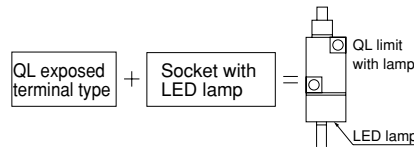


**High precision micro limit switches with excellent environment proofing**  
**Quickly upgraded to limit switches with lamps by mounting an LED lamp socket**



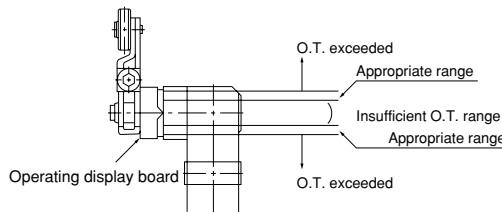
L socket type (roller arm)

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 $\pm 0.2$ (O.P. repeated accuracy initially $\pm 0.03$ ) 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  $\pm 0.2$ 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.  $3 \times 10^5$  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.

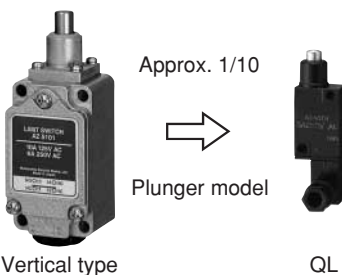
Compliance with RoHS Directive

## 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 <sup>2</sup> (Approx. 30G) (Adjustable rod type and adjustable roller arm type: Min. 100m/s <sup>2</sup> (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 <sup>7</sup> (at 120 cpm)
	Electrical	3 × 10 <sup>5</sup> (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.

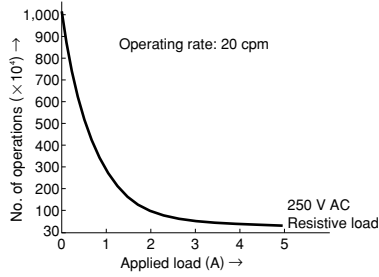
**5. LED rating**

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

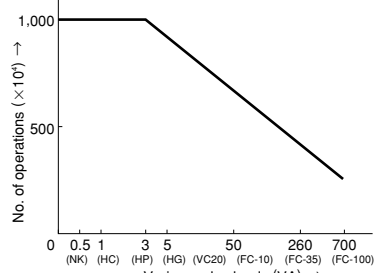
# QL (AZ4)

## DATA

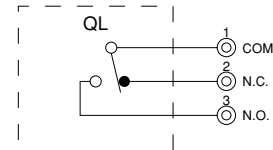
### 1. Life curve



### 2. Actual load life curve (relay coil load)



## WIRING DIAGRAMS

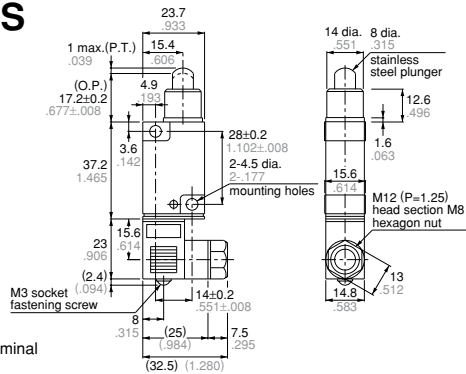


## DIMENSIONS

### 1. L socket type Push plunger



**AZ4601**  
Weight: 90g

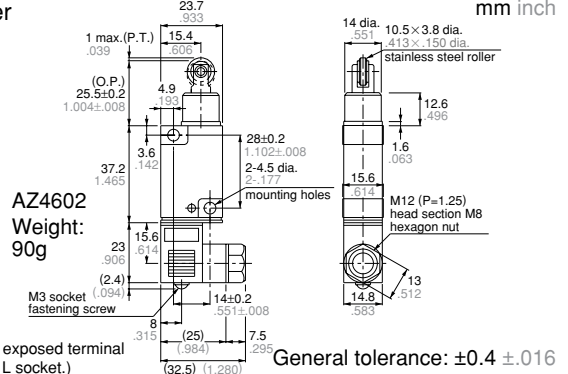


(Set with AZ4001 exposed terminal type and AZ3806 L socket.)

### Roller plunger



**AZ4602**  
Weight: 90g



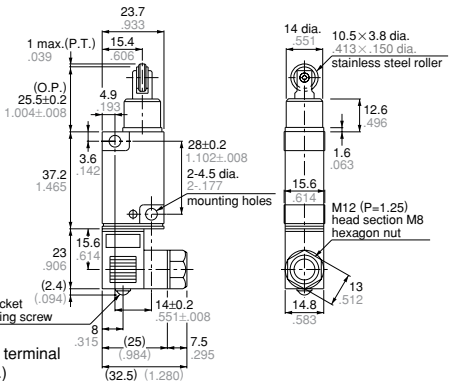
(Set with AZ4002 exposed terminal type and AZ3806 L socket.)

General tolerance: ±0.4 ±0.16

### Cross roller plunger



**AZ4603**

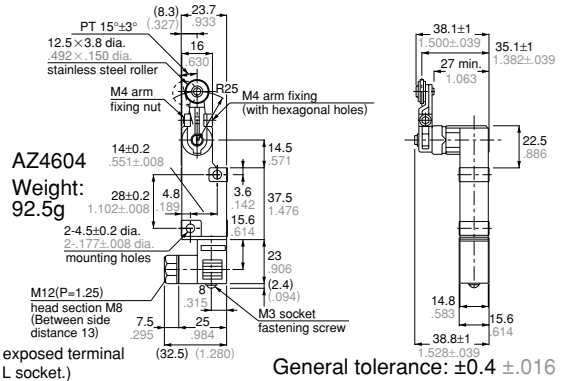


(Set with AZ4003 exposed terminal type and AZ3806 L socket.)

### Roller arm



**AZ4604**  
Weight: 92.5g



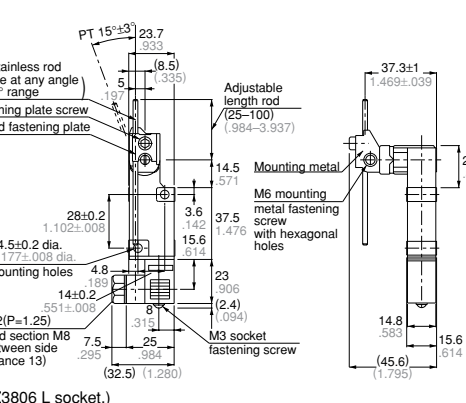
(Set with AZ4004 exposed terminal type and AZ3806 L socket.)

General tolerance: ±0.4 ±0.16

### Adjustable rod



**AZ4607**  
Weight: 94.5g

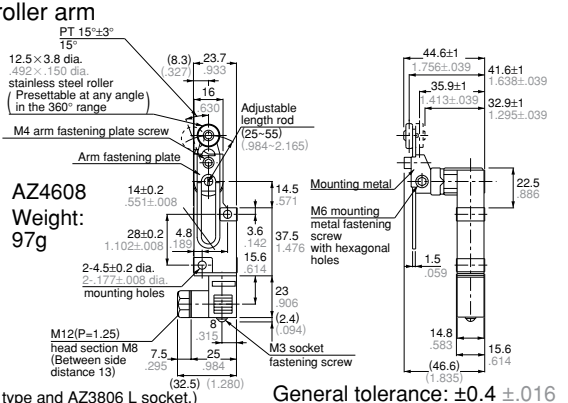


(Set with AZ4007 exposed terminal type and AZ3806 L socket.)

### Adjustable roller arm



**AZ4608**  
Weight: 97g



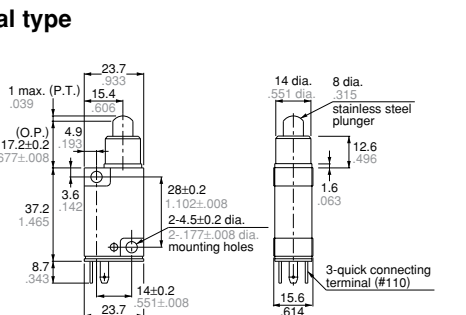
(Set with AZ4008 exposed terminal type and AZ3806 L socket.)

General tolerance: ±0.4 ±0.16

### 2. Exposed terminal type Push plunger



**AZ4001**

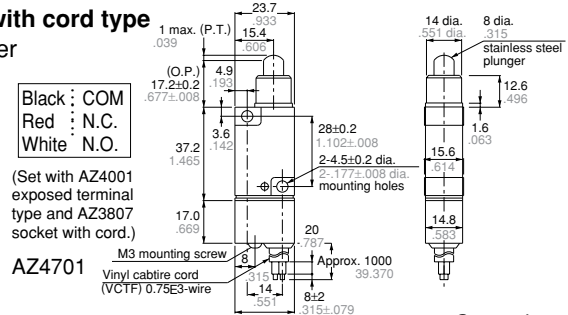


Note) The following types are also available. Roller plunger: AZ4002  
Cross roller plunger: AZ4003 Roller arm: AZ4004  
Adjustable rod: AZ4007 Adjustable roller arm: AZ4008

### 3. Socket with cord type Push plunger



**AZ4701**



Black : COM  
Red : N.C.  
White : N.O.

(Set with AZ4001 exposed terminal type and AZ3807 socket with cord.)

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

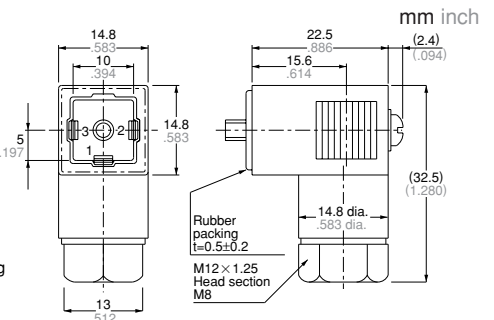
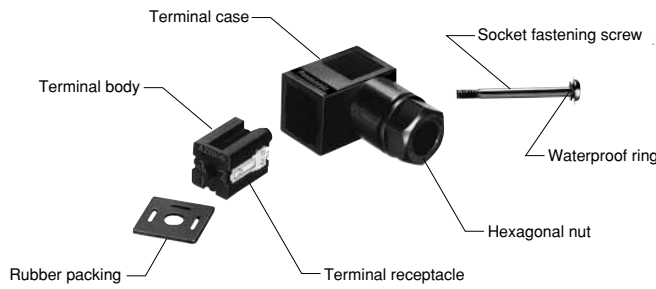
General tolerance: ±0.4 ±0.16

# SOCKETS

L socket



AZ3806



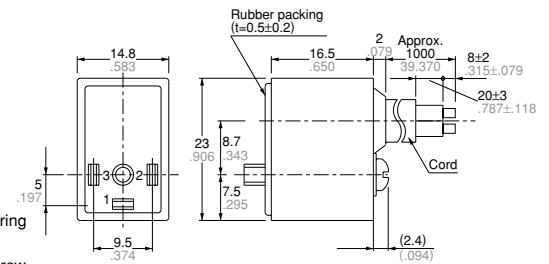
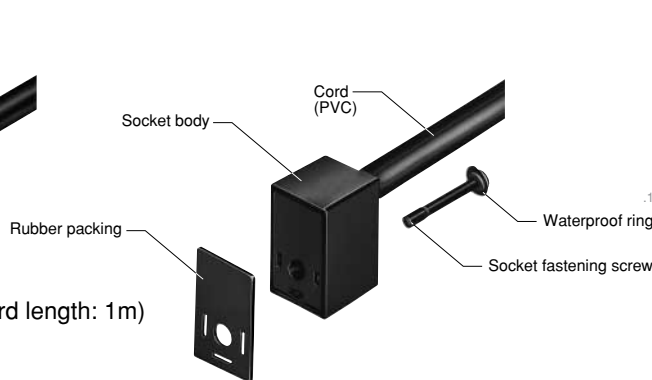
Terminal number	Terminal
1	COM
2	N.C.
3	N.O.

General tolerance:  $\pm 0.4 \pm 0.16$

## Socket with cord



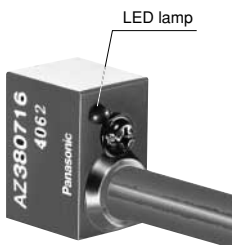
AZ3807 (cord length: 1m)  
weight: 85g



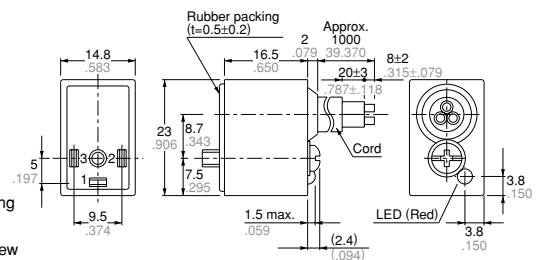
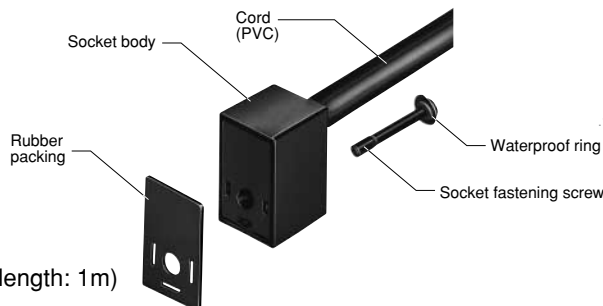
Terminal number	Cord color	Terminal
1	B (Black)	COM
2	R (Red)	N.C.
3	W (White)	N.O.

General tolerance:  $\pm 0.4 \pm 0.16$

## Socket with LED



AZ380716 (cord length: 1m)



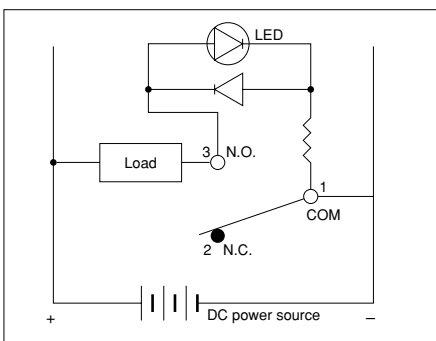
Terminal number	Cord color	Terminal
1	B (Black)	COM
2	R (Red)	N.C.
3	W (White)	N.O.

General tolerance:  $\pm 0.4 \pm 0.16$

# LAMP LIGHTING CIRCUIT

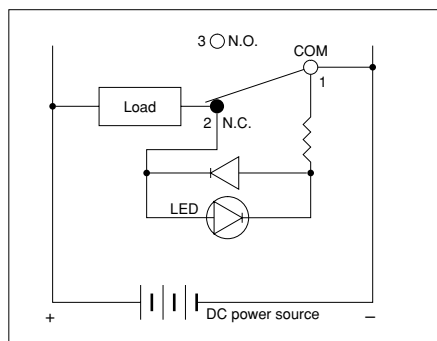
## 1. Load at N.O. side

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.

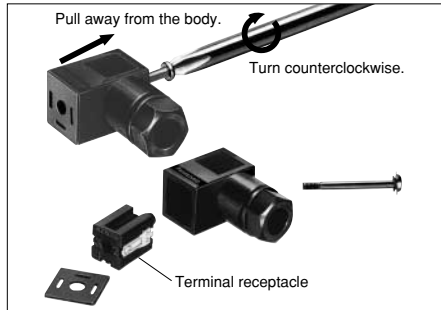
# QL (AZ4)

## 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.

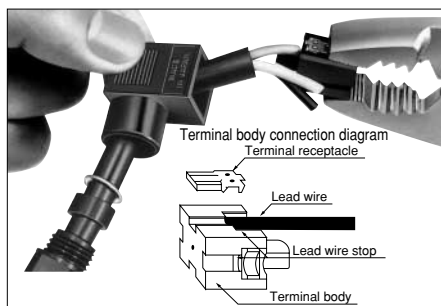


4) Select cord from applicable wire table.  
5) Decide which direction the cord outlet is to face and strip the sheath accordingly. (See page 43.)

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.



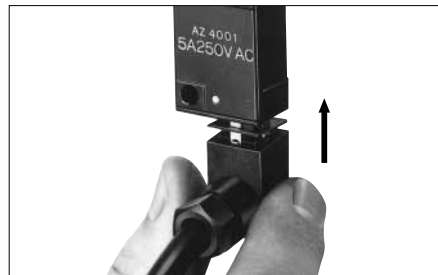
8) After the terminals have been properly crimped in the terminal body, insert the body into the terminal case. (When inserting the body, be careful not to block the hole for the fastening screw with the wires.)



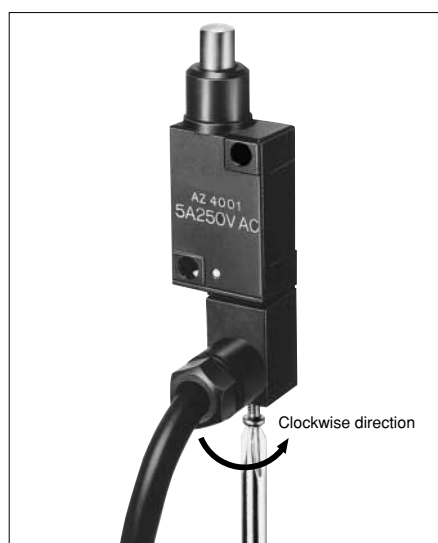
9) Temporarily screw in the fastening screw through the terminal body, then insert the washer and rubber bushing into the cord opening of L socket. Tighten it with a wrench or pliers.



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

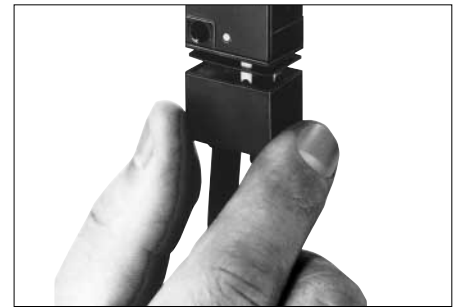


11) Tighten the fastening screw into the switch body.



### 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.

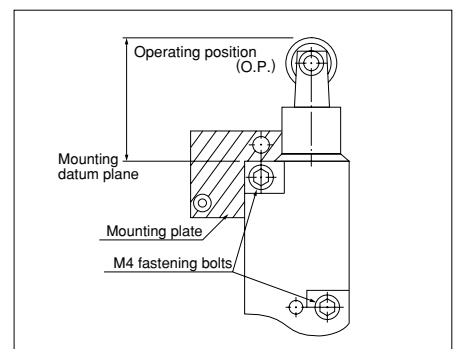


2) Screw the socket fastening screw into the switch body and tighten it.



## Mounting

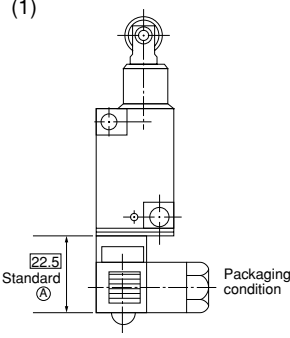
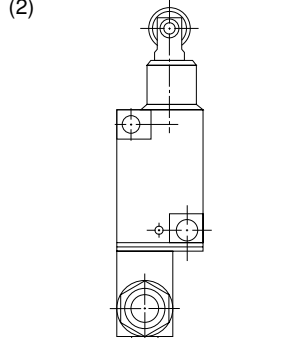
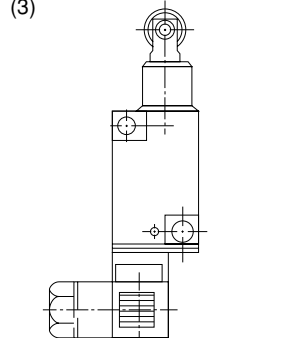
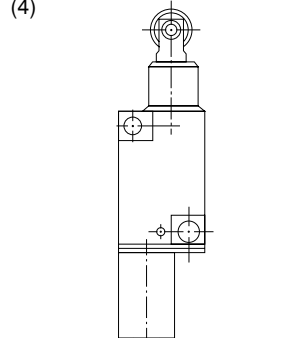
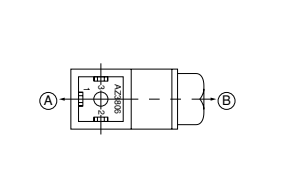
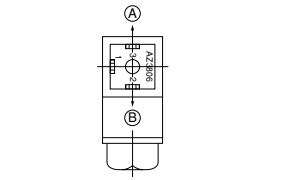
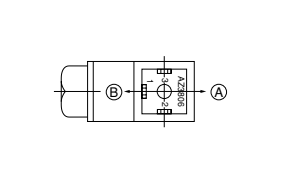
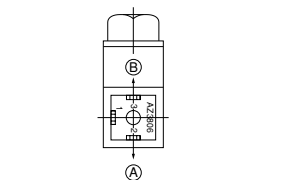
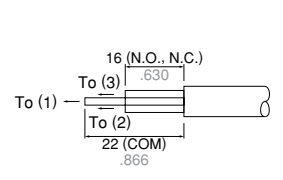
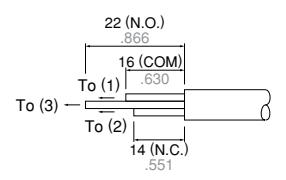
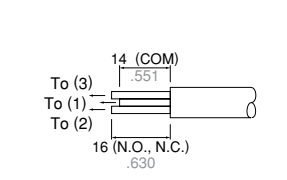
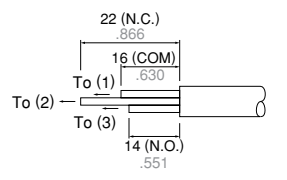
The QL micro limit switch is manufactured with a very small variation in the distance between the datum plane and the operating point. When the operating point has been accurately established and the mounting position clearly determined, two M4 bolts should be used securely fastening the switch.





## 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>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>				

### Applicable wire

Wire name	Applicable wire		
	Conductor	Wire strand	Finished outside diameter
Vinyl cabtire cord (VCTF)	0.75 mm <sup>2</sup>	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.

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