

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

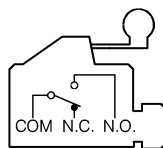
| AC rating | 115Vac | |
|-------------|------------|-----------|
| | Resistance | Induction |
| Current (A) | 0.1 | — |

| 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 |

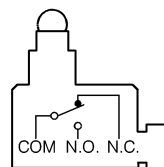
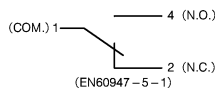
| DC rating | 8Vdc | | 14Vdc | | 30Vdc | |
|-------------|------------|-----------|------------|-----------|------------|-----------|
| | Resistance | Induction | Resistance | Induction | Resistance | Induction |
| Current (A) | 0.1 | — | 0.1 | — | 0.1 | — |

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**



Roller lever type



Roller plunger type









■ **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* |

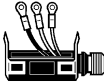
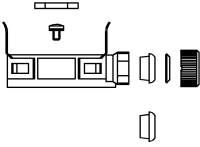

*Asterisk (*) after G indicates selectable cable length (1/2/3/5m).

*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 | — |

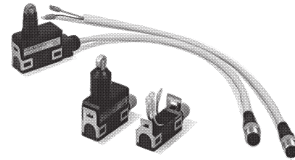
| Options | | | |
|---|---|---|---|
| Resin filling+AC indicator X:Cable exits on right Y:Cable exits on left | Resin filling+DC indicator X:Cable exits on right Y:Cable exits on left | Resin filling+low current load +AC indicator X:Cable exits on right Y:Cable exits on left | Resin filling+low current 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

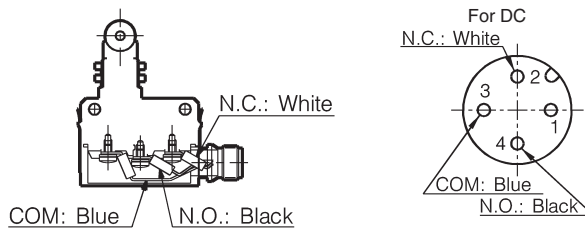
Switches in the **SL1** Series can be modified into the connector type by attaching the **SL1-PA5I3** onto the **SL1** switch body, as shown below. Either replace the terminal cover of the **SL1** standard type switch with a sealed connector with cable, or use the switch without a terminal cover.



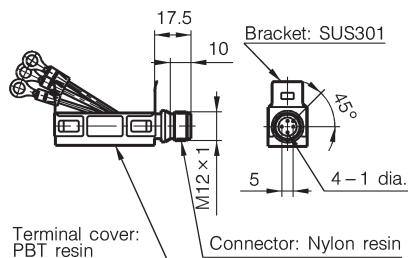
Assembly method



Wiring diagrams



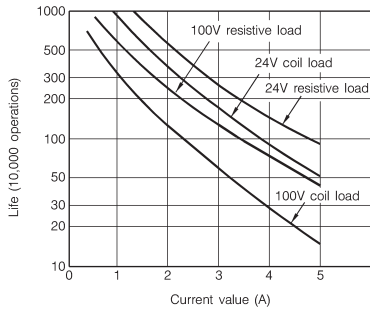
External dimensions



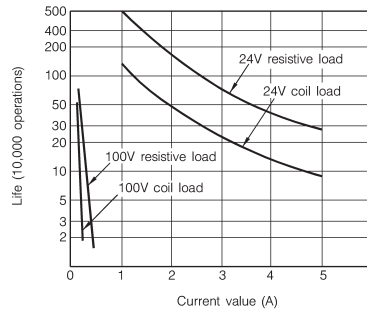
ELECTRICAL LIFE

● Normal load type

Contacts used for AC

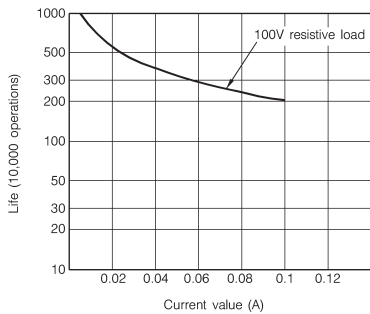


Contacts used for DC

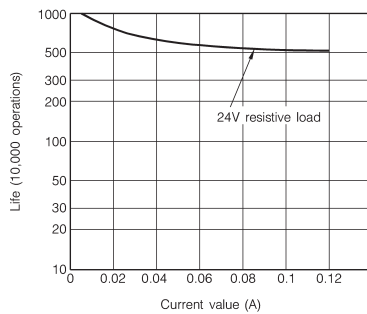


● Low current load type

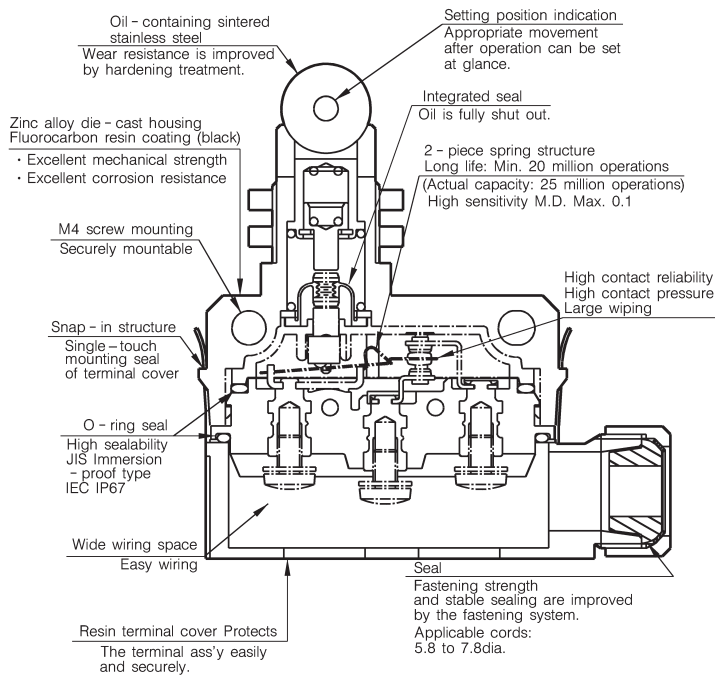
Contacts used for AC



Contacts used for DC



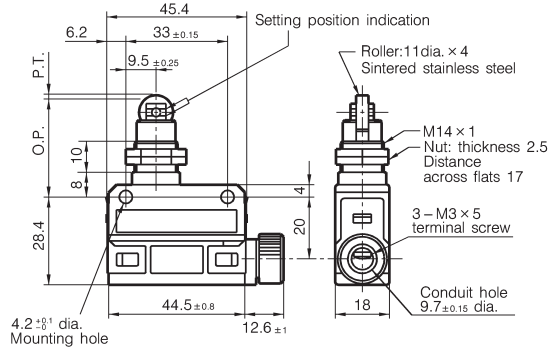
STRUCTURAL DIAGRAM



Roller plunger type



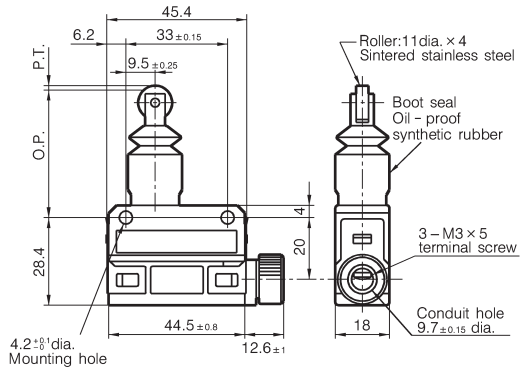
| | |
|---|----------------------|
| Catalog listing | SL1-A □ □ |
| Operating force O.F. (max. N) | 11.8 |
| Release force R.F. (min. N) | 4.9 |
| Pretravel P.T. (max. mm) | 1.5 |
| Overttravel O.T. (min. mm) | 3 |
| Movement differential M.D. (max. mm) | 0.1 |
| Operating position O.P. (mm) | 31.4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



Boot seal roller plunger type



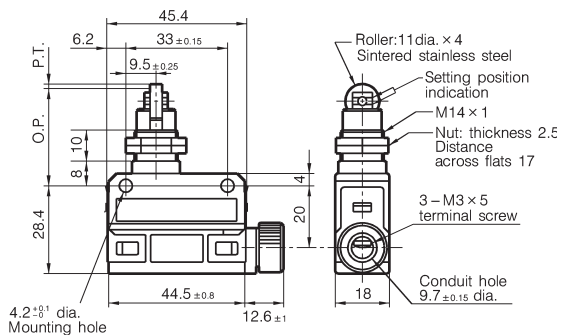
| | |
|---|----------------------|
| Catalog listing | SL1-B □ □ |
| Operating force O.F. (max. N) | 11.8 |
| Release force R.F. (min. N) | 4.9 |
| Pretravel P.T. (max. mm) | 1.5 |
| Overttravel O.T. (min. mm) | 3 |
| Movement differential M.D. (max. mm) | 0.1 |
| Operating position O.P. (mm) | 41.4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



Cross roller plunger type



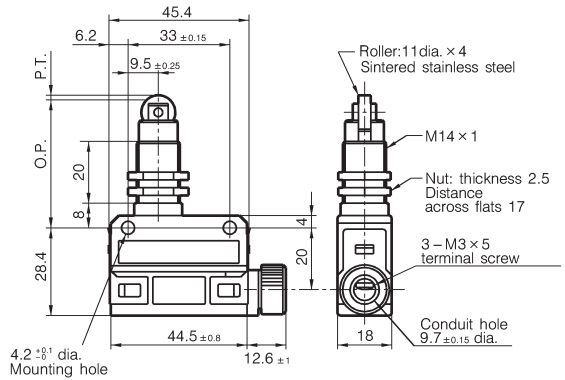
| | |
|---|----------------------|
| Catalog listing | SL1-D □ □ |
| Operating force O.F. (max. N) | 11.8 |
| Release force R.F. (min. N) | 4.9 |
| Pretravel P.T. (max. mm) | 1.5 |
| Overttravel O.T. (min. mm) | 3 |
| Movement differential M.D. (max. mm) | 0.1 |
| Operating position O.P. (mm) | 31.4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



Long roller plunger type



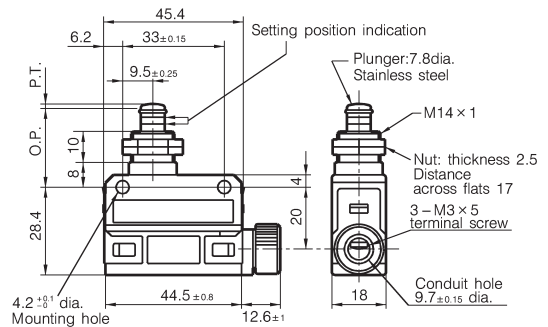
| | |
|---|----------------------|
| Catalog listing | SL1-E □□ |
| Operating force O.F. (max. N) | 11.8 |
| Release force R.F. (min. N) | 4.9 |
| Pretravel P.T. (max. mm) | 1.5 |
| Overtravel O.T. (min. mm) | 3 |
| Movement differential M.D. (max. mm) | 0.1 |
| Operating position O.P. (mm) | 41.4 ^{+0.8}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



Plunger type



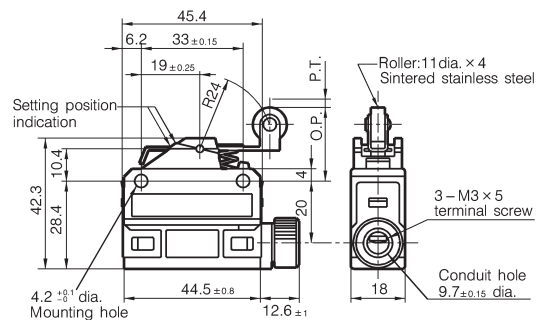
| | |
|---|----------------------|
| Catalog listing | SL1-H □□ |
| Operating force O.F. (max. N) | 11.8 |
| Release force R.F. (min. N) | 4.9 |
| Pretravel P.T. (max. mm) | 1.5 |
| Overtravel O.T. (min. mm) | 3 |
| Movement differential M.D. (max. mm) | 0.1 |
| Operating position O.P. (mm) | 25.4 ^{+0.8}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



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

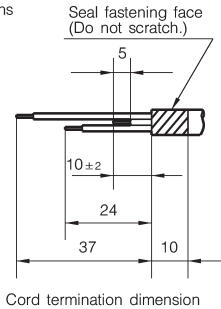


Mark tube or the like

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



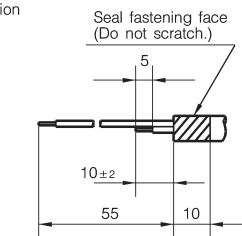
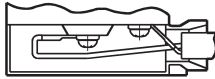
Short circuit



Cord termination dimension

1.2 For 2-core wires

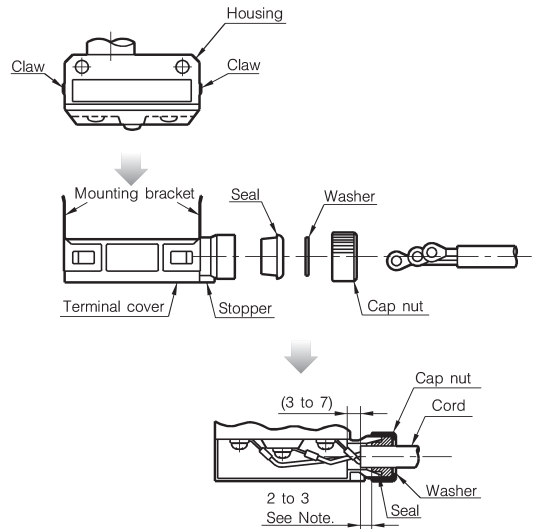
- An example of reversing the direction of a bare crimp-type terminal lug



Cord termination dimension

(unit: mm)

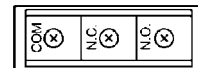
2. Wiring



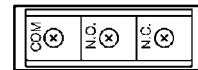
Note: Assemble these components so that the cable sheath protrudes 2 to 3mm from the end of the seal.

- 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.