

SL1 Series

Mechanical life of 20 million operations.
Robust long-life and maintenance-free compact horizontal-type limit switches with IP67 seal.



- Mechanical life exceeds 20 million operations, owing to a 2-piece spring mechanism
- High sensitivity (M.D. = 0.1mm)
- Superior seal: oil-resistant/immersion-proof type (JIS) and IP67 (IEC). O-ring and integral diaphragm seal are built in
- Small, space-saving body can be tightly gang-mounted
- UL/CSA/CE/CCC-certified models are available

PERFORMANCE

	Item	Details
Standards	Compliance	NECA C 4508/JIS C 8201-5-1/IEC 60947-5-1
	Certification	UL 508/CSA C22.2 No.14/EN 60947-5-1/GB14048.5-2001 (except high oil- and heat-resistance types)
Structure	Contact form	Single-Pole Double-Throw (SPDT; refer to contact diagram below)
	Contact type	Standard load type: pure silver rivet Low current load type: gold-plated rivet
	Terminal type	M3 screw
	Protective structure	IP67 (IEC 60529, JIS C 0920)
	Pollution level	3
Electrical performance	Electrical rating	See Table 1.
	Rated frequency	45 to 65Hz and D.C.
	Insulation resistance	Between non-continuous terminals: 100MΩ Between each terminal and non-live metal parts: 100MΩ
	Rated insulation resistance (Ui)	250V Dielectric strength between each terminal and non-conducting metal parts: 2,000Vac (45 to 65Hz, 5s, leak current 1mA)
	Dielectric strength between contacts	1,000Vac (50 to 60Hz, 1 minutes, leak current 1mA)
	Rated impulse dielectric strength (Uimp)	2,500V
	Switching overcurrent	Category II (60204-1)
	Initial contact resistance	Silver contacts: 50mΩ max. (6 to 8Vdc 1A, voltage drop method) Gold-plated contacts: 100mΩ max. (6 to 8Vdc 0.1A, voltage drop method)
	Contact minimum allowable load	Silver contacts: 5mA 24Vdc, 10mA 12Vdc Gold-plated contacts: 5mA 5Vdc
	Rated thermal current (Ith)	Silver contacts: 5A Gold-plated contacts: 1A (Temperature increase: 65°C max.)
	Short-circuit protection	M10A(IEC 60127) (TUV) Instant blowing fuse, 10A (silver contacts) or 3A (gold contacts) (CQC)
	Conditional rated short-circuit current	1,000A (power factor 0.5 to 0.7)
	Mechanical performance	Actuator strength
Terminal strength		Withstands tightening torque of 0.6N·m for 1 minute
Impact resistance (malfunction)		300m/s ² , contact opening for 1ms max. in free position and total travel position
Vibration resistance (malfunction)		1.5mm peak-to-peak amplitude for 2 continuous hours Contact opening for 1ms max. in free position and total travel position
Allowable operating speed		0.02mm/s to 0.5m/s. 0.02mm/s to 0.25m/s on the SL1-B Series
Operating frequency		120 operations/minute. (60 operations/min for cold- and weather-resistant / high oil and heat resistance type).

Life	Mechanical	Min. 20 million operations. Min. 2 million operations for the SL1-B Series. Min. 1 million operations for cold- and weather-resistant type. Min. 2 million operations for high oil and heat resistance type. (All values assume overtravel (O.T.) of 1/3 to 2/3 the rated amount.)
	Electrical	Standard load type: Min. 2 million operations (125Vac 1A) Min. 300,000 operations (250Vac 5A, 48Vdc 2A, 30Vdc 5A) Low current load type: Min. 5 million operations (125Vac-0.1A, 48Vdc-0.1A)
Ambient operating conditions	Temperature	Standard type: -10 to +70°C Cold and weather resistant type: -50 to +70°C -30 to +70°C for SL1-B High oil and heat resistance type: 0 to 120°C
	Humidity	Max. 98% RH
Recommended tightening torque	Body	1.3 to 1.7N·m (M4 hexagon socket head bolt)
	Terminal screw	0.4 to 0.6N·m (M3 binding head machine screw)
	Panel mounting nut	4 to 6N·m (M14 hexagonal nut)

● **Table 1. Electrical rating**

Item	Contact material	JIS/IEC/EN/GB	UL/CSA
Standard load type	Silver	AC-15:3A-250V AC-12:5A-250V DC-12:2A-48V	5A-250V ac General Use Load 5A-30V dc
Low current load type	Gold-plated	AC-12:0.1A-125V DC-12:0.1A-48V	0.1A-125V ac General Use Load 0.1A-30V dc

● **Reference ratings (Since values can vary due to operating environment and type of load, verify them on an operating unit.)**

Standard load model with silver contacts

AC rating	125Vac				250Vac			
	Resistance	Induction	Electric motor		Resistance	Induction	Electric motor	
			N.C.	N.O.			N.C.	N.O.
Current (A)	5	3	1	2	5	3	0.5	1

Low current load type with gold-plated contacts

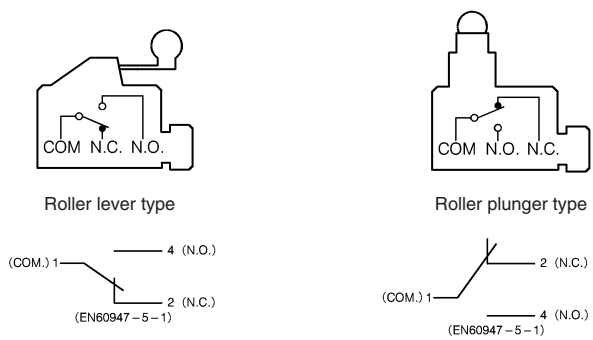
AC rating	115Vac	
	Resistance	Induction
Current (A)	0.1	—

DC rating	8Vdc		14Vdc		30Vdc		115Vdc		230Vdc	
	Resistance	Induction	Resistance	Induction	Resistance	Induction	Resistance	Induction	Resistance	Induction
Current (A)	5	3	5	3	5	3	0.5	0.1	0.25	0.05

DC rating	8Vdc		14Vdc		30Vdc	
	Resistance	Induction	Resistance	Induction	Resistance	Induction
Current (A)	0.1	—	0.1	—	0.1	—

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

■ **CONTACT FORM**









■ **STANDARDS**

	Approving body	Standard	File No.
Certification	UL	UL 508 CSA C22.2 No.14	E 96090
	TÜV	EN 60947-5-1	R2-50006349
	CQC	GB 14048.5-2001	2003010305083850

ORDER GUIDE







● Without cable

Actuator		Basic catalog listing*2	Options			
Name	Shape		Low current load K *2	Cold- and weather-resistant L *2	Cold- and weather-resistant + low current load KL *2	High temperature and high oil resistance V
Roller plunger		SL1-A	SL1-AK	SL1-AL	SL1-AKL	SL1-AV
Boot seal roller plunger		SL1-B	SL1-BK	SL1-BL	—	SL1-BV
Cross roller plunger		SL1-D	SL1-DK	SL1-DL	SL1-DKL	SL1-DV
Long roller plunger		SL1-E	SL1-EK	SL1-EL	—	SL1-EV
Plunger		SL1-H	SL1-HK	SL1-HL	SL1-HKL	SL1-HV
Short roller lever		SL1-P	SL1-PK	SL1-PL	SL1-PKL	SL1-PV

*1: Use with SL1-PA12.

*2. UL/C-UL/CE/CCC-certified model.

● With cable

Actuator		Options			
Name	Shape	No resin filling A:Cable exits on right B:Cable exits on left	With resin filling X:Cable exits on right Y:Cable exits on left	No resin filling+low current load A:Cable exits on right B:Cable exits on left	Resin filling+low current load X:Cable exits on right Y:Cable exits on left
		Roller plunger		SL1-A□G*	SL1-A□G*
Boot seal roller plunger		SL1-B□G*	SL1-B□G*	SL1-BK□G*	SL1-BK□G*
Cross roller plunger		SL1-D□G*	SL1-D□G*	SL1-DK□G*	SL1-DK□G*
Long roller plunger		SL1-E□G*	SL1-E□G*	SL1-EK□G*	SL1-EK□G*
Plunger		SL1-H□G*	SL1-H□G*	SL1-HK□G*	SL1-HK□G*
Short roller lever		SL1-P□G*	SL1-P□G*	SL1-PK□G*	SL1-PK□G*

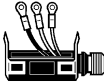
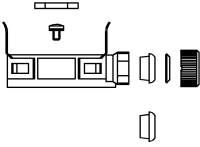

*Asterisk (*) after G indicates selectable cable length (1/2/3/5m).

*Model with indicator is available for SL1 switches with cable, except for those without resin filling.

Options		
High temperature and high oil resistance + low current load KV	Without cover N *1,2	Without cover + low current load KN *1,2
SL1-AKV	SL1-AN	SL1-AKN
—	—	SL1-BKN
—	SL1-DN	SL1-DKN
—	SL1-EN	—
—	SL1-HN	SL1-HKN
SL1-PKV	SL1-PN	—

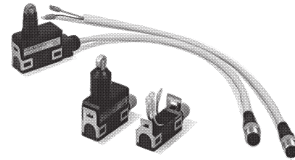
Options			
Resin filling+AC indicator X:Cable exits on right Y:Cable exits on left	Resin filling+DC indicator X:Cable exits on right Y:Cable exits on left	Resin filling+low current load +AC indicator X:Cable exits on right Y:Cable exits on left	Resin filling+low current load +DC indicator X:Cable exits on right Y:Cable exits on left
SL1-AE□G*	SL1-AF□G*	SL1-AKE□G*	SL1-AKF□G*
SL1-BE□G*	SL1-BF□G*	SL1-BKE□G*	SL1-BKF□G*
SL1-DE□G*	SL1-DF□G*	SL1-DKE□G*	SL1-DKF□G*
SL1-EE□G*	SL1-EF□G*	SL1-EKE□G*	SL1-EKF□G*
SL1-HE□G*	SL1-HF□G*	SL1-HKE□G*	SL1-HKF□G*
SL1-PE□G*	SL1-PF□G*	SL1-PKE□G*	SL1-PKF□G*

AUXILIARY PARTS

Name	Appearance	Specifications	Catalog listing
PA5 Series connector cover		For DC type, 3 leads	SL1-PA5I3
Terminal cover set		Cover, panel mounting nuts (2), cap nut, washer and seals (for 5.8 to 7.8mm dia. cable and for 7.9 to 9.6mm dia. cable)	SL1-PA12
Seal		for 7.9 to 9.6mm dia. cable (set of 10): Standard type: NBR containing PVC.	SL1-PA22
		for 7.9 to 9.6mm dia. cable (set of 10): Cold- and weather-resistant type: fluorosilicone rubber.	SL1-PA23
		for 7.9 to 9.6mm dia. cable (set of 10): High temperature and high oil resistance type: fluorocarbon rubber.	SL1-PA24

Connector for SL1 Series

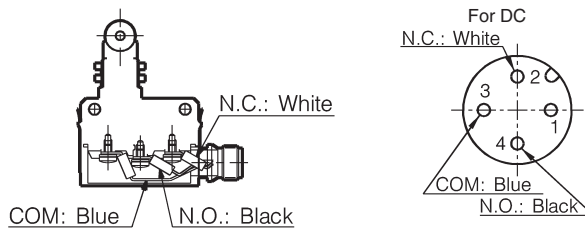
Switches in the **SL1** Series can be modified into the connector type by attaching the **SL1-PA5I3** onto the **SL1** switch body, as shown below. Either replace the terminal cover of the **SL1** standard type switch with a sealed connector with cable, or use the switch without a terminal cover.



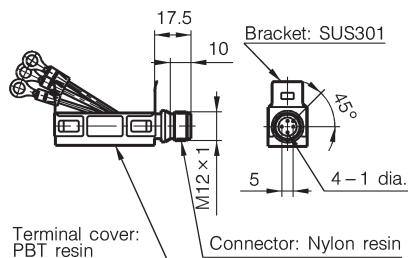
Assembly method



Wiring diagrams



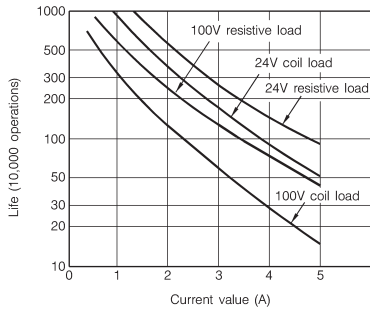
External dimensions



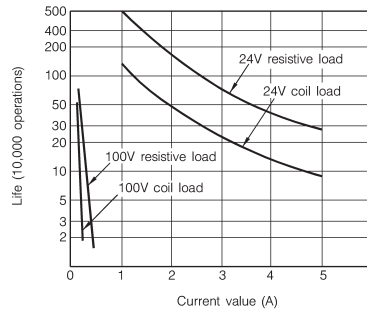
ELECTRICAL LIFE

● Normal load type

Contacts used for AC

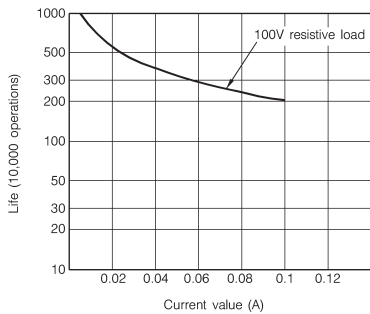


Contacts used for DC

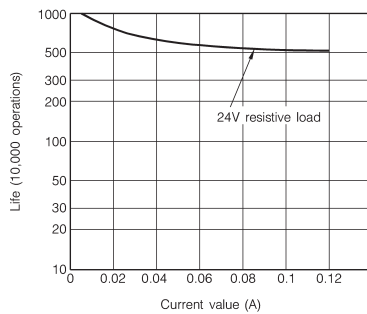


● Low current load type

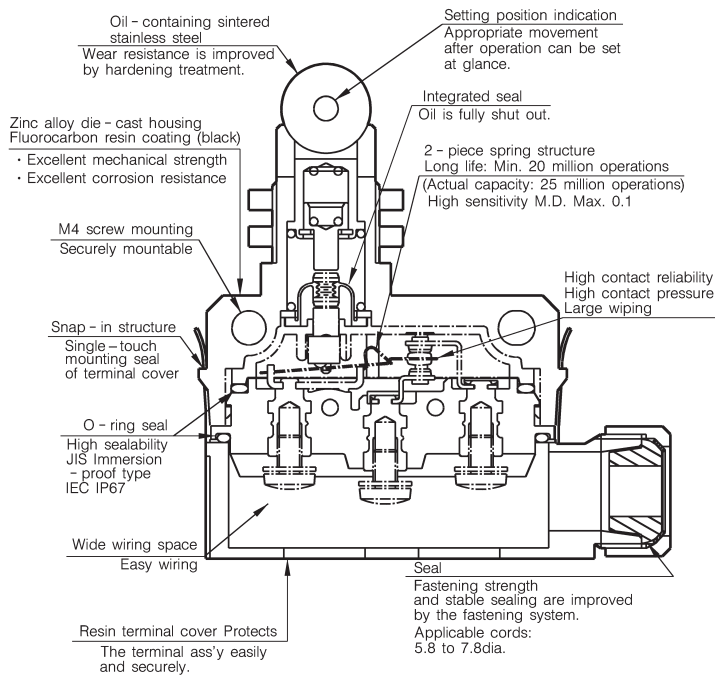
Contacts used for AC



Contacts used for DC



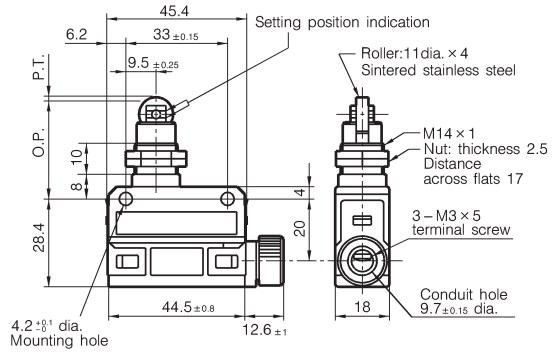
STRUCTURAL DIAGRAM



Roller plunger type



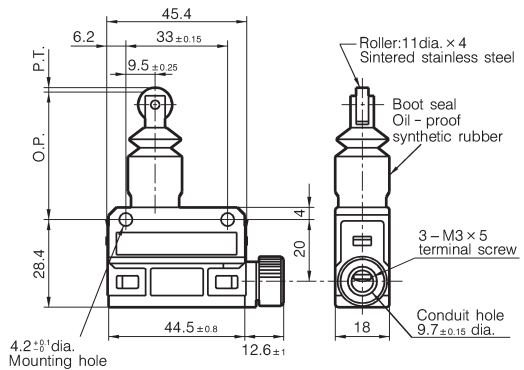
Catalog listing	SL1-A □ □
Operating force O.F. (max. N)	11.8
Release force R.F. (min. N)	4.9
Pretravel P.T. (max. mm)	1.5
Overttravel O.T. (min. mm)	3
Movement differential M.D. (max. mm)	0.1
Operating position O.P. (mm)	31.4 ^{±0.8}



Boot seal roller plunger type



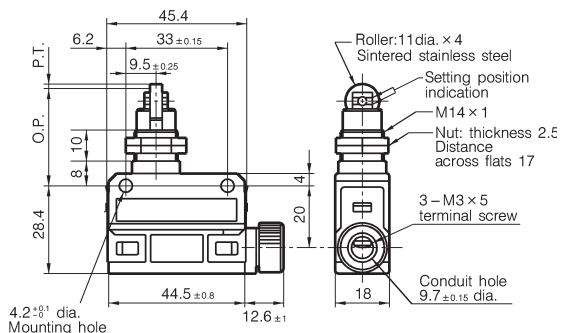
Catalog listing	SL1-B □ □
Operating force O.F. (max. N)	11.8
Release force R.F. (min. N)	4.9
Pretravel P.T. (max. mm)	1.5
Overttravel O.T. (min. mm)	3
Movement differential M.D. (max. mm)	0.1
Operating position O.P. (mm)	41.4 ^{±0.8}



Cross roller plunger type



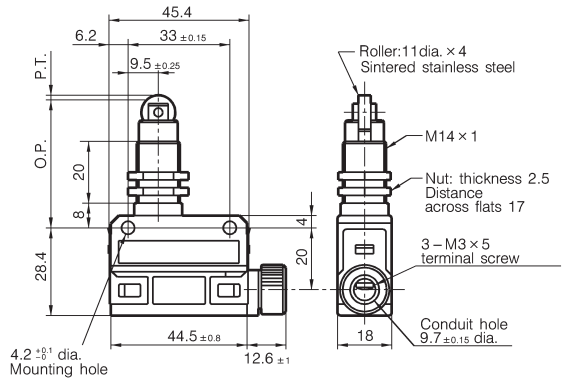
Catalog listing	SL1-D □ □
Operating force O.F. (max. N)	11.8
Release force R.F. (min. N)	4.9
Pretravel P.T. (max. mm)	1.5
Overttravel O.T. (min. mm)	3
Movement differential M.D. (max. mm)	0.1
Operating position O.P. (mm)	31.4 ^{±0.8}



Long roller plunger type



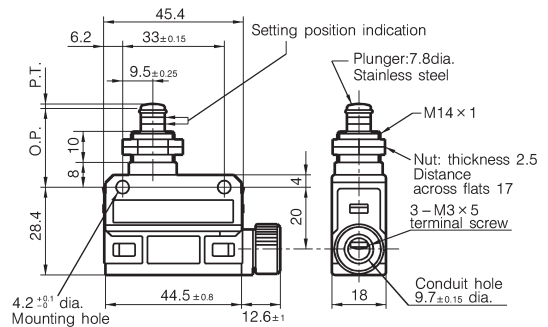
Catalog listing	SL1-E□□
Operating force O.F. (max. N)	11.8
Release force R.F. (min. N)	4.9
Pretravel P.T. (max. mm)	1.5
Overtravel O.T. (min. mm)	3
Movement differential M.D. (max. mm)	0.1
Operating position O.P. (mm)	41.4 ^{+0.8}



Plunger type



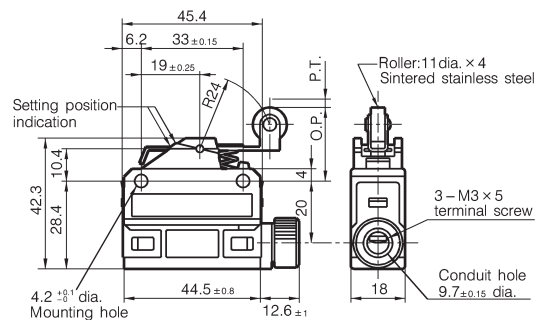
Catalog listing	SL1-H□□
Operating force O.F. (max. N)	11.8
Release force R.F. (min. N)	4.9
Pretravel P.T. (max. mm)	1.5
Overtravel O.T. (min. mm)	3
Movement differential M.D. (max. mm)	0.1
Operating position O.P. (mm)	25.4 ^{+0.8}



Short roller lever type



Catalog listing	SL1-P□□
Operating force O.F. (max. N)	4.0
Release force R.F. (min. N)	0.78
Pretravel P.T. (max. mm)	2
Overtravel O.T. (min. mm)	4
Movement differential M.D. (max. mm)	0.3
Operating position O.P. (mm)	23.1 ^{+0.8}



PRECAUTIONS FOR USE

1. Preparing lead wire tips

Cut and strip the lead wire tip as illustrated below, and use a round crimp-type terminal lug having an M3 insulating sleeve. A bare crimp-type terminal lug will cause a short-circuit. If a bare crimp-type terminal lug must be used, insulate it with a sleeve or the like, or point the terminal lugs in opposite directions to prevent a short-circuit.

Lead wire connection direction and recommended cutting sizes (unit: mm)

1.1 For 3-core wires

- An example of standard connections using crimp-type terminal lug, having an insulation sleeve



- An example of insulating a bare crimp-type terminal lug with a mark tube or the like

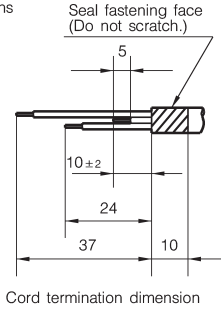


Mark tube or the like

- ✗ A wrong example of using a bare crimp-type terminal lug

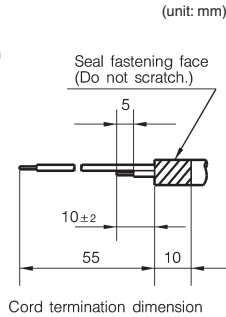
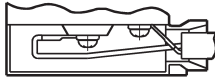


Short circuit

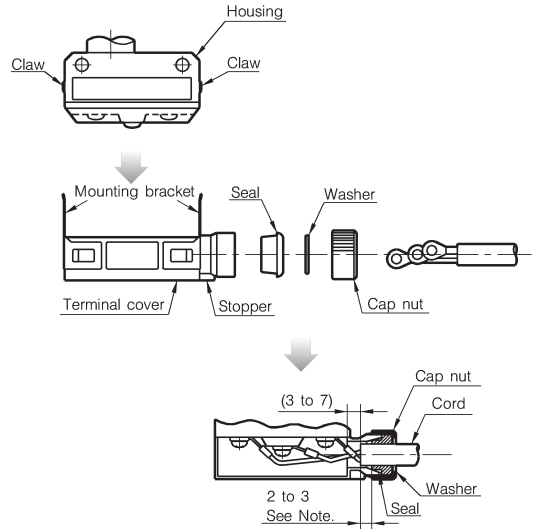


1.2 For 2-core wires

- An example of reversing the direction of a bare crimp-type terminal lug



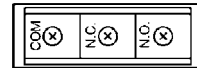
2. Wiring



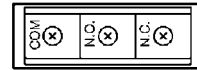
Note: Assemble these components so that the cable sheath protrudes 2 to 3mm from the end of the seal.

- Add components to the cable in the order: cap nut, washer, seal and terminal cover.
- Make sure that the mounting bracket on the terminal cover is held by the catches of the housing in this snap-in structure. Then tighten with the cap nut.
- To remove the terminal cover, release the snap-in structure with a screwdriver by expanding the mounting bracket on one side.
- The cable can be drawn out rightward or leftward by changing the mounting direction of the terminal cover.
- Be careful since the terminal layout differs for the (roller) lever type and (roller) plunger type, as illustrated below.

(roller) lever type



(roller) plunger type



- A seal suitable for a cable diameter of 5.8 to 7.8mm is attached to the terminal cover at the factory. If a cable of a different diameter is used, use replacement seal **SL1-PA22**, **SL1-PA23** or **SL1-PA24** (sold separately). To ensure a good seal, be sure to use a seal matching the diameter of the cable. If a question arises, please contact your nearest Yamatake sales agent.