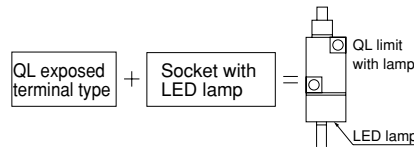


High precision micro limit switches with excellent environment proofing
Quickly upgraded to limit switches with lamps by mounting an LED lamp socket



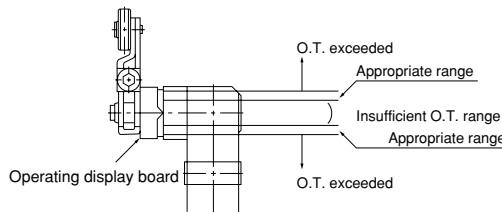
L socket type (roller arm)

An exposed terminal type model combined with a socket with cord for the built-in LED lamp (sold separately) easily become a limit switch with lamp. Convenient for maintenance such as operations checks.



3. With appropriate O.T. range display

The arm model has a convenient appropriate O.T. range display for attachment adjustment work. This should be set so that the operations display board's indicated protrusion winds inside the protrusion on the axle receptor, permitting use under optimum conditions.



4. Terminal uses both solder and tab (#110)

5. O.P. accuracy of ± 0.2 (O.P. repeated accuracy initially ± 0.03) achieved

Attachment accuracy improved greatly. The plunger model has achieved a high O.P. repeated accuracy of within 0.03mm through the development of a unique switch mechanism and a standard attachment surface on the upper surface of the unit (a surface with no slants.)

Also, through a unique mechanism that permits adjustment of the O.P. in each individual product at the time of assem-

bly, an O.P. accuracy of $\pm 0.2\text{mm}$ (.008inch) can be safeguarded between lots, so that almost no operating position adjustment is required during either attachment or replacement.

6. A subminiature limit switch with a great stroke margin (O.T./T.T.)

The T.T. has been enlarged by using a switching mechanism by coil spring for QL.

7. Long life

The unit has a long mechanical life of minimum 10^7 times and a long electrical life of min. 3×10^5 times (5A, 250V AC resistance load) by means of a silver alloy contact with excellent solvent-proof characteristics and a guaranteed wiping operation that possesses two hinges and switching method by coil spring.

8. A mechanism with excellent environment proofing

- A protective construction equivalent to IEC IP64

The actuator has an axle seal with special packing, and the main case and terminals have both a waterproof ring and an epoxy-sealed mechanism. Also, the entire mechanism is water-proof due to the optional socket.

Socket with cord type... IP64 equivalent

- A sturdy, shockproof construction

The body uses die-cast zinc, and the actuator uses stainless steel. Moreover, shock absorbers have been added to lessen the shock during plunger release.

TYPICAL APPLICATIONS

Any application where compactness, density, and robustness, such as sub-miniaturized machines and plant machinery, is required.

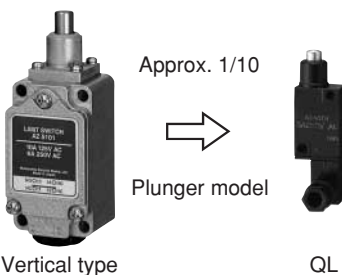
Compliance with RoHS Directive

FEATURES

1. Subminiature design

The size of the actual unit is approximately 1/10 in the case of the plunger model and approximately 1/6.5 in the case of the arm model, that of the vertical type limit switch.

Large-scale miniaturization has been achieved. Ideal for miniaturized machinery designs or highly accurate miniaturized machines.



Vertical type

QL

2. A lamp can be easily added for operations checks

PRODUCT TYPE

1. Switch body

| Actuator | Exposed terminal type | L socket type* | Socket with cord type* |
|-----------------------|-----------------------|----------------|------------------------|
| Push plunger | AZ4001 | AZ4601 | AZ4701 |
| Roller plunger | AZ4002 | AZ4602 | AZ4702 |
| Cross roller plunger | AZ4003 | AZ4603 | AZ4703 |
| Roller arm | AZ4004 | AZ4604 | AZ4704 |
| Adjustable rod | AZ4007 | AZ4607 | AZ4707 |
| Adjustable roller arm | AZ4008 | AZ4608 | AZ4708 |

Notes) 1. Cadmium free contact types are available on a custom-made basis. Please add an "F" to the end of the part number when ordering.

2. *L socket type or socket with cord type is combination of;

L socket type = Exposed terminal type + L socket, Socket with cord type = Exposed terminal type + Socket with cord type (cord length: 1m)

3. UL recognized, CSA certified type available. When ordering, add suffix 9 to part No..

(For the socket with cord type, only UL recognized type available with suffix 9 to the part No.)

2. Socket

| Applicable limit switches | Specifications | Part No. |
|---------------------------|------------------------|----------|
| Exposed terminal types | L socket | AZ3806 |
| | Socket with cord (1 m) | AZ3807 |
| | Socket with cord (2 m) | AZ3827 |
| | Socket with cord (3 m) | AZ3837 |
| | Socket with cord (5 m) | AZ3857 |

3. Socket with LED

| Applicable limit switches | Lamp connection | Lamp rating | Part No. |
|---------------------------|----------------------------|---------------|-----------|
| Exposed terminal types | Normally open connection | 6V DC | AZ3807162 |
| | | 12V DC | AX3807161 |
| | | 24V to 48V DC | AZ380716 |
| | Normally closed connection | 6V DC | AZ3807362 |
| | | 12V DC | AZ3807361 |
| | | 24V to 48V DC | AZ380736 |

Notes) 1. Types with 24 to 48V DC lamp rating are recommended for PC input use.
2. The following cord lengths are also available and lot-produced upon request.

| Cord length | Part No. |
|--------------|--------------|
| 2m 6.562ft. | AZ38 [2]7*6* |
| 3m 9.843ft. | AZ38 [3]7*6* |
| 5m 16.404ft. | AZ38 [5]7*6* |

The 5th digit (boxed) of product code denotes the length of cord.
Numerals come in the asterisked (*) digits, which show the lamp specifications.
The 7th digit: 1: N.O. connection, 3: N.C. connection
The 9th digit: None: 24 to 48V DC, 1: 12V DC, 2: 6V DC

FOREIGN STANDARDS

| Standards | Applicable product | Part No. |
|-----------------------|---|------------------------------------|
| UL recognized product | File No. : E122222 Ratings : 5A 250V AC Product type : All products | Add "9" to the end of the part No. |
| CSA certified product | File No. : LR55880 Ratings : 5A 250V AC Product type : All products excluding socket with cord types. | |

SPECIFICATIONS

1. Rating

| Rated control voltage | 125V AC | 250V AC | 30V DC | 125V DC |
|----------------------------|---------|---------|--------|---------|
| Resistive load (cos φ≒1) | 5A | 5A | 5A | 0.4A |
| Inductive load (cos φ≒0.4) | 3A | 3A | 3A | 0.1A |

2. Characteristics

| | | |
|--|--|--|
| Contact arrangement | 1 From C | |
| Initial contact resistance, max. | 50 mΩ (By voltage drop 5 to 6V DC 1A) | |
| Contact material | Ag alloy (Contains cadmium.) | |
| Initial insulation resistance (At 500V DC) | Min. 100MΩ | |
| Initial breakdown voltage | Between non-consecutive terminals | 1000 Vrms for 1 min |
| | Between dead metal parts and each terminal | 1500 Vrms for 1 min |
| | Between ground and each terminal | 1500 Vrms for 1 min |
| Shock resistance | In the free position | Max. 300 m/s ² (Approx. 30G) (Adjustable rod type and adjustable roller arm type: Min. 100m/s ² (Approx. 10G)) |
| | In the full operating position | |
| Vibration resistance | 10 to 55 Hz, double amplitude of 1.5 mm | |
| Expected life (min. operations) | Mechanical | 10 ⁷ (at 120 cpm) |
| | Electrical | 3 × 10 ⁵ (at 20 cpm, 5A 250V resistive load) |
| Ambient temperature | -20 to +60°C -4 to +140°F | |
| Ambient humidity | Max. 95% R.H. | |
| Max. operating speed | 120 cpm | |

3. Operating characteristics

| Characteristics | Operating Force [O.F.] (N{gf}) max. | Release Force [R.F.] (N{gf}) min. | Pretravel [P.T.], max. mm inch | Movement Differential [M.D.] max. mm inch | Overtravel [O.T.], min. mm inch | Totaltravel [T.T.], min. |
|-----------------------|-------------------------------------|-----------------------------------|--------------------------------|---|---------------------------------|--------------------------|
| Actuator | | | | | | |
| Push plunger | 6.86 {700} | 0.69 {70} | 1 .039 | 0.15 .006 | 4 .157 | — |
| Roller plunger | 6.86 {700} | 0.69 {70} | 1 .039 | 0.15 .006 | 4 .157 | — |
| Cross roller plunger | 6.86 {700} | 0.69 {70} | 1 .039 | 0.15 .006 | 4 .157 | — |
| Roller arm | 4.41 {450} | 0.24 {25} | 15°± 3° | 3° | — | 80° |
| Adjustable rod | 4.41 {450} to 1.11 {113} | 0.24 {25} to 0.06 {6} | 15°± 3° | 3° | — | 80° |
| Adjustable roller arm | 4.41 {450} to 2.01 {205} | 0.24 {25} to 0.11 {11} | 15°± 3° | 3° | — | 80° |

Note) For the operating characteristics, refer to the TECHNICAL INFORMATION.

4. Protective characteristics

| Protective construction IEC | Switch body | L socket type | Type with socket and cord |
|-----------------------------|-------------|---------------|---------------------------|
| IP64 | ○ | ○ | ○ |
| IP65 | ○ | — | — |
| IP66 | ○ | — | — |

Note) For the switch proper, protect its terminals.

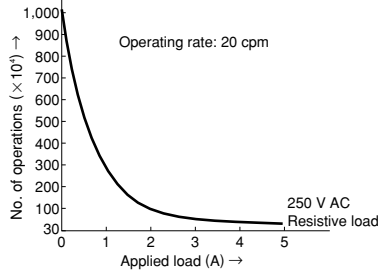
5. LED rating

| Rated operating voltage | Operating voltage range | Internal resistance |
|-------------------------|-------------------------|---------------------|
| 6V DC | 5 to 15V DC | 2.4kΩ |
| 12V DC | 9 to 28V DC | 4.7kΩ |
| 24 to 48V DC | 20 to 55V DC | 15kΩ |

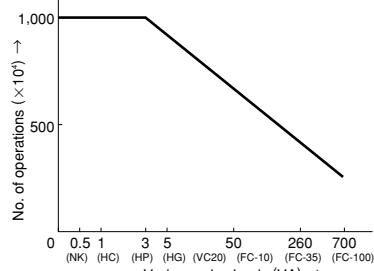
QL (AZ4)

DATA

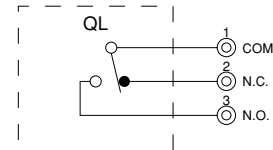
1. Life curve



2. Actual load life curve (relay coil load)



WIRING DIAGRAMS

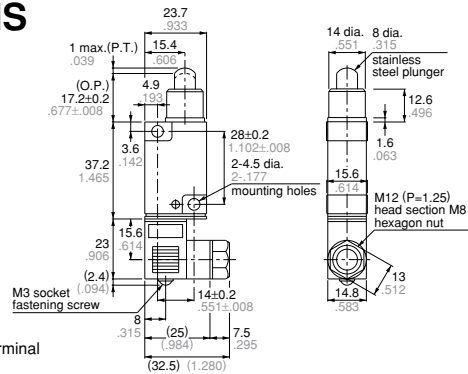


DIMENSIONS

1. L socket type Push plunger



AZ4601
Weight: 90g

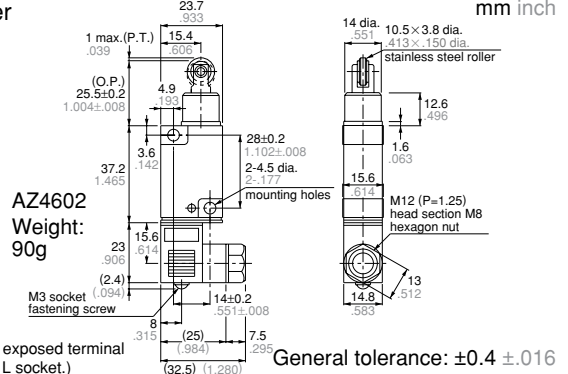


(Set with AZ4001 exposed terminal type and AZ3806 L socket.)

Roller plunger



AZ4602
Weight: 90g

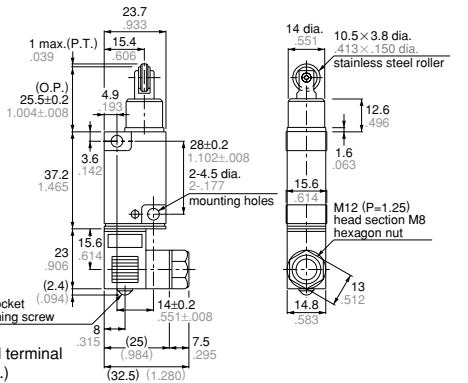


(Set with AZ4002 exposed terminal type and AZ3806 L socket.)

Cross roller plunger



AZ4603

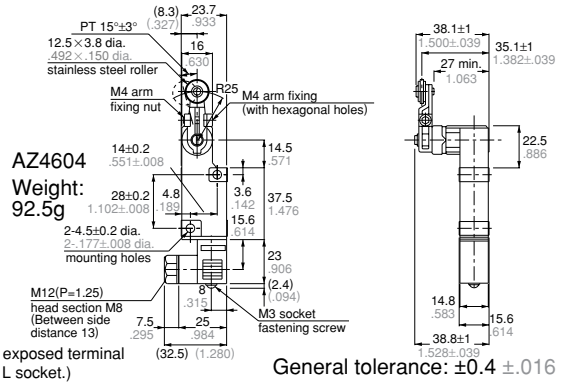


(Set with AZ4003 exposed terminal type and AZ3806 L socket.)

Roller arm



AZ4604
Weight: 92.5g

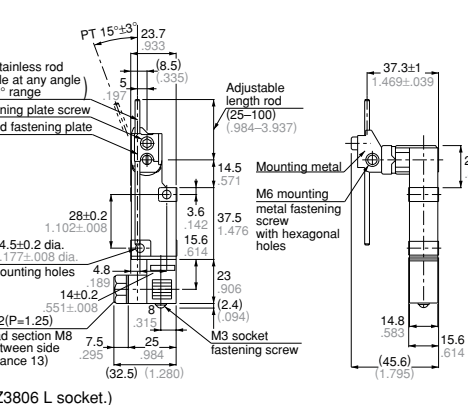


(Set with AZ4004 exposed terminal type and AZ3806 L socket.)

Adjustable rod



AZ4607
Weight: 94.5g

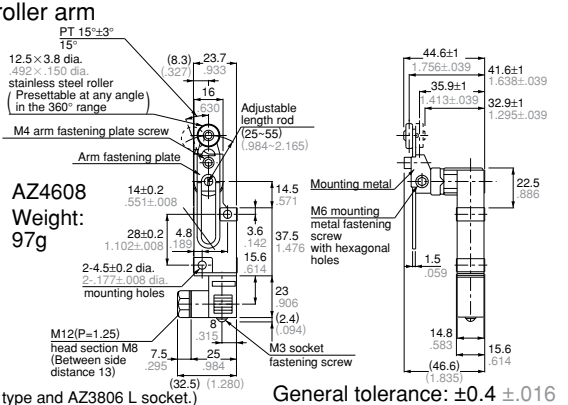


(Set with AZ4007 exposed terminal type and AZ3806 L socket.)

Adjustable roller arm



AZ4608
Weight: 97g

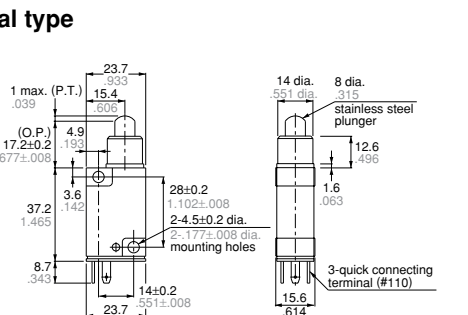


(Set with AZ4008 exposed terminal type and AZ3806 L socket.)

2. Exposed terminal type Push plunger



AZ4001

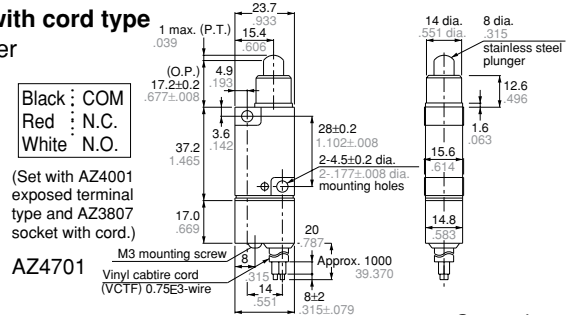


Note) The following types are also available. Roller plunger: AZ4002
Cross roller plunger: AZ4003 Roller arm: AZ4004
Adjustable rod: AZ4007 Adjustable roller arm: AZ4008

3. Socket with cord type Push plunger



AZ4701



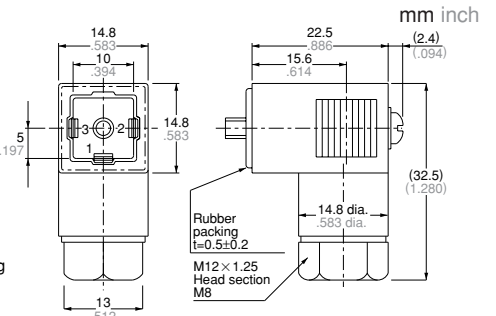
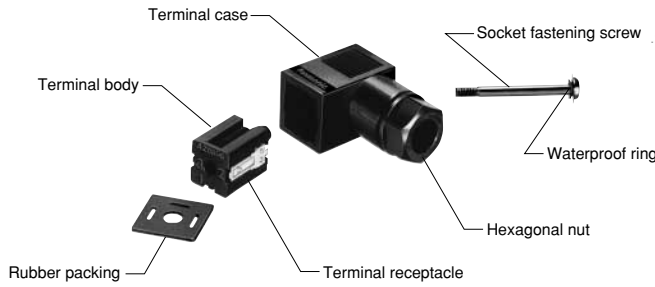
Note) The following types are also available. Roller plunger: AZ4702
Cross roller plunger: AZ4703 Roller arm: AZ4704
Adjustable rod: AZ4707 Adjustable roller arm: AZ4708

SOCKETS

L socket



AZ3806



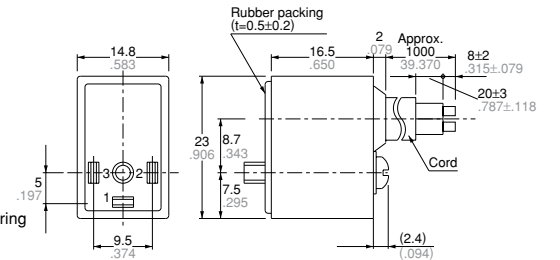
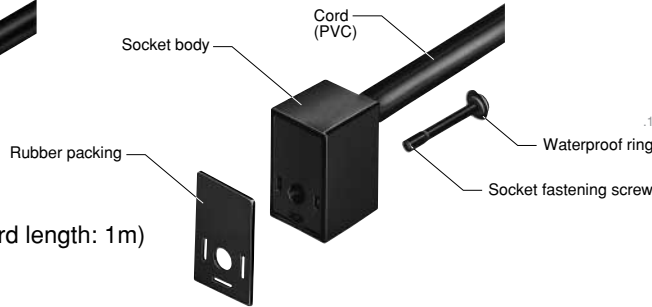
| Terminal number | Terminal |
|-----------------|----------|
| 1 | COM |
| 2 | N.C. |
| 3 | N.O. |

General tolerance: $\pm 0.4 \pm 0.16$

Socket with cord



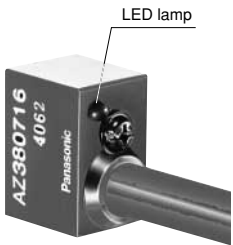
AZ3807 (cord length: 1m)
weight: 85g



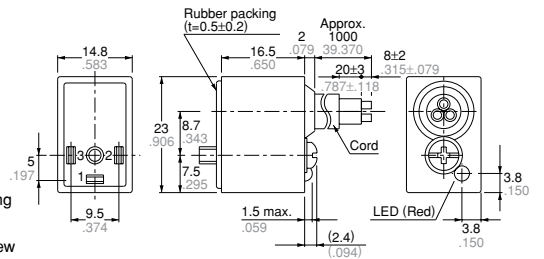
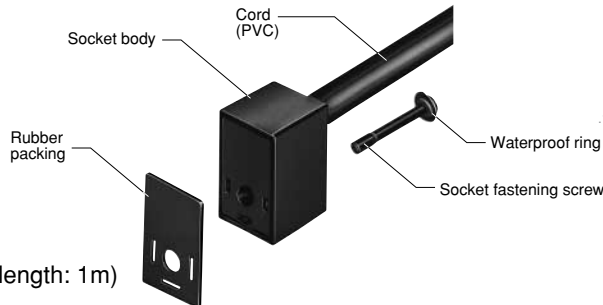
| Terminal number | Cord color | Terminal |
|-----------------|------------|----------|
| 1 | B (Black) | COM |
| 2 | R (Red) | N.C. |
| 3 | W (White) | N.O. |

General tolerance: $\pm 0.4 \pm 0.16$

Socket with LED



AZ380716 (cord length: 1m)



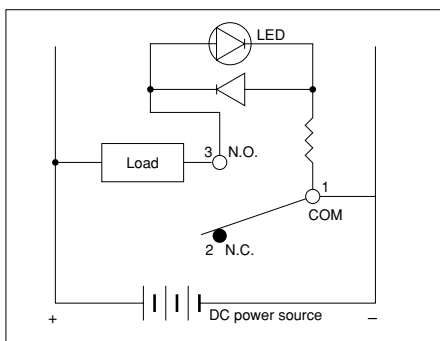
| Terminal number | Cord color | Terminal |
|-----------------|------------|----------|
| 1 | B (Black) | COM |
| 2 | R (Red) | N.C. |
| 3 | W (White) | N.O. |

General tolerance: $\pm 0.4 \pm 0.16$

LAMP LIGHTING CIRCUIT

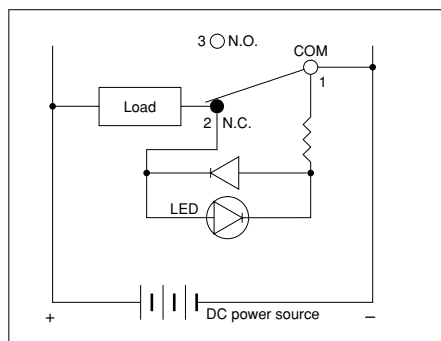
1. Load at N.O. side

Use normally open (N.O.) connection terminal. LED will be turned on when switch is in free position, when switch is on, LED will be turned off.



2. Load at N.C. side

Use normally closed (N.C.) connection terminal. LED will be turned off when is in free position, when switch is on, LED will be turned on.



Notes

1. Keep possible leakage current (see the CAUTIONS) in mind in order to prevent the load from malfunctioning.
2. Types with the 24 to 48V DC lamp rating are recommended for sequencer input use.
3. Connect the red and black leads to the positive ⊕ and negative ⊖ terminals, respectively, for the N.C. type, and the white and black leads to the positive ⊕ and negative ⊖ terminals, respectively, for the N.O. type.

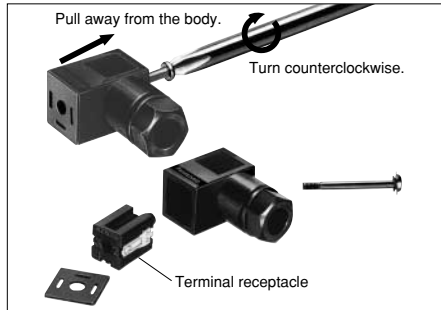
QL (AZ4)

MOUNTING METHOD

1. L socket type

1) After loosening the L socket fastening screws, grasp the terminal cover and pull it away from the switch body.

2) Remove the fastening screw from the terminal block. (Remove with the 3 terminal receptacle.)



3) Loosen the hexagonal nut and remove the rubber bushing and washer from the inside.

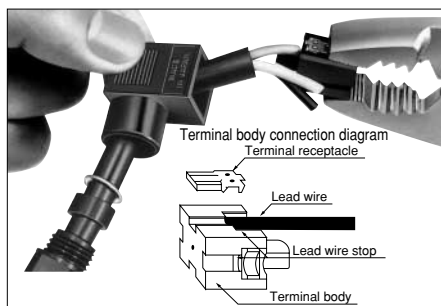


4) Select cord from applicable wire table.
5) Decide which direction the cord outlet is to face and strip the sheath accordingly. (See page 43.)

6) After passing the applicable cord through the hexagonal nut, bushing, and washer in that order, pass the cord through the terminal case.



7) After stripping the cord sheath, insert the corresponding wires into the grooves of the terminal body up to the wire stop, then crimp the terminal receptacle over the wires with a pair of pliers.



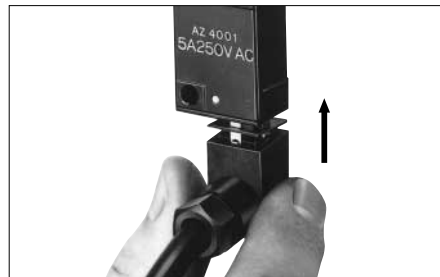
8) After the terminals have been properly crimped in the terminal body, insert the body into the terminal case. (When inserting the body, be careful not to block the hole for the fastening screw with the wires.)



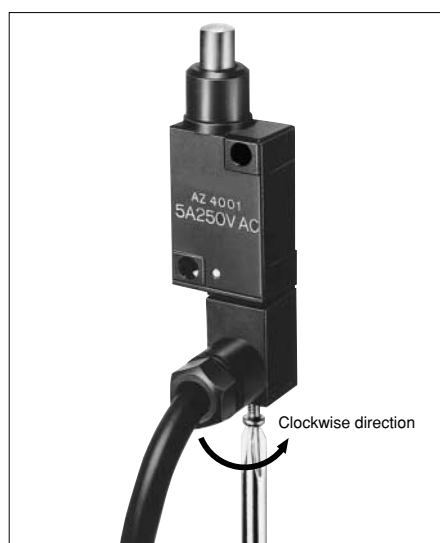
9) Temporarily screw in the fastening screw through the terminal body, then insert the washer and rubber bushing into the cord opening of L socket. Tighten it with a wrench or pliers.



10) Apply the rubber packing over the terminals, then insert the L socket into the switch body.

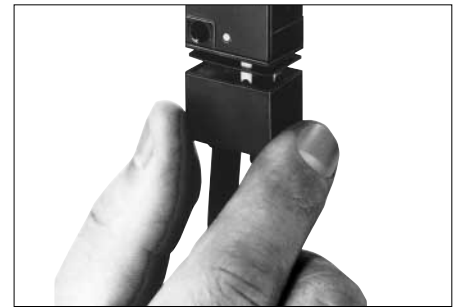


11) Tighten the fastening screw into the switch body.



2. Socket with cord (including socket with lamp)

1) Apply the rubber packing over the terminals, then insert the socket with cord into the switch body.

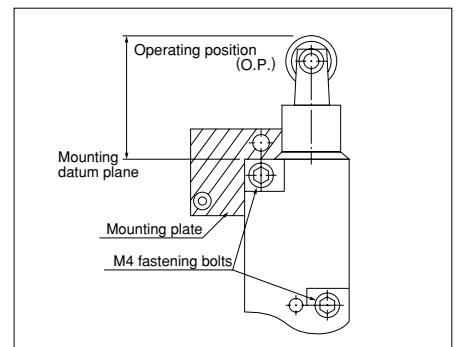


2) Screw the socket fastening screw into the switch body and tighten it.



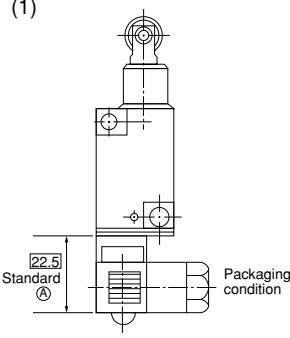
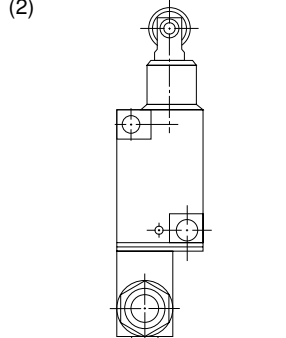
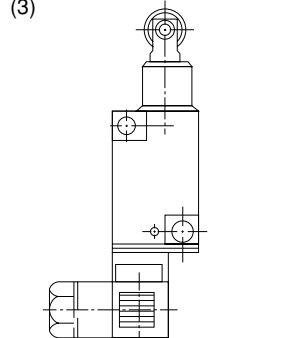
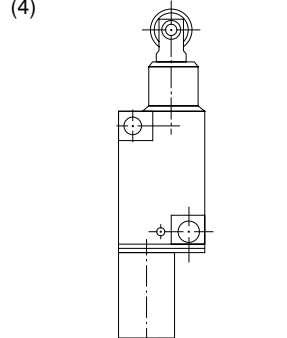
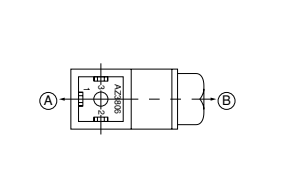
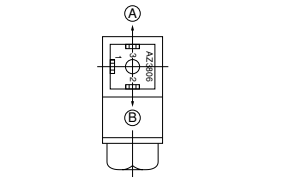
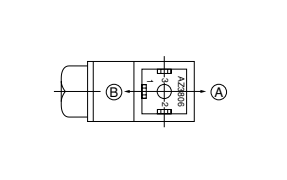
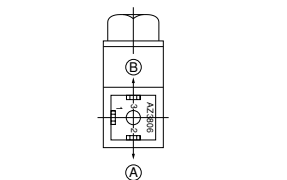
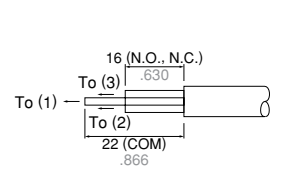
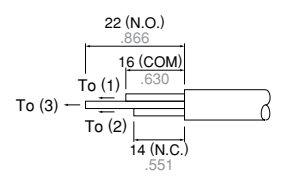
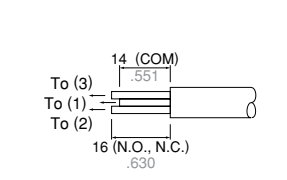
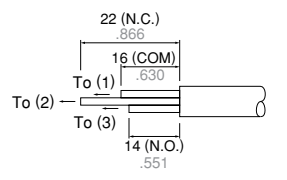
Mounting

The QL micro limit switch is manufactured with a very small variation in the distance between the datum plane and the operating point. When the operating point has been accurately established and the mounting position clearly determined, two M4 bolts should be used securely fastening the switch.



CORD OUTLET DIRECTION AND SHEATH STRIPPING DIMENSIONS

The cord outlet direction is selected from (1) of the (4) drawings below, and the cord is stripped to match the desired direction

| | | | | |
|---|---|--|--|--|
| <p>QL</p> | <p>(1)</p>  <p>Standard (A)</p> <p>Packaging condition</p> <p>Note: The stripping of the cord is based on a length for dimension A as standard and should be stripped accordingly.</p> | <p>(2)</p>  | <p>(3)</p>  | <p>(4)</p>  |
| <p>L socket direction</p> |  <p>Terminal (1) and (A) direction are aligned.</p> |  <p>Terminal (3) and (A) direction are aligned.</p> |  <p>Terminal (1) and (B) direction are aligned.</p> |  <p>Terminal (2) and (A) direction are aligned.</p> |
| <p>Cord sheath stripping dimensions</p> |  <p>To (1)</p> <p>To (2)</p> <p>To (3)</p> <p>.866</p> <p>.630</p> <p>22 (COM)</p> <p>16 (N.O., N.C.)</p> |  <p>To (3)</p> <p>To (1)</p> <p>To (2)</p> <p>.866</p> <p>.630</p> <p>.551</p> <p>22 (N.O.)</p> <p>16 (COM)</p> <p>14 (N.C.)</p> |  <p>To (3)</p> <p>To (1)</p> <p>To (2)</p> <p>.551</p> <p>.630</p> <p>14 (COM)</p> <p>16 (N.O., N.C.)</p> |  <p>To (2)</p> <p>To (1)</p> <p>To (3)</p> <p>.866</p> <p>.630</p> <p>.551</p> <p>22 (N.C.)</p> <p>16 (COM)</p> <p>14 (N.O.)</p> |

Applicable wire

| Wire name | Applicable wire | | |
|---------------------------|----------------------|-------------|---------------------------|
| | Conductor | Wire strand | Finished outside diameter |
| Vinyl cabtire cord (VCTF) | 0.75 mm ² | 2-wire | 6.6mm .268 inch dia. |
| | | 3-wire | 7.2mm .283 inch dia. |

CAUTIONS

1. Ambient conditions

1) The use of these switches under the following conditions should be avoided. If the following conditions should become necessary, we recommend consulting us first.

- Use where there will be direct contact with organic solvents, strong acids or alkalis, or direct exposure to their vapors.
- Use where inflammable or corrosive gases exist.

2) Because these switches are not of water resistant or immersion-proof construction, their use in water or oil should be avoided. Also, locations where water or oil can normally impinge upon the switch or where there is an excessive accumulation of dust should be avoided.

2. Wiring

1) Although QL limit switches have large over-travel (O.T.), excessive O.T. will occur wear and change in its characteristics. Specifically, where there is a need for long life, it is recommended that the proper O.T. should be used.

When the operating object is in the free condition, force should not be applied directly to the actuator.

2) Use their own accessories when mounting and wiring QL limit switches so as to maintain their own characteristics.

3) In order to maintain the reliability at a high level under practical conditions of use, the actual operating conditions should be checked for the benefit of the quality of the product.

4) Do not use the switch in a silicon

atmosphere. Case should be taken where organic silicon rubber, adhesive, sealing material, oil, grease or lead wire generates silicon.

5) Avoid use in excessively dusty environments where actuator operation would be hindered.

3. Socket with LED

1) The OFF condition leakage current at each voltage is as follows.

| Rated operating voltage | 6V | 12V | 24V | 48V |
|-------------------------|-------|-------|-------|-------|
| 24 to 48V DC | — | — | 1.6mA | 3.2mA |
| 12V DC | — | 2.6mA | 5.2mA | — |
| 6V DC | 2.5mA | 5.6mA | — | — |

2) Even the polarity of power source is connected in the opposite way, LED is not broken. However, LED is not lit on.