’06–’07

Panasonic

ideas for life

# Limit Switches

Limit Switches ’06–’07

Matsushita Electric Works, Ltd.

**Limit Switches**
ARCT1B272E ’06.9

Matsushita Electric Works, Ltd.

These materials are printed on ECF pulp.
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Panasonic®



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Specifications are subject to change without notice.

Printed in Japan.

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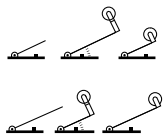
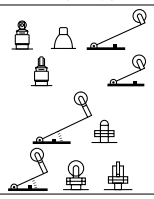
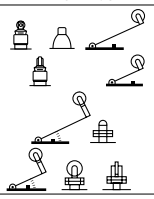
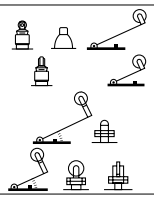
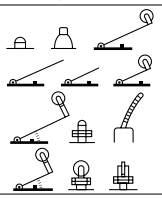
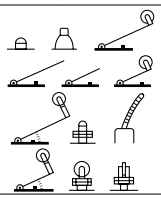
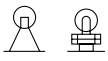
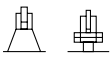
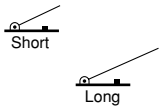
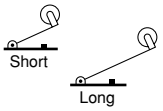
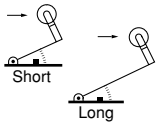
# SELECTOR CHART

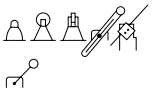
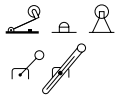
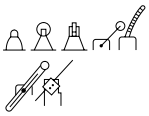
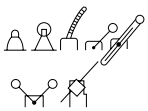
| Classification | | | Subminiature size | | Compact size | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Product name | | | SL (AZ3) Micro Limit Switches | | HL (AZH) Limit Switches (Die cast case) | HL (AZH) Limit Switches (Die cast case) | HL (AZH) Limit Switches (Plastic case) | ML (AZ7) Limit Switches (standard) | ML (AZ7) Limit Switches (Epoxy-Sealed terminal type) | |
| Appearance<br>Head code | | |  AZ3 | |  AZH20 22 |  AZH23 |  AZH10 12 |  AZ7 |  AZ7 | |
| Feature | | | • A limit switch with high-density mounting that improves stroke capacity through an O.T. absorption-type spring.<br>• LED lamp type also available. | | • High sealability that satisfies IEC IP67.<br>• Wiring is screw-terminal type.<br>• Bifurcated type also available. | • High sealability that satisfies IEC IP67.<br>• Less wiring, less installation connector type.<br>• LED lamp type also available. | • Bifurcated type available.<br>• Perfect for applications that prioritize economy. | • Switches installed with both economical and compact Z-basic microswitches and limit switch protective construction.<br>• Coil spring system provides long life. | • An ML compact limit switch with an epoxy-sealed case that completely encloses the terminal. | |
| Protective construction | Dust-proof type | IP60 | Rubber-cover type ○ | Socket with cord type ○ | ○ | ○ | ○ | ○ | ○ | |
| | Abrasion-proof type | IP64 | – | ○ | ○ | ○ | ○ | – | ○ | |
| | Surge-proof type | IP65 | – | – | ○ | ○ | – | – | – | |
| | Corrosion-proof type | IP67 | – | – | ○ | ○ | – | – | – | |
| | Oil-resistant type | – | – | ○ | ○ | ○ | ○ | – | ○ | |
| With lamps | Neon | | – | – | – | – | – | – | – | |
| | LED | | – | ○ | – | ○ (with LED lamps) | – | – | – | |
| Ratings (load resistance) | | | 4A250V AC<br>4A125V AC<br>4A30V DC<br>0.1A 125V DC | | [Standard type] 5A125V AC, 5A250V AC, 5A8V DC, 5A14V DC, 5A30V DC, 0.5A125V DC, 0.25A250V DC / [Bifurcated type] 0.1A125V AC, 0.1A8V DC, 0.1A14V DC, 0.1A30V DC | [Bifurcated type] without LEDlamps: 0.1A125V AC, 0.1A8V DC, 0.1A14V DC, 0.1A30V DC / with LEDlamps: 0.1A24V AC | [Standard type] 5A125V AC, 5A250V AC, 5A8V DC, 5A14V DC, 5A30V DC, 0.5A125V DC, 0.25A250V DC / [Bifurcated type] 0.1A125V AC, 0.1A8V DC, 0.1A14V DC, 0.1A30V DC | 10A250V AC<br>10A125V AC<br>0.4A115V DC | 10A250V AC<br>10A125V AC<br>0.4A115V DC | |
| Life (Min. ope.) | Mechanical | | $10^7$ | | $10^7$ | $10^7$ | $10^7$ | $10^7$ | $10^7$ | |
| | Electrical | | $10^5$ | | $5x10^5$ | $5x10^5$ | $5x10^5$ | $2x10^5$ | $2x10^5$ | |
| Operating force (max.) (hinge lever type) | | | 0. 98N {100gf}<br>1. 96N {200gf}<br>(short lever type)<br>2. 94N {300gf} | | 2.45N {250gf}<br>3. 92N {400gf}<br>11.8N {1,200gf}<br>(Plunger type) | 2.45N {250gf}<br>3.92N {400gf}<br>11.8N {1,200gf}<br>(Plunger type) | 2.45N {250gf}<br>3. 92N {400gf} | 1.47N {150gf}, 1.77N {180gf}, 1.96N {200gf}, 2.16N {220gf}, 2.35N {240gf}, 2.75N {280gf}, 5.88N {600gf} max. | 1.47N {150gf}, 1.77N {180gf}, 1.96N {200gf}, 2.16N {220gf}, 2.35N {240gf}, 2.75N {280gf}, 5.88N {600gf} max. | |
| Available actuators | | |  | |  |  |  |  |  | |
| Terminals | | | • Rubber cover (Solder and quick connect (#110) terminal)<br>• Socket with cord | | Screw terminal | Connector terminal | Screw terminal | Screw terminal | Vinyl cabtire cable (1m 3.281ft) | |
| Wiring | | | Cabtire code | | Cabtire code | Cabtire code | Cabtire code | Cabtire cable | Cabtire cable | |
| Mounting pitch (Applicable screw) | | | Cross-angled wiring<br>28 × 14mm<br>1.102 × .551inch<br>(M4 screw) | | 33mm 1.299inch<br>(M4 screw) | 33mm 1.299inch<br>(M4 screw) | 33mm 1.299inch<br>(M4 screw) | 25.4mm 1.000inch<br>(M4 screw) | 25.4mm 1.000inch<br>(M4 screw) | |
| Available standards | | | UL, CSA | | UL, CSA, TÜV, CE | UL, CSA, TÜV, CE | UL, CSA, TÜV, CE | UL, C-UL, TÜV, CE | – | |
| Page | | | P.13 | | P.18 | P.18 | P.18 | P.33 | P.33 | |

Note: Excludes limit switch replacement parts

## ■ Actuators

| Push plunger | Roller plunger | Cross-roller plunger | Roller arm | Adjustable roller arm | Adjustable rod | Fork |
|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |

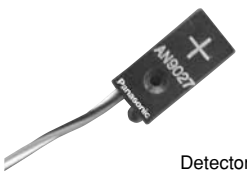
| Spring wire | Flexible rod | Hinge lever | Roller lever | One-way roller lever | Roller lever |
|---|---|---|---|---|---|
|  |  |  Short Long |  Short Long |  Short Long |  |

| Classification | | | Subminiature size vertical type | | Compact size vertical type | | Vertical type | | Touch type | Door switch | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Product name | | | QL (AZ4) Micro Limit Switches | | DL (AZD1) Mini Limit Switches | VL (AZ8) Mini Limit Switches | STOP AZ5 Limit Switches | | VL-T Mini Touch Limit Switches | Compact Magnelimit | Magnelimit |
| Appearance<br>Head code | | | AZ4 | | AZD1 | AZ8 | AZ5 | | AZ84 | AZC3 | AZC1 |
| Feature | | | • A subminiature, highly accurate limit switch with built-in environment-proof functions.<br>• Cord extraction can be changed in four directions, due to the dedicated L socket.<br>• LED lamp can also be attached. | | • Excellent safety even if the contact point is welded, due to the forced contact opening mechanism.<br>• Block mount system makes parts replacement easy.<br>• Conforms to DIN standards. | • In addition to the characteristics of stand mounted limit switches, is compact, easily installable, highly reliable, lightweight, and economical. | • Built-in dedicated circuit breaker (1 Form A 1 Form B).<br>• Different types of actuator available. | | • Operate just by touching lightly.<br>• Comes with sensitivity adjustment function and indicates operations.<br>• VL type touch limit switch | • Secured by magnet<br>• Built-in switch detection<br>Dual-role switch in one unit.<br>• Safe design prevents operator making errors. | • Secured by magnet<br>• Built-in switch detection<br>Dual-role switch in one unit.<br>• Construction possible with 100V AC power. |
| Protective construction | Dust-proof type | IP60 | L socket type ○ | Socket with cord type ○ | ○ | ○ | ○ | | ○ | – | – |
| | Abrasion-proof type | IP64 | ○ | ○ | ○ | ○ | ○ | | ○ | – | – |
| | Surge-proof type | IP65 | ○ | – | ○ | – | – | | – | – | – |
| | Corrosion-proof type | IP67 | – | – | ○ | – | ○ | | – | 1) ○ | – |
| | Oil-resistant type | – | ○ | ○ | – | ○ | ○ | | ○ | – | – |
| With lamps | Neon | | – | – | – | – | ○ | – | ○ | – | – | – |
| | LED | | – | ○ | – | – | ○ | – | ○ | ○ | – | – |
| Ratings (load resistance) | | | 5A250V AC | | 6A250V AC<br>6A380V AC<br>5A24V DC | [Standard type]<br>5A250V AC<br>5A125V AC<br>0.4A125V DC | [With lamp type]<br>[Neon lamp type]<br>5A 240V AC<br>5A 125V AC<br>[LED lamp type]<br>3A 24V DC | [Standard type]<br>10A125V AC<br>6A250V AC<br>2A500V AC<br>0.8A125V DC | [With lamp type]<br>[Neon lamp type]<br>10A 125V AC<br>6A 240V AC<br>[LED lamp type]<br>6A 24V DC | Input voltage<br>12-24V DC<br>Output current<br>150mA | 2)<br>5A (2A) 125V AC<br>5A (2A) 250V AC<br>5A (2A) 30VDC | 5A 125V AC<br>5A 250V AC<br>5A 30VDC |
| Life (Min. ope.) | Mechanical | | $10^7$ | | $10^7$ | $10^7$ | $10^7$ | | $10^7$ | $10^5$ | $10^5$ |
| | Electrical | | $3x10^5$ | | $1.5x10^5$ | $3x10^5$ | $5x10^5$ | | – | $5x10^4$ | $5x10^4$ |
| Operating force (max.) (hinge lever type) | | | 6.86N {700gf} (Plunger type)<br>1.11N {113gf}, 4.41N {450gf} (Arm type) | | 6.37N {650gf}<br>4.90N {500gf}<br>3.29N {400gf} | 0.88N {90gf},<br>5.88N {600gf},<br>8. 83N {900gf},<br>19.16N {2,000gf} | 1.39N {142gf}<br>26.67N {2,720gf} | | – | – | 3.43N {350gf} |
| Available actuators | | |  | |  |  |  | |  <br>Free attachment |  |  |
| Terminals | | | • L socket (Solderand quick connect (#110) terminal)<br>• Socket with code | | Screw terminal (Conduit connectors: PF: 1/2, PG: 13.5 types) | Screw terminal | Screw terminal | | Screw terminal | Tab #110 terminal<br>Lead wire | Screw terminal |
| Wiring | | | Cabtire code | | Cabtire code | Cabtire cord<br>Cap tire cable | Cabtire cable (wiring type) | | Cabtire cord<br>Cabtire cable | Cabtire cord | Cabtire cord |
| Mounting pitch (Applicable screw) | | | 14 × 28mm<br>.551 × 1.102inch<br>(M4 screws) | | 22 × (47mm)<br>.866 × 1.850inch<br>(M4 screws) | 21 × 56mm<br>.827 × 2.205inch<br>(M4 screws) | 30.2 × 58.7mm<br>1.189 × 2.311inch<br>(M5 screws) | | 21 × 56mm<br>827 × 2.205inch<br>(M4 screws) | 30mm 1.181inch<br>(M3) | 52mm 2.047inch<br>(M4) |
| Available standards | | | UL, CSA | | UL, C-UL, TÜV, CE | UL, C-UL, TÜV, CE | UL | | – | UL, C-UL | UL, C-UL, CE |
| Page | | | P.38 | | P.44 | P.52 | P.61 | | P.68 | P.72 | P.74 |

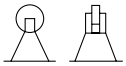
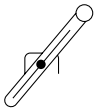
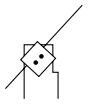
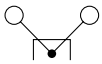
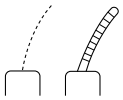
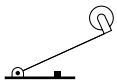
Notes: 1) Excludes exposed part of terminals, externally mounted components, and magnet catches.
2) Figures in parentheses ( ) indicate rated current of water-resistant type.

## ■ Other listed products

STOP Order Discontinued as of March 31, 2009

| Product name | PS Hall Sensors |
|---|---|
| Appearance |  <br>AN9<br>Detector distance 2.5mm .098inch |
| Feature | • Magnetic detector type subminiature sensor<br>• Perfect for slide table limiting<br>• Economical price with operating display lamp attached. |
| Page | P.76 |

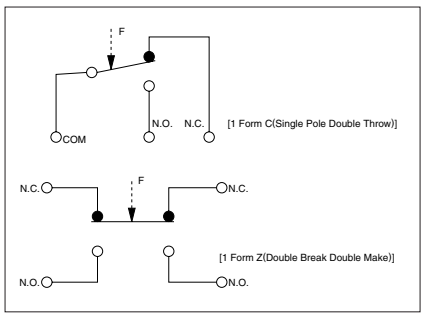
# ACTUATOR SELECTION

| Type | Classification | Pretravel (P.T.) | Overtravel (O.T.) | Operating force (O.F.) | Accuracy | Vibration shock | Characteristics |
|---|---|---|---|---|---|---|---|
|  | Push plunger type | Small | Medium | Large | Excellent | Excellent | High-level accuracy gives firm detection for position fixing, etc., by using perpendicular movement. |
|  | Roller plunger type (includes cross roller plunger) | Small | Medium | Large | Excellent | Excellent | Operating range can be widened by mounting accessory actuators like cams, dogs, cylinders, etc. High-level detection for position fixing. |
|  | Roller arm type | Small to large | Large | Medium | Good to excellent | Excellent | The stroke in the direction of revolution is large at between 45° and 90° and the lever angle can be set at will to within 360° for easy use. Wide angle type (large O.T.) available. Can be used for wide-range position fixing. |
|  | Adjustable roller arm type | Small to large | Large | Medium | Good to excellent | Good | Lever length can be altered to allow rough operation detection using the roller lever characteristics. |
|  | Adjustable rod type | Large | Large | Medium | Good | Good | Wide range of operations, and convenient for uneven mountings. Lightest operation among the revolving operation type of limit switches. Rod length is adjustable, and bending is also easy. |
|  | Fork | Large | Medium | Medium | Good | Excellent | If operated up to 55° position, revolves automatically to retain 90° position. Two dog operation enables recovery operation through single dog, or for anything that has caused the roller position to slip. |
|  | Spring wire and flexible rod | Medium | Large | Small | Possible | Possible | Excluding the thread direction, direction can be adjusted up to 360°. Operating power is the lowest of the limit switches, and is effective in detecting when direction and conditions are uneven. In order to absorb the movements after operation in the actuator part, work slippage tolerances are also large. |
|  | Hinge lever type | Large | Medium | Small | Possible | Possible | Using a low speed, low torque cam, the lever can assume various shapes suited to the operation. The lever is very sturdy. |
|  | Roller lever type | Large | Medium | Small | Possible | Possible | Suited to high speed cams through the attachment of a hinge roller lever. |
|  | One way roller lever type | Medium | Medium | Medium | Possible | Possible | Operation is possible with both hinge lever type and one way operation, but the roller will break if operated in the opposite direction, rendering the unit inoperable. Can be used to prevent opposite direction movement. |
|  | Roller lever type | Medium | Medium | Medium | Possible | Possible | The roller position can be changed. |

# TECHNICAL INFORMATION

## ■ Standard glossary

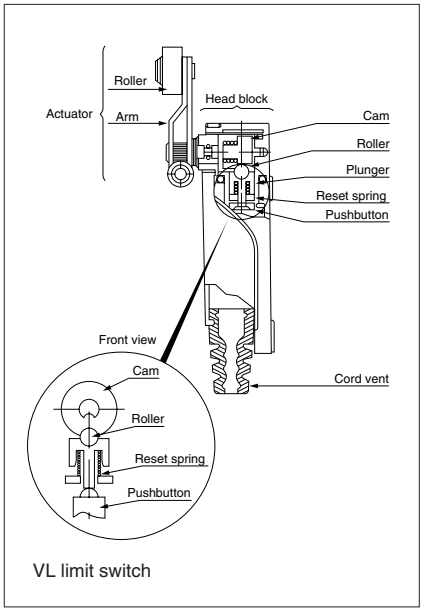
- **Fixed rating values**
  The values that guarantee the standards for the limit switch characteristics and functions. For example, the rated current and rated voltage, which are preset conditions (load type, current, voltage, frequency, etc.)
- **Operating object**
  The mechanism and mountings that operate the limit switch actuator. Used for mechanical operators such as cams and dogs.
- **Detective object**
  The unit other than mechanical mountings that operate the limit switch. Products, parts, jigs, etc.
- **Reaction spring (movable spring)**
  The mechanical part that switches the limit switch contact is called either the reaction spring or the moveable spring.
- **Contact**
  When the counter-spring revolves, power is switched on and off through the contact between metal parts
- **Contact gap**
  The effective clearance between the fixed contact and the moveable contact. Also called breaking distance.
- **Contact arrangement**
  The construction of the electrical input/output circuit depending on use. For example, the following two applications:




- **Contact type**
  Used in opposition to a semiconductor switch that has switching characteristics. Fulfills switch functions through a mechanical ON/OFF contact.
- **Terminal mold**
  After wiring, the connecting part is molding by epoxy resin for waterproof, oil-resistant and dust-proof capabilities.

## ■ CONSTRUCTION

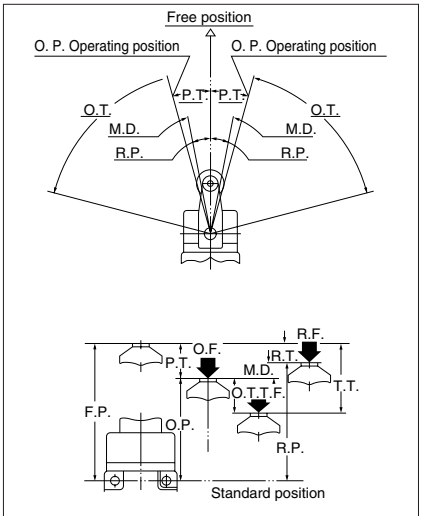
- **Actuator**
  This part directly detects movement of the dog, cam, and so forth in the operating unit, and transmits external force to the changeover mechanism, thereby engaging the moveable contact and operating the switch.
- **Headblock**
  An independent part of the actuator mechanism of the Limit Switch.
- **Wiring vent (cord vent)**
  The seal on the wiring at the mouth of the wiring vent. Also called the conduit vent for the screw hole used in the wiring.
- **Terminals**
  The part of the wiring work in the wiring that forms the circuit for electrical input and output.




VL limit switch

## ■ OPERATING CHARACTERISTICS

- **Operating Force (O.F.)**
  The force required to cause contact snap-action. It is expressed in terms of force applied to the actuator.
- **Release Force (R.F.)**
  The force to be applied to the actuator, at the moment contact snaps back from the operated position to unoperated position.
- **Pretravel (P.T.)**
  Distance of the actuator movement from free position to operating position.
- **Overtravel (O.T.)**
  The distance which the actuator is permitted to travel after actuation without any damage to the switching mechanism.
- **Total Travel (T.T.)**
  The distance which the actuator is permitted to travel from free position without any damage to the switching mechanism.
- **Movement Differential (M.D.)**
  The distance from operating to release position of the actuator.
- **Operating Position (O.P.)**
  The position of the actuator when the traveling contact snaps to the fixed contact.
- **Release Position (R.P.)**
  The position of the actuator when the traveling contact snaps back from the operating position to its original position.
- **Free Position (F.P.)**
  Position of the actuator when no force is applied to it.




Note: F.P., O.P., and R.P. are expressed as distances from the standard position.

## ■ Glossary relating to the EN60947-5-1

- **EN60947-5-1**
  EN standard same as IEC947-5-1
- **Utilization categories**
  The following examples express the classification of switches by category of use.

| Current type | Category | Contents |
|---|---|---|
| AC | AC-15 | Controls electromagnetic loads in excess of 72VA (Volt Amperes.) |
| DC | DC-12 | Controls resistance loads and semiconductor loads. |

- **Rated operational voltage (Ue)**
  The maximum rated voltage for switch operation. This must never exceed the maximum ratings insulation voltage (Ui).
- **Rated operational current (Ie)**
  The maximum rated current for switch operation.
- **Rated insulation voltage (Ui)**
  The maximum rated current value which guards the switch's insulation functions, forming the parameters for the resistance values and the mounting distance.
- **Rated impulse withstand voltage (Uimp)**
  The peak impulse current value which enables the switch to resist without insulation breakdown.
- **Rated enclosed thermal current (Ithe)**
  The current value that enables current to flow without exceeding the specified maximum temperature in the recharging contact switch. If the pins are made of brass, the maximum temperature limit is 65°C 149°F.
- **Conditional short circuit current**
  The current the switch can resist until the short circuit protection device is activated.
- **Short circuit protection device**
  A device that protects the switch from short circuits through a circuit break (breakers, fuses, etc.)
- **Switching overvoltage**
  The surge momentarily generated when a circuit is closed. Must be lower than the Uimp value.
- **Pollution degree**
  Expresses in levels the environment in which the switch is used. The four levels are shown below.
  Limit switches come under contamination level 3.

| Pollution degree | Contents |
|---|---|
| 1 | No contamination or, even if contamination is present, only non-conducting contamination is generated. |
| 2 | Normally, only non-conducting contamination is generated, but there remains the possibility of temporary conducting contamination when the circuit is formed. |
| 3 | Conducting contamination is generated, or else dry non-conducting contamination is generated by circuits which can be anticipated. |
| 4 | Permanent conducting contamination is generated by dust, rain, snow, and other conductors. |

# PROTECTIVE CONSTRUCTION

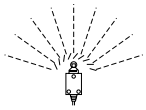
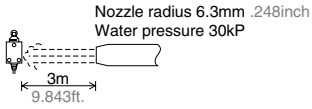
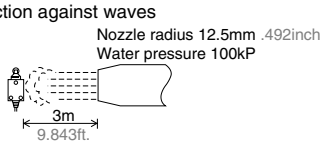
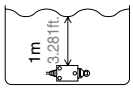
## ■ Protective construction

Expresses the degree of protective construction that guards the level of functionability of the switch against ingress of solid objects, water, and oil. The standards are IEC529 (IEC: International Electrotechnical Commission) standards. IEC standards determine the level of protection against both water and solid objects, but not against oil.

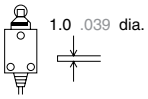
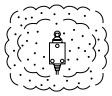
### ● Protection against both water and solid objects

IP- □ □

**Protection against water**

| Level | Protection level | Protection level and test methods |
|---|---|---|
| **0** | — | No particular protection |
| **3** | **Rain-proof** | Protection against rain fall  No damage incurred when sprayed with water continuously for 10 minutes at angles of up to 60° from the perpendicular. |
| **4** | **Foam-proof** | Protection against flying foam  No damage incurred when sprayed with water continuously for 10 minutes at angles of up to 180° from the perpendicular across a wide area. |
| **5** | **Spray-proof** | Protection against spray   No damage incurred when sprayed with a jet of water for 3 minutes from all directions, as per the diagram on the left. |
| **6** | **Water proof** | Protection against waves   Water does not invade the interior when sprayed with a jet of water for 3 minutes from all directions, as per the diagram on the left. |
| **7** | **Corrosion-proof** | Protection against corrosion while immersed in water   Water does not invade the interior during immersion for 30 minutes at a depth of 1m 3.281ft.. |

**Protection against solid objects**

| Level | Protection level | Protection level and test methods |
|---|---|---|
| **4** | — | Protection against solid objects exceeding 1mm .039inch in size.   A hard wire 1mm dia. .039 inch dia. across cannot penetrate the inside. |
| **5** | — | Protection against dust  The unit is left for 8 hours in an atmosphere in which 2kg of talcum powder per 1m³ is floating. No damage incurred from talcum powder penetrating the inside. |
| **6** | **Dust-proof** | Protection againt dust (dust does not penetrate)  The unit is left for 8 hours in an atmosphere in which 2kg of talcum powder per 1m³ is floating. The talcum powder does not penetrate the inside. |

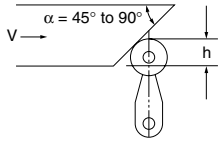
**Note:** 1. All of the tests cited above were conducted with the cord vent (conduit vent) tightly shut.
2. The above protective constructions are based on IEC standard but major differences may arise due to length of use and operating environment. This should be thoroughly discussed and verified.
3. When the corrosion-proof model is immersed in water for 30 minutes or more, verify that no water has penetrated the inside before use.

# CAUTIONS FOR USE

## ■ DESIGN OF OPERATING DOG AND OPERATING SPEED

Pay attention to the following points when designing the dog for limit switch operation.
1. Make the dog faceplate as smooth as possible.
2. Adjust both the dog angle and the set arm angle as below, depending on the operating speed.
3. The depth (h) of the dog effects the lifespan of the limit switch. Therefore, set the depth to a maximum of 80% of the Total Travel (T.T.)
4. The relationship between the speed of the dog (V = m/s) and the tip angle ($\alpha$) is as follows:

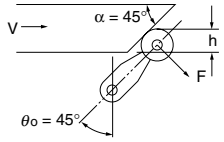
1) V≦0.2m/s




| α | Vmax (m/s) |
|---|---|
| 45° | 0.2 |
| 60° | 0.1 |
| 60 to 90° | 0.05 |

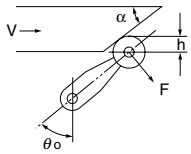
When V≦0.2m/s, set the arm to perpendicular and set the arm rise angle to between 45° and 90°. If the dog rise angle is reduced, the maximum tolerable speed is increased.
As a rule, $\alpha$ = 45° is optimum.

2) V≦0.5m/s




Because the arm jiggle is as a minimum at a comparative speed such as V≦0.5m/s, setting both the dog angle so that it travels perpendicularly and the arm angle to 45° is optimum.

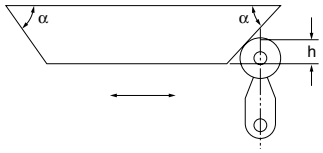
3) 0.5m/s < V≦2m/s




| α | Vmax (m/s) |
|---|---|
| 40° | 0.7 |
| 35° | 0.9 |
| 30° | 1.3 |
| 25° | 2.0 |

The maximum tolerable speed can be extended by further reducing the dog rise angle from 45° when 0.5m/s < V≦2m/s. It is necessary to set the arm so that the dog's cutting surfaces are always parallel ($\theta$o = 90°– $\alpha$)

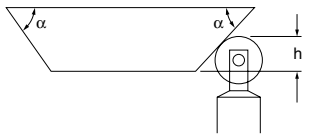
4) Overriding the dog (V≦0.2m/s)




| α | Vmax (m/s) |
|---|---|
| 45° | 0.2 |
| 60° | 0.1 |
| 60 to 90° | 0.05 |

If overriding the dog, set the arm perpendicularly, so that $\alpha$ =45°. If the dog angle is reduced, the tolerable speed is increased.

5) Roller plunger type

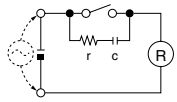
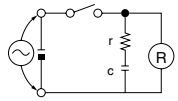
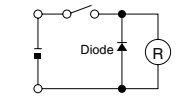
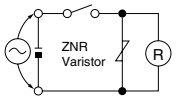



| α | Vmax (m/s) | h |
|---|---|---|
| 20° | 0.5 | (0.5 to 0.7) T.T. |
| 30° | 0.25 | (0.6 to 0.8) T.T. |

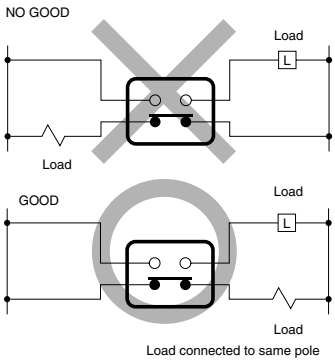
Even if overriding the dog, set the forwards and rearwards motion exactly the same, and avoid any settings that make the actuator accelerate rapidly from the dog.
5. Operation speed
1) When the operation (acting and reverting) speed is exceedingly slow, switching of the contacts will become unstable and this could cause problems such as failure to make contact and welding. As a guide, the speed should be at least 1mm/s.
2) When the operation (acting and reverting) speed is exceedingly fast, be careful because the violent motion could cause breakage and with increased frequency, contact switching will not be able to keep up. As a guide, the switching frequency should be within 20 times per minute.

## ■ PROTECTION CIRCUIT

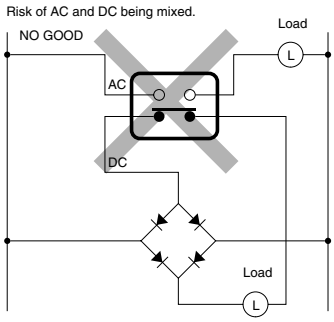
1. The ON/OFF circuit for the guidance load may suffer contact damage due to surges or inrushes when the power is turned either ON or OFF.
Consequently, insertion of a protective circuit as per the following diagram is recommended, in order to protect the contacts.

| Circuit | Cautions for use |
|---|---|
| Limit switch contact   | (1) r must be a minimum of 10Ω;<br>(2) When using AC power:<br>① Impossible when R impedance is large.<br>② Possible when c, r impedance is sufficiently small compared with R impedance. |
| Limit switch contact   | Can be used with both AC and DC as appropriate.<br>r≃R<br>C: 0.1 μF |
| Limit switch contact   | (1) Dedicated DC use.<br>(2) AC is impossible |
| Limit switch contact   | Can be used with both AC and DC as appropriate. |

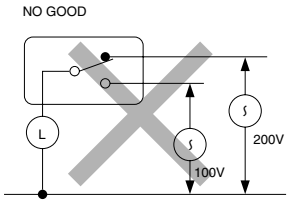
2. Do not connect either irregular poles or power sources to a switch contact.
Power connection examples (irregular pole connection)




Example of unsuitable power connection (abnormal power connection)




3. Avoid circuits where power may find a way between the contact points (as this may cause welding.)




4. Using electronic switch circuits (low power, low current)
1) Bouncing and chattering are generated due to collision between the contacts when the limit switch is switching between them, and this sometimes causes such problems as white noises and error pulses in both the electronic circuit and the reverberation equipment.
2) If the generation of bouncing and chattering becomes a problem, it is necessary to consider installing a CR circuit or other absorption circuit given the circuit design.
3) This is particularly necessary when high contact reliability is needed, and is unsuitable for silver contact switches. Switches with gold contacts possess excellent performance.

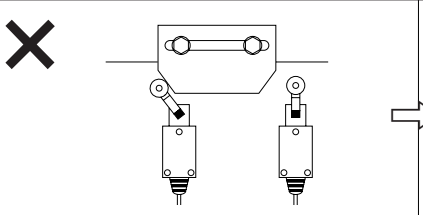
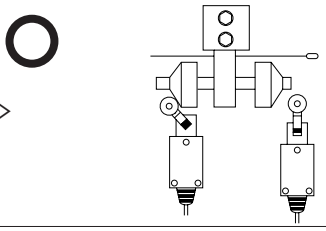
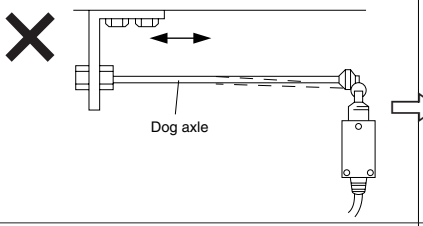
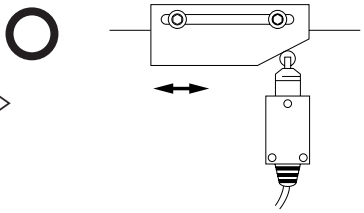
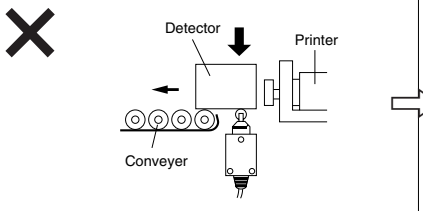
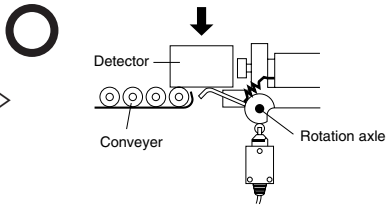
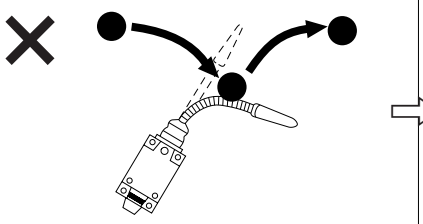
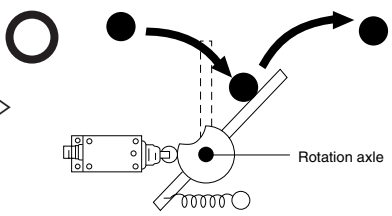
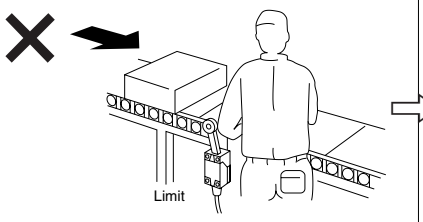
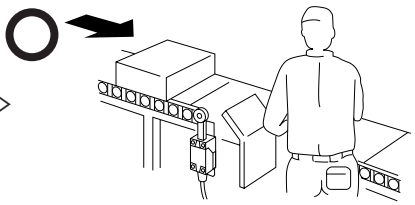
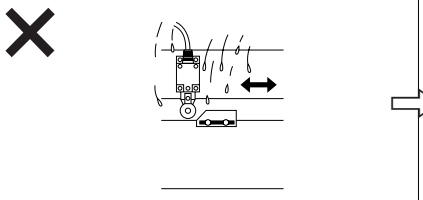
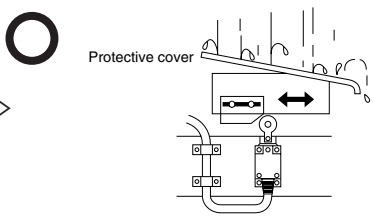
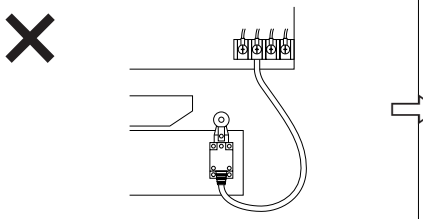
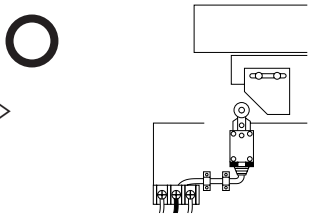
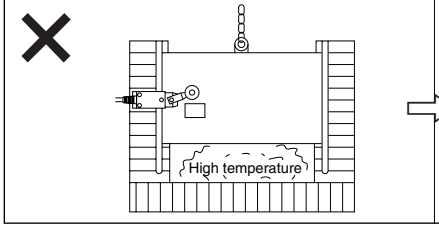
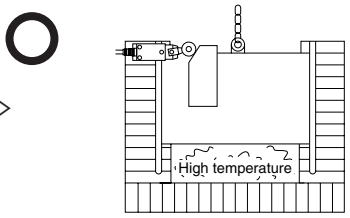
## ■ CAUTIONS FOR USE

1) Do not attempt to physically alter any part of the switch itself, such as the actuator, or switch attachment vent, as this may cause alterations to both characteristics and performance, and damage the insulation.
2) Do not pour any lubricants such as oil or grease onto the moving parts of the actuator, as there is a possibility that this will cause a malfunction due to seepage into the inside, and impair the motion. Silicon-based grease in particular affects the contact points badly.
3) If the switches are not to be used for an extended period of time, their contact reliability may be reduced due to oxidation of the contact points. Because accidents may result from the impaired conductivity, always implement a check beforehand.
4) Prolonged continuous use of the switch hastens deterioration of the parts (especially the seal rubber) and may cause a malfunction in the release. For this reason, always implement a check beforehand.
5) Usage in the vicinity of either the switch operating position (O.P.) or the release position (R.P.) results in unstable contacts. If using the NC contact point, set the actuator to return to the free position (F.P.) Also, is using the NO contact point, hold the ratings values down to 70 to 100% for the overtravel (O.T.)
6) If the actuator is forced beyond its total travel (T.T.), the internal mechanism may be damaged. Always use within the T.T.
7) Do not apply unreasonable force to the actuator, as this may result in damage and impaired movement.
8) The switch, if dropped, may break due to excessive vibration and impact. Therefore, please use extra caution when transporting and installing.
9) Condensation inside the switch may occur if there are rapid ambient temperature changes when the switch is in a high temperature and humidity. Since this occurs easily during marine transport, be extra cautious of what the environment will be when shipping. Condensation is the phenomenon in which water vapor condenses into switch-adhering water droplets when the temperature rapidly drops in a high-temperature, high-humidity atmosphere or when the switch is quickly moved from a low temperature location to a place of high temperature and high humidity. It is the cause of insulation deterioration and of rust.
10) Be careful of freezing in temperatures below 0°C. Freezing is the phenomenon in which moisture adhering to the switch from condensation or when in unusually high-humidity environments freezes onto the switch when the temperature drops below the freezing point. Please extra caution because freezing can lock moving parts, cause operational delays, or interfere with conductivity when there is ice between the contacts.
11) In low-temperature, low-humidity conditions, plastic becomes brittle and the rubber and grease harden, which may lead to malfunction.
12) Long term storage (including during transport) in high temperature or high humidity environments or where the atmosphere contains organic or sulfide gas, will cause sulfide or oxide membrane to form on the contact surfaces. This in turn will cause unstable or failed contacting that may lead to functional malfunction. Please verify the atmosphere when storing and transporting.
13) Packaging should be designed to reduce as much as possible the potential influence of humidity, organic gas, and sulfide gas, etc.
14) Please avoid sudden changes in temperature. This is a cause of switch deformation and encourages the seal structure to breathe, which may lead to seal failure and operational malfunction.
15) If installing a thermoplastic resin case, the use of a spring washer tightened directly against the case will cause the case to collapse and become damaged. Therefore, please add a flat washer before tightening. Also, be careful not to install if the case is being twisted.
16) For the purpose of improving quality, materials and internal structure may be changed without notice.
17) When used outdoors (in places where there is exposure to direct sunlight or rain such as in multistory car parks) or in ambient temperature environments where ozone is generated, the influence of these environments may cause deterioration of the rubber material. Please consult us if you intend to use a switch in such environments.

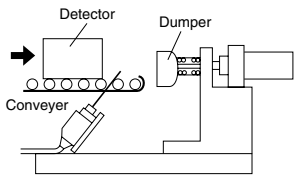
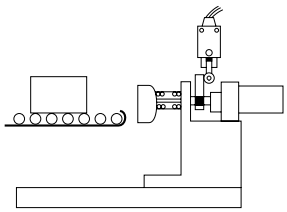
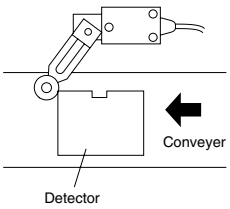
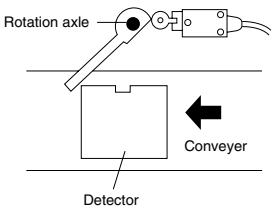
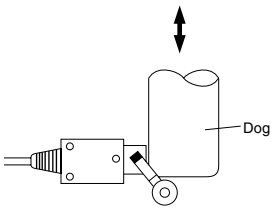
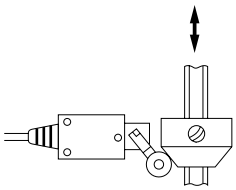
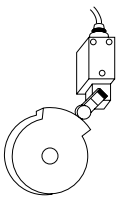
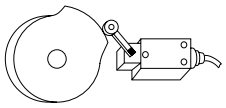
## ■ PRECAUTIONS RELATING TO THE INSTALLATION ENVIRONMENT

Avoid using in silicon environments such as organic silicon-based rubber, solvents, sealants, oil, grease, or wiring.

# IMPROVEMENT EXAMPLES

| Poor design | Improved design | Explanation |
|---|---|---|
|  |  | ■ Problem • Dog adjustment is difficult.<br>■ Solution • Separate each one until the dog can be adjusted. |
|  |  | ■ Problem • The dog axis is too long, and slips out during operation.<br>• For this reason, the limit switch operating position slips.<br>■ Solution • Firmly fix the dog plate to the base. |
|  |  | ■ Problem • The detector sinks, applying force to the limit switch.<br>• The limit switch O.T. cannot be set.<br>■ Solution • Relieve the pressure using an additional actuator, and the O.T. can also be set. |
|  |  | ■ Problem • The area around the actuator coil is easily damaged.<br>• Friction generated during operation.<br>■ Solution • Relieve the friction by installing an additional actuator.<br>• Change the type of limit switch. |
|  |  | ■ Problem • Workers keep bumping the actuator.<br>■ Solution • Fit a protective cover to the side of the limit switch. |
|  |  | ■ Problem • Because the cord vent for the limit switch faces upwards, water droplets and so forth can easily penetrate the interior.<br>• The cord is constantly moving and thus easily damaged.<br>■ Solution • Fix the limit switch position on the stationary board.<br>• Fit a protective cover, so that water and oil cannot come into direct contact with the limit switch. |
|  |  | ■ Problem • The cord is not fixed, and gets pulled during work.<br>• Dog adjustment is ineffective.<br>■ Solution • Change the limit switch position, and fix the cord.<br>• Attach an adjustment mechanism to the dog. |
|  |  | ■ Problem • The limit switch is near a high-temperature area.<br>• Dog adjustment is ineffective, and the dog keeps bumping the lever.<br>■ Solution • Move the limit switch further away.<br>• Make dog adjustment possible, and change the shape of the unit. |

# IMPROVEMENT EXAMPLES

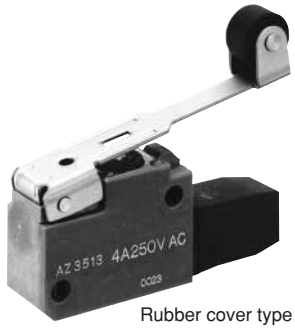
| Poor design | Improved design | Explanation |
|---|---|---|
| ✕   | ○  | ■ Problem • The detector is scratched.<br>• Limit attachment adjustments are difficult<br>• The actuator is damaged.<br>• Specimen transfer is impeded.<br>■ Solution • Fix the limit position to behind the dumper to solve the above problems. |
| ✕   | ○   | ■ Problem • The transfer path of the detector is not fixed, and it keeps bumping the actuator.<br>• The operating position is unstable.<br>• The actuator is damaged.<br>■ Solution • Stabilize the operating position by fitting an additional actuator.<br>• Make limit switch adjustment possible. |
| ✕   | ○  | ■ Problem • Stroke adjustment ineffective.<br>• Release the limit switch position, and ensure that the dog does not bump the lever.<br>■ Solution • Make dog adjustment possible.<br>• Change the limit switch position, and sure that the dog does not bump the lever. |
| ✕  | ○  | ■ Problem • The cam shape is unsuitable (especially during release and strike release.)<br>• Direction of limit switch attachment is unsuitable.<br>■ Solution • Render the cam shape smooth.<br>• Change the limit switch position. |

Panasonic
ideas for life

**SUBMINIATURE SIZE LIMIT SWITCHES**

# SL (AZ3) Micro Limit Switches

## Quickly upgraded to limit switches with lamps by mounting an LED lamp socket.

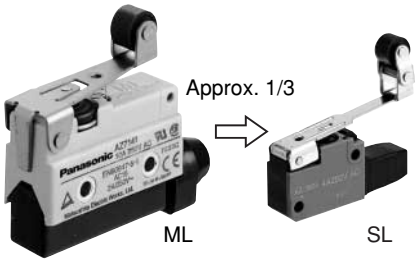


Rubber cover type (roller lever)

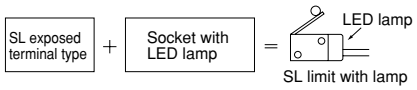
**RoHS Directive compatibility information**
**http://www.nais-e.com/**

## FEATURES

**1. Subminiature limit switch**
Managed to miniaturize the comparative bulk with high density mountings in the equipment's detector to approximately 1/3 of our own ML limit switches, or approximately 1/1.6 of the Z model microswitch.




**2. A lamp can be easily added for operations checks**
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 checks such as operations checks.




**3. Operates with a light force**
Comes in two types: O.F. is a maximum of 1.18N {120gf} (light force model) and light force commensurate to the microswitch.

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

**5. Achieves stroke tolerance (O.T./T.T.) of 0.67**
Plenty of scope for position fixing with long life.
Because of the optimum design of the built-in limit switch and the original L-model spring for use in O.T. absorption, the total travel range has been enlarged, and both position fixing and the unit's lifespan have been improved a level.

Stroke range: 3 times more than the ML limit

**6. Long life**
By combining the excellent reliability and solvent proofing of the FS-T microswitch with the L shape spring, we have achieved a unit with both long life and high reliability (electrical life: $10^5$ mechanical life: $10^7$

**7. Built-in safety features and excellent environment proofing**
The case uses 66 nylon glass fiber the doubly protect the switch. Also, the body and cap have been ultrasonically welded, creating a flush construction except for the terminals. Moreover, by adding a dedicated socket, the construction is drip-proof, dust-proof, and dirt-proof, creating a flush construction for the unit as a whole including the terminals.

Rubber cover type: Equivalent to IP60
Socket with cord type: Equivalent to IP64

## TYPICAL APPLICATIONS

Dust proofing and oil resistance requirement.

## PRODUCT TYPE

**1. Switch body**

| Actuator | Operating Force (O.F.) | Exposed terminal type | Rubber cover type | Socket with cord type* |
|---|---|---|---|---|
| Hinge lever | 1.18N {120gf} | AZ3012 | AZ3512 | AZ3712 |
| | 1.96N {200gf} | AZ3022 | AZ3522 | AZ3722 |
| Roller lever | 1.18N {120gf} | AZ3013 | AZ3513 | AZ3713 |
| | 1.96N {200gf} | AZ3023 | AZ3523 | AZ3723 |
| One-way roller lever | 1.96N {200gf} | AZ3024 | AZ3524 | AZ3724 |
| Hinge short lever | 2.94N {300gf} | AZ3025 | AZ3525 | AZ3725 |
| Short roller lever | 2.94N {300gf} | AZ3026 | AZ3526 | AZ3726 |
| One-way short roller lever | 2.94N {300gf} | AZ3027 | AZ3527 | AZ3727 |

Notes) 1. Socket with cord type is combination of; Exposed terminal type + Socket with cord (cord length: 1m 3.281ft.)
2. UL reconized, CSA certified type available. (See page 14.)

**2. Socket**

| Applicable limit switches | Specifications | Part No. |
|---|---|---|
| Exposed terminal types | L socket | AZ3806 |
| | Socket with cord (1 m 3.281ft.) | AZ3807 |
| | Socket with cord (2 m 6.562ft.) | AZ3827 |
| | Socket with cord (3 m 9.843ft.) | AZ3837 |
| | Socket with cord (5 m 16.404ft.) | AZ3857 |

### 3. Socket with LED (cord length: 1m 3.281ft.)

| Applicable limit switches | Lamp Connection | Lamp rating | Part No. |
|---|---|---|---|
| Expoced terminal types | Normally open (N.O.) connection | 6V DC | AZ3807162 |
| | | 12V DC | AZ3807161 |
| | | 24 to 48V DC | AZ380716 |
| | Normally closed (N.C.) connection | 6V DC | AZ3807362 |
| | | 12V DC | AZ3807361 |
| | | 24 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 | AZ38 2 7*6* |
| 3m | AZ38 3 7*6* |
| 5m | AZ38 5 7*6* |

The 5th digit (boxed) of part number 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: None: 24 to 48V DC, 1: 12V DC, 2: 6V DC

# FOREIGN STANDARDS

| Standards | Applicable product | Part No. |
|---|---|---|
| UL recognized product | File No.: E122222<br>Ratings: $10^5$ rating 4A, 250V AC<br>Product type: All products | Add “9” to the end of the part No. |
| CSA certified product | File No.: LR55880<br>Ratings: $10^5$ rating 4A, 250V AC<br>Product type: All products excluding types with socket and cord. | |

# SPECIFICATIONS

### 1. Rating

| | | | | |
|---|---|---|---|---|
| Rated control voltage | 125V AC | 250V AC | 30V DC | 125V DC |
| Resistive load (cos $\phi \fallingdotseq 1$) | 4A | 4A | 4A | 0.1A |
| Inductive load (cos $\phi \fallingdotseq 0.4$) | 2.5A | 2.5A | 2.5A | 0.1A |

### 2. Characteristics

| | | |
|---|---|---|
| Contact arrangement | | 1 From C |
| Initial contact resistance, max. | | 60 mΩ (By voltage drop 5 to 6V DC 1A) |
| Contact material | | AgNi contact |
| Initial insulation resistance (At 500V DC) | | Min. 100MΩ |
| Initial breakdown voltage | Between non-consective 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 |
| Expected life (min. operations) | Mechanical | $10^7$ (at 60 cpm) |
| | Electrical | $10^5$ (at 20 cpm, 4A 250V AC resistive) |
| Ambient temperature | | –20 to +60°C -4 to +140°F |
| Ambient humidity | | Max. 95% R.H. |
| Max. operating speed | | 120 cpm |

### 3. Mechanical characteristics

| Actuator | | Hinge lever | | Roller lever | | One-way roller lever | Hinge short lever | Short roller lever | One-way short roller lever |
|---|---|---|---|---|---|---|---|---|---|
| Operating Force (O.F.) | | 1.18N {120gf} | 1.96N {200gf} | 1.18N {120gf} | 1.96N {200gf} | 1.96N {200gf} | 2.94N {300gf} | 2.94N {300gf} | 2.94N {300gf} |
| Shock resistance, min. | In the free position | 98m/s² {10G} | 294m/s² {30G} | 98m/s² {10G} | 196m/s² {20G} | 147m/s² {15G} | 294m/s² {30G} | 196m/s² {20G} | 147m/s² {15G} |
| | In the full operating position | 294m/s² {30G} | 294m/s² {30G} | 294m/s² {30G} | 294m/s² {30G} | 294m/s² {30G} | 294m/s² {30G} | 294m/s² {30G} | 294m/s² {30G} |
| Vibration resistance | Vibration rate | 10 to 55Hz | | 10 to 45Hz | 10 to 55Hz | 10 to 45Hz | 10 to 55Hz | 10 to 55Hz | 10 to 55Hz |
| | Double amplitude | 1.5mm .059inch | | 1.0mm .039inch | 1.5mm .059inch | 1.0mm .039inch | 1.5mm .059inch | 1.5mm .059inch | 1.5mm .059inch |

### 4. Operating characteristics

| Characteristics / Actuator | O.F.(N{gf}) max. | | R.F. (N{gf}) min. | | Pretravel (P.T.), max. mm inch | Movement Differential (M.D.), max. mm inch | Overtravel (O.T.), min. mm inch | Operating Position (O.P.) mm inch |
|---|---|---|---|---|---|---|---|---|
| Hinge lever | 1.18 {120} | 1.96 {200} | 0.24 {25} | 0.49 {50} | 3.0 .118 | 1.5 .059 | 6.0 .236 | 16.7±1.5 .657±.059 |
| Roller lever | 1.18 {120} | 1.96 {200} | 0.24 {25} | 0.49 {50} | 3.0 .118 | 1.5 .059 | 6.0 .236 | 30.7±1.5 1.209±.059 |
| One-way roller lever | 1.96 {200} | | 0.49 {50} | | 3.0 .118 | 1.5 .059 | 6.0 .236 | 40.5±1.5 1.594±.059 |
| Hinge short lever | 2.94 {300} | | 0.59 {60} | | 2.0 .079 | 1.0 .039 | 3.5 .138 | 13.7±1.5 .539±.059 |
| Short roller lever | 2.94 {300} | | 0.59 {60} | | 2.0 .079 | 1.0 .039 | 3.5 .138 | 27.7±1.5 1.091±.059 |
| One-way short roller lever | 2.94 {300} | | 0.59 {60} | | 2.0 .079 | 1.0 .039 | 3.5 .138 | 36.7±1.5 1.445±.059 |

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

### 5. Protective characteristics

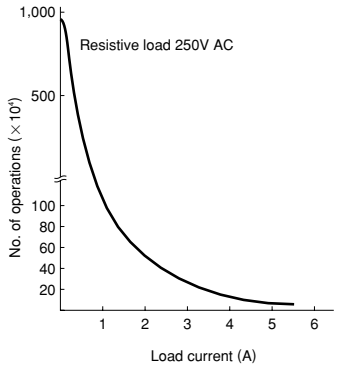
| Protective construction IEC | Rubber cover type | Types with socket and cord |
|---|---|---|
| IP60 | ○ | ○ |
| IP62 | – | ○ |
| IP63 | – | ○ |
| IP64 | – | ○ |

### 6. LED rating

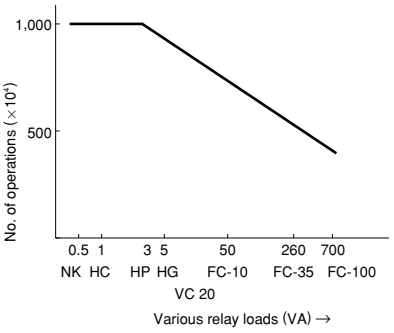
| Rated operating voltage | Operating voltage range | Internal resistance |
|---|---|---|
| 6V DC | 5 to 15V DC | 2.4KΩ |
| 12V DC | 9 to 28V DC | 4.7KΩ |
| 24 to 48V DC | 20 to 55V DC | 15KΩ |

# DATA

### 1. Life curve

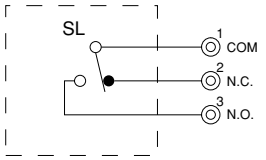



### 2.Actual load life curve




Note: The FC magnetic contactor series is 200V AC.
The NK is 2 Form C 24V DC type.

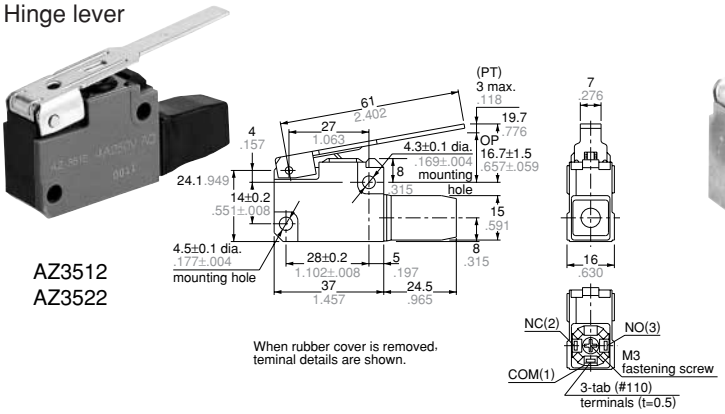
# WIRING DIAGRAMS



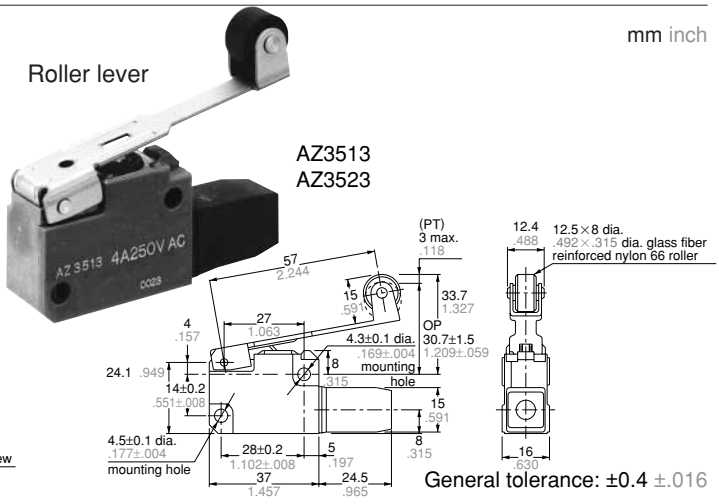

# DIMENSIONS

mm inch

1. Rubber cover
Hinge lever

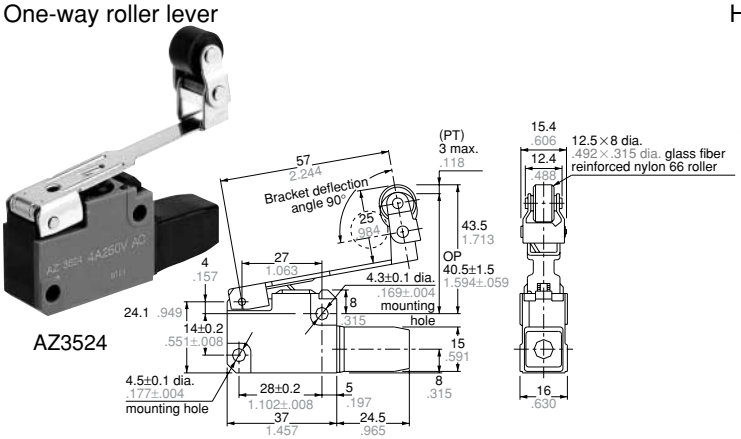



Roller lever

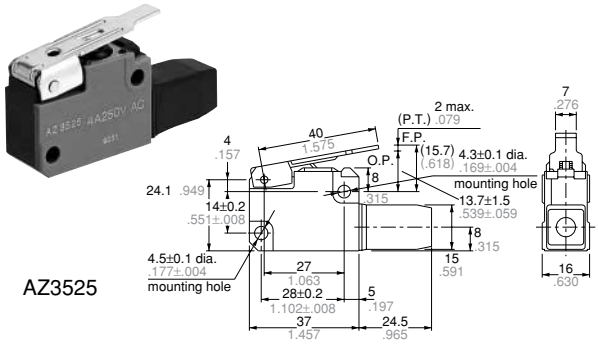



General tolerance: ±0.4 ±.016

One-way roller lever

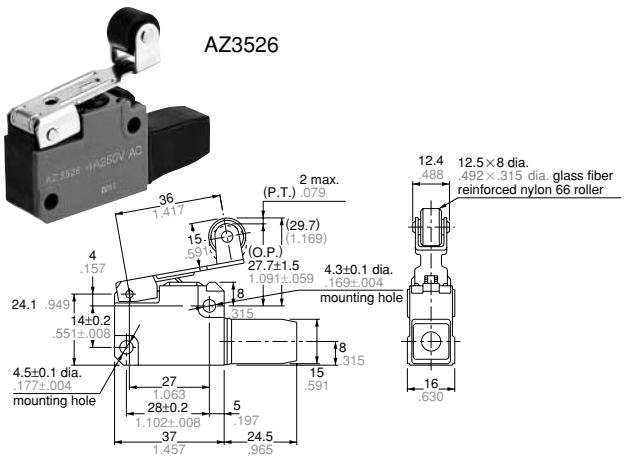



Hinge short lever

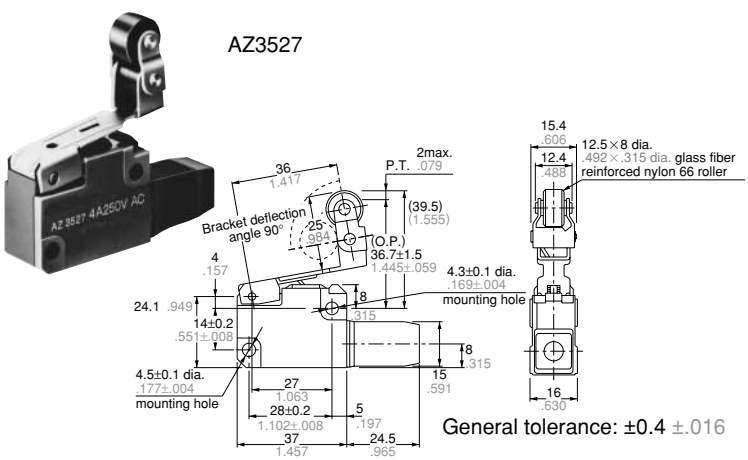



General tolerance: ±0.4 ±.016

Short roller lever

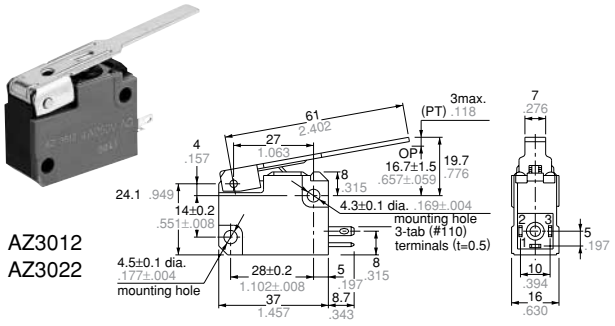



One-way short roller lever




General tolerance: ±0.4 ±.016

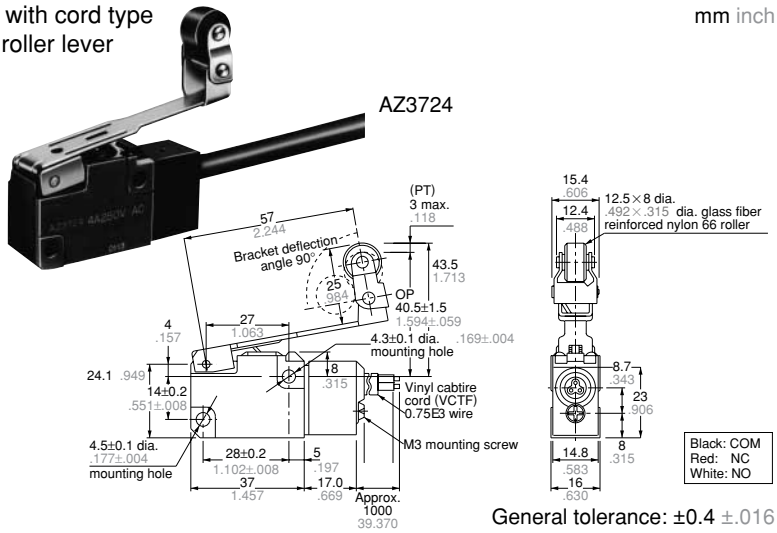
2. Exposed terminal type
Hinge lever




Note) The following types are also available.
Roller lever: AZ3013, AZ3023
One-way roller lever: AZ3024
Hinge short lever: AZ3025
Short roller lever: AZ3026
One-way short roller lever: AZ3027

3. Socket with cord type
One-way roller lever

mm inch




General tolerance: ±0.4 ±.016

(Combination of the AZ3024 exposed terminal type and the AZ3807 socket with cord type)

Note) The following types are also available.
Hinge lever: AZ3712, AZ3722
Roller lever: AZ3713, AZ3723
Hinge short lever: AZ3725
Short roller lever: AZ3726
One-way short roller lever: AZ3727

## CONNECTION METHOD FOR RUBBER COVER

1) Remove the rubber cover from the limit switch.

2) After stripping the sheath from the appropriate cord (refer to table on the right) and removing the covering of the lead wires, insert the cord into the rubber cover.

3) Connect lead wire to the receptacle terminals (#110) with insulating sleeve provided and insert it into the terminal of limt switch. (The lead wire can directly be soldered to the terminals without using receptacle terminals)

| Wire name | Applicable wire | | |
|---|---|---|---|
| | Conductor | Wire strand | Finished outside diameter |
| Vinyl cabtire cord (VCTF) | 0.75mm² | 2-wire | 6.6mm .260inch dia. |
| | 0.75mm² | 3-wire | 7.0mm .276inch dia. |

4) Push the rubber cover securely over the terminals.

# 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 con tact with organic solvents, strong acids or alkalis, or direct exposure to their vapors.

• Use where inflammable or corrosive gases exist.

• 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 impringe upon the switch or where there is an excessive accumulation of dust should be avoided.

2) To improve reliability during actual use, it is recommended that the operation be checked under installation conditions.

3) If OT is too big, the life of limit switch will be shortened switching friction. Use it with enough margin of OT. 70% of OT standard value will be good for use.

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.

6) When used outdoors (in places where there is exposure to direct sunlight or rain such as in multistory car parks) or in environments where ozone is generated, the influence of these environments may cause deterioration of the rubber material. Please consult us if you intend to use a switch in environments such as these.

**2. Mounting and wiring**

1) Although SL 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. as given below should be used. Specifically, where there is a need for long life, it is recommended that the proper O.T. as given below should be used.

• Within 1 to 3mm .039 to .118inch

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

3) Use their own accessories when mounting and wiring SL limit switches so as to maintain their own characteristics. When the SL rubber cover type is used, there should absolutely be no tension applied to the cord. If there is the fear that tension may be applied, the L socket or socket with cord attached should be used. The maximum permissible tension with the above socket use is 98N{10kgF}.

4) The tightening torque when installing this limit switch should be 1.18 to 1.47 N·m (12 to 15 kg·cm).

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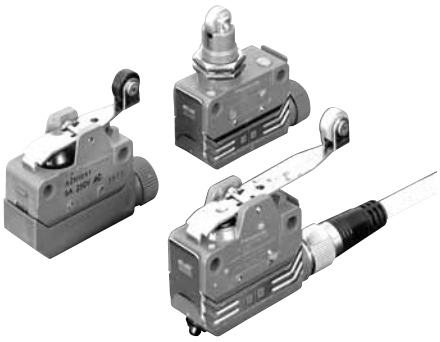
**COMPACT SIZE LIMIT SWITCHES**

# HL (AZH) Limit Switches

## Compact, high-performance limit switch with superior environmental resistance. Broad lineup covers from die casting cases to economical plastic cases.

Industrie Forum Design Hannover Prize awarded



**RoHS Directive compatibility information**
**http://www.nais-e.com/**

## FEATURES

**1. Broad lineup**
Lineup includes reduced-wiring connector type, die casting type with commonly-used screw terminals, and a plastic case type that puts a priority on economy.

**2. Superior environmental resistance**
The die-cast type has high sealing characteristics that satisfy the IEC IP67.

**3. Standardized connector type**
We standardized the reduced-wiring and easy-installation connector type. This increases worker efficiency when wiring, maintaining, and replacing.

**4. Lineup includes bifucated (twin contact) type as well as standard load type.**
The lineup includes a standard load type (5 A, 250 VAC) and a bifucated type (0.1 A, 30 VDC). The bifucated type uses gold-clad twin contacts, which makes it ideal for electronic circuit control.

**5. Economical plastic case type**
A plastic case IP64 economy type is included as well as the die-cast type. It is perfect for applications in which economy is the priority.

**6. UL/CSA certified.**

**7. TÜV accredited products also available.**

## PRODUCT TYPE

**1. Limit Switches**

| Actuator \ Type | Die casting case | | | | Plastic case | |
|---|---|---|---|---|---|---|
| | Screw terminal type | | Connector type | | Screw terminal type | |
| | Standard | Bifurcated | Bifucated | | Standard | Bifurcated |
| | | | Without LED | With LED | | |
| Push plunger | Common to panel mount push plunger | | | | AZH1001 | AZH1201 |
| Roller plunger | Common to panel mount roller plunger | | | | AZH1002 | AZH1202 |
| Cross roller plunger | Common to panel mount cross roller plunger | | | | AZH1003 | AZH1203 |
| Panel mount push plunger | AZH2031 | AZH2231 | AZH2331 | AZH233116 | AZH1031 | AZH1231 |
| Panel mount roller plunger | AZH2032 | AZH2232 | AZH2332 | AZH233216 | AZH1032 | AZH1232 |
| Panel mount cross roller plunger | AZH2033 | AZH2233 | AZH2333 | AZH233316 | AZH1033 | AZH1233 |
| Sealed push plunger | AZH2011 | AZH2211 | AZH2311 | AZH231116 | AZH1011 | AZH1211 |
| Sealed roller plunger | AZH2012 | AZH2212 | AZH2312 | AZH231216 | AZH1012 | AZH1212 |
| Sealed cross roller plunger | AZH2013 | AZH2213 | AZH2313 | AZH231316 | AZH1013 | AZH1213 |
| Short roller lever | AZH2041 | AZH2241 | AZH2341 | AZH234116 | AZH1041 | AZH1241 |
| Roller lever | AZH2021 | AZH2221 | AZH2321 | AZH232116 | AZH1021 | AZH1221 |
| One-way short roller lever | AZH2044 | AZH2244 | AZH2344 | AZH234416 | AZH1044 | AZH1244 |
| One-way short lever | AZH2024 | AZH2224 | AZH2324 | AZH232416 | AZH1024 | AZH1224 |
| Flexible | — | — | — | — | AZH1066 | AZH1266 |
| Remarks | | | Notes)<br>1. Lamp with LED is rated at 24 V DC. Please inquire if you need a 12 V DC type.<br>2. When shipped, the cords are all placed for extension from the right side. If you need cords for the left side, please make the change following the instructions on page 31. | | | |

Notes) 1. For TÜV accredited products, please add "CE" at the end of the part number when ordering.
2. 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. Accessories**

| Product | Specifications | | | | | | Application | Part No. |
|---|---|---|---|---|---|---|---|---|
| | Pin arrangement | Type | Core No. | Color of wire | Conductor | Length of cable | | |
| Cable connector cord | AC | Straight | 4 | Brown<br>White<br>Blue<br>Black | 0.5 mm$^2$<br>(Circumference: 6.5 dia.) | 3 m<br>9.843 ft | All connector type | AZH28113 |
| | | Angle | | | | | | AZH28133 |

# FOREIGN STANDARDS

| Standard | Applicable product | Part No. |
|---|---|---|
| UL | File no.: E122222<br>Ratings: Standard: 5 A, 250 VAC ($10^5$ cycles), Pilot Duty B300<br>Bifurcated: 0.1 A, 30 VDC<br>Certified products: All models | Order using the standard part number. |
| CSA | File no.: LR55880<br>Ratings: Standard: 5 A, 250 VAC, Pilot Duty B300<br>Bifurcated: 0.1 A, 30 VDC<br>Certified products: All models | |
| TÜV | File no.: Plastic case type J9650515<br>Die-cast case type J9650514<br>Ratings: Standard for plastic case type: AC–15 2A/250V~, DC–12 1A/30V ⎓<br>Bifurcated for plastic case type: DC–12 0.1A/30V ⎓<br>Standard for die-cast case type: DC–12 1A/30V ⎓<br>Bifurcated for die-cast case type: DC–12 0.1A/30V ⎓<br>Certified products: All models except those with LED lamps | Place a CE at the end of the part number when ordering. |

# SPECIFICATIONS

### 1. Ratings

| Load / Rated control voltage | Standard type | | | | | Bifurcated type | |
|---|---|---|---|---|---|---|---|
| | Resistive | Lamp | Inductive | Motor | | Without LED | With LED |
| | | | | N.C. | N.O. | Resistive | |
| 125 V AC | 5 A | 1.5 A | 3 A | 2 A | 1 A | 0.1 A | — |
| 250 V AC | 5 A | 1.5 A | 3 A | 1 A | 0.5 A | — | — |
| 8 V DC | 5 A | — | 1.5 A | — | — | 0.1 A | — |
| 14 V DC | 5 A | — | 1.5 A | — | — | 0.1 A | — |
| 24 V DC | — | — | — | — | — | — | 0.1 A |
| 30 V DC | 5 A | — | 1.5 A | — | — | 0.1 A | — |
| 125 V DC | 0.5 A | — | 0.05 A | — | — | — | — |
| 250 V DC | 0.25 A | — | 0.03 A | — | — | — | — |

Notes) 1. The values above indicate steady-state current.
2. Parameter of inductive load: AC power factor: Min. 0.4; DC time constant: Max. 7 ms.
3. Lamp load generates 10 times of inrush current.
4. Motor load generates 6 times of inrush current.

### 2. Characteristics

| Item \ Type | | Standard type | Bifurcated type | |
|---|---|---|---|---|
| | | | Screw terminal type | Connector type |
| Contact arrangement | | 1 Form C | 1 Form C (Bifurcated contact) | |
| Contact resistance | | Initial: Max. 15 mΩ | Initial: Max. 100 mΩ | Initial: Max. 150 mΩ |
| Contact material | | AgCdO | Au clad Ag alloy (Cadmium free) | |
| Insulation resistance | | Initial: Min. 100MΩ (at 500 V DC) | | |
| Initial breakdown voltage | | 1,000 Vrms for 1 min. between non-consecutive terminals<br>1,500 Vrms for 1 min. between dead metal parts and terminals<br>1,500 Vrms for 1 min. between ground and terminals | | |
| Shock resistance | Free position | Max. 98 m/s² {10 G} | | |
| | Full operating position | Max. 294 m/s² {30 G} | | |
| Vibration resistance | | 10 to 55 Hz (Double amplitude for max. 1.5 mm) | | |
| Mechanical life | | $10^7$ (at 120 cpm) | | |
| Electrical life | | $5 \times 10^5$ (at 20 cpm, 5 A 250 V AC resistive load) | $5 \times 10^5$ (at 20 cpm, 0.1 A 125 V AC resistive load) | |
| Ambient temperature | | –10 to +80°C +14 to +176°F | | |
| Ambient humidity | | Max. 95% R.H. | | |
| Max. switching frequency | | Max. 120 cpm | | |

### 3. Performance data for EN60947-5-1

| Item | Plastic case Standard | Plastic case Bifurcated | Die casting case Standard | Die casting case Bifurcated |
|---|---|---|---|---|
| Rated insulated voltage | 250V AC | 250V AC | 30V DC | 30V DC |
| Impulse withstand voltage | 2.5kV | 2.5kV | 1.5kV | 1.5kV |
| Switching excess voltage | 2.5kV | 0.8kV | 0.8kV | 0.8kV |
| Rated closed thermocurrent | 5A | 1A | 5A | 1A |
| Conditional short-circuit current | 100A | 100A | 100A | 100A |
| Short-circuit protection | 10A Fuse | 10A Fuse | 10A Fuse | 10A Fuse |
| Protective construction | IP64 (switch)<br>IP54 (terminal) | IP64 (switch)<br>IP54 (terminal) | IP67 | IP67 |
| Degree of contamination | 3 | 3 | 3 | 3 |

**4. Operating characteristics**

**• Die casting case**

| Characteristics / Actuator | Operating force, max. N (gf) | Release force, min. N (gf) | Pretravel, max. mm (inch) | Movement differential, max. mm (inch) | Overtravel, min. mm (inch) | Operating position, max. mm (inch) |
|---|---|---|---|---|---|---|
| Panel mount push plunger | 11.8 (1200) | 4.90 (500) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 17.4±0.8 (.685±.031) |
| Panel mount roller plunger | 11.8 (1200) | 4.90 (500) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 23.4±0.8 (.921±.031) |
| Panel mount cross roller plunger | 11.8 (1200) | 4.90 (500) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 23.4±0.8 (.921±.031) |
| Sealed push plunger | 11.8 (1200) | 4.90 (500) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 30.0±0.8 (1.181±.031) |
| Sealed roller plunger | 11.8 (1200) | 4.90 (500) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 41.3±0.8 (1.626±.031) |
| Sealed cross roller plunger | 11.8 (1200) | 4.90 (500) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 41.3±0.8 (1.626±.031) |
| Short roller lever | 3.92 (400) | 0.78 (80) | 2.0 (.079) | 0.3 (.012) | 4.0 (.157) | 23.1±0.8 (.909±.031) |
| Roller lever | 2.45 (250) | 0.39 (40) | 4.0 (.157) | 0.6 (.024) | 7.0 (.276) | 23.1±0.8 (.909±.031) |
| One-way short roller lever | 3.92 (400) | 0.78 (80) | 2.0 (.079) | 0.3 (.012) | 4.0 (.157) | 34.3±0.8 (1.350±.031) |
| One-way short lever | 2.45 (250) | 0.39 (40) | 4.0 (.157) | 0.6 (.024) | 7.0 (.276) | 34.3±0.8 (1.350±.031) |

**• Plastic case**

| Characteristics / Actuator | Operating force, max. N (gf) | Release force, min. N (gf) | Pretravel, max. mm (inch) | Movement differential, max. mm (inch) | Overtravel, min. mm (inch) | Operating position, max. mm (inch) |
|---|---|---|---|---|---|---|
| Push plunger | 5.88 (600) | 0.98 (100) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 25.4±0.8 (1.000±.031) |
| Roller plunger | 5.88 (600) | 0.98 (100) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 31.4±0.8 (1.236±.031) |
| Cross roller plunger | 5.88 (600) | 0.98 (100) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 31.4±0.8 (1.236±.031) |
| Panel mount push plunger | 5.88 (600) | 0.98 (100) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 17.4±0.8 (.685±.031) |
| Panel mount roller plunger | 5.88 (600) | 0.98 (100) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 23.4±0.8 (.921±.031) |
| Panel mount cross roller plunger | 5.88 (600) | 0.98 (100) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 23.4±0.8 (.921±.031) |
| Sealed push plunger | 5.88 (600) | 0.98 (100) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 30.0±0.8 (1.181±.031) |
| Sealed roller plunger | 5.88 (600) | 0.98 (100) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 41.3±0.8 (1.626±.031) |
| Sealed cross roller plunger | 5.88 (600) | 0.98 (100) | 1.5 (.059) | 0.1 (.004) | 3.0 (.118) | 41.3±0.8 (1.626±.031) |
| Short roller lever | 3.92 (400) | 0.78 (80) | 2.0 (.079) | 0.3 (.012) | 4.0 (.157) | 23.1±0.8 (.909±.031) |
| Roller lever | 2.45 (250) | 0.39 (40) | 4.0 (.157) | 0.6 (.024) | 7.0 (.276) | 23.1±0.8 (.909±.031) |
| One-way short roller lever | 3.92 (400) | 0.78 (80) | 2.0 (.079) | 0.3 (.012) | 4.0 (.157) | 34.3±0.8 (1.350±.031) |
| One-way short lever | 2.45 (250) | 0.39 (40) | 4.0 (.157) | 0.6 (.024) | 7.0 (.276) | 34.3±0.8 (1.350±.031) |
| Flexible | 0.88 (90) | — | 30.0 (1.181) | — | 20.0 (.787) | — |

**5. Protective characteristics**

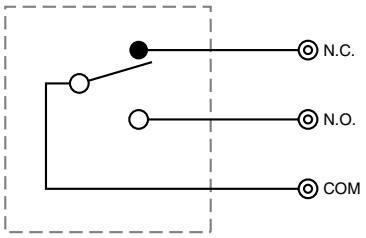
| Protective construction | Die cast case | Plastic case |
|---|---|---|
| IEC | | |
| IP64 | ❍ | ❍ |
| IP67 | ❍ | — |

**6. LED rating**

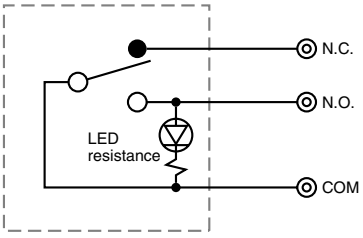
| Rating | Leakage current | Internal resistance |
|---|---|---|
| 24 V DC | 1.5 mA | 18 kΩ |

The leakage current changes depends on the resistance of load connected in parallel.

# OUTPUT CIRCUIT




With LED type

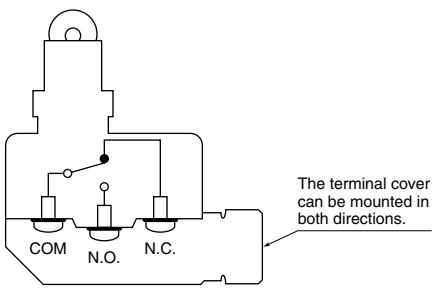



Note: Since LED is connected to N.O. side, the polarity of the load shall be + for N.O.

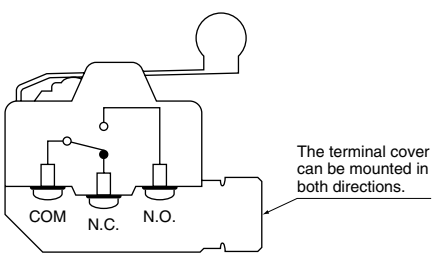
# CONTACTS

**Screw terminal type**

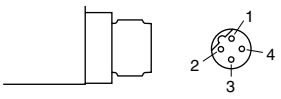
Plunger type




Lever type




**Connector type**




| Contact No. | Terminals | Color of lead-wire |
|---|---|---|
| 1 | — | Brown |
| 2 | N.C. | White |
| 3 | COM | Blue |
| 4 | N.O. | Black |

# DIMENSIONS

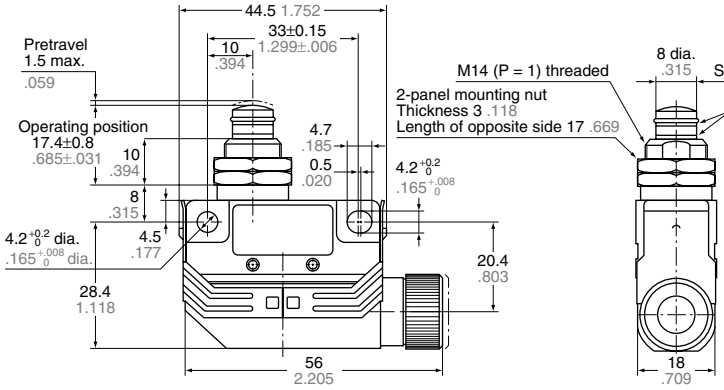
mm inch General tolerance: ±0.4 ±.016

**Die cast case**

1. Screw terminal type

Panel mount push plunger

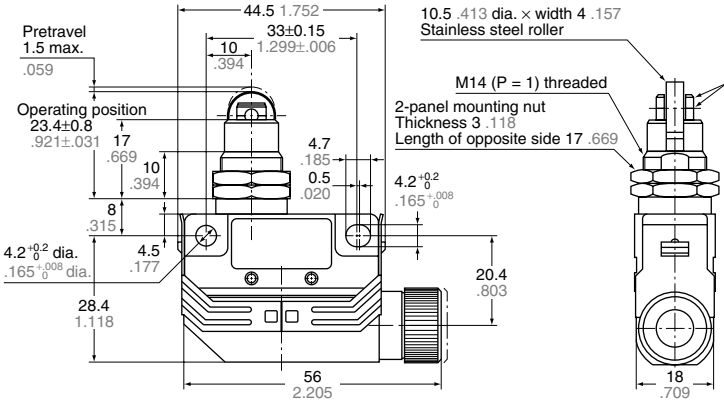
AZH2031
AZH2231




| | |
|---|---|
| Operating force, max. N (gf) | 11.8 (1200) |
| Release force, min. N (gf) | 4.90 (500) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 17.4±0.8 (.685±.031) |

Panel mount roller plunger

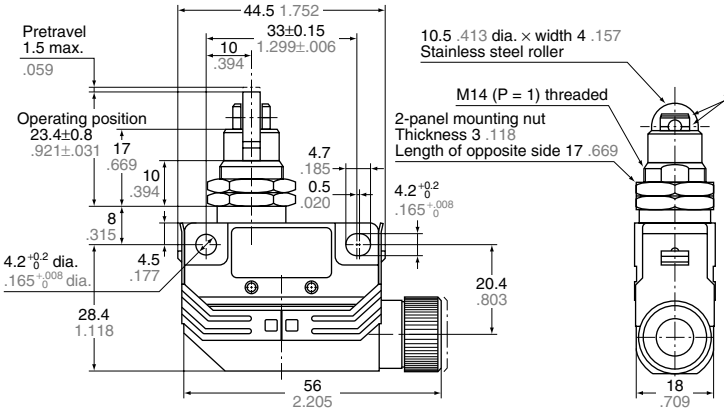
AZH2032
AZH2232




| | |
|---|---|
| Operating force, max. N (gf) | 11.8 (1200) |
| Release force, min. N (gf) | 4.90 (500) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 23.4±0.8 (.909±.031) |

Panel mount cross roller plunger

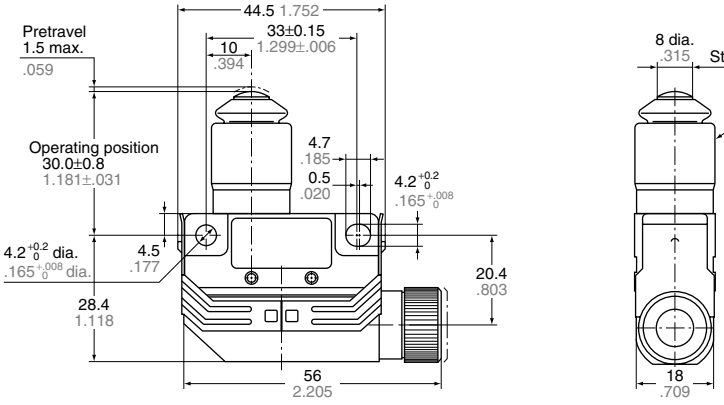
AZH2033
AZH2233




| | |
|---|---|
| Operating force, max. N (gf) | 11.8 (1200) |
| Release force, min. N (gf) | 4.90 (500) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 23.4±0.8 (.909±.031) |

Sealed push plunger

AZH2011
AZH2211



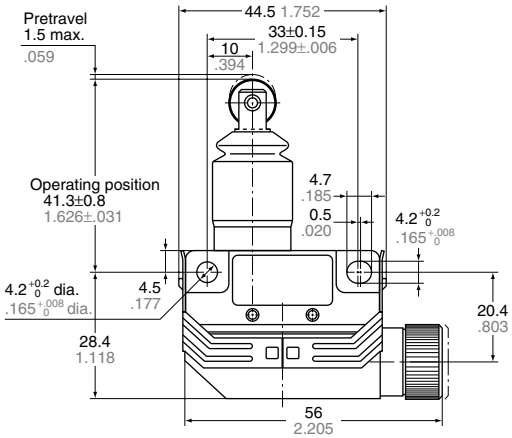

| | |
|---|---|
| Operating force, max. N (gf) | 11.8 (1200) |
| Release force, min. N (gf) | 4.90 (500) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 30.0±0.8 (1.181±.031) |

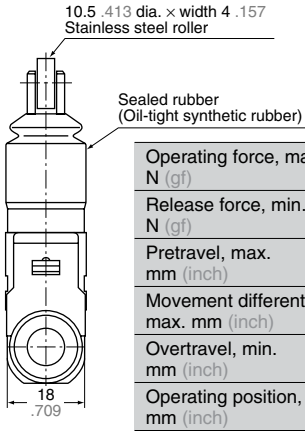
# HL (AZH)

## Sealed roller plunger

mm inch General tolerance: ±0.4 ±.016

AZH2012
AZH2212

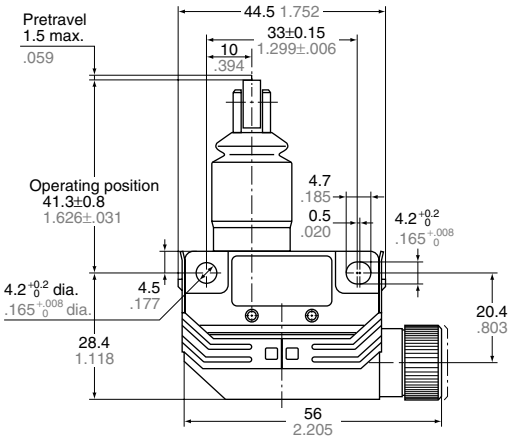


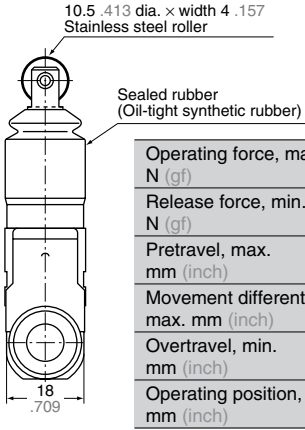




| | |
|---|---|
| Operating force, max. N (gf) | 11.8 (1200) |
| Release force, min. N (gf) | 4.90 (500) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 41.3±0.8 (1.626±.031) |

## Sealed cross roller plunger

AZH2013
AZH2213

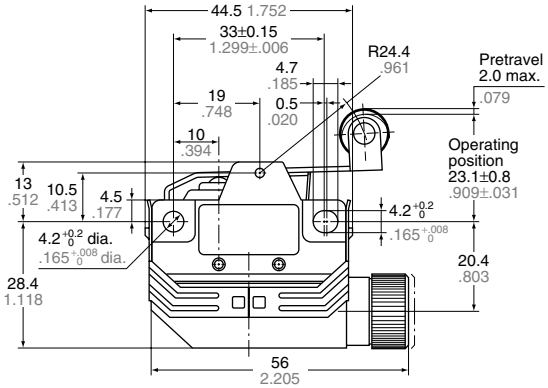


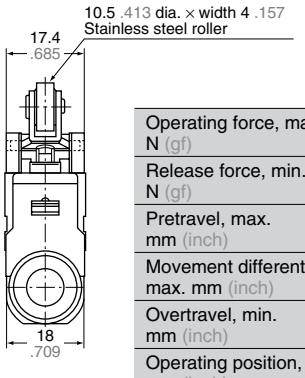




| | |
|---|---|
| Operating force, max. N (gf) | 11.8 (1200) |
| Release force, min. N (gf) | 4.90 (500) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 41.3±0.8 (1.626±.031) |

## Short roller lever

AZH2041
AZH2241

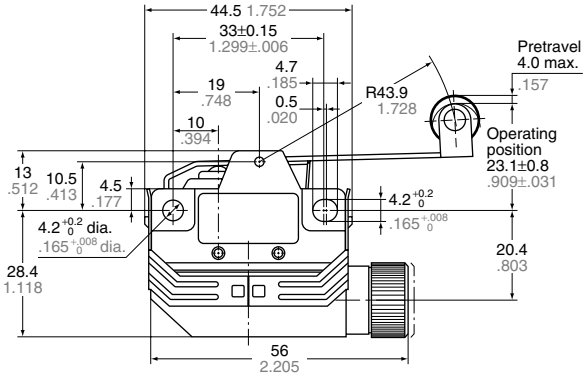


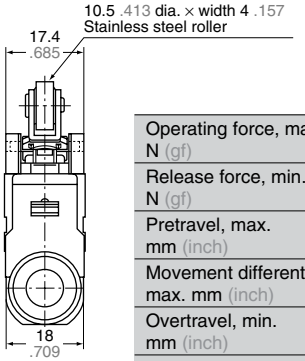




| | |
|---|---|
| Operating force, max. N (gf) | 3.92 (400) |
| Release force, min. N (gf) | 0.78 (80) |
| Pretravel, max. mm (inch) | 2.0 (.079) |
| Movement differential, max. mm (inch) | 0.3 (.012) |
| Overtravel, min. mm (inch) | 4.0 (.157) |
| Operating position, mm (inch) | 23.1±0.8 (.909±.031) |

## Roller lever

AZH2021
AZH2221



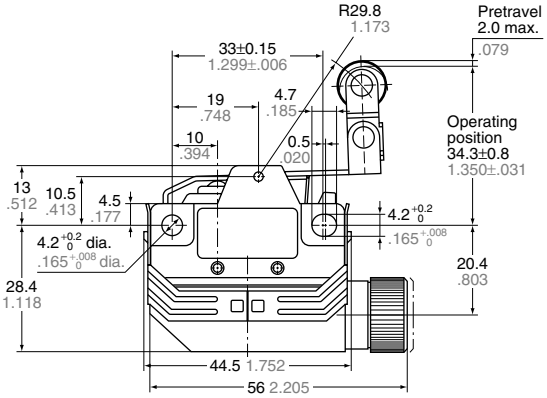



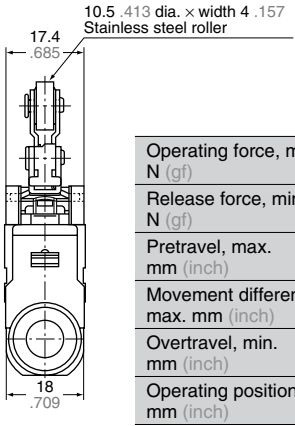

| | |
|---|---|
| Operating force, max. N (gf) | 2.45 (250) |
| Release force, min. N (gf) | 0.39 (40) |
| Pretravel, max. mm (inch) | 4.0 (.157) |
| Movement differential, max. mm (inch) | 0.6 (.024) |
| Overtravel, min. mm (inch) | 7.0 (.276) |
| Operating position, mm (inch) | 23.1±0.8 (.909±.031) |

One-way short roller lever

mm inch General tolerance: ±0.4 ±.016

AZH2044
AZH2244

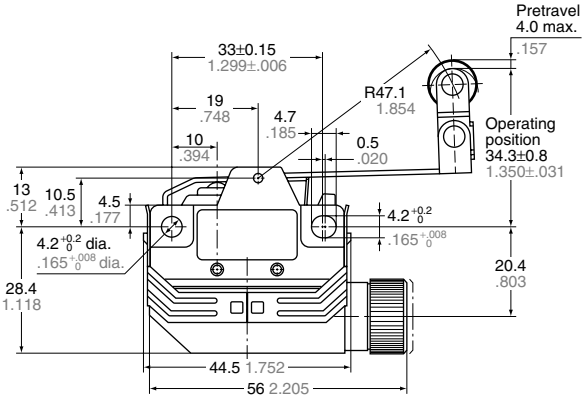


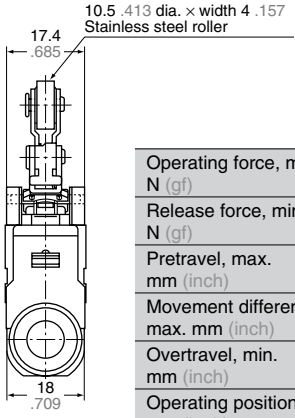




| | |
|---|---|
| Operating force, max. N (gf) | 3.92 (400) |
| Release force, min. N (gf) | 0.78 (80) |
| Pretravel, max. mm (inch) | 2.0 (.079) |
| Movement differential, max. mm (inch) | 0.3 (.012) |
| Overtravel, min. mm (inch) | 4.0 (.157) |
| Operating position, mm (inch) | 34.3±0.8 (1.350±.031) |

One-way roller lever

AZH2024
AZH2224



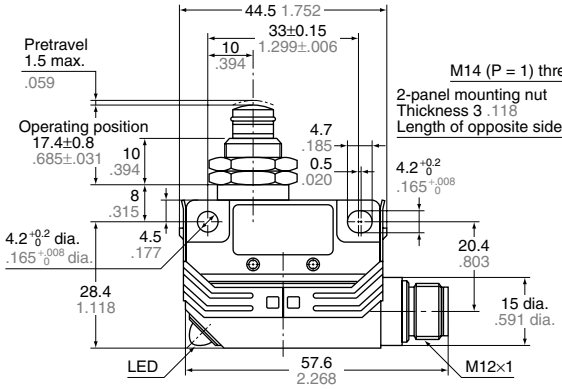




| | |
|---|---|
| Operating force, max. N (gf) | 2.45 (250) |
| Release force, min. N (gf) | 0.39 (40) |
| Pretravel, max. mm (inch) | 4.0 (.157) |
| Movement differential, max. mm (inch) | 0.6 (.024) |
| Overtravel, min. mm (inch) | 7.0 (.276) |
| Operating position, mm (inch) | 34.3±0.8 (1.350±.031) |

## 2. Connector type

Panel mount push plunger

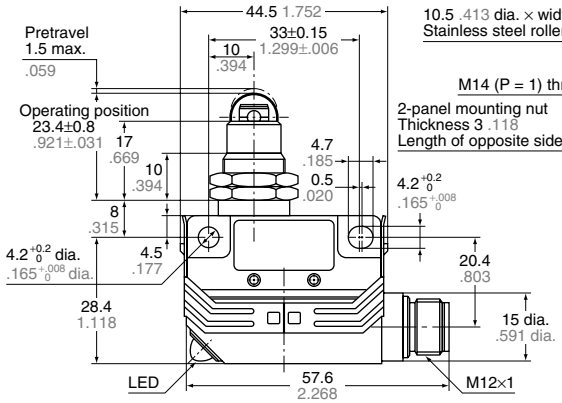
AZH2331
AZH233116 LED type on the photo




| | |
|---|---|
| Operating force, max. N (gf) | 11.8 (1200) |
| Release force, min. N (gf) | 4.90 (500) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 17.4±0.8 (.685±.031) |

Panel mount roller plunger

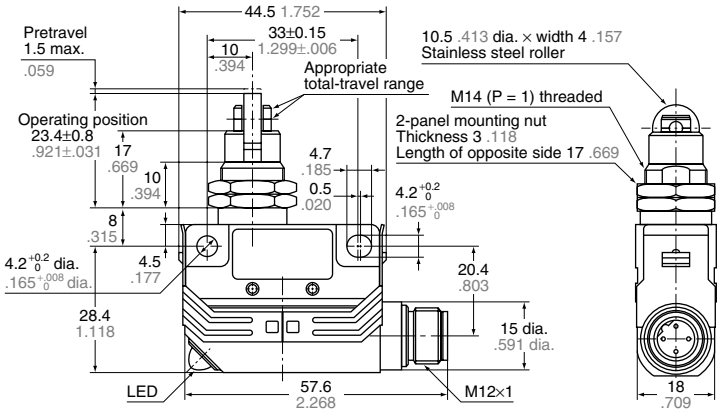
AZH2332
AZH233216 LED type on the photo




| | |
|---|---|
| Operating force, max. N (gf) | 11.8 (1200) |
| Release force, min. N (gf) | 4.90 (500) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 23.4±0.8 (.909±.031) |

## Panel mount cross roller plunger

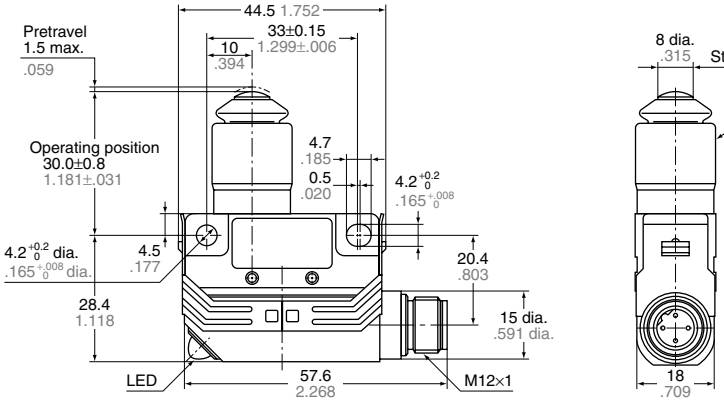
mm inch General tolerance: ±0.4 ±.016

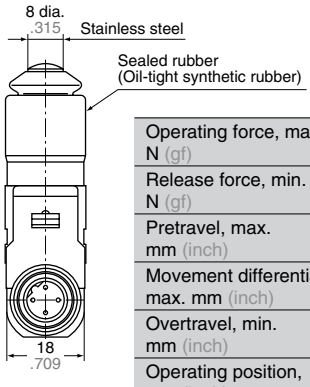



AZH2333
AZH233316 LED type on the photo

| | |
|---|---|
| Operating force, max. N (gf) | 11.8 (1200) |
| Release force, min. N (gf) | 4.90 (500) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 23.4±0.8 (.921±.031) |

## Sealed push plunger

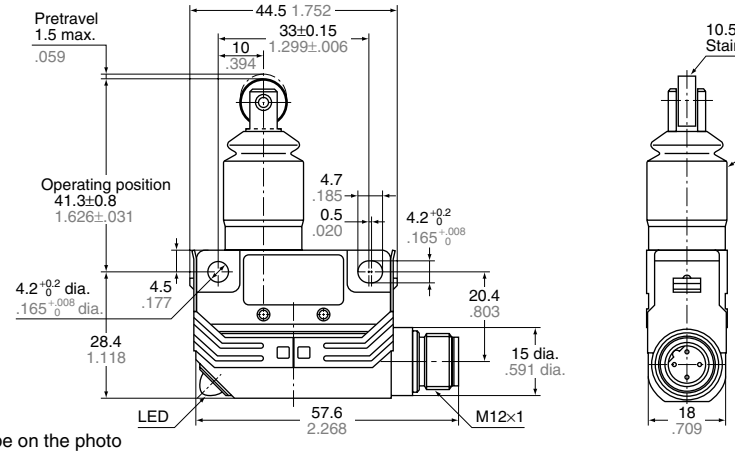


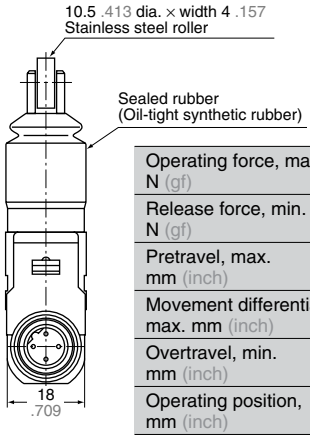




AZH2311
AZH231116 LED type on the photo

| | |
|---|---|
| Operating force, max. N (gf) | 11.8 (1200) |
| Release force, min. N (gf) | 4.90 (500) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 30.0±0.8 (1.181±.031) |

## Sealed roller plunger

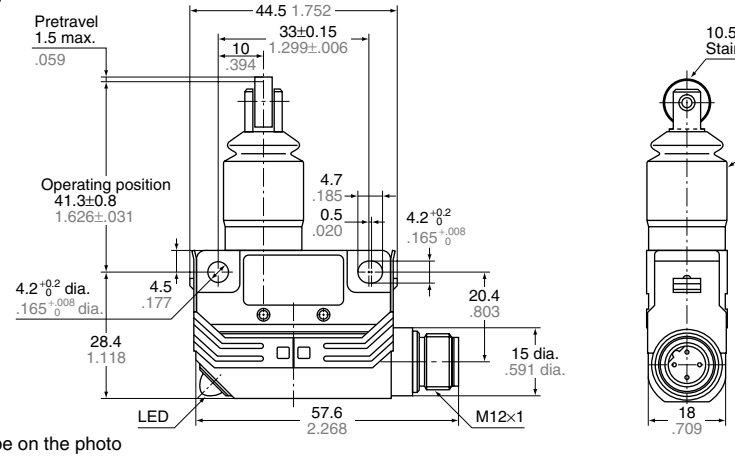


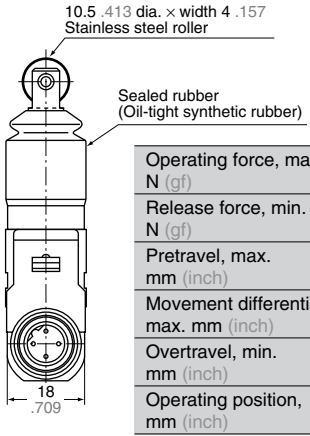




AZH2312
AZH231216 LED type on the photo

| | |
|---|---|
| Operating force, max. N (gf) | 11.8 (1200) |
| Release force, min. N (gf) | 4.90 (500) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 41.3±0.8 (1.626±.031) |

## Sealed cross roller plunger



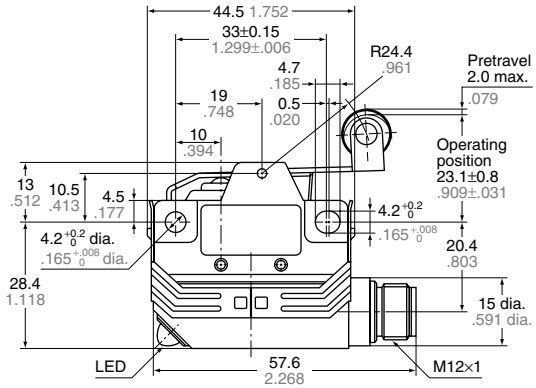



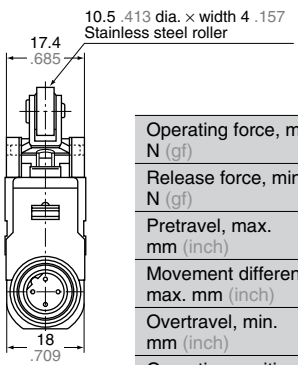

AZH2313
AZH231316 LED type on the photo

| | |
|---|---|
| Operating force, max. N (gf) | 11.8 (1200) |
| Release force, min. N (gf) | 4.90 (500) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 41.3±0.8 (1.626±.031) |

## Short roller lever

mm inch General tolerance: ±0.4 ±.016

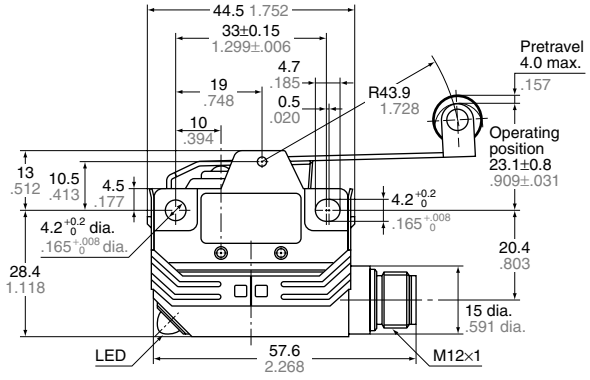


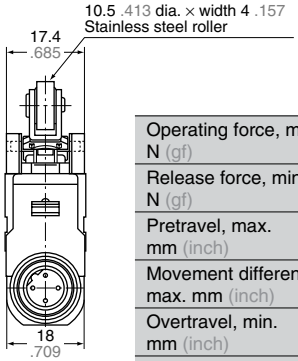




AZH2341
AZH234116 LED type on the photo

| | |
|---|---|
| Operating force, max. N (gf) | 3.92 (400) |
| Release force, min. N (gf) | 0.78 (80) |
| Pretravel, max. mm (inch) | 2.0 (.079) |
| Movement differential, max. mm (inch) | 0.3 (.012) |
| Overtravel, min. mm (inch) | 4.0 (.157) |
| Operating position, mm (inch) | 23.1±0.8 (.909±.031) |

## Roller lever

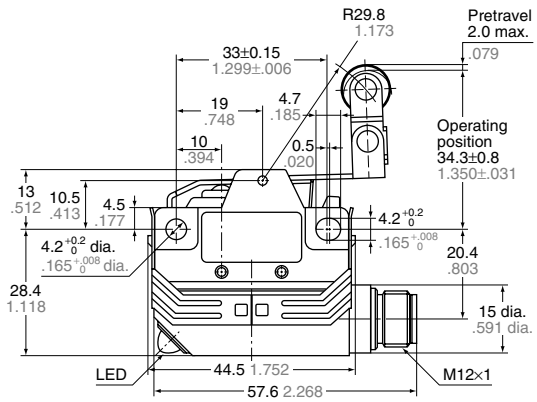


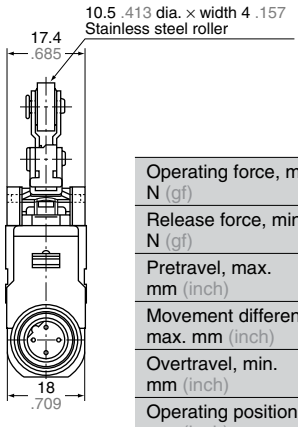




AZH2321
AZH232116 LED type on the photo

| | |
|---|---|
| Operating force, max. N (gf) | 2.45 (250) |
| Release force, min. N (gf) | 0.39 (40) |
| Pretravel, max. mm (inch) | 4.0 (.157) |
| Movement differential, max. mm (inch) | 0.6 (.024) |
| Overtravel, min. mm (inch) | 7.0 (.276) |
| Operating position, mm (inch) | 23.1±0.8 (.909±.031) |

## One-way short roller lever

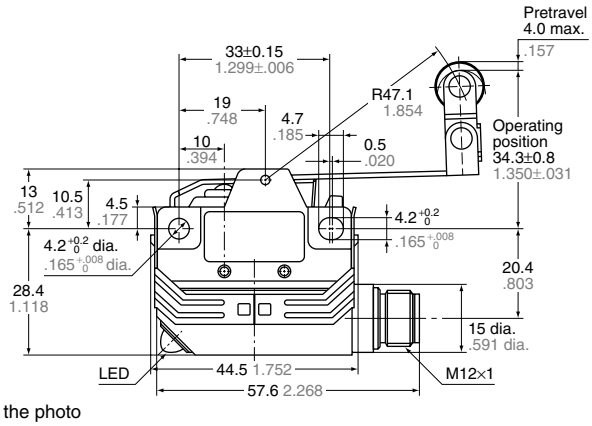


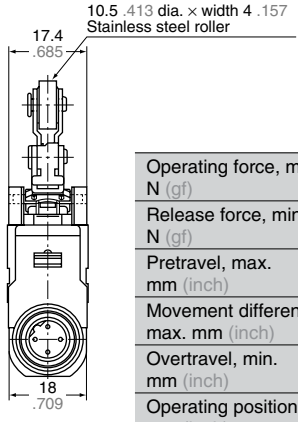




AZH2344
AZH234416 LED type on the photo

| | |
|---|---|
| Operating force, max. N (gf) | 3.92 (400) |
| Release force, min. N (gf) | 0.78 (80) |
| Pretravel, max. mm (inch) | 2.0 (.079) |
| Movement differential, max. mm (inch) | 0.3 (.012) |
| Overtravel, min. mm (inch) | 4.0 (.157) |
| Operating position, mm (inch) | 34.3±0.8 (1.350±.031) |

## One-way roller lever




AZH2324
AZH232416 LED type on the photo

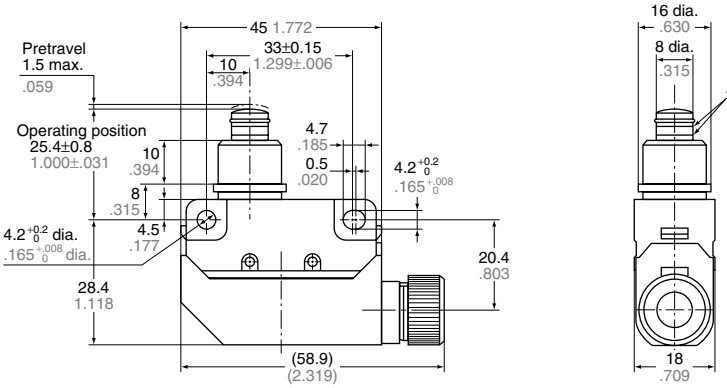
| | |
|---|---|
| Operating force, max. N (gf) | 2.45 (250) |
| Release force, min. N (gf) | 0.39 (40) |
| Pretravel, max. mm (inch) | 4.0 (.157) |
| Movement differential, max. mm (inch) | 0.6 (.024) |
| Overtravel, min. mm (inch) | 7.0 (.276) |
| Operating position, mm (inch) | 34.3±0.8 (1.350±.031) |

**Plastic case**

mm inch General tolerance: ±0.4 ±.016

Push plunger

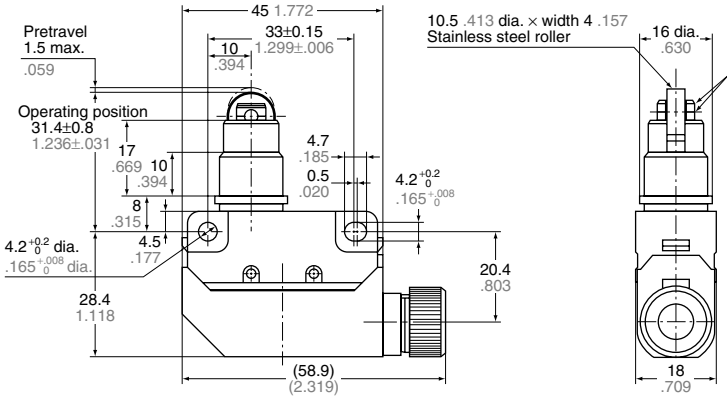
AZH1001
AZH1201




| | |
|---|---|
| Operating force, max. N (gf) | 5.88 (600) |
| Release force, min. N (gf) | 0.98 (100) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 25.4±0.8 (1.000±.031) |

Roller plunger

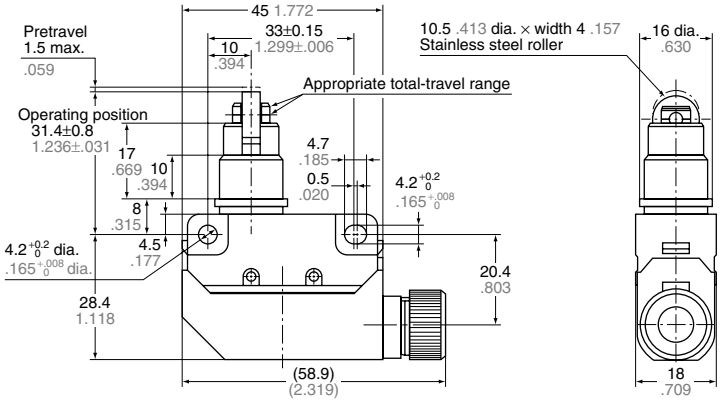
AZH1002
AZH1202




| | |
|---|---|
| Operating force, max. N (gf) | 5.88 (600) |
| Release force, min. N (gf) | 0.98 (100) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 31.4±0.8 (1.236±.031) |

Cross roller plunger

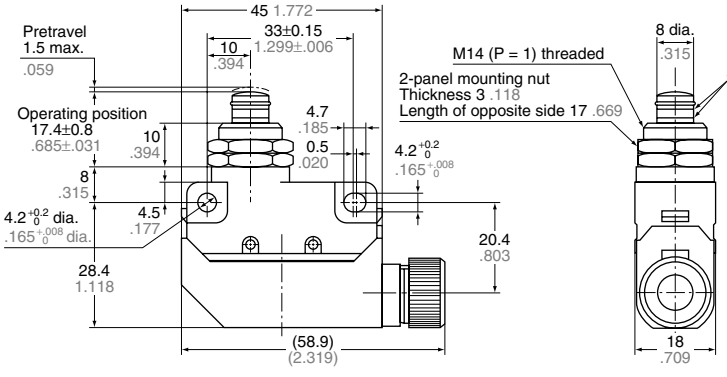
AZH1003
AZH1203




| | |
|---|---|
| Operating force, max. N (gf) | 5.88 (600) |
| Release force, min. N (gf) | 0.98 (100) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 31.4±0.8 (1.236±.031) |

Panel mount push plunger

AZH1031
AZH1231

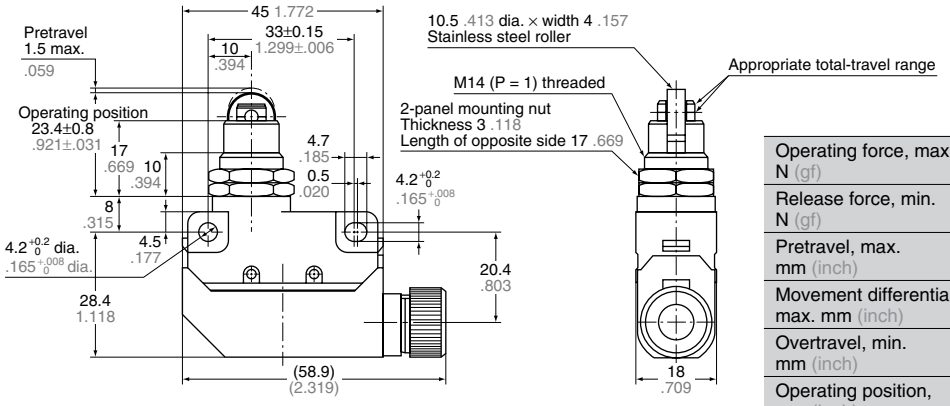



| | |
|---|---|
| Operating force, max. N (gf) | 5.88 (600) |
| Release force, min. N (gf) | 0.98 (100) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 17.4±0.8 (.685±.031) |

## Panel mount roller plunger

mm inch General tolerance: ±0.4 ±.016

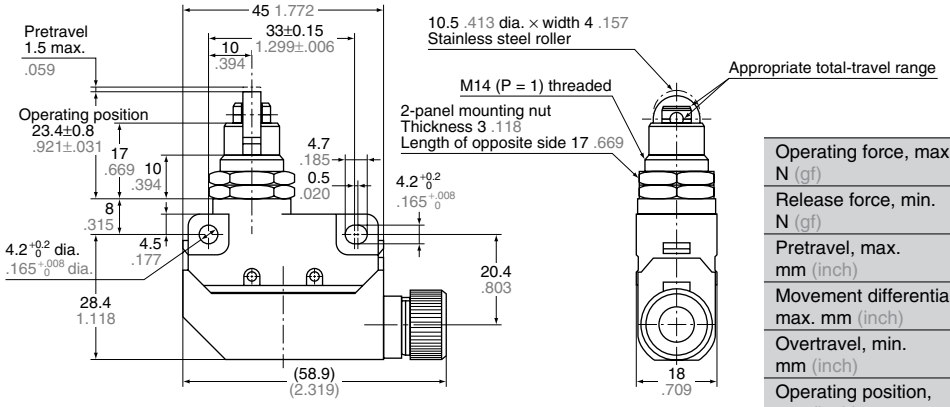
AZH1032
AZH1232




| | |
|---|---|
| Operating force, max. N (gf) | 5.88 (600) |
| Release force, min. N (gf) | 0.98 (100) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 23.4±0.8 (.921±.031) |

## Panel mount cross roller plunger

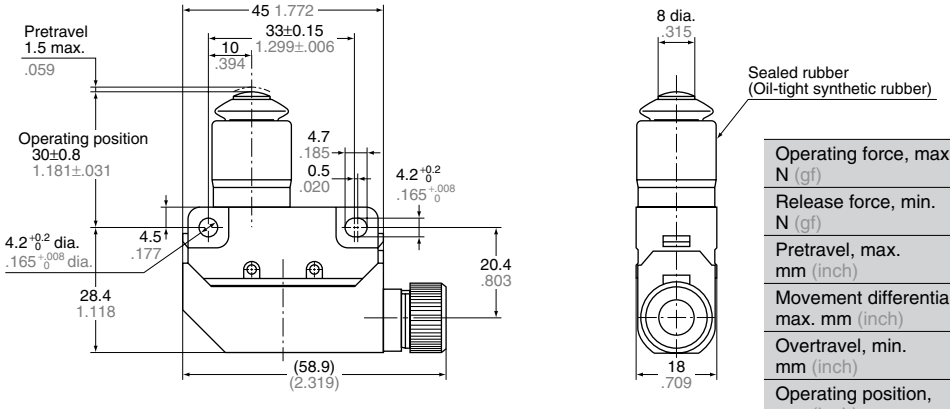
AZH1033
AZH1233




| | |
|---|---|
| Operating force, max. N (gf) | 5.88 (600) |
| Release force, min. N (gf) | 0.98 (100) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 23.4±0.8 (.921±.031) |

## Sealed push plunger

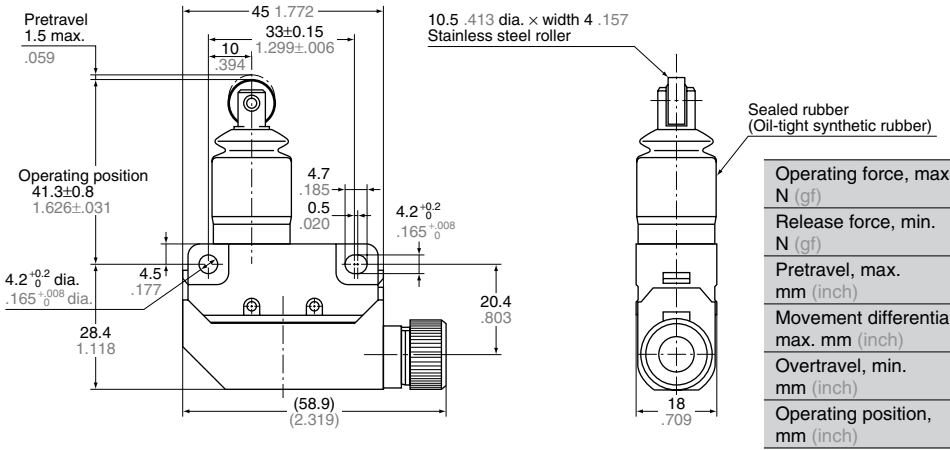
AZH1011
AZH1211




| | |
|---|---|
| Operating force, max. N (gf) | 5.88 (600) |
| Release force, min. N (gf) | 0.98 (100) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 30.0±0.8 (1.181±.031) |

## Sealed roller plunger

AZH1012
AZH1212



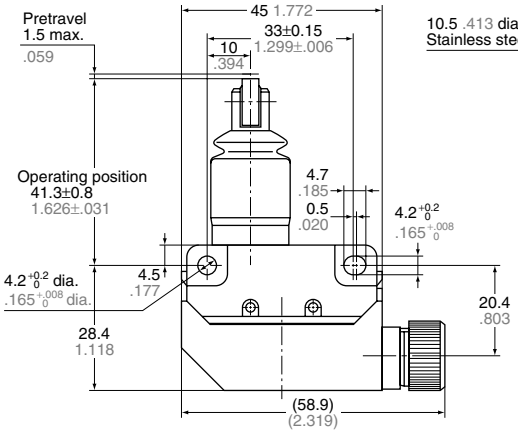

| | |
|---|---|
| Operating force, max. N (gf) | 5.88 (600) |
| Release force, min. N (gf) | 0.98 (100) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 41.3±0.8 (1.626±.031) |

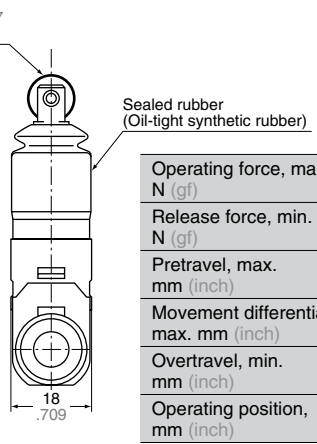
# HL (AZH)

## Sealed cross roller plunger

mm inch General tolerance: ±0.4 ±.016

AZH1013
AZH1213

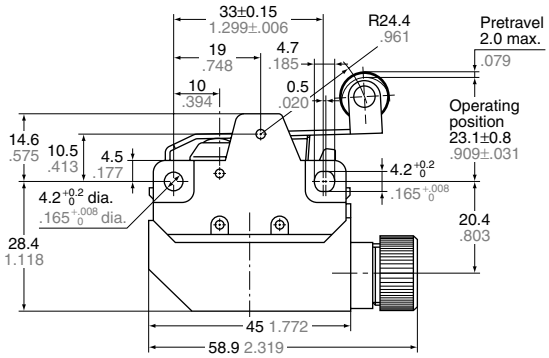


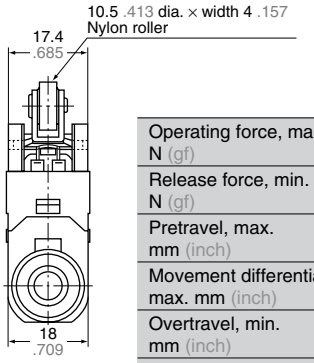




| | |
|---|---|
| Operating force, max. N (gf) | 5.88 (600) |
| Release force, min. N (gf) | 0.98 (100) |
| Pretravel, max. mm (inch) | 1.5 (.059) |
| Movement differential, max. mm (inch) | 0.1 (.004) |
| Overtravel, min. mm (inch) | 3.0 (.118) |
| Operating position, mm (inch) | 41.3±0.8 (1.626±.031) |

## Short roller lever

AZH1041
AZH1241

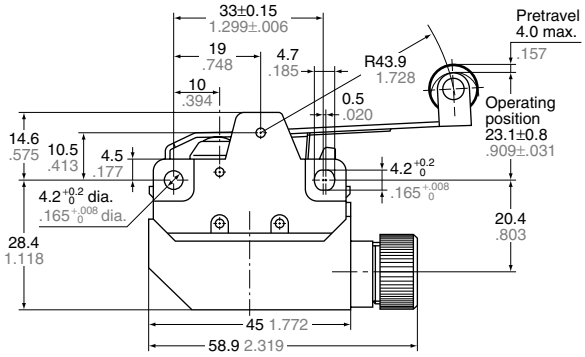


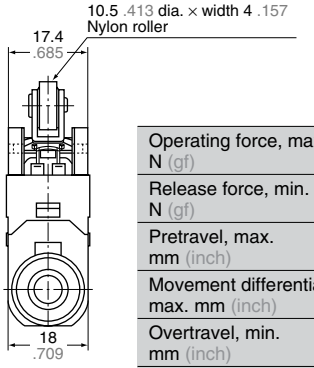




| | |
|---|---|
| Operating force, max. N (gf) | 3.92 (400) |
| Release force, min. N (gf) | 0.78 (80) |
| Pretravel, max. mm (inch) | 2.0 (.079) |
| Movement differential, max. mm (inch) | 0.3 (.012) |
| Overtravel, min. mm (inch) | 4.0 (.157) |
| Operating position, mm (inch) | 23.1±0.8 (.909±.031) |

## Roller lever

AZH1021
AZH1221

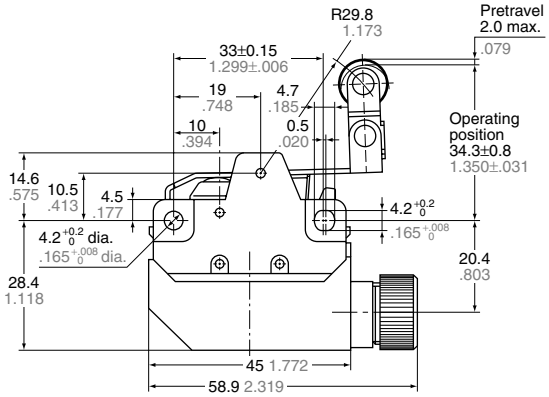


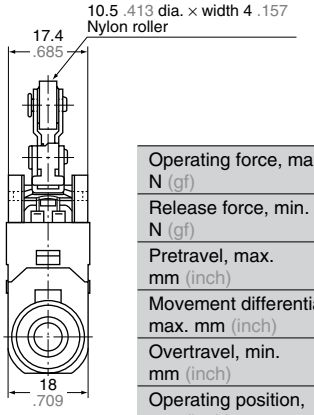




| | |
|---|---|
| Operating force, max. N (gf) | 2.45 (250) |
| Release force, min. N (gf) | 0.39 (40) |
| Pretravel, max. mm (inch) | 4.0 (.157) |
| Movement differential, max. mm (inch) | 0.6 (.024) |
| Overtravel, min. mm (inch) | 7.0 (.276) |
| Operating position, mm (inch) | 23.1±0.8 (.909±.031) |

## One-way short roller lever

AZH1044
AZH1244



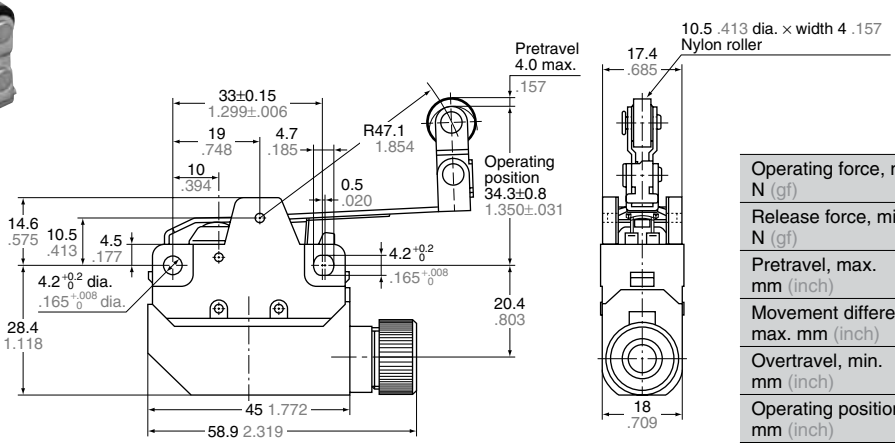




| | |
|---|---|
| Operating force, max. N (gf) | 3.92 (400) |
| Release force, min. N (gf) | 0.78 (80) |
| Pretravel, max. mm (inch) | 2.0 (.079) |
| Movement differential, max. mm (inch) | 0.3 (.012) |
| Overtravel, min. mm (inch) | 4.0 (.157) |
| Operating position, mm (inch) | 34.3±0.8 (1.350±.031) |

One-way roller lever

mm inch General tolerance: ±0.4 ±.016

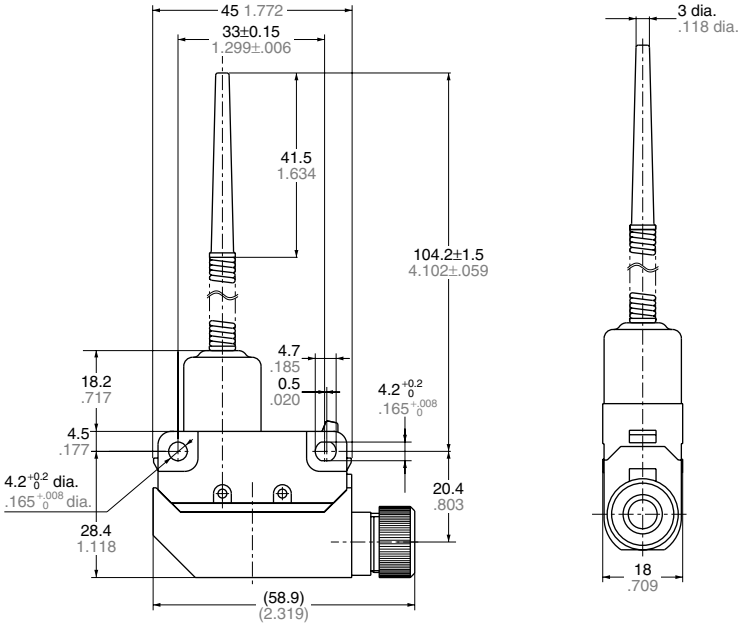
AZH1024
AZH1224




| | |
|---|---|
| Operating force, max. N (gf) | 2.45 (250) |
| Release force, min. N (gf) | 0.39 (40) |
| Pretravel, max. mm (inch) | 4.0 (.157) |
| Movement differential, max. mm (inch) | 0.6 (.024) |
| Overtravel, min. mm (inch) | 7.0 (.276) |
| Operating position, mm (inch) | 34.3±0.8 (1.350±.031) |

Flexible

AZH1066
AZH1266

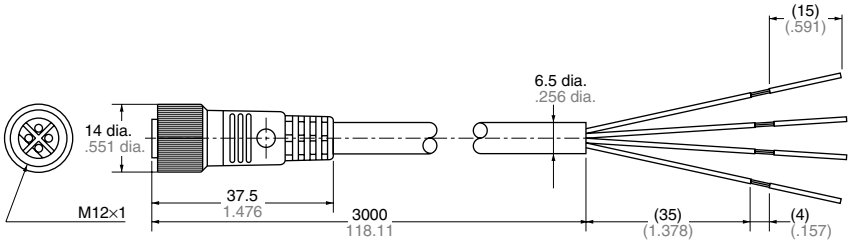



| | |
|---|---|
| Operating force, max. N (gf) | 0.88 (90) |
| Pretravel, min. mm (inch) | 30.0 (1.181) |
| Overtravel, max. mm (inch) | 20.0 (.787) |

**Cable connected cord**

Straight type

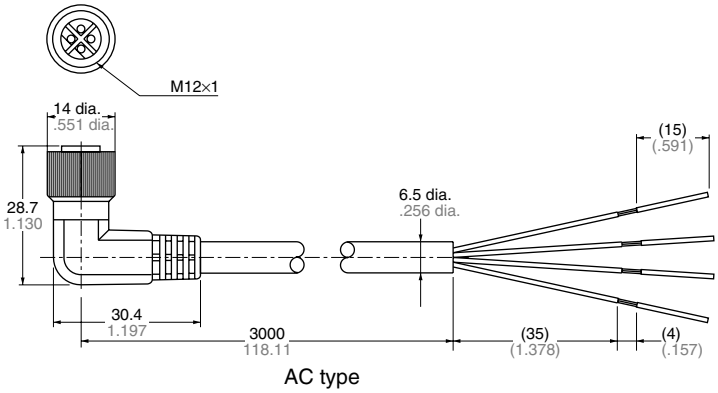
AZH28113




AC type

Angle type

AZH28133



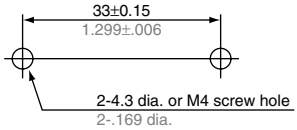

AC type

# MOUNTING METHOD

**Side mounting**

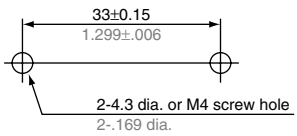
1. Die casting case
M4 screw is used for mounting on side. Mount it firmly with washer. Mounting torque is 1.37 to 1.57 N·m {14 to 16 kg·cm}.
Remove the hexagonal nut when plunger type is used in side mounting.

Side mounting hole dimensions




2. Plastic case
M4 screw is used for mounting on side. Mount it firmly with washer. Mounting torque is 1.18 to 1.47 N·m {12 to 15 kg·cm}.

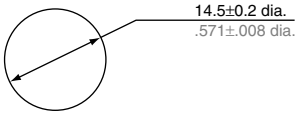
Side mounting hole dimensions




**Panel mounting**

(Panel plunger type)
When the panel mounting type is fixed on the panel, the torque of hexagonal nut is set under 7.84 N·m {80 kg·cm}.

Panel mounting hole dimensions




# APPLICABLE WIRE

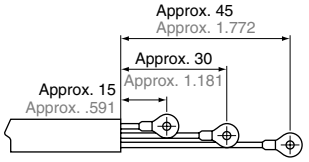
(For screw terminal)

Sealed rubber of the lead wire is applicable for 6 dia. to 8 dia.

| Electric wire name | Applicable wire | | |
|---|---|---|---|
| | Wire strand | Conductor | Finished outside diameter |
| Vinyl cabtyre cord (VCTF) | 2-wire | 0.75 mm² | 6.6 mm dia. |
| | | 1.25 mm² | 7.4 mm dia. |
| | | 2.0 mm² | 8.0 mm dia. |
| | 3-wire | 0.75 mm² | 7.0 mm dia. |
| | | 1.25 mm² | 7.8 mm dia. |

# WIRING (For screw terminal)

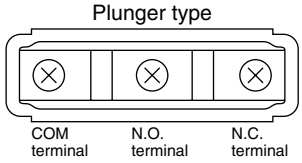
1) M3 small binding screw is used as a terminal screw.
2) When wiring, don't connect the lead wire to the terminal directly. Fasten the crimped terminals securely applying a tightening torque of 0.20 to 0.29 N·m {2 to 3 kg·cm}. Avoid using solder when wiring.
3) Refer to the following diagram for power supply wiring.



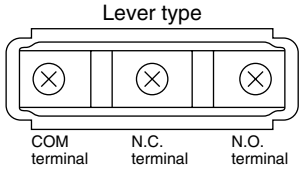

(Unit: mm inch)

4) Take note the terminal arrangement is different between plunger type and lever type. (The arrangement of N.C. and N.O. is reversed.)

Plunger type



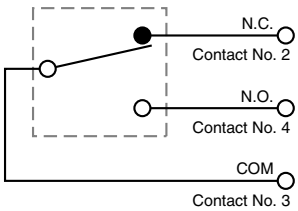

Lever type



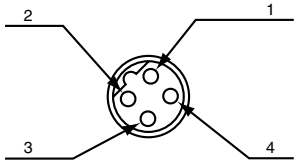

5) Mount the terminal case securely after ensuring that the rubber seals are attached at the proper positions. Do a visual check to make sure that the retainer is properly inserted on the protrusion of the case. When installing the terminal case of the plastic case type, push the terminal case until it clicks into place, and make sure there is no play afterwards.

# CONNECTOR TYPE

1) The cord outlet direction is interchangeable. Refer to "HOW TO CHANGE THE CORD OUTLET DIRECTION FOR CONNECTOR TYPE".
2) Do not remove the connector over 50 times.
3) Wiring diagram as shown below.



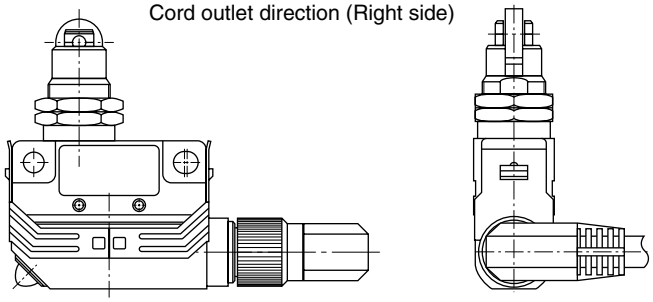

Contact No. of connector



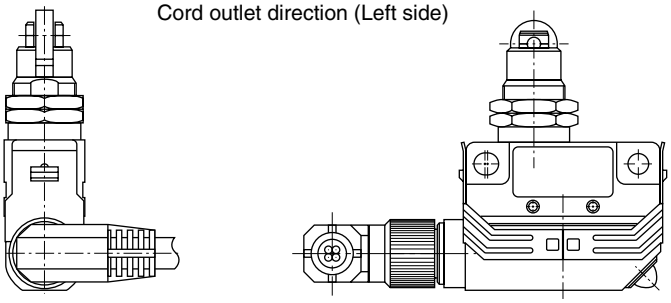

Note: Contact No. 1 is not in use.

4) When the angle type of connector cord is used, the cord outlet direction is as follows.

Cord outlet direction (Right side)



Cord outlet direction (Left side)

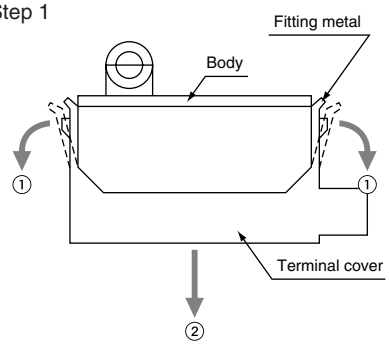


# HOW TO CHANGE THE CORD OUTLET DIRECTION FOR CONNECTOR TYPE

The cord outlet direction is interchangeable both right and left sides. The direction of connector cord is set to the right when it is shipped. When it is used left side direction, follow the next procedure.

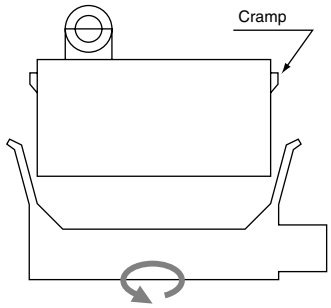
Cord outlet direction (Right side)

Step 1




Push down the fitting metal while pulling it horizontal direction.

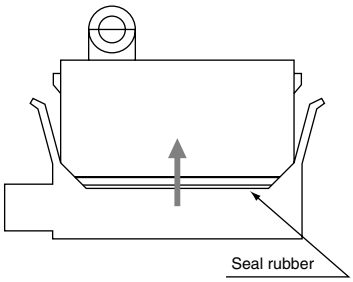
Step 2




Turn the terminal cover at an angle of 180 degree. Follow the step 3.
- Do not pull the terminal cover.
- Do not rotate the terminal cover many times.
- Do not loosen the terminal screw.

Be careful, because not doing so could cause wire cutoff and contact failure.

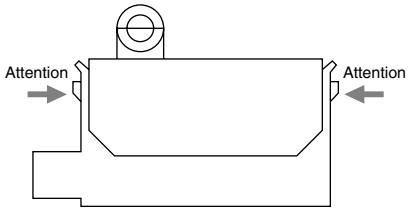
Step 3




Press up the terminal cover.
- Do not put the lead wire between terminal cover and body.
- Put the seal rubber at the right place.

Cord outlet direction (Left side)

Step 4

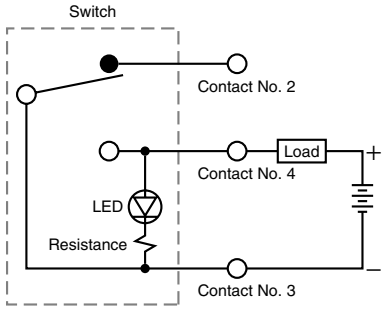



Confirm the fitting metal is on tightly. If it is loosen, it might be cause of the trouble.

# INDICATOR LIGHTING CIRCUIT (Connector type only)

1) See the circuit diagram.
2) The LED only takes 24 DC V, but please use a connector designed for AC.
3) Since the LED lamp is connected to the N.O. side (contact No. 4), please connect the load to contact No. 4. The load side should be on the “+” power supply side. Be careful, because the LED will break if the connection is reversed.
4) The LED is turned on when the switch is at a free position. The LED is turned off when the switch operates.
5) Applicable power source is 24 V DC. Use it with care on leakage current. The leakage current is approx. 1.5 mA at 24 V DC.

Circuit diagram



# CAUTIONS

**Common for all types**

**1. There are limits to what type of environment can be tolerated.**

This limit switch is designed under the premise that it will be used in a standard industrial device. Accordingly, there are limits as to what can be tolerated if used outdoors or where water and oil, etc., may get on the device. The following table indicates how much water and oil can be withstood (classification of protective structure).

| | Plastic case (AZH1*) | Die casting case (AZH2*) |
|---|---|---|
| Protective classification | IP64 | IP67 |
| Testing method | No harmful effect when sprayed with water for 10 minutes from all angles. | Water does not enter product after immersion in water 1m deep for 30 minutes. |
| Limits on use | Cannot be used outdoors or in a place where water and oil, etc., will continually contact the device. | Cannot be used outdoors where it can be rained on directly and cannot be used submersed in water or in oil, etc. |

Note: Although, initially, the protective classification complies under the testing above, due consideration must be taken because great differences may result depending on factors such as duration of operation, installation method, and environment.

**2. The internal mechanism will break if the actuator is moved beyond its Total-travel (T.T.). Always use within the T.T.**

**Die casting case**

1) Do not expose HL limit switch to hot water (over 60°C 140°F) and in a water vapor environment.
2) Avoid the place where organic solvents, strong acid, strong alkali liquid and vapor may attach to the products directly. Prevent using the HL limit switch in place where inflammable or corrosive gas will be generated.
3) Do not change the operating position by bending the actuator.
4) Use within an ambient temperature of –10 to 80°C. (However, do not allow it to freeze.)
5) If OT is too big, the life of limit switch will be shortened by switching friction. Use it with enough margin of OT. 70% of OT standard value will be good.
6) Attach the terminal cover securely to the body with the metal stop latch to the projection of the body.
7) Confirmation test in the actual application is highly recommended.
8) Do not use the switch in a silicon atmosphere. Care should be taken where organic silicon rubber, adhesive, seling material, oil, grease or lead wire generates silicon.
9) When used outdoors (in places where there is exposure to direct sunlight or rain such as in multistory car parks) or in environments where ozone is generated, the influence of these environments may cause deterioration of the rubber material. Please consult us if you intend to use a switch in environments such as these.
10) Avoid use in excessively dusty environments where actuator operation would be hindered.

**Plastic case**

1) Do not use in water or oil. Do not place the switch where it is always exposed to water or dust splash.
2) Do not expose HL limit switch to hot water (over 60°C 140°F) and in a water vapor environment.
3) Avoid the place where organic solvents, strong acid, strong alkali liquid and vapor may attach to the products directly. Prevent using the HL limit switch is place where inflammable or corrosive gas will be generated.
4) Do not change the operating position by bending the actuator.
5) Use within an ambient temperature of –10 to 80°C. (However, do not allow it to freeze.)
6) If OT is too big, the life of limit switch will be shortened switching friction. Use it with enough margin of OT. 70% of OT standard value will be good for use.
7) Attach the terminal cover securely to the body to the extent you can identify the clicking or locking sound.
8) A confirmation test in the actual application is highly recommended.
9) 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.
10) When used outdoors (in places where there is exposure to direct sunlight or rain such as in multistory car parks) or in environments where ozone is generated, the influence of these environments may cause deterioration of the rubber material. Please consult us if you intend to use a switch in environments such as these.
11) Avoid use in excessively dusty environments where actuator operation would be hindered.

Panasonic
ideas for life

**COMPACT SIZE LIMIT SWITCHES**

# ML (AZ7) Limit Switches

## Terminal mold types (epoxy-sealed terminal type) also available.

Standard type
(Short roller lever)

**RoHS Directive compatibility information**
**http://www.nais-e.com/**

## FEATURES

**1. Long life**
High efficiency coil spring switching mechanism for long life: More than $10^7$ mechanical operations.

**2. Great mechanical strength while being compact and lightweight**
The attachment pitch is 25.4mm (1.000inch), same as for the Z basic model microswitch. Also, the outer cover cap uses a strong plastic with excellent mechanical characteristics. An M4 bolt can be used for the attachment.

**3. The overtravel (O.T.) is large with great shock absorption**

**4. The switch itself is constructed to be dust-proof and oil resistant**
The switch itself is closed flush with the diaphragm and the compressed rubber ring, so that the terminal mold type (epoxy-sealed terminal type) is perfectly flush with the terminal parts.

## TYPICAL APPLICATIONS

Used in sequence control of food processing machines, automatic packaging machines, conveyers, and processors. Ideal for light industry machinery when installation pace is limited and a protective construction is sought.

## PRODUCT TYPE

**1. Standard type**

| Actuator | Part No. |
|---|---|
| Short push plunger | AZ7100 |
| Push plunger | AZ7110 |
| Hinge lever | AZ7120 |
| Roller lever | AZ7121 |
| One-way roller lever | AZ7124 |
| Hinge short lever | AZ7140 |
| Short roller lever | AZ7141 |
| One-way short roller lever | AZ7144 |
| Panel mount push plunger | AZ7310 |
| Panel mount roller plunger | AZ7311 |
| Panel mount cross roller plunger | AZ7312 |
| Flexible rod | AZ7166 |

Notes) 1. When ordering an overseas-specified product,refer to the foreign standards overview.
2. 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. Terminal mold type (epoxy-sealed terminal type)**

| Actuator | Cord outlet direction | |
|---|---|---|
| | N.C. | COM |
| | Part No. | |
| Short push plunger | AZ7400 | AZ7401 |
| Push plunger | AZ7405 | AZ7406 |
| Hinge lever | AZ7410 | AZ7411 |
| Roller lever | AZ7415 | AZ7416 |
| One-way roller lever | AZ7420 | AZ7421 |
| Hinge short lever | AZ7425 | AZ7426 |
| Short roller lever | AZ7430 | AZ7431 |
| One-way short roller lever | AZ7435 | AZ7436 |
| Panel mount push plunger | AZ7440 | AZ7441 |
| Panel mount roller plunger | AZ7445 | AZ7446 |
| Panel mount cross roller plunger | AZ7450 | AZ7451 |
| Flexible rod | AZ7460 | AZ7461 |

## FOREIGN STANDARDS

| Standards | Applicable product | Part No. |
|---|---|---|
| UL | File No. : E122222<br>Ratings : 10A 250V AC<br>Product type : Standard type only | Order by standard part No. |
| C-UL | File No. : E122222<br>Ratings : 10A 250V AC<br>Product type : Standard type only | |
| TÜV | File No. : J9551204<br>Ratings : AC-15 2A/250V~<br>Product type : Standard type only | |

## SPECIFICATIONS

### 1. Rating

| Rated control voltage \ Load | Resistive load ($\cos\phi \fallingdotseq 1$) | Inductive load ($\cos\phi \fallingdotseq 0.4$) | Motor or lamp load | |
|---|---|---|---|---|
| | | | N.C. contact | N.O. contact |
| 125V AC | 10A | 6A | 3A | 1.5A |
| 250V AC | 10A | 4A | 1.5A | 1A |
| 115V DC | 0.4A | 0.05A | – | – |

### 2.Characteristics

| | | |
|---|---|---|
| Contact arrangement | | 1 Form C |
| Initial contact resistance, max. | | 15mΩ* (By voltage drop 6 to 8V DC at rated current) |
| Contact material | | AgCdO contact |
| Initial insulation resistance (At 500V DC) | | Min. 100 MΩ |
| Initial breakdown voltage | | 1,500 Vrms for 1 min Between non-consecutive terminals<br>2,000 Vrms for 1 min Between dead metal parts and each terminal<br>2,000 Vrms for 1 min Between ground and each terminal |
| Shock resistance | In the free position | Max. 98m/s$^2$ {10G} |
| | In the full operating position | Max. 294m/s$^2$ {30G} |
| Vibration resistance | | 55 Hz, double amplitude of 1.5 mm |
| Expected life (Min. operation) | Mechanical | $10^7$ (at 50 cpm) |
| | Electrical | $2 \times 10^5$ (at 20 cpm) |
| Ambient temperature/Ambient humidity | | –20 to +60°C –4 to +140°F/Max. 95% R.H. (at 20°C 68°F) |
| Max. operating speed | | 120 cpm |

*The resistance of a copper wire is not included.

### 3.EN60947-5-1 performance

| Item | Rating |
|---|---|
| Rated insulation voltage (Ui) | 250VAC |
| Rated impulse withstand voltage (Uimp) | 2.5kV |
| Switching over voltage | 2.5kV |
| Rated enclosed thermal current (Ithe) | 10A |
| Conditional short-circuit current | 100A |
| Short-circuit protection device | 10A fuse |
| Protective construction | IP64 (switch) |
| Pollution degree | 3 |

### 4. Operating characteristics

| Characteristics / Actuator | O.F. (N{gf}) max. | R.F. (N{gf}) min. | Pretravel (P.T.), max. mm inch | Movement Differential (M.D.), max. mm inch | Overtravel (O.T.), min. mm inch | Operating Position (O.P.) mm inch |
|---|---|---|---|---|---|---|
| Short push plunger | 5.88 {600} | 0.98 {100} | 2.0 .079 | 0.8 .031 | 0.8 .031 | 30±0.8 1.181±.031 |
| Push plunger | 5.88 {600} | 0.98 {100} | 2.0 .079 | 0.8 .031 | 5.0 .197 | 44±1.2 1.732±.047 |
| Hinge lever | 1.47 {150} | 0.39 {40} | 13.5 .531 | 3.2 .126 | 4.0 .157 | 25±2.0 .984±.079 |
| Roller lever | 1.77 {180} | 0.49 {50} | 11.0 .433 | 2.4 .094 | 3.0 .118 | 40±1.9 1.575±.75 |
| One-way roller lever | 1.96 {200} | 0.59 {60} | 11.0 .433 | 2.4 .094 | 3.0 .118 | 50±2.0 1.969±.079 |
| Hinge short lever | 2.16 {200} | 0.59 {60} | 8.5 .335 | 2.0 .079 | 2.5 .098 | 25±1.3 .984±.051 |
| Short roller lever | 2.35 {240} | 0.78 {80} | 6.5 .256 | 1.5 .059 | 2.0 .079 | 40±1.6 1.575±.063 |
| One-way short roller lever | 2.75 {280} | 0.98 {100} | 6.5 .256 | 1.5 .059 | 2.0 .079 | 50±1.6 1.969±.063 |
| Panel mount push plunger | 5.88 {600} | 0.98 {100} | 2.0 .079 | 0.8 .031 | 6.0 .236 | 21.8±0.8 .858±.031 |
| Panel mount roller plunger | 5.88 {600} | 0.98 {100} | 2.0 .079 | 0.8 .031 | 6.0 .236 | 33.3±1.2 1.311±.047 |
| Panel mount cross roller plunger | 5.88 {600} | 0.98 {100} | 2.0 .079 | 0.8 .031 | 6.0 .236 | 33.3±1.2 1.311±.047 |
| Flexible rod | 1.18 {120} | – | 25 .984 | – | 11 .433 | 36 1.417 (T.T.) |

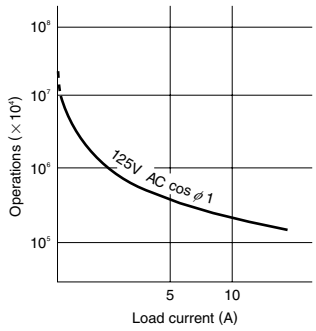
Note) For the operating characteristics, refer to the TECHNICAL INFORMATION.

### 5. Protective characteristics

| Protective construction / IEC | Standard type | Terminal mold type (Epoxy-sealed terminal type) |
|---|---|---|
| IP60 | ○ | ○ |
| IP64 | – | ○ |

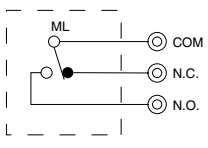
## DATA

### 1. Life curve

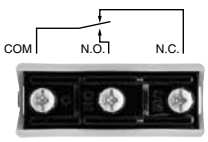



## WIRING DIAGRAM

Circuit




Terminal



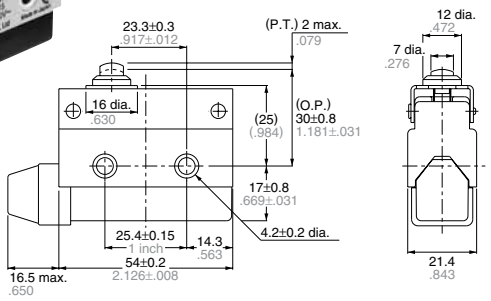

Standard type

# DIMENSIONS

mm inch

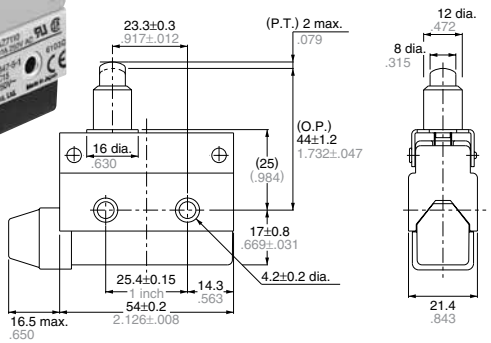
## • Short push plunger

AZ7100




## • Push plunger

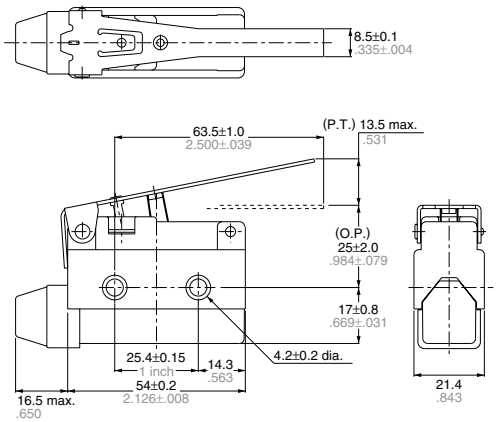
AZ7110




General tolerance: ±0.4 ±.016

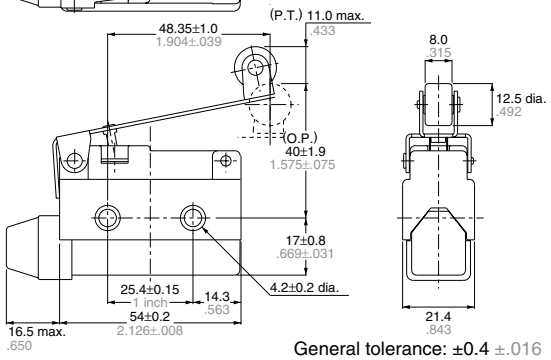
## • Hinge lever

AZ7120




## • Roller lever

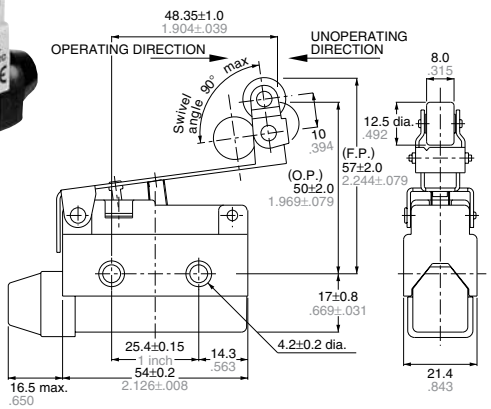
AZ7121



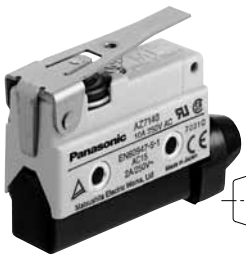

General tolerance: ±0.4 ±.016

## • One-way roller lever

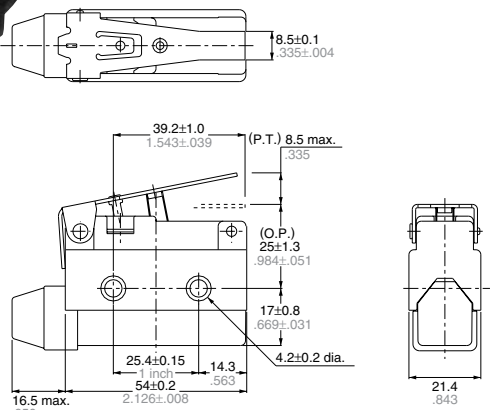
AZ7124




## • Hinge short lever



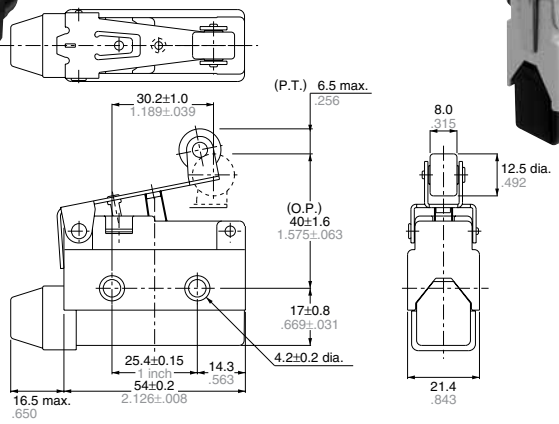
AZ7140




General tolerance: ±0.4 ±.016

## • Short roller lever

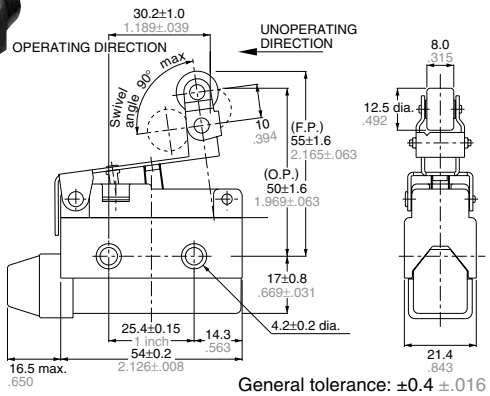
AZ7141




## • One-way short roller lever

mm inch

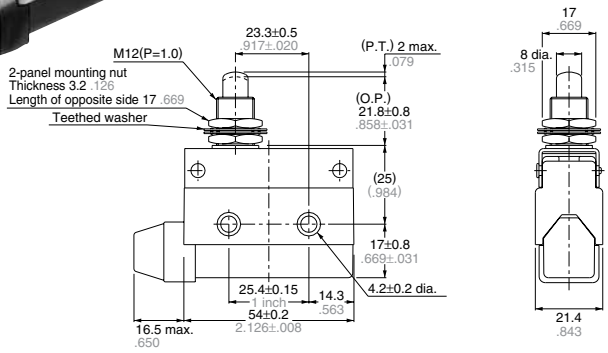
AZ7144




General tolerance: ±0.4 ±.016

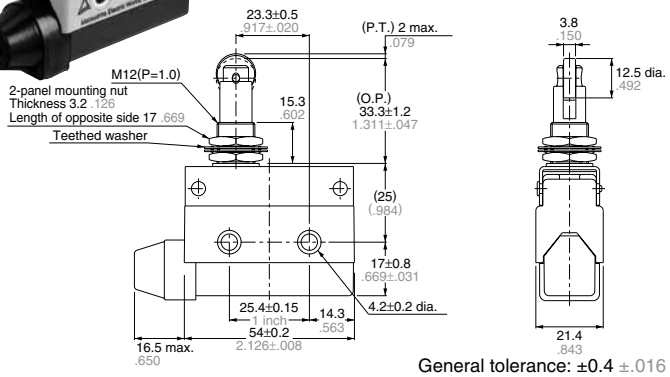
## • Panel mount push plunger

AZ7310




## • Panel mount roller planger

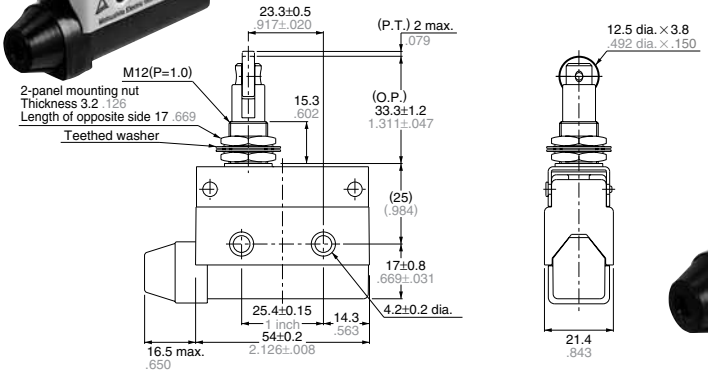
AZ7311




General tolerance: ±0.4 ±.016

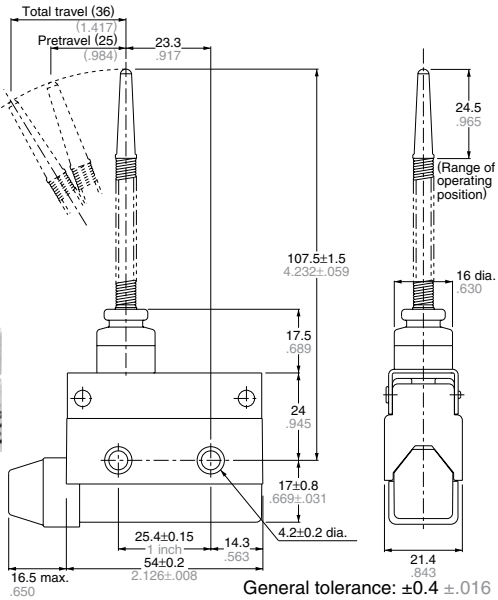
## • Panel mount cross roller planger

AZ7312




## • Flexible rod

AZ7166




General tolerance: ±0.4 ±.016

## Terminal Mold Type (Epoxy-Sealed Terminal Type)

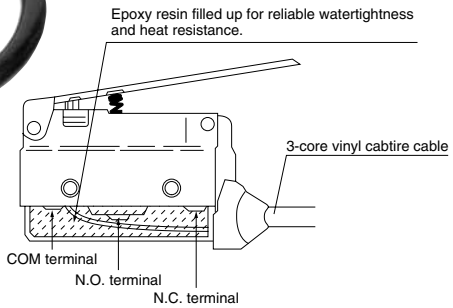
The waterproof type (IP64) has its terminals sealed with epoxy resin.

**1. Type of product**

All the standard type have this epoxy-sealed terminal types.

**2. Appearance**

The dimensions are the same as those of the standard type.
The cord outlet is located either at the N.C. or COM side.
The cord is 1 m 3.281ft. long.




Cord outlet direction: N.C.

Cord outlet direction: COM

**• Cord specifications**

| | |
|---|---|
| Type | Vinyl cabtire cable (VCT)(3 × 1.25mm²) |
| Cord length | 1m 3.281ft. |
| Lead colors | Black: COM<br>Red: N.C.<br>White: N.O. |

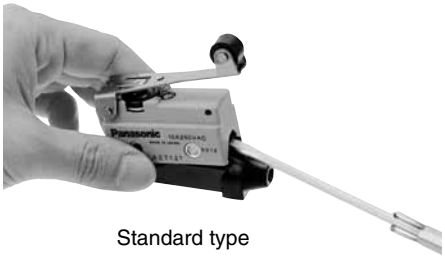
## CAUTIONS

**1. Ambient conditions**

1) When the switch is to be used in places where oil or is abundant, bore a drain hole in the bottom of the terminal cover.
2) Avoid places where highly acid or alkaline fluids are used or high temperatures prevail.
3) This model uses silver terminals. Therefore, if used at relatively low frequencies for long periods of time, or if used with very small loads, the oxidization that forms on the contact surfaces will not wear away and eventually cause improper contact. For such applications, use limit switches with gold/metal contacts (e.g. VL limit switches) or ones meant for small loads (e.g. HL limit switches).
4) This switch is not designed for underwater use. Do not use the unit underwater.
5) To improve reliability during actual use, it is recommended that the operation be checked under installation conditions.
6) If OT is too big, the life of limit switch will be shortened switching friction. Use it with enough margin of OT. 70% of OT standard value will be good for use.
7) 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.
8) Avoid use in excessively dusty environments where actuator operation would be hindered.
9) When used outdoors (in places where there is exposure to direct sunlight or rain such as in multistory car parks) or in environments where ozone is generated, the influence of these environments may cause deterioration of the rubber material. Please consult us if you intend to use a switch in environments such as these.
10) Do not store in places where organic gas might be generated or in places of high dust content or high humidity.

**2.Mounting and wiring**

1) Remove the terminal cover with a ⊖ driver. Insert the lead wire through the knock-out of the terminal cover.
(The terminal cover of the epoxy-sealed terminal type is filled with resin. It cannot be removed.)



Standard type

2) Connect the lead wire to the terminal. When connecting the terminals with the fasten lug, those with the insulation sleeve are recommended.
Tightening torque: 1.18 to 1.47 N·m {12 to 15 kg·cm}
3) The terminal cover can be mounted in both directions.
• In this case, fasten the terminal cover in the opposite direction.

N.C.

COM

• Side mounting
To mount onto a side, use M4 screws with washers and secure it firmly. The tightening torque should be 1.18 to 1.47 N·m (12 to 15 kg·cm).
• Panel mounting
(panel mount plunger type)
When installing the panel mounting type onto a panel, the tightening torque for the hex. nut should be 7.84 N·m (80 kg·cm).
• For terminal mold types (epoxy-sealed terminal types), there are two types by the cord outlet direction; N.C. side and COM side.

**3. Flexible rod**

1) Put the detective object to the tip of plastic part.
2) Avoid pushing the tip of actuating spring in the direction of axis. In the places of oil or water splashes and much dust area, use the limit switch with keeping the actuating spring in the vertical direction.

Panasonic
ideas for life

**SUBMINIATURE SIZE LIMIT SWITCHES**

# QL (AZ4) Micro Limit Switches

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

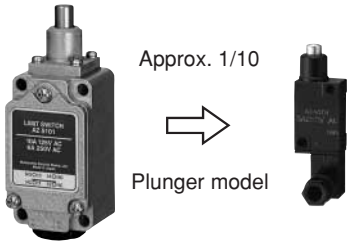
L socket type (roller arm)

**RoHS Directive compatibility information**
**http://www.nais-e.com/**

## FEATURES

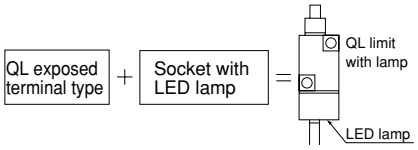
**1. Subminiature design**

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.



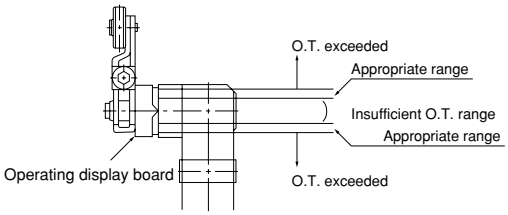

**2. A lamp can be easily added for operations checks**

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 assembly, an O.P. accuracy of ±0.2mm .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 subminiaturized machines and plant machinery, is required.

## 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<br>Ratings : 5A 250V AC<br>Product type : All products | Add “9” to the end of the part No. |
| CSA certified product | File No. : LR55880<br>Ratings : 5A 250V AC<br>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 $\phi \fallingdotseq 1$) | 5A | 5A | 5A | 0.4A |
| Inductive load (cos $\phi \fallingdotseq 0.4$) | 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-consective 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/s² {Approx. 30G} (Adjustable rod type and adjustable roller arm type: Min. 100m/s² {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 | $3 \times 10^5$ (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 / Actuator | 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. |
|---|---|---|---|---|---|---|
| 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 | ○ | – | – |

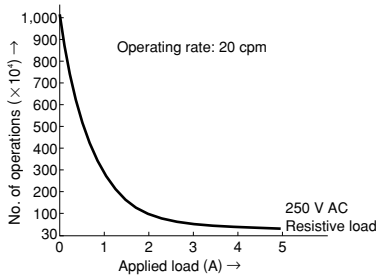
Note) For the switch proper, protect its terminals.

### 5. LED rating

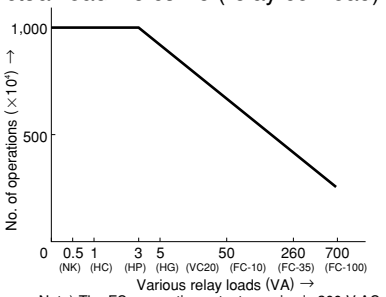
| Rated operating voltage | Operating voltage range | Internal resistance |
|---|---|---|
| 6V DC | 5 to 15V DC | 2.4kΩ |
| 12V DC | 9 to 28V DC | 4.7kΩ |
| 24 to 48V DC | 20 to 55V DC | 15kΩ |

# DATA

1. Life curve

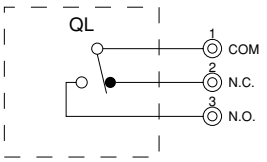



2. Actual load life curve (relay coil load)




Note) The FC magnetic contactor series is 200 V AC.
The NK is 2 Form C 24 V DC type.

# WIRING DIAGRAMS



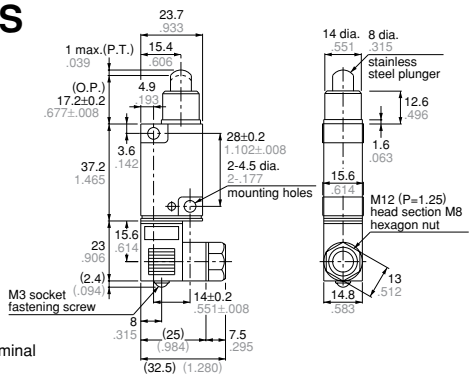

# DIMENSIONS

mm inch

## 1. L socket type

Push plunger

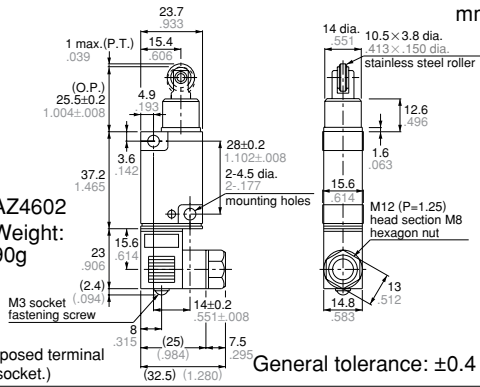
AZ4601
Weight: 90g




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

Roller pluger

AZ4602
Weight: 90g

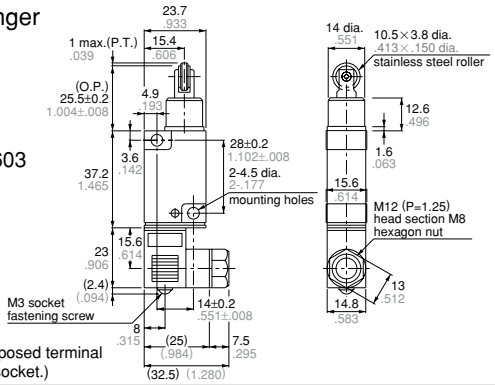



(Set with AZ4002 exposed terminal type and AZ3806 L socket.)

General tolerance: ±0.4 ±.016

Cross roller plunger

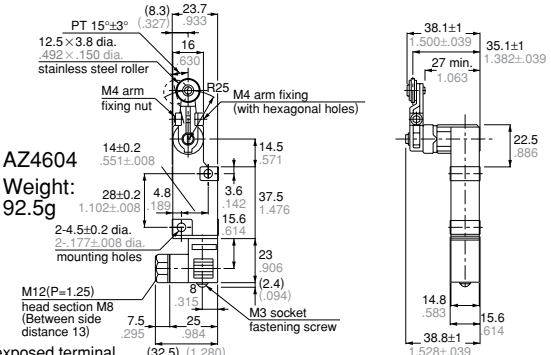
AZ4603




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

Roller arm

AZ4604
Weight: 92.5g

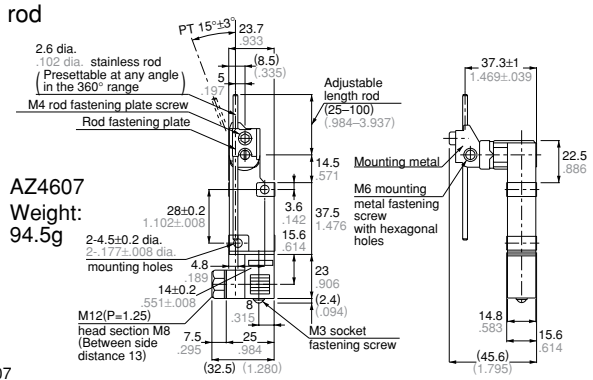



(Set with AZ4004 exposed terminal type and AZ3806 L socket.)

General tolerance: ±0.4 ±.016

Adjustable rod

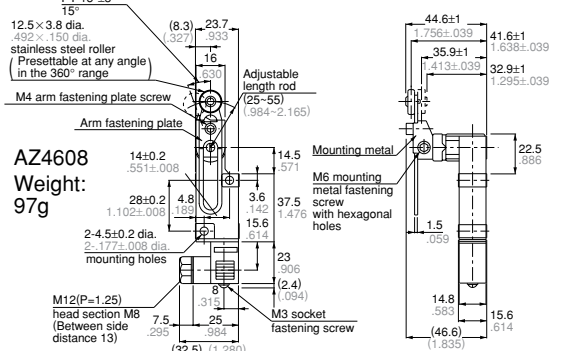
AZ4607
Weight: 94.5g




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

Adjustable roller arm

AZ4608
Weight: 97g



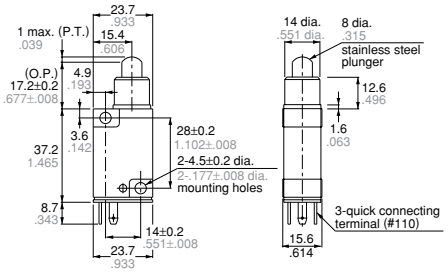

(Set with AZ4008 exposed terminal type and AZ3806 L socket.)

General tolerance: ±0.4 ±.016

## 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

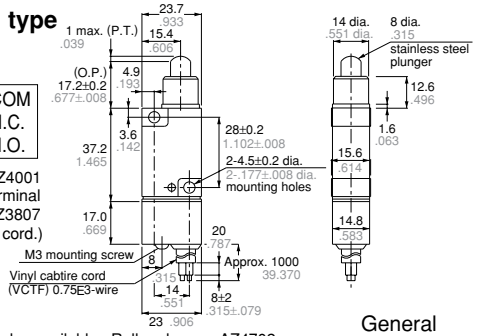
## 3. Socket with cord type

Push plunger

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

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

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

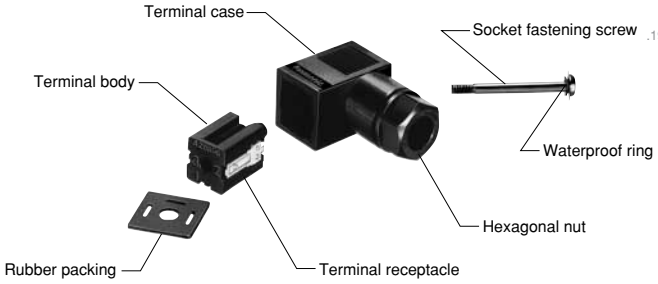
General tolerance: ±0.4 ±.016

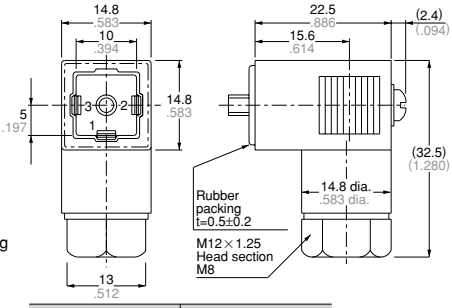
# SOCKETS

mm inch

## L socket

AZ3806



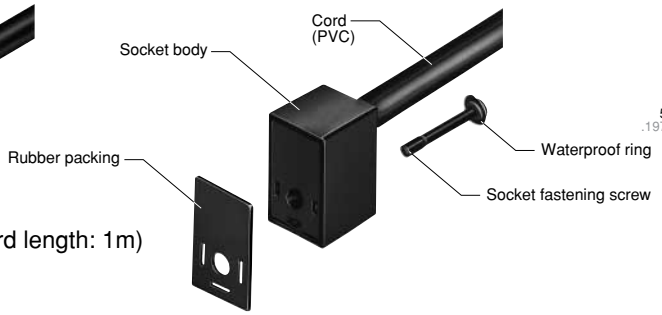



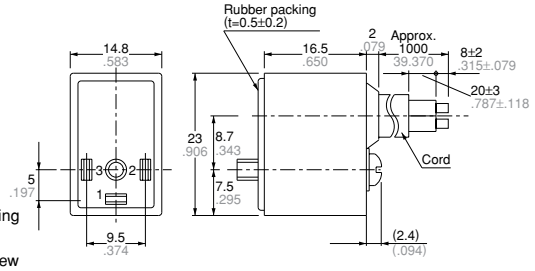

| Terminal number | Terminal |
|---|---|
| 1 | COM |
| 2 | N.C. |
| 3 | N.O. |

General tolerance: ±0.4 ±.016

## Socket with cord

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

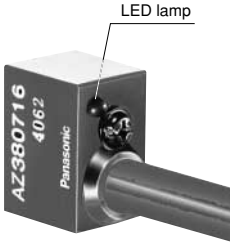


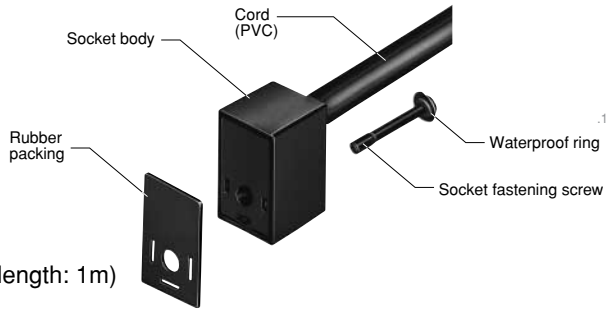

| Terminal number | Cord color | Terminal |
|---|---|---|
| 1 | B (Black) | COM |
| 2 | R (Red) | N.C. |
| 3 | W (White) | N.O. |

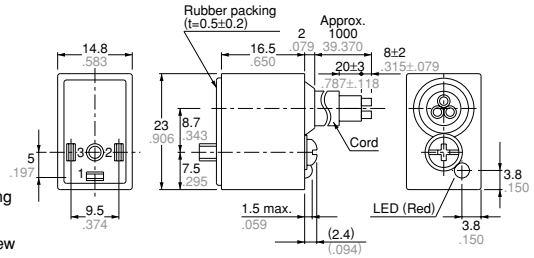
General tolerance: ±0.4 ±.016

## Socket with LED




AZ380716 (cord length: 1m)



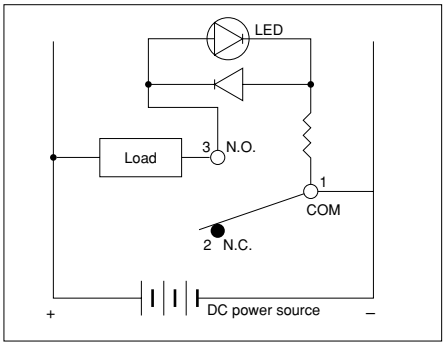

| Terminal number | Cord color | Terminal |
|---|---|---|
| 1 | B (Black) | COM |
| 2 | R (Red) | N.C. |
| 3 | W (White) | N.O. |

General tolerance: ±0.4 ±.016

# LAMP LIGHTING CIRCUIT

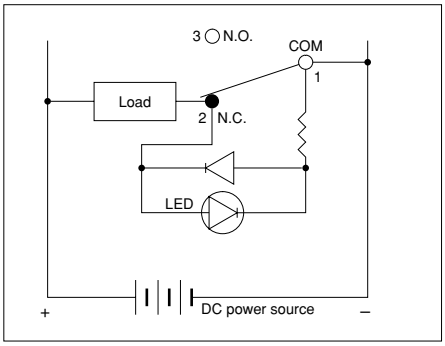
**1. Load at N.O. side**

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.



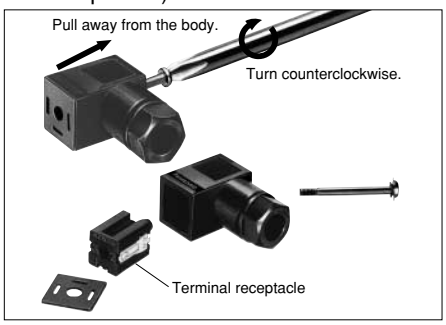

Notes)

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.

## MOUNTING METHOD

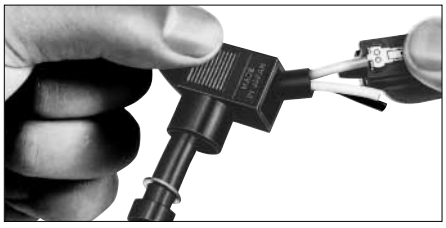
**1. L socket type**

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.)

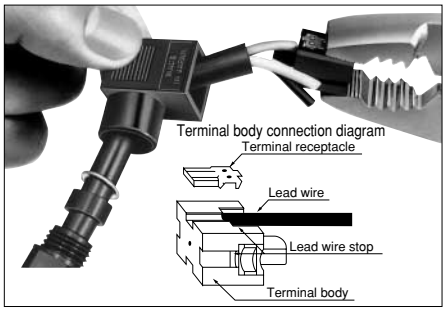



3) Loosen the hexagonal nut and remove the rubber bushing and washer from the inside.


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.



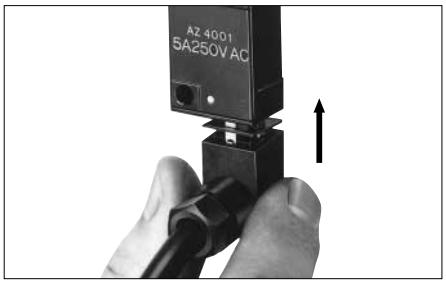
7) After stripping the cord sheath, insert the corresponding wires into the grooves of the terminal body up to the wire stop, then crimp the terminal receptacle over the wires with a pair of pliers.




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.

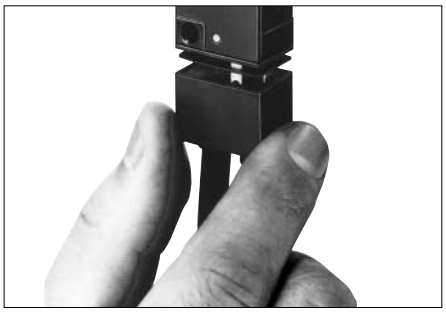
10) Apply the rubber packing over the terminals, then insert the L socket into the switch body.




11) Tighten the fastening screw into the switch body.


**2. Socket with cord (including socket with lamp)**

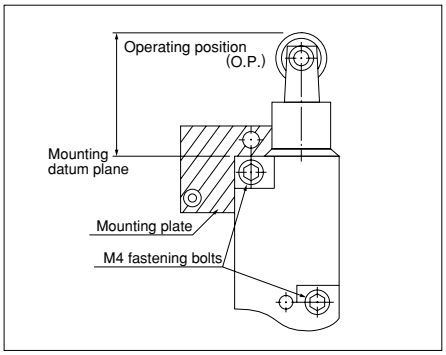
1) Apply the rubber packing over the terminals, then insert the socket with cord into the switch body.



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

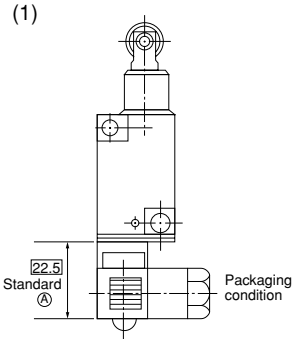
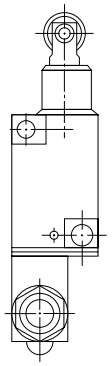
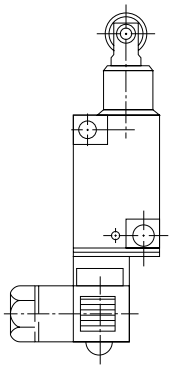
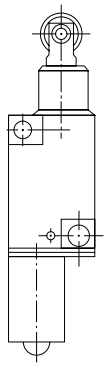
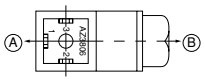
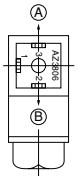
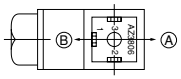
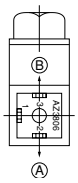
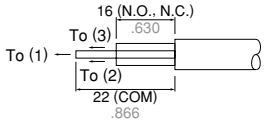
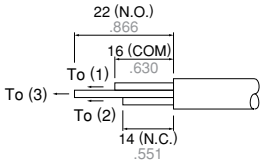
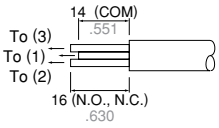
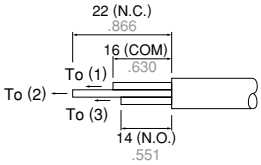

## Mounting

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 dorection

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| QL |  Note: The stripping of the cord is based on a length for dimension A as standard and should be stripped accordingly. |  |  |  |
| L socket direction |  Terminal (1) and (A) direction are aligned. |  Terminal (3) and (A) direction are aligned. |  Terminal (1) and (B) direction are aligned. |  Terminal (2) and (A) direction are aligned. |
| Cord sheath stripping dimensions |  |  |  |  |

## Aplicable wire

| Wire name | Applicable wire | | |
|---|---|---|---|
| | Conductor | Wire strand | Finished outside diameter |
| Vinyl cabtire cord (VCTF) | 0.75 mm² | 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 switchies 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 impringe 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 characterisrics.

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.

Panasonic
ideas for life

**COMPACT SIZE LIMIT SWITCHES**

# DL (AZD1) Mini Limit Switches
(with forced contact opening mechanism)

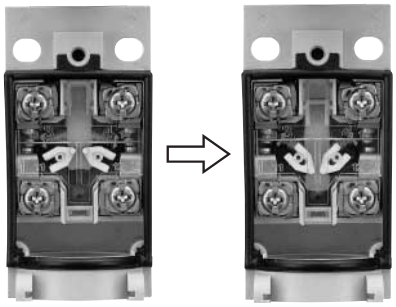
## An economic compact limit switch equipped with a forced contact opening mechanism and excellent environment proofing (IP67).

(Roller arm) + (Conduit connector)

**RoHS Directive compatibility information**
**http://www.nais-e.com/**

## FEATURES

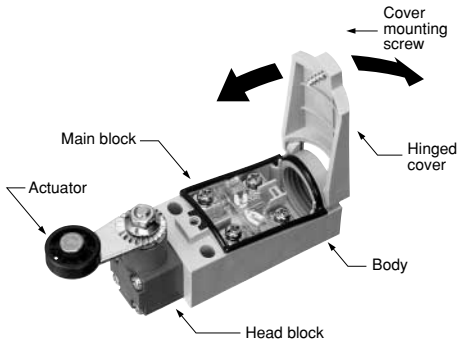
**1. Forced contact opening mechanism**
When the limit switch is ON, the contact is forced open by the N.C. contact through the cam movement.



**2. Conforms to EN standard (EN50047)**

**3. Uses a unit system**
Any combination of actuator, head block, and unit block is possible. The units are also sold separately, making maintenance easy.

**4. Hinged cover for easy wiring**




**5. Protective construction (IP67), and wide operating temperature range (–30°C to +80°C –22°F to +176°F)**

## TYPICAL APPLICATIONS

General plant facilities such as food processing, light machinery such as packaging machines, and assembly lines.

## PRODUCT TYPE

### 1. Basic products

| Actuator | Part No. | |
|---|---|---|
| | PF type | PG type |
| Roller Lever | AZD1000 | AZD1050 |
| Push Plunger | AZD1001 | AZD1051 |
| Roller Plunger | AZD1002 | AZD1052 |
| Adjustable roller arm (50 dia. rubber roller) | AZD1003 | AZD1053 |
| Roller Arm | AZD1004 | AZD1054 |
| Adjustable rod (2.6 dia.) | AZD1007 | AZD1057 |
| Adjustable Roller Arm | AZD1008 | AZD1058 |
| Roller lever (vertical action) | AZD1009 | AZD1059 |

Notes: 1. Type of conduit size: PF type (G1/2), PG type (PG13.5)
2. PG is a size standard used in Europe.
3. The roller arm and adjustable roller arm are available with metal rollers on a custom-made basis. Please inquire.
4. 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. Blocks

| Product name | | | Part No. |
|---|---|---|---|
| Actuator | Roller Lever | | AZD1800 |
| | Roller Arm | | AZD1804 |
| | Adjustable Roller Arm | | AZD1808 |
| Head block | | | AZD1820 |
| Main block | For plunger | PF type | AZD1101 |
| | | PG type | AZD1151 |
| | For arm | PF type | AZD1104 |
| | | PG type | AZD1154 |

### 3. Conduit connector

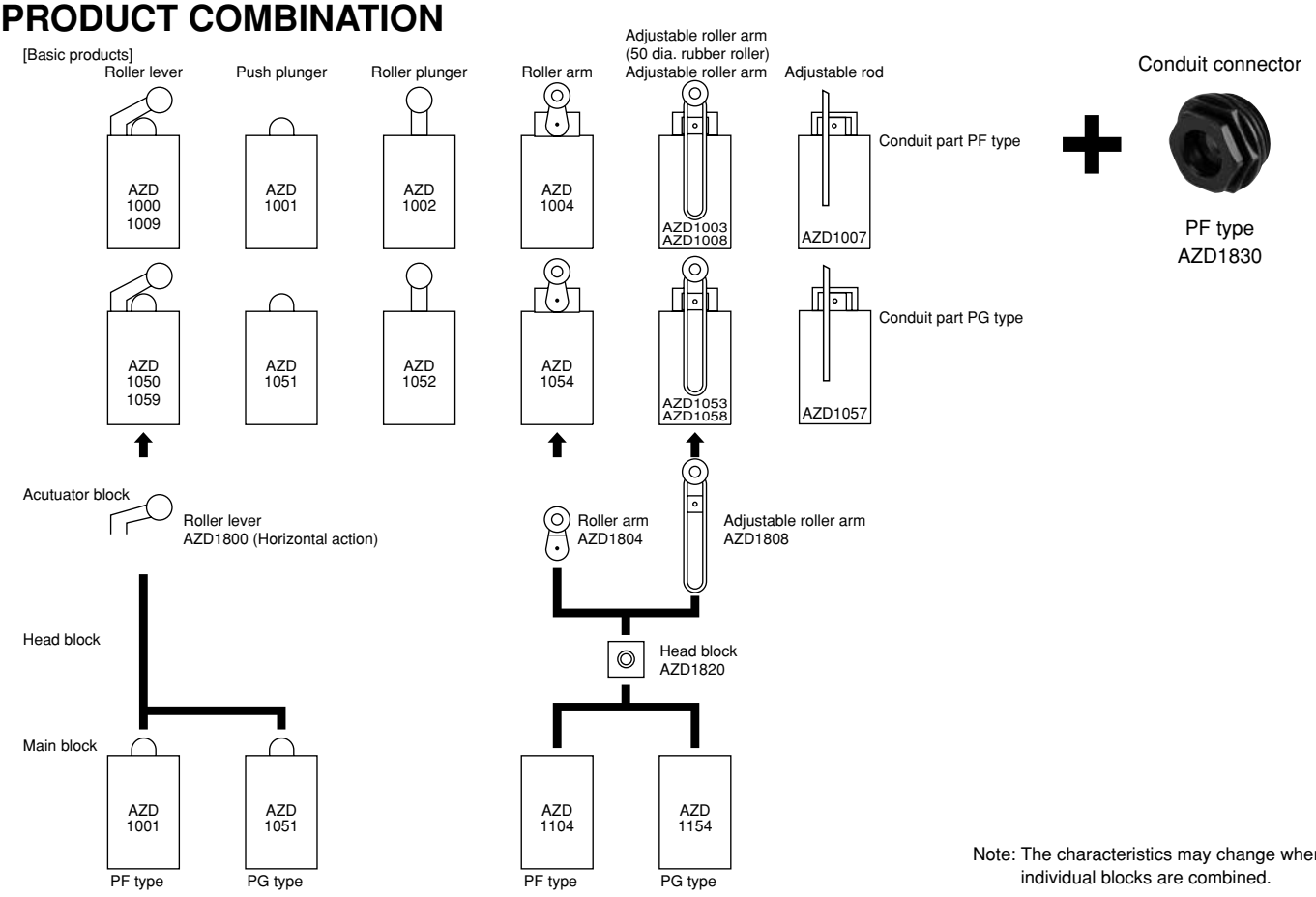
| Product name | Part No. |
|---|---|
| PF type conduit connector | AZD1830 |

Note: The conduit connector is for cabtire cable.
Rubber seals with an inside diameter of 9 and 11 are attached.

## Foreign standards

| Standards | Applicable product | Part No. |
|---|---|---|
| UL | File No. : E122222<br>Ratings : 6A 380V AC Pilot duty A300<br>Product type : All models | Order by standard part No. |
| C-UL | File No. : E122222<br>Ratings : 6A 380V AC Pilot duty A300<br>Product type : All models | |
| TÜV | File No. : J9551205<br>Ratings : AC-15 2A/250V~<br>Product type : All models | |

# PRODUCT COMBINATION




Note: The characteristics may change when the individual blocks are combined.

# SPECIFICATIONS

## 1. Rating

| Voltage \ Load | | Resistive load (cos $\phi \fallingdotseq 1$) | Inductive load (cos $\phi \fallingdotseq 0.4$) |
|---|---|---|---|
| AC | 125V | 6A | 6A |
| | 250V | 6A | 6A |
| | 380V | 6A | 3A |
| DC | 24V | 5A | 2.5A |
| | 60V | 1.5A | 1.5A |
| | 220V | 0.3A | 0.3A |

Note: When DC voltage is applied, the time constant is (τ=) 0ms for resistive load, (τ=) 100ms or less for inductive load.

## 3. EN60947-5-1 performance

| Item | Rating |
|---|---|
| Rated insulation voltage (Ui) | 250VAC |
| Rated impulse withstand voltage (Uimp) | 2.5kV |
| Switching overvoltage | 2.5kV |
| Rated enclosed thermal current (Ithe) | 6A |
| Conditional short-circuit current | 100A |
| Short-circuit protection device | 10A Fuse |
| Protective construction | IP67 (Note 1) |
| Pollution degree | 2 |

Note 1: Adjustable roller arm (50 dia. rubber roller) type is IP65.

## 5. Protective characteristics

| Protective construction | DL mini limit switches |
|---|---|
| IEC | |
| IP60 | ○ |
| IP64 | ○ |
| IP67 | ○ (Note 1) |

Note 1: The value for protective function characteristics is the initially set value. Also, adjustable roller arm (50 dia. rubber roller) type is IP65.

The switches are compatible with DIN EN50047.

## 2. Characteristics

| | | |
|---|---|---|
| Contact arrangement | | 1 Form A 1 Form B |
| Initial contact resistance, max. | | 25mΩ (By voltage drop of 5 to 6 V DC 1A) |
| Contact material | | AgCdO |
| Initial insulation resistance (At 500V DC) | | Min. 100MΩ |
| Initial breakdown voltage | | 1,000Vrms for 1 min Between non-consecutive terminals<br>2,500Vrms for 1 min Between dead metal parts and each terminal<br>2,500Vrms for 1 min Between ground and each terminal |
| Shock resistance | Functional | Max. 294 m/s² (equivalent 30G) (Noe 1) |
| | Destructive | Max. 980 m/s² (equivalent 100G) |
| Vibration resistance | | 10 to 55Hz, double amplitude of 1.5mm |
| Expected life (min. operations) | Mechanical | $10^7$ (at 120 cpm) |
| | Electrical | $1.5\times10^5$ (at 20 cpm, 6A 380V AC resistive load) |
| Ambient temperature | | –30 to +80°C –22°F to +176°F (but not ina frozen environment) |
| Ambient himidity | | Max. 95%R.H. (without dew at 40°C 104°F) |
| Max. operating speed | | 120 cpm |

Note) The ratings, characteristics and operating characteristics are based on the basic model.
Note 1: This value applies when the arm length of the adjustable roller arm (50 dia. rubber roller) is 70 mm or less.

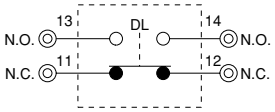
## 4. Operating characteristics

| Characteristics / Actuator | O.F. (N {gf}) max. | R.F. (N {gf}) min. | Pretravel (P.T.), max. mm inch | Movement Diferential (M.D.), max. mm inch | Overtravel (O.T.), min. mm inch | Operating Position (O.P.), mm inch |
|---|---|---|---|---|---|---|
| Push plunger | 6.37 {650} | 1.47 {150} | 2 .079 | 1.2 .047 | 4 .157 | 18±0.5 .708±.020 |
| Roller plunger | 6.37 {650} | 1.47 {150} | 2 .079 | 1.2 .047 | 4 .157 | 28±1 1.102±.03 |
| Roller arm | 4.90 {500} | 0.49 {50} | 20° to 26° | 14° | 30° | – |
| Roller lever | 3.92 {400} | 0.78 {80} | 4 .157 | 1.6 .063 | 5 .197 | – |
| Adjustable roller arm (Note) | 4.90 {500} | 0.49 {50} | 20° to 26° | 14° | 30° | – |
| Adjustable roller arm (50 dia. rubber roller) | 4.17 {425} | 0.42 {43} | 20° to 26° | 14° | 30° | – |
| Adjustable rod (2.6 dia.) | 4.90 {500} | 0.49 {50} | 20° to 26° | 14° | 30° | – |
| Roller lever (vertical action) | 4.41 {450} | 0.88 {90} | 4 .157 | 1.7 .067 | 5 .197 | 27±0.8 1.063±.031 |

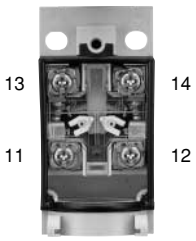
Note: The above values of adjustable roller arm shows the values when roller length is set at 26mm same as roller type.
The value of adjustable roller arm (50 dia. rubber roller) type shows the value when roller length is set at 32 mm.
The value of adjustable rod (2.6 dia.) type shows the value when length of rod is set at 26 mm same as the roller arm type.

## WIRING DIAGRAM

Internal circuit




Terminals

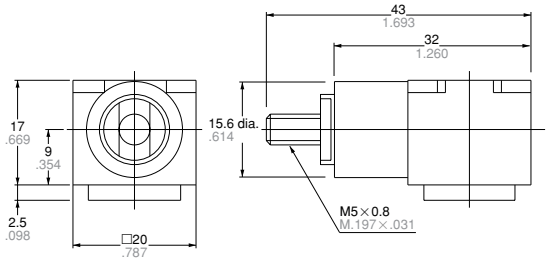



## DIMENSIONS

mm inch

• Head block

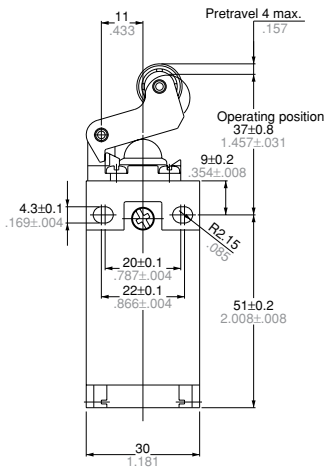
AZD1820

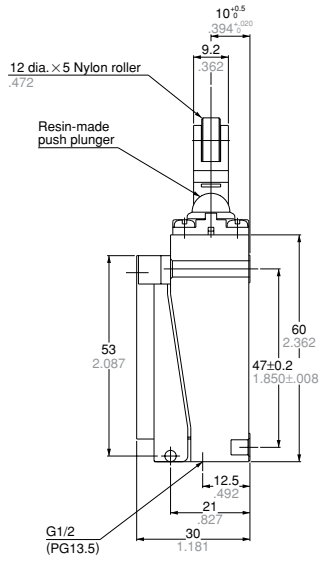


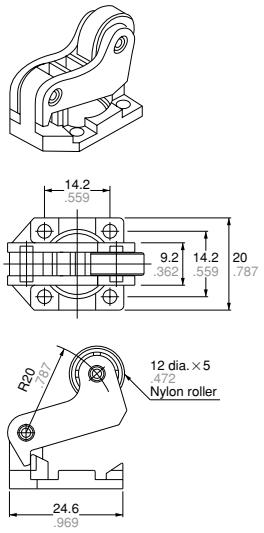

General tolerance: ±0.4 ±.016

• Roller lever

AZD1000
AZD1050



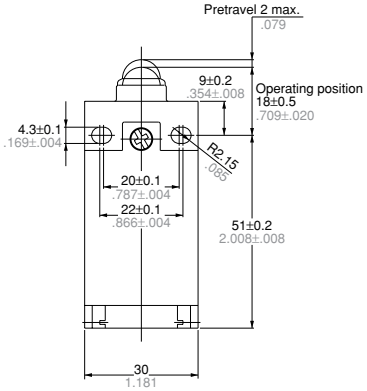



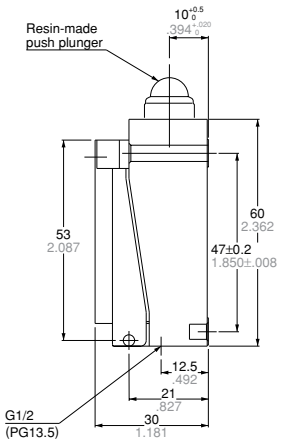




General tolerance: ±0.4 ±.016

• Push plunger

AZD1001
AZD1051



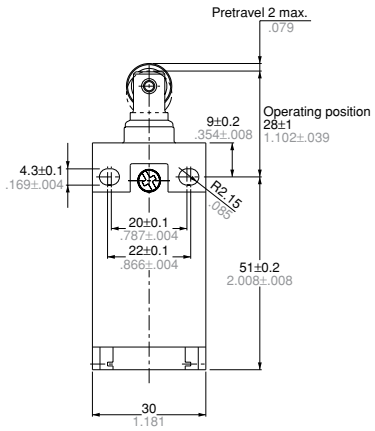



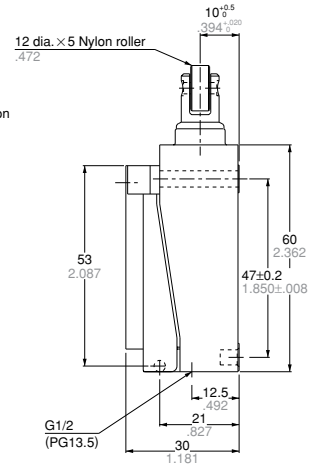

General tolerance: ±0.4 ±.016

• Roller plunger

mm inch

AZD1002
AZD1052

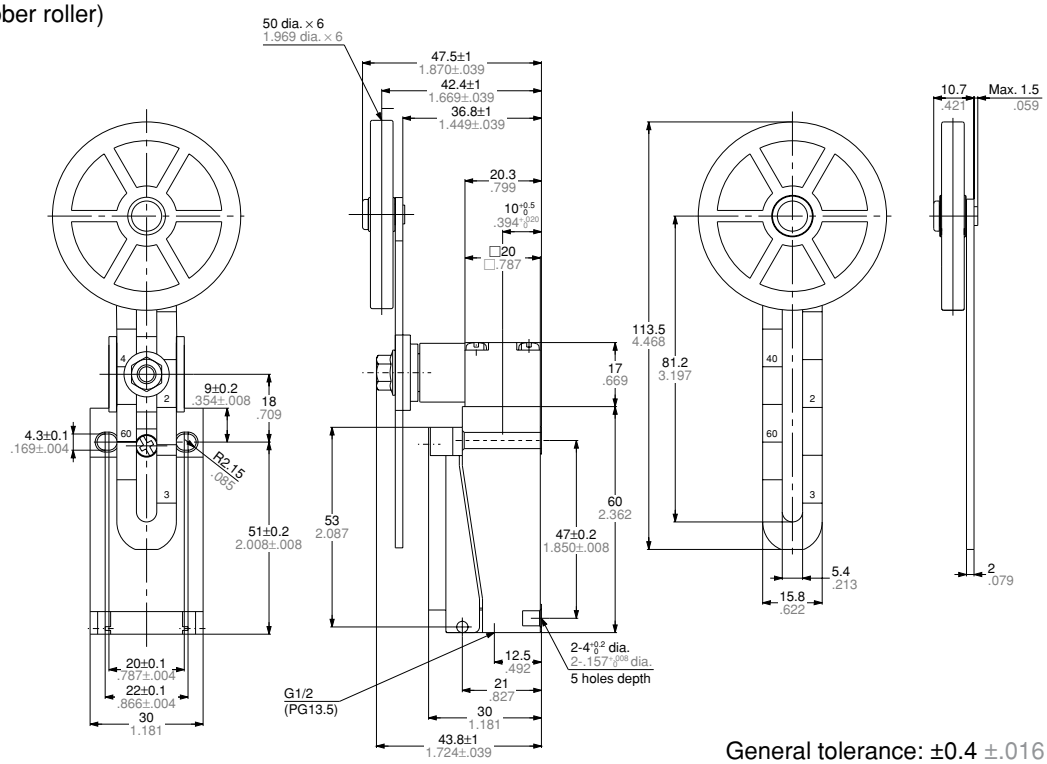



General tolerance: ±0.4 ±.016

• Adjustable roller arm (50 dia. rubber roller)

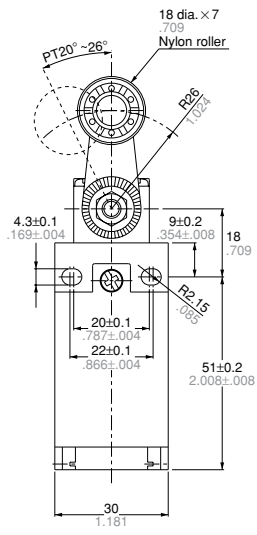
AZD1003
AZD1053

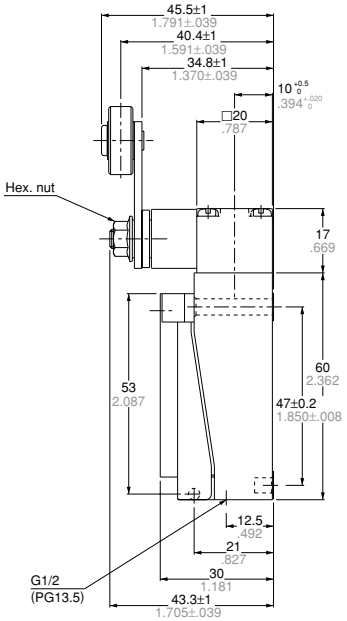


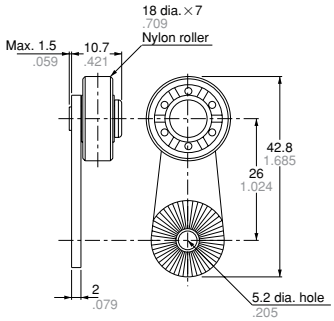

General tolerance: ±0.4 ±.016

• Roller arm

AZD1004
AZD1054



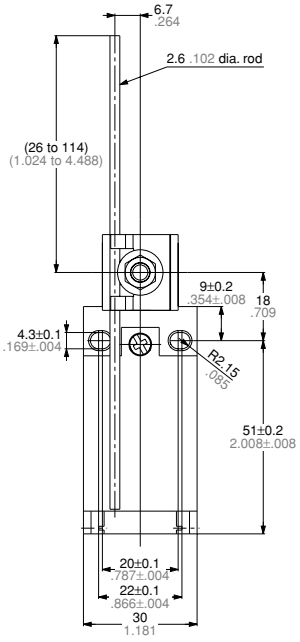



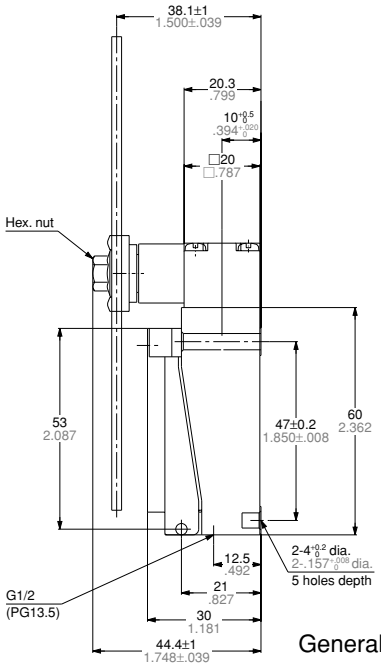

General tolerance: ±0.4 ±.016

• Adjustable rod (2.6 dia.)

mm inch

AZD1007
AZD1057

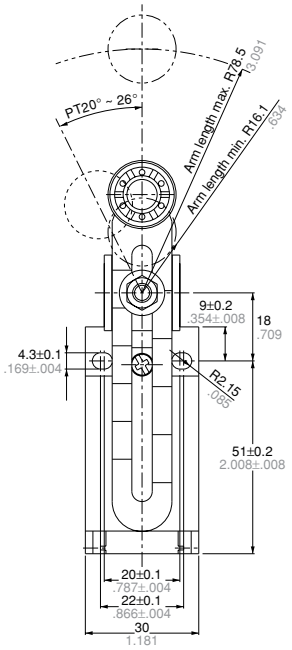


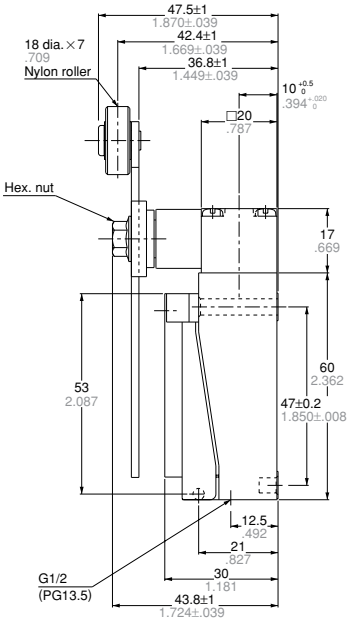



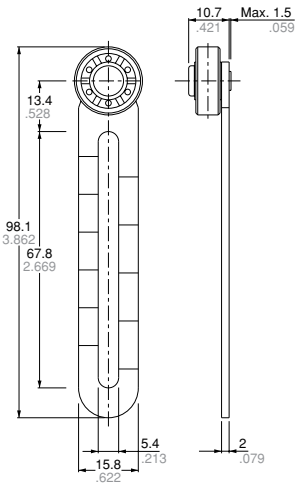

General tolerance: ±0.4 ±.016

• Adjustable roller arm

AZD1008
AZD1058



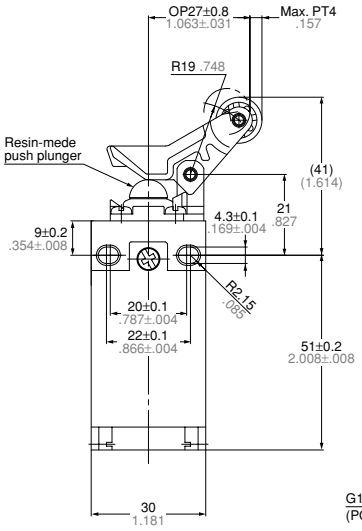



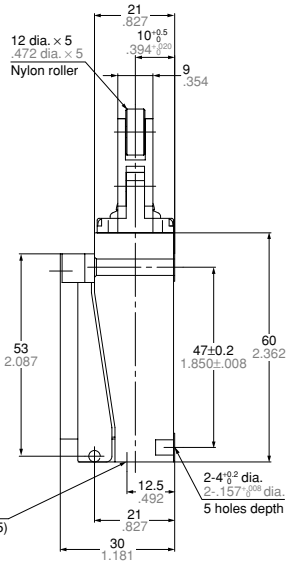



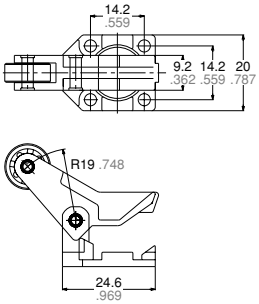

General tolerance: ±0.4 ±.016

• Roller lever (vertical action)

AZD1009
AZD1059



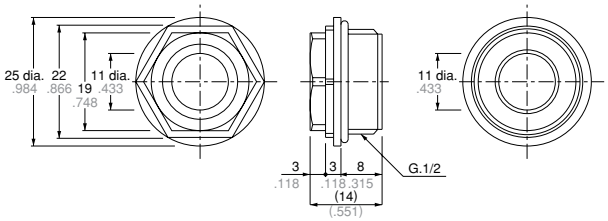




General tolerance: ±0.4 ±.016

• Conduit connector

mm inch

AZD1830

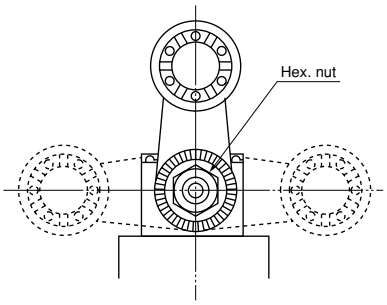



| Rubber seal inside diameter | Adaptable cable outer diameter | |
|---|---|---|
| | Min. | Max. |
| 9 dia. (.354) | 7.5 dia. (.295) | 9.5 dia. (.374) |
| 11 dia. (.433) | 9 dia. (.354) | 11 dia. (.433) |

General tolerance: ±0.5 ±.020

## Arm Setting Position

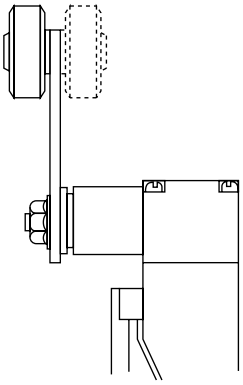
The roller arm of the arm types (AZD1003, AZD1004, AZD1008, AZD1053, AZD1054 and AZD1058) can be set in any position at 15° intervals. Loosen the arm fastening hex. nut, reposition the arm, and retighten the hex. nut. When doing so tighten the hex. nut with the arm secured to the unit. Tightening without securing may cause damage. Also, the same is true of the adjustable rod types (AZD1007 and AZD1057).




## Roller Direction

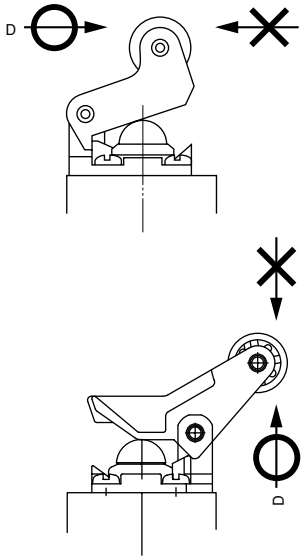
The roller of the arm types (AZD1003, AZD1004, AZD1008, AZD1053, AZD1054 and AZD1058) can be mounted on the front and rear (dotted line in the figure) sides of the switch, as shown below. (Positioned on the front side at delivery.)

To set the roller on the rear side, remove the arm fastening hex. nut, and reinsert the arm so as to face the roller in the rear direction. Then, retighten the hex. nut.



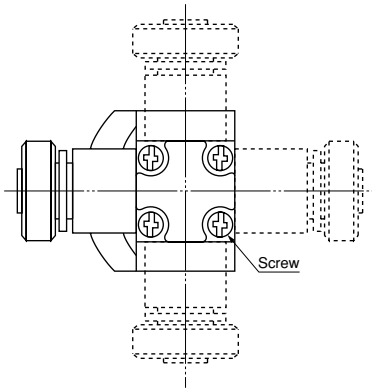
## Roller Lever Direction

AZD1000, AZD1009, AZD1050 and AZD1059 type is move a detection object in the D direction as shown below. Be sure not to move the object oppositely. If the opposite direction is required, change the direction of the lever.



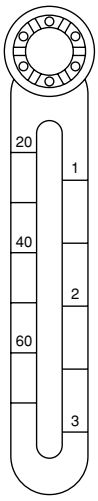

## Head Block Direction

The head of the arm types (AZD1003, AZD1004, AZD1008, AZD1053, AZD1054 and AZD1058) can be set in any of four directions at 90° intervals, but not in any other intermediate directions. Loosen four screws on the upper side of the head, and set the head in a desired direction, and retighten them at a torque of 0.20 to 0.39 N·m {2 to 4 kg·cm}. Be careful not to use too much strength when tightening as this will cause the threads to strip. Also, the same is true of the adjustable rod types (AZD1007 and AZD1057).

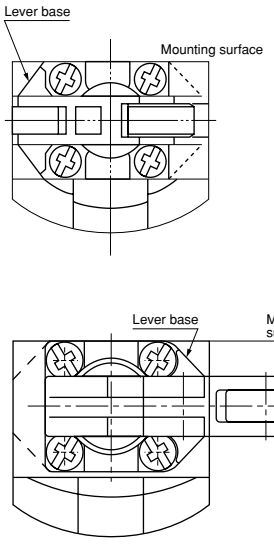



## Adjustable Arm Length

To adjust the length of the adjustable arm of AZD1003, AZD1008, AZD1053 and AZD1058, slightly loosen the arm fastening hex. nut, and adjust the length. The adjustable arm is graduated in two kinds of length units. Use these indications as the reference during adjustment.




The roller lever can be set in two directions at 180° intervals. (Even though it can be also set in the 90° direction, the mounting surface will project.) Remove the four lever base fastening screws, turn the lever together with the lever base in 180°, and retighten the four screws at a torque of 0.20 to 0.39 N·m {2 to 4 kg·cm}.



## Open and close the cover

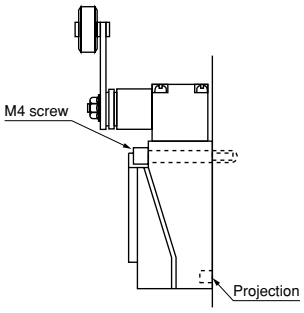
For the adjustable roller arm, the cover will not open and close since it contacts the adjustable arm. Either extend the arm fully or remove the arm, then open or close the cover. Also, the same is true of the adjustable rod types (AZD1007 and AZD1057).

## Adjustable Rod Length

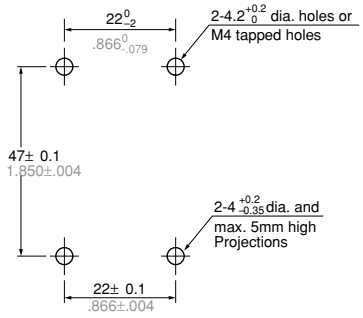
To adjust the length of the adjustable rod, slightly loosen the hex. nut that is securing the rod and then change the length. After making the change, tighten the hex. nut keeping within a tightening torque of 0.98 and 1.37 N·m. Over tightening might damage the rod presser plate.

## Mounting

1) When mounting, use washers (to prevent loosening) and tighten at a torque of 0.49 to 0.69 N·m {5 to 7 kg·cm}.
2) To securely mount the switch, not only fasten the main switch body only with two mounting holes, but also provide two $4^{+0.2}_{-0.35}$ mm dia. and max. 5mm .197inch high projections and insert them into the holes on the bottom of the main switch body.



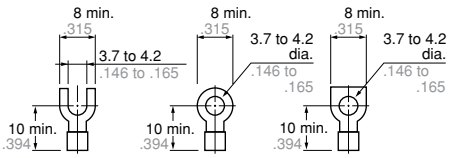

• Mounting dimensions



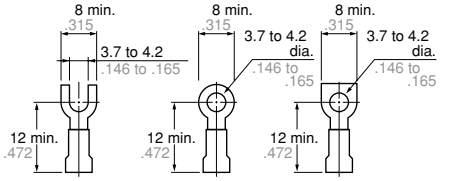

## CAUTIONS

1) This model uses silver terminals. Therefore, if used at relatively low frequencies for long periods of time, or if used with very small loads, the oxidization that forms on the contact surfaces will not wear away and eventually cause improper contact. For such applications, use limit switches with gold/metal contacts (e.g. VL limit switches) or ones meant for small loads (e.g. HL limit switches).
2) This switch is not designed for underwater use. Do not use the unit underwater.
3) Do not use the switch where it may come in direct contact with organic solvents, strong acids, strong alkaline liquids or stream, or in atmospheres containing flammable or corrosive gases.
4) For the arm type (roller arm type, adjustable roller arm type), the arm can only be set at 15° interval.
5) To improve reliability during actual use, it is recommended that the operation be checked under installation conditions.
6) If OT is too big, the life of limit switch will be shortened switching friction. Use it with enough margin of OT. 70% of OT standard value will be good for use.
7) 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.

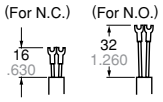
Adaptable crimp terminal (Bare terminal) mm inch




(Terminal with insulating grip)




When crimp terminals are used.




8) When wiring, do not connect the lead wires directly to the terminals, but use the crimp terminals and tighten them to a torque of 0.39 to 0.59 N·m {4 to 6 kg·cm}.
9) After wiring, when attaching the cover to switch body, be careful that the cover to switch body, be careful that the cover seal rubber is set normaly on it and tighten the screw to a torque of 0.20 to 0.39 N·m {2 to 4 kg·cm}. If tighten the screw strongly, the thread is broken.
10) Safety mechanism is adopted which secures positive break under such abnormal conditions like contact welding, spring break, etc. In case of using the safety mechanism which breaks welded N.C. contact, conform to the conditions as shown below.
(For the value below of adjustable rod, the length of the rod shows the value when length of rod is set at 26 mm same as the roller arm. The value of adjustable roller arm (50 dia. rubber roller) type shows the value when arm length is set at 40 mm.)

| | Actuator movement | Required force (Min.) |
|---|---|---|
| Push plunger<br>Roller plunger | Approx. 3.5mm .138 inch | Approx. 29.4 N |
| Roller arm<br>Adjustable rod<br>Adjustable roller arm | Approx. 45° | 9.8 N |
| (50 dia. rubber roller) | Approx. 45° | 6.4 N |
| Roller lever | Approx. 7 mm .276 inch | 19.6 N |

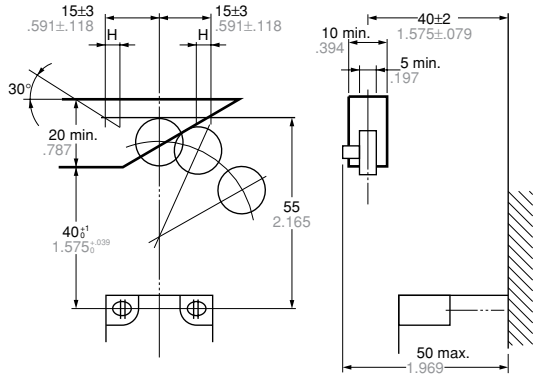
11) To protect against entry of foreign matter from the outside, we recommend sealing as much as possible using conduit connectors.
12) Avoid use in excessively dusty environments where actuator operation would be hindered.
13) When used outdoors (in places where there is exposure to direct sunlight or rain such as in multistory car parks) or in environments where ozone is generated, the influence of these environments may cause deterioration of the rubber material. Please consult us if you intend to use a switch in environments such as these.
14) Do not store in places where organic gas might be generated or in places of high dust content or high humidity.
15) Since the roller section of the roller arm (50 mm dia. rubber roller type) (AZD1003 and AZD1053) is heavy, the contacts may reverse due to inertia of the roller section which easily leads to erroneous operation.
If there is a possibility of exposure to shock, please make considerations for safety, for example, by providing a redundant circuit so that danger can be avoided in the event that the contacts reverse and cause erroneous operation.

# Design of Operating Dog

mm inch

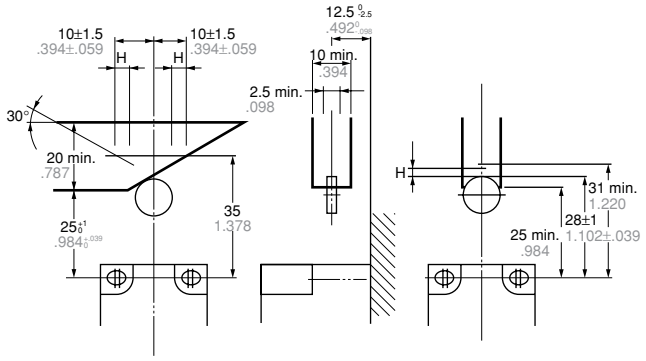
## Roller arm type

(H: Hysterisis)



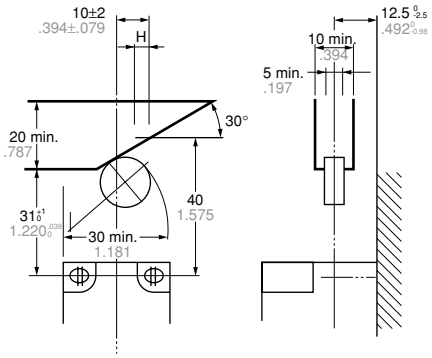

## Roller plunger type

(H: Hysterisis)



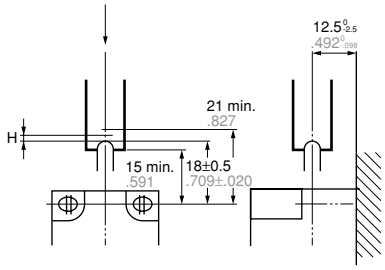

## Roller lever type

(H: Hysterisis)




## Push plunger type

(H: Hysterisis)



Panasonic
ideas for life

**COMPACT SIZE LIMIT SWITCHES**

# VL (AZ8) Mini Limit Switches

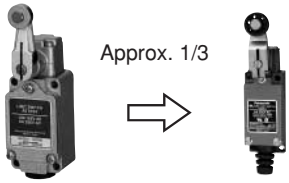
## A compact and accurate vertical limit switch. Type with a lamp which makes maintenance convenient; either a neon AC powered lamp or an LED DC powered lamp.

Standard type (Roller arm) | With lamps

**RoHS Directive compatibility information**
**http://www.nais-e.com/**

## FEATURES

**1. Compact design approximately 1/3 of the AZ5 limit switches**




AZ5 type | VL

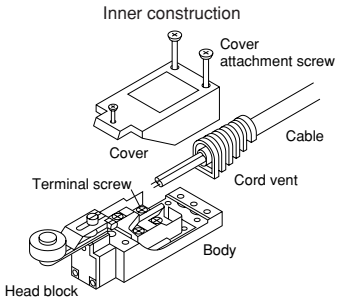
**2. Au-clad contacts that can even use low level circuit and little chattering and bouncing**

The built-in switch has Au-clad contacts with excellent contact reliability and uses a crossbar contact method, and moreover, has a dual cutoff circuit (1 Form A 1 Form B contact) with little chattering and bouncing due to computer-operated analysis.

**3. Easy wiring with full-open terminals**

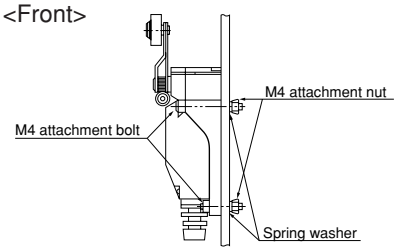
When the cover is removed, the terminals are open as far as the flank, so the necessity to insert your fingers into a case to complete the wiring has been removed. Moreover, the wiring space is large despite the compact size, and the terminals are spread in a tiered array, so that wiring work can be completed very easily.

The cable can either be screwed in directly, or can use U-shaped and circular pressure terminals.

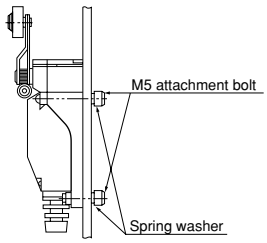



**4. Mounting are possible to both front and back**

<Front>




<Back>




**5. Type with a lamp that can be used with a wide range of voltages**

• With neon lamp
Compatible with: 100 and 200V AC;
Even at 100V AC, sufficient luminosity is achieved through the diamond-cut lens. Also with a long lifespan of more than 20 thousand hours.

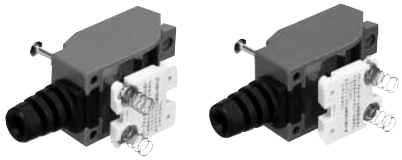
• With LED lamp
Covers 6 to 48V DC and comes in three types, 6V DC, 12V DC, 24 to 48V DC
Uses two highly luminescent LEDs and in addition, sufficient luminosity is achieved through the diamond-cut lens.

**6. Lamp connection can be either spring type or lead wire type**

• Spring type (wiring unnecessary)
(With neon or LED lamp type)
Wiring is unnecessary because the lamp is directly connected to the terminals. By simply changing the direction of the lamp holder attachment, it is possible to display both lights during inoperability and during operation (however, if both N.O. and N.C. loads are connected, only the inoperability lamp can be displayed.)

**Construction permits lamp attachment method to be changed.**

Operating lamp | Inoperability lamp (with shipping)



• Lead wiring type <Current leakage: 0>
(LED lamp type only)
Because the wiring can be made parallel to the load, current leakage from the lamp can be reduced to 0. Even with a slight leak, the electronic circuit incurring the leak can be used safely.

**7. Dust-proof, waterproof, oil resistant construction**

The main unit and the cover are sealed with rubber packing, and the cord runner is doubly sealed by the cord vent. The actuator is sealed by both a rubber cap and an O ring in all models. Also, the lens and cover are formed simultaneously with the lamp type, and moreover, a nameplate is affixed to the upper surface, thereby improving the already excellent waterproof capabilities.
(Note: Applications directly involving the cord entrance and the locations which are always wet and oily, or submersion in water or oil, cannot be used.)

## TYPICAL APPLICATIONS

Ideal for general plant facilities such as engineering machinery, conveyer machinery, and assembly lines
LED lamp type is also compatible with low-voltage DC control circuits such as in PCs and computers.

# PRODUCT TYPE

### 1. Standard type

| Actuator | Part No. |
|---|---|
| Push plunger | AZ8111 |
| Roller plunger | AZ8112 |
| Cross roller plunger | AZ8122 |
| Roller arm | AZ8104 |
| Adjustable roller arm | AZ8108 |
| Adjustable rod | AZ8107 |
| Flexible rod | AZ8166 |
| Spring wire | AZ8169 |

Note) When ordering an overseas-specified product,refer to the “FOREIGN STANDARDS” given below.

### 2. With neon lamp

| Lamp connection | Actuator | Lamp rating | Part No. |
|---|---|---|---|
| Spring type | Push plunger | 100 to 200V AC | AZ811106 |
| | Roller plunger | | AZ811206 |
| | Cross roller plunger | | AZ812206 |
| | Roller arm | | AZ810406 |
| | Adjustable roller arm | | AZ810806 |
| | Adjustable rod | | AZ810706 |
| | Flexible rod | | AZ816606 |
| | Spring wire | | AZ816906 |

Note) When ordering an overseas-specified product,refer to the “FOREIGN STANDARDS” given below.

### 3. With LED

| Lamp connection | Actuator | Lamp rating | |
|---|---|---|---|
| | | 12V DC | 24 to 48V DC |
| | | Part No. | |
| Spring type | Push plunger | AZ8111161 | AZ811116 |
| | Roller plunger | AZ8112161 | AZ811216 |
| | Cross roller plunger | AZ8122161 | AZ812216 |
| | Roller arm | AZ8104161 | AZ810416 |
| | Adjustable roller arm | AZ8108161 | AZ810816 |
| | Adjustable rod | AZ8107161 | AZ810716 |
| | Flexible rod | AZ8166161 | AZ816616 |
| | Spring wire | AZ8169161 | AZ816916 |
| Lead wire type | Push plunger | AZ8111661 | AZ811166 |
| | Roller plunger | AZ81122661 | AZ811266 |
| | Cross roller plunger | AZ8122661 | AZ812266 |
| | Roller arm | AZ8104661 | AZ810466 |
| | Adjustable roller arm | AZ8108661 | AZ810866 |
| | Adjustable rod | AZ8107661 | AZ810766 |
| | Flexible rod | AZ8166661 | AZ816666 |
| | Spring wire | AZ8169661 | AZ816966 |

Notes) 1. LED rating 6V DC type is available. When ordering, add suffix 162(spring type) or 662(lead wire type) to the standard part No.
2.The 24 to 48V DC rated lamp is recommended for PC input use.
3. The roller arm and adjustable roller arm are available with metal rollers on a custom-made basis. Please inquire.

### 4. Option

| | Application | Part No. |
|---|---|---|
| VL limit conduit adapter | VL, VL with lamp, VL-T | AZ8801 |

# FOREIGN STANDARDS

| Standard | Applicable product | Part No. |
|---|---|---|
| UL | File No. : E122222<br>Ratings : 5A 250V AC<br>Pilot duty B300<br>Product type : Standard model, with neon lamp | Order by standard part No. However, add “9” to the end of the part No. for the model with neon lamp. |
| C-UL | File No. : E122222<br>Ratings : 5A 250V AC<br>Pilot duty B300<br>Product type : Standard model, with neon lamp | |
| TÜV | File No. : J9551203<br>Ratings : AC-15 2A/250V~<br>Product type : Standard model only | Order by standard part No. |

# SPECIFICATIONS

## 1. Rating

1) Standard type

| Load / Rated control voltage | Resistive load (cos $\phi \fallingdotseq 1$) | Inductive load (cos $\phi \fallingdotseq 0.4$) |
|---|---|---|
| 125V AC | 5A | 3A |
| 250V AC | 5A | 2A |
| 125V DC | 0.4A | 0.1A |

2) Types with neon lamp and with LED

| Types | Rated control voltage | Resistive load (cos $\phi \fallingdotseq 1$) | Inductive load (cos $\phi \fallingdotseq 0.4$) |
|---|---|---|---|
| With Neon lamp | 125V AC | 5A | 3A |
| | 240V AC | 5A | 2A |
| With LED | 24V DC | 3A | – |

## 2. Characteristics

| | | |
|---|---|---|
| Contact arrangement | | 1 Form A 1 Form B |
| Initial contact resistance, max. | | 15mΩ (By voltage drop 6 to 8V DC at rated current) |
| Contact material | | Gold clad silver alloy (cadmium free) |
| Initial insulation resistance (At 500V DC) | | Min. 100MΩ |
| Initial breakdown voltage | | 1,000Vrms for 1 min Between non-consecutive terminals 2,000Vrms for 1 min Between dead metal parts and each terminal 2,000Vrms for 1 min Between ground and each terminal |
| Shock resistance max. | In the free position | Max. 98m/s$^2$ {10G} |
| | In the full operating position | Max. 294m/s$^2${30G} |
| Vibration resistance | | Standard type: Max. 55Hz Type with indicator: 10 to 50Hz, double amplitude of 1.5mm |
| Expected life (Min. operations) | Mechanical | $10^7$ (at 120 cpm) |
| | Electrical | $3\times10^5$ (at rated resistive load) $5\times10^6$ (Magnetic contactor FC-100 200V AC load) |
| | Life of lamp | Min. $2\times10^4$ hours (Neon lamp type) |
| Ambient temperature/Ambient humidity | | –20 to +60°C –4 to +140°F/Max. 95% |
| Max. operating speed | | 120 cpm |

## 3. EN60947-5-1 performance

| Item | Rating |
|---|---|
| Rated insulation voltage (Ui) | 250VAC |
| Rated impulse withstand voltage (Uimp) | 2.5kV |
| Switching overvoltage | 2.5kV |
| Rated enclosed thermal current (Ithe) | 5A |
| Conditional short-circuit current | 100A |
| Short-circuit protection device | 10A fuse |
| Protective construction | IP64 |
| Pollution degree | 3 |

## 4. Operating characteristics

| Characteristics / Actuator | O.F. (N {gf}) max. | 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. mm inch |
|---|---|---|---|---|---|---|
| Push plunger<br>Roller plunger<br>Cross roller plunger | 8.83 {900} | 1.47 {150} | 1.5 .059 | 0.7 .028 | 4 .028 | 5.5 .217 |
| Roller arm | 5.88 {600} | 0.49 {50} | 20° | 10° | 75° | 95° |
| Adjustable roller arm | 7.84 {800}~3.35 {342} | 0.49 {50}~0.21 {21} | 20° | 10° | 75° | 95° |
| Adjustable rod | 7.84 {800}~1.99 {203} | 0.49 {50}~0.12 {12} | 20° | 10° | 75° | 95° |
| Flexible rod spring wire | 0.88 {90} | – | 30 (1.181) | – | 20 (.787) | 50 (1.969) |

*Characteristics measured at bent condition: min. radius 100mm 3.937inch.

Notes) 1. Keep the total travel values in the specified range. Otherwise the actuator force may rise to several times the operating force, resulting in a mechanical failure or much shorter service life.
2. For the operating characteristics, refer to the TECHNICAL INFORMATION.

## 5. Protective construction

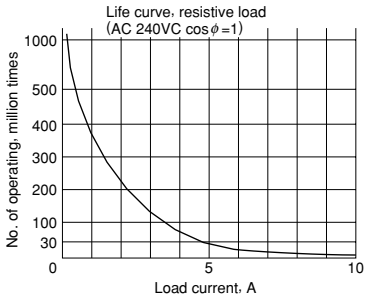
| Protective construction / IEC | VL Mini limit switch | VL Mini limit switch (with lamp) |
|---|---|---|
| IP60 | ○ | ○ |
| IP64 | ○ | ○ |

## 6.Lamp rating

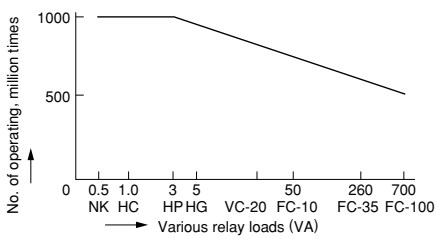
| Types | Rated operating voltage | Operating voltage range | Internal resister |
|---|---|---|---|
| Neon lamp | 100 to 200V AC | 80 to 240V AC | 120kΩ |
| LED | 6V DC | 5 to 15V DC | 2.4kΩ |
| | 12V DC | 9 to 28V DC | 4.7kΩ |
| | 24 to 48V DC | 20 to 55V DC | 15kΩ |

# DATA

## 1. Life curve



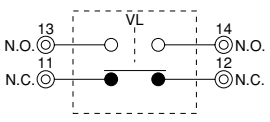

## 2. Actual load life curve (relay coil load)



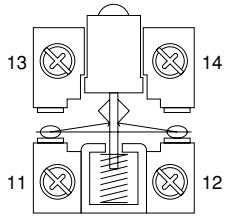

Note: The FC magnetic contactor series is 200V AC. The NK is 2 Form C 24V DC type.

# WIRING DIAGRAM

## Output circuit




## Terminal

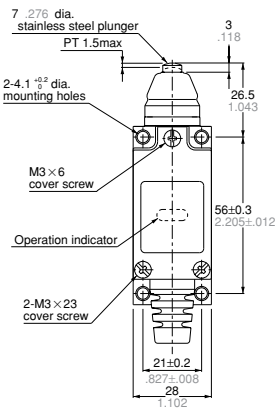


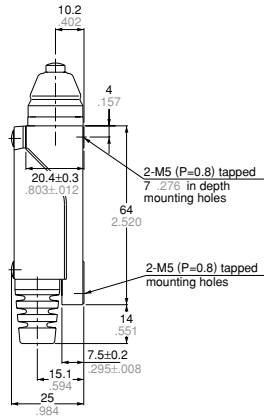
# DIMENSIONS

mm inch

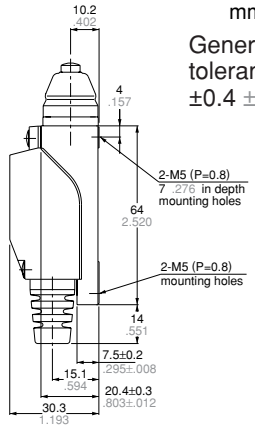
General tolerance: ±0.4 ±.016

## Push plunger
Standard type
AZ8111



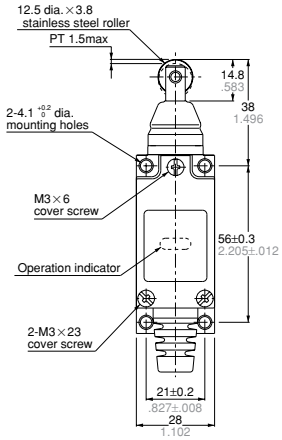



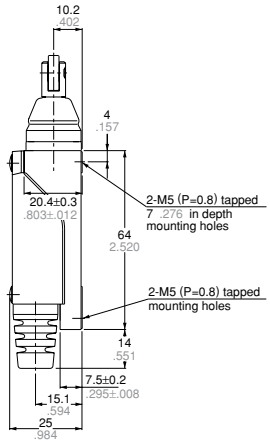

Standard type



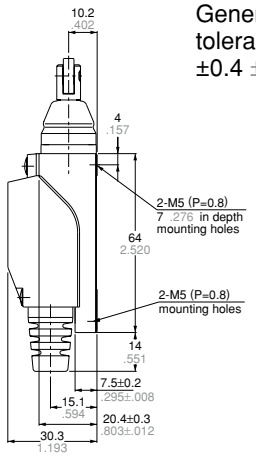

With lamp

## Roller plunger
Standard type
AZ8112



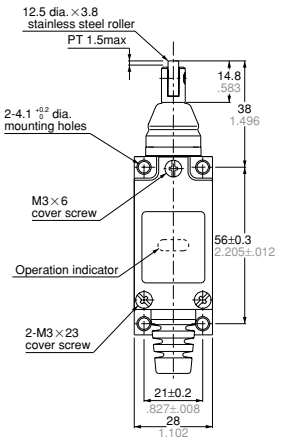



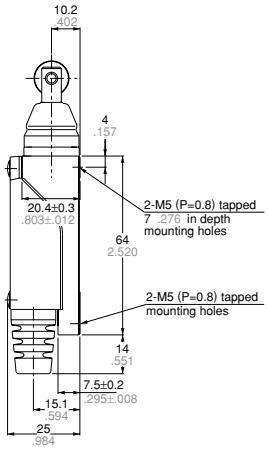

Standard type



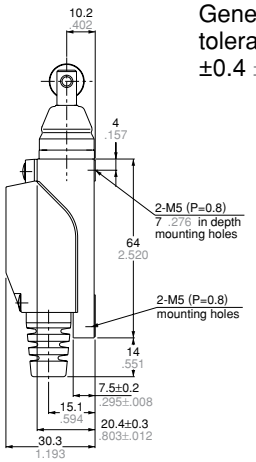

With lamp

## Cross roller plunger
Standard type
AZ8122



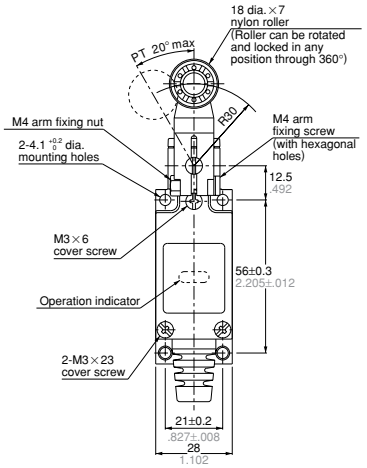

Standard type

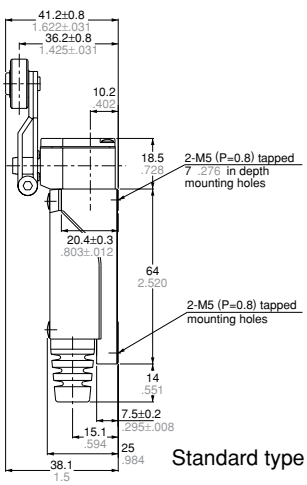



With lamp

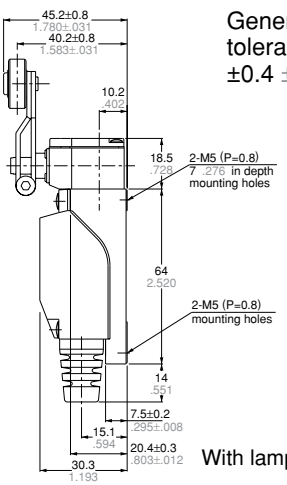
## Roller arm
Standard type
AZ8104

Weight: 156.5g




Standard type

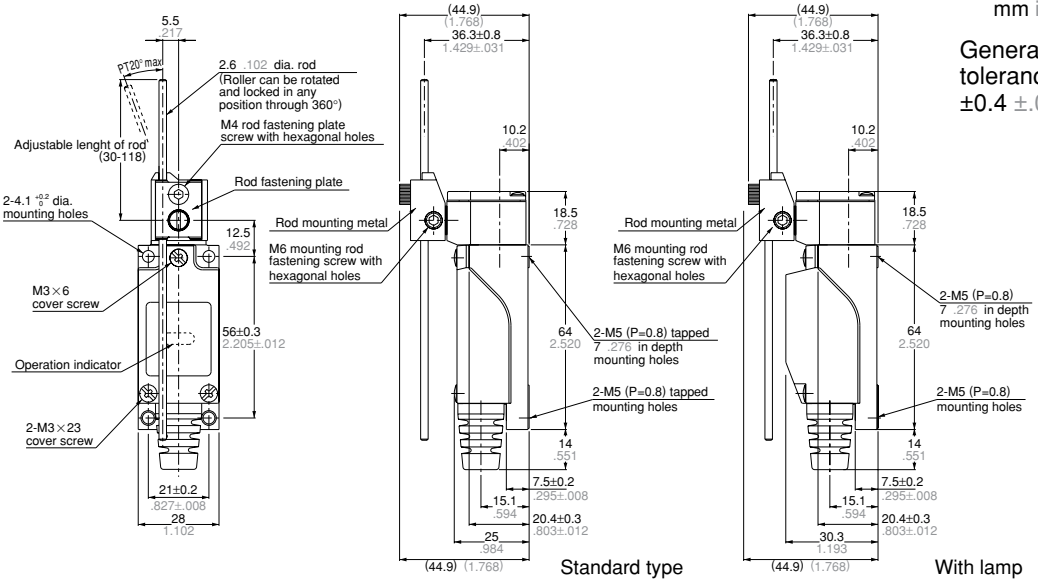



With lamp

## Adjustable rod
Standard type
AZ8107

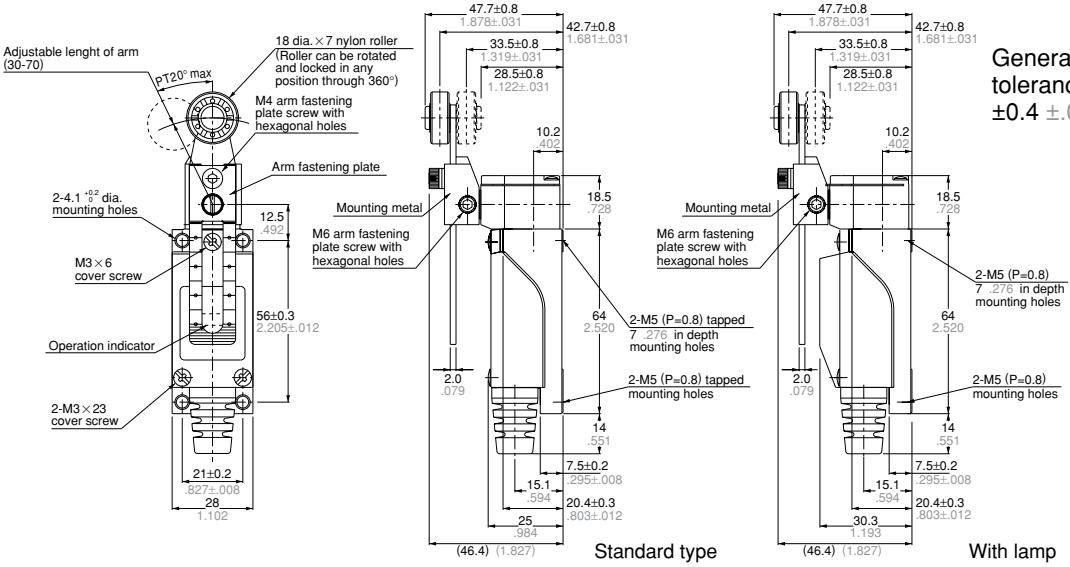
mm inch

General tolerance: ±0.4 ±.016




## Adjustable roller arm
Standard type
AZ8108

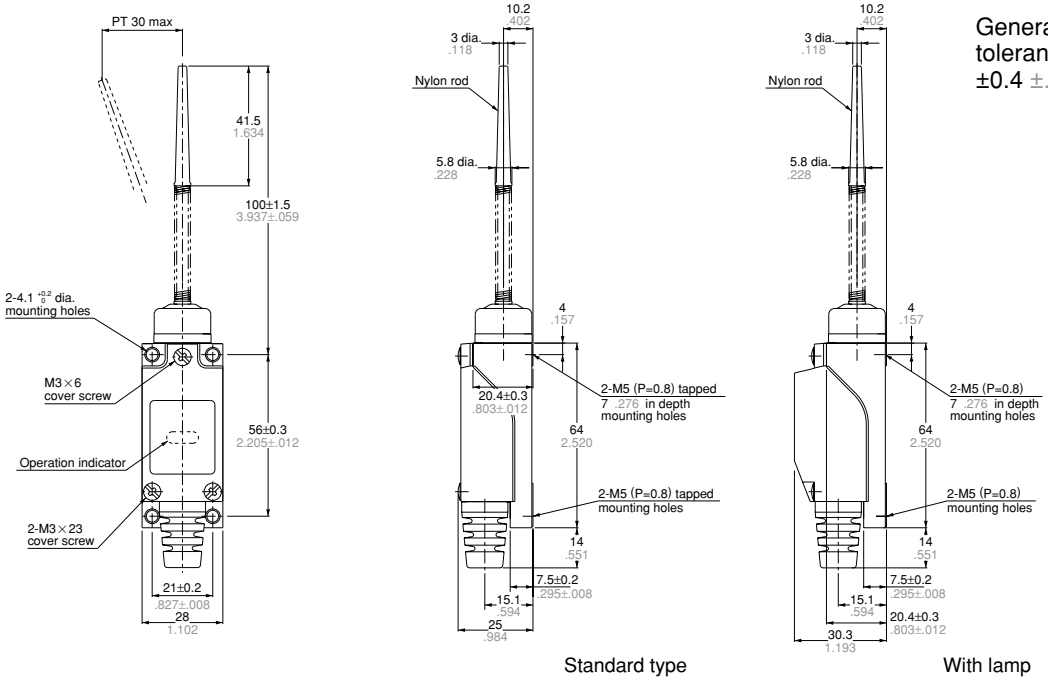
(Length of arm can be adjustable within 30 to 70mm 1.181 to 2.756inch by 1mm .039inch pitch)




## Flexible rod type (Should be used with less than 50mm 1.969inch of T.T.)
Standard type
AZ8166

Weight: 112g

General tolerance: ±0.4 ±.016

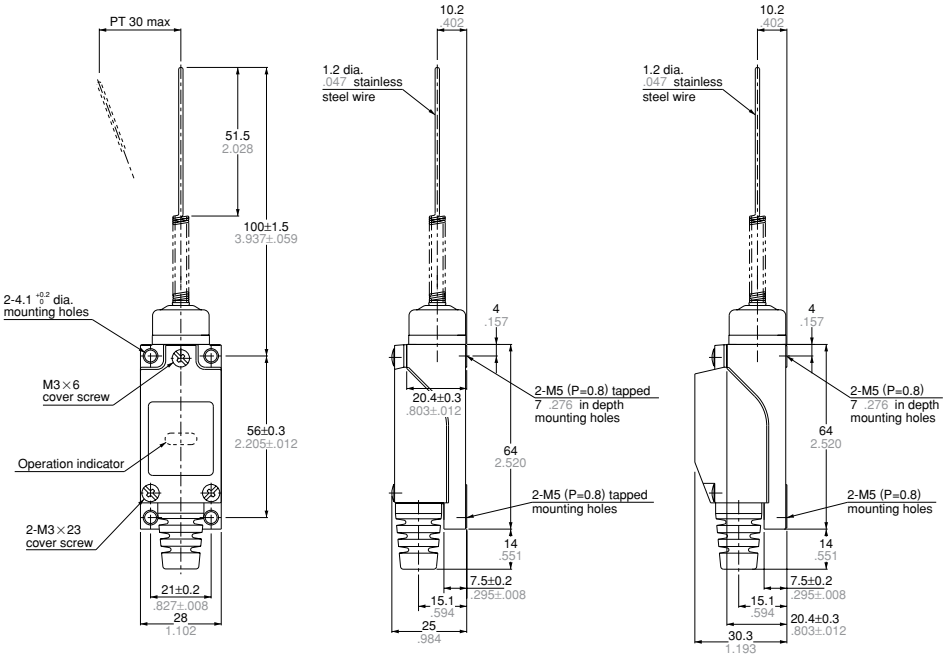


Spring wire (Should be used with less than 50mm 1.969inch of T.T.)

General tolerance: ±0.4 ±.016

Standard type
AZ8169

Weight: 112g




Standard type

With lamp

# OPTION

mm inch

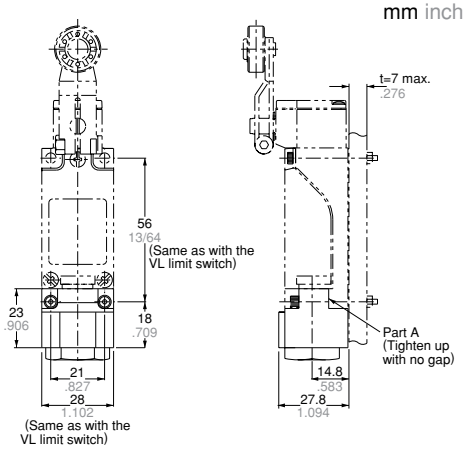
VL Limit Conduit Adapter

AZ8801

Applicable wire

| Electric wire name | Finished outside diameter |
|---|---|
| Vinyl cabtire cord (VCTF) | 8.7 to 11 dia. .343 to .433 dia. |
| Vinyl cabtire cable (VCT) | |

(A set of mounting hex. socket screws is supplied.)




(Front)

(Side)

Note: Diagram shows adapter when installed to an AZ8104.

# LAMP LIGHTING CIRCUIT

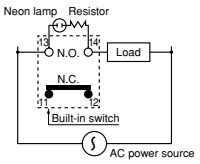
**1. Spring type**

1) When connecting load to N.O. side:
When the switch is at free position, the lamp is lit, and when the switch operates, the lamp turns off. (Use the lamp holder in the same condition as when it was at the time of shipment.)

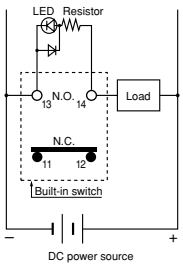
2) When connecting load to N.C. side:
When connecting switch is at free position, the lamp turns off, and when the switch operates, the lamp is lit.
(Use the lamp holder, changing it direction by 180°.)

3) When connecting loads to both N.O. and N.C. sides: Same as in 1).
(Use the lamp holder in the same condition as when it was at the time of shipment. In this case, it is impossible to use it, changing its direction by 180°.)

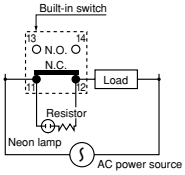
(With neon lamp)



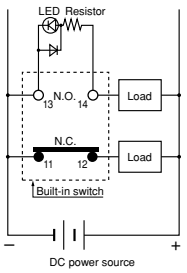

(With LED)



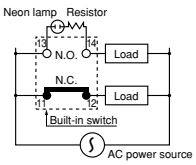

(With neon lamp)



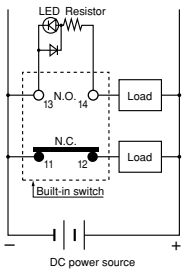

(With LED)




(With neon lamp)




(With LED)

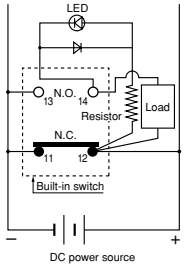



**2. Lead wire type (only for types with LED)**

1) When giving indication on N.O. side and N.C. side, operation is same as that in the case of the spring type. However, when load is connected to both N.O. side and N.C. side, indication can be given on both N.C. side and N.O. side.

2) When the indication circuit is connected with load in parallel:
Load performs the same operation as the indication circuit does.
(When load operates, the lamp is lit, and when load is turned off, the lamp goes out.)

- More loads than for one circuit cannot be controlled.
- There is no leakage current.

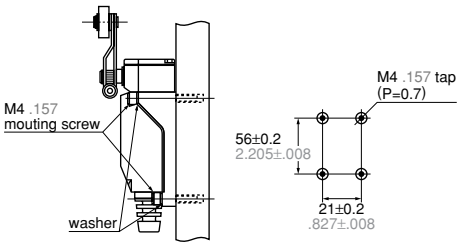



# MOUNTING DIMENSIONS

mm inch

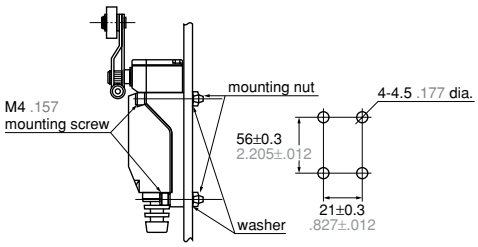
**1. Surface mounting**

1) When installation hole is tapped.



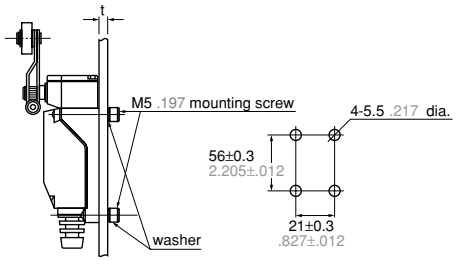

Depth of screw holes > 15mm .591inch

2) Through hole mounting




Thickness of panel < 5mm .197inch

**2. Rear mounting**




Length of bolt < panel thickness t+7mm .276inch

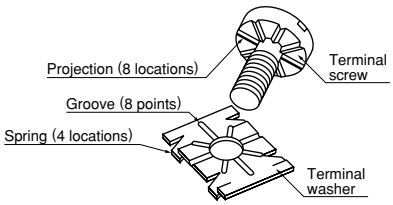
## WIRING (unit: mm inch)

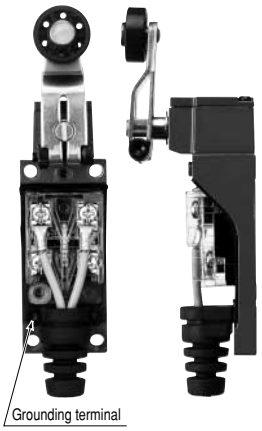
**1. Insulation distance greater than 6.4 mm**

Reinforced plastic with superior electrical insulation characteristics is used in the wiring and charging sections. Despite its compactness, to maintain stable insulation performance, the insulation distance for each part is greater than 6.4 mm without using an insulation sheet. (Complies with UL, CSA, and VDE.)

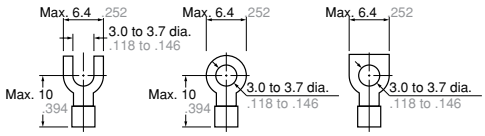
**2. Includes ground terminal**

**3. Loose stop terminals used.**

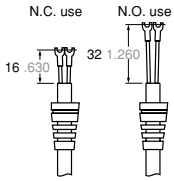


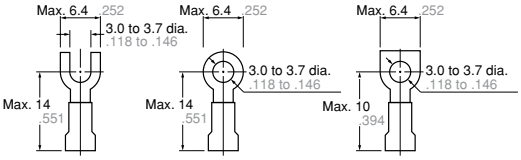

Applicable fasten terminal




Fasten terminal




With insulated grip



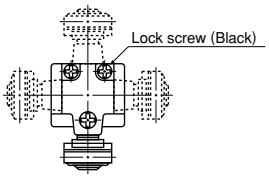

## Applicable wire

| Wire name | Applicable wire | | |
|---|---|---|---|
| | Wire-strand | Conductor | Finished outside diameter |
| Vinyl cabtire cord (VCTF) | 2-wire<br>3-wire<br>4-wire | 0.75mm²·1.25mm²<br>2.0mm²<br>0.75mm²·1.25mm² | Round shape<br>6 dia. to 9 dia.<br>Flat shape Max. 9.4 |
| Vinyl cabtire cable (VCT) | 2-wire | 0.75mm² | |
| 600V vinyl insulation sealed cable (VVF) | 2-wire | 1.0 dia. to 1.2 dia. | |
| | | 1.6 dia. | |

## Head block direction change

(Roller arm, adjustable roller arm, adjustable rod types)

Actuator heads may be moved in 90° increments to any of four directions, by removing one screw.




## CAUTIONS

**1. Over travel (O.T.)**

1) When overtravel is too large, life is shortened due to possible damage to the mechanism. Please use in the following appropriate range.

| Types | Overtravel |
|---|---|
| Plunger (AZ8111, 8112, 8122) | 1.5 to 2.0mm .059 to .079inch |
| Roller Arm (AZ8104, 8107, 8108) | 20 to 30° |
| Flexible Rod (AZ8166, 8169) | 15 to 20mm .591 to .787inch (at the top) |

**2. Ambient conditions**

1) Because these switches are not of immersion protected 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) 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.

3) Use within an ambient temperature of –20 to +60°C –4 to +140°F. (However, do not allow it to freeze.)

4) 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.

5) If OT is too big, the life of limit switch will be shortened switching friction. Use it with enough margin of OT. 70% of OT standard value will be good for use.

6) 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.

7) When wiring, do not connect the lead wires directly to the terminals, but use the crimp terminals and tighten them to a torque of 0.39 to 0.59 N·m {4 to 6 kg·cm}.

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

9) When used outdoors (in places where there is exposure to direct sunlight or rain such as in multistory car parks) or in environments where ozone is generated, the influence of these environments may cause deterioration of the rubber material. Please consult us if you intend to use a switch in environments such as these.

10) Do not store in places where organic gas might be generated or in places of high dust content or high humidity.

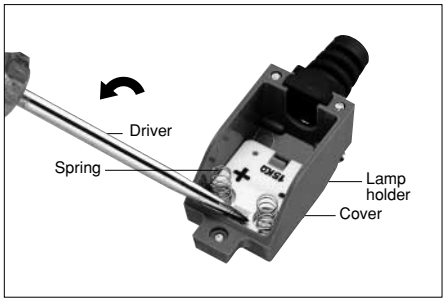
**3. Installation**

1) Tighten the three cover installation screws equally. Tightening torque is 0.2 to 0.29 N·m (2 to 3 kg·cm).

2) Avoid having extra cord length pushed into the cord vent. Any extra length when wiring should be allowed to rest in its natural position.

**4. Lamp holder**

1) As shown in the photograph, wrench a minus-driver in the gap between the cover and the part of the indicator holder indicated by the arrow in the direction of insertion, and raise the lamp a little.
2) After removing the indicator holder, insert it in the reverse direction, and push it in until a snap is heard.
3) After changing the direction of the indicator holder, put the cover on it in such a way that the spring touches the top of the terminal screw.
(Unless the spring rests completely on the terminal screw, distortion of the spring, failure in lighting of the lamp or short circuit may result.)




**5. Spring type**

1) When loads are connected to both N.O. and N.C. only the indicatin at non-operation time can be used.
2) Take special care not to damage or deform the contact spring during change of indicator holder direction or during connection work.
3) In the case of VL limit switch with neon lamp, if the lamp is connected in series in a 100V circuit, the lamp ceases to be lighted.
However, for a 200V circuit, up to 2 lamps can be connected in series.

**6. Lead type**

1) When loads are connected to both N.O. and N.C. indication can be given on both N.O. and N.C. sides, but it is impossible to connect the indication circuit to the load in series and parallel.

STOP **Order Discontinued as of August 31, 2009**

Panasonic
ideas for life

**VERTICAL TYPE LIMIT SWITCHES (INCLUDES LAMP TYPE)**

# AZ5 Limit Switches

## General use vertical limit switch. Type with a lamp which makes maintenance convenient; either a neon AC powered lamp or an LED DC powered lamp.

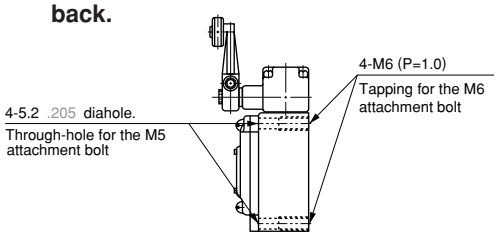
Standard type
Roller arm

With lamps
Adjustable roller arm

**RoHS Directive compatibility information**
**http://www.nais-e.com/**

## FEATURES

**1. Can be mounting either front or back.**




**2. Lamps that can be used with a wide range of voltages**

• Neon lamp
Comes in two types: 100V AC and 200V AC, sufficient luminosity is achieved through the diamond-cut lens. Also with a long lifespan of more than 20 thousand hours.

• LED lamp
Covers 6V to 48V and comes in three types, 6V AC/DC, 12V AC/DC, and 24 to 48V AC/DC. Uses two highly luminescent LEDs and in addition, sufficient luminosity is achieved through the diamond-cut lens.

**3. Lamp connection can be either spring type or lead wire type**

• Spring type (wiring unnecessary)
(With neon or LED lamp type)
Wiring is unnecessary because the lamp is directly connected to the terminals. By simply changing the direction of the lamp cover, it is possible to display both lights during operation (normally closed side) and no operation (normally open side.)

• Lead wiring type <Current leakage: 0>
(LED type only)
Because the wiring can be made parallel to the load, current leakage from the lamp can be reduced to 0. Even with a slight leak, the electronic circuit incurring the leak can be used safely.

**4. Corrosion-proof, oil-resistant construction**

The protective construction is corrosion-proof (conforms to IP67.) Also, the lens and cover are formed simultaneously with the lamp type, and moreover, a nameplate is affixed to the upper surface, thereby improving the already-excellent waterproof capabilities.

## TYPICAL APPLICATIONS

Conveyer equipment, conveyer belts, plant facilities, cranes, cleaning plants, etc. The LED lamp type is also compatible with both PC and computer direct current low voltage control circuits.

## PRODUCT TYPE

**1. Standard type**

| Actuator | | Part No. |
|---|---|---|
| Push plunger | | AZ5101 |
| Roller plunger | | AZ5102 |
| Roller arm | Standard type | AZ5104 |
| | O.T. amplified type | AZ5124 |
| Yoke | | AZ5105 |
| Flexible | | AZ5106 |
| Adjustable rod | Standard type | AZ5107 |
| | O.T. amplified type | AZ5127 |
| Adjustable roller arm | Standard type | AZ5108 |
| | O.T. amplified type | AZ5128 |

**2. With neon lamp**

| Lamp connection | Actuator | | Lamp rating | |
|---|---|---|---|---|
| | | | 100V AC | 200V AC |
| | | | Part No. | |
| Spring type | Push plunger | | AZ510141 | AZ510142 |
| | Roller plunger | | AZ510241 | AZ510242 |
| | Roller arm | Standard type | AZ510441 | AZ510442 |
| | | O.T. amplified type | AZ512441 | AZ512442 |
| | Yoke | | AZ510541 | AZ510542 |
| | Flexible | | AZ510641 | AZ510642 |
| | Adjustable rod | Standard type | AZ510741 | AZ510742 |
| | | O.T. amplified type | AZ512741 | AZ512742 |
| | Adjustable roller arm | Standard type | AZ510841 | AZ510842 |
| | | O.T. amplified type | AZ512841 | AZ512842 |

STOP Order Discontinued as of August 31, 2009

### 3. With LED

| Lamp connection | Actuator | | Lamp rating | |
|---|---|---|---|---|
| | | | 12V DC | 24 to 48V DC |
| | | | Part No. | |
| Spring type | Push plunger | | AZ5101161 | AZ510116 |
| | Roller plunger | | AZ5102161 | AZ510216 |
| | Roller arm | Standard type | AZ5104161 | AZ510416 |
| | | O.T. amplified type | AZ5124161 | AZ512416 |
| | Yoke | | AZ5105161 | AZ510516 |
| | Flexible | | AZ5106161 | AZ510616 |
| | Adjustable rod | Standard type | AZ5107161 | AZ510716 |
| | | O.T. amplified type | AZ5127161 | AZ512716 |
| | Adjustable roller arm | Standard type | AZ5108161 | AZ510816 |
| | | O.T. amplified type | AZ5128161 | AZ512816 |
| Lead wire type | Push plunger | | AZ5101661 | AZ510166 |
| | Roller plunger | | AZ5102661 | AZ510266 |
| | Roller arm | Standard type | AZ5104661 | AZ510466 |
| | | O.T. amplified type | AZ5124661 | AZ512466 |
| | Yoke | | AZ5105661 | AZ510566 |
| | Flexible | | AZ5106661 | AZ510666 |
| | Adjustable rod | Standard type | AZ5107661 | AZ510766 |
| | | O.T. amplified type | AZ5127661 | AZ512766 |
| | Adjustable roller arm | Standard type | AZ5108661 | AZ510866 |
| | | O.T. amplified type | AZ5128661 | AZ512866 |

Note) Cadmium free contact types are available on a custom-made basis. Please add an "F" to the end of the part number when ordering.
LED rating 6V DC type is available. When ordering, add suffix 162 (spring type) or 662 (lead wire type) to the standard part No..

# SPECIFICATIONS

## 1. Rating

1) Standard type

| Types of load / Rated load | Resistive load (cos $\phi \fallingdotseq 1$) | Inductive load (cos $\phi \fallingdotseq 0.4$) | Motor or lamp load | |
|---|---|---|---|---|
| | | | N.C. contact | N.O. contact |
| 125V AC | 10A | 6A | 4A | 2A |
| 250V AC | 6A | 4A | 2.5A | 1.2A |
| 500V AC | 2A | 1.2A | 0.75A | 0.5A |
| 125V DC | 0.8A | 0.1A | – | – |

2) Type with lamp

| | Rated control voltage | Resistive load (cos $\phi \fallingdotseq 1$) | Inductive load (cos $\phi \fallingdotseq 0.4$) |
|---|---|---|---|
| With neon lamp | 125V AC | 10A | 6A |
| | 240V AC | 6A | 4A |
| With LED | 24V DC | 6A | – |

## 2. Characteristics

| | | |
|---|---|---|
| Contact arrangement | | 1 Form A 1Form B |
| Initial contact resistance, max. | | 15mΩ (By voltage drop 6 to 8V DC 1A) |
| Contact material | | Silver |
| Initial insulation resistance (At 500V DC) | | Min. 100MΩ |
| Initial breakdown voltage | | 1,000Vrms for 1 min Between non-consective terminals<br>2,000Vrms for 1 min Between dead metal parts and each terminal<br>2,000Vrms for 1 min Between ground and each terminal |
| Shock resistance | | 294m/s² {30G} |
| Vibration resistance | | Standard type: Max. 55Hz<br>Type with indicator: 10 to 50 Hz, double amplitude of 1.5mm |
| Expected life (Min. operations) | Mechanical | $10^7$ (at 60 cpm) |
| | Electrical | $5\times10^5$ (at 20 cpm, rated load) |
| Ambient temperature | | Standard type: –5 to +80°C +23 to +176°F<br>With indicator: –5 to +60°C +23 to +140°F |
| Ambient humidity | | Max. 95%R.H. |
| Max. operating speed | | 120 cpm |

## 3. Operating characteristics

| Actuator \ Characteristics | | O.F. (N {gf}) max. | 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. | Repeat Accuracy of Operating Position, max. mm inch*1 |
|---|---|---|---|---|---|---|---|---|
| Push plunger | | 26.67 {2,720} | 8.92 {910} | 1.7 .067 | 1.0 .039 | 6.4 .252 | – | 0.1 .004 |
| Roller plunger | | 26.67 {2,720} | 8.92 {910} | 1.7 .067 | 1.0 .039 | 5.6 .220 | – | 0.1 .004 |
| Roller arm | Standard type | 13.34 {1,360} | 2.23 {227} | 15°±5° | 12° | – | 45° | 1° |
| | O.T. amplified type | 8.83 {900} | 0.49 {50} | 25°±5° | 15° | – | 90° | 1° |
| Yoke | | 8.90 {908} | 8.90 {908} | 50°±5° | – | – | 90°±10° | – |
| Flexible*2 | | 1.39 {142} | – | 20±10 .787±.394 | – | – | – | – |
| Adjustable rod*3 | Standard type | 1.39 {142} | 0.27 {28} | 15°±5° | 12° | – | 45° | 1° |
| | O.T. amplified type | 2.39 {244} | 0.14 {14} | 25°±5° | 15° | – | 90° | 1° |
| Adjustable roller arm*4 | Standard type | 13.34 {1,360} | 2.23 {227} | 15°±5° | 12° | – | 45° | 1° |
| | O.T. amplified type | 8.83 {900} | 0.49 {50} | 25°±5° | 15° | – | 90° | 1° |

*1) Value between max. and min. value in the operating position at 20 cpm, no-load
*2) Measured at the position within 5mm from the top of actuator.
*3) O.F., R.F.: measured at the center distance of 135mm 5.315inch.
*4) O.F., R.F.: measured at the center distance of 38mm 1.496inch.
*5) For the operating characteristics, refer to the TECHNICAL INFORMATION.

## 4. Protective characteristics

| Protective construction | AZ5 limit switches (Standard type) | AZ5 limit switches (With lamp) (neon/LED) |
|---|---|---|
| IEC | | |
| IP60 | ○ | ○ |
| IP64 | ○ | ○ |
| IP67 | ○ | ○ |

## 5. Lamp rating

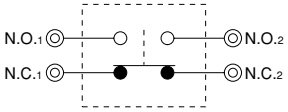
| Types | Rated operating voltage | Operating voltage range | Internal resistance |
|---|---|---|---|
| neon lamp | 100V AC | 80 to 120V AC | 120kΩ |
| | 200V AC | 160 to 240V AC | 240kΩ |
| LED lamp | 6V AC/DC | 5 to 15V AC/DC | 2.4kΩ |
| | 12V AC/DC | 9 to 28V AC/DC | 4.7kΩ |
| | 24 to 48V AC/DC | 20 to 55V AC/DC | 15kΩ |

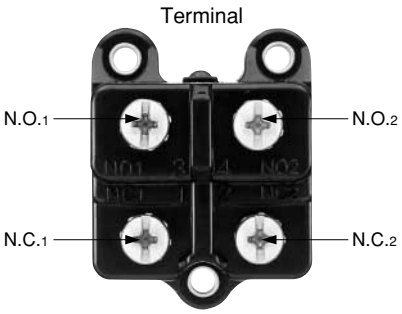
# FOREIGN STANDARD

| Standard | Applicable product | Part No. | Notes |
|---|---|---|---|
| UL recognized product | File No. : E99838<br>Ratings : 10A, 1/2HP, 125V AC<br>6A, 1/2HP, 250V AC<br>Product type : standard model only | Add "9" to the end of the standard part No. | Please ask about the price. Comes fitted with an earth pin. |

# WIRING DIAGRAM

Output circuit



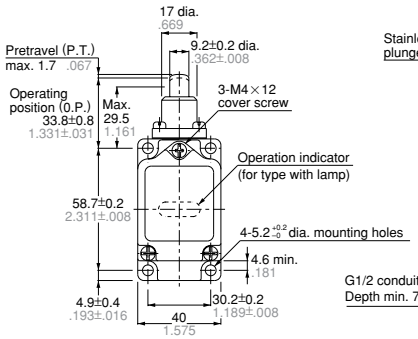

# DIMENSIONS

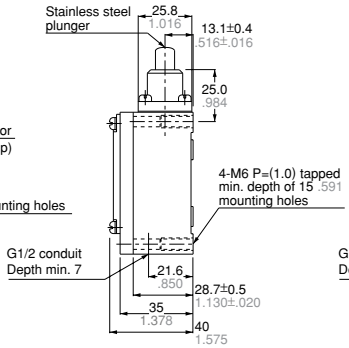
mm inch

General tolerance: ±0.4 ±.016

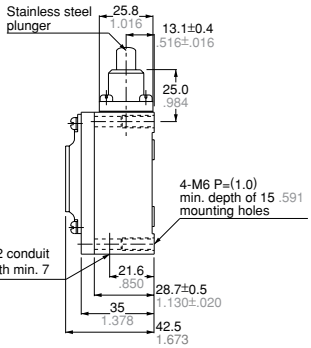
• Push plunger
Standard type

AZ5101




Standard

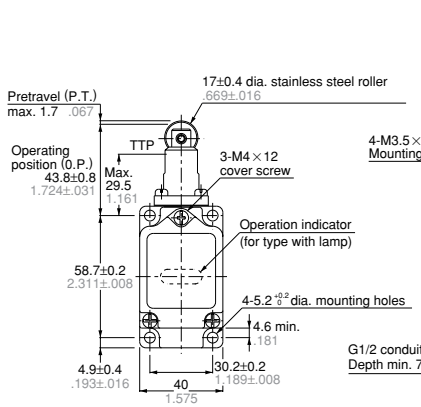


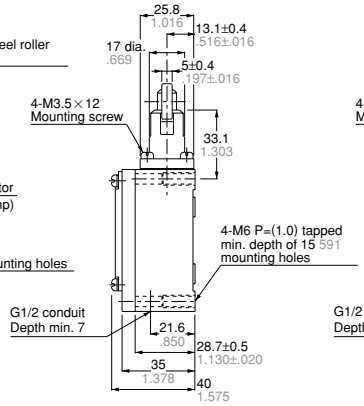

With lamp

• Roller plunger
Standard type

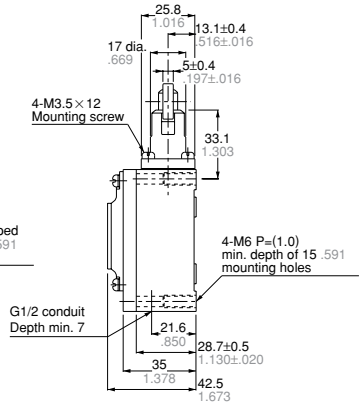
General tolerance: ±0.4 ±.016

AZ5102




Standard

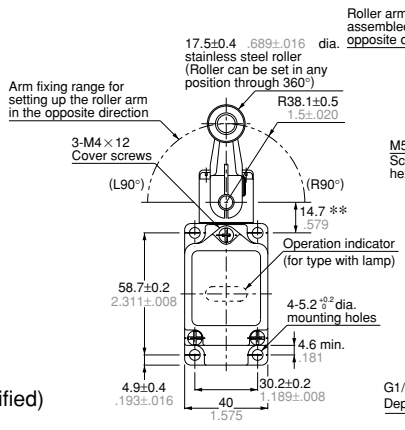


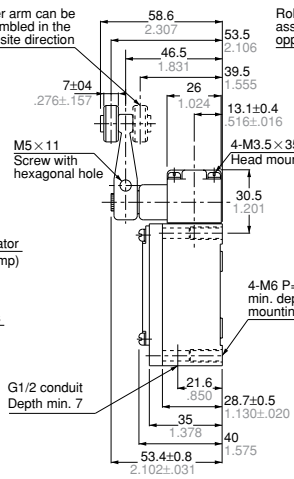

With lamp

• Roller arm
Standard type

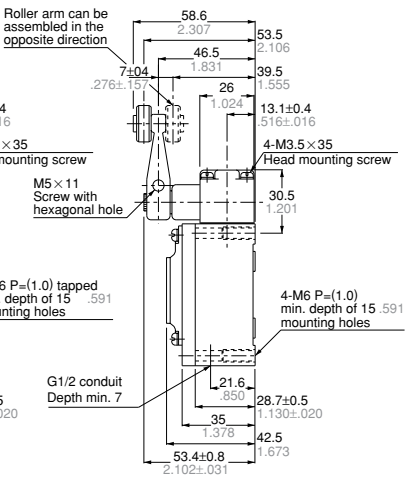
General tolerance: ±0.4 ±.016

AZ5104
AZ5124 (O.T. amplified)
Weight: 250g




Standard




With lamp

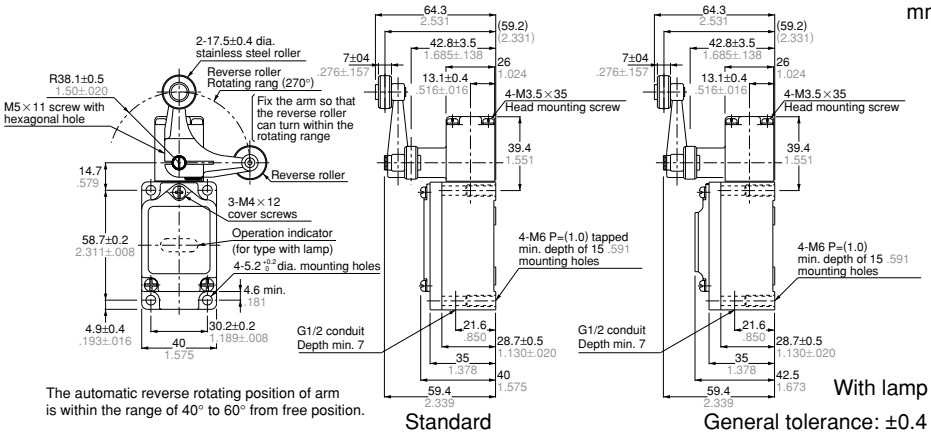
**Dimension: AZ5104 . . . 14.7 (.059)
AZ5124 . . . 16.2 (.638)

STOP **Order Discontinued as of August 31, 2009**

mm inch

## • Yoke
Standard type

AZ5105



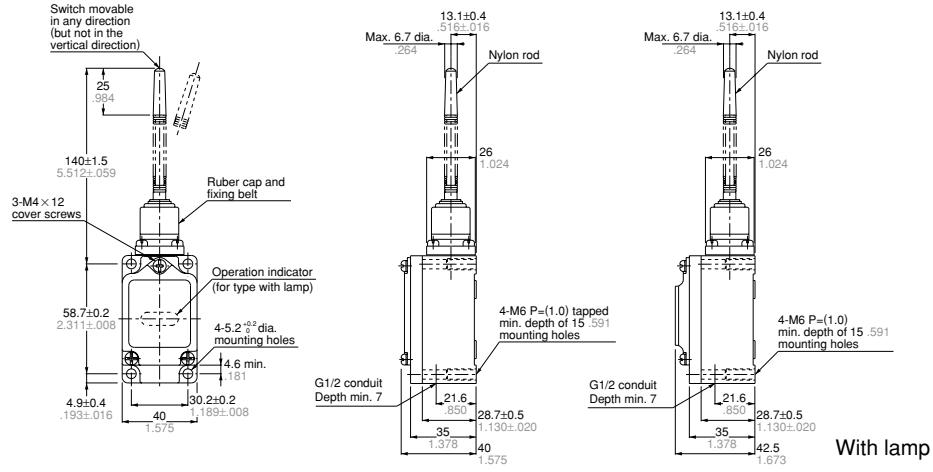

The automatic reverse rotating position of arm is within the range of 40° to 60° from free position.

Standard

General tolerance: ±0.4 ±.016

## • Flexible rod
Standard type

AZ5106

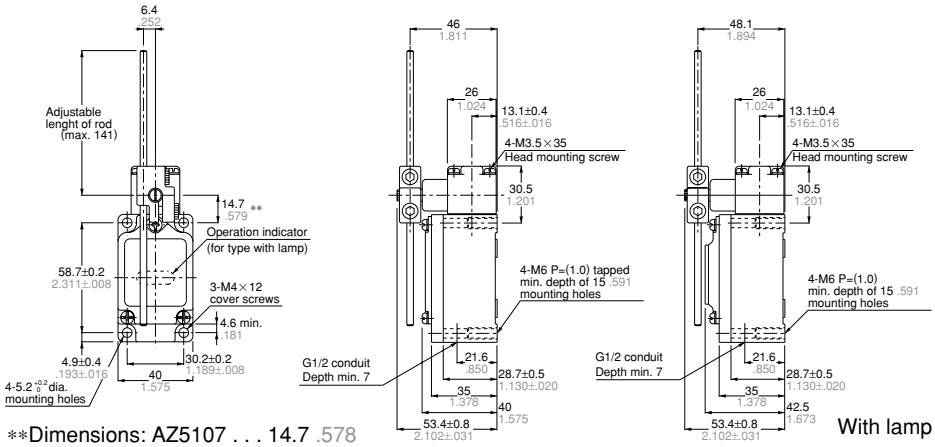



Standard

General tolerance: ±0.4 ±.016

## • Adjustable rod
Standard type

AZ5107
AZ5127
(O.T. amplified)
Weight: 252g



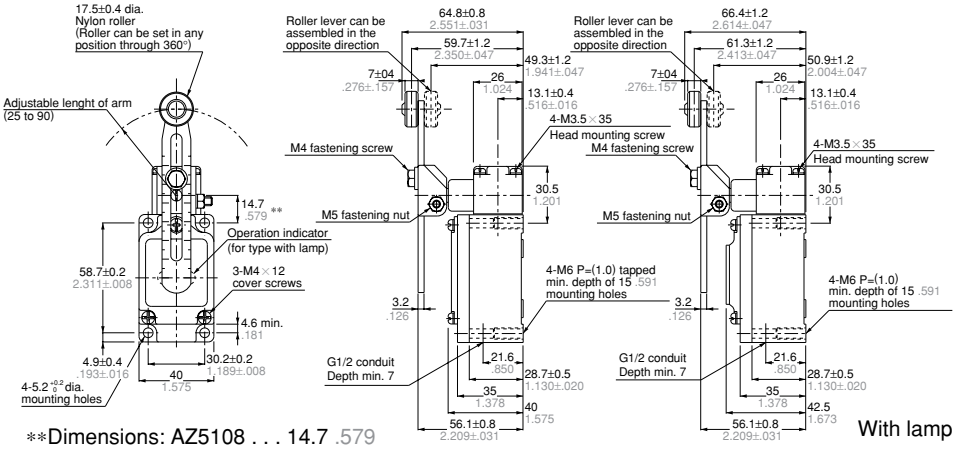

**Dimensions: AZ5107 . . . 14.7 .578
AZ5127 . . . 16.2 .638

Standard

General tolerance: ±0.4 ±.016

## • Adjustable roller arm
Standard type

AZ5108
AZ5128 (O.T. amplified)



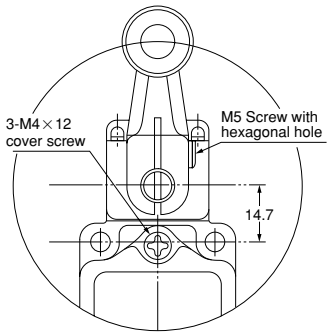

**Dimensions: AZ5108 . . . 14.7 .579
AZ5128 . . . 16.2 .638

Standard

General tolerance: ±0.4 ±.016

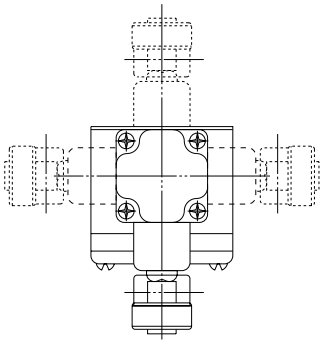
## Arm Setting Position

The roller arm of the arm types (AZ5104, AZ5105, AZ5107, AZ5108, AZ5124, AZ5127, AZ5128 and each type with lamp) can be set in any position through 360°.
Loosen the arm fastening hex. bolt, reposition the arm, and retighten the hex. bolt.

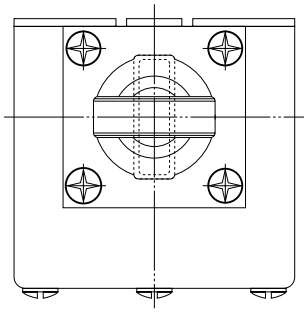



## Head Block Direction

1. The head block of the arm types (AZ5104, AZ5105, AZ5107, AZ5108, AZ5124, AZ5127, AZ5128 and each type with lamp) can be set in any of four directions.
Loosen four screws on the head, and set the head in a desired direction.
At this time, change the operation plunger orientation at the same time.

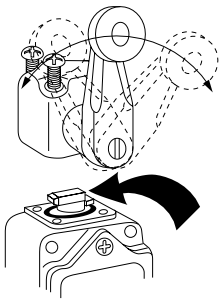


2. The head block of the roller plunger type (AZ5102) can be set in two directions. Remove the four bushing screws, and set the head in a desired direction.



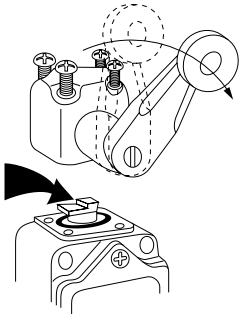
## Operating Direction

1) Both direction
The arm of AZ5104, AZ5107, AZ5108 and each type with lamp can be set to be operate electrically either to both directions or only to the right or the left.

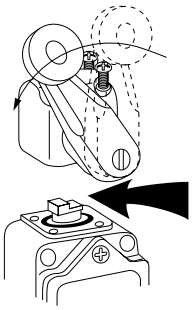


*O.T. amplified types “AZ5124, AZ5127 and AZ5128”: only both directions

2) Clockwise
Remove the head block, turn the notch of a operating plunger counterclockwise in 90°, and retighten the head block.

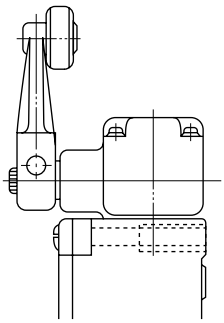


3) Counterclockwise
Remove the head block, turn the notch of a operating plunger clockwise in 90°, and retighten the head block.



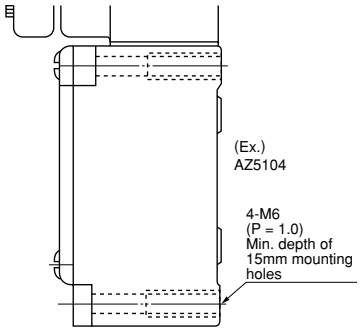
## Roller Direction

The roller of the arm types (AZ5104, AZ5108, AZ5124, AZ5128 and each type with lamp) can be mounted on the front and rear side. To set the roller on the rear side, remove the arm fastening hex. nut, and reinsert the arm so as to face the roller in the rear direction.
Then, retighten the hex. nut.



## REVERSE MOUNTING

When a switch is mounted from the reverse side of a panel, use the mounting holes in the body.



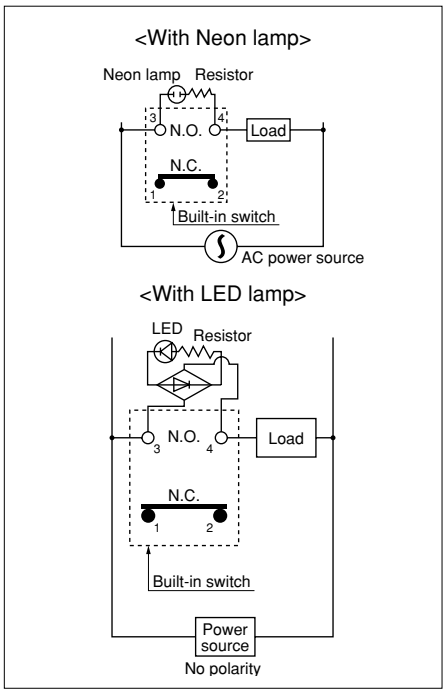
# LAMP LIGHTING CIRCUIT

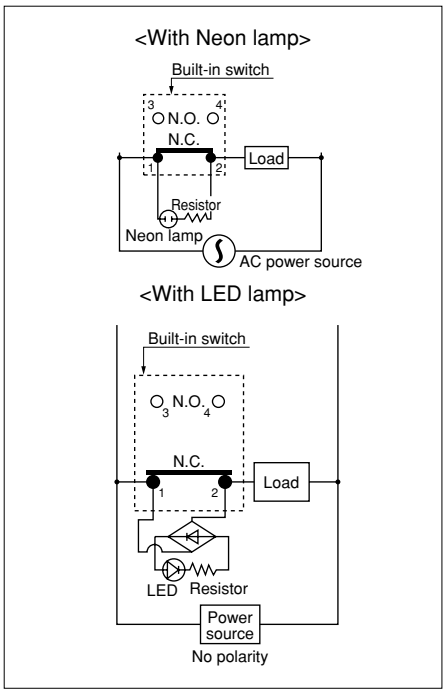
**1. Spring type**

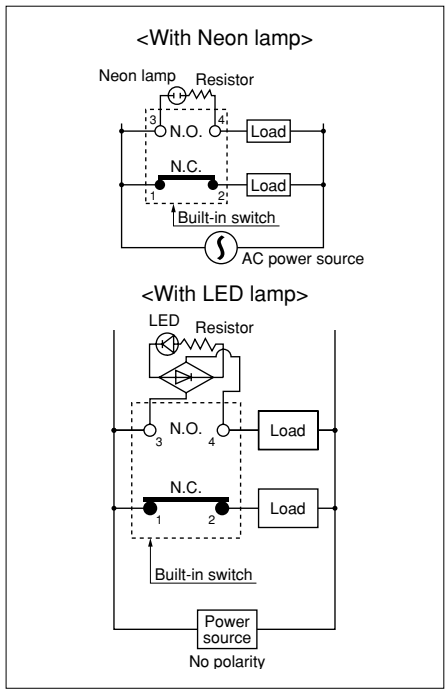
1) When connecting load to N.O. side:
When the switch is at free position, the lamp is lit, and when the switch operates, the lamp turns off.
(Use the lamp holder in the same condition as when it was at the time of shipment.)

2) When connecting load to N.C. side:
When the switch is at free position, the lamp turns off, and when the switch operates, the lamp is lit.
(Use the lamp holder, changing it direcion by 180°.)

3) When connecting loads to both N.O. and N.C. sides:
Same as in 1).
(Use the lamp holder in the same condition as when it was at the time of shipment. In this case, it is impossible to use it, changing its direction by 180°.)



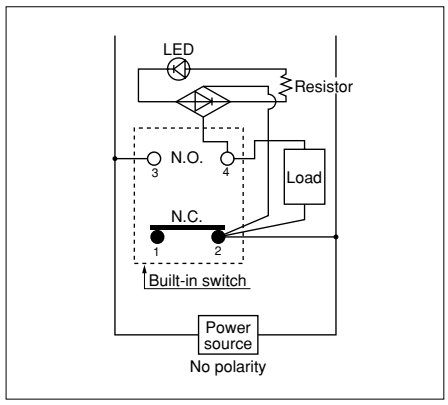




**2. Lead wire type (only for types with LED)**

1) When giving indication on N.O. side and N.C. side:
Operation is same as that in the case of the spring type. However, when load is connected to both N.O. side and N.C. side, indication can be given on both N.C. side and N.O. side.

2) When the indication circuit is connected with load in parallel:
Load performs the same operation as the indication circuit does.
(When load operates, the lamp is lit, and when load is turned off, the lamp goes out.)
• More loads than for one circuit connot be controlled.
• There is no leakage current.




# CAUTIONS

1. Please use the lamp connection circuit within the lamp ratings.
2. Nylon is used for a lamp cover. Avoid using in the atmospheres containing acid substance.
3. The lamp cover cannot be installed on previous limit switches.
4. Remove the lamp holder with a ⊖ driver, and insert it in the opposite direction.

# CAUTIONS

1) This model uses silver terminals. Therefore, if used at relatively low frequencies for long periods of time, or if used with very small loads, the oxidization that forms on the contact surfaces will not wear away and eventually cause improper contact. For such applications, use limit switches with gold/metal contacts (e.g. VL limit switches) or ones meant for small loads (e.g. HL limit switches).
2) This switch is not designed for underwater use. Do not use the unit underwater.
3) Do not use the switch where it may come in direct contact with organic solvents, strong acids, strong alkaline liquids or stream, or in atmospheres containing flammable or corrosive gases.
4) To improve reliability during actual use, it is recommended that the operation be checked under installation conditions.
5) If OT is too big, the life of limit switch will be shortened switching friction. Use it with enough margin of OT. 70% of OT standard value will be good for use.
6) 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.
7) To protect against entry of foreign matter from the outside, we recommend sealing as much as possible using conduit connectors.
8) Avoid use in excessively dusty environments where actuator operation would be hindered.
9) When used outdoors (in places where there is exposure to direct sunlight or rain such as in multistory car parks) or in environments where ozone is generated, the influence of these environments may cause deterioration of the rubber material. Please consult us if you intend to use a switch in environments such as these.
10) Do not store in places where organic gas might be generated or in places of high dust content or high humidity.

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**COMPACT VL TYPE TOUCH LIMIT SWITCHES**

# VL-T Mini Touch (AZ84) Limit Switches

## Operate just by touching lightly. Comes with sensitivity adjustment function and Indicates operations.

Free attachment type　　Wire spring type

**RoHS Directive compatibility information**
**http://www.nais-e.com/**

## FEATURES

**1. Compact**
Same size as the VL mini limit switch: a compact limit switch perfectly suited to this era of space-saving.

**2. Sturdy construction**
A sturdy construction comparable to any limit switch which uses a zinc die-cast body, a glass-weave reinforced plastic head, and a cover. The terminal cover also boasts excellent dust-proof and drip-proof capabilities.

**3. Easy wiring**
Because this unit uses the same terminal screw wiring method as the VL mini limit switch, the wiring space is large and the wiring work easy.

**4. Highly accurate position detection**
Because hardly any pretravel (P.T.) is necessary, highly accurate position detection is possible.

**5. Detection of thin sheet materials is also possible**
Because the movement differential (M.D.) is zero, detection of thin sheet materials is also possible.

**6. Level control of conducting fluids is also possible**
Because contact detection is possible, the level of conducting fluids can also be controlled.

**7. High frequency detection possible**
Because the output is contactless, there is no chattering or bounce at all. This makes for fast response speed and high frequency detection, with long unit life.

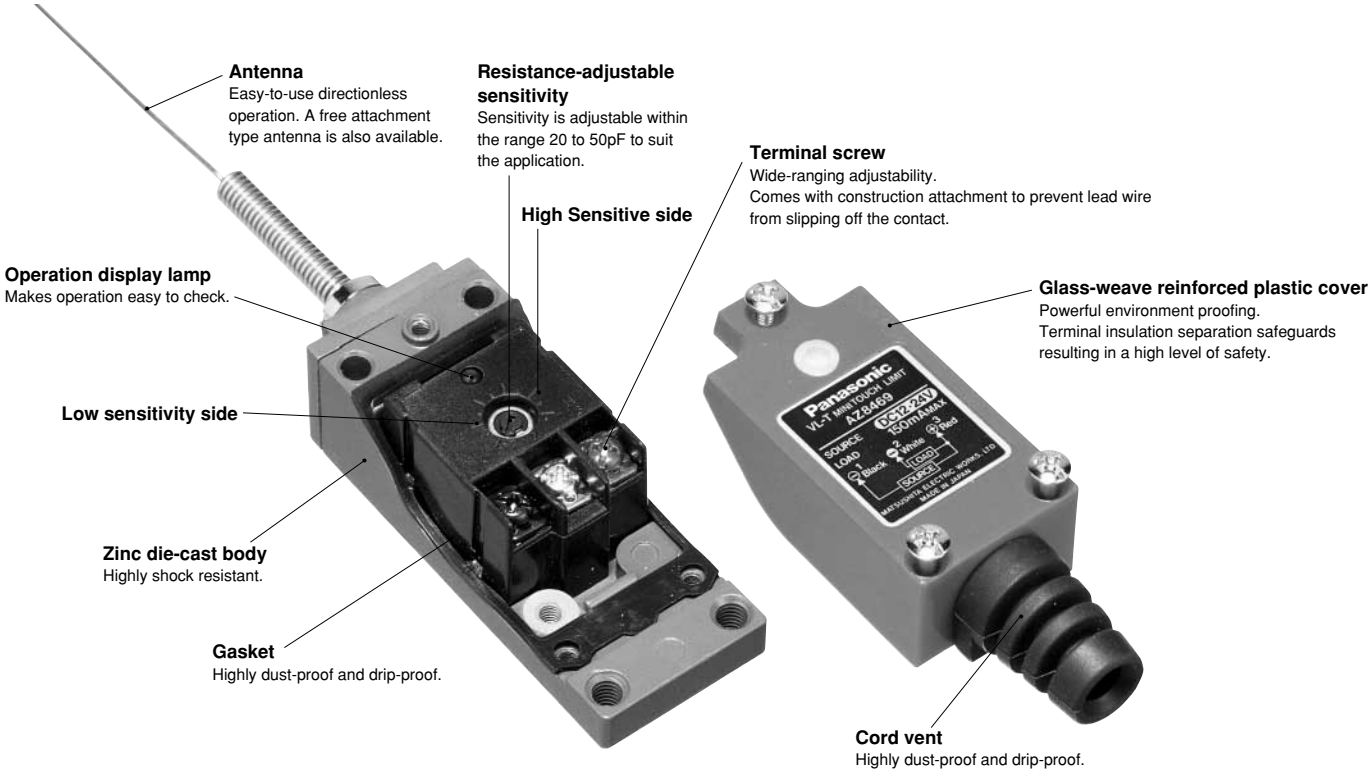
**8. Comes with operation display lamp**
Any operation can be verified by means of the blinking light-emitting diode.

**9. Comes with sensitivity adjustment function**
The sensitivity can be set appropriate to the application by adjusting the touch sensitivity.

## PRODUCT TYPE

| Actuator | Part No. |
|---|---|
| Free attachment | AZ8430 |
| Wire spring | AZ8469 |

## PARTS NAMES AND FUNCTIONS



# SPECIFICATIONS

## 1. Rating

| | |
|---|---|
| Rated control voltage | 12/24V DC (at 12V DC: approx. 6 mA, 24V DC: approx. 11 mA) |
| Response time | Max. 10ms |
| Output current | Max. 150 mA |

Note) When used as a direct load, any DC type relay may be applied.

## 2. Characteristics

| | | |
|---|---|---|
| Allowable operating voltage | | 10 to 30V DC (Ripple factor: max. 10%) |
| Adjustable sensitivity | | 20 to 50pF |
| Vibration resistance | Functional | 10 to 55 Hz, double amplitude of 0.3mm .012inch |
| | Destructive | 16.7 Hz, double amplitude of 4mm .157inch |
| Shock resistance | | Min. 980m/s² {100G} |
| Initial insulation resistance (At 500V DC) | | Min. 100MΩ; Between each terminal, antenna and ground |
| Breakdown voltage | | 1,500V AC for 1 min Between each terminal, antenna and ground |
| Expected life (min. operations) | | $10^7$ (at 500 cps, 150mA resistive load) (Antenna portion of wire spring type: operating speed 120 cpm at O.T.=20mm) |
| Power source ripple factor | | Max. 10% |
| Ambient temperature/humidity | | –20 to +60°C –4 to +140°F/Max. 95%R.H. (at 20°C 68°F) |
| Max. operating speed | | 50 cps (Antenna portion of wire spring type: 120 cpm at O.T.=20mm) |
| Detected object | | Conductor |

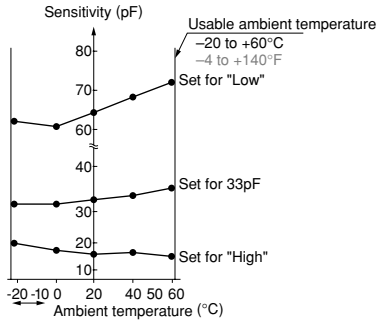
## 3. Protective characteristics

| Protective construction | VL-T Mini touch limit switches |
|---|---|
| IEC | |
| IP60 | ○ |
| IP64 | ○ |

# DATA

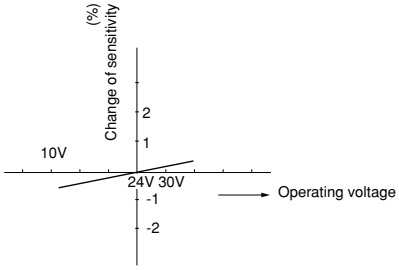
## 1. Temperature characteristics

(typical characteristics at 20°C 68°F)




## 2. Voltage characteristics

(typical characteristics at 24V DC)




# APPLICABLE WIRE

| Name of electric wire | Applicable wire | | |
|---|---|---|---|
| | Wire stand | Conductor | Finished outside diameter |
| Vinyl insulation vinyl captive cord (round) (VCTF) | 3-wire | 0.75mm² | 6 dia. to 9 dia. |
| | | 1.25mm² | |
| Rubber insulation vinyl captive cable (round) (RVCTF) | | 2.0mm² | |

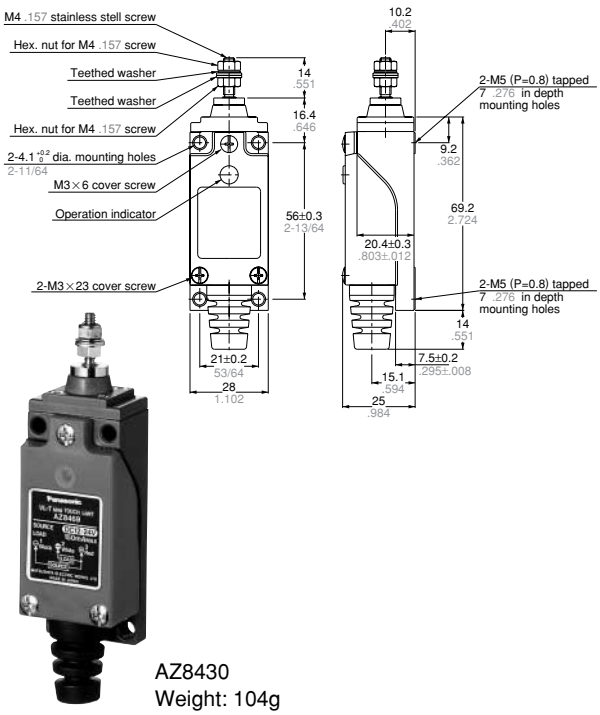
# MOUNTING DIMENSIONS

The dimensions are the same as for the VL type limit switches. Refer back to the VL type data.

# DIMENSIONS

mm inch

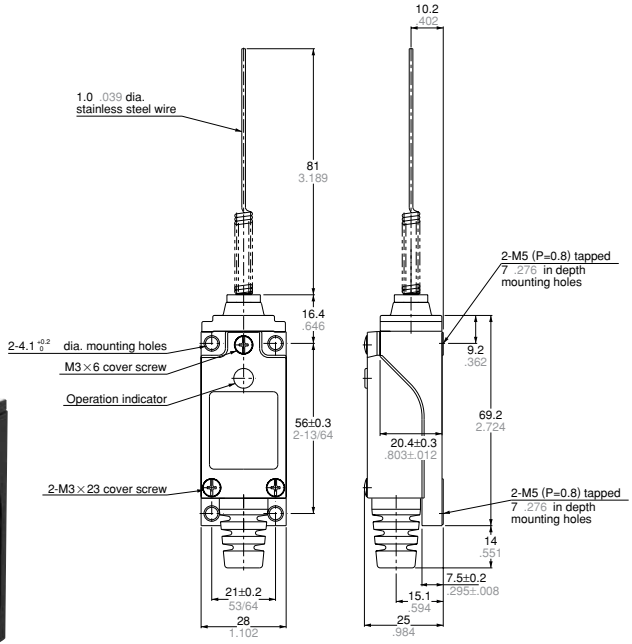
• **Free attachment type**






AZ8430
Weight: 104g

• **Wire spring type**




AZ8469

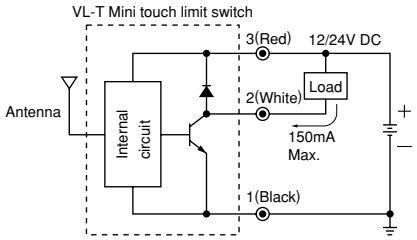
General tolerance: ±0.4 ±.016

# WIRING

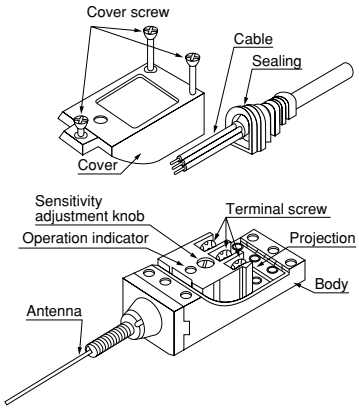
mm inch

If the wiring is miswired, the unit may be damaged. Ensure that the power ⊕ is connected to the red screw, and the ground ⊖ is connected to the black screw.

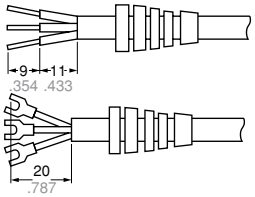
**Wiring diagram**



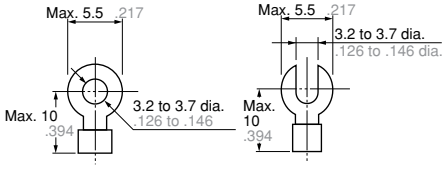

• Analysis figure




• Cable treatment




• Applicable connectors

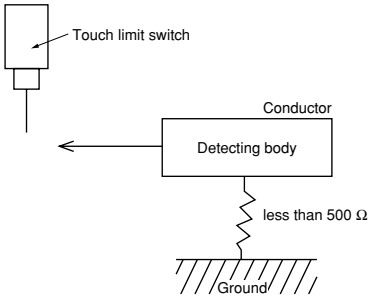



# APPLICATION HINTS

**1. Fundamental applications**

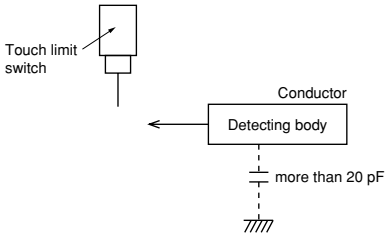
Detection of grounded objects

The resistance between objects (conductor) and ground should be less than 500Ω; if they are grounded. It has nothing to do with the volume of objects.



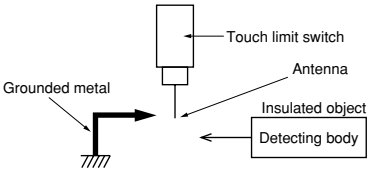

Detection of ungrounded objects

Detection is possible if the surface area of objects is large enough and electrostatic capacitance between objects and ground is more than 20 pF. (more than approx. 30 $cm^3$) For example, a human body has more than 60 pF electrostatic capacitance, therefore it can be detected.




Detection of insulated objects

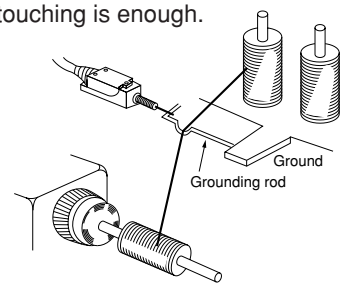
It is possible to detect insulated objects by having the antenna touch grounded metals, making use of the movement of the objects.




**2. Typical applications**

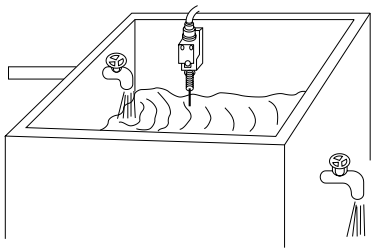
Detection of a snap of threads

When threads are snapped, the grounded rod will touch the antenna and actuate the switches. The force of the grounded rod can be small because just touching is enough.



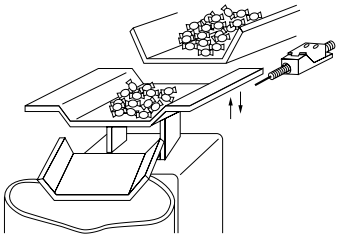

Liquid level control

The switches are actuated when the antenna touches liquid materials (conductor). Liquid level control like the detection of overflow is possible.



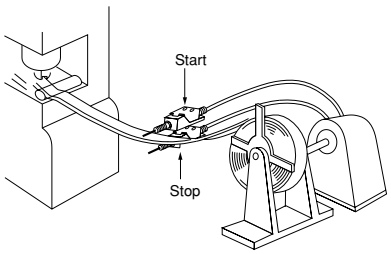
Measuring equipment

A receptacle (conductor) is lowered down by the weight of measured objects, touches the antennas and actuates the switches. As there is almost no movement differential (MD), accurate measurement is possible.



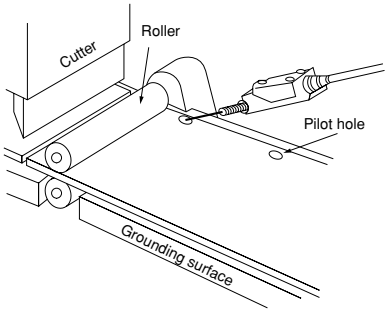
Detection of hoop materials

When hoop materials (conductor) are loosened, a motor stops and starts again when they are pulled.



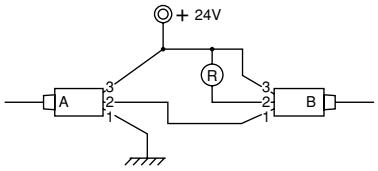

Detection of cloth and paper

When cloth and paper are removed, the antenna touches ground and actuates the switches.

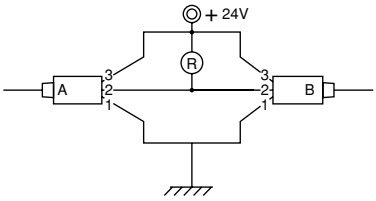


**3. Construction of logic circuits**

(1) AND circuit
Load R will operate only when both A and B touch limit switches are in detecting condition.




(2) OR circuit
Load R will operate when either A or B touch limit switch is in detecting condition.

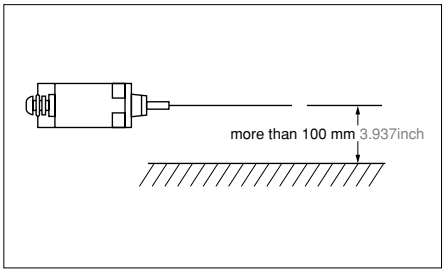



# CAUTIONS

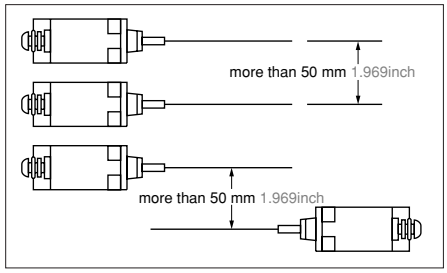
**1. Antenna**

1) Material of antenna
Any kind of material is usable if it is conductive. Protect it from oil, dirt and rust which may lead to non-conductivity.

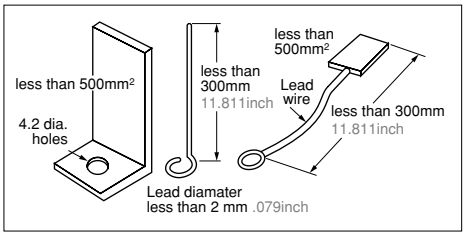
2) Distance between antenna and ground
At least 100 mm 3.937inch distance is required between antenna and earth.



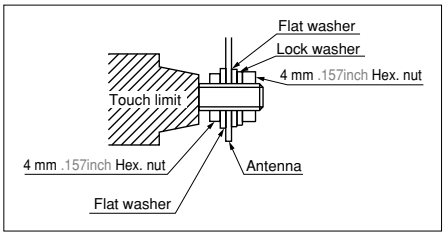

3) Distance between antennas used in parallel
More than 50 mm 1.969inch distance is required when two or more switches are used in parallel. Also, leave a distance of at least 20 mm between the VL-T mini touch limit switch bodies.



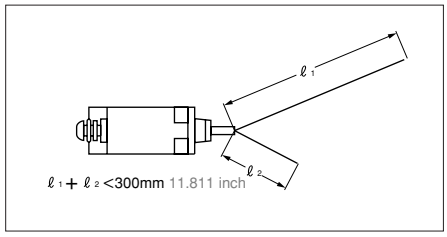

4) Limitation of free attachement antenna
Any kind of shape is usable. If it is too large, switches may malfunction. Total area should be within 500 mm² and maximum length should be 300 mm 11.811inch.




5) Mounting of free attachment antenna
Fasten it tightly using attached washers.




6) Limitation of free attachment antenna (in the case of more than one antenna)
Total length should be less than 300 mm 11.811inch for line materials (dia. <2 mm .079inch) and total area should be less than 500 mm² for metal plates.




**2. Ambient conditions**

1) Avoid using VL-T switches in the following conditions:
• In corrosive gases.
• In flammable or explosive atmospheres
2) Use within an operating voltage of 10 to 30 V (ripple factor: max. 10%)
3) Use within an ambient temperature of –20 to +60°C –4 to +140°F.
4) When VL-T detects water (conductor), its antenna can be immersed in water. Since its body is not of water tight construction, avoid using it in locations where water or oil can splash over it or dust is heavily accumulated.
5) Avoid installing lead wires or antenna of VL-T in parallel with power wire.
6) Surge absorbing elements are recommended to protect internal circuit when external surge voltage exceeds 500 V [at ± (1 × 40) μs single polarity all wave voltage].
7) When heavy static electric runs in an antenna, the internal circuit might be broken. Avoid using at the case of more than 3 kV.
8) When VL-T is operated by dry cells or batteries, DC power source with ⊕ polarity grounded by chassis, ground ⊕ or ⊖ polarity of power source.
9) It is not necessary to ground main units.

**3. Sensitivity adjustment**

1) Use a ⊖ screw driver and turn the sensitivity adjustment knob to the right (H) for higher sensitivity (Max. 20 pF) and to the left (L) for lower sensitivity (50 pF).
Max. 20 pF to min. 50 pF sensitivity adjustment is possible.
2) When you set the sensitivity, you must set it a little higher than the detection level and provide a sensitivity allowance.

**4. Refer to temperature and voltage**

Characteristics in DATA in page 69 when temperature and voltage fluctuate extremely. Testing under a practical condition is recommended.

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**COMPACT MAGNETIC LIMIT SWITCHES**

# Compact Magnelimit


**RoHS Directive compatibility information**
**http://www.nais-e.com/**

## FEATURES

**1. Combination of magnet (support) and limit switch (detection) saves on both construction and space, making it a perfect choice for equipment interlock**
**2. The built-in magnet safeguards checking of the facility's cover and gate.**
**3. Safe design prevents operator making errors.**
**4. 1 Form C (N.O., N.C.) contact construction**
**5. The product comes with three different types of weight sustainability: 9.8N{1kgf}, 29.4N{3kgf} and 49.0N{5kgf}.**
**6. Water-resistant type also available (internal switches only)**

## TYPICAL APPLICATIONS

**1. Detection of safety cover opening/closing for factory automation equipment and inspection systems, etc.**
**2. Detection of opening/closing of closet or storage-room doors.**

## PRODUCT TYPE

| Form | Specifications | | | Available standards | Part No. |
|---|---|---|---|---|---|
| | Contact construction | Case color | Sustainable weight sustainability | | |
| General #110 terminal | 1 Form C | Ash-gray | 1kgf | UL, C-UL | AZC31111G |
| | | | 3kgf | | AZC31113G |
| | | | 5kgf | | AZC31115G |
| Water-resistant #110 terminal | | | 1kgf | | AZC31211G |
| | | | 3kgf | | AZC31213G |
| | | | 5kgf | | AZC31215G |
| Water-resistant, lead wire down | | | 1kgf | | AZC31311G |
| | | | 3kgf | | AZC31313G |
| | | | 5kgf | | AZC31315G |
| Water-resistant, lead wire out | | | 1kgf | | AZC31411G |
| | | | 3kgf | | AZC31413G |
| | | | 5kgf | | AZC31415G |

Note: The unit comes with one magnetic plate. Water resistance (IP67) applies to internal switches only. Excludes exposed part of terminals, externally mounted components, and magnet catches.

## SPECIFICATIONS

### 1. Ratings

Figures in parentheses ( ) indicate rated current of water-resistant type.

| Load type / Rated voltage | Resistance load | Lamp load | Inductive load |
|---|---|---|---|
| 125V AC | 5A (2A) | 1A (0.6A) | 3A (2A) |
| 250V AC | 5A (2A) | — | 3A (2A) |
| 30V DC | 5A (2A) | — | 3A (2A) |

Note:
1. Lamp load has 10 times the inrush current.
2. Inductive load is a minimum 0.4 (AC) and time duration is maximum 7ms (DC).

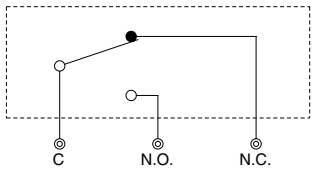
### 2. Switch operating features

| | |
|---|---|
| Operating Position (O.P.) | 0.8 mm min. (dimensions from case top) |
| Release Position (R.P.) | 2.2 mm max. (dimensions from case top) |

### 3. Capabilities overview

| | | |
|---|---|---|
| Contact | Material | AgNi |
| Electrical capabilities | Insulation resistance (initial) | Min. 100 Ω (measured at DC 500V insulation resistance) |
| | Voltage resistance | Between non-consecutive: 1000V AC/1 min. (initial) |
| | | Between each pin and uncharged metal parts: 1500V AC/1 min. |
| | | Between each pin and earth: 1500V AC/1 min. |
| Life | Mechanical life | Min. $10^5$ (ON/OFF frequency 30 times/min.) |
| | Electrical life | Min. $5\times10^4$ (resistance load 125V AC 5A) ON/OFF frequency 10 times/min. |
| Usage conditions | Ambient temperature | –20 to +80°C –4 to +176°F (but not in a frozen environment.) |
| | Ambient humidity | Max. 85% RH |
| | Tolerable operating frequency | Mechanical: 30 times/min. Electrical: 10 times/min. |
| Sustainability (when using the enclosed adhesive board) | | 9.8N {1kgf}, 29.4N {3kgf}, 49.0N {5kgf} |

## OUTPUT CIRCUIT DIAGRAM



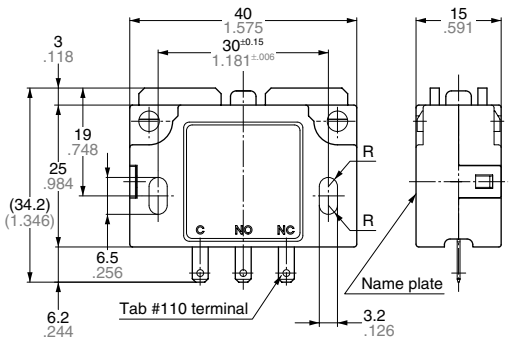

## WIRING METHOD

- Tab #110 terminal
- Lead wire

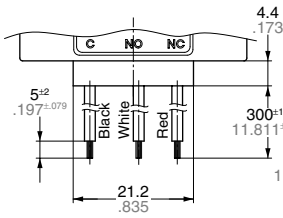
## DIMENSIONS

mm inch

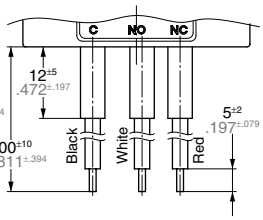
- Main unit: AZC3111∗G, AZC3121∗G



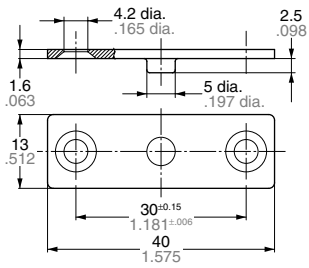

AZC3131∗G



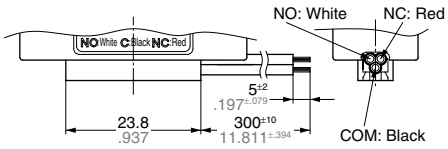

AZC3151∗G




- Magnetic plate




AZC3141∗G



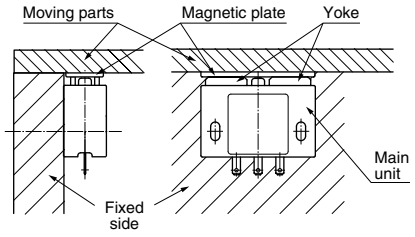

General tolerance: ±0.5 .020

## ATTACHMENT

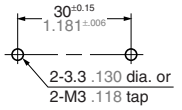
**1. Attaching the main unit**

1) Using an M3 screw, attach firmly remembering to employ a toothed washer, etc. The appropriate torque is 0.88 to 1.08N·m (9 to 11kgf·cm.)

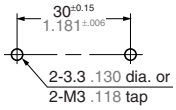
2) When moving parts such as the gate are closed, ensure that the yoke of main unit and magnetic plate are flush with each other.




Attachment hole processing dimensions for main unit



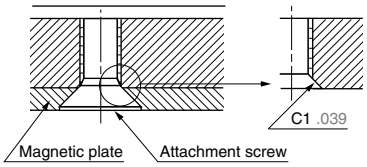

Hole processing dimensions for magnet plate



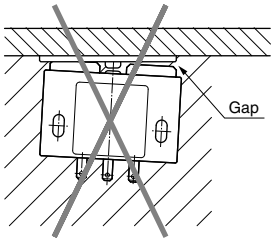

**2. Attaching the magnetic plate**

1) Install the magnetic plate using flat head screws, so that the screw heads do not protrude from the plate surface (short M3 flat head screws, and long 2.7 flat head screws).

2) Fit a C1 panel to the inlet vent of attaching moving parts for magnetic plate.




Note: Unless the magnetic plate and the yoke are flush with each other, adhesive power will be lost, and there is a risk that the switch will not operate.




**3. Wiring the tab #110 terminal**

(AZC3111∗G, AZC3121∗G)

1) Use a commercially available tab #110 terminal connector for wiring.

2) Use the three immediate-connection connectors shown below for wiring:

Product name: 7.6 mm pitch microswitch connector (3P)

Manufacturer: Nippon Tanshi Co., Ltd.

Product Number:

| Name | Product Number | Application Elec. Wiring |
|---|---|---|
| Housing | 9880 - 4203 | — |
| Receptacle | 171587 - M2 | 0.3 to 0.75mm² |

Note: This product is not sold by Matsushita Electric Works, Ltd. Please direct inquiries to:
Nippon Tanshi Co., Ltd.
Sales +81-463-30-1150

STOP Partly Order Discontinued

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SAFEGUARDED BY MAGNET BUILT-IN DETECTOR SWITCH

# Magnelimit

**RoHS Directive compatibility information**
**http://www.nais-e.com/**

## FEATURES

1. A switch that makes electrical construction possible at 100V power.
2. The built-in magnet safeguards checking of the facility cover and gate.
3. Built-in switch with accurate ON/OFF detection.
4. Combination of magnet (support) and limit switch (detection) saves on both construction and space.
5. Two types of contact: 1 Form A (ON when gate is closed), and 1 Form B (ON when gate is open.)
6. The unit case comes in three colors: Yellow, brown, and gray.
7. The product comes with three different types of weight sustainability: 1kg, 3kg, and 5kg.

## TYPICAL APPLICATIONS

Closets, Storage areas and Facilities covers

## PRODUCT TYPE

| Product name | Specifications | | | | Part No. |
|---|---|---|---|---|---|
| | Contact construction | Case color | Sustainable weight sustainability | Packaging | |
| Magnelimit 1 Form A type | 1 Form A (ON when gate is closed) | Yellow | 3kg type (29.4N {3kgf}) (Note 3) | – | AZC11013Y |
| | | | | Blister pack | STOP AZC11013YP |
| | | Brown | | – | AZC11013A |
| | | | | Blister pack | STOP AZC11013AP |
| | | Gray | | – | AZC11013H |
| | | | | Blister pack | STOP AZC11013HP |
| Magnelimit 1 Form B type | 1 Form B (ON when gate is open) | Yellow | | – | AZC11113Y |
| | | | | Blister pack | STOP AZC11113YP |
| | | Brown | | – | AZC11113A |
| | | | | Blister pack | STOP AZC11113AP |
| | | Gray | | – | AZC11113H |
| | | | | Blister pack | STOP AZC11113HP |
| Options | Metal plate (Note 1) | Metal plate (13mm × 60mm × 1.6mm .512inch × 2.362inch × .063inch) | | | AZC1801 |

Note: 1. The unit comes with an metal plate enclosed.
2. The blister pack type comes with 1 metal plate and 4 screws (2 long, 2 short) enclosed. STOP
3. Weight sustainability also comes in 1kg and 5kg types. Specify when ordering by replacing "3" with "1" for the 1kg type, and "5" for the 5kg type at the end of the part No.

## SPECIFICATIONS

### 1. Ratings

| Rated voltage \ Load type | Resistance load | Lamp load | Guidance load |
|---|---|---|---|
| 125V AC | 5A | 1.5A | 3A |
| 250V AC | 5A | – | 3A |
| 30V DC | 5A | – | 1.5A |

Note: 1. Inductive load is a minimum 0.4 (AC) and time duration is maximum 7ms (DC).
2. Lamp load has 10 times the inrush current.
3. Minute load ratings: 5mA 6V DC, 1mA 24V DC.

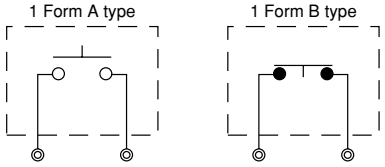
### 2. Switch operating features

| | |
|---|---|
| Pretravel (P.T.) | 1.8mm .071inch max. |
| Movement differential (M.D.) | 0.2 to 0.8 mm |
| Release position (R.P.) | 4.0mm .157inch max. |

### 3. Capabilities overview

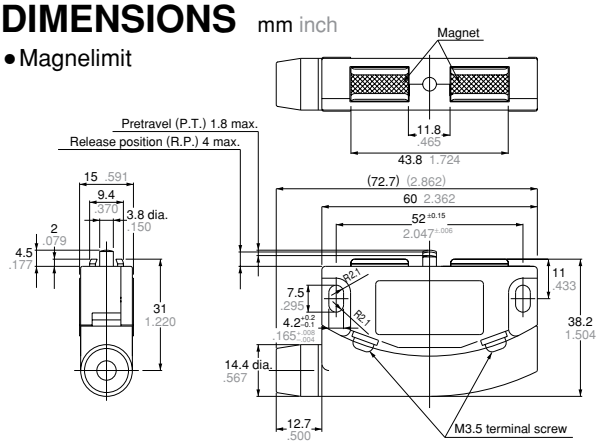
| | | |
|---|---|---|
| Contact | Material | Au clud Ag alloy (Cadmium free) |
| Electrical capabilities | Insulation resistance (initial) | Min. 100Ω (measured at 500V DC insulation resistance) |
| | Voltage resistance | Contact distance: 1000V AC/1 min. (initial)<br>Distance between each pin and uncharged metal parts: 2100V AC/1 min.<br>Distance between each pin and earth: 2100V AC/1 min. |
| Mechanical capabilites | Vibration resistance | 10 to 55 Hz, double amplitude of 1.5 mm |
| | Shock resistance | 294 m/s² (equivalent 30G) |
| Life | Mechanical life | Min. 100 thousand times (ON/OFF frequency 60 times/min.) |
| | Electrical life | Min. 50 thousand times (resistance load AC 250V 5A)<br>Min. 30 thousand times (lamp load AC 125V 1.5V)<br>ON/OFF frequency 20 times/min. |
| Protective capabilities | | IP40 |
| Usage conditions | Ambient temperature | –20 to +80°C –4 to 176°F (but not in a frozen environment.) |
| | Ambient humidity | Max. 95% RH |
| | Tolerable operating frequency | Mechanical: 60 times/min.<br>Electrical: 20 times/min. |
| Sustainability (when using the enclosed metal plate) | | 1kg (9.8N {1kgf}), 3kg (29.4N {3kgf}), 5kg (49N {5kgf}) |

## OUTPUT CIRCUIT DIAGRAM

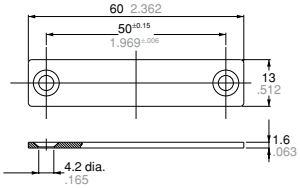



## DIMENSIONS mm inch

● Magnelimit




● Metal plate



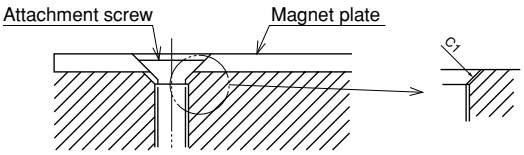
# ATTACHMENT

**• Attaching the main unit**

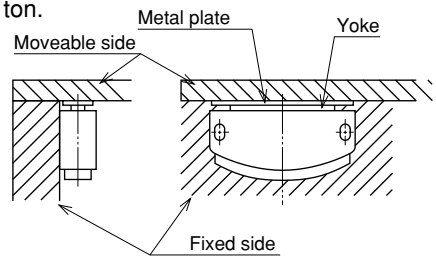
1. Using an M4 screw, attach firmly remembering to employ a washer, etc. The appropriate torque is 1.18 to 1.47N (12 to 15kg/cm.)
2. When moveable parts such as the gate are closed, ensure that the yoke and metal plate are flush with each other.

**• Attaching the metal plate**

1. Using an M3 dish screw, attach to the side opposite from the yoke. Pay particular attention that the head of the attached screw does not protrude further than the surface of the metal plate (if using wooden screws, a call of 2.7 is optimum.)

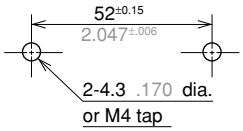



3. Attach making sure that no load is being applied diagonally to the pushbutton.

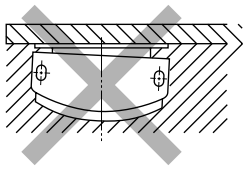



2. If the adhesive side is magnetic (metal plate), the adhesion may prove ineffective. Further, since the sustainability varies depending on the board thickness and the surface processing (paint, etc.), it is best to check beforehand.

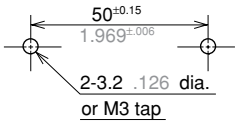
Unit attachment hole processing dimensions




Unless the metal plate and the yoke are flush with each other, adhesive power will be lost, and there is a risk that the switch will not operate.



Adhesion board hole processing dimensions




(Fit a C1 panel to the inlet vent)

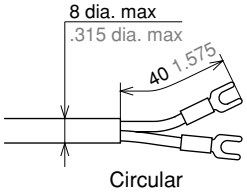
# SUITABLE WIRING

**• Maximum external dimensions upon completion**

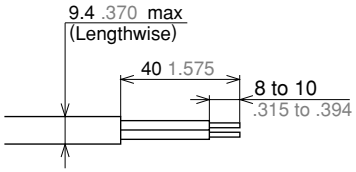
Circular: 8mm dia. .315 inch dia. max.
Flat: Lengthwise 9.4mm .370inch max.
(VVF 2 cores, conductor radius 1.6 dia.)

**• Wiring processing dimensions**

Refer to the diagram below for the wiring processing dimensions




Circular



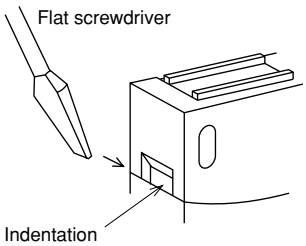

Flat (VVF 2 cores, conductor radius 1.6 .063 dia)

# WIRING

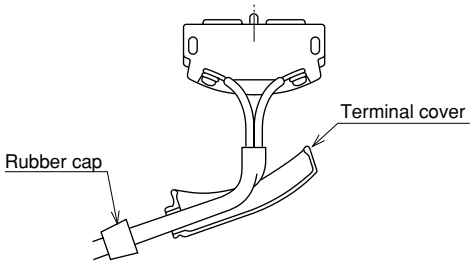
• Terminal uses a M3.5 angle washer attachment.
• During wiring work, do not connect the lead wire directly to the terminal, but via a crimp contact. However, this excludes single wiring.
• Wiring by solder should be avoided.

1. Wiring method

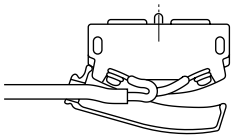
Insert a flat screwdriver into the indentation of the product side, and remove the terminal cover.




2. Slide the rubber cap and the terminal cover over the wire, as shown in the illustration then attach a crimp contact to the terminal. The torque applied to the terminal screw should be within the range of 0.39 to 0.59 N·m (4 to 6 kg/cm).




3. If using a VVF wire, bend the wire towards the unit, and once it has taken the proper shape, install the terminal cover. After installing the terminal cover, attach the rubber cap.



# CAUTIONS FOR USE

• Because the magnelimit is not waterproof, avoid using in areas where it may be splashed with either water or oil. Also, avoid using in locations where dust may accumulate.
• Do not use in atmospheres where the unit may directly come into contact with any kind of organic solvent, strong acid or alkaline liquids, or combustible or corrosive gasses.
• Avoid using in silicon environments such as organic silicon-based rubber, solvents, sealants, oil, grease, or wiring.
• The moveable parts on the magnelimit such as the gates are equipped with a stopper, so avoid attachments that require them to bear the full load.
• In order to improve reliability under actual working conditions, check the quality under as close to actual working conditions as possible.
• This magnelimit has a built-in electromagnet. For this reason, take care not to place floppy disks, magnetic cards, or other magnetic recording mediums near the unit, as the data may be corrupted or lost.

STOP **Order Discontinued as of March 31, 2009**

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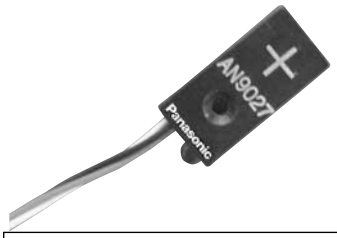
**MAGNETIC CLOSE CONTACT SWITCH**

# PS Hall Sensor

## A compact and lightweight position detection sensor




**RoHS Directive compatibility information**
**http://www.nais-e.com/**

## FEATURES

**1. Compact and lightweight**
Subminiature 10 × 20 × 5mm (.394 ×.787 ×.197inch) size, and ultra-light-weight at approximately only 10g .35oz even with the cable, means space-saving when it comes to machine attachments.

**2. Absolutely no effect from light or dust**
Because the sensor is magnetically operated, ternal light and dust has no effect on the unit.

**3. With LED display**
Operations can be easily checked with the LED display.

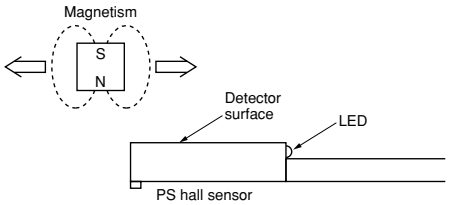
## SPECIFICATIONS

| | |
|---|---|
| Power voltage Vcc | 4.5 to 15V DC |
| Current consumption | Max. 17mA |
| Output current capacity | Max. 15mA |
| Rise and shutdown time | Max. 1 µsec. (When Vcc = 12V Load resistance 820Ω Output cord 1.2m) |
| Output saturation voltage | Max. 0.4 (when output current capacity is 15mA) |
| Response frequency | Min. 1KHz |
| Standard detection electromagnet | Rare earth magnet [(BH) max. = 20MGOe] 5 dia.× 2 |
| Detection distance | 2. 5mm .098inch |
| Settings distance | 0 to 2mm 0 to .079inch |
| Movement differential | 1. 5mm .059inch max. at set distance of 1mm .039inch. |
| Electromagnet polarity | Sensor detected at [N] pole. *No detection at [S] pole. |
| Ambient temperature | 0°C to +55°C +32°F to +131°F |
| Storage temperature | –10°C to 70°C +14°F to +158°F |
| Insulation resistance | 50MΩ (at DC 500V mega) (between lead wire and attachment board) |
| Voltage resistance | AC 500V 1 min. (between lead wire and attachment board) |
| Vibration resistance | 10 to 55Hz amplitude 1.5mm .059inch 2 hours X, Y, Z each direction |
| Shock absorption | 490m/s² {50G} X, Y, Z each axis three times each |

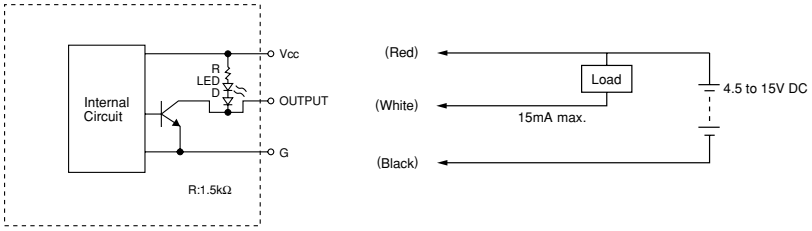
*These characteristics occur when there is no strong magnetic body (iron, etc.) near either the magnet or the sensor, and no external magnetic field either.

## OPERATION EXPLANATION

The PS hall sensor is a proximity switch that detects magnet. When magnet approaches the ON type while it is operating, the operating lamp (LED) illuminates.
The OFF type operates as an opposite detection way of the ON type.




## Output circuit diagram




## TYPICAL APPLICATIONS

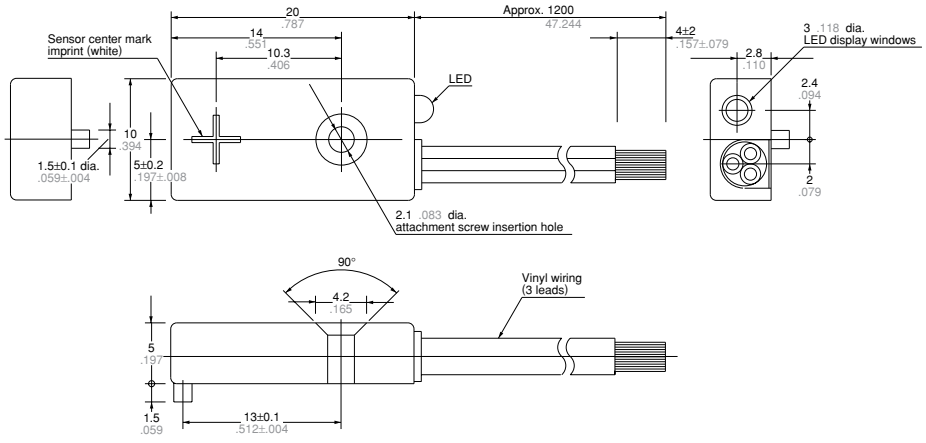
Position fixing for assembly and processing equipment, and position detection of limit detection cylinders.
Open/close verification of PPC doors

## PRODUCT TYPE

| Specifications | | Part No. |
|---|---|---|
| Sensor unit only | ON during operation type | AN9027 |
| | OFF during operation type | AN9028 |

## DIMENSIONS

mm inch



# Table of Recommended Substitute Products for Discontinued Products

| Products to be discontinued | Recommended substitute products | Page |
|---|---|---|
| AZ1 series Limit switches | ML (AZ7) Limit switches | P.33 |
| AZ2 series Limit switches | ML (AZ7) Limit switches | P.33 |
| Slitted type Limit switches (AZ6) | ML (AZ7) Limit switches | P.33 |
| New slitted type Limit switches (AZ66) | ML (AZ7) Limit switches | P.33 |

| Products to be discontinued | Recommended substitute products | Installation |
|---|---|---|
| AZ1***   | AZ7***  | Please note that installation method and operation characteristics are different. |
| AZ2***  | AZ7***  | Please note that installation method and operation characteristics are different. |
| AZ6***  | AZ7***  | Please note that installation method and operation characteristics are different. |
| AZ66***  | AZ7***  | Please note that installation method and operation characteristics are different. |

# FOREIGN STANDARDS OVERVIEW

## 1. International Standards

**IEC standard**

**International Electrotechnical Commission**
By promoting international cooperation toward all problems and related issues regarding standardization in the electrical and electronic technology fields, the IEC, a non-governmental organization, was started in October, 1908, for the purpose of realizing mutual understanding on an international level. To this end, the IEC standard was enacted for the purpose of promoting international standardization.

## 2. North America

**UL (Underwiters Laboratories Inc.)**
This is a non-profit testing organization formed in 1894 by a coalition of U.S. fire insurance firms, which tests and approves industrial products (finished products). When electrical products are marketed in the U.S., UL approval is mandated in many states, by state law and city ordinances. In order to obtain UL approval, the principal parts contained in industrial products must also be UL-approved parts.

LISTING MARK

Fig. 1

RECOGNITION MARK

Fig. 2

UL approval is divided into two general types. One is called “listing” (Fig. 1), and applies to industrial products (finished products). Under this type of approval, products must be approved unconditionally. The other type is called “recognition” (Fig. 2), and is a conditional approval which applies to parts and materials.

**CSA (Canadian Standards Association)**
This was established in 1919 as a non-profit, non-governmental organization aimed at promoting standards. It sets standards for industrial products, parts, and materials, and has the authority to judge electrical products to determine whether they conform to those standards. The CSA is the ultimate authority in the eyes of both the government and the people in terms of credibility and respect. Almost all states and provinces in Canada require CSA approval by law, in order to sell electrical products. As a result, electrical products exported from Japan to Canada are not approved under Canadian laws unless they have received CSA approval and display the CSA mark. Approval is called “certification”, and products and parts which have been approved are called “certified equipment”, and display the mark shown in Fig. 3. The mark shown in Fig. 4 is called the “Component Acceptance” mark, and indicates conditional approval which is applicable to parts. The C-UL mark shown in Fig. 5 (finished products) and Fig. 6 (parts) indicates that the product has been tested and approved in UL laboratories, based on UL and CSA standards, through mutual approval activities.

Certification

Fig. 3

Component Acceptance

Fig. 4

Fig. 5

Fig. 6

## 3. Europe

**EN standard**

**European Standards/Norme Europeennee (France)/Europaishe Norm (Germany)**
Abbreviation for European Standards. A unified standard enacted by CEN/CENELEC (European Standards Committee/European Electrical Standards Committee). EU and EFTA member nations employ the content of the EN standards into their own national standards and are obligated to abolish those national standards that do not agree with the EN standards.

**(1) Germany**

**VDE (Verband Deutscher Elektrotechniker)**
The VDE laboratory was established mainly by the German Electric Technology Alliance, which was formed in 1893. It carries out safety experiments and passes approval for electrical devices and parts. Although VDE certification is not enforced under German law, punishment is severe should electrical shock or fire occur; therefore, it is, in fact, like an enforcement.

**TÜV (Technischer Überwachungs-Verein)**
TÜV is a civilian, non-profit, independent organization that has its roots in the German Boiler Surveillance Association, which was started in 1875 for the purpose of preventing boiler accidents. A major characteristic of TÜV is that it exists as a combination of 14 independent organizations (TÜV Rheinland, TÜV Bayern, etc.) throughout Germany. TÜV carries out inspection on a wide variety of industrial devices and equipment, and has been entrusted to handle electrical products, as well, by the government. TÜV inspection and certification is based mainly on the VDE standard.
TÜV certification can be obtained from any of the 14 TÜVs throughout Germany and has the same effectiveness as obtaining VDE certification.

# SAFETY STANDARDS RECOGNITION

## Limit switches

| Product name | | UL recognized | | CSA certified | | TÜV approval | |
|---|---|---|---|---|---|---|---|
| | | File No. | Approved ratings | File No. | Approved ratings | File No. | Approved ratings |
| SL limit switches | | E122222 | 4A 250V AC | LR55880 | 4A 250V AC | – | – |
| HL limit switches | Dies-cast case standard load type | E122222 | 5A 250V AC<br>Pilot duty B300 | LR55880 | 5A 250V AC<br>Pilot duty B300 | J9650514 | DC-12 1A 30V- |
| | Die-cast case low level load type (includes connector type) | | 0.1A 30V DC | | 0.1A 30V DC | | DC-12 0.1A 30V- |
| | Plastic case standard load type | | 5A 250V AC<br>Pilot duty B300 | | 5A 250V AC<br>Pilot duty B300 | J9650515 | AC-15 2A 250V~<br>DC-12 1A 30V- |
| | Plastic case low level load type | | 0.1A 30V DC | | 0.1A 30V DC | | DC-12 0.1A 30V- |
| ML limit switches | Standard type | E122222 | 10A 250V AC | E122222 (C-UL) | 10A 250V AC | J9551204 | AC-15 2A 250V~ |
| | Epoxy-sealed terminal type | – | – | – | – | – | – |
| | With lamp | – | – | – | – | – | – |
| QL limit switches | | E122222 | 5A 250V AC | LR55880 | 5A 250V AC | – | – |
| VL limit switches | Standard type | E122222 | 5A 250V AC<br>Pilot duty B300 | E122222 (C-UL) | 5A 250V AC<br>Pilot duty B300 | J9551203 | AC-15 2A 250V~ |
| | With neon lamp | | | | | – | – |
| DL limit switches | | E122222 | 6A 380V AC<br>Pilot duty A300 | E122222 (C-UL) | 6A 380V AC<br>Pilot duty A300 | J9551205 | AC-15 2A 250V~ |
| Vertical limit switches | | E99838 | 10A 1/2HP 125V AC<br>6A 1/2HP 250V AC | – | – | – | – |
| Compact Magnelimit | Standard type | E43149 | 5A 250V AC | E43149 (C-UL) | 5A 250V AC | – | – |
| | Water-resistant type | | 2A 250V AC | E43149 (C-UL) | 2A 250V AC | – | – |
| Magnelimit | | E122222 | 5A 250V AC<br>Pilot duty B300 | E122222 (C-UL) | 5A 250V AC<br>Pilot duty B300 | – | – |

# CE MARKINGS OVERVIEW

## Limit switches conforming to EN/IEC standards

The limit switches shown below conform to both EN and IEC standards, and may display the CE markings.

| Product classification | Product name | Suitable standard | Approving body | File No. |
|---|---|---|---|---|
| Limit switches | HL | EN60947-5-1 | TÜV | J9650514/J9650515 |
| | ML | EN60947-5-1 | TÜV | J9551204 |
| | VL | EN60947-5-1 | TÜV | J9551203 |
| | DL | EN60947-5-1 | TÜV | J9551205 |
| | Magnelimit | EN60947-5-1 | – | – |

Note: Refer to the page for each individual product for detailed approval conditions and approved types. Moreover, the HL limit switch alone does not display the CE mark as standard. If the CE mark is necessary, add (CE) to the end of the part No. when ordering.

## What are EN standards?

An abbreviation of Norme Europeenne (in French), and called European Standards in English. Approval is by vote among the CEN/CENELEC member countries, and is a unified standards limited to EU member countries, but the contents conform to the international ISO/IEC standards.

If the relevant EN standard does not exist, it is necessary to obtain approval based on the relevant IEC standard or, if the relevant IEC standard does not exist, the relevant standard from each country, such as VDE, BS, SEMKO, and so forth.

## CE markings and EC directives

The world's largest single market, the European Community (EC) was born on 1 January 1993 (changing its name to EU in November 1993. It is now always expressed as EU, apart from EC directives.) EU member country products have always had their quality and safety guaranteed according to the individual standards of each member country. However, the standards of each country being different prevented the free flow of goods within the EU. For this reason, in order to eliminate non-tariff barriers due to these standards, and to maximize the merits of EU unification, the EC directives were issued concomitant to the birth of the EU.

The EN standards were established as universal EU standards in order to facilitate EU directives. These standards were merged with the international IEC standards and henceforth reflect the standards in all countries. Also, the CE markings show that products conform to EC directives, and guarantee the free flow of products within the EC.

## Appropriate EC directives for control equipment products

The main EC directives that are to do with machinery and electrical equipment are the machinery directive, the EMC directive, the low voltage directive, and the telecom directive. Although these directives have already been issued, the date of their enactment is different for each one. The machinery directive was 1 January 1995. The EMC directive was 1 January 1996, and the low voltage directive was enacted from 1 January 1997. The telecom directive was established by the separate CTR (Common Technology references.)

# INDEX

## AN



## AZ



## AZC



## AZD



## AZH