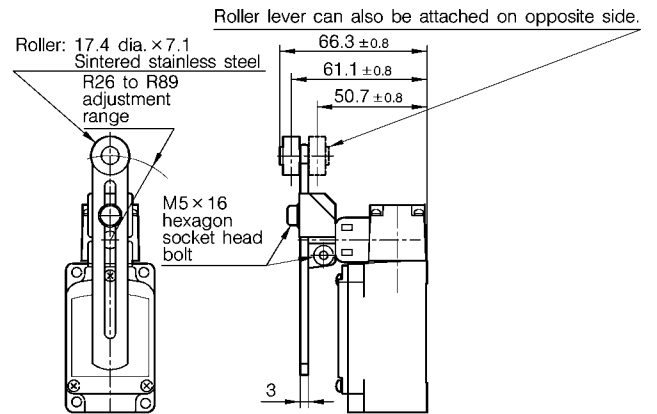


• Actuator mounting dimensions

• Roller lever type

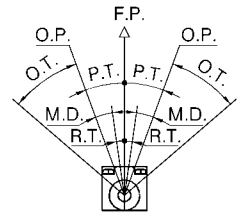


• Adjustable roller lever type



OPERATING CHARACTERISTICS

Catalog listing		1LS-J80□□□	1LS-J82□□□	1LS-J83□□□
Characteristics	O.F. (N max.)	13.4	8.9	8.9
	R.F. (N min.)	2.2	0.98	0.98
	P.T. (°)	20	20	10 \pm 1
	M.D. (° max.)	12	12	5
	O.T. (° min.)	30	55	62
	R.T. (°)	5	5	-

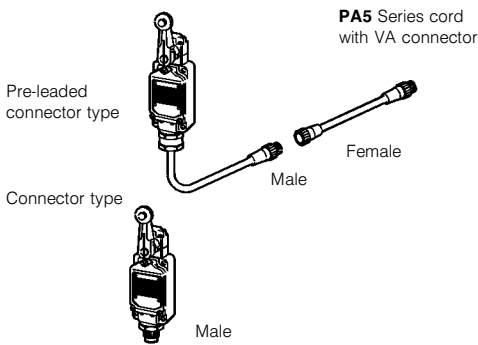


CORD WITH CONNECTOR

Be sure to use **PA5** Series cords with **VA** connector for connecting pre-leaded connector and connector type limit switches.

● PA5 Series cord with VA connector

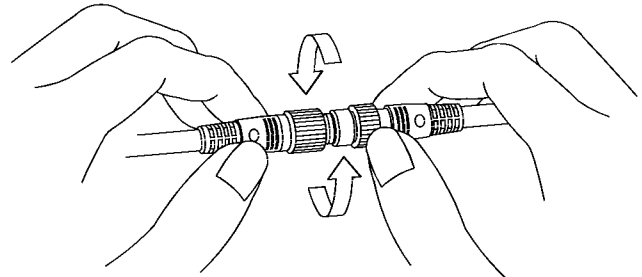
Shape	Power supply	Cord length	Catalog listing	Lead color
	DC	2m	PA5-4ISX2HK	1-Brown, 2-White 3-Blue, 4-Black
		5m	PA5-4ISX5HK	
	AC	2m	PA5-4JSX2HK	
		5m	PA5-4JSX5HK	







● Connector tightening torque

Align both of the grooves, rotate the tightening screw on the **PA5** cord with the **VA** connector, and firmly tighten the screw on the limit switch by hand.

Limit switch side PA5 cord with VA connector



For AC		For DC	
Switch side (male)	VA connector side (female)	Switch side (male)	VA connector side (female)
			

Note: The shape of the key differs on plugs and sockets for AC and DC connectors and is not mutually compatible.

CONNECTOR SPECIFICATIONS Note 1

Item	Specification details	
Operating voltage/current range	For AC: Min. 5V-5mA, max. 250V-3A For DC: Min. 5V-5mA, max. 125V-3A	
Insulating resistance	Max. 100MΩ (at 500Vdc)	
Dielectric strength	1,500Vac for 1 minute (between contacts, and between contact and connector housing)	
Initial contact resistance	Max. 40mΩ (when 3A current is supplied to combined male and female connectors. Lead semiconductor specific resistance not included.)	
Connector withstand stress	0.4 to 4.0N per contact	
Number of connector insertions	50 times	
Connector tightening strength	Min. 0.8N-m <small>Note 2</small>	
Cord pullout strength	Min. 100N	
Vibration resistance	10 to 55Hz, 1.5mm peak-to-peak amplitude, for 2 hours in X, Y and Z directions	
Impact resistance	300m/s ² , 3 times in each X, Y and Z directions	
Protective structure	IP67	
Operating ambient temperature	-10 to +70°C	
Storage ambient temperature	-20 to +80°C	
Operating ambient humidity	Max. 95%RH	
Material	Contact	Gold-plated brass
	Contact holder	Glass-lined polyester resin
	Housing	Polyester elastomer
	Coupling	Brass Ni-plated, orange-coated (AC type only)
	O-ring	NBR

Note 1: Specifications according to combined use with a Yamatake VA connector **PA5** Series.

Note 2: The recommended tightening torque is 0.4 to 0.6N-m. If the connector is not tightened firmly, IP67 protection may become insufficient, or may result in loosening of the connector. Tighten firmly by hand.

PRECAUTIONS UPON USE

● Connecting switches with lamp indicators

• Series connection

Up to six switches can be connected in series when the power voltage is 100V. Programmable controllers can also be connected in series.

The brightness of the LED lamp is a fixed brightness regardless of the power voltage as light is generated by a built-in fixed-current diode.

• PC connection possible:

The leakage current when the limit switch is not operating is a maximum 1.3mA. The PC does not malfunction due to dark lighting of the LED. Moreover, a fixed-current diode is built in to ensure a fixed LED brightness regardless of the power voltage.

● Handling of connector/pre-leaded connector type switches

• Tightening the fixing cap ring and outside screw lock ring

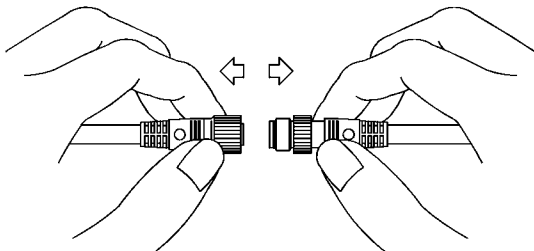
When the screw of the mating part is made of resin, the threads may be damaged when the connector is first tightened.

When assembling the connector, align the center of the cores, push in as far as possible, and tighten.

Be sure to tighten firmly 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 become insufficient, or may result in the connector becoming loose.



• Inserting and removing connectors

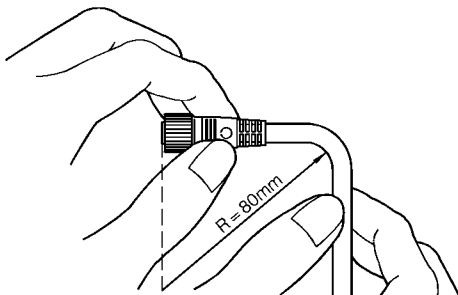
Before inserting or removing connectors, be sure to turn the power OFF.

When removing connectors, do not pull the cord. Be sure to hold the connector by its body when removing.

• Cautions when folding and bending cords

The minimum bending radius (R) of the cord is 80mm.

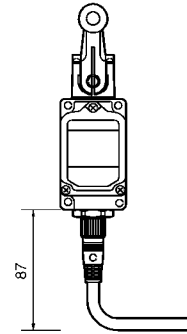
Provide sufficient margin when bending cords.



● Assembly method with connector type switches

(The below dimension is the dimension when the connector is assembled. Add the insertion/removal (approx. 15mm) space during actual fitting.)

• In the case of a connector type limit switch/straight type PA5 (unit: mm)



● Protective structure

• IP67 protection does not assure watertightness (complete waterproofing).

Avoid use accompanied by constant contact with water.

• Avoid use in a state where external force is applied at all times on the connector connecting section.

• The body is a resin integrated formed part. Do not use the body as a step or place heavy objects on the body.

● Cautions during replacement

• When removing connectors to replace the switch or cord, fully wipe the connector and the surrounding area to remove any water. After removing the connector, prevent the connector from being immersed in chemicals or in powder, or being dropped.

If the connector is immersed in a fluid, allow the connector to fully dry before connecting again.

If the connector is dropped in powder, fully wipe off any powder before connecting again.

Failure to observe the above may result in short circuits or prevent the connector from being connected.



RESTRICIONS ON USE

This product has been designed, developed and manufactured for general-purpose application in machinery and equipment. Accordingly, when used in applications outlined below, special care should be taken to implement a fail-safe and/or redundant design concept as well as a periodic maintenance program.

- Safety devices for plant worker protection
- Start/stop control devices for transportation and material handling machines
- Aeronautical/aerospace machines
- Control devices for nuclear reactors

Never use this product in applications where human safety may be put at risk.

YAMATAKE

Specifications are subject to change without notice.

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