Panasonic
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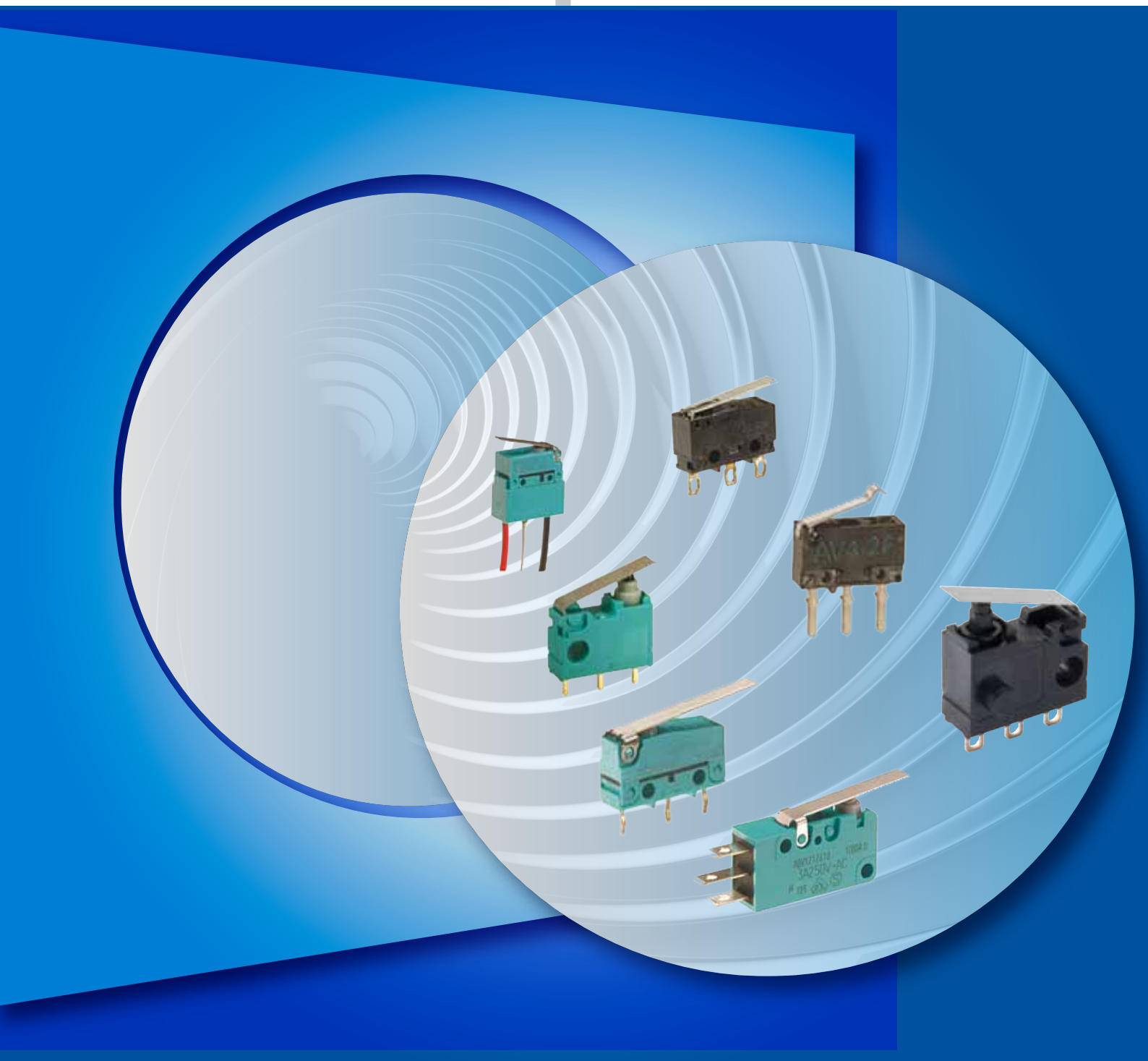
# GENERAL CATALOG

SWITCHES



Development cycles in modern industry are becoming ever shorter and more complex, and they require a high degree of engineering. Components integrated into machines must therefore not only meet the current qualitative and technical standards but must also fulfill functional and application demands. Individual products can often only be integrated after they have been customized.

Panasonic Electric Works has always stood for product innovation – also when it comes to mechanical switches. Our immense portfolio includes switches in all common sizes and with various IP degrees of protection, and are guaranteed to cover all standard requirements. Our switches are characterized by a large switching capacity range, long lifetime and exceptional reliability. A wide selection of supplemental actuators coupled with various terminal styles, e.g. solder, quick connect, PC board terminal and cable connections, maximize flexibility and ease application design.

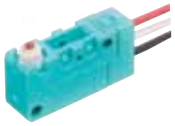
In addition, we concentrate on the development and implementation of customer-specific solutions: Does the cable have to be a little bit longer? Or is a pluggable solution necessary? With the engineering know-how at our European manufacturing sites, we guarantee flexible, on-time delivery and provide immediate, on-site technical support.

## Product lineup

ASQ

ABJ

ABS



ABV

AV4 AH1

AEQ

AV3/AVM3/AVT3/AVL3

AV6

AM5

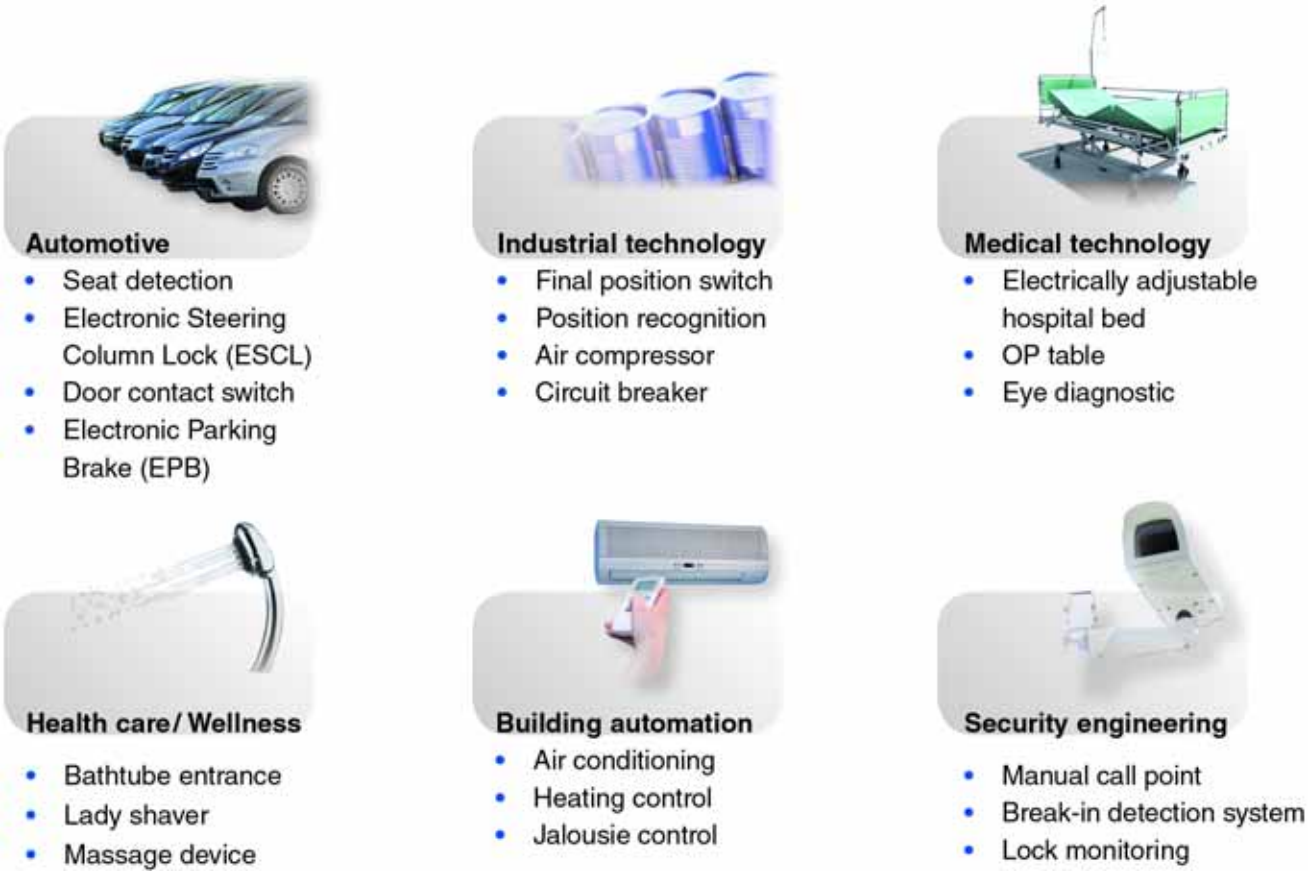
AM1 AV1 AGX AJ7/8 T Series

## Tailoring equipment

# Contents



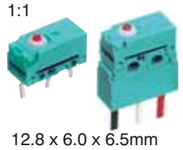
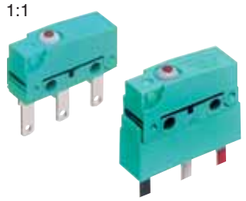
# Application areas



About this Selector Chart

This selector chart is designed to help you quickly select a switch best suited for your needs. Please note: the values given for switching current and switching voltage do not necessarily indicate standard operating conditions. For the nominal switching capacity and other critical values, please refer to the respective data sheet or contact your Panasonic representative.

Actuator Symbols: Push-button, Toggle, Rocker

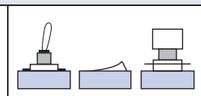
| Type (Picture scale: DIN A4) | Features | Switching current | Contact types | Contact material | Switching voltage (max.) | | Ambient temperature | Service life (min.) | | Operating force on pin in N (max.) | Connection types | Actuator | Degree of protection | Page Approvals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VDC | VAC | | Mechanical | Electrical | | | | | |
| **Micro switches IP67** | | | | | | | | | | | | | | |
| **ASQ**<br>1:1<br>  <br>13.3 x 5.4 x 10.1mm | • Ultra miniature design with slide contact<br>• Over-travel 2.5mm<br>• Noiseless switching<br>• Side operation possible<br>• High contact reliability | 1mA to 100mA | SPDT, SPST-NC, SPST-NO | Ag/Au | 30 | — | -40°C to +85°C | 1,000,000 | 500,000 | 1.7 | • Solder<br>• PCB<br>• Lead wire | • Pin plunger<br>• Hinge lever<br>• Simulated roller lever | IP67 | 18<br>— |
| **ABJ**<br>1:1<br>  <br>12.8 x 6.0 x 6.5mm<br>13.9 x 6.0 x 12.5mm | • Ultra miniature design<br>• Highly resistant to environmental conditions<br>• Frost-resistant | 1mA to 2A | SPDT, SPST-NC, SPST-NO | Ag/Au | 30 | 125 | -40°C to +85°C | 1,000,000 | 30,000/<br>100,000 | 1.96 | • Solder<br>• PCB<br>• Lead wire | • Pin plunger<br>• Roller lever<br>• Hinge lever<br>• Simulated roller lever<br>• Other | IP67 | 29<br>UL, CSA |
| **ABS**<br>1:1<br>  <br>19.8 x 6.4 x 11.1mm<br>21.2 x 6.4 x 16.9mm | • Subminiature design<br>• Highly resistant to environmental conditions<br>• Frost-resistant | 1mA to 2A | SPDT, SPST-NC, SPST-NO | Ag/Au 3-layer contact | 30 | 250 | -40°C to +85°C | 5,000,000 | 50,000/<br>200,000 | 1.47 | • Solder<br>• PCB<br>• Lead wire<br>• Quick connect | • Pin plunger<br>• Roller lever<br>• Hinge lever<br>• Simulated roller lever<br>• Other | IP67 | 40<br>UL, CSA,<br>VDE, SEMKO |
| **ABV**<br>1:1<br>  <br>33.0 x 15.9 x 13.0mm | • Miniature design<br>• Highly resistant to environmental conditions<br>• Frost-resistant | 1mA to 5A | SPDT, SPST-NC, SPST-NO | Ag/Au | 30 | 250 | -40°C to +85°C | 5,000,000 | 100,000/<br>1,000,000 | 2.94 | • Lead wire<br>• Quick connect | • Pin plunger<br>• Roller lever<br>• Hinge lever<br>• Simulated roller lever<br>• Other | IP67 | 51<br>UL, CSA,<br>VDE, SEMKO |

| Type (Picture scale: DIN A4) | Features | Switching current | Contact types | Contact material | Switching voltage (max.) | | Ambient temperature | Service life (min.) | | Operating force on pin in N (max.) | Connection types | Actuator | Degree of protection | Page Approvals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VDC | VAC | | Mechanical | Electrical | | | | | |
| **Micro switches IP40** | | | | | | | | | | | | | | |
| **Basic switches** | | | | | | | | | | | | | | |
| **AM1**<br>1:2<br>  <br>49.2 x 17.5 x 24.1mm | • End of travel limit switch<br>• High precision and long service life<br>• Oil-proof design available | 10mA to 10A | SPDT | Ag | 250 | 480 | -25°C to +80°C | 20,000,000 | 500,000 | 3.63 | • Solder<br>• Screw | • Standard plunger<br>• Roller lever<br>• Simulated roller lever<br>• Straight lever<br>• Other | IP40 | 60<br>UL, CSA |
| **Miniature switches** | | | | | | | | | | | | | | |
| **AM5**<br>1:1<br>  <br>29.6 x 10.3 x 15.9mm | • Miniature design<br>• Wide variety of types<br>• Inrush current to 160 A<br>• Type available with contact gap > 1mm | 100mA to 16A | SPDT, SPST-NC, SPST-NO | Ag/Au | 125 | 250 | -25°C to +105°C | 10,000,000 | 100,000/<br>2,000,000 | 3.92 | • Solder<br>• Quick connect | • Pin plunger<br>• Roller lever<br>• Hinge lever<br>• Simulated roller lever<br>• Other | IP40 | 68<br>UL, CSA, VDE, SEMKO, ENEC |
| **Subminiature switches** | | | | | | | | | | | | | | |
| **AV3, AVM3, AVT3, AVL3**<br>1:1<br>  <br>19.8 x 6.4 x 11.1mm | • Subminiature design<br>• Wide variety of types<br>• High-capacity type available for 10A<br>• Long service life | 1mA to 5A | SPDT | Ag/Au 3-layer contact | 125 | 250 | -25°C to +85°C | 500,000/<br>30,000,000 | 50,000/<br>200,000 | 1.47 | • Solder<br>• PCB<br>• Quick connect | • Pin plunger<br>• Roller lever<br>• Simulated roller lever<br>• Hinge lever<br>• Other | IP40 | 86<br>UL, CSA, VDE, SEMKO |
| **AV3 (FS)**<br>(Contact gap > 1mm)<br>1:1<br>  <br>19.8 x 6.4 x 11.1mm | • Contact gap more than 1mm<br>• Subminiature design<br>• Conforming to IEC60950-1 | 100mA to 3A | SPDT | Ag | 30 | — | -25°C to +85°C | 500,000 | 10,000 | 1.47 | • Solder<br>• PCB<br>• Quick connect | • Pin plunger<br>• Short hinge lever<br>• Hinge lever<br>• Long hinge lever<br>• Simulated roller lever<br>• Roller lever<br>• Other | IP40 | 99<br>UL, CSA, VDE, SEMKO under application |
| **AV6**<br>1:1<br>  <br>29.2 x 10.0 x 7.0mm | • Subminiature design<br>• Connector type for simple connections | 1mA to 100mA | SPST-NC<br>SPST-NO | Au | 30 | — | -25°C to +85°C | 500,000 | 200,000 | 1.50 | • Connector | • Pin plunger<br>• Roller lever<br>• Simulated roller lever<br>• Hinge lever<br>• Other | IP40 | 101<br>UL, CSA |

| Type (Picture scale: DIN A4) | Features | Switching current | Contact types | Contact material | Switching voltage (max.) | | Ambient temperature | Service life (min.) | | Operating force on pin in N (max.) | Connection types | Actuator | Degree of protection | Page Approvals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VDC | VAC | | Mechanical | Electrical | | | | | |
| **Ultraminiature switches** | | | | | | | | | | | | | | |
| **AEQ**<br>1:1<br>  <br>13.3 x 5.4 x 10.1mm | • Subminiature design<br>• Handles low level loads 100µA/3VDC to 100mA/30VDC | 100µA to 100mA | SPDT | Au | 30 | — | -40°C to +85°C | 200,000 | 100,000 | 1.7 | • Solder<br>• PCB | • Pin plunger<br>• Leaf lever<br>• Simulated leaf lever | IP40 | 81<br>— |
| **AH1**<br>1:1<br>  <br>12.8 x 6.0 x 6.5mm | • Ultra miniature design<br>• Flux-resistant<br>• Gold contact available for low loads | 1mA to 3A | SPDT, SPST-NO | Ag/Au | 30 | 125 | -25°C to +80°C | 1,000,000 | 30,000/ 100,000 | 1.47 | • Solder<br>• PCB | • Pin plunger<br>• Simulated roller lever<br>• Hinge lever | IP40 | 106<br>UL, CSA |
| **AV4**<br>1:1<br>  <br>7.5 x 2.5 x 4.5mm | • Super miniature design | 1mA to 0.5A | SPDT | Ag/Au | 30 | — | -25°C to +85°C | 300,000 | 20,000/ 200,000 | 0.98 | • Solder<br>• PCB | • Pin plunger<br>• Simulated roller lever<br>• Hinge lever | IP40 | 111<br>— |
| **Interlock switches** | | | | | | | | | | | | | | |
| **AGX**<br>1:1<br>  <br>27.0 x 14.6/27.2 x 24.6mm | • Door interlock switch<br>• Contact gap more than 4mm<br>• Snap-in fixing<br>• Separate signal and switching contacts for 3 Form A type | 10mA to 10.1A | SPST-NO | Ag | 48 | 250 | -25°C to +85°C | 1,000,000 | 100,000 | 5.88 | • Quick connect |  | IP40 | 117<br>UL, CSA, VDE, SEMKO, ENEC |
| **AV1**<br>1:1<br>  <br>30.0 x 12.4 x 34.0mm | • Door interlock switch<br>• Snap-in/screw fixing<br>• Contact gap 8mm for 2 Form A/3 Form A snap-in mounting type | 10mA to 10.1A | SPST-NC<br>SPST-NO | Ag | 30 | 250 | -25°C to +85°C | 1,000,000 | 100,000 | 9.81 | • Quick connect |  | IP40 | 121<br>UL, CSA, VDE, ENEC |

| Type (Picture scale: DIN A4) | Features | Switching current | Contact types | Contact material | Switching voltage (max.) | | Ambient temperature | Service life (min.) | | Operating force on pin in N (max.) | Connection types | Actuator | Degree of protection | Page Approvals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VDC | VAC | | Mechanical | Electrical | | | | | |
| **Detection switches** | | | | | | | | | | | | | | |
| **AHF2**<br>1:1<br>  <br>9.3 x 9.5mm | • Photo sensor inside | Photo transistor. Please refer to the data sheet. | Operation angle: 25° to 60° | — | — | — | -20°C to +80°C | 100,000 | 100,000 | — | • PCB | • Photo sensor | — | 126<br>— |
| **Micro operator switches IP40** | | | | | | | | | | | | | | |
| **Rocker switches** | | | | | | | | | | | | | | |
| **AJ8S**<br>1:1<br>  <br>29.8 x 21.7 x 29.5mm | • Power switch with a contact for low level current, i.e. HDD protection<br>• Inrush current to 160A<br>• Complies with EN61058-1 class II insulation grade<br>• Insulation distance: 8mm<br>• Contact gap: 3mm | 10mA to 16A | ON - OFF | Power: Ag<br>Signal: Au-plated | 5 per signal section | 250 per power section | -25°C to +85°C | 50,000 | 10,000 | — | • Quick connect |  | IP40 | 158<br>UL, C-UL, TÜV |
| **AJ8R**<br>With trip function<br>1:1<br>  <br>29.8 x 21.7 x 29.5mm | • Power switch with coil operated reset function<br>• Inrush current to 160A<br>• Good feel of switch operation<br>• Complies with IEC61058-1 | 10mA to 16A | ON - OFF | Ag | 30 | 250 | 0°C to +60°C | 50,000 | 10,000 | — | • Quick connect |  | IP40 | 176<br>UL, C-UL, TÜV, SEMKO |

| Type (Picture scale: DIN A4) | Features | Switching current | Contact types | Contact material | Switching voltage (max.) | | Ambient temperature | Service life (min.) | | Operating force on pin in N (max.) | Connection types | Actuator | Degree of protection | Page Approvals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VDC | VAC | | Mechanical | Electrical | | | | | |
| **AJ7**<br>1:1<br>  <br>28.0 x 12.5/21.0 x 16.0mm | • Power switch for safety requirements<br>• Standard and wide actuator types available<br>• Insulation distance 8mm<br>• Contact gap 3mm<br>• Inrush current to 100A<br>• TV-5 type available | 10mA to 10A | ON - OFF | Ag | 30 | 250 | -25°C to +85°C | 50,000 | 10,000 | — | • Quick connect<br>• Solder<br>• PCB |  | IP40 | 167<br>UL, C-UL, ENEC, VDE |
| **AJ8**<br>1:1<br>  <br>28.0 x 12.5/21.0 x 16.0mm | • Power switch for safety requirements<br>• Standard and wide actuator types available<br>• Insulation distance 8mm<br>• Contact gap 3mm<br>• Inrush current to 160A<br>• TV-8 type available | 10mA to 16A | ON - OFF | Ag | 30 | 250 | -25°C to +85°C | 50,000 | 10,000 | — | • Quick connect<br>• Solder<br>• PCB |  | IP40 | 176<br>UL, C-UL, ENEC, VDE |

| Type (Picture scale: DIN A4) | Features | Switching current | Switching function | Contact material | Switching voltage (max.) | | Ambient temperature | Service life (min.) | | Switching contact | Connection types | Actuator | Degree of protection | Page Approvals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VDC | VAC | | Mechanical | Electrical | | | | | |
| **Toggle switches** | | | | | | | | | | | | | | |
| **T15**<br>1:1<br>  <br>29.0 x 15.8 x 23.7mm | • Toggle, rocker and push-button switches with safety design<br>• Contact gap more than 3mm<br>• Degrees of protection up to IP67<br>• Rubber cap available for excellent weather resis-tance | 10mA to 15A | • On-Off<br>• On-On<br>• On-Off-On<br>• On-(On)<br>• (On)-Off-(On)<br>• On-Off-(On) | Ag | 250 | 250 | -25°C to +70°C | 100,000 | 50,000 | 1-pole, 2-pole, 3-pole, 4-pole | • Solder<br>• Screw<br>• Quick connect<br>• Lead wire |  | IP40<br>IP60<br>IP67 | 134<br>UL, C-UL |
| **T10**<br>1:1<br>  <br>29.0 x 15.8 x 23.7mm | • Toggle switches with safety design<br>• Rubber cap available for excellent weather resis-tance<br>• Terminal construction for easy soldering work | 10mA to 10A | • On-Off<br>• On-On | Ag | 250 | 250 | -25°C to +70°C | 100,000 | 30,000 | 1-pole, 2-pole | • Solder |  | IP40 | 152<br>UL, C-UL |
| **T-06, T-03**<br>1:1<br>  <br>29.0 x 15.8 x 23.7mm | • Compact toggle switches for space-saving design<br>• Rubber cap available for excellent weather resis-tance | 10mA to 3A/6A | • On-Off<br>• On-On | Ag | 30 | 250 | -25°C to +70°C | 50,000 | 30,000/ 10,000 | 1-pole, 2-pole | • Solder |  | IP40 | 155<br>— |

# Micro Switches IP67

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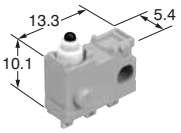
**ULTRA-LONG STROKE, HIGH CONTACT RELIABILITY SEALED SWITCHES (SAME SIZE AS J TYPE)**

# TURQUOISE SWITCHES ASQ TYPE




(mm)

## FEATURES

**1. Same size as J type with ultra-long stroke. For pin plunger type, it maintains an ultra-long stroke O.T. (over travel) with over 2.2 mm on the NO side and over 2.5 mm on the NC side. Variations in operation can be absorbed.**

**2. Since contact pressure does not depend on the operation stroke, the range of possible use over the entire stroke is greatly increased.**
(Please refer to operation concept diagram.)

**3. High contact reliability to support low level switching loads**
High contact reliability is maintained with gold plating on both sides of sliding contact.

**4. Highly effective sealing for resistance against adverse environments**
**Immersion protection type**
- JIS C0920 (water-resistance experiments for electrical machines and protection rating against incursion of solid substances)

**D2**
- JIS D0203 (method for testing moisture resistance and water resistance in automotive components)

**IP67**
- IEC529 (rating for outer shell protection)

**5. Silent operation**
With sliding contact construction there is no operation noise.

**6. Direct operation possible from lateral direction with pin plunger (lever-less operation allows space-savings)**

**7. Contains no harmful substances (mercury, lead, hexivalent chromium, cadmium)**

## TYPICAL APPLICATIONS

**1. Automobiles (detection of door opening and closing and shift lever position, etc.)**

**2. Household appliances (propane stoves, vacuum cleaners, air conditioners, washing machines, etc.)**

## ORDERING INFORMATION

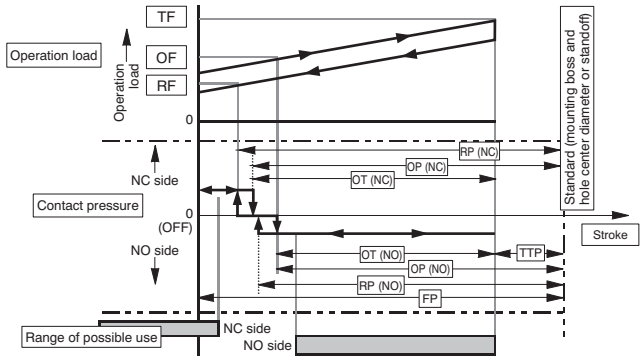
Ex. ASQ1 ☐ ☐ ☐ ☐

| Type of switch | Size of mounting hole | Terminal | Contact form | Actuator |
|---|---|---|---|---|
| ASQ1: Turquoise stroke switch | 0: 3 mm standard type<br>1: 3 mm without boss type<br>4: Right side pin type (solder terminal only)<br>5: Left side pin type (solder terminal only)<br>6: Right 2 boss type (solder terminal only)<br>7: Left 2 boss type (solder terminal only) | 2: Wire leads right side type (NC and NO type only)<br>3: Wire leads left side type (NC and NO type only)<br>4: Solder terminal<br>5: PC board terminal<br>6: Wire leads (bottom type)<br>7: PC right angle terminal<br>8: PC left angle terminal | 1: SPDT<br>2: SPST-NC (wire lead type only)<br>3: SPST-NO (wire lead type only) | 0: Pin plunger<br>7: Leaf lever<br>8: Simulated leaf lever |

Remark: Not every combination is available. Please refer to the following table, “PRODUCT TYPES”.

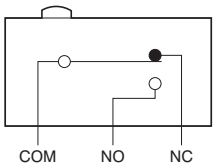
# OPERATION CONCEPT DIAGRAM (reference)

**Contact form: terminal type**

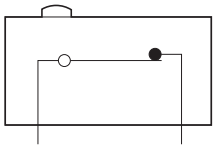



# CONTACT ARRANGEMENT

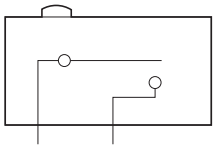
1. SPDT



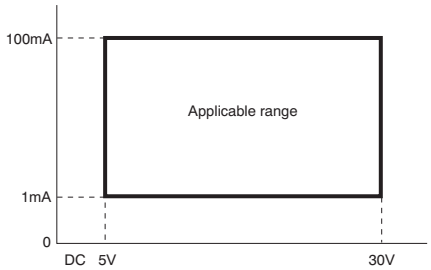

2. SPST-NC
(wire leads type only)




3. SPST-NO
(wire leads type only)




# APPLICABLE CURRENT RANGE (reference)




# PRODUCT TYPES

**1. Terminal type (mounting hole: 3mm standard type/3mm without boss type/2 boss type/side pin type)**

| Actuator | Operating force max. | Mounting hole: 3mm standard type | | | Mounting hole: 3mm without boss type | Right 2 boss type | Left 2 boss type | Right side pin type | Left side pin type |
|---|---|---|---|---|---|---|---|---|---|
| | | Solder terminal | PC right angle terminal | PC left angle terminal | PC board terminal | Solder terminal | Solder terminal | Solder terminal | Solder terminal |
| Pin plunger | 1.5N | ASQ10410 | ASQ10710 | ASQ10810 | ASQ11510 | ASQ16410 | ASQ17410 | ASQ14410 | ASQ15410 |
| Leaf lever | 1.7N | ASQ10417 | ASQ10717 | ASQ10817 | ASQ11517 | ASQ16417 | ASQ17417 | ASQ14417 | ASQ15417 |
| Simulated leaf lever | 1.5N | ASQ10418 | ASQ10718 | ASQ10818 | ASQ11518 | ASQ16418 | ASQ17418 | ASQ14418 | ASQ15418 |

**2. Wire leads bottom type (mounting hole: 3mm standard type)**

| Actuator | Operating force max. | Wire leads bottom type (mounting hole: 3mm standard type) | | |
|---|---|---|---|---|
| | | Switching type | NC type | NO type |
| Pin plunger | 1.5N | ASQ10610 | ASQ10620 | ASQ10630 |
| Leaf lever | 1.7N | ASQ10617 | ASQ10627 | ASQ10637 |
| Simulated leaf lever | 1.5N | ASQ10618 | ASQ10628 | ASQ10638 |

**3. Wire leads side type (mounting hole: 3mm standard type)**

| Actuator | Operating force max. | Wire leads right side type (mounting hole: 3mm standard type) | | Wire leads left side type (mounting hole: 3mm standard type) | |
|---|---|---|---|---|---|
| | | NC type | NO type | NC type | NO type |
| Pin plunger | 1.5N | ASQ10220 | ASQ10230 | ASQ10320 | ASQ10330 |
| Leaf lever | 1.7N | ASQ10227 | ASQ10237 | ASQ10327 | ASQ10337 |
| Simulated leaf lever | 1.5N | ASQ10228 | ASQ10238 | ASQ10328 | ASQ10338 |

# RATING

### 1. Rating

1 mA, 5 V DC to 100 mA, 30 V DC

Note: Please consult us regarding 42 V DC rating.

### 2. Operation environment and conditions

| Item | Specifications |
|---|---|
| Ambient and storage temperature | –40°C to +85°C (no freezing and condensing) |
| Allowable operating speed | 30 to 500 mm/s |
| Max. operating cycle rate | 120 cpm |

Note: When switching at low and high speeds or under vibration, or in high-temperature, high-humidity environments, life and performance may be reduced significantly depending on the load capacity. Please consult us.

### 3. Electrical characteristics

| | |
|---|---|
| Withstand voltage (initial) | Between non-continuous terminals: 600 Vrms, Between each terminal and other exposed metal parts: 1,500 Vrms, Between each terminal and ground: 1,500 Vrms (at detection current of 1 mA) |
| Insulation resistance (initial) | Min. 100 MΩ (at 500 V DC insulation resistance meter) (Locations measured same as withstand voltage.) |
| Contact resistance (initial) | Max. 1Ω (by voltage drop 0.1 A 6 to 8 V DC) |

### 4. Characteristics

| Item | | Specifications | |
|---|---|---|---|
| Electrical switching life | 5 V DC 1 mA (resistive load) | Min. $5 \times 10^5$ | Switching frequency: 20 times/min.<br>Conduction ratio: 1:1<br>Push-button operation speed: 100 mm/s<br>Push-button switching position: free position (FP) to operation limit position (TTP) |
| | 16 V DC 50 mA (resistive load) | Min. $5 \times 10^5$ | |
| | 30 V DC 100 mA (resistive load) | Min. $2 \times 10^5$ | |
| Vibration resistance (malfunction vibration resistance) | | Single amplitude: 0.75 mm<br>Amplitude of vibration: 10 to 55 Hz (4 minutes cycle)<br>Direction and time: 30 minutes each in X, Y and Z directions | |
| | | Amplitude of vibration: 5 to 200 Hz (10 minutes cycle)<br>Acceleration: 43.1 m/s²<br>Direction and time: 30 minutes each in X, Y and Z directions | |
| Shock resistance (malfunction shock resistance) | | Shock value: 980 m/s²<br>Direction and time: 5 times each in X, Y and Z directions | |
| Vibration resistance endurance | | Frequency of vibration: 33.3 Hz, Acceleration: 43.1 m/s²<br>Direction and time: 8 hours each in X, Y and Z directions | |
| Terminal strength | | 6 N min. (each direction) *Terminal deformation possible. | |
| Heat resistance | | 85°C 500 houres | |
| Cold resistance | | –40°C 500 houres | |
| Humidity resistance | | 40°C 95% RH 500 houres | |
| High-temperature, high-humidity resistance | | 85°C 85% RH 500 houres | |
| Thermal shock resistance | | 30 min. at 85°C to 30 min at –40°C for 1,000 cycles | |
| Water resistance | | IP67 (wire leads type) | |

Notes: As long as there are no particular designations, the following conditions apply to the test environment.
- Ambient temperature: 5 to 35°C
- Relative humidity: 25 to 85% RH
- Air pressure: 86 to 106 kPa

### 5. Protective structure

1) JIS C0920: Waterproof type
A concrete testing method is to check for any adverse effect on the structure after leaving it submerged for 30 minutes under 1 m of water (with temperature difference between water and switch no larger than 5°C).

2) IEC 60529: IP67 (waterproof type)
A concrete testing method is to check for any adverse effect on the structure after leaving it submerged for 30 minutes under 1 m of water (with temperature difference between water and switch no larger than 5°C).

3) JIS D0203: Equivalent of D2
A concrete testing method is to check for any adverse effect on the structure after leaving it submerged for 30 minutes under 10 cm of water (with temperature difference between water and switch no larger than 30°C).

Note: Names of the standards can be found in the section describing features.

### 6. Operating characteristics

| Actuator | | Pin plunger | Leaf lever | Simulated leaf lever |
|---|---|---|---|---|
| Operating Force (max. O.F.) *Note 2 | | 1.5N | 1.7N | 1.5N |
| Total travel Force (max. T.F.) (reference value) | | (2.0N) | (3.1N) | (2.8N) |
| Free Position (max. F.P.) | From mounting boss and hole center line | 9.2mm | 11.5mm | 14.4mm |
| | From standoff | 13.4mm | 15.7mm | 18.6mm |
| Operating Position on NC side O.P. (N.C.) *Note 3 | From mounting boss and hole center line | 8.7±0.3mm | 9.8±0.5mm | 12.5±0.5mm |
| | From standoff | 12.9±0.3mm | 14.0±0.5mm | 16.7±0.5mm |
| Operating Position on NO side O.P. (N.O.) *Note 4 | From mounting boss and hole center line | 8.4±0.3mm | 9.3±0.5mm | 12.0±0.5mm |
| | From standoff | 12.6±0.3mm | 13.5±0.5mm | 16.2±0.5mm |
| Release Position on NC side R.P. (N.C.) *Note 5 | From mounting boss and hole center line | 8.8±0.3mm | 10.1±0.5mm | 12.9±0.5mm |
| | From standoff | 13.0±0.3mm | 14.3±0.5mm | 17.1±0.5mm |
| Release Position on NO side R.P. (N.O.) *Note 6 | From mounting boss and hole center line | 8.5±0.3mm | 9.6±0.5mm | 12.4±0.5mm |
| | From standoff | 12.7±0.3mm | 13.8±0.5mm | 16.6±0.5mm |
| Over travel on N.C. side (min. O.T. (N.C.)) | | 2.5mm | 3.1mm | 3.3mm |
| Over travel on N.O. side (min. O.T. (N.O.)) | | 2.2mm | 2.6mm | 2.8mm |
| Total Travel Position (T.T.P.) (reference value) | From mounting boss and hole center line | (5.9mm) | (6.2mm) | (8.7mm) |
| | From standoff | (10.1mm) | (10.4mm) | (12.9mm) |

Notes: 1. The above indicates the characteristics when operating the push-button from the vertical direction.
2. Indicates operation load for NO contact to achieve ON status.
3. Indicates position for NC contact to achieve OFF status.
4. Indicates position for NO contact to achieve ON status.
5. Indicates position for NC contact to achieve ON status.
6. Indicates position for NO contact to achieve OFF status.

## DIMENSIONS

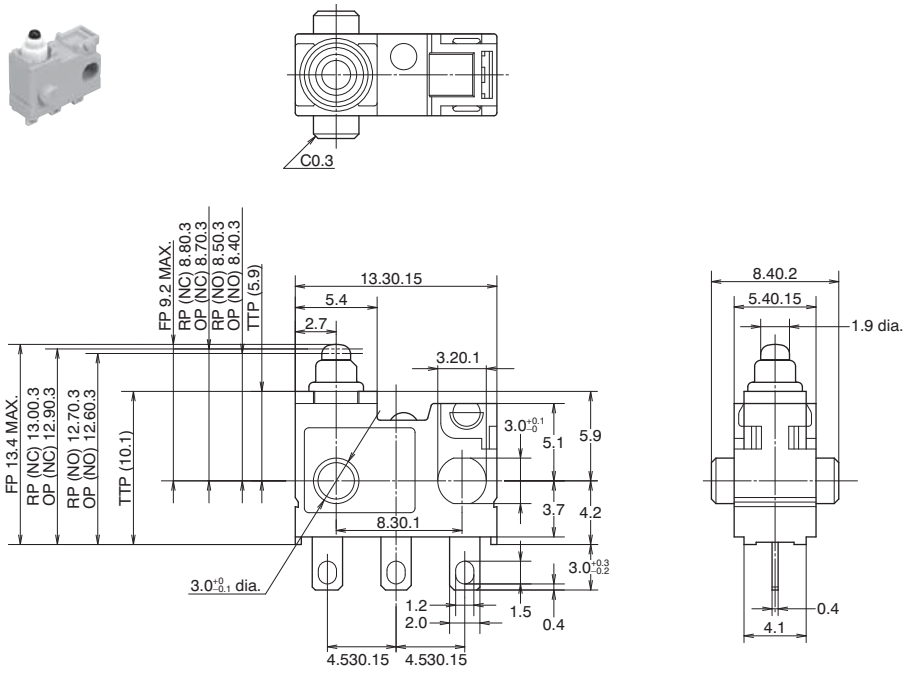
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

### 1. Terminal type: Mounting hole 3mm, standard type

mm General tolerance: ±0.25

Pin plunger

**CAD Data**

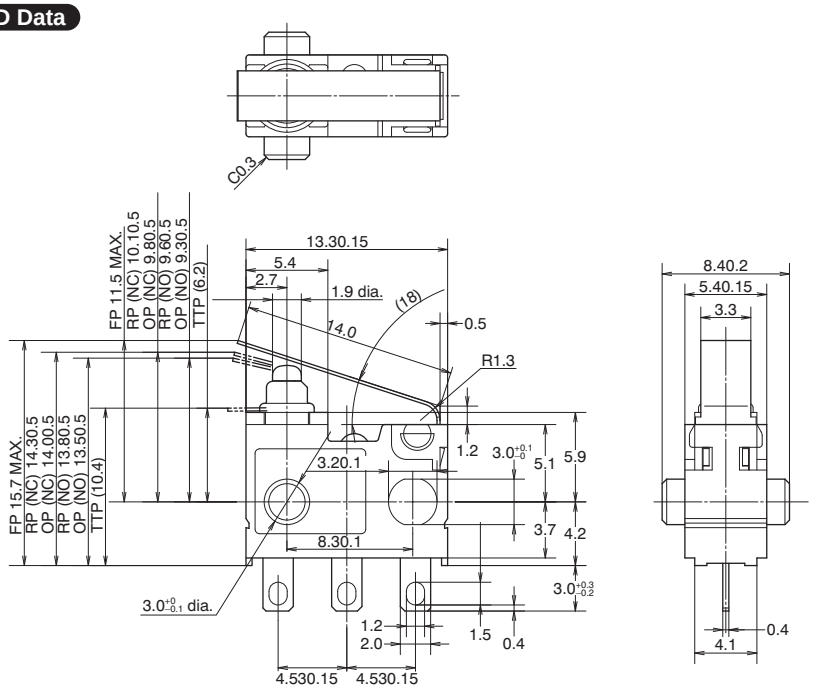



| Operating Force (max. O.F.) | | 1.5N |
|---|---|---|
| Free Position (max. F.P.) | From mounting boss and hole center line | 9.2mm |
| | From standoff | 13.4mm |
| Operating Position on NC side O.P. (N.C.) | From mounting boss and hole center line | 8.7±0.3mm |
| | From standoff | 12.9±0.3mm |
| Operating Position on NO side O.P. (N.O.) | From mounting boss and hole center line | 8.4±0.3mm |
| | From standoff | 12.6±0.3mm |
| Release Position on NC side R.P. (N.C.) | From mounting boss and hole center line | 8.8±0.3mm |
| | From standoff | 13.0±0.3mm |
| Release Position on NO side R.P. (N.O.) | From mounting boss and hole center line | 8.5±0.3mm |
| | From standoff | 12.7±0.3mm |
| Over travel on N.C. side (min. O.T. (N.C.)) | | 2.5mm |
| Over travel on N.O. side (min. O.T. (N.O.)) | | 2.2mm |

# ASQ1

## Leaf lever

**CAD Data**



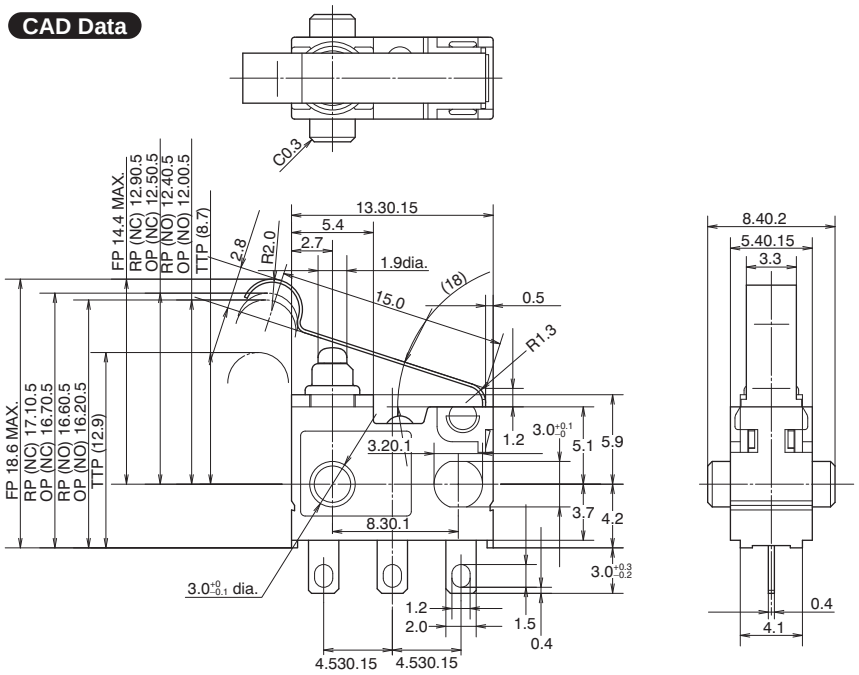

| Operating Force (max. O.F.) | | 1.7N |
|---|---|---|
| Free Position (max. F.P.) | From mounting boss and hole center line | 11.5mm |
| | From standoff | 15.7mm |
| Operating Position on NC side O.P. (N.C.) | From mounting boss and hole center line | 9.8±0.5mm |
| | From standoff | 14.0±0.5mm |
| Operating Position on NO side O.P. (N.O.) | From mounting boss and hole center line | 9.3±0.5mm |
| | From standoff | 13.5±0.5mm |
| Release Position on NC side R.P. (N.C.) | From mounting boss and hole center line | 10.1±0.5mm |
| | From standoff | 14.3±0.5mm |
| Release Position on NO side R.P. (N.O.) | From mounting boss and hole center line | 9.6±0.5mm |
| | From standoff | 13.8±0.5mm |
| Over travel on N.C. side (min. O.T. (N.C.)) | | 3.1mm |
| Over travel on N.O. side (min. O.T. (N.O.)) | | 2.6mm |

Note: When switching at high speed or under shock, lever endurance may drop. Therefore, please be sure to conduct an endurance evaluation under actual switching conditions.

## Simulated leaf lever

mm General tolerance: ±0.25

**CAD Data**

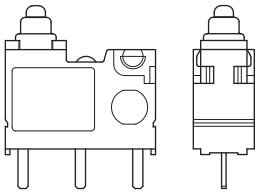



| Operating Force (max. O.F.) | | 1.5N |
|---|---|---|
| Free Position (max. F.P.) | From mounting boss and hole center line | 14.4mm |
| | From standoff | 18.6mm |
| Operating Position on NC side O.P. (N.C.) | From mounting boss and hole center line | 12.5±0.5mm |
| | From standoff | 16.7±0.5mm |
| Operating Position on NO side O.P. (N.O.) | From mounting boss and hole center line | 12.0±0.5mm |
| | From standoff | 16.2±0.5mm |
| Release Position on NC side R.P. (N.C.) | From mounting boss and hole center line | 12.9±0.5mm |
| | From standoff | 17.1±0.5mm |
| Release Position on NO side R.P. (N.O.) | From mounting boss and hole center line | 12.4±0.5mm |
| | From standoff | 16.6±0.5mm |
| Over travel on N.C. side (min. O.T. (N.C.)) | | 3.3mm |
| Over travel on N.O. side (min. O.T. (N.O.)) | | 2.8mm |

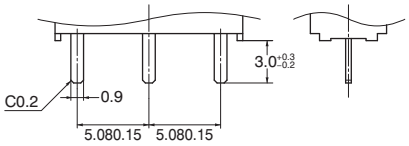
Note: When switching at high speed or under shock, lever endurance may drop. Therefore, please be sure to conduct an endurance evaluation under actual switching conditions.

Mounting hole: 3 mm without boss type

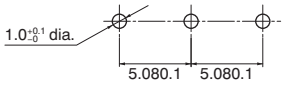
**CAD Data**



PC board terminal

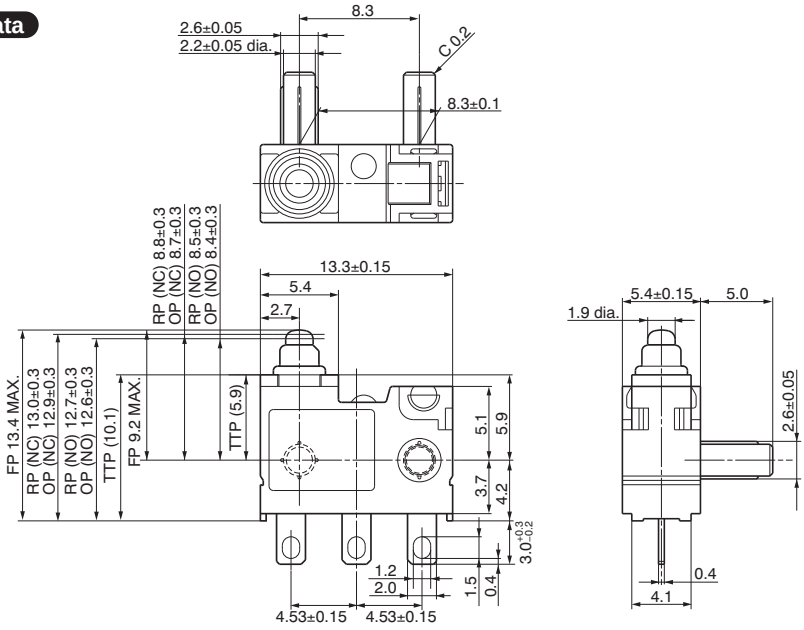



PC board pattern




**2. Right side pin type (solder terminal only)**

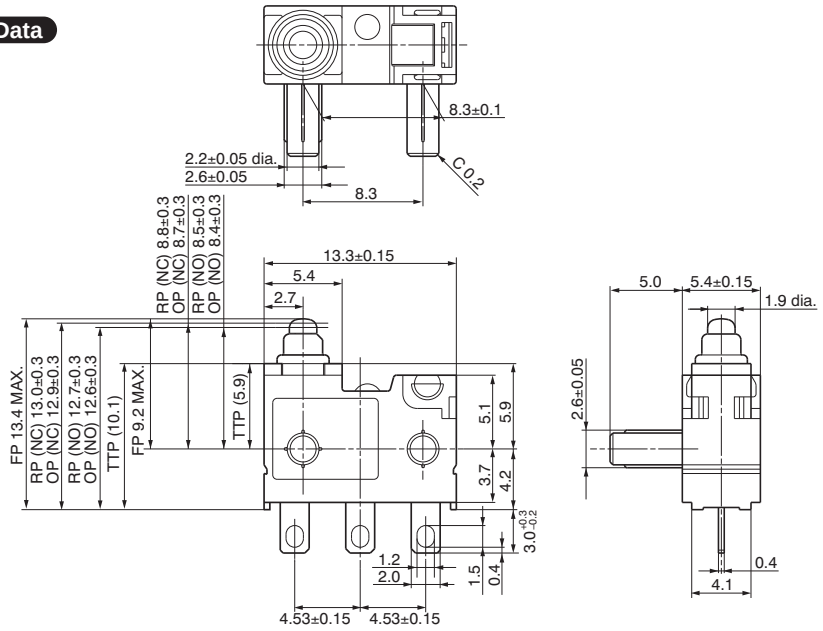
**CAD Data**



Left side pin type (solder terminal only)

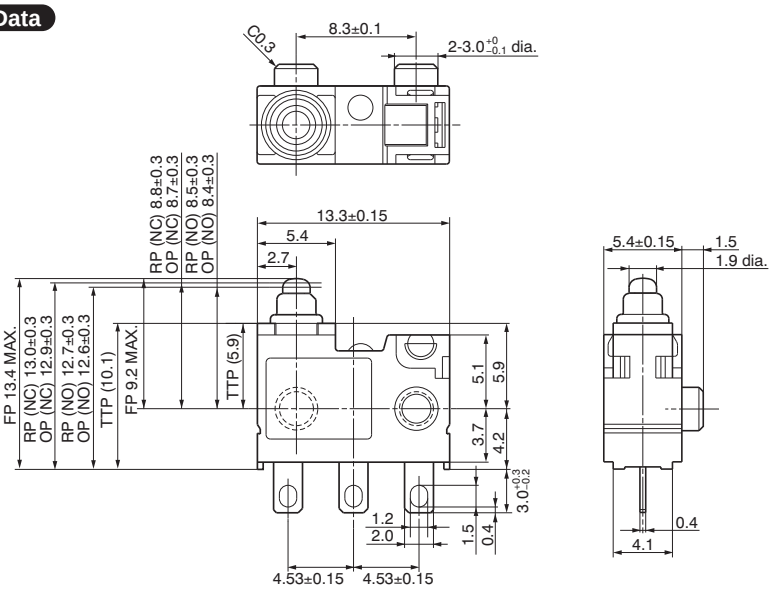
mm General tolerance: ±0.25

**CAD Data**



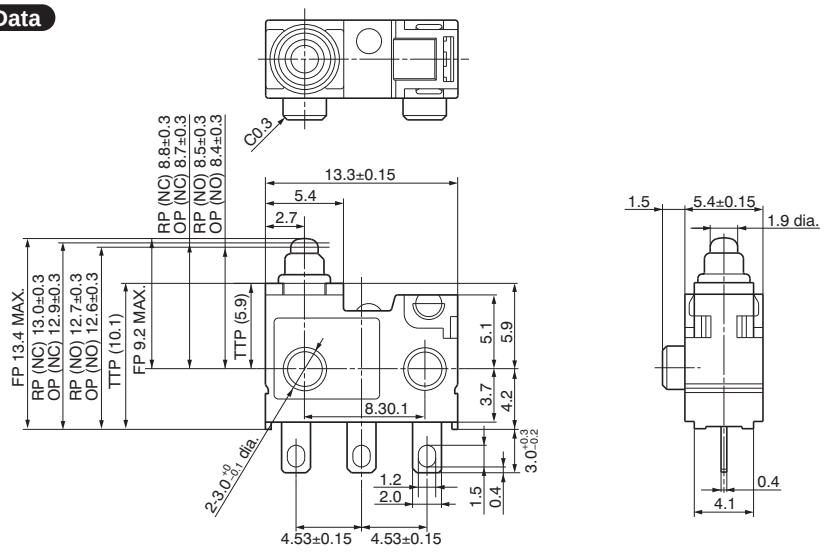

Right 2 boss type (solder terminal only)

**CAD Data**




Left 2 boss type (solder terminal only)

**CAD Data**

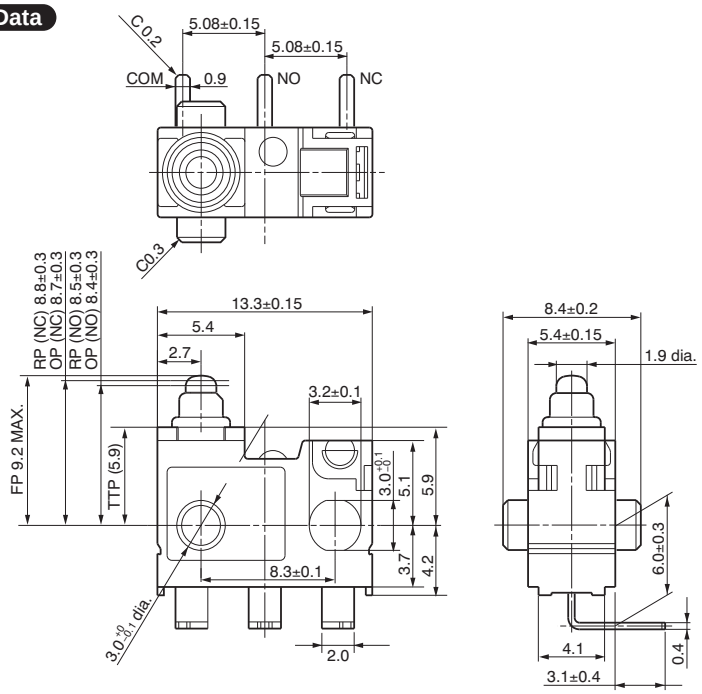


**3. Angle terminal type: mounting hole 3 mm, standard type**

mm General tolerance: ±0.25

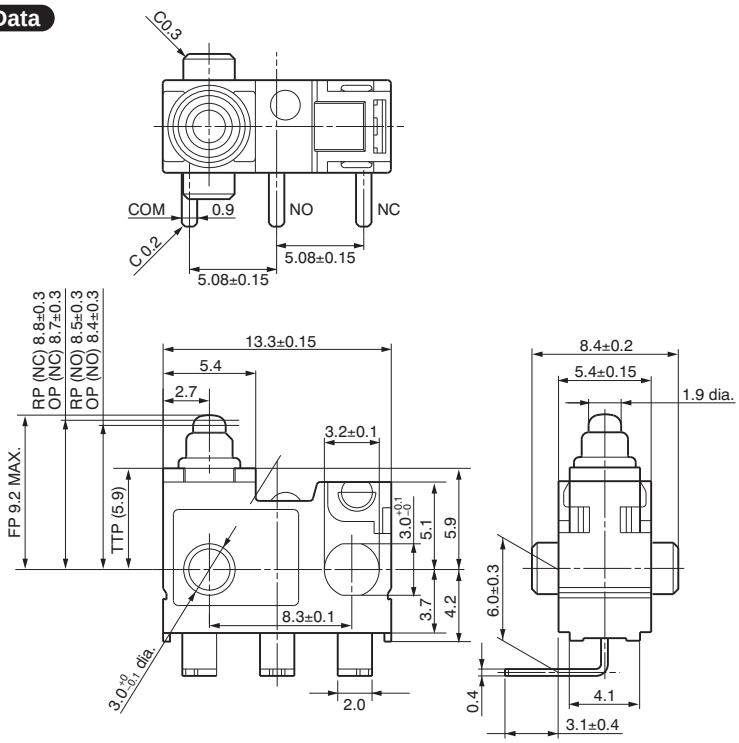
Right type

**CAD Data**




Left type: mounting hole 3 mm, standard type

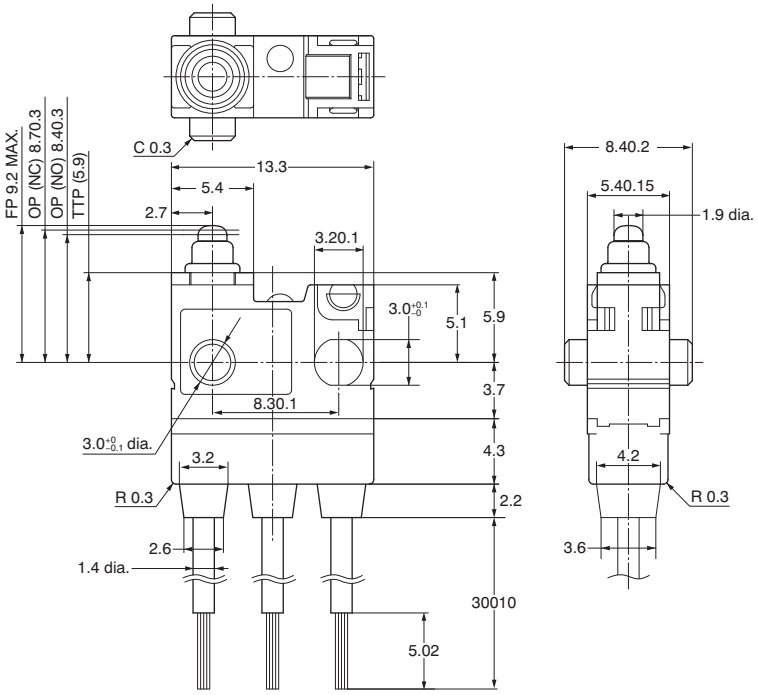
**CAD Data**



## 4. Wire leads bottom type: Mounting hole 3mm, standard type

mm General tolerance: ±0.25

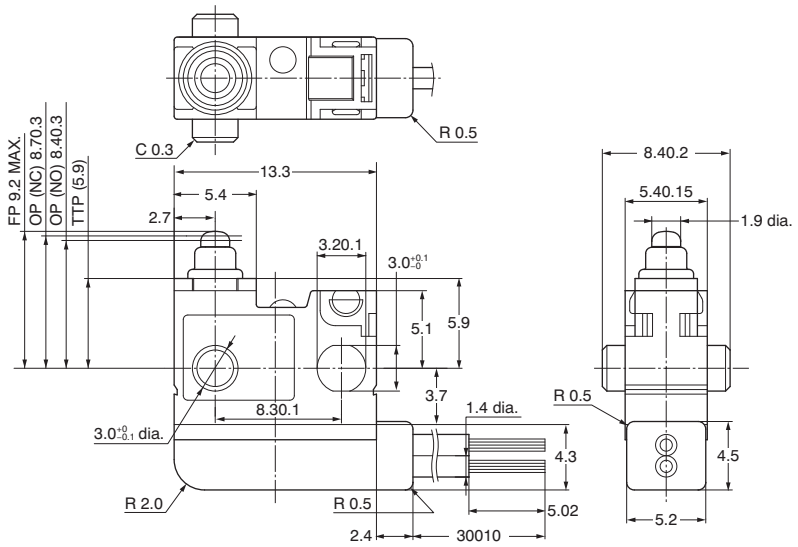
**CAD Data**




* Wire lead thickness : 0.3mm²
Wire lead color : COM ···· Black
: NC ····· Red
: NO ····· White

## 5. Wire leads right side type: Mounting hole 3mm, standard type

**CAD Data**

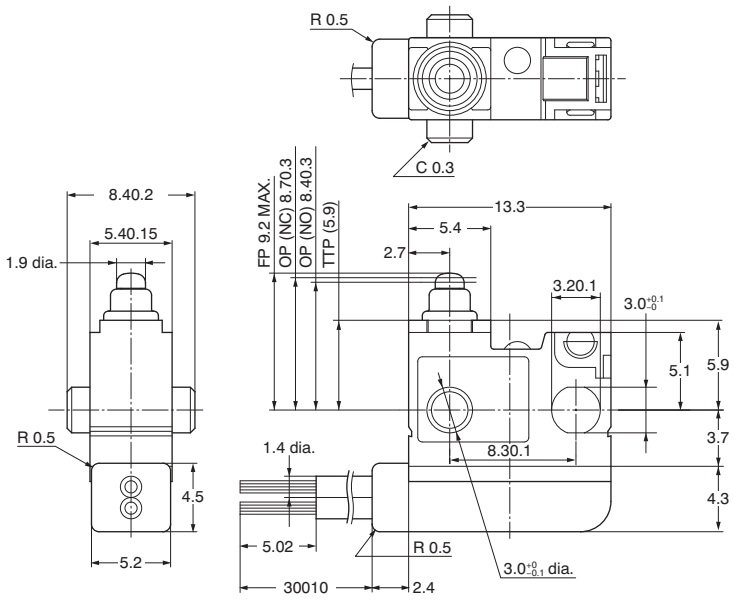



* Wire lead thickness : 0.3mm²
Wire lead color : COM ···· Black
: NC ····· Red
: NO ····· White

**6. Wire leads left side type: Mounting hole 3mm, standard type**

mm General tolerance: ±0.25

**CAD Data**




∗Wire lead thickness : 0.3mm²
Wire lead color : COM ···· Black
: NC ····· Red
: NO ····· White

# NOTES

**1. Soldering conditions**

The application of excessive heat upon the switch when soldering can cause degradation of switch operation. Therefore, be sure to keep within the conditions given below.

1) Manual soldering: use soldering irons (max. 350°C, within 3 seconds) capable of temperature adjustment. This is to prevent deterioration due to soldering heat. Care should be taken not to apply force to the terminals during soldering.

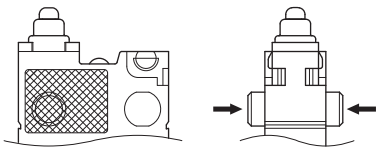
2) Automatic soldering: Soldering must be done as below;

260°C: within 6 seconds

350°C: within 3 seconds

**2. Mounting**

Please avoid use in which load would be applied to the sides (hatch part [both sides] shown below) of the switch in the direction indicated by the arrows. This could cause erroneous operation. Also, when using a metal installation board, please make allowance for burr direction designation and burr suppressing, etc., so that the burr side will not be on the switch installation side.



1) To secure the switch, please use an M3 small screw on a flat surface and tighten using a maximum torque of 0.29 N·m. It is recommended that spring washers be used with the screws and adhesive be applied to lock the screws to prevent loosening of the screws. Please make sure not to apply adhesive onto the moving parts.

2) Be sure to maintain adequate insulating clearance between each terminal and ground.

3) Although it is possible to directly operate the pin plunger type from the lateral direction, please consult us if doing so.

4) After mounting please make sure no tensile load will be applied to the switch terminals.

5) Range of possible use: Please set the operation position to within the ranges in the following table so that there is sufficient insulation distance and to maintain contact reliability.

mm

| Actuator | Plunger/lever free | |
|---|---|---|
| | From mounting boss and hole center line | From standoff |
| Pin plunger | >9.2 | >13.4 |
| Leaf lever | >10.7 | >14.9 |
| Simulated leaf lever | >13.5 | >17.7 |

| Actuator | Plunger/Lever pushed | |
|---|---|---|
| | From mounting boss and hole center line | From standoff |
| Pin plunger | 7.8 to 5.9 | 12.0 to 10.1 |
| Leaf lever | 8.4 to 6.2 | 12.6 to 10.4 |
| Simulated leaf lever | 11.1 to 8.7 | 15.3 to 12.9 |

6) PC board terminal type should be used if the products are to be soldered on the PC board. Solder terminal type is not for soldering on PC board.

**3. Cautions regarding the circuit**

1) In order to prevent malfunction in set devices caused by bounce and chattering during the ON-OFF switch operation, please verify the validity of the circuit under actual operating conditions and temperature range.

2) When switching inductive loads (relays, solenoids, buzzers, etc.), an arc absorbing circuit is recommended to protect the contacts.

**4. Please verify under actual conditions.**

Please be sure to conduct quality verification under actual operating conditions in order to increase reliability during actual use.

**5. Switch selection**

Please make your selection so that there will be no problems even if the operating characteristics vary up to ±20% from the standard values.

**6. Oil-proof and chemical-proof characteristics**

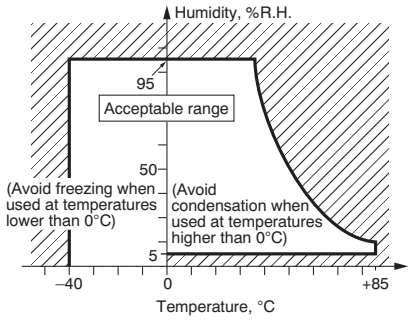
The rubber cap swells when exposed to oil and chemicals. The extent of swelling will vary widely depending on the type and amount of oil and chemicals. Check with the actual oil or chemicals used.

In particular, be aware that solvents such as freon, chlorine, and toluene cannot be used.

**7. Environment**

• Although continuous operation of the switch is possible within the range of ambient temperature (humidity), as the humidity range differs depending on the ambient temperature, the humidity range indicated below should be used. Continuous use near the limit of the range should be avoided.

• This humidity range does not guarantee permanent performance.




**8. Other**

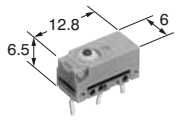
1) Please remember that this switch cannot be used under water. Also, please be warned that switching and sudden temperature changes with the presence of water droplets can cause seepage into the unit.

2) Keep away from environments where silicon based adhesives, oil or grease are present as faulty contacts may result from silicon oxide. Do not use in areas where flammable or explosive gases from gasoline and thinner, etc., may be present.

3) When using the lever type, please be careful not to apply unreasonable load from the reverse or lateral directions of operation.

4) Do not exceed the total travel position (TTP) and press the actuator. This could cause operation failure. Also, when switching at high speed or under shock even within the operation limit, the working life may decrease. Therefore, please be sure to verify the quality under actual conditions of use.

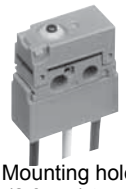
5) Please make considerations so that the switch does not become the stopper for the moving part.

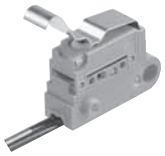


Dust protected type


Mounting hole (2.3mm) type


Immersion protected type (wire leads bottom type)


Mounting hole (2.3mm) type


Immersion protected (wire leads side type)


Long stroke type

## FEATURES

- **Ultra-miniature size (12.8×6.5×6 mm)**
- **Sealed construction for use in adverse environment-Sealed construction by epoxy resin and rubber cap greatly reduces possible miscontact due to contaminants such as dust. Conforming to IP67* of IEC protective construction classification**
- **Elastomer double molding technology, an industry first and ultrasonic swaging technology contribute to uniform sealing in high production quantities**
- **UL/CSA approved (except the long stroke type of ABJ2 and the side wire leads type.)**
- **Long stroke type is available**
  Since the repeatability is excellent and the play distance (over travel) from the operating position is ample, the task of performing adjustments during installation is easy.
  Operating position accuracy ±0.4 mm
  Overtravel= Min. 2.0 mm
  As wide range of high pressure is achieved, a stable reliability is ensured
- **Leaf lever side wire leads type added. We now offer two types.**
  M3 type installation hole
  Fixed pin type
- **Based on the protective construction classification of IEC, items which satisfy the test requirements are denoted with an IP designation**

## TYPICAL APPLICATIONS

- **Industrial use video jack**
- **Automotive (ex. Device for opening and shutting of automobile doors)**

## ORDERING INFORMATION

(If Agency standard required, please refer to the “with Agency standard type”. See next page.)

Ex. ABJ 1 4 1 0 4 0

| Type of switch | Size of mounting hole | Terminal | Contact arrangement | Actuator | Operating force by pin plunger (max.) | Contact |
|---|---|---|---|---|---|---|
| ABJ: Turquoise switch J type | 1: 1.2 mm<br>2: 2.3 mm<br>3: 3 mm<br>4: Fixed pin (right side pin) type<br>Fixed pin (left side pin) type | 4: Solder terminal<br>5: PC board terminal<br>6: Wire leads (bottom type)<br>7: Wire leads (right side type)<br>8: Wire leads (left side type) | 1: SPDT<br>2: SPST-NC (Wire leads type only)<br>3: SPST-NO (Wire leads type only) | 0: Pin plunger<br>2: Hinge lever<br>4: Simulated roller lever<br>6: Roller lever<br>8: Leaf lever (Mounting hole 3 mm lead wire type only)<br>L: Long stroke type | 4: 1.23 N<br>6: 1.96 N<br>7: 2.45 N<br>(Long stroke type only) | 0: AgNi alloy<br>1: AgNi alloy + Au-clad |

Remarks: 1. Standard packing: Dust protected type 100 pcs./carton, 2,000 pcs./case; Immersion protected type 50 pcs./case.
2. Not every combination is available. Please refer to the following table, “PRODUCT TYPES”.

# ABJ1,2,3,4,5

With Agency standard type

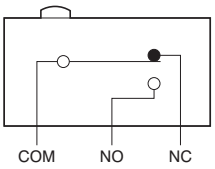
Ex. ABJ 1 4 1 0 4 0 9

| Type of switch | Size of mounting hole | Terminal | Contact arrangement | Actuator | Operating force by pin plunger (max.) | Contact | Agency standard |
|---|---|---|---|---|---|---|---|
| ABJ: Turquoise switch J type | 1: 1.2 mm<br>2: 2.3 mm<br>3: 3 mm | 4: Solder terminal<br>5: PC board terminal<br>6: Wire leads (bottom type) | 1: SPDT<br>2: SPST-NC (Wire leads type only)<br>3: SPST-NO (Wire leads type only) | 0: Pin plunger<br>2: Hinge lever<br>4: Simulated roller lever<br>6: Roller lever<br>8: Leaf lever (Mounting hole 3 mm lead wire type only) | 4: 1.23 N<br>6: 1.96 N | 0: AgNi alloy<br>1: AgNi alloy + Au-clad | 9: UL/CSA $6 \times 10^3$ rated (Except wire leads type) |

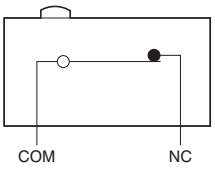
Remarks: 1. Standard packing: Dust protected type 100 pcs./carton, 2,000 pcs./case; Immersion protected type 50 pcs./case.
2. Not every combination is available. Please refer to the following table, “PRODUCT TYPES”.

## CONTACT ARRANGEMENT

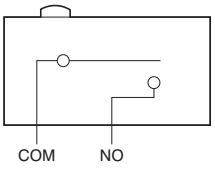
1. SPDT



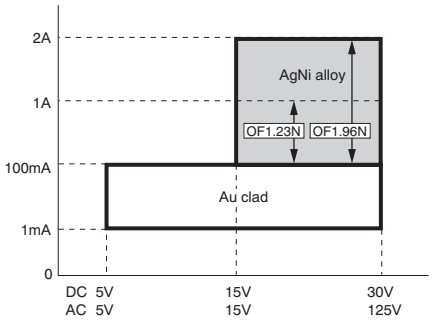

2. SPST-NC (wire leads type only)




3. SPST-NO (wire leads type only)




## APPLICABLE CURRENT RANGE (reference)




Note) OF: Value of pin plunger

# PRODUCT TYPES

**1. Dust protected type (terminal type)**

Mounting hole 1.2mm type / Mounting hole 2.3mm type

AgNi alloy

| Actuator | Operating force max. | Mounting hole 1.2 mm type | | Mounting hole 2.3 mm type |
|---|---|---|---|---|
| | | Solder terminal | PC board terminal | Solder terminal |
| Pin plunger | 1.23 N | ABJ1410409 | ABJ1510409 | ABJ2410409 |
| | 1.96 N | ABJ1410609 | ABJ1510609 | ABJ2410609 |
| Hinge lever | 0.39 N | ABJ1412409 | ABJ1512409 | ABJ2412409 |
| | 0.64 N | ABJ1412609 | ABJ1512609 | ABJ2412609 |
| Simulated roller lever | 0.39 N | ABJ1414409 | ABJ1514409 | ABJ2414409 |
| | 0.64 N | ABJ1414609 | ABJ1514609 | ABJ2414609 |
| Roller lever | 0.39 N | ABJ1416409 | ABJ1516409 | ABJ2416409 |
| | 0.64 N | ABJ1416609 | ABJ1516609 | ABJ2416609 |

AgNi alloy + Au-clad

| Actuator | Operating force max. | Mounting hole 1.2 mm type | | Mounting hole 2.3 mm type |
|---|---|---|---|---|
| | | Solder terminal | PC board terminal | Solder terminal |
| Pin plunger | 1.23 N | ABJ1410419 | ABJ1510419 | ABJ2410419 |
| | 1.96 N | ABJ1410619 | ABJ1510619 | ABJ2410619 |
| Hinge lever | 0.39 N | ABJ1412419 | ABJ1512419 | ABJ2412419 |
| | 0.64 N | ABJ1412619 | ABJ1512619 | ABJ2412619 |
| Simulated roller lever | 0.39 N | ABJ1414419 | ABJ1514419 | ABJ2414419 |
| | 0.64 N | ABJ1414619 | ABJ1514619 | ABJ2414619 |
| Roller lever | 0.39 N | ABJ1416419 | ABJ1516419 | ABJ2416419 |
| | 0.64 N | ABJ1416619 | ABJ1516619 | ABJ2416619 |

**2-(1). Immersion protected type (bottom wire leads type)**

Mounting hole 1.2mm type

AgNi alloy

| Actuator | Operating force max. | Mounting hole 1.2 mm type | | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger | 1.23 N | ABJ161040 | ABJ162040 | ABJ163040 |
| | 1.96 N | ABJ161060 | ABJ162060 | ABJ163060 |
| Hinge lever | 0.39 N | ABJ161240 | ABJ162240 | ABJ163240 |
| | 0.64 N | ABJ161260 | ABJ162260 | ABJ163260 |
| Simulated roller lever | 0.39 N | ABJ161440 | ABJ162440 | ABJ163440 |
| | 0.64 N | ABJ161460 | ABJ162460 | ABJ163460 |
| Roller lever | 0.39 N | ABJ161640 | ABJ162640 | ABJ163640 |
| | 0.64 N | ABJ161660 | ABJ162660 | ABJ163660 |

AgNi alloy + Au-clad

| Actuator | Operating force max. | Mounting hole 1.2 mm type | | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger | 1.23 N | ABJ161041 | ABJ162041 | ABJ163041 |
| | 1.96 N | ABJ161061 | ABJ162061 | ABJ163061 |
| Hinge lever | 0.39 N | ABJ161241 | ABJ162241 | ABJ163241 |
| | 0.64 N | ABJ161261 | ABJ162261 | ABJ163261 |
| Simulated roller lever | 0.39 N | ABJ161441 | ABJ162441 | ABJ163441 |
| | 0.64 N | ABJ161461 | ABJ162461 | ABJ163461 |
| Roller lever | 0.39 N | ABJ161641 | ABJ162641 | ABJ163641 |
| | 0.64 N | ABJ161661 | ABJ162661 | ABJ163661 |

Mounting hole 2.3mm type
AgNi alloy

| Actuator | Operating force max. | Mounting hole 2.3 mm type | | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger | 1.23 N | ABJ261040 | ABJ262040 | ABJ263040 |
| | 1.96 N | ABJ261060 | ABJ262060 | ABJ263060 |
| Hinge lever | 0.39 N | ABJ261240 | ABJ262240 | ABJ263240 |
| | 0.64 N | ABJ261260 | ABJ262260 | ABJ263260 |
| Simulated roller lever | 0.39 N | ABJ261440 | ABJ262440 | ABJ263440 |
| | 0.64 N | ABJ261460 | ABJ262460 | ABJ263460 |
| Roller lever | 0.39 N | ABJ261640 | ABJ262640 | ABJ263640 |
| | 0.64 N | ABJ261660 | ABJ262660 | ABJ263660 |

AgNi alloy + Au-clad

| Actuator | Operating force max. | Mounting hole 2.3 mm type | | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger | 1.23 N | ABJ261041 | ABJ262041 | ABJ263041 |
| | 1.96 N | ABJ261061 | ABJ262061 | ABJ263061 |
| Hinge lever | 0.39 N | ABJ261241 | ABJ262241 | ABJ263241 |
| | 0.64 N | ABJ261261 | ABJ262261 | ABJ263261 |
| Simulated roller lever | 0.39 N | ABJ261441 | ABJ262241 | ABJ263441 |
| | 0.64 N | ABJ261461 | ABJ262461 | ABJ263461 |
| Roller lever | 0.39 N | ABJ261641 | ABJ262641 | ABJ263641 |
| | 0.64 N | ABJ261661 | ABJ262661 | ABJ263661 |

Mounting hole 3mm type (leaf lever type)
AgNi alloy

| Actuator | Operating force max. | Mounting hole 3 mm type | | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Leaf lever | 0.98 N | ABJ361840 | ABJ362840 | ABJ363840 |
| | 1.27 N | ABJ361860 | ABJ362860 | ABJ363860 |

AgNi alloy + Au-clad

| Actuator | Operating force max. | Mounting hole 3 mm type | | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Leaf lever | 0.98 N | ABJ361841 | ABJ362841 | ABJ363841 |
| | 1.27 N | ABJ361861 | ABJ362861 | ABJ3638619 |

**2-(2). Immersion protected type (side wire leads type)**
Fixed pin (right side pin) type
AgNi alloy

| Actuator | Operating force max. | Wire leads direction | Wire leads type | |
|---|---|---|---|---|
| | | | SPST-NC | SPST-NO |
| Leaf lever | 1.27 N | Right | ABJ472840 | ABJ473840 |
| | 1.27 N | Left | ABJ482840 | — |
| | 1.76 N | Right | ABJ472860 | ABJ473860 |
| | 1.76 N | Left | ABJ482860 | — |

AgNi alloy + Au-clad

| Actuator | Operating force max. | Wire leads direction | Wire leads type | |
|---|---|---|---|---|
| | | | SPST-NC | SPST-NO |
| Leaf lever | 1.27 N | Right | ABJ472841 | ABJ473841 |
| | 1.27 N | Left | ABJ482841 | — |
| | 1.76 N | Right | ABJ472861 | ABJ473861 |
| | 1.76 N | Left | ABJ482861 | — |

Fixed pin (left side pin) type
AgNi alloy

| Actuator | Operating force max. | Wire leads direction | Wire leads type | |
|---|---|---|---|---|
| | | | SPST-NC | SPST-NO |
| Leaf lever | 1.27 N | Right | ABJ572840 | ABJ573840 |
| | 1.27 N | Left | ABJ582840 | — |
| | 1.76 N | Right | ABJ572860 | ABJ573860 |
| | 1.76 N | Left | ABJ582860 | — |

AgNi alloy + Au-clad

| Actuator | Operating force max. | Wire leads direction | Wire leads type | |
|---|---|---|---|---|
| | | | SPST-NC | SPST-NO |
| Leaf lever | 1.27 N | Right | ABJ572841 | ABJ573841 |
| | 1.27 N | Left | ABJ582841 | — |
| | 1.76 N | Right | ABJ572861 | ABJ573861 |
| | 1.76 N | Left | ABJ582861 | — |

Mounting hole 3mm type
AgNi alloy

| Actuator | Operating force max. | Wire leads direction | Wire leads type |
|---|---|---|---|
| | | | SPST-NC |
| Leaf lever | 1.27 N | Left | ABJ382840 |
| | 1.76 N | | ABJ382860 |

AgNi alloy + Au-clad

| Actuator | Operating force max. | Wire leads direction | Wire leads type |
|---|---|---|---|
| | | | SPST-NC |
| Leaf lever | 1.27 N | Left | ABJ382841 |
| | 1.76 N | | ABJ382861 |

**3. Immersion protected type (bottom wire leads type) Long stroke type**
Mounting hole 2.3mm type
AgNi alloy

| Actuator | Operating force max. | Mounting hole 2.3 mm type | | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger (horizontal) | 2.45 N | *ABJ261L70 | ABJ262L70 | ABJ263L70 |

AgNi alloy + Au-clad

| Actuator | Operating force max. | Mounting hole 2.3 mm type | | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger (horizontal) | 2.45 N | *ABJ261L71 | ABJ262L71 | ABJ263L71 |

# SPECIFICATIONS

**1. Contact rating**

| Type | Operating force max. | Standard rating | Low-level circuit rating |
|---|---|---|---|
| AgNi alloy contact | 1.76 N, 1.96 N | 2 A 125 V AC<br>2 A 30 V DC | — |
| | 1.23 N, 1.27 N | 1 A 125 V AC<br>1 A 30 V DC | — |
| Long stroke type<br>AgNi alloy contact | 2.45 N | 1 A 125 V AC<br>1 A 30 V DC | — |
| AgNi alloy + Au-clad contact | 1.23 N, 1.27 N<br>1.76 N, 1.96 N | 0.1 A 125 V AC<br>0.1 A 30 V DC | 5 mA 6 V DC<br>2 mA 12 V DC<br>1 mA 24 V DC |
| Long stroke type<br>AgNi alloy + Au-clad contact | 2.45 N | 0.1 A 125 V AC<br>0.1 A 30 V DC | 5 mA 6 V DC<br>2 mA 12 V DC<br>1 mA 24 V DC |

## 2. Characteristics

| | | |
|---|---|---|
| Mechanical life (O.T.: Specified value) | Leaf lever, Long stroke type | Min. $5\times10^5$ (at 60 cpm) |
| | Wire leads (right & left side type) | Min. $3\times10^5$ (at 60 cpm) |
| | Other types | Min. $10^6$ (at 60 cpm) |
| Electrical life at rated load (O.T.: max.) | AgNi alloy contact type | Min. $3\times10^4$ (at 20 cpm) |
| | AgNi alloy + Au-clad contact type | Min. $10^5$ (at 20 cpm) |
| Insulation resistance | | Min. 100 MΩ (at 500 V DC insulation resistance meter) |
| Dielectric strength<br>Between non-continuous terminals<br>Between each terminal and other exposed metal parts<br>Between each terminal and ground | | <br>600 Vrms<br>1,500 Vrms<br>1,500 Vrms |
| Vibration resistance (pin plunger type) | | 10 to 55 Hz at single amplitude of 0.75 mm (contact opening max. 1 ms) |
| Shock resistance (pin plunger type) | | Min. 294 m/s²{30 G} (contact opening max. 1 ms) |
| Contact resistance (initial) | Ag contact type | Dust protected type (IP50): Max. 50 mΩ<br>Immersion protected type (IP67): Max. 100 mΩ<br>(by voltage drop 1 A 6 to 8 V DC) |
| | Au-clad contact type | Dust protected type (IP50): Max. 100 mΩ<br>Immersion protected type (IP67): Max. 150 mΩ<br>(by voltage drop 0.1 A 6 to 8 V DC) |
| Allowable operating speed (at no load) | | 1 to 500 mm/s |
| Max. operating cycle rate (at no load) | | Other type: 120 cpm<br>Long stroke type: 60 cpm |
| Ambient temperature | | –40°C to +85°C |
| Unit weight | | Approx. 0.5 g (IP50 type) |
| Water resistance | | IP67 (wire leads type) |

## 3. Operating characteristics

| Type of actuator | | 8th digit of part no. | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max. mm | Overtravel, min. mm | Operating position, mm |
|---|---|---|---|---|---|---|---|---|
| Pin plunger | | 4 | 1.23N | 0.15N | 0.6 | 0.12 | 0.25 | Mounting hole: 1.2<br>5.5±0.2<br>Mounting hole: 2.3<br>7.0±0.2 |
| | | 6 | 1.96N | 0.25N | | | | |
| Hinge lever | | 4 | 0.39N | 0.029N | 3.0 | 0.5 | 0.5 | Mounting hole: 1.2<br>6.8±1.0<br>Mounting hole: 2.3<br>8.3±1.0 |
| | | 6 | 0.64N | 0.049N | | | | |
| Simulated roller lever | | 4 | 0.39N | 0.029N | 3.0 | 0.5 | 0.5 | Mounting hole: 1.2<br>9.8±1.0<br>Mounting hole: 2.3<br>11.3±1.0 |
| | | 6 | 0.64N | 0.049N | | | | |
| Roller lever | | 4 | 0.39N | 0.029N | 3.0 | 0.5 | 0.5 | Mounting hole: 1.2<br>13.1 ±1.0<br>Mounting hole: 2.3<br>14.6±1.0 |
| | | 6 | 0.64N | 0.049N | | | | |
| Leaf lever | Wire leads bottom type | 4 | 0.98N | 0.20N | 6.0 | 1.0 | 2.5 | Mounting hole: 3.0<br>16.0±2.0 |
| | | 6 | 1.27N | 0.29N | 6.0 | 1.0 | 2.5 | Mounting hole: 3.0<br>16.0±2.0 |
| | Wire leads side type | 4 | 1.76N | 0.26N | 2.6 | 0.5 | 1.4 | Fixed pin type<br>10.7±0.7<br>Mounting hole: 3.0<br>16.25±0.7 |
| | | 6 | 1.27N | 0.22N | 2.6 | 0.5 | 1.4 | Fixed pin type<br>10.7±0.7<br>Mounting hole: 3.0<br>16.25±0.7 |
| Long stroke type | | 7 | 2.45N | 0.20N | — | 0.5 | 2.0 | 2.5±0.4 |

Note: The O.P. differs between the 1.2 mm and 2.3 mm dia. mounting hole types.

# DIMENSIONS

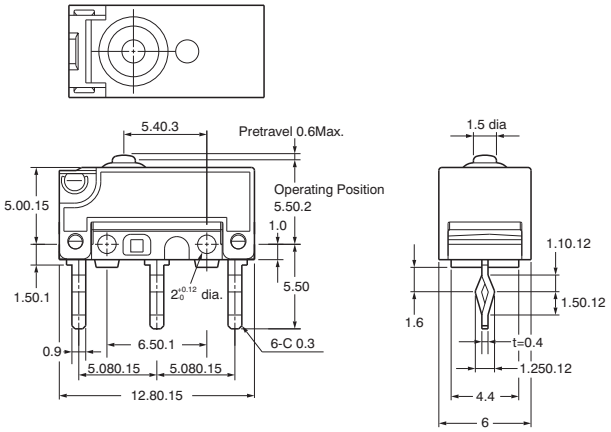
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

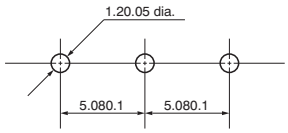
mm General tolerance: ±0.25

## 1. Dust protected type

1-(1) PC board terminal
Mounting hole 1.2 mm type
Pin plunger

**CAD Data**

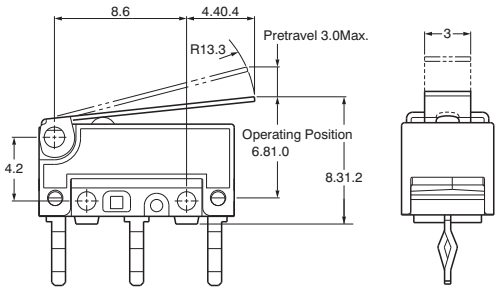


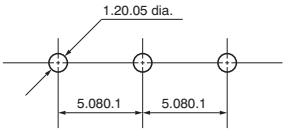




| | | |
|---|---|---|
| Pretravel, max. mm | | 0.6 |
| Movement differential, max. mm | | 0.12 |
| Overtravel, Min. mm | | 0.25 |
| Operating position | Distance from mounting hole, mm | 5.5±0.2 |
| | Distance from stand-off, mm | 7±0.3 |

Hinge lever

**CAD Data**

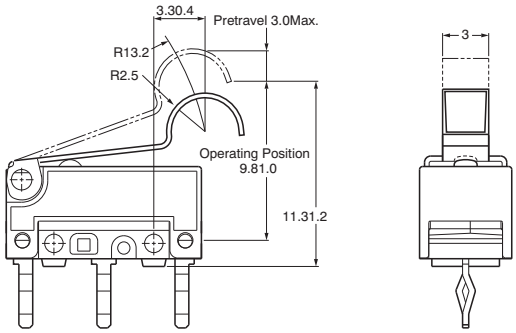


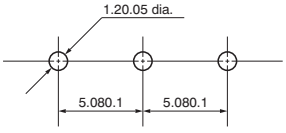




| | | |
|---|---|---|
| Pretravel, max. mm | | 3.0 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min. mm | | 0.5 |
| Operating position | Distance from mounting hole, mm | 6.8±1.0 |
| | Distance from stand-off, mm | 8.3±1.2 |

Simulated roller lever

**CAD Data**

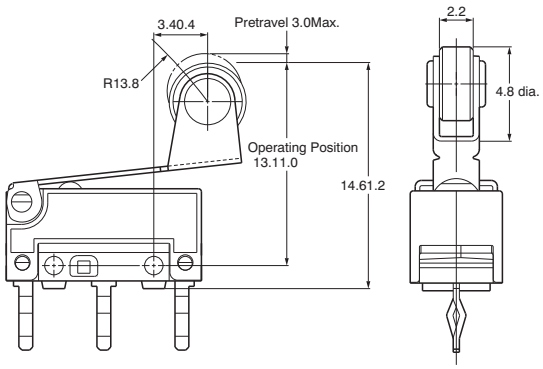


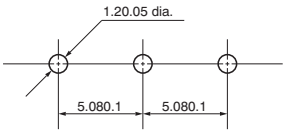




| | | |
|---|---|---|
| Pretravel, max. mm | | 3.0 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min. mm | | 0.5 |
| Operating position | Distance from mounting hole, mm | 9.8±1.0 |
| | Distance from stand-off, mm | 11.3±1.2 |

Roller lever

**CAD Data**




| | | |
|---|---|---|
| Pretravel, max. mm | | 3.0 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min. mm | | 0.5 |
| Operating position | Distance from mounting hole, mm | 13.1±1.0 |
| | Distance from stand-off, mm | 14.6±1.0 |

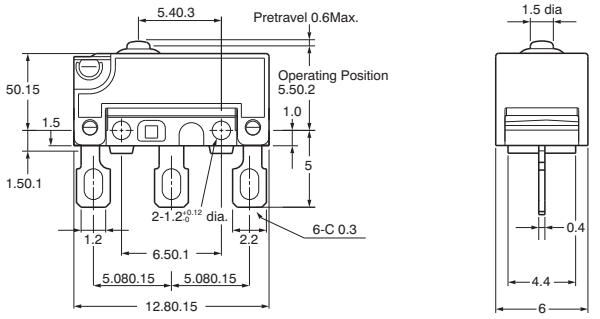
1-(2) Solder terminal

mm General tolerance: ±0.25

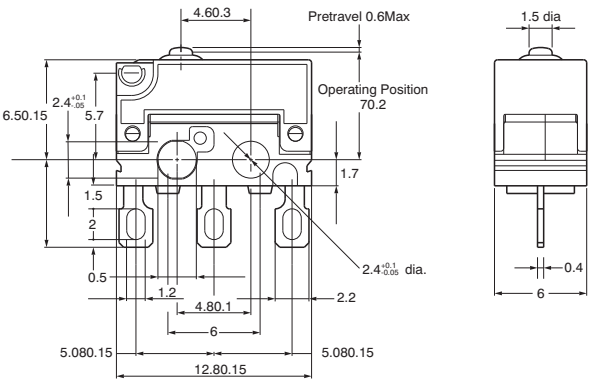
Pin plunger

**CAD Data**

Mounting hole: 1.2 mm




Mounting hole: 2.3 mm




Remarks: Dimensions of the actuator type are the same as corresponding PC board terminal types.

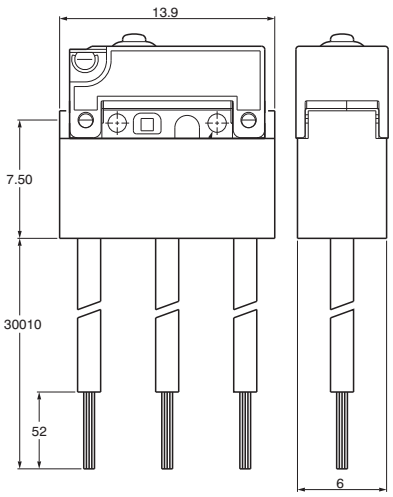
**2. Immersion protected type**

2-(1) Bottom wire leads type

Pin plunger

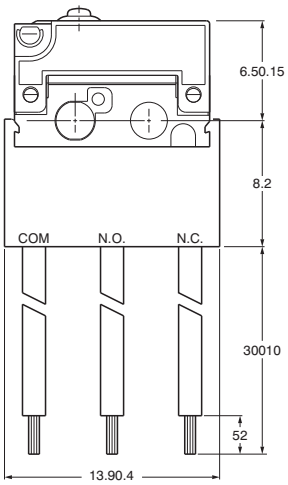
**CAD Data**

Mounting hole: 1.2 mm




Thickness of the lead wire: 0.3 mm²
UL/CSA approved type: AWG22
Color of the lead wire:
COM... Black
N.C. ... Red
N.O. ... White

Mounting hole: 2.3 mm




Thickness of the lead wire: 0.3 mm²
UL/CSA approved type: AWG22
Color of the lead wire:
COM... Black
N.C. ... Red
N.O. ... White

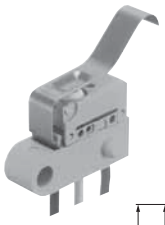
Remarks: 1. As for M1.2 type, other dimensions are the same as those of corresponding PC board terminal types.
As for M2.3 type, other dimensions are the same as those of corresponding solder terminal types.
2. Dimensions of the actuator type are the same as those of corresponding PC board terminal types.

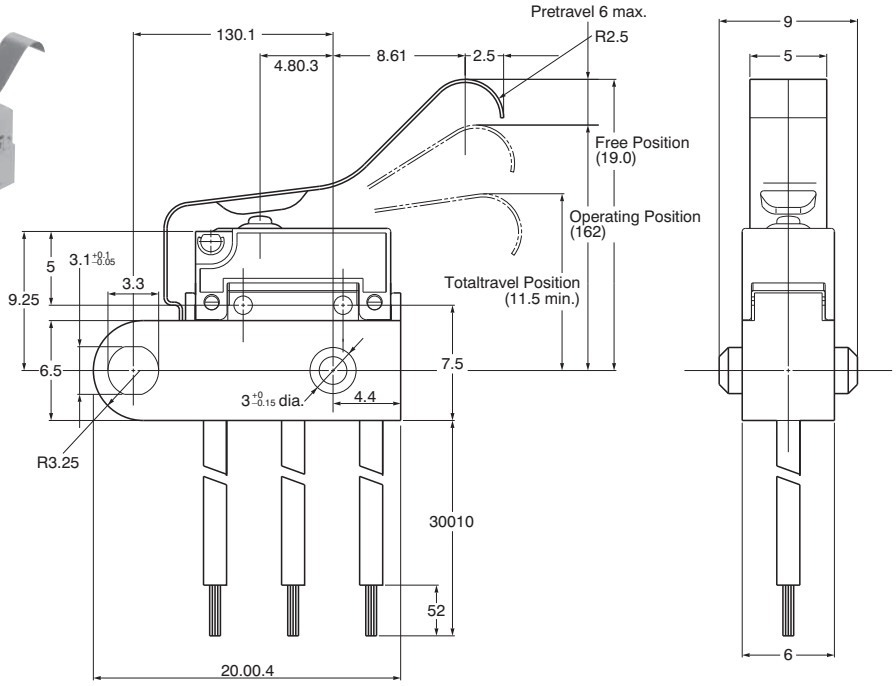
Leaf lever

mm General tolerance: ±0.25

Mounting hole: 3 mm

**CAD Data**






| | | |
|---|---|---|
| Pretravel, max. mm | | 6.0 |
| Movement differential, max. mm | | 1.0 |
| Overtravel, min mm | | 2.5 |
| Operating position | Distance from mounting hole, mm | 16.0±2.0 |

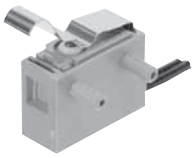
2-(2) Side wire leads type

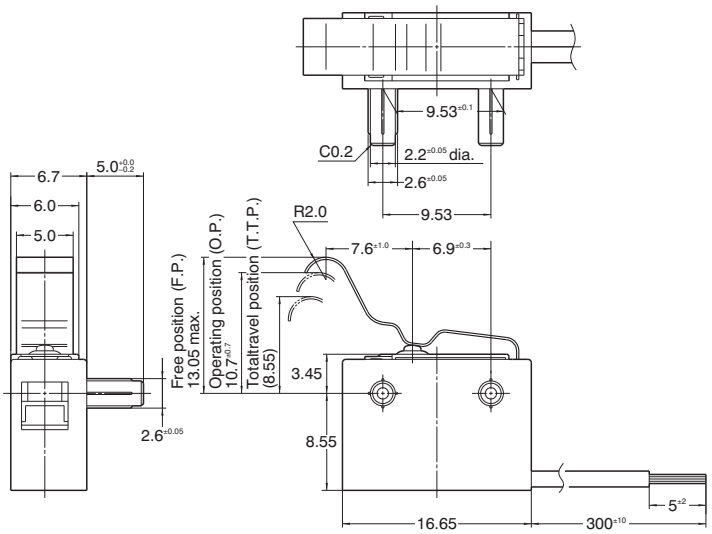
Fixed pin type

Right side pin type

Right wire leads type

**CAD Data**

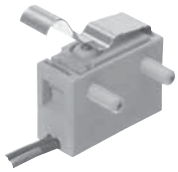




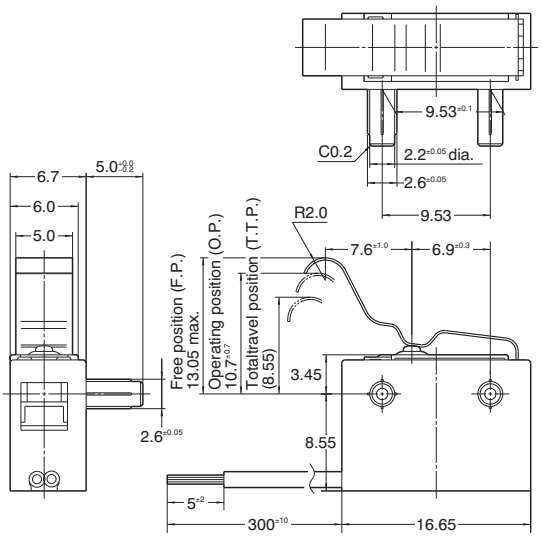

| | | |
|---|---|---|
| Pretravel, max. mm | | 2.6 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min mm | | 1.4 |
| Operating position | Distance from mounting hole, mm | 10.7±0.7 |

Right side pin type
Left wire leads type

**CAD Data**



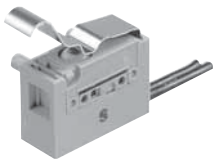
mm General tolerance: ±0.25

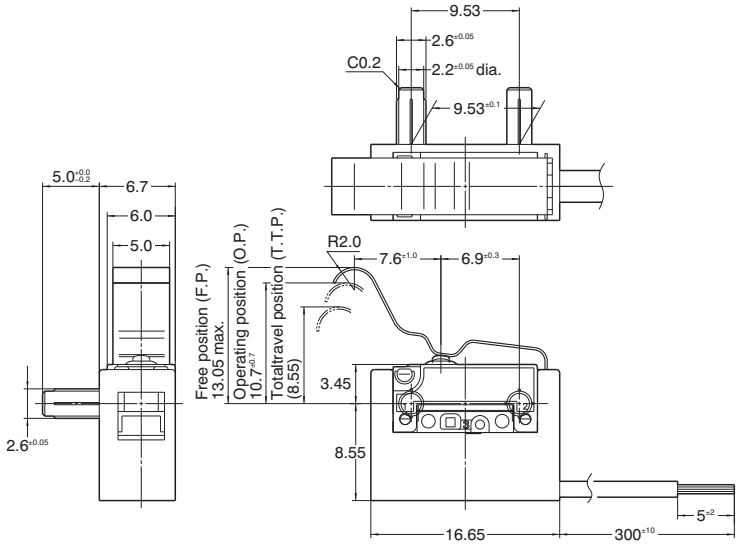



| | | |
|---|---|---|
| Pretravel, max. mm | | 2.6 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min mm | | 1.4 |
| Operating position | Distance from mounting hole, mm | 10.7±0.7 |

Left side pin type
Right wire leads type

**CAD Data**

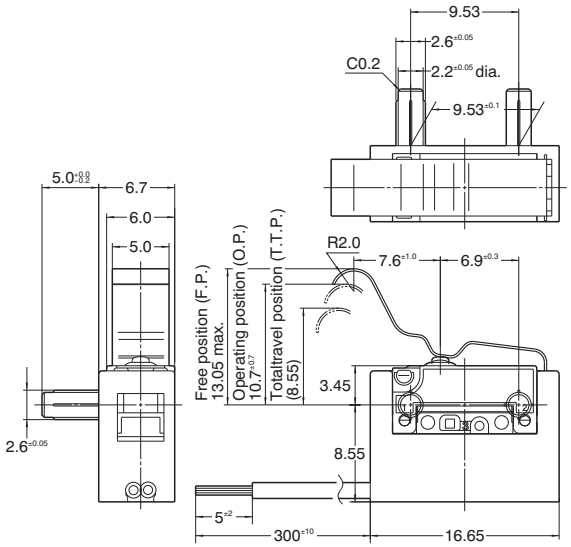





| | | |
|---|---|---|
| Pretravel, max. mm | | 2.6 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min mm | | 1.4 |
| Operating position | Distance from mounting hole, mm | 10.7±0.7 |

Left side pin type
Left wire leads type

**CAD Data**

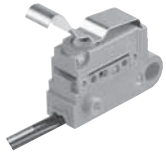


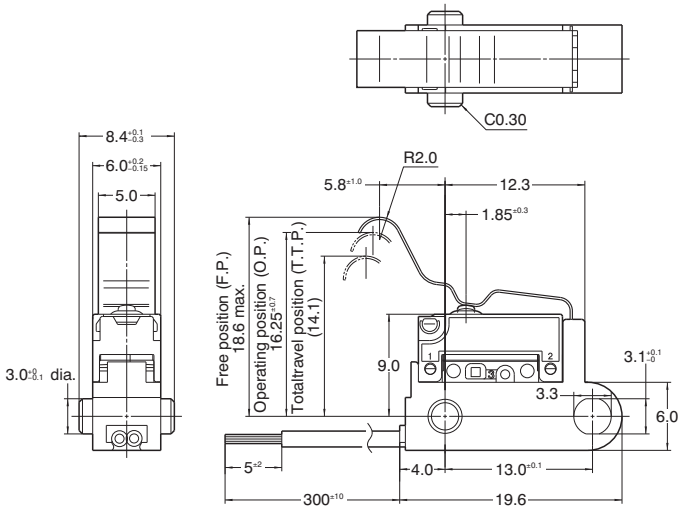

| | | |
|---|---|---|
| Pretravel, max. mm | | 2.6 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min mm | | 1.4 |
| Operating position | Distance from mounting hole, mm | 10.7±0.7 |

Mounting hole 3mm type

mm General tolerance: ±0.25

**CAD Data**



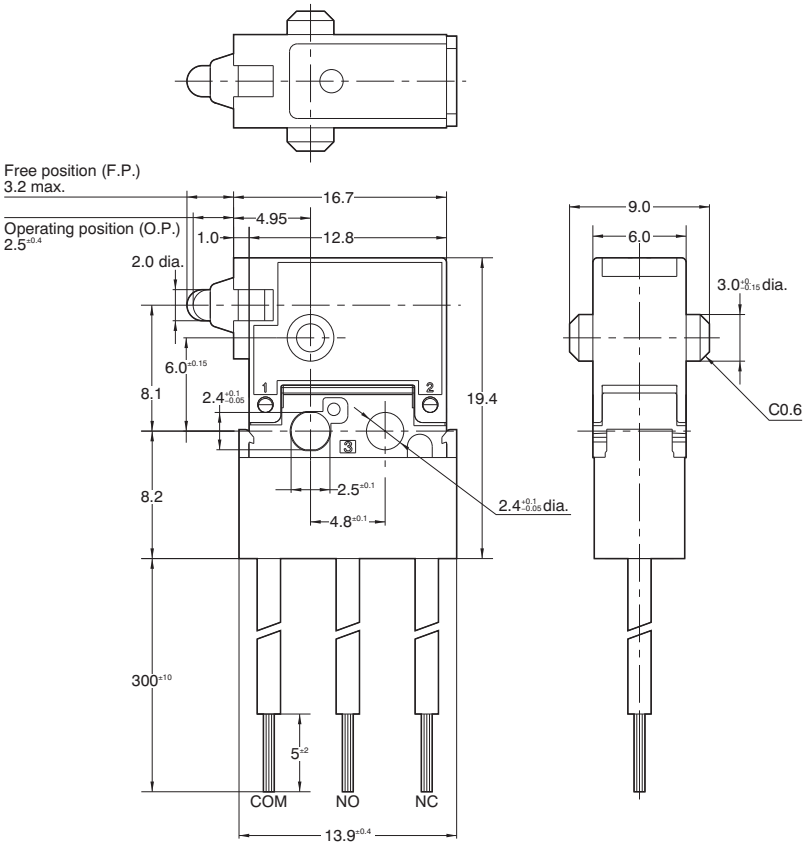



| | | |
|---|---|---|
| Pretravel, max. mm | | 2.6 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min mm | | 1.4 |
| Operating position | Distance from mounting hole, mm | 16.25±0.7 |

**3. Immersion protected type (bottom wire leads type) Long stroke type**

Mounting hole: 2.3 mm

**CAD Data**




| | |
|---|---|
| Movement differential, max. mm | 0.5 |
| Overtravel, min mm | 2.0 |
| Operating position | 2.5 ±0.4 |

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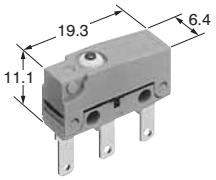
**HIGH ENVIRONMENTAL RESISTANCE**

# TURQUOISE SWITCHES ABS TYPE




## FEATURES

- **Subminiature size (19.8×11.1×6.4 mm)**
- **Sealed construction for use in adverse environment. Sealed construction by epoxy resin and rubber cap greatly reduces possible miscontact due to contaminants such as dust. Conforming to IP67* of IEC protective construction classification**
- **Elastomer double molding technology, an industry first and ultrasonic swaging technology contribute to uniform sealing in high production quantities**
- **Expansion of low-level circuit type**
- **We offer a Au-clad 2-ply contact type (for small loads) that we developed specifically for small current and voltage loads in the range of 1 mA to 100 mA and 5 V to 30 V.**
- **UL/CSA/VDE/SEMKO approved (AS for Au-clad twin layer, VDE and SEMKO are not approved.)**

* Based on the protective construction classification of IEC, items which satisfy the test requirements are denoted with an IP designation.

## TYPICAL APPLICATIONS

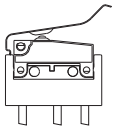
- **Automotive**
- **Home appliances (vacuum cleaner, air purifier)**
- **Others (gas cooking range)**

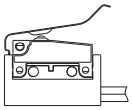
## ORDERING INFORMATION

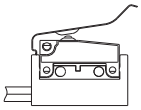
Ex. ABS 1 1 1 0 4 0 3

| Type of switch | Wire and terminal position | Terminal | Contact arrangement | Actuator | Operating force by pin plunger (max.) | Contact* | Agency standard |
|---|---|---|---|---|---|---|---|
| ABS: Turquoise switch S type | 1: Straight type<br>4: Right angle<br>5: Left angle | 1: .110 quick-connect terminal<br>4: Solder terminal<br>5: PC board terminal<br>6: Wire leads | 1: SPDT<br>2: SPST-NC<br>3: SPST-NO | 0: Pin plunger<br>1: Short hinge lever<br>2: Hinge lever<br>3: Long hinge lever<br>4: Simulated roller lever<br>6: Roller lever<br>8: Leaf lever | 4: 0.98 N<br>5: 1.47 N | 0: AgNi alloy<br>1: Au-clad triple layer<br>4: Au-clad double layer | 3: UL/CSA/VDE/SEMKO (AgNi alloy contact, Au-clad triple layer type) (Except wire leads type)<br>9: UL/CSA (Au-clad double layer type) (Except wire leads type) |

Remarks: 1. Standard packing: Dust protected type 100 pcs./carton, 1,000 pcs./case; Immersion protected type 50 pcs./case.
2. SPST-NC and SPST-NO are only available for wire leads type.
3. Leaf lever is only available for wire leads type
4. As for wire position:


Straight type


Wire opposite to the actuator side type (Right angle)


Wire actuator side type (Left angle)

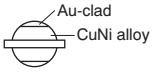
5. Not every combination is available. Please refer to the following table, “PRODUCT TYPES”.

* Contact

0: AgNi alloy

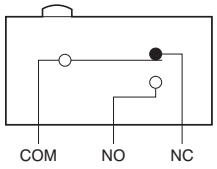

1: Au-clad triple layer


4: Au-clad double layer

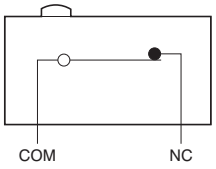


# CONTACT ARRANGEMENT

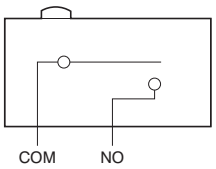
1. SPDT




2. SPST-NC (wire leads type only)




3. SPST-NO (wire leads type only)




# PRODUCT TYPES

**1. Dust protected type**

AgNi alloy

| Actuator | Operating force max. | .110 quick-connect terminal | Solder terminal | PC board terminal | | |
|---|---|---|---|---|---|---|
| | | | | Terminal position | | |
| | | | | Straight | Right angle | Left angle |
| Pin plunger | 0.98 N | ABS1110403 | ABS1410403 | ABS1510403 | ABS4510403 | ABS5510403 |
| | 1.47 N | ABS1110503 | ABS1410503 | ABS1510503 | ABS4510503 | ABS5510503 |
| Short hinge lever | 0.39 N | ABS1111403 | ABS1411403 | ABS1511403 | ABS4511403 | ABS5511403 |
| | 0.59 N | ABS1111503 | ABS1411503 | ABS1511503 | ABS4511503 | ABS5511503 |
| Hinge lever | 0.34 N | ABS1112403 | ABS1412403 | ABS1512403 | ABS4512403 | ABS5512403 |
| | 0.54 N | ABS1112503 | ABS1412503 | ABS1512503 | ABS4512503 | ABS5512503 |
| Long hinge lever | 0.25 N | ABS1113403 | ABS1413403 | ABS1513403 | ABS4513403 | ABS5513403 |
| | 0.44 N | ABS1113503 | ABS1413503 | ABS1513503 | ABS4513503 | ABS5513503 |
| Simulated roller lever | 0.34 N | ABS1114403 | ABS1414403 | ABS1514403 | ABS4514403 | ABS5514403 |
| | 0.54 N | ABS1114503 | ABS1414503 | ABS1514503 | ABS4514503 | ABS5514503 |
| Roller lever | 0.39 N | ABS1116403 | ABS1416403 | ABS1516403 | ABS4516403 | ABS5516403 |
| | 0.59 N | ABS1116503 | ABS1416503 | ABS1516503 | ABS4516503 | ABS5516503 |

Au-clad triple layer

| Actuator | Operating force max. | .110 quick-connect terminal | Solder terminal | PC board terminal | | |
|---|---|---|---|---|---|---|
| | | | | Terminal position | | |
| | | | | Straight | Right angle | Left angle |
| Pin plunger | 0.98 N | ABS1110413 | ABS1410413 | ABS1510413 | ABS4510413 | ABS5510413 |
| | 1.47 N | ABS1110513 | ABS1410513 | ABS1510513 | ABS4510513 | ABS5510513 |
| Short hinge lever | 0.39 N | ABS1111413 | ABS1411413 | ABS1511413 | ABS4511413 | ABS5511413 |
| | 0.59 N | ABS1111513 | ABS1411513 | ABS1511513 | ABS4511513 | ABS5511513 |
| Hinge lever | 0.34 N | ABS1112413 | ABS1412413 | ABS1512413 | ABS4512413 | ABS5512413 |
| | 0.54 N | ABS1112513 | ABS1412513 | ABS1512513 | ABS4512513 | ABS5512513 |
| Long hinge lever | 0.25 N | ABS1113413 | ABS1413413 | ABS1513413 | ABS4513413 | ABS5513413 |
| | 0.44 N | ABS1113513 | ABS1413513 | ABS1513513 | ABS4513513 | ABS5513513 |
| Simulated roller lever | 0.34 N | ABS1114413 | ABS1414413 | ABS1514413 | ABS4514413 | ABS5514413 |
| | 0.54 N | ABS1114513 | ABS1414513 | ABS1514513 | ABS4514513 | ABS5514513 |
| Roller lever | 0.39 N | ABS1116413 | ABS1416413 | ABS1516413 | ABS4516413 | ABS5516413 |
| | 0.59 N | ABS1116513 | ABS1416513 | ABS1516513 | ABS4516513 | ABS5516513 |

Au-clad double layer

| Actuator | Operating force max. | .110 quick-connect terminal | Solder terminal | PC board terminal | | |
|---|---|---|---|---|---|---|
| | | | | Terminal position | | |
| | | | | Straight | Right angle | Left angle |
| Pin plunger | 0.98 N | ABS1110449 | ABS1410449 | ABS1510449 | ABS4510449 | ABS5510449 |
| | 1.47 N | ABS1110549 | ABS1410549 | ABS1510549 | ABS4510549 | ABS5510549 |
| Short hinge lever | 0.39 N | ABS1111449 | ABS1411449 | ABS1511449 | ABS4511449 | ABS5511449 |
| | 0.59 N | ABS1111549 | ABS1411549 | ABS1511549 | ABS4511549 | ABS5511549 |
| Hinge lever | 0.34 N | ABS1112449 | ABS1412449 | ABS1512449 | ABS4512449 | ABS5512449 |
| | 0.54 N | ABS1112549 | ABS1412549 | ABS1512549 | ABS4512549 | ABS5512549 |
| Long hinge lever | 0.25 N | ABS1113449 | ABS1413449 | ABS1513449 | ABS4513449 | ABS5513449 |
| | 0.44 N | ABS1113549 | ABS1413549 | ABS1513549 | ABS4513549 | ABS5513549 |
| Simulated roller lever | 0.34 N | ABS1114449 | ABS1414449 | ABS1514449 | ABS4514449 | ABS5514449 |
| | 0.54 N | ABS1114549 | ABS1414549 | ABS1514549 | ABS4514549 | ABS5514549 |
| Roller lever | 0.39 N | ABS1116449 | ABS1416449 | ABS1516449 | ABS4516449 | ABS5516449 |
| | 0.59 N | ABS1116549 | ABS1416549 | ABS1516549 | ABS4516549 | ABS5516549 |

* Agency standard: Please refer to “Ordering information”.

**2. Immersion protected type (3 wire leads type SPDT)**

AgNi alloy

| Actuator | Operating force max. | SPDT | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Pin plunger | 0.98 N | ABS161040 | ABS461040 | ABS561040 |
| | 1.47 N | ABS161050 | ABS461050 | ABS561050 |
| Short hinge lever | 0.39 N | ABS161140 | ABS461140 | ABS561140 |
| | 0.59 N | ABS161150 | ABS461150 | ABS561150 |
| Hinge lever | 0.34 N | ABS161240 | ABS461240 | ABS561240 |
| | 0.54 N | ABS161250 | ABS461250 | ABS561250 |
| Long hinge lever | 0.25 N | ABS161340 | ABS461340 | ABS561340 |
| | 0.44 N | ABS161350 | ABS461350 | ABS561350 |
| Simulated roller lever | 0.34 N | ABS161440 | ABS461440 | ABS561440 |
| | 0.54 N | ABS161450 | ABS461450 | ABS561450 |
| Roller lever | 0.39 N | ABS161640 | ABS461640 | ABS561640 |
| | 0.59 N | ABS161650 | ABS461650 | ABS561650 |

Au-clad triple layer

| Actuator | Operating force max. | SPDT | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Pin plunger | 0.98 N | ABS161041 | ABS461041 | ABS561041 |
| | 1.47 N | ABS161051 | ABS461051 | ABS561051 |
| Short hinge lever | 0.39 N | ABS161141 | ABS461141 | ABS561141 |
| | 0.59 N | ABS161151 | ABS461151 | ABS561151 |
| Hinge lever | 0.34 N | ABS161241 | ABS461241 | ABS561241 |
| | 0.54 N | ABS161251 | ABS461251 | ABS561251 |
| Long hinge lever | 0.25 N | ABS16141 | ABS46141 | ABS56141 |
| | 0.44 N | ABS16151 | ABS46151 | ABS56151 |
| Simulated roller lever | 0.34 N | ABS161441 | ABS461441 | ABS561441 |
| | 0.54 N | ABS161451 | ABS461451 | ABS561451 |
| Roller lever | 0.39 N | ABS161641 | ABS461641 | ABS561641 |
| | 0.59 N | ABS161651 | ABS461651 | ABS561651 |

Au-clad double layer

| Actuator | Operating force max. | SPDT | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Pin plunger | 0.98 N | ABS161044 | ABS461044 | ABS561044 |
| | 1.47 N | ABS161054 | ABS461054 | ABS561054 |
| Short hinge lever | 0.39 N | ABS161144 | ABS461144 | ABS561144 |
| | 0.59 N | ABS161154 | ABS461154 | ABS561154 |
| Hinge lever | 0.34 N | ABS161244 | ABS461244 | ABS561244 |
| | 0.54 N | ABS161254 | ABS461254 | ABS561254 |
| Long hinge lever | 0.25 N | ABS161344 | ABS461344 | ABS561344 |
| | 0.44 N | ABS161354 | ABS461354 | ABS561354 |
| Simulated roller lever | 0.34 N | ABS161444 | ABS461444 | ABS561444 |
| | 0.54 N | ABS161454 | ABS461454 | ABS561454 |
| Roller lever | 0.39 N | ABS161644 | ABS461644 | ABS561644 |
| | 0.59 N | ABS161654 | ABS461654 | ABS561654 |

* Agency standard: Please refer to “Ordering information”.

**3. Immersion protected type (2 wire leads type SPST-NC)**

AgNi alloy

| Actuator | Operating force max. | SPST-NC | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Pin plunger | 0.98 N | ABS162040 | ABS462040 | ABS562040 |
| | 1.47 N | ABS162050 | ABS462050 | ABS562050 |
| Short hinge lever | 0.39 N | ABS162140 | ABS462140 | ABS562140 |
| | 0.59 N | ABS162150 | ABS462150 | ABS562150 |
| Hinge lever | 0.34 N | ABS162240 | ABS462240 | ABS562240 |
| | 0.54 N | ABS162250 | ABS462250 | ABS562250 |
| Long hinge lever | 0.25 N | ABS162340 | ABS462340 | ABS562340 |
| | 0.44 N | ABS162350 | ABS462350 | ABS562350 |
| Simulated roller lever | 0.34 N | ABS162440 | ABS462440 | ABS562440 |
| | 0.54 N | ABS162450 | ABS462450 | ABS562450 |
| Roller lever | 0.39 N | ABS162640 | ABS462640 | ABS562640 |
| | 0.59 N | ABS162650 | ABS462650 | ABS562650 |

Au-clad triple layer

| Actuator | Operating force max. | SPST-NC | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Pin plunger | 0.98 N | ABS162041 | ABS462041 | ABS562041 |
| | 1.47 N | ABS162051 | ABS462051 | ABS562051 |
| Short hinge lever | 0.39 N | ABS162141 | ABS462141 | ABS562141 |
| | 0.59 N | ABS162151 | ABS462151 | ABS562151 |
| Hinge lever | 0.34 N | ABS162241 | ABS462241 | ABS562241 |
| | 0.54 N | ABS162251 | ABS462251 | ABS562251 |
| Long hinge lever | 0.25 N | ABS162341 | ABS462341 | ABS562341 |
| | 0.44 N | ABS162351 | ABS462351 | ABS562351 |
| Simulated roller lever | 0.34 N | ABS162441 | ABS462441 | ABS562441 |
| | 0.54 N | ABS162451 | ABS462451 | ABS562451 |
| Roller lever | 0.39 N | ABS162641 | ABS462641 | ABS562641 |
| | 0.59 N | ABS162651 | ABS462651 | ABS562651 |

Au-clad double layer

| Actuator | Operating force max. | SPST-NC | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Pin plunger | 0.98 N | ABS162044 | ABS462044 | ABS562044 |
| | 1.47 N | ABS162054 | ABS462054 | ABS562054 |
| Short hinge lever | 0.39 N | ABS162144 | ABS462144 | ABS562144 |
| | 0.59 N | ABS162154 | ABS462154 | ABS562154 |
| Hinge lever | 0.34 N | ABS162244 | ABS462244 | ABS562244 |
| | 0.54 N | ABS162254 | ABS462254 | ABS562254 |
| Long hinge lever | 0.25 N | ABS162344 | ABS462344 | ABS562344 |
| | 0.44 N | ABS162354 | ABS462354 | ABS562354 |
| Simulated roller lever | 0.34 N | ABS162444 | ABS462444 | ABS562444 |
| | 0.54 N | ABS162454 | ABS462454 | ABS562454 |
| Roller lever | 0.39 N | ABS162644 | ABS462644 | ABS562644 |
| | 0.59 N | ABS162654 | ABS462654 | ABS562654 |

* Agency standard: Please refer to “Ordering information”.

**4. Immersion protected type (2 wire leads type SPST-NO)**

AgNi alloy

| Actuator | Operating force max. | SPST-NO | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Pin plunger | 0.98 N | ABS163040 | ABS463040 | ABS563040 |
| | 1.47 N | ABS163050 | ABS463050 | ABS563050 |
| Short hinge lever | 0.39 N | ABS163140 | ABS463140 | ABS563140 |
| | 0.59 N | ABS163150 | ABS463150 | ABS563150 |
| Hinge lever | 0.34 N | ABS163240 | ABS463240 | ABS563240 |
| | 0.54 N | ABS163250 | ABS463250 | ABS563250 |
| Long hinge lever | 0.25 N | ABS163340 | ABS463340 | ABS563340 |
| | 0.44 N | ABS163350 | ABS463350 | ABS563350 |
| Simulated roller lever | 0.34 N | ABS163440 | ABS463440 | ABS563440 |
| | 0.54 N | ABS163450 | ABS463450 | ABS563450 |
| Roller lever | 0.39 N | ABS163640 | ABS463640 | ABS563640 |
| | 0.59 N | ABS163650 | ABS463650 | ABS563650 |

Au-clad triple layer

| Actuator | Operating force max. | SPST-NO | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Pin plunger | 0.98 N | ABS163041 | ABS463041 | ABS563041 |
| | 1.47 N | ABS163051 | ABS463051 | ABS563051 |
| Short hinge lever | 0.39 N | ABS163141 | ABS463141 | ABS563141 |
| | 0.59 N | ABS163151 | ABS463151 | ABS563151 |
| Hinge lever | 0.34 N | ABS163241 | ABS463241 | ABS563241 |
| | 0.54 N | ABS163251 | ABS463251 | ABS563251 |
| Long hinge lever | 0.25 N | ABS163341 | ABS463341 | ABS563341 |
| | 0.44 N | ABS163351 | ABS463351 | ABS563351 |
| Simulated roller lever | 0.34 N | ABS163441 | ABS463441 | ABS563441 |
| | 0.54 N | ABS163451 | ABS463451 | ABS563451 |
| Roller lever | 0.39 N | ABS163641 | ABS463641 | ABS563641 |
| | 0.59 N | ABS163651 | ABS463651 | ABS563651 |

Au-clad double layer

| Actuator | Operating force max. | SPST-NO | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Pin plunger | 0.98 N | ABS163044 | ABS463044 | ABS563044 |
| | 1.47 N | ABS163054 | ABS463054 | ABS563054 |
| Short hinge lever | 0.39 N | ABS163144 | ABS463144 | ABS563144 |
| | 0.59 N | ABS163154 | ABS463154 | ABS563154 |
| Hinge lever | 0.34 N | ABS163244 | ABS463244 | ABS563244 |
| | 0.54 N | ABS163254 | ABS463254 | ABS563254 |
| Long hinge lever | 0.25 N | ABS163344 | ABS463344 | ABS563344 |
| | 0.44 N | ABS163354 | ABS463354 | ABS563354 |
| Simulated roller lever | 0.34 N | ABS163444 | ABS463444 | ABS563444 |
| | 0.54 N | ABS163454 | ABS463454 | ABS563454 |
| Roller lever | 0.39 N | ABS163644 | ABS463644 | ABS563644 |
| | 0.59 N | ABS163654 | ABS463654 | ABS563654 |

* Agency standard: Please refer to “Ordering information”.

**5. Immersion protected type (3 wire leads type SPDT)**

• Leaf lever type

AgNi alloy

| Actuator | Operating force max. | SPDT | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Leaf lever | 0.88 N | ABS161840 | ABS461840 | ABS561840 |
| | 1.08 N | ABS161850 | ABS461850 | ABS561850 |

Au-clad triple layer

| Actuator | Operating force max. | SPDT | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Leaf lever | 0.88 N | ABS161841 | ABS461841 | ABS561841 |
| | 1.08 N | ABS161851 | ABS461851 | ABS561851 |

Au-clad double layer

| Actuator | Operating force max. | SPDT | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Leaf lever | 0.88 N | ABS161844 | ABS461844 | ABS561844 |
| | 1.08 N | ABS161854 | ABS461854 | ABS561854 |

**6. Immersion protected type (2 wire leads type SPST-NC)**

• Leaf lever type

AgNi alloy

| Actuator | Operating force max. | SPST-NC | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Leaf lever | 0.88 N | ABS162840 | ABS462840 | ABS562840 |
| | 1.08 N | ABS162850 | ABS462850 | ABS562850 |

Au-clad triple layer

| Actuator | Operating force max. | SPST-NC | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Leaf lever | 0.88 N | ABS162841 | ABS462841 | ABS562841 |
| | 1.08 N | ABS162851 | ABS462851 | ABS562851 |

Au-clad double layer

| Actuator | Operating force max. | SPST-NC | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Leaf lever | 0.88 N | ABS162844 | ABS462844 | ABS562844 |
| | 1.08 N | ABS162854 | ABS462854 | ABS562854 |

**7. Immersion protected type (2 wire leads type SPST-NO)**

• Leaf lever type

AgNi alloy

| Actuator | Operating force max. | SPST-NO | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Leaf lever | 0.88 N | ABS163840 | ABS463840 | ABS563840 |
| | 1.08 N | ABS163850 | ABS463850 | ABS563850 |

Au-clad triple layer

| Actuator | Operating force max. | SPST-NO | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Leaf lever | 0.88 N | ABS163841 | ABS463841 | ABS563841 |
| | 1.08 N | ABS163851 | ABS463851 | ABS563851 |

* Agency standard: Please refer to “Ordering information”.

Au-clad double layer

| Actuator | Operating force max. gf | SPST-NO | | |
|---|---|---|---|---|
| | | Wire position | | |
| | | Straight | Right angle | Left angle |
| Leaf lever | 0.88 N | ABS163844 | ABS463844 | ABS563844 |
| | 1.08 N | ABS163854 | ABS463854 | ABS563854 |

* Agency standard: Please refer to “Ordering information”.

# SPECIFICATIONS

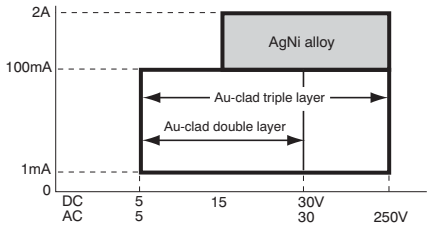
## 1. Contact rating

| Voltage | AgNi alloy contact type | | Au-clad contact type | |
|---|---|---|---|---|
| | | | Au-clad triple layer | Au-clad double layer |
| | Resistive load | Inductive load | Resistive load | |
| 125 V AC | 2 A | 2 A | 0.1 A | — |
| 250 V AC | 2 A | 2 A | 0.1 A | — |
| 30 V DC | 2 A | 2 A | 0.1 A | 0.1 A |
| 125 V DC | 0.4 A | 0.05 A | — | — |

Low-level circuit rating (Au-clad contact type)

| Rated voltage | Resistive load |
|---|---|
| 6 V DC | 5 mA |
| 12 V DC | 2 mA |
| 24 V DC | 1 mA |

Recommended contact material chart classified by load voltage & current (reference)




Remarks: If the contact is being used in the constant low-level circuit load range, the Au-clad double layer contact is recommended. If there is a danger of the current being less than 0.5 A, for instance if the contact is being turned on and off, the Au-clad triple layer type is recommended.

## 2. Characteristics

| | | |
|---|---|---|
| Mechanical life (O.T.: Specified value) | Leaf lever | Min. $5x10^5$ (at 60 cpm) |
| | Other types | Min. $5x10^6$ (at 60 cpm) |
| Electrical life at rated load (O.T.: Max.) | AgNi alloy contact type | Min. $5x10^4$ (at 20 cpm) |
| | Au-clad contact type | Min. $2x10^5$ (at 20 cpm) |
| Insulation resistance | | Min. 100 MΩ (at 500 V DC insulation resistance meter) |
| Dielectric strength<br>Between non-continuous terminals<br>Between each terminal and other exposed metal parts<br>Between each terminal and ground | | <br>1,000 Vrms<br>1,500 Vrms<br>1,500 Vrms |
| Vibration resistance (pin plunger type) | | 10 to 55 Hz at single amplitude of 0.75 mm (contact opening max. 1 ms) |
| Shock resistance (pin plunger type) | | Min. 294 $m/s^2$ (contact opening max. 1 ms) |
| Contact resistance (initial) | AgNi alloy contact type | Dust protected type (IP50): Max. 50 mΩ<br>Immersion protected type (IP67): Max. 100 mΩ (by voltage drop 1 A 6 to 8 V DC) |
| | Au-clad contact type | Dust protected type (IP50): Max. 100 mΩ<br>Immersion protected type (IP67): Max. 150 mΩ (by voltage drop 0.1 A 6 to 8 V DC) |
| Allowable operating speed (at no load) | | 0.1 to 500 mm/s |
| Max. operating cycle rate (at no load) | | 120 cpm |
| Ambient temperature | | –40°C to +85°C |
| Unit weight | | Approx. 2 g (IP50 type) |
| Water resistance | | IP67 (wire leads type) |

## 3. Operating characteristics

| Type of actuator | Operating force, max. | | Release force, min. | | Pretravel, max. mm | Movement differential, max. mm | Overtravel, min. mm | Operating position, mm |
|---|---|---|---|---|---|---|---|---|
| 8th digit of part no. | 4 | 5 | 4 | 5 | | | | |
| Pin plunger | 0.98N | 1.47N | 0.15N | 0.20N | 0.6 | 0.1 | 0.4 | 8.4±0.3 |
| Short hinge lever | 0.39N | 0.59N | 0.034N | 0.039N | 2.5 | 0.5 | 0.8 | 8.8±0.8 |
| Hinge lever | 0.34N | 0.54N | 0.029N | 0.034N | 2.8 | 0.8 | 1.2 | 8.8±0.8 |
| Long hinge lever | 0.25N | 0.44N | 0.025N | 0.029N | 3.5 | 1.0 | 1.6 | 8.8±1.2 |
| Simulated roller lever | 0.34N | 0.54N | 0.029N | 0.034N | 2.8 | 0.8 | 1.2 | 11.65±0.8 |
| Roller lever | 0.39N | 0.59N | 0.034N | 0.039N | 2.5 | 0.5 | 0.8 | 14.5±0.8 |
| Leaf lever | 0.88N | 1.08N | 0.17N | 0.20N | 4.5 | 1.0 | 2.5 | 14.5±1.5 |

# DIMENSIONS

Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

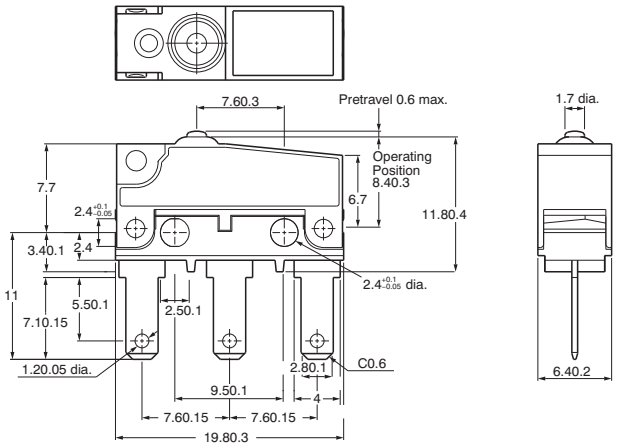
mm General tolerance: ±0.25

## 1. Dust protected type

1-(1) .110 quick-connect terminal

Pin plunger

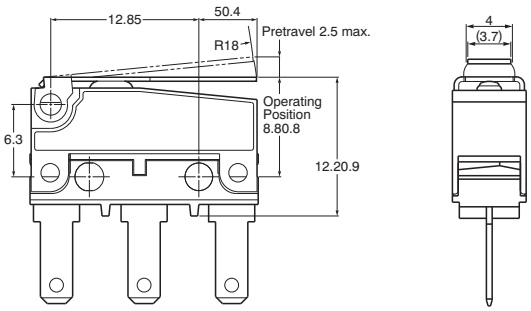
**CAD Data**




| | | |
|---|---|---|
| Pretravel, max. mm | | 0.6 |
| Movement differential, max. mm | | 0.1 |
| Overtravel, min. mm | | 0.4 |
| Operating position | Distance from mounting hole, mm | 8.4±0.3 |
| | Distance from stand-off, mm | 11.8±0.4 |

Short hinge lever

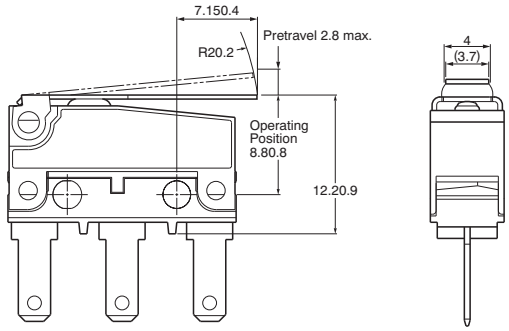
**CAD Data**




| | | |
|---|---|---|
| Pretravel, max. mm | | 2.5 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min. mm | | 0.8 |
| Operating position | Distance from mounting hole, mm | 8.8±0.8 |
| | Distance from stand-off, mm | 12.2±0.9 |

Hinge lever

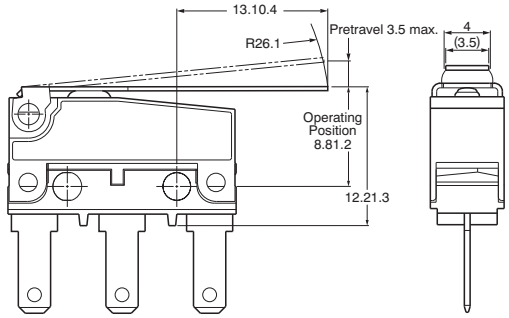
**CAD Data**




| | | |
|---|---|---|
| Pretravel, max. mm | | 2.8 |
| Movement differential, max. mm | | 0.8 |
| Overtravel, Min. mm | | 1.2 |
| Operating position | Distance from mounting hole, mm | 8.8±0.8 |
| | Distance from stand-off, mm | 12.2±0.9 |

Long hinge lever

**CAD Data**



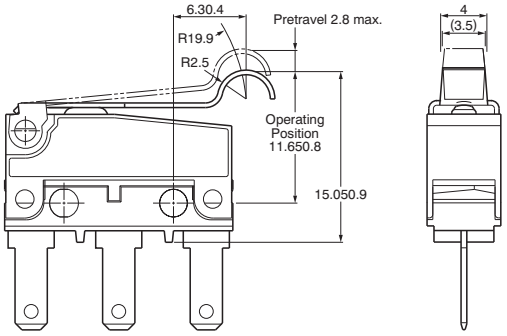

| | | |
|---|---|---|
| Pretravel, max. mm | | 3.5 |
| Movement differential, max. mm | | 1 |
| Overtravel, min. mm | | 1.6 |
| Operating position | Distance from mounting hole, mm | 8.8±1.2 |
| | Distance from stand-off, mm | 12.2±1.3 |

# ABS1,4,5

## Simulated roller lever

mm General tolerance: ±0.25

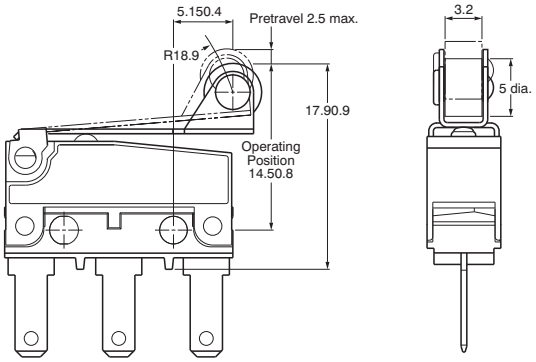
**CAD Data**




| | | |
|---|---|---|
| Pretravel, max. mm | | 2.8 |
| Movement differential, max. mm | | 0.8 |
| Overtravel, min. mm | | 1.2 |
| Operating position | Distance from mounting hole, mm | 11.65±0.8 |
| | Distance from stand-off, mm | 15.05±0.9 |

## Roller lever

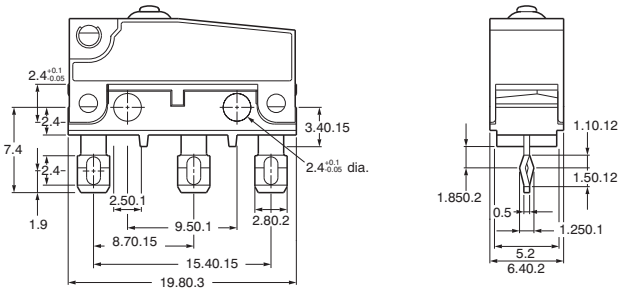
**CAD Data**




| | | |
|---|---|---|
| Pretravel, max. mm | | 2.5 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min. mm | | 0.8 |
| Operating position | Distance from mounting hole, mm | 14.5±0.8 |
| | Distance from stand-off, mm | 17.9±0.9 |

## 1-(2) Solder terminal

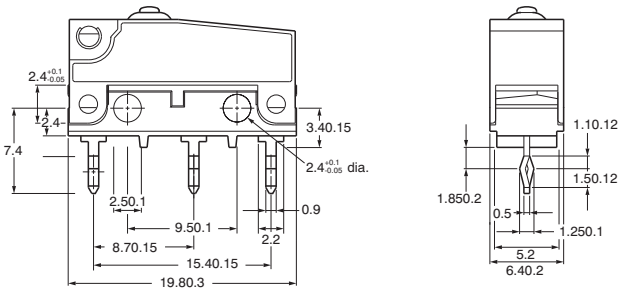
**CAD Data**

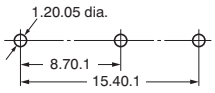



Remarks: Dimensions of the actuator types are the same as those of corresponding .110 quick-connect terminal types.

## 1-(3) PC board terminal
## Straight type

**CAD Data**



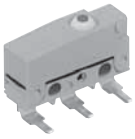



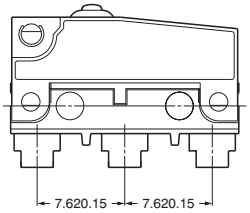

Remarks: Dimensions of the actuator types are the same as those of corresponding .110 quick-connect terminal types.

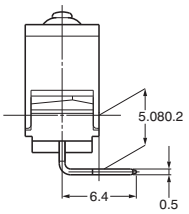
Right angle type

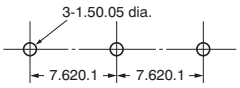
mm General tolerance: ±0.25

**CAD Data**





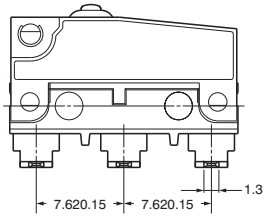



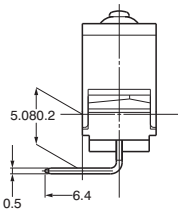



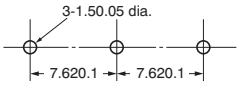

Remarks: Dimensions of the actuator types are the same as those of corresponding .110 quick-connect terminal types.

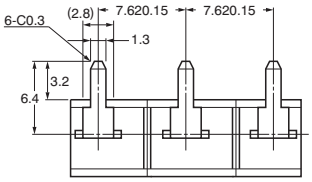
Left angle type

**CAD Data**




Remarks: Dimensions of the actuator types are the same as those of corresponding .110 quick-connect terminal types.

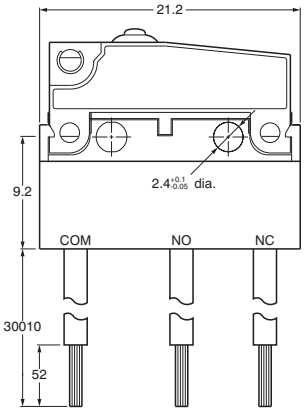
**2. Immersion protected type**

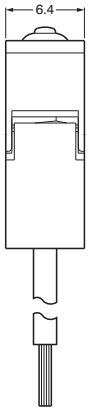
Wire leads

Pin plunger

Straight type

**CAD Data**




Thickness of the lead wire: 0.5 mm²

UL/CSA approved type and Right/Left angle type: AWG #20

Color of the lead wire:

COM... Black

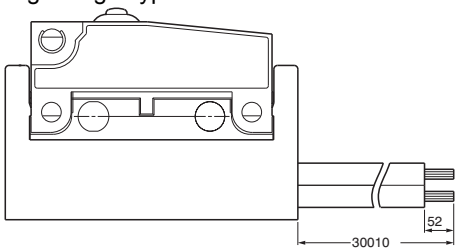
N.C. ... Red

N.O. ... White

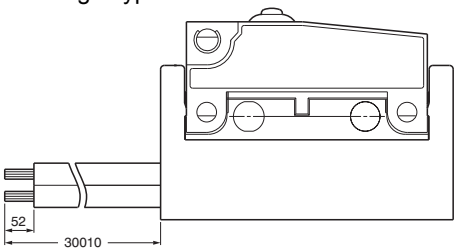
Remarks: 1. Other dimensions are the same as those of .110 quick-connect terminal types.

2. Dimensions of the actuator types are the same as those of corresponding .110 quick-connect terminal types.

Right angle type



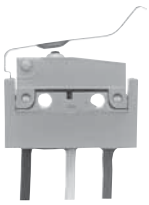

Left angle type

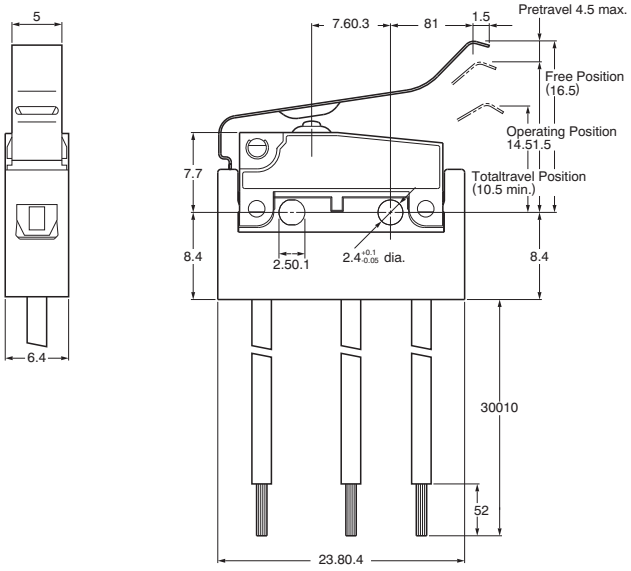


Leaf lever
Straight type

mm General tolerance: ±0.25

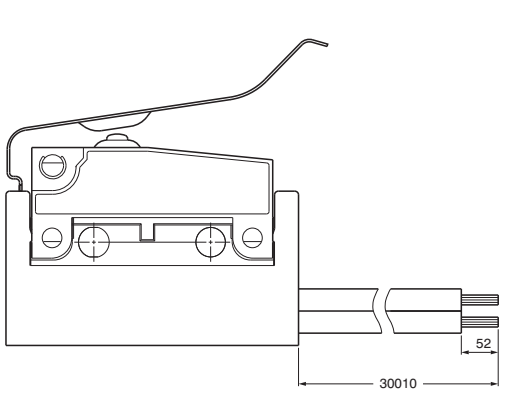
**CAD Data**

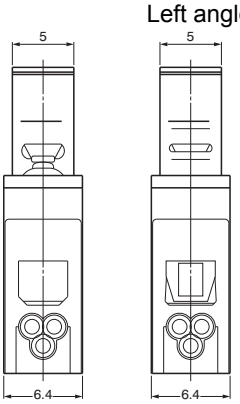




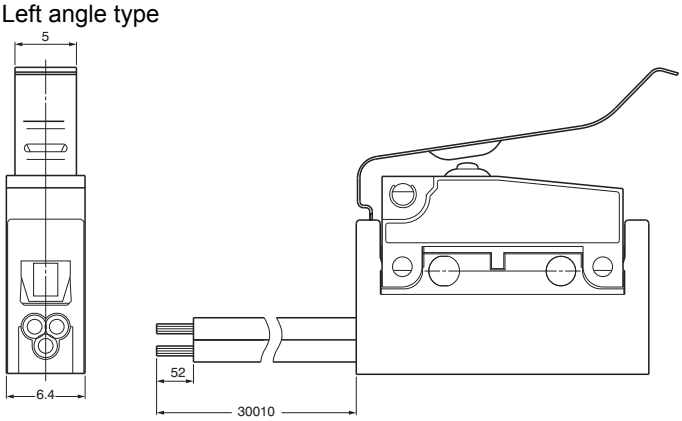

Thickness of the lead wire: 0.5 mm²
UL/CSA approved type and Right/Left angle type:
AWG #20
Color of the lead wire:
COM... Black
N.C. ... Red
N.O. ... White

Right angle type



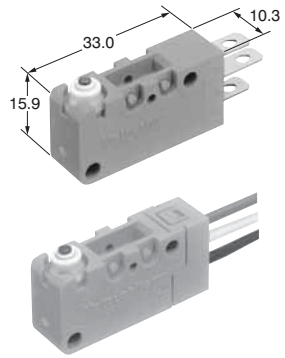




Left angle type



**HIGH ENVIRONMENTAL RESISTANCE**

# TURQUOISE SWITCHES ABV TYPE




## FEATURES

- **Miniature size (33×15.9×10.3 mm)**
- **Sealed construction for use in adverse environment-Sealed construction by epoxy resin and rubber cap greatly reduces possible miscontact due to contaminants such as dust. Conforming to IP67* of IEC protective construction classification**
- **Elastomer double molding technology, an industry first and ultrasonic swaging technology contribute to uniform sealing in high production quantities**
- **UL/CSA/VDE/SEMKO approved**

* Based on the protective construction classification of IED, items which satisfy the test requirements are denoted with an IP designation.

## TYPICAL APPLICATIONS

- **Automotive**
- **Agricultural devices**
- **Industrial equipment**

## ORDERING INFORMATION

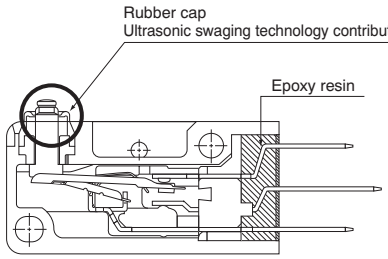
Ex. ABV1 | 2 | 1 | 0 | 4 | 1 | 3 | R

| Type of switch | Terminal | Contact arrangement | Actuator | Operating force by pin plunger (max.) | Contact | Agency standard | Short roller lever |
|---|---|---|---|---|---|---|---|
| ABV1: Turquoise switch V type | 2: .187 quick-connect terminal<br>6: Wire leads | 1: SPDT<br>2: SPST-NC<br>3: SPST-NO | 0: Pin plunger<br>2: Hinge lever<br>4: Simulated roller lever<br>5: Short roller lever<br>6: Roller lever | 4: 0.98 N<br>5: 1.96 N | 0: AgNi alloy<br>1: AgNi alloy + Au-clad | 3: UL/CSA/VDE/ SEMKO | R: Improved short roller lever |

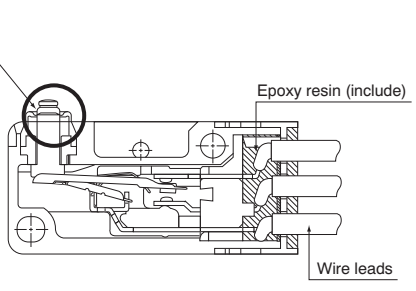
Remarks: 1. Standard packing: Dust protected type 50 pcs./carton, 500 pcs./case; Immersion protected type 50 pcs./case.
2. Not every combination is available. Please refer to the following table, “PRODUCT TYPES”.

## CONSTRUCTION

.187 quick-connect terminal

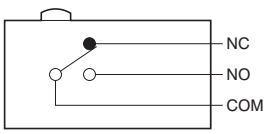



Wire leads

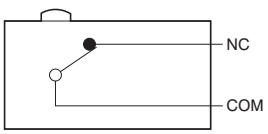



## CONTACT ARRANGEMENT

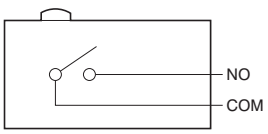
1. SPDT



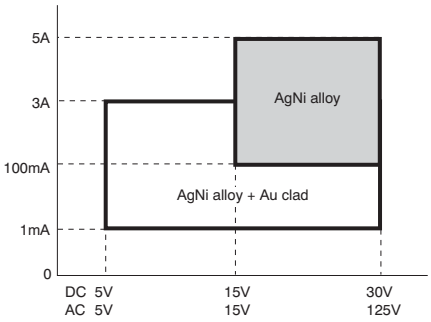

2. SPST-NC




3. SPST-NO



## APPLICABLE CURRENT RANGE (reference only)




## PRODUCT TYPES

**AgNi alloy**

| Contact | Actuator | Contact Arrangement | Operating force, max. | 187 Quick-connect terminal | Wire Leads |
|---|---|---|---|---|---|
| AgNi alloy | Pin plunger | SPDT | 0.98 N | ABV1210403 | ABV1610403 |
| | | | 1.96 N | ABV1210503 | ABV1610503 |
| | | SPST-NC | 0.98 N | ABV1220403 | ABV1620403 |
| | | | 1.96 N | ABV1220503 | ABV1620503 |
| | | SPST-NO | 0.98 N | ABV1230403 | ABV1630403 |
| | | | 1.96 N | ABV1230503 | ABV1630503 |
| | Hinge lever | SPDT | 0.59 N | ABV1212403 | ABV1612403 |
| | | | 1.18 N | ABV1212503 | ABV1612503 |
| | | SPST-NC | 0.59 N | ABV1222403 | ABV1622403 |
| | | | 1.18 N | ABV1222503 | ABV1622503 |
| | | SPST-NO | 0.59 N | ABV1232403 | ABV1632403 |
| | | | 1.18 N | ABV1232503 | ABV1632503 |
| | Simulated roller lever | SPDT | 0.59 N | ABV1214403 | ABV1614403 |
| | | | 1.18 N | ABV1214503 | ABV1614503 |
| | | SPST-NC | 0.59 N | ABV1224403 | ABV1624403 |
| | | | 1.18 N | ABV1224503 | ABV1624503 |
| | | SPST-NO | 0.59 N | ABV1234403 | ABV1634403 |
| | | | 1.18 N | ABV1234503 | ABV1634503 |
| | Short roller lever | SPDT | 1.08 N | ABV1215403R | ABV1615403R |
| | | | 2.16 N | ABV1215503R | ABV1615503R |
| | | SPST-NC | 1.08 N | ABV1225403R | ABV1625403R |
| | | | 2.16 N | ABV1225503R | ABV1625503R |
| | | SPST-NO | 1.08 N | ABV1235403R | ABV1635403R |
| | | | 2.16 N | ABV1235503R | ABV1635503R |
| | Roller lever | SPDT | 0.59 N | ABV1216403 | ABV1616403 |
| | | | 1.18 N | ABV1216503 | ABV1616503 |
| | | SPST-NC | 0.59 N | ABV1226403 | ABV1626403 |
| | | | 1.18 N | ABV1226503 | ABV1626503 |
| | | SPST-NO | 0.59 N | ABV1236403 | ABV1636403 |
| | | | 1.18 N | ABV1236503 | ABV1636503 |

**AgNi alloy + Au-clad**

| Contact | Actuator | Contact Arrangement | Operating force, max. | 187 Quick-connect terminal | Wire Leads |
|---|---|---|---|---|---|
| AgNi alloy + Au-clad | Pin plunger | SPDT | 0.98 N | ABV1210413 | ABV1610413 |
| | | | 1.96 N | ABV1210513 | ABV1610513 |
| | | SPST-NC | 0.98 N | ABV1220413 | ABV1620413 |
| | | | 1.96 N | ABV1220513 | ABV1620513 |
| | | SPST-NO | 0.98 N | ABV1230413 | ABV1630413 |
| | | | 1.96 N | ABV1230513 | ABV1630513 |
| | Hinge lever | SPDT | 0.59 N | ABV1212413 | ABV1612413 |
| | | | 1.18 N | ABV1212513 | ABV1612513 |
| | | SPST-NC | 0.59 N | ABV1222413 | ABV1622413 |
| | | | 1.18 N | ABV1222513 | ABV1622513 |
| | | SPST-NO | 0.59 N | ABV1232413 | ABV1632413 |
| | | | 1.18 N | ABV1232513 | ABV1632513 |
| | Simulated roller lever | SPDT | 0.59 N | ABV1214413 | ABV1614413 |
| | | | 1.18 N | ABV1214513 | ABV1614513 |
| | | SPST-NC | 0.59 N | ABV1224413 | ABV1624413 |
| | | | 1.18 N | ABV1224513 | ABV1624513 |
| | | SPST-NO | 0.59 N | ABV1234413 | ABV1634413 |
| | | | 1.18 N | ABV1234513 | ABV1634513 |
| | Short roller lever | SPDT | 1.08 N | ABV1215413R | ABV1615413R |
| | | | 2.16 N | ABV1215513R | ABV1615513R |
| | | SPST-NC | 1.08 N | ABV1225413R | ABV1625413R |
| | | | 2.16 N | ABV1225513R | ABV1625513R |
| | | SPST-NO | 1.08 N | ABV1235413R | ABV1635413R |
| | | | 2.16 N | ABV1235513R | ABV1635513R |
| | Roller lever | SPDT | 0.59 N | ABV1216413 | ABV1616413 |
| | | | 1.18 N | ABV1216513 | ABV1616513 |
| | | SPST-NC | 0.59 N | ABV1226413 | ABV1626413 |
| | | | 1.18 N | ABV1226513 | ABV1626513 |
| | | SPST-NO | 0.59 N | ABV1236413 | ABV1636413 |
| | | | 1.18 N | ABV1236513 | ABV1636513 |

# SPECIFICATIONS

### 1. Contact rating

| Type | Standard rating | Low-level rating |
|---|---|---|
| AgNi alloy + Au-clad contact | 3 A 250 V AC (O.F. 1.96 N)<br>1 A 250 V AC (O.F. 0.98 N) | 5 mA 6 V DC<br>2 mA 12 V DC<br>1 mA 24 V DC |
| AgNi alloy | 5 A 250 V AC (O.F. 1.96 N)<br>3 A 250 V AC (O.F. 0.98 N) | — |

### 2. Characteristics

| | | |
|---|---|---|
| Mechanical life (O.T.: Specified value) | | Min. $5\times10^6$ (at 60 cpm) |
| Electrical life | Nominal rating (O.T.: Max.) | Min. $10^5$ (at 20 cpm)*1 |
| | Low-level rating (O.T.: Specified value) | Min. $10^6$ (at 20 cpm) |
| Insulation resistance | | Min. 100 MΩ (at 500 V DC insulation resistance meter) |
| Dielectric strength<br>Between non-continuous terminals<br>Between each terminal and other exposed metal parts<br>Between each terminal and ground | | <br>1,000 Vrms<br>2,000 Vrms<br>2,000 Vrms |
| Vibration resistance | | 10 to 55 Hz at single amplitude of 0.75 mm (contact opening: max. 1 ms) |
| Shock resistance | | Min. 294 m/s² (contact opening: max. 1 ms) |
| Contact resistance | AgNi alloy contact type | Dust protected type (IP50): max. 50 mΩ<br>Immersion protected type (IP67): max. 100 mΩ<br>(by voltage drop 1A 6 to 8V DC) |
| | AgNi alloy + Au-clad contact type | Dust protected type (IP50): max. 50 mΩ<br>Immersion protected type (IP67): max. 100 mΩ<br>(by voltage drop 0.1A 6 to 8V DC) |
| Allowable operating speed (at no load) | | 1 to 500 mm/s |
| Max. operating cycle rate (at no load) | | 120 cpm |
| Ambient temperature (at no load) | | −40°C to +85°C |
| Unit weight | | Approx. 7 g (IP50 type) |
| Water resistance | | IP67 (wire leads type) |

Note: *1 O.F. 0.98N type is Min $5\times10^5$ (at 20 com)

### 3. Operating characteristics

| Type of actuator | Operating force, max. | | Release force, min. | | Pretravel, max. mm | Movement differential, max. mm | Overtravel, min. mm | Operating position, mm |
|---|---|---|---|---|---|---|---|---|
| 8th digit of part no. | 5 | 4 | 5 | 4 | | | | |
| Pin plunger | 1.96N | 0.98N | 0.39N | 0.25N | 1.6 | 0.4 | 0.8 | 14.7±0.6 |
| Hinge lever | 1.18N | 0.59N | 0.13N | 0.098N | 3.2 | 1.2 | 1.2 | 15.3±1.2 |
| Simulated roller lever | 1.18N | 0.59N | 0.13N | 0.098N | 3.2 | 1.2 | 1.2 | 18.5±1.2 |
| Short roller lever | 2.16N | 1.08N | 0.39N | 0.20N | 1.6 | 0.5 | 0.8 | 20.7±0.8 |
| Roller lever | 1.18N | 0.59N | 0.13N | 0.098N | 3.2 | 1.2 | 1.2 | 20.7±1.2 |

# DIMENSIONS

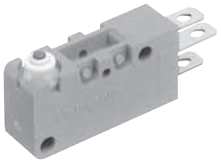
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

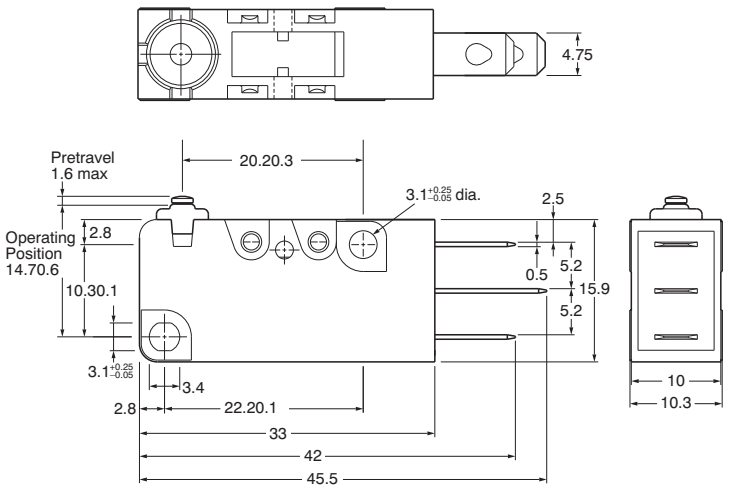
### 1. Dust protected type

mm General tolerance: ±0.4

1-(1) .187 quick-connect terminal
Pin plunger

**CAD Data**



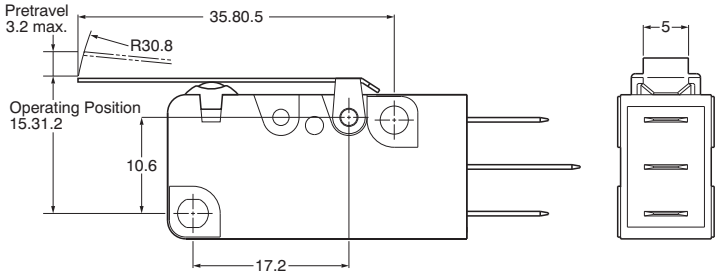



| | |
|---|---|
| Pretravel, max. mm | 1.6 |
| Movement differential, max. mm | 0.4 |
| Overtravel, min. mm | 0.8 |
| Operating position, mm | 14.7±0.6 |

## Hinge lever

mm General tolerance: ±0.25

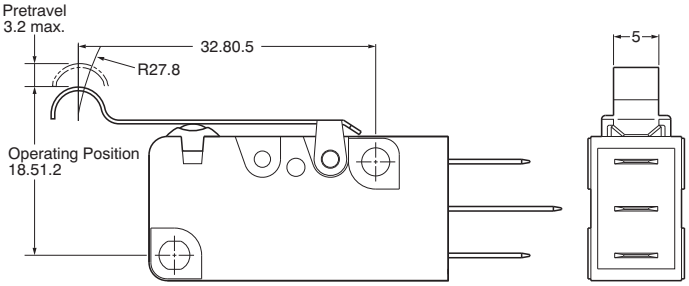
**CAD Data**




| | |
|---|---|
| Pretravel, max. mm | 3.2 |
| Movement differential, max. mm | 1.2 |
| Overtravel, min. mm | 1.2 |
| Operating position, mm | 15.3±1.2 |

## Simulated roller lever

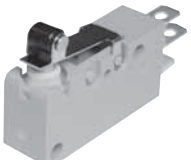
**CAD Data**

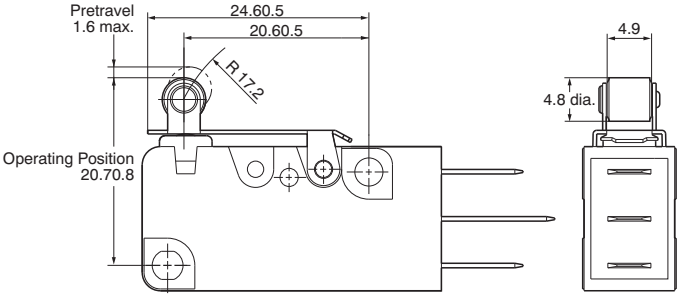



| | |
|---|---|
| Pretravel, max. mm | 3.2 |
| Movement differential, max. mm | 1.2 |
| Overtravel, min. mm | 1.2 |
| Operating position, mm | 18.5±1.2 |

## Short roller lever

**CAD Data**

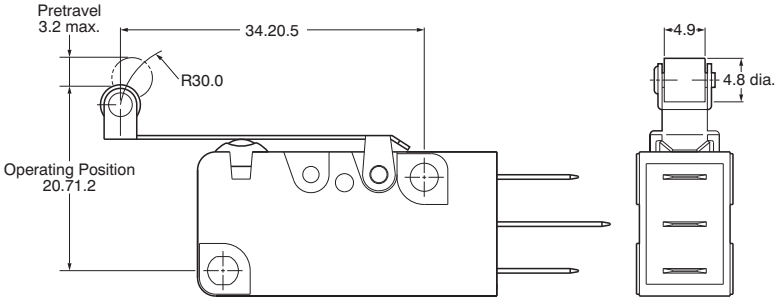





| | |
|---|---|
| Pretravel, max. mm | 1.6 |
| Movement differential, max. mm | 0.5 |
| Overtravel, min. mm | 0.8 |
| Operating position, mm | 20.7±0.8 |

## Roller lever

**CAD Data**

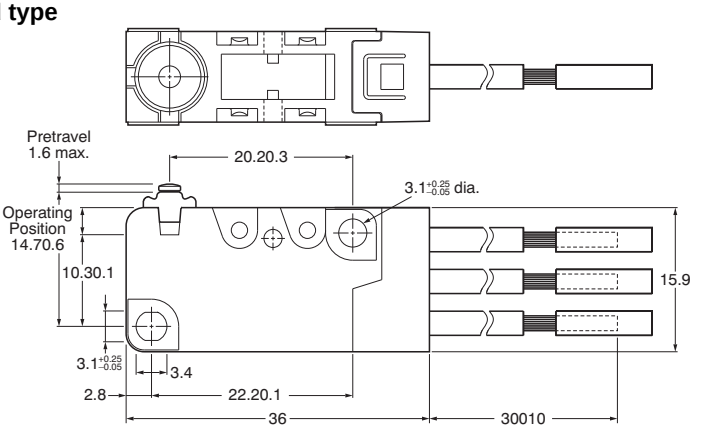



| | |
|---|---|
| Pretravel, max. mm | 3.2 |
| Movement differential, max. mm | 1.2 |
| Overtravel, min. mm | 1.2 |
| Operating position, mm | 20.7±1.2 |

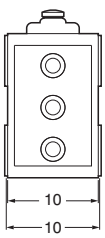
## 2. Immersion protected type

Wire Leads

**CAD Data**




Remarks: Dimensions of the actuator types are the same as those of corresponding solder and .110 quick-connect terminal types.




Thickness of the lead wire:
Standard type: 0.75mm²
UL/CSA approved type: AWG #18
Color of the lead wire
COM ...black
N.C. ...red
N.O. ...white

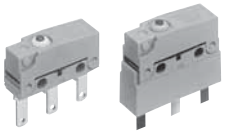
# Turquoise switches

## High-Environmental-Resistance-Turquoise-Colored-Seal-Switches

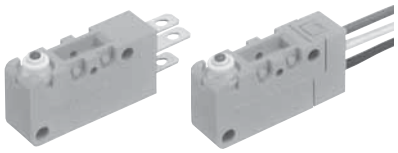
Against dust, gas and water

**Elastomer double molding technology, an industry first, and ultrasonic swaging technology contribute to uniform sealing in high production quantities IP67 type (immersion protected)**
**Broad lineup: J, S and V models make up over 1,000 types.**

ABJ (J type)



ABS (S type)



ABV (V type)

### Lineup

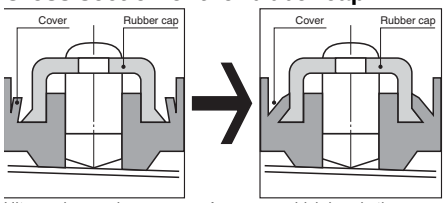
● Available

| Size | Type | Terminal | | | | | | Contact | Actuator | | | | | | | | Mounting hole |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | PC board | | | | | | | | | | | | | | |
| | | Solder | Straight | Angle | .110 quick-connect | .187 quick-connect | Wire leads | | Pin plunger | Hinge lever | Short hinge lever | Long hinge lever | Simulated roller lever | Roller lever | Short roller lever | Leaf lever | |
| J type | Terminals | ● | ● | | | | | Au, Ag | ● | ● | | | ● | ● | | | M1.2, M2.3, M3 |
| | Wire leads | | | | | | ● | Au, Ag | ● | ● | | | ● | ● | | ● | |
| S type | Terminals | ● | ● | ● | ● | | | Au, Ag | ● | ● | ● | ● | ● | ● | | | M2.3 |
| | Wire leads | | | | | | ● | Au, Ag | ● | ● | ● | ● | ● | ● | | ● | |
| V type | Terminals | | | | | ● | | Au, Ag | ● | ● | | | ● | ● | ● | | M3 |
| | Wire leads | | | | | | ● | Au, Ag | ● | ● | | | ● | ● | ● | | |

### Ultrasonic swaging process

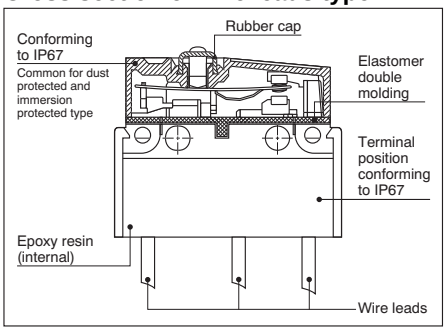
The rubber cap is securely sealed to the switch cover during an ultrasonic swaging process.

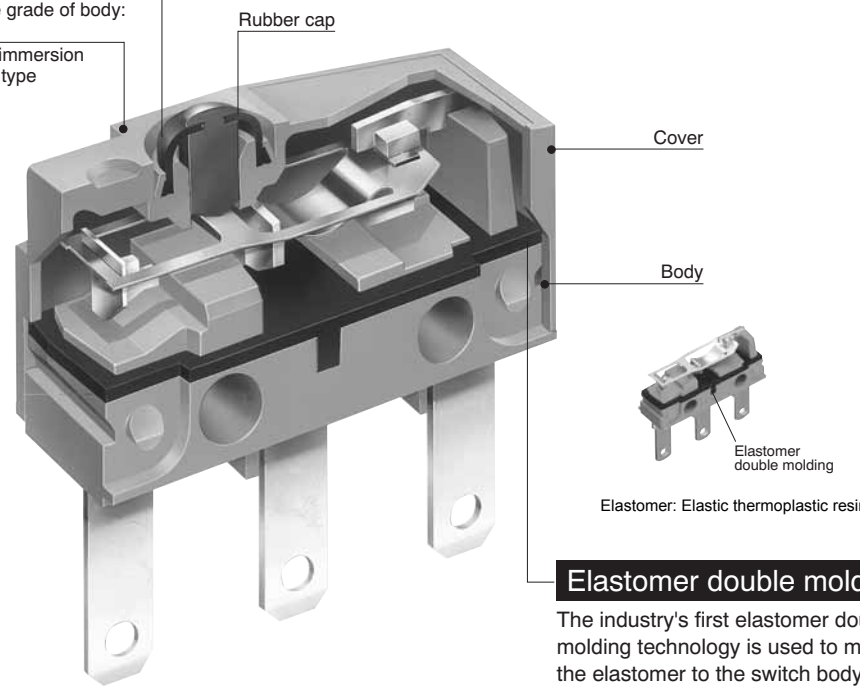
**Cross section of the rubber cap**




Ultrasonic swaging process: A process which bends the material through ultrasonic vibration.

**Cross section of wire leads type**




Elastomer: Elastic thermoplastic resin

### Elastomer double molding

The industry's first elastomer double molding technology is used to mold the elastomer to the switch body. A reliable seal of the body and cover is achieved.

## ■ Construction

The dust protected type (IP50) and the immersion protected type (IP67) pass the following tests, respectively. The immersion protected type is especially tested to check for the entry of water after soaking for a certain period of time. Avoid operation where they are immersed in water.

**[Test conditions]**

• Dust protected type (IP50)
The powder circulation pump may be replaced by other means suitable to maintain the talcum powder in suspension in a closed test chamber. The talcum powder used shall be able to pass through a square-meshed sieve the nominal wire diameter of which is 50 µm and the nominal width between wires 75 µm.
The amount of talcum powder to be used is 2 kg per cubic metre of the test chamber volume. The duration of the test is 8 hours.

• Immersion protected type (IP67)
The lowest point of enclosures should be least 1 m below the surface of the water. The duration of the test is 30 minutes.

# TURQUOISE SWITCHES: IMPORTANT NOTES REGARDING USE

**1. Fastening of the switch body**

1) Fasten the switch body onto a smooth surface using the correct screw as shown in the chart below and tighten it with the prescribed torque. Be careful not to exceed the prescribed torque when tightening as this may adversely affect the sealing properties and switch functioning, and also cause damage. If using a torque driver, verify that it is set to the prescribed torque. Also, we recommend that you use a spring washer and adhesive to prevent loosening and to lessen the tightening load on the switch.

| | Screws | Tightening torque |
|---|---|---|
| ABJ | M1.2 | Not more than 0.098N·m |
| | M2.3 | Not more than 0.29N·m |
| | M3.0 | Not more than 0.29N·m |
| ABS | M2.3 | Not more than 0.29N·m |
| ABV | M3.0 | Not more than 0.49N·m |

2) Fixed pin type

To secure the switch unit, thermally crimp or press-fit the mounting pins. If the pins are to be press-fitted, install a guide on the opposite surface to the mounting pins to prevent them from slipping out of position and developing play.

3) Be sure to maintain adequate insulating clearance between each terminal and ground.

4) The positioning of the switch should be such that direct force is not applied to the push-button or actuator in its free position. The operating force to the push-button should only be applied in a perpendicular direction.

5) The standard value of overtravel used should be within the range of 70% to 100% of the rated O.T. value.

6) When soldering the V-type turquoise switch or the immersion protected type of the J and S type switches, the sealing material sometimes forms a lump or bulge at the base of the terminal or lead. Be sure to allow enough space for this when attaching the switch.

**2. Soldering operations**

1) Manual soldering: use soldering irons (max. 350°C 662°F) capable of temperature adjustment. This is to prevent deterioration due to soldering heat. Care should be taken not to apply force to the terminals during soldering.

Specifications

| | Wattage | Soldering time |
|---|---|---|
| ABJ | 18 W | Within 3 seconds |
| ABS | 60 W | Within 3 seconds |
| ABV | 60 W | Within 5 seconds |

2) Terminal portions should not be moved within 1 minute after soldering.

**3. Variance of operating characteristics**

Allow for up to ±20% variation of the specified characteristics values to compensate for long term operational wear of the switch in your design.

**4. Cautions regarding use**

1) When switching inductive loads (relays, solenoids, buzzers, etc.), an arc absorbing circuit is recommended to protect the contacts.

2) If switching of the contact is synchronized with the phase of the AC power, reduced electrical life or welded contact may occur. Therefore, test the switch while it is operating under actual loads for this condition. If found, you may wish to take corrective action in your design.

3) In the following operating condition, the electrical life might be greatly reduced depending upon the switching load. Please consult us before use.

• Switching operation at a high or low speed (near limits specified).

4) If the build up of dust or dirt becomes so severe that it requires the use of the attached lever, there is the concern that the flexible part may be impeded and return movement may not be possible. In this situation take the following precautions:

• Select a product number for a switch with a higher operation load or use a leaf type lever.

• Attach a protective cover to the lever.

5) If the leaf lever type switch is excessively pushed (pushed further than the operational limit position) or switching is done at high speed or is accompanied by the impact, the lever will break. Please be careful. Also, be careful with the BV short roller lever type switch as improper return may result from pressing too much.

**5. Protection from dust, water and corrosive gas**

1) The pin button and the space around the body cap Turquoise switches are sealed with elastic material, the terminal portion is integrally molded. This prevents dust entry and protects the switch against corrosive gases. Wireleaded types are recommended for applications subject to water or oil splash. However, avoid soaking these immersion protected types in oil or water, because they types are not of completely oil tight construction.

2) Take care that breathing actions don't allow water vapor to get inside during opening and closing or cause rapid temperature changes.

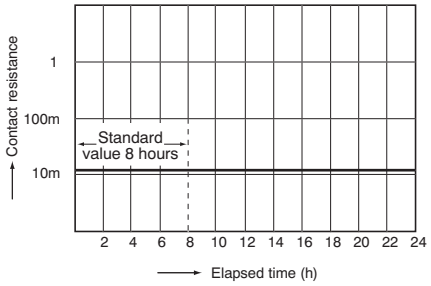
3) Keep away from environments where silicon based adhesives, oil or grease are present as faulty contacts may result from silicon oxide. Do not use in areas where flammable or explosive gases from gasoline and thinner, etc., may be present.

• Dust protection test

Test conditions:

Dust-protected IP50 switches ...

Repeatedly pass pure talc powder through a standard wire sieve with a 75μm nominal diameter so that the talc is suspended in the air around the switch area. Two kilograms of talc powder should be suspended for each cubic meter of laboratory space. The talc suspension should then be left for eight hours.

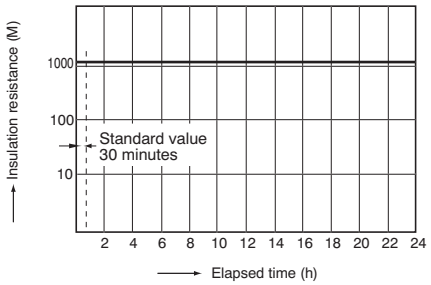



• Waterproof test

Test conditions:

Immersion protected IP67 switches ...

Submerge at 1 m below the water surface for 30 minutes.



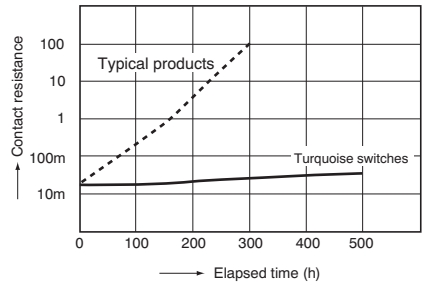

• Hydrogen sulfide exposure test

Test conditions:

Concentration: 3 ppm

Temperature: 40°C 104°F

Humidity: 75% RH



# Notes for Turquoise Switches

**6. Oil-proof and chemical-proof characteristics**

The rubber elastomer swells when exposed to oil and chemicals. The extent of swelling will vary widely depending on the type and amount of oil and chemicals. Check with the actual oil or chemicals used.

In particular, be aware that solvents such as freon, chlorine, and toluene cannot be used.

**7. Washability (ABJ and ABS)**

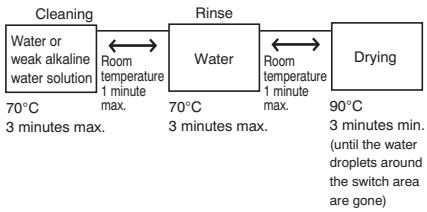
The Turquoise switch terminal with lead wires type and without lead wires typeshare the same main body. As a result, if the print board terminal type satisfies the set conditions, then it can undergo a complete cleaning after automatic soldering. After soldering is completed, perform cleaning within the prescribed temperature and time range, and pay careful attention to the following points.

1) Perform proper temperature, time, drying control in the cleaning process in order to prevent absorption of the liquid due to respiratory action. Be particularly careful that all the water droplets in the switch area are cleaned off in the final drying process.

2) Some cleaning liquids (solvents) may harm the rubber parts. Use water or a weak alkaline water solution.

3) Ultrasonic cleaning methods may damage the internal components or contacts. Use immersion or shower cleaning methods. In addition to the above points, the use of automatic cleaning equipment is particularly recommended for easy control of the process temperature and time.The recommended cleaning conditions for the Turquoise switches are shown below. However, please evaluate the actual cleaning process to verify its suitability for the switch.

Recommended Cleaning Method




# REFERENCE

**1. Dust-protected type**

This type of construction prevents dust that is large enough to have an effect on operation from getting inside the unit. This construction is stipulated by protective classes against solid matter in the IEC standards (IEC60529).

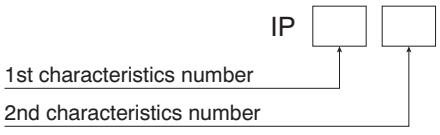
Test conditions: The switch is left for eight hours in a test chamber with a constant level of floating pure talc that has passed through a standard 75μm sieve, in a concentration of 2kg of talc per cubic meter of volume in the test chamber.

**2. Immersion-protected type**

This type of construction prevents any harmful effects even after the device is left underwater at a depth of 1 m for 30 minutes. This construction is stipulated by protective classes against water in the IEC standards (IEC60529).

**3. IEC's IP Codes**

The IEC (International Electrotechnical Commission) has defined the IP characteristic code that represents the levels of protection described in IEC standard (IEC60529). The two numbers that follow the IP code (the characteristics numbers) indicate the suitability of this protection for all environmental conditions.




• Level of Protection Indicated by the 1st Characteristics Number

| 1st Characteristics Number | Protection level (IEC60529/Solid matter) |
|---|---|
| 0 | No protection |
| 1 | Protected against solid matter larger than 50mm |
| 2 | Protected against solid matter larger than 12mm |
| 3 | Protected against solid matter larger than 2.5mm |
| 4 | Protected against solid matter larger than 1.0mm |
| 5 | Dust-protected type<br>Prevents dust that is large enough to have an effect on operation from getting inside the unit |
| 6 | Dust-resistant type<br>Prevents dust from getting inside the unit |

• Level of Protection Indicated by the 2nd Characteristics Number

| JIS C0920 | 2nd Characteristics Number | Protection level (IEC60529/Liquid matter) |
|---|---|---|
| | 0 | No protection |
| Droplet-protected type I | 1 | Protected against water droplets that fall perpendicular to the unit |
| Droplet-protected type II | 2 | Protected against water droplets that fall from within 15° of perpendicular to the unit |
| Rain-protected type | 3 | Protected against water droplets that fall from within 60° of perpendicular to the unit |
| Splash-protected type | 4 | Protected against water that splashes on the unit from any direction |
| Spray-protected type | 5 | Free from adverse effects even if sprayed directly with water from any direction |
| Water-resistant type | 6 | Protected against water sprayed directly on the unit from any direction |
| Immersion-protected type | 7 | Water does not get inside of the unit when submerged in water according to the specified conditions |
| Underwater type | 8 | Unit can be used underwater |

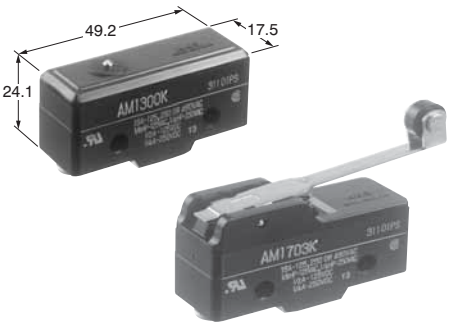
Note: Details of test conditions are the same as JIS C 0920. Please refer to them.

# Micro Switches IP40

Panasonic
ideas for life

**HIGH CONTACT CAPACITY, PRECISE OPERATION**

# AM1 (NZ BASIC) SWITCHES




## FEATURES

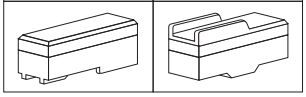
- **10 A High current switching capacity and high precision**
- **Wide allowance of operating speed**
- **Versatile variety of actuators**
- **UL/C-UL approved**

## TYPICAL APPLICATION

- **General industrial machinery**
- **Medical equipment**
- **Measuring instruments**
- **Transportation equipment**
- **Home electric appliances**

## ORDERING INFORMATION

Ex. AM | 1 | 5 | 0 | 1 | F

| Type of switch | Upper body cover shape & terminal | Basic specifications | Actuators | Contact |
|---|---|---|---|---|
| NZ basic (AM1) switch | 1: Flat, solder terminal<br>3: Flat, screw terminal<br>5: Grooved, solder terminal<br>7: Grooved, screw terminal<br>Upper body cover shape: Flat / Grooved  | 0: Standard type<br>1: Oil tight type<br>3: Reversed action type<br>4: One way type | 0: Pin plunger<br>1: Hinge lever (leaf spring)<br>3: Hinge roller lever (roller, leaf, spring)<br>4: Hinge short roller lever<br>5: Overtravel plunger<br>6: Compact overtravel plunger<br>7: Panel mount plunger<br>811: Panel mount roller plunger<br>812: Panel mount cross roller plunger | F: Cadmium free |

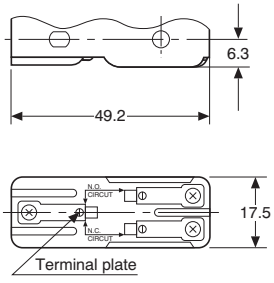
Remarks: Not every combination is available. Please refer to the following table, “PRODUCT TYPES”.

## TERMINAL VARIATION

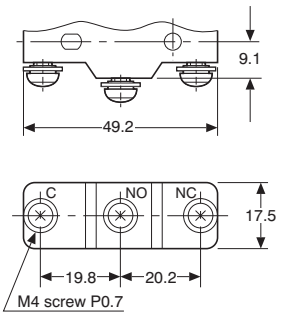
Standard types, reversed action types and oil tight types are available in two terminal designs, solder and screw terminals, as shown in the above columns:
Differences in dimension between solder and screw terminals are as follows;

mm

Solder terminal




Screw terminal



# PRODUCT TYPES

### 1. Standard type

| Actuator | Solder terminal | Screw terminal |
|---|---|---|
| Pin plunger | AM1100F | AM1300F |
| Over travel plunger | AM1105F | AM1305F |
| Compact over travel plunger | AM1106F | AM1306F |
| Panel mount plunger | AM1107F | AM1307F |
| Panel mount roller plunger | AM110811F | AM130811F |
| Panel mount cross roller plunger | AM110812F | AM130812F |
| Flexible leaf lever | AM1101F | AM1301F |
| Flexible roller leaf lever | AM1103F | AM1303F |
| Hinge lever | AM1501F | AM1701F |
| Hinge short roller lever | AM1504F | AM1704F |
| Hinge roller lever | AM1503F | AM1703F |
| One way type•hinge short roller lever | AM1544F | AM1744F |
| One way type•hinge roller lever | AM1543F | AM1743F |
| Reversed action type•hinge lever | AM1531F | AM1731F |
| Reversed action type•hinge short roller lever | AM1534F | AM1734F |
| Reversed action type•hinge roller lever | AM1533F | AM1733F |

### 2. Oil tight types

| Actuator | Solder terminal | Screw terminal |
|---|---|---|
| Hinge lever | AM1511F | AM1711F |
| Hinge short roller lever | AM1514F | AM1714F |
| Hinge roller lever | AM1513F | AM1713F |

Remarks: 1. Standard part number indicates UL/C-UL mark.
2. Standard packing for inner carton: 20cps.

# SPECIFICATIONS

### 1. Contact Rating

| Type | Voltage | Resistive load (cos $\phi$ = 1) | Inductive load (cos $\phi$ = 0.6 to 0.7) | Motor or lamp load | |
|---|---|---|---|---|---|
| | | | | N.C. | N.O. |
| Standard types<br>One way types<br>Reversed action types | 125 V AC | 10 A | 6 A | 3 A | 1.5 A |
| | 250 V AC | 10 A | 6 A | 2 A | 1 A |
| | 480 V AC | 1 A | 0.5 A | — | — |
| | 125 V DC | 0.5 A | 0.05 A | — | — |
| | 250 V DC | 0.25 A | 0.03 A | — | — |
| Oil tight types | 125 V AC | 10 A | 6 A | 3 A | 1.5 A |
| | 250 V AC | 10 A | 6 A | 2 A | 1.0 A |
| | 125 V DC | 0.5 A | 0.05 A | — | — |

### 2. Characteristics

| Item | | | Specifications |
|---|---|---|---|
| Expected life | Mechanical | Pin plunger types (O.T.: specified value) | Min. $2 \times 10^7$ (60 cpm) (at rated overtravel)<br>(oil tight: Min. $1.5 \times 10^6$) |
| | | Other types (O.T.: specified value) | Min. $5 \times 10^6$ (60 cpm) (at rated overtravel)<br>(oil tight: Min. $1.5 \times 10^6$) |
| | Electrical (O.T.: Max.) | | Min. $5 \times 10^5$ (20 cpm) (at rated load)<br>(oil tight: Min. $1.5 \times 10^5$) |
| Insulation resistance | | | Min. 100 MΩ (at 500 V DC) |
| Dielectric strength | Between open terminals | | 1,000 Vrms for 1 min. |
| | Between each terminal and other exposed metal parts | | 2,000 Vrms for 1 min. |
| | Between each terminal and ground | | 2,000 Vrms for 1 min. |
| Contact resistance (initial) | | | Max. 50 mΩ (by voltage drop, 1 A, 6 to 8 V DC) |
| Vibration resistance (pin plunger type) | | | Single amplitude: 0.75 mm, 10 to 55 Hz (contact opening: max. 1 ms) |
| Shock resistance | Pin plunger types | | Min. 300 m/s² (contact opening: max. 1 ms) |
| | Other types | | Min. 50 m/s² (contact opening: max. 1 ms) |
| Allowable operating speed (at no load) | | | 0.1 to 1,000 mm/s (at pin plunger position) |
| Max. operating cycle rate (at no load) | | | 240 cpm |
| Ambient temperature | | | –25°C to +80°C (no freezing at low temperature) |
| Weight | | | Approx. 20 to 55 g |
| Contact material | | | Ag alloy |

# OPERATING CHARACTERISTICS



### Standard types

| Types of actuator | Pin plunger | Overtravel plunger | Compact overtravel plunger | Panel mount plunger |
|---|---|---|---|---|
| Operating force, max. | 3.63 N | | | |
| Release force, min. | 1.12 N | | | |
| Pretravel, max. mm | 0.4 | | | |
| Movement differential, max. mm | 0.05 | | | |
| Overtravel, min. mm | 0.13 | 1.5 | 1.5 | 5.6 |
| Operating position, mm | 15.9±0.4 | 28.2±0.5 | 21.2±0.5 | 21.8±0.8 |

| Types of actuator | Panel mount roller plunger | Panel mount cross roller plunger | Flexible leaf lever | Flexible roller leaf lever |
|---|---|---|---|---|
| Operating force, max. | 3.63 N | | 1.47 N | |
| Release force, min. | 1.12 N | | 0.14 N | |
| Pretravel, max. mm | 0.4 | | 4 | |
| Movement differential, max. mm | 0.05 | | 1.3 | |
| Overtravel, min. mm | 3.6 | | 1.6 | |
| Operating position, mm | 33.3±1.2 | | 17.5±0.8 | 28.6±0.8 |

| Types of actuator | Hinge lever | Hinge short roller lever | Hinge roller lever |
|---|---|---|---|
| Operating force, max. | 0.69 N | 1.57 N | 0.98 N |
| Release force, min. | 0.14 N | 0.42 N | 0.2 N |
| Pretravel, max. mm | 10 | 4.5 | 7.5 |
| Movement differential, max. mm | 1.3 | 0.7 | 1.3 |
| Overtravel, min. mm | 5.6 | 2.4 | 3.6 |
| Operating position, mm | 19.1±0.7 | 30.2±0.4 | 30.2±0.7 |

### One way types

| Types of actuator | Hinge short roller lever | Hinge roller lever |
|---|---|---|
| Operating force, max. | 2.23 N | 1.67 N |
| Release force, min. | 0.42 N | 0.42 N |
| Pretravel, max. mm | 3.5 | 4.5 |
| Movement differential, max. mm | 0.4 | 0.5 |
| Overtravel, min. mm | 1.5 | 2.4 |
| Free position, max. mm | 31.8 | 43.3 |
| Operating position, mm | 30.2±0.4 | 41.3±0.4 |

### Reversed action types

| Types of actuator | Hinge lever | Hinge short roller lever | Hinge roller lever |
|---|---|---|---|
| Operating force, max. | 1.67 N | 5.30 N | 2.35 N |
| Release force, min. | 0.27 N | 1.67 N | 0.56 N |
| Pretravel, max. mm | 5.0 | 2.5 | 3.6 |
| Movement differential, max. mm | 0.9 | 0.4 | 0.7 |
| Overtravel, min. mm | 5.6 | 2.0 | 4.0 |
| Operating position, mm | 19.1±0.8 | 30.2±0.5 | 30.2±0.8 |

### Oil tight types

| Types of actuator | Hinge lever | Hinge short roller lever | Hinge roller lever |
|---|---|---|---|
| Operating force, max. | 0.69 N | 1.67 N | 0.98 N |
| Release force, min. | 0.14 N | 0.42 N | 0.20 N |
| Pretravel, max. mm | 10 | 4.5 | 7.5 |
| Movement differential, max. mm | 1.5 | 0.7 | 1.3 |
| Overtravel, min. mm | 5.6 | 2.4 | 3.6 |
| Operating position, mm | 19.1±0.7 | 30.2±0.4 | 30.2±0.7 |

# DIMENSIONS

Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

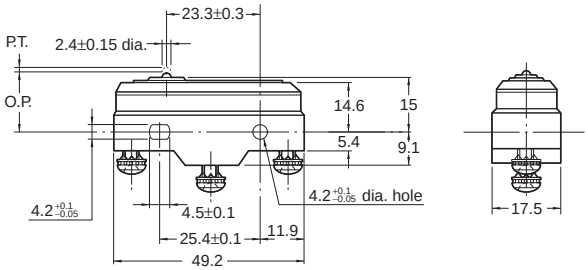
## 1. Standard types

mm General tolerance: ±0.4

### Pin plunger

**CAD Data**

AM1100F (solder terminal)
AM1300F (screw terminal)

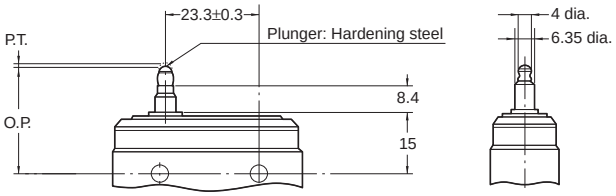



| | |
|---|---|
| Operating force, max. | 3.63 N |
| Release force, min. | 1.12 N |
| Pretravel, max. mm | 0.4 |
| Movement differential, max. mm | 0.05 |
| Overtravel, min. mm | 0.13 |
| Operating position, mm | 15.9±0.4 |

### Overtravel plunger

**CAD Data**

AM1105F (solder terminal)
AM1305F (screw terminal)

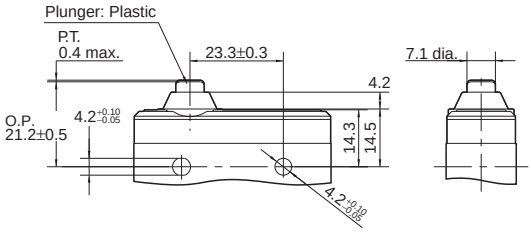



| | |
|---|---|
| Operating force, max. | 3.63 N |
| Release force, min. | 1.12 N |
| Pretravel, max. mm | 0.4 |
| Movement differential, max. mm | 0.05 |
| Overtravel, min. mm | 1.5 |
| Operating position, mm | 28.2±0.5 |

### Compact over plunger

**CAD Data**

AM1106F (solder terminal)
AM1306F (screw terminal)

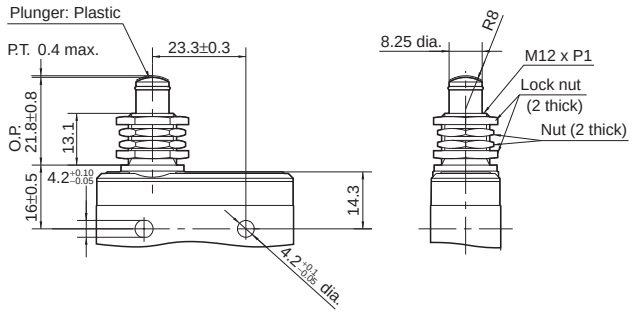



| | |
|---|---|
| Operating force, max. | 3.63 N |
| Release force, min. | 1.12 N |
| Pretravel, max. mm | 0.4 |
| Movement differential, max. mm | 0.05 |
| Overtravel, min. mm | 1.5 |
| Operating position, mm | 21.2±0.5 |

### Panel mount plunger

**CAD Data**

AM1107F (solder terminal)
AM1307F (screw terminal)




| | |
|---|---|
| Operating force, max. | 3.63 N |
| Release force, min. | 1.12 N |
| Pretravel, max. mm | 0.4 |
| Movement differential, max. mm | 0.05 |
| Overtravel, min. mm | 5.6 |
| Operating position, mm | 21.8±0.8 |

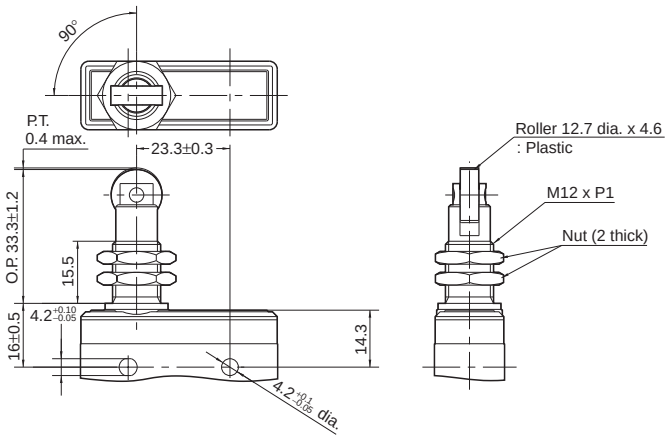
# AM1

## Panel mount roller plunger

mm General tolerance: ±0.4

**CAD Data**

AM110811F (solder terminal)
AM130811F (screw terminal)

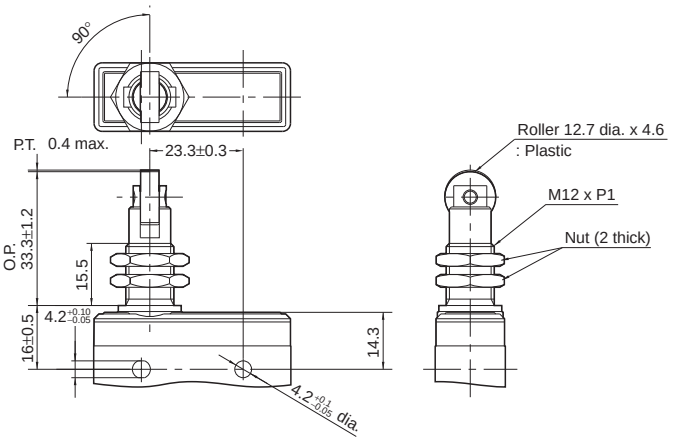



| | |
|---|---|
| Operating force, max. | 3.63 N |
| Release force, min. | 1.12 N |
| Pretravel, max. mm | 0.4 |
| Movement differential, max. mm | 0.05 |
| Overtravel, min. mm | 3.6 |
| Operating position, mm | 33.3±1.2 |

## Panel mount cross roller plunger

**CAD Data**

AM110812F (solder terminal)
AM130812F (screw terminal)



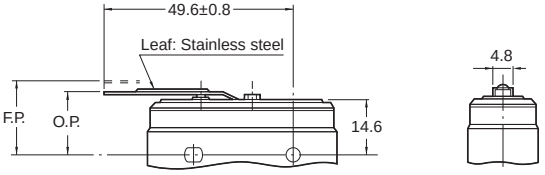

| | |
|---|---|
| Operating force, max. | 3.63 N |
| Release force, min. | 1.12 N |
| Pretravel, max. mm | 0.4 |
| Movement differential, max. mm | 0.05 |
| Overtravel, min. mm | 3.6 |
| Operating position, mm | 33.3±1.2 |

Dimensions and Operating characteristics are the same as those of Panel mount roller plunger type. However, the roller joins the switch body at an angle of 90°.

## Flexible leaf lever

**CAD Data**

AM1101F (solder terminal)
AM1301F (screw terminal)

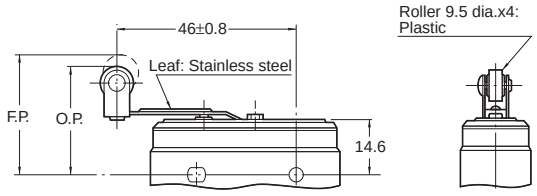



| | |
|---|---|
| Operating force, max. | 1.47 N |
| Release force, min. | 0.14 N |
| Pretravel, max. mm | 4 |
| Movement differential, max. mm | 1.3 |
| Overtravel, min. mm | 1.6 |
| Operating position, mm | 17.5±0.8 |

## Flexible roller leaf lever

**CAD Data**

AM1103F (solder terminal)
AM1303F (screw terminal)

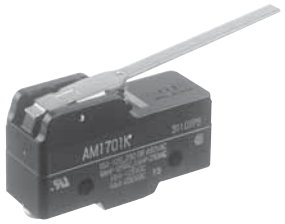



| | |
|---|---|
| Operating force, max. | 1.47 N |
| Release force, min. | 0.14 N |
| Pretravel, max. mm | 4 |
| Movement differential, max. mm | 1.3 |
| Overtravel, min. mm | 1.6 |
| Operating position, mm | 28.6±0.8 |

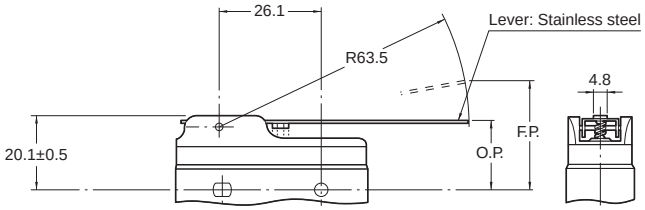
Hinge lever

mm General tolerance: ±0.4

**CAD Data**



AM1501F (solder terminal)
AM1701F (screw terminal)

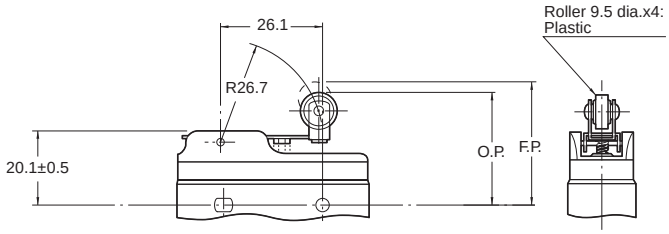



| | |
|---|---|
| Operating force, max. | 0.69 N |
| Release force, min. | 0.14 N |
| Pretravel, max. mm | 10 |
| Movement differential, max. mm | 1.3 |
| Overtravel, min. mm | 5.6 |
| Operating position, mm | 19.1±0.7 |

Hinge short roller lever

**CAD Data**

AM1504F (solder terminal)
AM1704F (screw terminal)

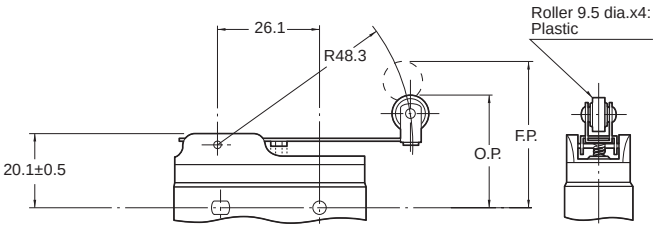



| | |
|---|---|
| Operating force, max. | 1.57 N |
| Release force, min. | 0.42 N |
| Pretravel, max. mm | 4.5 |
| Movement differential, max. mm | 0.7 |
| Overtravel, min. mm | 2.4 |
| Operating position, mm | 30.2±0.4 |

Hinge roller lever

**CAD Data**

AM1503F (solder terminal)
AM1703F (screw terminal)




| | |
|---|---|
| Operating force, max. | 0.98 N |
| Release force, min. | 0.2 N |
| Pretravel, max. mm | 7.5 |
| Movement differential, max. mm | 1.3 |
| Overtravel, min. mm | 3.6 |
| Operating position, mm | 30.2±0.7 |

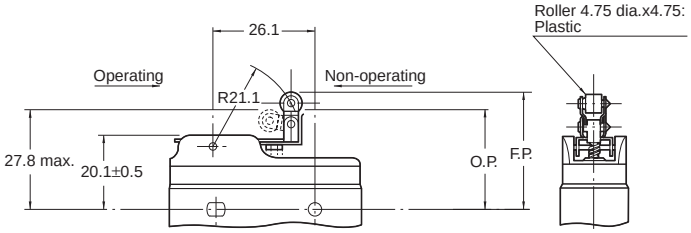
**2. One way types**

This type is operated only to one direction, not to the reversed direction by the construction of the roller lever, pivoting away from the cam on the return stroke.

Hinge short roller lever

**CAD Data**

AM1544F (solder terminal)
AM1744F (screw terminal)



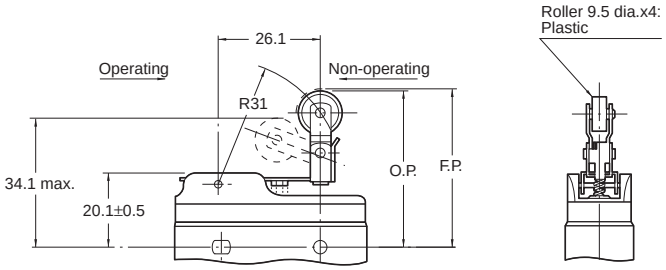

| | |
|---|---|
| Operating force, max. | 2.23 N |
| Release force, min. | 0.42 N |
| Pretravel, max. mm | 3.5 |
| Movement differential, max. mm | 0.4 |
| Overtravel, min. mm | 1.5 |
| Operating position, mm | 30.2±0.4 |

Hinge roller lever

mm General tolerance: ±0.4

**CAD Data**

AM1543F (solder terminal)
AM1743F (screw terminal)



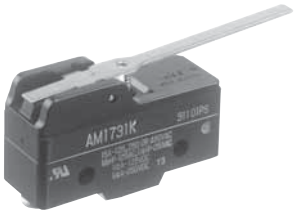

| | |
|---|---|
| Operating force, max. | 1.67 N |
| Release force, min. | 0.42 N |
| Pretravel, max. mm | 4.5 |
| Movement differential, max. mm | 0.5 |
| Overtravel, min. mm | 2.4 |
| Operating position, mm | 41.3±0.4 |

**3. Reversed action types**

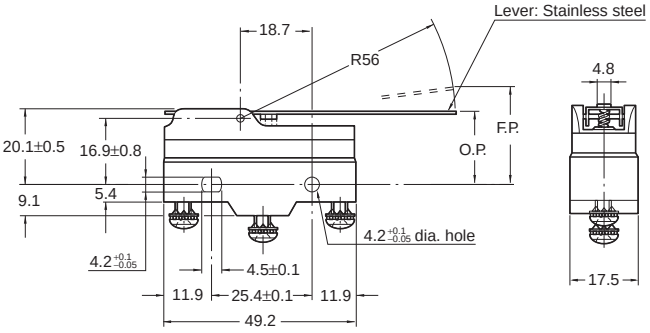
When the actuator is operated, the switching mechanism returns to the free position. Extraordinary force by pushing the plunger too much is not put on the switching mechanism, which means stability in life.

Hinge lever

**CAD Data**



AM1531F (solder terminal)
AM1731F (screw terminal)

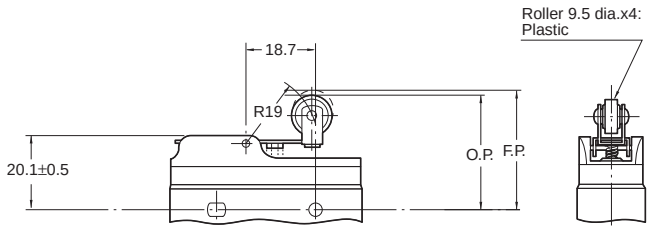



| | |
|---|---|
| Operating force, max. | 1.67 N |
| Release force, min. | 0.27 N |
| Pretravel, max. mm | 5.0 |
| Movement differential, max. mm | 0.9 |
| Overtravel, min. mm | 5.6 |
| Operating position, mm | 19.1±0.8 |

Hinge short roller lever

**CAD Data**

AM1534F (solder terminal)
AM1734F (screw terminal)

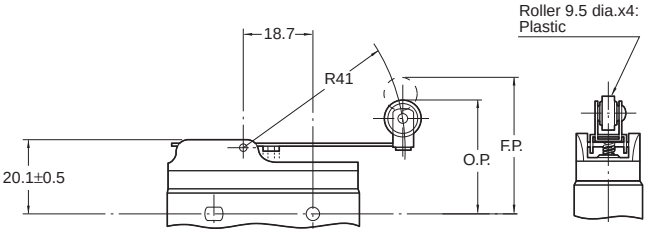



| | |
|---|---|
| Operating force, max. | 5.30 N |
| Release force, min. | 1.67 N |
| Pretravel, max. mm | 2.5 |
| Movement differential, max. mm | 0.4 |
| Overtravel, min. mm | 2.0 |
| Operating position, mm | 30.2±0.5 |

Hinge roller lever

**CAD Data**

AM1533F (solder terminal)
AM1733F (screw terminal)




| | |
|---|---|
| Operating force, max. | 2.35 N |
| Release force, min. | 0.56 N |
| Pretravel, max. mm | 3.6 |
| Movement differential, max. mm | 0.7 |
| Overtravel, min. mm | 4.0 |
| Operating position, mm | 30.2±0.8 |

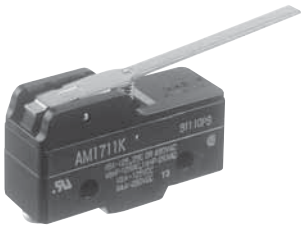
**4. Oil tight types**

mm General tolerance: ±0.4

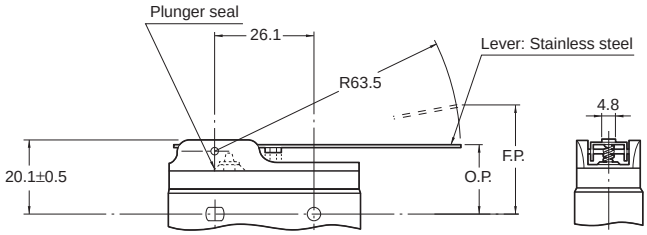
The push-button part is sealed with the rubber cap and the connected part between the cap and body is also coated with resin so that these parts are kept away from foreign matters. This type has resistance to oil.

Hinge lever

**CAD Data**



AM1511F (solder terminal)
AM1711F (screw terminal)

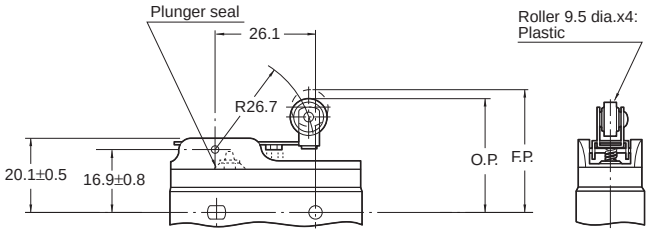



| | |
|---|---|
| Operating force, max. | 0.69 N |
| Release force, min. | 0.14 N |
| Pretravel, max. mm | 10 |
| Movement differential, max. mm | 1.5 |
| Overtravel, min. mm | 5.6 |
| Operating position, mm | 19.1±0.7 |

Hinge short roller lever

**CAD Data**

AM1514F (solder terminal)
AM1714F (screw terminal)

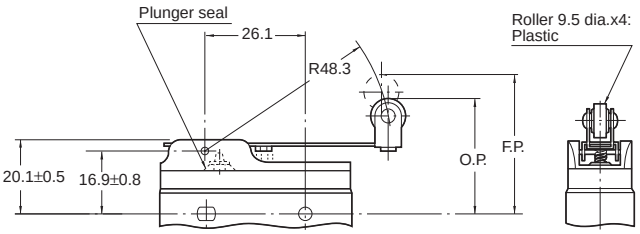



| | |
|---|---|
| Operating force, max. | 1.67 N |
| Release force, min. | 0.42 N |
| Pretravel, max. mm | 4.5 |
| Movement differential, max. mm | 0.7 |
| Overtravel, min. mm | 2.4 |
| Operating position, mm | 30.2±0.4 |

Hinge roller lever

**CAD Data**

AM1513F (solder terminal)
AM1713F (screw terminal)




| | |
|---|---|
| Operating force, max. | 0.98 N |
| Release force, min. | 0.20 N |
| Pretravel, max. mm | 7.5 |
| Movement differential, max. mm | 1.3 |
| Overtravel, min. mm | 3.6 |
| Operating position, mm | 30.2±0.7 |

# NOTES

**1. Regarding fastening of switch body**

1) In fastening the switch body, use M4 mounting screws to attach switches with the torque 1.5 N·m or less.

2) After mounting and wiring, the insulation distance between ground and each terminal should be confirmed as sufficient.

**2. Adjustment of the operating device**

The operating device should be positioned so that it applies no stress to the push-button or actuator when the switch is in the open position. If this condition is exceeded, the mechanical and electrical performance will be impaired. In addition, the force applied by the operating device should be in a perpendicular direction. Even if the push-button is used in the full total travel position, there will be no influence on the life of the switch.

**3. Soldering operations**

Soldering should be done in less than 5 seconds, with a 60 watt iron (tip temperature = 350°C max.). Care should be taken not to apply force to the terminal during soldering.

**4. Avoid using switches in the following conditions:**

- In corrosive gases such as hydrogen sulfide.
- In flammable or explosive gases such as gasoline or thinner etc.
- In a dusty environment.
- In an ambient humidity over 85%.
- In conditions where the perpendicular operating speed is less than 0.1 mm/s or more than 1,000 mm/s
- In a silicon atmosphere.

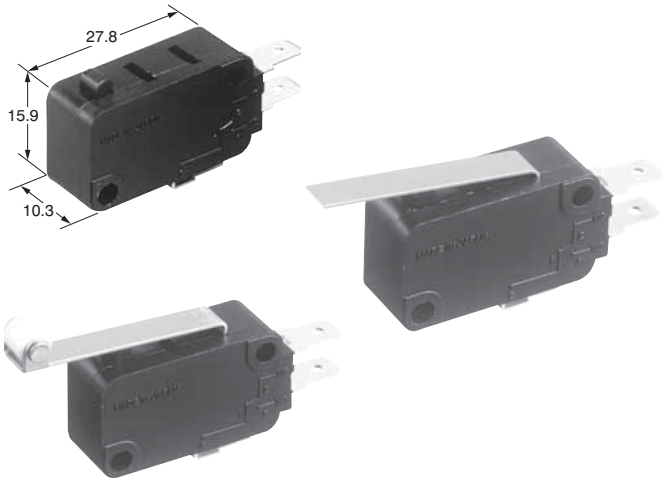
**5. Others**

Caution should be taken not to drop switches.

Panasonic
ideas for life

**MINIATURE SWITCHES WITH HIGH PRECISION**

# AM5 (QV) SWITCHES




Standard type contact gap is 1mm. Please consult us if you need more than 1mm contact gap.

## FEATURES

- **High precision as a result of designing ideal spring by using computer analysis**
  O.P. 14.7±0.4mm
- **Reliable design with shock resistance min. 980 m/s²**
- **High inrush resistance 160A**
- **Wide variety of contact ratings and terminal types**
- **UL/C-UL, ENEC/VDE approved**

**Protection grade: IP40**

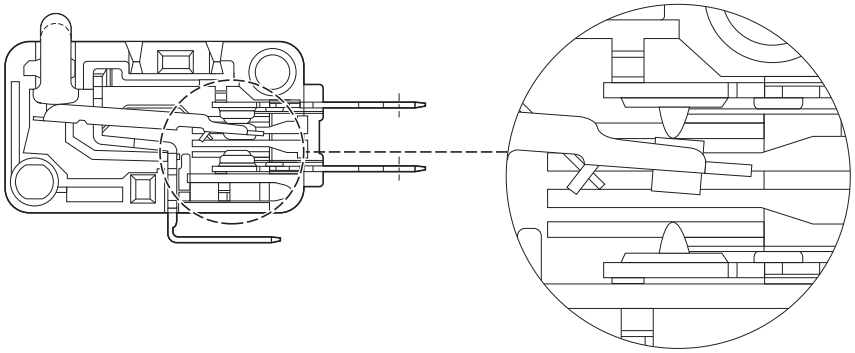
## TYPICAL APPLICATION

- **Home appliances**
- **Vending machines**
- **Amusement and communication equipment**
- **Copies**
- **General industrial machines**

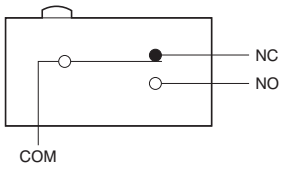
## CONSTRUCTION

1. Ag alloy contact

2. Au-clad contact

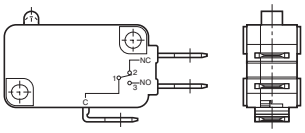


## CONTACT ARRANGEMENT

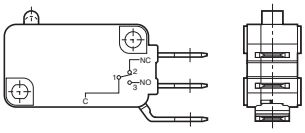


# TERMINALS

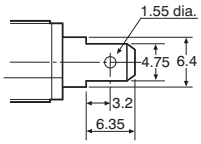
**.187 Quick-connect terminal**
**.187 Quick-connect/solder terminal**
Bottom COM terminal



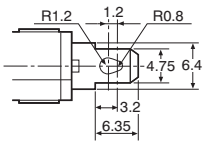

Side COM terminal



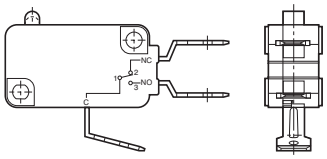

Dimensions
.187 Quick-connect terminal



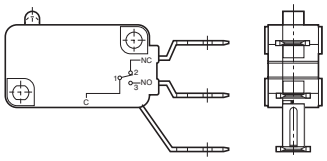

Dimensions
.187 Quick-connect/solder terminal



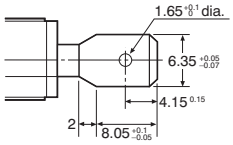

**.250 Quick-connect terminal**
Bottom COM terminal




Side COM terminal




Dimensions




# OPERATION FORCE CHART

| Actuator / 7th digit of part number | Operation Force, max. by actuator | | | | |
|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 |
| Pin plunger | 0.49N | 0.98N | 1.96N | 2.94N | 3.92N |
| Short hinge lever | 0.59N | 1.08N | 2.16N | 3.14N | 4.12N |
| Hinge lever | 0.29N | 0.59N | 1.18N | 1.77N | 2.35N |
| Long hinge lever | 0.15N | 0.29N | 0.59N | 0.88N | 1.18N |
| Simulated roller lever | 0.29N | 0.59N | 1.18N | 1.77N | 2.35N |
| Short roller lever | 0.59N | 1.08N | 2.16N | 3.14N | 4.12N |
| Roller lever | 0.29N | 0.59N | 1.18N | 1.77N | 2.35N |

# ORDERING INFORMATION



### 0.1A type

Ex. AM5 | 0 | 0 | 1 | 0 | C | 5 | 3

| Type of switch | Contact rating | Terminals | Actuators | Terminals | Operating force by pin plunger (max.) | Agency standard |
|---|---|---|---|---|---|---|
| AM5: QV switch | 00: 0.1 A (AgNi alloy + Au-clad) | 1: Bottom COM, SPDT<br>2: Bottom COM, SPST-NC<br>3: Bottom COM, SPST-NO<br>4: Side COM, SPDT<br>5: Side COM, SPST-NC<br>6: Side COM, SPST-NO | 0: Pin plunger<br>1: Short hinge lever<br>2: Hinge lever<br>3: Long hinge lever<br>4: Simulated roller lever<br>5: Short roller lever<br>6: Roller lever | A: .187 Quick-connect/solder terminal<br>C: .187 Quick-connect terminal | 3: 0.49 N<br>4: 0.98 N<br>5: 1.96 N | 3: UL/C-UL rated, ENEC/VDE approved |

Remarks: 1. Not every combination is available. Please refer to the table, “PRODUCT TYPES”.
2. Please refer to the Standard Chart regarding Agency Standard

### 6A type

Ex. AM5 | 0 | 6 | 1 | 0 | C | 5 | 3

| Type of switch | Contact rating | Terminals | Actuators | Terminals | Operating force by pin plunger (max.) | Agency standard |
|---|---|---|---|---|---|---|
| AM5: QV switch | 06: 6 A (AgNi alloy) | 1: Bottom COM, SPDT<br>2: Bottom COM, SPST-NC<br>3: Bottom COM, SPST-NO<br>4: Side COM, SPDT<br>5: Side COM, SPST-NC<br>6: Side COM, SPST-NO | 0: Pin plunger<br>1: Short hinge lever<br>2: Hinge lever<br>3: Long hinge lever<br>4: Simulated roller lever<br>5: Short roller lever<br>6: Roller lever | A: .187 Quick-connect/solder terminal<br>C: .187 Quick-connect terminal | 3: 0.49 N | 3: UL/C-UL rated, ENEC/VDE approved |

Remarks: 1. Not every combination is available. Please refer to the table, “PRODUCT TYPES”.
2. Please refer to the Standard Chart regarding Agency Standard

### 11A type

Ex. AM5 | 1 | 1 | 1 | 0 | C | 4 | 3 | N

| Type of switch | Contact rating | Terminals | Actuators | Terminals | Operating force by pin plunger (max.) | Agency standard | Contact |
|---|---|---|---|---|---|---|---|
| AM5: QV switch | 11: 11 A ($AgSnO_2$ alloy) | 1: Bottom COM, SPDT<br>2: Bottom COM, SPST-NC<br>3: Bottom COM, SPST-NO<br>4: Side COM, SPDT<br>5: Side COM, SPST-NC<br>6: Side COM, SPST-NO | 0: Pin plunger<br>1: Short hinge lever<br>2: Hinge lever<br>3: Long hinge lever<br>4: Simulated roller lever<br>5: Short roller lever<br>6: Roller lever | A: .187 Quick-connect/solder terminal<br>C: .187 Quick-connect terminal<br>D: .250 Quick-connect terminal | 4: 0.98 N | 3: UL/C-UL rated, ENEC/ VDE approved | N: Cadmium free |

Remarks: 1. Not every combination is available. Please refer to the table, “PRODUCT TYPES”.
2. Please refer to the Standard Chart regarding Agency Standard

### 16A type

Ex. AM5 | 1 | 6 | 1 | 0 | C | 5 | 3 | N

| Type of switch | Contact rating | Terminals | Actuators | Terminals | Operating force by pin plunger (max.) | Agency standard | Contact |
|---|---|---|---|---|---|---|---|
| AM5: QV switch | 16: 16 A ($AgSnO_2$ alloy) | 1: Bottom COM, SPDT<br>2: Bottom COM, SPST-NC<br>3: Bottom COM, SPST-NO<br>4: Side COM, SPDT<br>5: Side COM, SPST-NC<br>6: Side COM, SPST-NO | 0: Pin plunger<br>1: Short hinge lever<br>2: Hinge lever<br>3: Long hinge lever<br>4: Simulated roller lever<br>5: Short roller lever<br>6: Roller lever | A: .187 Quick-connect/solder terminal<br>C: .187 Quick-connect terminal<br>D: .250 Quick-connect terminal | 5: 1.96 N<br>6: 2.94 N<br>7: 3.92 N | 3: UL/C-UL rated, ENEC/ VDE approved | N: Cadmium free |

Remarks: 1. Not every combination is available. Please refer to the table, “PRODUCT TYPES”.
2. Please refer to the Standard Chart regarding Agency Standard

# PRODUCT TYPES

**0.1A type (AgNi alloy + Au-clad contact)**

.187 Quick-connect terminal

1) Bottom COM terminal

| Actuator | Operating force, max. | Contact arrangement | Contact arrangement | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger | 0.49N | AM50010C33 | AM50020C33 | AM50030C33 |
| | 0.98N | AM50010C43 | AM50020C43 | AM50030C43 |
| | 1.96N | AM50010C53 | AM50020C53 | AM50030C53 |
| Short hinge lever | 0.59N | AM50011C33 | AM50021C33 | AM50031C33 |
| | 1.08N | AM50011C43 | AM50021C43 | AM50031C43 |
| | 2.16N | AM50011C53 | AM50021C53 | AM50031C53 |
| Hinge lever | 0.29N | AM50012C33 | AM50022C33 | AM50032C33 |
| | 0.59N | AM50012C43 | AM50022C43 | AM50032C43 |
| | 1.18N | AM50012C53 | AM50022C53 | AM50032C53 |
| Long hinge lever | 0.15N | AM50013C33 | AM50023C33 | AM50033C33 |
| | 0.29N | AM50013C43 | AM50023C43 | AM50033C43 |
| | 0.59N | AM50013C53 | AM50023C53 | AM50033C53 |
| Simulated roller lever | 0.29N | AM50014C33 | AM50024C33 | AM50034C33 |
| | 0.59N | AM50014C43 | AM50024C43 | AM50034C43 |
| | 1.18N | AM50014C53 | AM50024C53 | AM50034C53 |
| Short roller lever | 0.59N | AM50015C33 | AM50025C33 | AM50035C33 |
| | 1.08N | AM50015C43 | AM50025C43 | AM50035C43 |
| | 2.16N | AM50015C53 | AM50025C53 | AM50035C53 |
| Roller lever | 0.29N | AM50016C33 | AM50026C33 | AM50036C33 |
| | 0.59N | AM50016C43 | AM50026C43 | AM50036C43 |
| | 1.18N | AM50016C53 | AM50026C53 | AM50036C53 |

2) Side COM terminal

| Actuator | Operating force, max. | Contact arrangement | Contact arrangement | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger | 0.49N | AM50040C33 | AM50050C33 | AM50060C33 |
| | 0.98N | AM50040C43 | AM50050C43 | AM50060C43 |
| | 1.96N | AM50040C53 | AM50050C53 | AM50060C53 |
| Short hinge lever | 0.59N | AM50041C33 | AM50051C33 | AM50061C33 |
| | 1.08N | AM50041C43 | AM50051C43 | AM50061C43 |
| | 2.16N | AM50041C53 | AM50051C53 | AM50061C53 |
| Hinge lever | 0.29N | AM50042C33 | AM50052C33 | AM50062C33 |
| | 0.59N | AM50042C43 | AM50052C43 | AM50062C43 |
| | 1.18N | AM50042C53 | AM50052C53 | AM50062C53 |
| Long hinge lever | 0.15N | AM50043C33 | AM50053C33 | AM50063C33 |
| | 0.29N | AM50043C43 | AM50053C43 | AM50063C43 |
| | 0.59N | AM50043C53 | AM50053C53 | AM50063C53 |
| Simulated roller lever | 0.29N | AM50044C33 | AM50054C33 | AM50064C33 |
| | 0.59N | AM50044C43 | AM50054C43 | AM50064C43 |
| | 1.18N | AM50044C53 | AM50054C53 | AM50064C53 |
| Short roller lever | 0.59N | AM50045C33 | AM50055C33 | AM50065C33 |
| | 1.08N | AM50045C43 | AM50055C43 | AM50065C43 |
| | 2.16N | AM50045C53 | AM50055C53 | AM50065C53 |
| Roller lever | 0.29N | AM50046C33 | AM50056C33 | AM50066C33 |
| | 0.59N | AM50046C43 | AM50056C43 | AM50066C43 |
| | 1.18N | AM50046C53 | AM50056C53 | AM50066C53 |

Remark: Also .187 Quick-connect/solder terminal is available. When ordering, change the eighth digit of part number C to A.
<ex.> .187 Quick-connect terminal .187 Quick-connect/solder terminal
AM50010C33 → AM50010A33

**6A type (AgNi alloy contact)**

.187 Quick-connect terminal

1) Bottom COM terminal

| Actuator | Operating force, max. | Contact arrangement | Contact arrangement | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger | 0.49N | AM50610C33 | AM50620C33 | AM50630C33 |
| Short hinge lever | 0.59N | AM50611C33 | AM50621C33 | AM50631C33 |
| Hinge lever | 0.29N | AM50612C33 | AM50622C33 | AM50632C33 |
| Long hinge lever | 0.15N | AM50613C33 | AM50623C33 | AM50633C33 |
| Simulated roller lever | 0.29N | AM50614C33 | AM50624C33 | AM50634C33 |
| Short roller lever | 0.59N | AM50615C33 | AM50625C33 | AM50635C33 |
| Roller lever | 0.29N | AM50616C33 | AM50626C33 | AM50636C33 |

2) Side COM terminal

| Actuator | Operating force, max. | Contact arrangement | Contact arrangement | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger | 0.49N | AM50640C33 | AM50650C33 | AM50660C33 |
| Short hinge lever | 0.59N | AM50641C33 | AM50651C33 | AM50661C33 |
| Hinge lever | 0.29N | AM50642C33 | AM50652C33 | AM50662C33 |
| Long hinge lever | 0.15N | AM50643C33 | AM50653C33 | AM50663C33 |
| Simulated roller lever | 0.29N | AM50644C33 | AM50654C33 | AM50664C33 |
| Short roller lever | 0.59N | AM50645C33 | AM50655C33 | AM50665C33 |
| Roller lever | 0.29N | AM50646C33 | AM50656C33 | AM50666C33 |

Remarks: Also .187 Quick-connect/solder terminal is available. When ordering, change the eighth digit of part number C to A.
<ex.> .187 Quick-connect terminal .187 Quick-connect/solder terminal
AM50610C33 → AM50610A33

**11A type ($AgSnO_2$ alloy contact)**

.187 Quick-connect terminal

1) Bottom COM terminal

| Actuator | Operating force, max. | Contact arrangement | Contact arrangement | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger | 0.98N | AM51110C43N | AM51120C43N | AM51130C43N |
| Short hinge lever | 1.08N | AM51111C43N | AM51121C43N | AM51131C43N |
| Hinge lever | 0.59N | AM51112C43N | AM51122C43N | AM51132C43N |
| Long hinge lever | 0.29N | AM51113C43N | AM51123C43N | AM51133C43N |
| Simulated roller lever | 0.59N | AM51114C43N | AM51124C43N | AM51134C43N |
| Short roller lever | 1.08N | AM51115C43N | AM51125C43N | AM51135C43N |
| Roller lever | 0.59N | AM51116C43N | AM51126C43N | AM51136C43N |

2) Side COM terminal

| Actuator | Operating force, max. | Contact arrangement | Contact arrangement | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger | 0.98N | AM51140C43N | AM51150C43N | AM51160C43N |
| Short hinge lever | 1.08N | AM51141C43N | AM51151C43N | AM51161C43N |
| Hinge lever | 0.59N | AM51142C43N | AM51152C43N | AM51162C43N |
| Long hinge lever | 0.29N | AM51143C43N | AM51153C43N | AM51163C43N |
| Simulated roller lever | 0.59N | AM51144C43N | AM51154C43N | AM51164C43N |
| Short roller lever | 1.08N | AM51145C43N | AM51155C43N | AM51165C43N |
| Roller lever | 0.59N | AM51146C43N | AM51156C43N | AM51166C43N |

Remarks: 1. Also .187 Quick-connect/solder terminal is available. When ordering, change the eighth digit of part number C to A.
<ex.> .187 Quick-connect terminal .187 Quick-connect/solder terminal
AM51110C43N → AM51110A43N
2. .250 Quick-connect terminal is available. When ordering, change the eighth digit of part number C to D.
<ex.> .187 Quick-connect terminal .250 Quick-connect terminal
AM51110C43N → AM51110D43N

**16A type ($AgSnO_2$ alloy contact)**

.187 Quick-connect terminal

1) Bottom COM terminal

| Actuator | Operating force, max. | Contact arrangement | Contact arrangement | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger | 1.96N | AM51610C53N | AM51620C53N | AM51630C53N |
| | 2.94N | AM51610C63N | AM51620C63N | AM51630C63N |
| | 3.92N | AM51610C73N | AM51620C73N | AM51630C73N |
| Short hinge lever | 2.16N | AM51611C53N | AM51621C53N | AM51631C53N |
| | 3.14N | AM51611C63N | AM51621C63N | AM51631C63N |
| | 4.12N | AM51611C73N | AM51621C73N | AM51631C73N |
| Hinge lever | 1.18N | AM51612C53N | AM51622C53N | AM51632C53N |
| | 1.77N | AM51612C63N | AM51622C63N | AM51632C63N |
| | 2.35N | AM51612C73N | AM51622C73N | AM51632C73N |
| Long hinge lever | 0.59N | AM51613C53N | AM51623C53N | AM51633C53N |
| | 0.88N | AM51613C63N | AM51623C63N | AM51633C63N |
| | 1.18N | AM51613C73N | AM51623C73N | AM51633C73N |
| Simulated roller lever | 1.18N | AM51614C53N | AM51624C53N | AM51634C53N |
| | 1.77N | AM51614C63N | AM51624C63N | AM51634C63N |
| | 2.35N | AM51614C73N | AM51624C73N | AM51634C73N |
| Short roller lever | 1.18N | AM51615C53N | AM51625C53N | AM51635C53N |
| | 3.14N | AM51615C63N | AM51625C63N | AM51635C63N |
| | 4.12N | AM51615C73N | AM51625C73N | AM51635C73N |
| Roller lever | 1.18N | AM51616C53N | AM51626C53N | AM51636C53N |
| | 1.77N | AM51616C63N | AM51626C63N | AM51636C63N |
| | 2.35N | AM51616C73N | AM51626C73N | AM51636C73N |

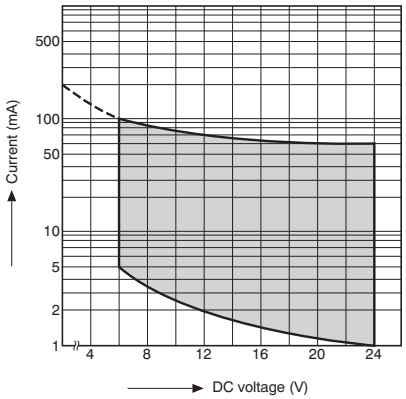
2 Side COM terminal

| Actuator | Operating force, max. | Contact arrangement | Contact arrangement | |
|---|---|---|---|---|
| | | SPDT | SPST-NC | SPST-NO |
| Pin plunger | 1.96N | AM51640C53N | AM51650C53N | AM51660C53N |
| | 2.94N | AM51640C63N | AM51650C63N | AM51660C63N |
| | 3.92N | AM51640C73N | AM51650C73N | AM51660C73N |
| Short hinge lever | 2.16N | AM51641C53N | AM51651C53N | AM51661C53N |
| | 3.14N | AM51641C63N | AM51651C63N | AM51661C63N |
| | 4.12N | AM51641C73N | AM51651C73N | AM51661C73N |
| Hinge lever | 1.18N | AM51642C53N | AM51652C53N | AM51662C53N |
| | 1.77N | AM51642C63N | AM51652C63N | AM51662C63N |
| | 2.35N | AM51642C73N | AM51652C73N | AM51662C73N |
| Long hinge lever | 0.59N | AM51643C53N | AM51653C53N | AM51663C53N |
| | 0.88N | AM51643C63N | AM51653C63N | AM51663C63N |
| | 1.18N | AM51643C73N | AM51653C73N | AM51663C73N |
| Simulated roller lever | 1.18N | AM51644C53N | AM51654C53N | AM51664C53N |
| | 1.77N | AM51644C63N | AM51654C63N | AM51664C63N |
| | 2.35N | AM51644C73N | AM51654C73N | AM51664C73N |
| Short roller lever | 2.16N | AM51645C53N | AM51655C53N | AM51665C53N |
| | 3.14N | AM51645C63N | AM51655C63N | AM51665C63N |
| | 4.12N | AM51645C73N | AM51655C73N | AM51665C73N |
| Roller lever | 1.18N | AM51646C53N | AM51656C53N | AM51666C53N |
| | 1.77N | AM51646C63N | AM51656C63N | AM51666C63N |
| | 2.35N | AM51646C73N | AM51656C73N | AM51666C73N |

Remarks: 1. Also .187 Quick-connect/solder terminal is available. When ordering, change the eighth digit of part number C to A.
<ex.> .187 Quick-connect terminal .187 Quick-connect/solder terminal
AM51610C53N → AM51610A53N
2. .250 Quick-connect terminal is available. When ordering, change the eighth digit of part number C to D.
<ex.> .187 Quick-connect terminal .250 Quick-connect terminal
AM51610C53N → AM51610D53N

# DATA

Au-clad type
Range of low-level current and voltage




# SPECIFICATIONS

### 1. Contact rating

| Type | | Voltage | Resistive load (cos $\phi$ = 1) | Inductive load (cos $\phi$ ≈ 0.6 to 0.7) |
|---|---|---|---|---|
| AgNi alloy + Au-clad contact | 0.1A type | 250V AC | 0.1A | 0.1A |
| | | 125V AC | 0.1A | 0.1A |
| | | 30V DC | 0.1A | 0.1A |
| AgNi alloy contact | 6A type | 250V AC | 6A | 3A |
| | | 125V AC | 6A | 3A |
| | | 125V DC | 0.5A | 0.5A |
| $AgSnO_2$ alloy contact | 11A type | 250V AC | 11A | 6A |
| | | 125V AC | 11A | 6A |
| | | 125V DC | 0.6A | 0.6A |
| | 16A type | 250V AC | 16A | 10A |
| | | 125V AC | 16A | 10A |
| | | 125V DC | 0.6A | 0.6A |
| AgNi alloy + Au-clad contact for low level circuit | | 6V DC | 5mA | — |
| | | 12V DC | 2mA | — |
| | | 24V DC | 1mA | — |

Remark: The inductive load for DC should have a time constant of 7 ms or less.

### 2. Characteristics

| Type | | 16, 11, 6A type | 0.1A type |
|---|---|---|---|
| Expected life (min.) | Mechanical | $10^7$ operations (at 60 cpm) | |
| | Electrical | $10^5$ Operations (at rated load 20 cpm) | $10^5$ operations (at rated load)<br>$2 \times 10^6$ operations (at low-level circuit rating) |
| Insulation resistance | | 100MΩ (at 500V DC) | |
| Dielectric strength | Between terminals | 1,000Vrms for 1 min. | |
| | Between terminals and other exposed metal parts | 2,000Vrms for 1 min. | |
| | Between terminals and ground | 2,000Vrms for 1 min. | |
| Contact resistance (initial) | | 50mΩ (by voltage drop at 1A 6 to 8V DC) | 50mΩ (by voltage drop at 0.1A 6 to 8V DC) |
| Vibration resistance (by pin plunger) | | 10 to 55Hz at simple amplitude of 0.75mm (contact opening: max. 1ms) | |
| Shock resistance (by pin plunger) (contact opening: max. 1ms) | | O.F. 0.49N max. type Min. 98m/s²<br>O.F. 0.98N max. type Min. 196m/s²<br>O.F. 1.96N to 3.92N max. type Min. 294m/s² | O.F. 0.49N max. type Min. 98m/s²<br>O.F. 0.98N max. type Min. 196m/s²<br>O.F. 1.96N max. type Min. 294m/s² |
| Allowable operating speed | | 0.1 to 1,000mm/s (at pin plunger) | |
| Maximum operating cycle rate | | 600cpm | |
| Ambient temperature | | –25 to +105°C (not freezing below 0°C) | |
| Weight | | Approx. 6.3g | |
| Contact material | | 6A type: AgNi alloy,<br>11A and 16A type: $AgSnO_2$ alloy | AgNi alloy + Au-clad |

Remarks: 1. Test conditions and judgement are in accordance with NECA C 4505.
2. OF: Value of pin plunger
3. When switching at low and high speeds or under vibration, or in high-temperature, high-humidity environments, life and performance may be reduced significantly depending on the load capacity. Please consult us.

**3. Operating characteristics**

1) Pin plunger

| 7th digit of part no. | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|
| Operating force, max. | 0.49N | 0.98N | 1.96N | 2.94N | 3.92N |
| Release force, min. | 0.12N | 0.25N | 0.49N | 0.74N | 0.98N |
| Pretravel, max. mm | 1.4 | | | | |
| Movement differential, max. mm | 0.4 | | | | |
| Overtravel, min. mm | 1.0 | | | | |
| Operating position mm | 14.7±0.4 | | | | |

2) Short hinge lever

| 7th digit of part no. | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|
| Operating force, max. | 0.59N | 1.08N | 2.16N | 3.14N | 4.12N |
| Release force, min. | 0.098N | 0.20N | 0.39N | 0.59N | 0.78N |
| Pretravel, max. mm | 1.6 | | | | |
| Movement differential, max. mm | 0.5 | | | | |
| Overtravel, min. mm | 0.9 | | | | |
| Operating position mm | 15.3±0.5 | | | | |

3) Hinge lever

| 7th digit of part no. | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|
| Operating force, max. | 0.29N | 0.59N | 1.18N | 1.77N | 2.35N |
| Release force, min. | 0.049N | 0.098N | 0.20N | 0.29N | 0.39N |
| Pretravel, max. mm | 3.2 | | | | |
| Movement differential, max. mm | 1.0 | | | | |
| Overtravel, min. mm | 1.4 | | | | |
| Operating position mm | 15.3±1.0 | | | | |

4) Long hinge lever

| 7th digit of part no. | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|
| Operating force, max. | 0.15N | 0.29N | 0.59N | 0.88N | 1.18N |
| Release force, min. | 0.025N | 0.049N | 0.098N | 0.15N | 0.20N |
| Pretravel, max. mm | 7.5 | | | | |
| Movement differential, max. mm | 2.0 | | | | |
| Overtravel, min. mm | 2.2 | | | | |
| Operating position mm | 15.3±2.6 | | | | |

5) Simulated roller lever

| 7th digit of part no. | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|
| Operating force, max. | 0.29N | 0.59N | 1.18N | 1.77N | 2.35N |
| Release force, min. | 0.049N | 0.098N | 0.20N | 0.29N | 0.39N |
| Pretravel, max. mm | 3.2 | | | | |
| Movement differential, max. mm | 1.0 | | | | |
| Overtravel, min. mm | 1.4 | | | | |
| Operating position mm | 18.5±1.0 | | | | |

6) Short roller lever

| 7th digit of part no. | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|
| Operating force, max. | 0.59N | 1.08N | 2.16N | 3.14N | 4.12N |
| Release force, min. | 0.098N | 0.20N | 0.39N | 0.59N | 0.78N |
| Pretravel, max. mm | 1.6 | | | | |
| Movement differential, max. mm | 0.5 | | | | |
| Overtravel, min. mm | 0.9 | | | | |
| Operating position mm | 20.7±0.5 | | | | |

7) Roller lever

| 7th digit of part no. | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|
| Operating force, max. | 0.29N | 0.59N | 1.18N | 1.77N | 2.35N |
| Release force, min. | 0.049N | 0.098N | 0.20N | 0.29N | 0.39N |
| Pretravel, max. mm | 3.2 | | | | |
| Movement differential, max. mm | 1.0 | | | | |
| Overtravel, min. mm | 1.4 | | | | |
| Operating position mm | 20.7±1.0 | | | | |

# DIMENSIONS

Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

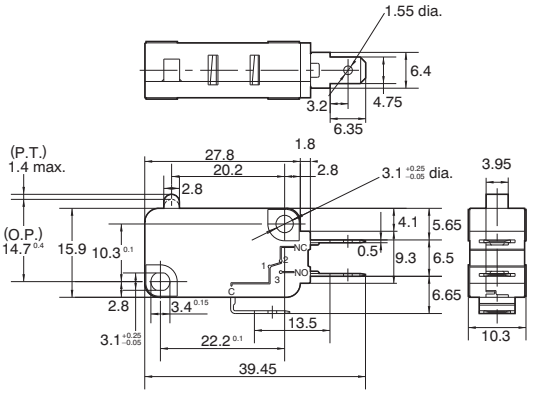
## 1. Pin plunger

mm General tolerance: ±0.25

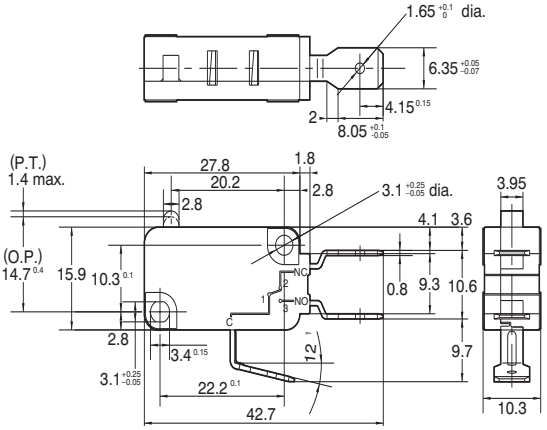
Bottom COM terminal

**CAD Data**

.187 Quick-connect terminal



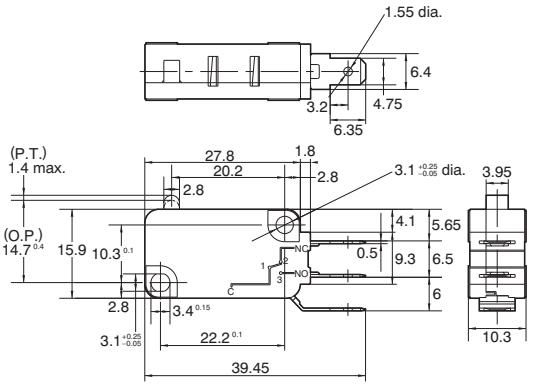

.250 Quick-connect terminal



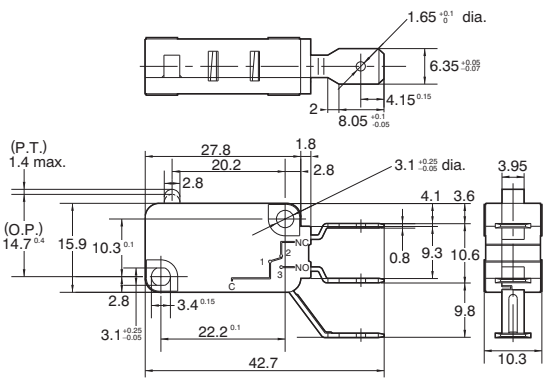

Side COM terminal

**CAD Data**

.187 Quick-connect terminal

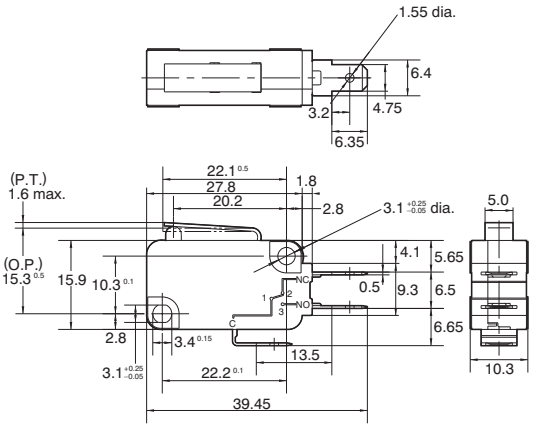



.250 Quick-connect terminal




## 2. Short hinge lever

**CAD Data**

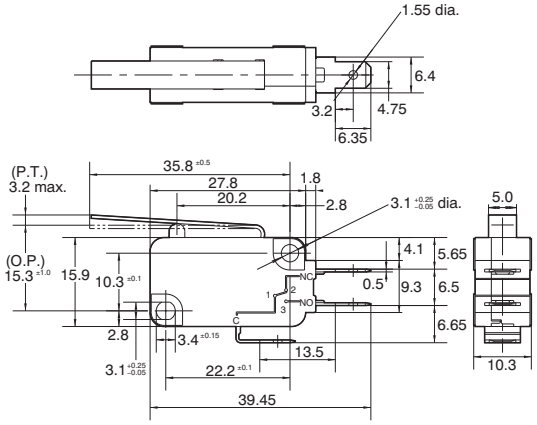



The dimensions other than drawn above are same as pin plunger type.

### 3. Hinge lever

mm General tolerance: ±0.25

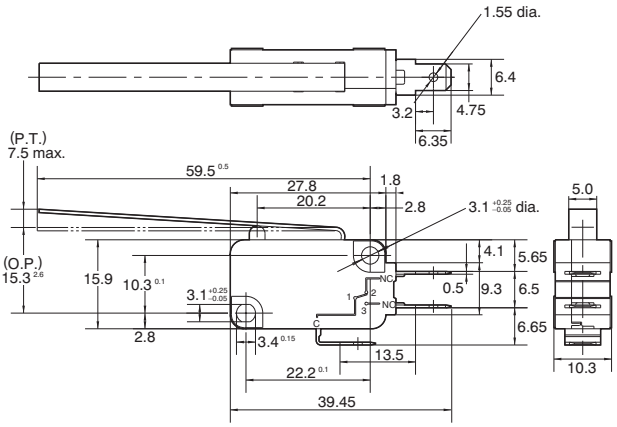
**CAD Data**




The dimensions other than drawn above are same as pin plunger type.

### 4. Long hinge lever

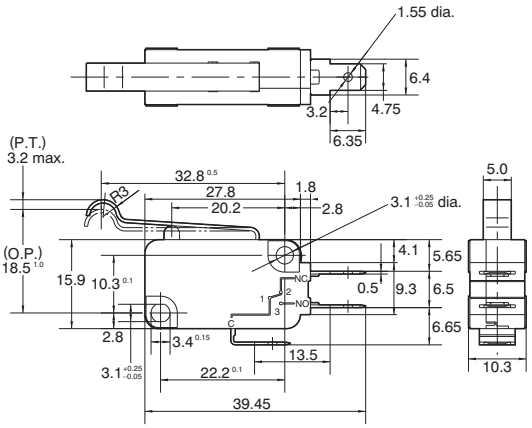
**CAD Data**




The dimensions other than drawn above are same as pin plunger type.

### 5. Simulated roller lever

**CAD Data**

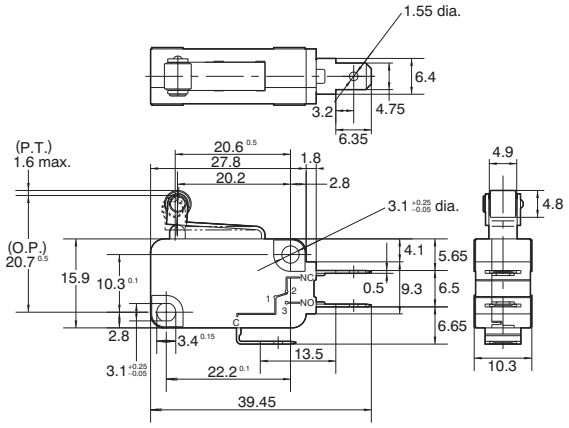



The dimensions other than drawn above are same as pin plunger type.

### 6. Short roller lever

mm General tolerance: ±0.25

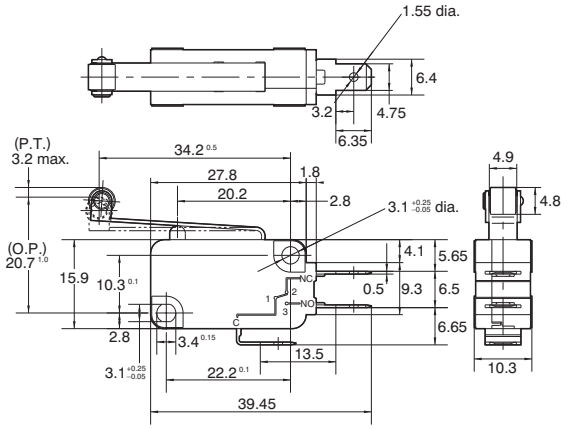
**CAD Data**




The dimensions other than drawn above are same as pin plunger type.

### 7. Hinge Roller lever

**CAD Data**




The dimensions other than drawn above are same as pin plunger type.

# NOTES

**1. Fastening of the switch body**

1) Use flat filister head M3 screws to mount switches with less than a 0.49 N·m torque. Use of screws washers or adhesive lock is recommended to prevent loosening of the screws.

2) Check insulation distance between ground and each terminal.

3) When the operation object is in the free position, force should not be applied directly to the actuator or pin plunger. Also force should be applied to the pin plunger from vertical direction to the switch.

4) The standard value of overtravel should be the range of 70% to 100% of the rated O.T. value.

**2. Soldering operations**

Manual soldering should be accomplished within 5 seconds, with max. 350°C iron. Care should be taken not to apply force to the terminal during soldering.

Terminal portions must not be moved in min.1 minute after soldering.

Also no tensile strength of lead wires should be applied to terminals.

**3. Varience of operating characteristics**

When specifying the switch, allow +20% to the listed operating and release forces.

**4. Environment**

Avoid using the switches in the following conditions;

• In corrosive gases, such as silicon gas

• In a dusty environment

**5. For switching of inductive loads (relays, solenoids, etc.)**

1) In order to prevent damage to contacts due to the occurrence of arcing, an arc absorbing circuit should be applied.

2) Care should be taken that occurrence in AC load possibly shorten the expected life.

**6. Please assure the quality and reliability of the switch under the actual service condition.**

**7. It is recommended to use Au-clad contact type in use of low-level circuit rating.**

**8. Cover and body are press-fitted. Once it is taken apart, it may cause change of characteristics.**

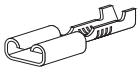
# USE OF CONNECTOR

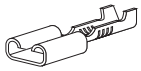
The .187 Quick-connect terminal and .250 Quick-connect terminal accept the all kinds of 1 polarity connectors and the “Positive Lock” connectors

Please contact the manufacturers directly.

**• receptacle terminal**

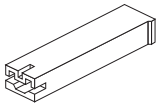
.250 series .187 series



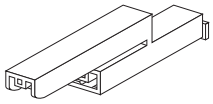


**• “Positive Lock” connector. (equipped with the lock construction of low insertion type)**

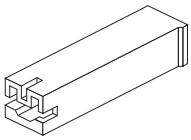
.187 type (1 polarity)



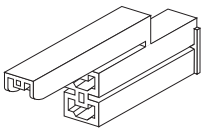
.187 type (2 polarities)



.250 type (1 polarity)



.187 type (3 polarities)



Panasonic
ideas for life

**MINIATURE SWITCHES WITH HIGH PRECISION**

# AM5 (QV) SWITCHES
(contact gap more than 1mm)



- **Conforms with the IEC950 standards for secondary circuit insulation distance.**
  **Assures a contact gap of at least 1mm**
- **Can handle high-capacity loads on the secondary side that S-type size switches cannot**
- **High inrush and hard impacts resistant**
- **Excellent operating position precision**
- **UL/CSA/VDE/SEMKO/TÜV approved**

## PRODUCT TYPES

Contact rating: 0.1A, 6A, 11A, 16A (250V AC)
Terminal shape: .187 Quick connect terminal, .187 Quick connect/solder terminal
For other specifications, please consult us.

## DIMENSIONS AND NOTES

Please refer to Standard QV switches catalog for dimensions and notes.

## SPECIFICATIONS

**• Contact ratings (0.1 to 16 A)**

| Voltage | Resistive load (cos □= 1.0) | | | | Inductive load (cos ϕ ≈ 0.6 to 0.7) | | | |
|---|---|---|---|---|---|---|---|---|
| Type | 0.1A | 6A | 11A | 16A | 0.1A | 6A | 11A | 16A |
| 250V AC | 0.1A | 6A | 11A | 16A | 0.1A | 3A | 6A | 10A |
| 125V AC | 0.1A | 6A | 11A | 16A | 0.1A | 3A | 6A | 10A |
| 125V DC | 0.1A | 0.5A | 0.6A | 0.6A | 0.1A | 0.5A | 0.6A | 0.6A |

Remark: The inductive load for DC should have a time constant of 7 ms or less.

- **0.1A type minimum load:**
  6V DC 5mA (resistive load)
  12V DC 2mA (resistive load)
  24V DC 1mA (resistive load)

Please consult us for further information.

Panasonic
ideas for life

**LOW LEVEL LOAD SWITCH (100μA at 3V DC)**

# AEQ (EQ) SWITCHES



## FEATURES

- **Handles low level load 100μA at 3V DC to 100mA 30V DC [Minimum switching capacity (reference value) 10μA at 1V DC]**
- **Ultra-long stroke. For pin plunger type, it maintains an ultra-long stroke O.T. (over travel) with over 2.2mm on the NO side and over 2.5mm on the NC side.**
- **Since contact pressure does not depend on the operation stroke, the range of possible use over the entire stroke is greatly increased.**
- **Silent operation**
- **Protection grade: IP40**

## TYPICAL APPLICATIONS

- **Household appliances (Cover detection of air conditioners and air purifiers for safety purpose. Cover destruction detection of crime prevention devices.)**

## ORDERING INFORMATION

**AEQ1** □ □ □ □

Size of mounting hole
0: 3 mm standard type
1: 3 mm without boss type

Terminal
4: Solder terminal

5: PC board terminal

Contact form
1: SPDT


Actuator
0: Pin plunger
7: Leaf lever
8: Simulated leaf lever

## PRODUCT TYPES

**Terminal type (mounting hole: 3mm standard type / 3mm without boss type)**

| Actuator | Operating force max. | Mounting hole: 3mm standard type | Mounting hole: 3mm without boss type |
|---|---|---|---|
| | | Solder terminal | PC board terminal |
| Pin plunger | 1.2N | AEQ10410 | AEQ11510 |
| Leaf lever | 1.7N | AEQ10417 | AEQ11517 |
| Simulated leaf lever | 1.5N | AEQ10418 | AEQ11518 |

# RATING

### 1. Rating

100μA at 3V DC to 100mA 30V DC.
[Min. switching capacity (reference value*) 10μA at 1V DC]

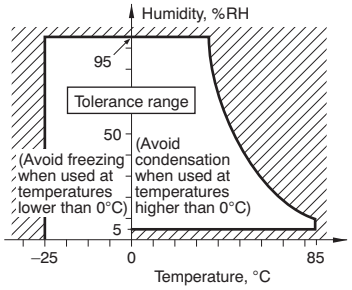
* This value is a rough indication of the lowest possible low level load at which switching is possible.
This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.

### 2. Operation environment and conditions

| Item | Specifications |
|---|---|
| Ambient and storage temperature | –25°C to +85°C (no freezing and condensing) |
| Allowable operating speed | 30 to 500 mm/s |
| Max. operating cycle rate | 120 cpm |

Note 1: When switching at low and high speeds or under vibration, or in high-temperature, high-humidity environments, life and performance may be reduced significantly depending on the load capacity. Please consult us.

Note 2:




### 3. Electrical characteristics

| | |
|---|---|
| Dielectric strength (initial) | Between non-continuous terminals: 600 Vrms, Between each terminal and other exposed metal parts: 1,500 Vrms, Between each terminal and ground: 1,500 Vrms (at detection current of 1 mA) |
| Insulation resistance (initial) | Min. 100 MΩ (at 500 V DC insulation resistance meter, Locations measured same as breakdown voltage.) |
| Contact resistance (initial) | Max. 1 Ω (by voltage drop 0.1 A, 6 to 8 V DC) |

### 4. Characteristics

| Item | | Specifications | |
|---|---|---|---|
| Electrical switching life | 3V DC 0.1mA (resistive load) | Min. $2 \times 10^5$ | Switching frequency: 20 times/min.<br>Conduction ratio: 1:1<br>Push-button operation speed: 100 mm/s<br>Push-button switching position: free position (F.P.) to total travel position (T.T.P.) |
| | 30V DC 100mA (resistive load) | Min. $10^5$ | |
| Vibration resistance (malfunction vibration resistance) | | Single amplitude: 0.75 mm<br>Amplitude of vibration: 10 to 55 Hz (4 minutes cycle)<br>Direction and time: 2 hours each in X, Y and Z directions | |
| Shock resistance (malfunction shock resistance) | | Shock value: 294 $m/s^2$<br>Direction and time: 3 times each in X, Y and Z directions | |
| Vibration resistance endurance | | Frequency of vibration: 33.3 Hz, Acceleration: 43.1 $m/s^2$<br>Direction and time: 8 hours each in X, Y and Z directions | |
| Terminal strength | | Min. 6 N (to each direction, applied power at 1 minute) *Terminal deformation possible. | |
| Salt spray resistance | | Density of salt water: 5 %<br>Temperature: 35°C each 100 hours<br>At free position (F.P.) and total travel position (T.T.P.) | |
| Heat and cold resistance | | –45 to –40°C 48 hours<br>85 to 90°C 48 hours | |
| Humidity resistance | | 40°C 95% R.H. 96 hours | |
| Protection grade | | IP40 | |

Notes: As long as there are no particular designations, the following conditions apply to the test environment.
Ambient temperature: 5 to 35°C
Relative humidity: 25 to 85% R.H.
Air pressure: 86 to 106 kPa

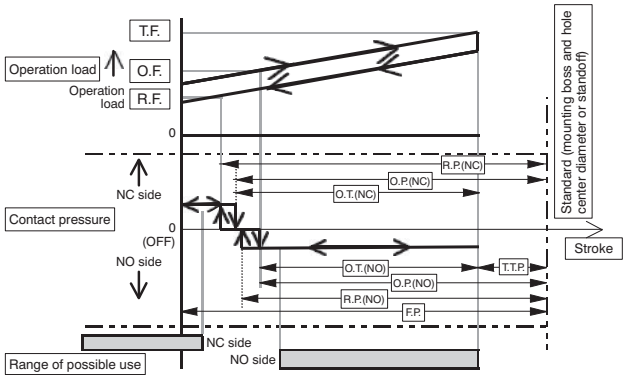
### 5. Operating characteristics

| Item | | Standard value | | |
|---|---|---|---|---|
| | | Pin plunger | Leaf lever | Simulated leaf lever |
| Operating Force (max. O.F.) *Note 2 | | 1.2 N | 1.7 N | 1.5 N |
| Total travel Force (max. T.F.) reference value | | (1.8 N) | (3.1 N) | (2.8 N) |
| Free Position (max. F.P.) | From mounting boss and hole center line | 9.2 mm | 11.5 mm | 14.4 mm |
| Operating Position on NC side [O.P. (N.C.)] *Note 3 | From mounting boss and hole center line | 8.7±0.3 mm | 9.8±0.5 mm | 12.5±0.5 mm |
| Operating Position on NO side [O.P. (N.O.)] *Note 4 | From mounting boss and hole center line | 8.4±0.3 mm | 9.3±0.5 mm | 12.0±0.5 mm |
| Release Position on NC side [R.P. (N.C.)] *Note 6 | From mounting boss and hole center line | 8.8±0.3 mm | 10.1±0.5 mm | 12.9±0.5 mm |
| Release Position on NO side [R.P. (N.O.)] *Note 7 | From mounting boss and hole center line | 8.5±0.3 mm | 9.6±0.5 mm | 12.4±0.5 mm |
| Over travel on NC side [min. O.T. (N.C.)] | | 2.5 mm | 3.1 mm | 3.3 mm |
| Over travel on NO side [min. O.T. (N.O.)] | | 2.2 mm | 2.6 mm | 2.8 mm |
| Total Travel Position (T.T.P.) reference value | From mounting boss and hole center line | (5.9 mm) | (6.2 mm) | (8.7 mm) |

Notes: 1. The above indicates the characteristics when operating the push-button from the vertical direction.
2. Indicates operation load for NO contact to achieve ON status.
3. Indicates position for NC contact to achieve OFF status.
4. Indicates position for NO contact to achieve ON status.
5. Although there is some overlap in the range of the operating position (O.P.) on the NC and NO sides due to the tolerance, actually there is always an intermediate OFF range (the NC and NO sides will never ON at the same time.)
6. Indicates position for NC contact to achieve ON status.
7. Indicates position for NO contact to achieve OFF status.

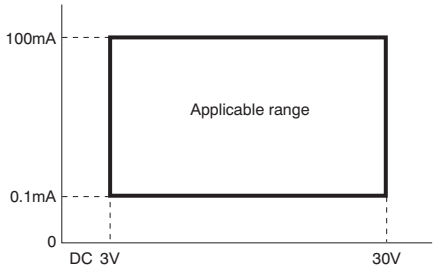
# OPERATION CONCEPT DIAGRAM

**Contact form: terminal type**

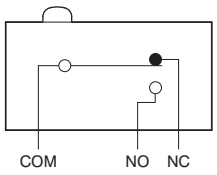



# DATA

**Applicable current range (reference)**




# CONTACT ARRANGEMENT



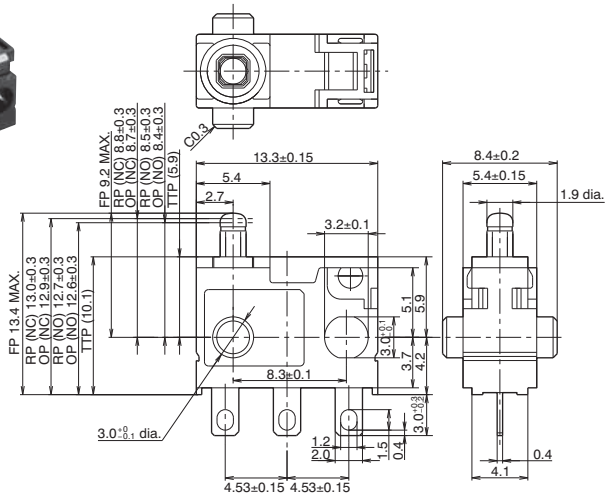
## DIMENSIONS (unit: mm)

Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

### 1. Solder terminal; Mounting hole: 3mm, standard type

Pin plunger

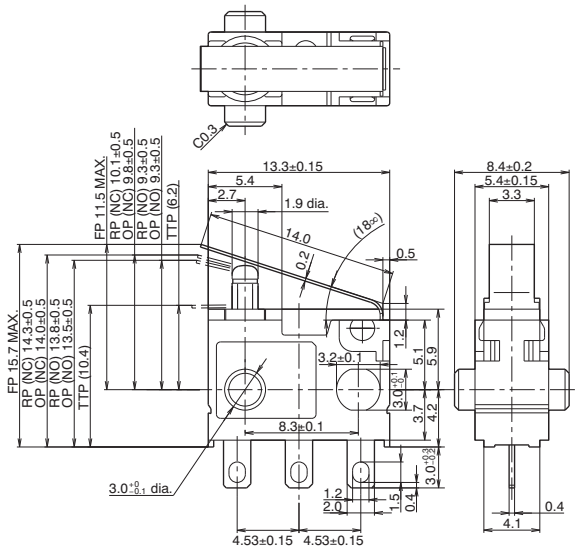
**CAD Data**




| | | |
|---|---|---|
| Operating Force (max. O.F.) | | 1.2 N |
| Total travel Force (max. T.F.) reference value | | (1.8 N) |
| Free Position (F.P.) | From mounting boss and hole center line | 9.2 mm max. |
| Operating Position on NC side [O.P. (N.C.)] | From mounting boss and hole center line | 8.7±0.3 mm |
| Operating Position on NO side [O.P. (N.O.)] | From mounting boss and hole center line | 8.4±0.3 mm |
| Release Position on NC side [R.P. (N.C.)] | From mounting boss and hole center line | 8.8±0.3 mm |
| Release Position on NO side [R.P. (N.O.)] | From mounting boss and hole center line | 8.5±0.3 mm |
| Over travel on NC side [min. O.T. (N.C.)] | | 2.5 mm |
| Over travel on NO side [min. O.T. (N.O.)] | | 2.2 mm |

### 2. Leaf lever

**CAD Data**

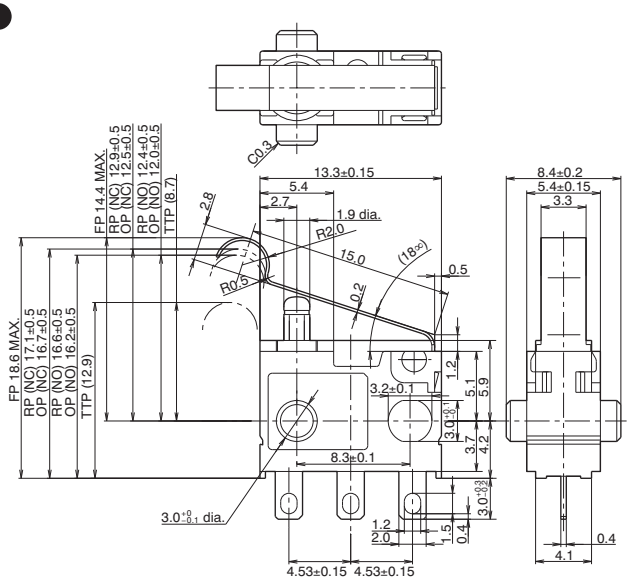



| | | |
|---|---|---|
| Operating Force (max. O.F.) | | 1.7 N |
| Total travel Force (max. T.F.) reference value | | (3.1 N) |
| Free Position (F.P.) | From mounting boss and hole center line | 11.5 mm max. |
| Operating Position on NC side [O.P. (N.C.)] | From mounting boss and hole center line | 9.8±0.5 mm |
| Operating Position on NO side [O.P. (N.O.)] | From mounting boss and hole center line | 9.3±0.5 mm |
| Release Position on NC side [R.P. (N.C.)] | From mounting boss and hole center line | 10.1±0.5 mm |
| Release Position on NO side [R.P. (N.O.)] | From mounting boss and hole center line | 9.6±0.5 mm |
| Over travel on NC side [min. O.T. (N.C.)] | | 3.1 mm |
| Over travel on NO side [min. O.T. (N.O.)] | | 2.6 mm |

Note: When switching at high speed or under shock, lever endurance may drop. Therefore, please be sure to conduct an endurance evaluation under actual switching conditions.

### 3. Simulated leaf lever

**CAD Data**



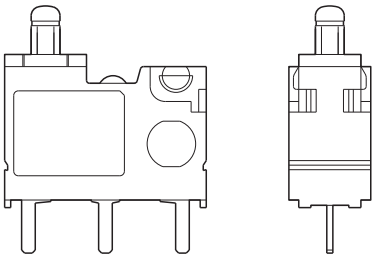

| | | |
|---|---|---|
| Operating Force (max. O.F.) | | 1.5 N |
| Total travel Force (max. T.F.) reference value | | (2.8 N) |
| Free Position (F.P.) | From mounting boss and hole center line | 14.4 mm max. |
| Operating Position on NC side [O.P. (N.C.)] | From mounting boss and hole center line | 12.5±0.5 mm |
| Operating Position on NO side [O.P. (N.O.)] | From mounting boss and hole center line | 12.0±0.5 mm |
| Release Position on NC side [R.P. (N.C.)] | From mounting boss and hole center line | 12.9±0.5 mm |
| Release Position on NO side [R.P. (N.O.)] | From mounting boss and hole center line | 12.4±0.5 mm |
| Over travel on NC side [min. O.T. (N.C.)] | | 3.3 mm |
| Over travel on NO side [min. O.T. (N.O.)] | | 2.8 mm |

Note: When switching at high speed or under shock, lever endurance may drop. Therefore, please be sure to conduct an endurance evaluation under actual switching conditions.

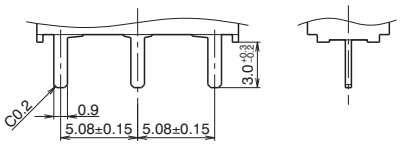
**4. PC board terminal; Mounting hole: 3 mm, without boss type**

Pin plunger

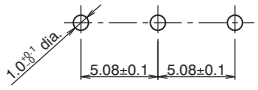
CAD Data



PC board terminal




PC board pattern



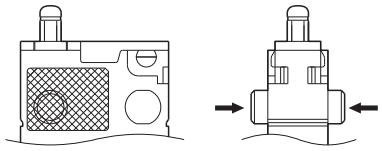

# NOTES

■ **Soldering conditions**

Manual soldering: use soldering irons (max. 350°C, within 2 seconds) capable of temperature adjustment. This is to prevent deterioration due to soldering heat. Care should be taken not to apply force to the terminals during soldering. Terminal portion must not be moved within 1 minute after soldering.

■ **Mounting**

Please avoid use in which load would be applied to the sides [hatch part (both sides) shown below] of the switch in the direction indicated by the arrows. This could cause erroneous operation. Also, when using a metal installation board, please make allowance for burr direction designation and burr suppressing, etc., so that the burr side will not be on the switch installation side.



1) To secure the switch, please use an M3 small screw on a flat surface and tighten using a maximum torque of 0.29 N·m. It is recommended that spring washers be used with the screws and adhesive be applied to lock the screws to prevent loosening of the screws. Please make sure not to apply adhesive onto the moving parts.

2) Be sure to maintain adequate insulating clearance between each terminal and ground.

3) Although it is possible to directly operate the pin plunger type from the lateral direction, please consult us if doing so.

4) After mounting please make sure no tensile load will be applied to the switch terminals.

5) Range of possible use: Please set the operation position to within the ranges in the following table so that there is sufficient insulation distance and to maintain contact reliability.

| Actuator | Plunger/lever free | |
|---|---|---|
| | From boss and hole center line | From standoff |
| Pin plunger | >9.2 mm | >13.4 mm |
| Leaf lever | >10.7 mm | >14.9 mm |
| Simulated leaf lever | >13.5 mm | >17.7 mm |

| Actuator | Plunger/Lever pushed | |
|---|---|---|
| | From boss and hole center line | From standoff |
| Pin plunger | 7.8 to 5.9 mm | 12.0 to 10.1 mm |
| Leaf lever | 8.4 to 6.2 mm | 12.6 to 10.4 mm |
| Simulated leaf lever | 11.1 to 8.7 mm | 15.3 to 12.9 mm |

6) PC board terminal type should be used if the products are to be soldered on the PC board. (Solder terminal type is not for soldering on PC board.)

■ **Cautions regarding the circuit**

1) In order to prevent malfunction in set devices caused by bounce and chattering during the ON-OFF switch operation, please verify the validity of the circuit under actual operating conditions and temperature range.

2) When switching inductive loads (relays, solenoids, buzzers, etc.), an arc absorbing circuit is recommended to protect the contacts.

■ **Please verify under actual conditions.**

Please be sure to conduct quality verification under actual operating conditions in order to increase reliability during actual use.

■ **Switch selection**

Please make your selection so that there will be no problems even if the operating characteristics vary up to ±20% from the standard values.

■ **Other**

1) Keep away from environments where silicon based adhesives, oil or grease are present as faulty contacts may result from silicon oxide. Do not use in areas where flammable or explosive gases from gasoline and thinner, etc., may be present.

2) When using the lever type, please be careful not to apply unreasonable load from the reverse or lateral directions of operation.

3) Do not exceed the total travel position (TTP) and press the actuator. This could cause operation failure. Also, when switching at high speed or under shock even within the operation limit, the working life may decrease. Therefore, please be sure to verify the quality under actual conditions of use.

4) Please make considerations so that the switch does not become the stopper for the operating part. The switch could break.

Panasonic
ideas for life

**NEW SUBMINIATURE SWITCHES WITH HIGH PRECISION**

# AV (FS•FS-T) SWITCHES

FS

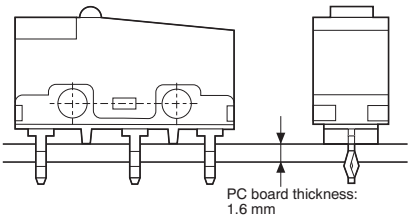
FS-T

## FEATURES

**• Consistent quality and high precision through sophisticated automatic fabrication system —O.P.: 8.4±0.3 mm (O.P.of conventional subminiature switches: 8.4±0.5)**
**• Flux-resistant construction with integrally molded terminals**
**• Solder terminal; Self-standing, internationally common pitch, right angle, left angle terminals for PC board; Quick connect .110 terminals for easy mounting**
**• Insulation guard available for safety mounting**
**• 2 lever pivot positions available for applications where low operating force is required**

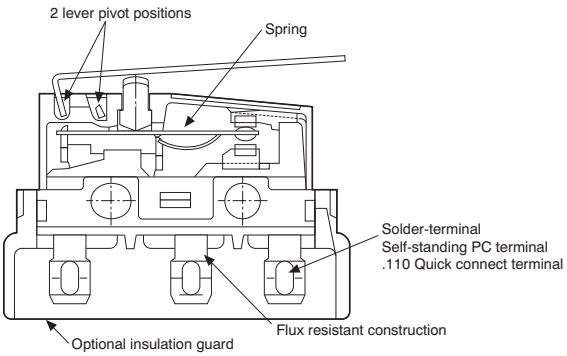
## TYPICAL APPLICATIONS

**• Communication equipment**
**• Vending machines**
**• Security systems**
**• Data systems**
**• Medical equipment**
**• VCR**

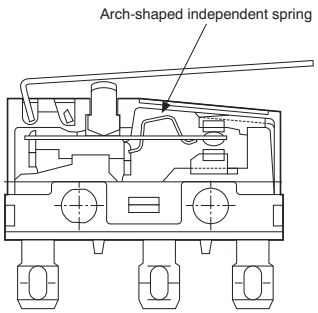



## CONSTRUCTION (example: AV3/AVM3 type)

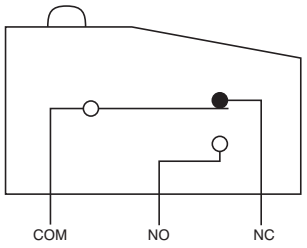
Standard version




Long life version




## CONTACT ARRANGEMENT




Remark: As for FS-T switches, the terminals are the different shape.

# ORDERING INFORMATION

1.FS switches (in-line terminal type)

Ex. AV 3 2 0 2 ☐ ☐ 3

| Type of switch | Version | Terminals | Actuators | Operating force by pin plunger, max. | Lever position | Contacts | Agency standard |
|---|---|---|---|---|---|---|---|
| AV3(FS) switch | 3: Standard | 2: Solder terminal<br>4: Self-standing PC board terminal<br>5: Internationally common pitch PC board terminal<br>6: Right angle terminal<br>7: Left angle terminal<br>8: .110 Quick-connect terminal | 0: Pin plunger<br>1: Short hinge lever<br>2: Hinge lever<br>3: Long hinge lever<br>4: Simulated roller lever<br>5: Roller lever | 0: 0.25 N (Au-clad contact only)<br>2: 0.49 N<br>4: 0.98 N | Nil: Standard | Nil: AgNi alloy<br>61: Au-clad triple layer* | 3: UL/C-UL, ENEC/ VDE |

Ex. AV M3 2 0 2 ☐ ☐ 3

| Type of switch | Version | Terminals | Actuators | Operating force by pin plunger, max. | Lever position | Contacts | Agency standard |
|---|---|---|---|---|---|---|---|
| AV3 (FS long life ver.) switch | M3: Long life | 2: Solder terminal<br>4: Self-standing PC board terminal<br>5: Internationally common pitch PC board terminal<br>6: Right angle terminal<br>7: Left angle terminal<br>8: .110 Quick-connect terminal | 0: Pin plunger<br>1: Short hinge lever<br>2: Hinge lever<br>3: Long hinge lever<br>4: Simulated roller lever<br>5: Roller lever | 5: 1.47 N | Nil: Standard | Nil: AgNi alloy<br>61: Au-clad triple layer* | 3: UL/C-UL, ENEC/ VDE |

2.FS-T switches (cross-line terminal type)

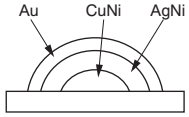
Ex. AV T3 2 0 2 ☐ ☐ 3

| Type of switch | Version | Terminals | Actuators | Operating force by pin plunger, max. | Lever position | Contacts | Agency standard |
|---|---|---|---|---|---|---|---|
| AVT3 (FS-T) switch | T3: Standard | 2: Solder terminal<br>4: PC board terminal<br>8: .110 Quick-connect terminal | 0: Pin plunger<br>1: Short hinge lever<br>2: Hinge lever<br>3: Long hinge lever<br>4: Simulated roller lever<br>5: Roller lever | 0: 0.25 N (Au-clad contact only)<br>2: 0.49 N<br>4: 0.98 N | Nil: Standard | Nil: AgNi alloy (Not applicable to 0.25 N type)<br>61: Au-clad triple layer* | 3: UL/C-UL, ENEC/ VDE |

Ex. AV L3 2 0 2 ☐ ☐ 3

| Type of switch | Version | Terminals | Actuators | Operating force by pin plunger, max. | Lever position | Contacts | Agency standard |
|---|---|---|---|---|---|---|---|
| AVL3 (FS-T long life ver.) switch | L3: Long life | 2: Solder terminal<br>4: PC board terminal<br>8: .110 Quick-connect terminal | 0: Pin plunger<br>1: Short hinge lever<br>2: Hinge lever<br>3: Long hinge lever<br>4: Simulated roller lever<br>5: Roller lever | 5: 1.47 N | Nil: Standard | Nil: AgNi alloy (Not applicable to 0.25 N type)<br>61: Au-clad triple layer* | 3: UL/C-UL, ENEC/ VDE |

* Au-clad triple layer contact



## APPLICABLE CURRENT RANGE

| Type | Contact | Rating | | | | O.F. | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1mA | 100mA | 3A | 5A | 0.25 N | 0.49 N | 0.98 N | 1.47 N |
| Standard version | AgNi alloy contact | | | | | | ● | ● | |
| | Au-clad triple layer contact type | | | | | ● | ● | ● | |
| Long life version | AgNi alloy contact | | | | | | | | ● |
| | Au-clad triple layer contact type | | | | | | | | ● |

Remark: For high capacity contact rating up to 10.1 A, please refer to PS (AVM3❍❍❍P) switches catalog.

# PRODUCT TYPES

**1. FS switches (in-line terminal type)**

Standard version

| | Actuator | Operating force, max. | Part no. | | |
|---|---|---|---|---|---|
| | | | Solder terminal without guard | Self-standing PC board terminal | Internationally common pitch PC board terminal |
| AgNi alloy contact type | Pin plunger | 0.49N | AV32023 | AV34023 | AV35023 |
| | | 0.98N | AV32043 | AV34043 | AV35043 |
| | Short hinge lever | 0.20N | AV32123 | AV34123 | AV35123 |
| | | 0.39N | AV32143 | AV34143 | AV35143 |
| | Hinge lever | 0.16N | AV32223 | AV34223 | AV35223 |
| | | 0.34N | AV32243 | AV34243 | AV35243 |
| | Long hinge lever | 0.12N | AV32323 | AV34323 | AV35323 |
| | | 0.25N | AV32343 | AV34343 | AV35343 |
| | Simulated roller lever | 0.16N | AV32423 | AV34423 | AV35423 |
| | | 0.34N | AV32443 | AV34443 | AV35443 |
| | Roller lever | 0.20N | AV32523 | AV34523 | AV35523 |
| | | 0.39N | AV32543 | AV34543 | AV35543 |
| Au-clad triple layer contact type | Pin plunger | 0.25N | AV3200613 | AV3400613 | AV3500613 |
| | | 0.49N | AV3202613 | AV3402613 | AV3502613 |
| | | 0.98N | AV3204613 | AV3404613 | AV3504613 |
| | Short hinge lever | 0.098N | AV3210613 | AV3410613 | AV3510613 |
| | | 0.20N | AV3212613 | AV3412613 | AV3512613 |
| | | 0.39N | AV3214613 | AV3414613 | AV3514613 |
| | Hinge lever | 0.078N | AV3220613 | AV3420613 | AV3520613 |
| | | 0.16N | AV3222613 | AV3422613 | AV3522613 |
| | | 0.34N | AV3224613 | AV3424613 | AV3524613 |
| | Long hinge lever | 0.12N | AV3232613 | AV3432613 | AV3532613 |
| | | 0.25N | AV3234613 | AV3434613 | AV3534613 |
| | Simulated roller lever | 0.16N | AV3242613 | AV3442613 | AV3542613 |
| | | 0.34N | AV3244613 | AV3444613 | AV3544613 |
| | Roller lever | 0.20N | AV3252613 | AV3452613 | AV3552613 |
| | | 0.39N | AV3254613 | AV3454613 | AV3554613 |

Standard version

| | Actuator | Operating force, max. | Part no. | | |
|---|---|---|---|---|---|
| | | | Right angle terminal | Left angle terminal | .110 Quick-connect |
| AgNi alloy contact type | Pin plunger | 0.49N | AV36023 | AV37023 | AV38023 |
| | | 0.98N | AV36043 | AV37043 | AV38043 |
| | Short hinge lever | 0.20N | AV36123 | AV37123 | AV38123 |
| | | 0.39N | AV36143 | AV37143 | AV38143 |
| | Hinge lever | 0.16N | AV36223 | AV37223 | AV38223 |
| | | 0.34N | AV36243 | AV37243 | AV38243 |
| | Long hinge lever | 0.12N | AV36323 | AV37323 | AV38323 |
| | | 0.25N | AV36343 | AV37343 | AV38343 |
| | Simulated roller lever | 0.16N | AV36423 | AV37423 | AV38423 |
| | | 0.34N | AV36443 | AV37443 | AV38443 |
| | Roller lever | 0.20N | AV36523 | AV37523 | AV38523 |
| | | 0.39N | AV36543 | AV37543 | AV38543 |
| Au-clad triple layer contact type | Pin plunger | 0.25N | AV3600613 | AV3700613 | AV3800613 |
| | | 0.49N | AV3602613 | AV3702613 | AV3802613 |
| | | 0.98N | AV3604613 | AV3704613 | AV3804613 |
| | Short hinge lever | 0.098N | AV3610613 | AV3710613 | AV3810613 |
| | | 0.20N | AV3612613 | AV3712613 | AV3812613 |
| | | 0.39N | AV3614613 | AV3714613 | AV3814613 |
| | Hinge lever | 0.078N | AV3620613 | AV3720613 | AV3820613 |
| | | 0.16N | AV3622613 | AV3722613 | AV3822613 |
| | | 0.34N | AV3624613 | AV3724613 | AV3824613 |
| | Long hinge lever | 0.12N | AV3632613 | AV3732613 | AV3832613 |
| | | 0.25N | AV3634613 | AV3734613 | AV3834613 |
| | Simulated roller lever | 0.16N | AV3642613 | AV3742613 | AV3842613 |
| | | 0.34N | AV3644613 | AV3744613 | AV3844613 |
| | Roller lever | 0.20N | AV3652613 | AV3752613 | AV3852613 |
| | | 0.39N | AV3654613 | AV3754613 | AV3854613 |

Remark: When ordering, please refer to “Remarks” of ordering information.

**2. FS-T switches (cross-line terminal type)**

Standard version

| | Actuator | Operating force, max. | Part no. | | |
|---|---|---|---|---|---|
| | | | Solder terminal without guard | PC board terminal | .110 Quick-connect terminal |
| AgNi alloy contact type | Pin plunger | 0.49N | AVT32023 | AVT34023 | AVT38023 |
| | | 0.98N | AVT32043 | AVT34043 | AVT38043 |
| | Short hinge lever | 0.20N | AVT32123 | AVT34123 | AVT38123 |
| | | 0.39N | AVT32143 | AVT34143 | AVT38143 |
| | Hinge lever | 0.16N | AVT32223 | AVT34223 | AVT38223 |
| | | 0.34N | AVT32243 | AVT34243 | AVT38243 |
| | Long hinge lever | 0.12N | AVT32323 | AVT34323 | AVT38323 |
| | | 0.25N | AVT32343 | AVT34343 | AVT38343 |
| | Simulated roller lever | 0.16N | AVT32423 | AVT34423 | AVT38423 |
| | | 0.34N | AVT32443 | AVT34443 | AVT38443 |
| | Roller lever | 0.20N | AVT32523 | AVT34523 | AVT38523 |
| | | 0.39N | AVT32543 | AVT34543 | AVT38543 |
| Au-clad triple layer contact type | Pin plunger | 0.25N | AVT3200613 | AVT3400613 | AVT3800613 |
| | | 0.49N | AVT3202613 | AVT3402613 | AVT3802613 |
| | | 0.98N | AVT3204613 | AVT3404613 | AVT3804613 |
| | Short hinge lever | 0.098N | AVT3210613 | AVT3410613 | AVT3810613 |
| | | 0.20N | AVT3212613 | AVT3412613 | AVT3812613 |
| | | 0.39N | AVT3214613 | AVT3414613 | AVT3814613 |
| | Hinge lever | 0.078N | AVT3220613 | AVT3420613 | AVT3820613 |
| | | 0.16N | AVT3222613 | AVT3422613 | AVT3822613 |
| | | 0.34N | AVT3224613 | AVT3424613 | AVT3824613 |
| | Long hinge lever | 0.12N | AVT3232613 | AVT3432613 | AVT3832613 |
| | | 0.25N | AVT3234613 | AVT3434613 | AVT3834613 |
| | Simulated roller lever | 0.16N | AVT3242613 | AVT3442613 | AVT3842613 |
| | | 0.34N | AVT3244613 | AVT3444613 | AVT3844613 |
| | Roller lever | 0.20N | AVT3252613 | AVT3452613 | AVT3852613 |
| | | 0.39N | AVT3254613 | AVT3454613 | AVT3854613 |

### 3. FS switches (in-line terminal type)

Long life version

| | Actuator | Operating force, max. | Part no. | | |
|---|---|---|---|---|---|
| | | | Solder terminal without guard | Self-standing PC board terminal | Internationally common pitch PC board terminal |
| AgNi alloy contact type | Pin plunger | 1.47N | AVM32053 | AVM34053 | AVM35053 |
| | Short hinge lever | 0.59N | AVM32153 | AVM34153 | AVM35153 |
| | Hinge lever | 0.54N | AVM32253 | AVM34253 | AVM35253 |
| | Long hinge lever | 0.44N | AVM32353 | AVM34353 | AVM35353 |
| | Simulated roller lever | 0.54N | AVM32453 | AVM34453 | AVM35453 |
| | Roller lever | 0.59N | AVM32553 | AVM34553 | AVM35553 |
| Au-clad triple layer contact type | Pin plunger | 1.47N | AVM3205613 | AVM3405613 | AVM3505613 |
| | Short hinge lever | 0.59N | AVM3215613 | AVM3415613 | AVM3515613 |
| | Hinge lever | 0.54N | AVM3225613 | AVM3425613 | AVM3525613 |
| | Long hinge lever | 0.44N | AVM3235613 | AVM3435613 | AVM3535613 |
| | Simulated roller lever | 0.54N | AVM3245613 | AVM3445613 | AVM3545613 |
| | Roller lever | 0.59N | AVM3255613 | AVM3455613 | AVM3555613 |

Long life version

| | Actuator | Operating force, max. | Part no. | | |
|---|---|---|---|---|---|
| | | | Right angle terminal | Left angle terminal | .110 Quick-connect |
| | | | Without guard | With guard | With opposite side guard |
| AgNi alloy contact type | Pin plunger | 1.47N | AVM36053 | AVM37053 | AVM38053 |
| | Short hinge lever | 0.59N | AVM36153 | AVM37153 | AVM38153 |
| | Hinge lever | 0.54N | AVM36253 | AVM37253 | AVM38253 |
| | Long hinge lever | 0.44N | AVM36353 | AVM37353 | AVM38353 |
| | Simulated roller lever | 0.54N | AVM36453 | AVM37453 | AVM38453 |
| | Roller lever | 0.59N | AVM36553 | AVM37553 | AVM38553 |
| Au-clad triple layer contact type | Pin plunger | 1.47N | AVM3605613 | AVM3705613 | AVM3805613 |
| | Short hinge lever | 0.59N | AVM3615613 | AVM3715613 | AVM3815613 |
| | Hinge lever | 0.54N | AVM3625613 | AVM3725613 | AVM3825613 |
| | Long hinge lever | 0.44N | AVM3635613 | AVM3735613 | AVM3835613 |
| | Simulated roller lever | 0.54N | AVM3645613 | AVM3745613 | AVM3845613 |
| | Roller lever | 0.59N | AVM3655613 | AVM3755613 | AVM3855613 |

Remark: When ordering, please refer to “Remarks” of ordering information.

### 4. FS-T switches (cross-line terminal type)

Long life version

| | Actuator | Operating force, max. | Part no. | | |
|---|---|---|---|---|---|
| | | | Solder terminal without guard | PC board terminal | .110 Quick-connect terminal |
| AgNi alloy contact type | Pin plunger | 1.47N | AVL32053 | AVL34053 | AVL38053 |
| | Short hinge lever | 0.59N | AVL32153 | AVL34153 | AVL38153 |
| | Hinge lever | 0.54N | AVL32253 | AVL34253 | AVL38253 |
| | Long hinge lever | 0.44N | AVL32353 | AVL34353 | AVL38353 |
| | Simulated roller lever | 0.54N | AVL32453 | AVL34453 | AVL38453 |
| | Roller lever | 0.59N | AVL32553 | AVL34553 | AVL38553 |
| Au-clad triple layer contact type | Pin plunger | 1.47N | AVL3205613 | AVL3405613 | AVL3805613 |
| | Short hinge lever | 0.59N | AVL3215613 | AVL3415613 | AVL3815613 |
| | Hinge lever | 0.54N | AVL3225613 | AVL3425613 | AVL3825613 |
| | Long hinge lever | 0.44N | AVL3235613 | AVL3435613 | AVL3835613 |
| | Simulated roller lever | 0.54N | AVL3245613 | AVL3445613 | AVL3845613 |
| | Roller lever | 0.59N | AVL3255613 | AVL3455613 | AVL3855613 |

Remark: When ordering, please refer to “Remarks” of ordering information.

# SPECIFICATIONS

### 1. Contact rating

| Voltage | Standard version | | | Long life version | | |
|---|---|---|---|---|---|---|
| | AgNi alloy contact type | | Au-clad contact type Triple layer | AgNi alloy contact type | | Au-clad contact type Triple layer |
| | Resistive load (cosϕ≈1) | Inductive load (cosϕ≈0.6 to 0.7) | Resistive load (cosϕ≈1) | Resistive load (cosϕ≈1) | Inductive load (cosϕ≈0.6 to 0.7) | Resistive load (cosϕ≈1) |
| 125V AC | 3A | 2A | 0.1A | 5A | 3A | 0.1A |
| 250V AC | 3A | 2A | 0.1A | 5A | 3A | 0.1A |
| 30V DC | 3A | 2A | 0.1A | 5A | 3A | 0.1A |
| 125V DC | 0.4A | 0.05A | — | 0.4A | 0.05A | — |

Remark: Time constant shall be less than 7 ms for DC inductive loads.

### 2. Characteristics

| Item | Standard version | | Long life version | |
|---|---|---|---|---|
| | AgNi alloy contact type | Au-clad contact type | AgNi alloy contact type | Au-clad contact type |
| Electrical life at rated load (O.T.max.) | $5 \times 10^4$ at 20 cpm | $2 \times 10^5$ at 20 cpm | $5 \times 10^4$ at 20 cpm | $2 \times 10^5$ at 20 cpm |
| Mechanical life | $5 \times 10^5$ at 60 cpm (O.T.max.) | | $3 \times 10^7$ (O.T.: Specified value)<br>$10^7$ (O.T.max.) at 60 cpm | |
| Insulation resistance | Min.100MΩ at 500V DC | | | |
| Dielectric strength<br>Between non-continuous terminals<br>Between each terminal and other exposed metal parts<br>Between each terminal and ground | 1,000 Vrms<br>1,500 Vrms<br>1,500 Vrms | | | |
| Vibration resistance (pin plunger type) | 10 to 55 Hz at single amplitude of 0.75mm (contact opening: 1 ms max.) | | | |
| Shock resistance (pin plunger type) (contact opening: 1ms max.) | 294 m/s² min. (O.F. 0.98 N)<br>147 m/s² min. (O.F. 0.49 N) | 294 m/s² min. (O.F. 0.98 N)<br>147 m/s² min. (O.F. 0.49 N)<br>49 m/s² min. (O.F. 0.25 N) | 294 m/s² min. | |
| Contact resistance (initial) | 50 mΩ max. (by voltage drop 1 A 6 to 8V DC) | 100 mΩ max. (by voltage drop 0.1 A 6 to 8V DC) | 50 mΩ max. (by voltage drop 1 A 6 to 8V DC) | 50 mΩ max. (by voltage drop 0.1 A 6 to 8V DC) |
| Allowable operating speed | 0.1 to 1,000 mm/s | | | |
| Max.operating cycle rate | 300 cpm | | | |
| Ambient temperature | –25°C to +85°C (no freezing below 0°C) | | | |
| Unit weight | Approx.2g | | | |

### 3. Operating characteristics

1) Pin plunger

| 4th digit number of part no. | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max., mm | Overtravel, min. mm | Operating position, mm |
|---|---|---|---|---|---|---|
| 0 | 0.25N | 0.020N | 0.6 | 0.1 | 0.4 | Distance from mounting holes: 8.4±0.3<br>Distance from stand-off: FS 11.8±0.4<br>FS-T 11.7±0.4 |
| 2 | 0.49N | 0.074N | | | | |
| 4 | 0.98N | 0.15N | | | | |
| 5 | 1.47N | 0.20N | | | | |

2) Short hinge lever

| 4th digit number of part no. | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max., mm | Overtravel, min. mm | Operating position, mm |
|---|---|---|---|---|---|---|
| 0 | 0.098N | 0.004N | 2.5 | 0.5 | 0.8 | Distance from mounting holes: 8.8±0.8<br>Distance from stand-off: FS 12.2±0.9<br>FS-T 12.1±0.9 |
| 2 | 0.20N | 0.017N | | | | |
| 4 | 0.39N | 0.034N | | | | |
| 5 | 0.59N | 0.039N | | | | |

3) Hinge lever

| 4th digit number of part no. | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max., mm | Overtravel, min. mm | Operating position, mm |
|---|---|---|---|---|---|---|
| 0 | 0.078N | 0.003N | 2.8 | 0.8 | 1.2 | Distance from mounting holes: 8.8±0.8<br>Distance from stand-off: FS 12.2±0.9<br>FS-T 12.1±0.9 |
| 2 | 0.16N | 0.015N | | | | |
| 4 | 0.34N | 0.029N | | | | |
| 5 | 0.54N | 0.034N | | | | |

4) Long hinge lever

| 4th digit number of part no. | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max., mm | Overtravel, min. mm | Operating position, mm |
|---|---|---|---|---|---|---|
| 0 | — | — | 3.5 | 1.0 | 1.6 | Distance from mounting holes: 8.8±1.2<br>Distance from stand-off: FS 12.2±1.3<br>FS-T 12.1±1.3 |
| 2 | 0.12N | 0.012N | | | | |
| 4 | 0.25N | 0.025N | | | | |
| 5 | 0.44N | 0.029N | | | | |

5) Simulated roller lever

| 4th digit number of part no. | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max., mm | Overtravel, min. mm | Operating position, mm |
|---|---|---|---|---|---|---|
| 0 | — | — | 2.8 | 0.8 | 1.2 | Distance from mounting holes: 11.65±0.8<br>Distance from stand-off: FS 15.05±0.9<br>FS-T 14.95±0.9 |
| 2 | 0.16N | 0.015N | | | | |
| 4 | 0.34N | 0.029N | | | | |
| 5 | 0.54N | 0.034N | | | | |

6) Roller lever

| 4th digit number of part no. | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max., mm | Overtravel, min. mm | Operating position, mm |
|---|---|---|---|---|---|---|
| 0 | — | — | 2.5 | 0.5 | 0.8 | Distance from mounting holes: 14.5±0.8<br>Distance from stand-off: FS 17.9±0.9<br>FS-T 17.8±0.9 |
| 2 | 0.20N | 0.017N | | | | |
| 4 | 0.39N | 0.034N | | | | |
| 5 | 0.59N | 0.039N | | | | |

# DIMENSIONS

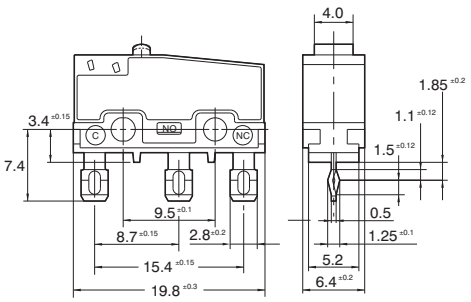
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

**1. FS switches (In-line terminal type)**

mm General tolerance: ±0.25

1-(1) Solder terminal (without guard)

**CAD Data**



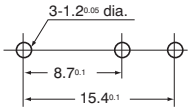

Dimensions other than drawn above is same as self-standing PC board terminal.

# AV3,AVM3/AVT3,AVL3

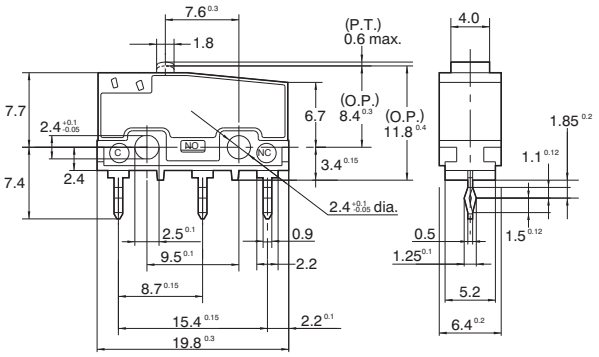
## 1-(2) Self-standing PC board terminal
Pin plunger

mm General tolerance: ±0.25

PC board pattern



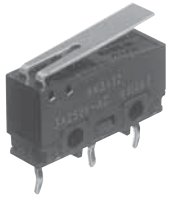

**CAD Data**

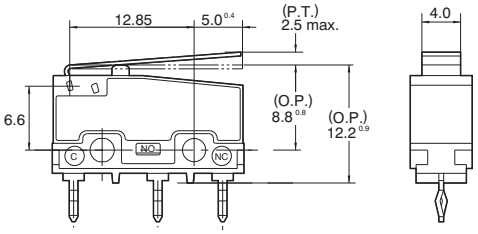



| | | |
|---|---|---|
| Pretravel, max. mm | | 0.6 |
| Movement differential, max. mm | | 0.1 |
| Overtravel, min. mm | | 0.4 |
| Operating position | Distance from mounting hole, mm | 8.4±0.3 |
| | Distance from standoff, mm | 11.8±0.4 |

## Short hinge lever

**CAD Data**

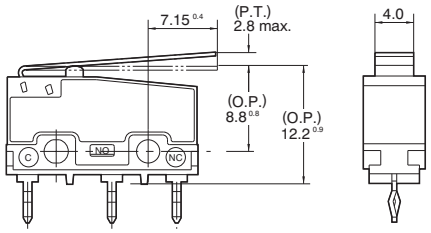





| | | |
|---|---|---|
| Pretravel, max. mm | | 2.5 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min. mm | | 0.8 |
| Operating position | Distance from mounting hole, mm | 8.8±0.8 |
| | Distance from standoff, mm | 12.2±0.9 |

## Hinge lever

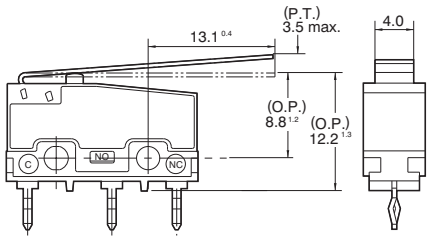
**CAD Data**




| | | |
|---|---|---|
| Pretravel, max. mm | | 2.8 |
| Movement differential, max. mm | | 0.8 |
| Overtravel, min. mm | | 1.2 |
| Operating position | Distance from mounting hole, mm | 8.8±0.8 |
| | Distance from standoff, mm | 12.2±0.9 |

## Long hinge lever

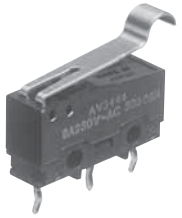
**CAD Data**

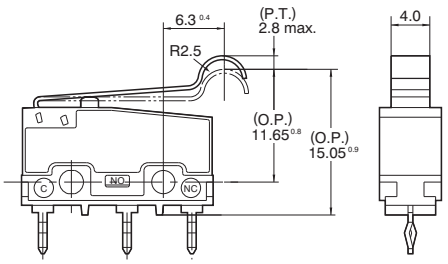



| | | |
|---|---|---|
| Pretravel, max. mm | | 3.5 |
| Movement differential, max. mm | | 1.0 |
| Overtravel, min. mm | | 1.6 |
| Operating position | Distance from mounting hole, mm | 8.8±1.2 |
| | Distance from standoff, mm | 12.2±1.3 |

## Simulated roller lever

**CAD Data**



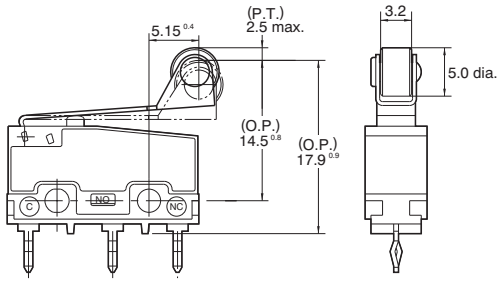



| | | |
|---|---|---|
| Pretravel, max. mm | | 2.8 |
| Movement differential, max. mm | | 0.8 |
| Overtravel, min. mm | | 1.2 |
| Operating position | Distance from mounting hole, mm | 11.65±0.8 |
| | Distance from standoff, mm | 15.05±0.9 |

Roller lever

mm General tolerance: ±0.25

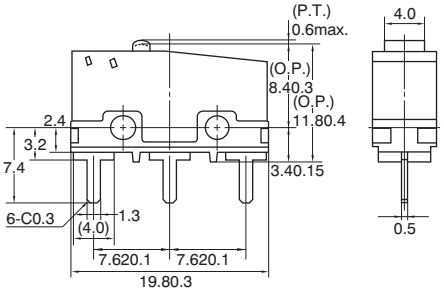
**CAD Data**



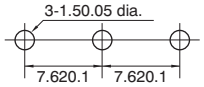

| | | |
|---|---|---|
| Pretravel, max. mm | | 2.5 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min. mm | | 0.8 |
| Operating position | Distance from mounting hole, mm | 14.5±0.8 |
| | Distance from standoff, mm | 17.9±0.9 |

1-(3) Internationally common pitch PC board terminal

**CAD Data**

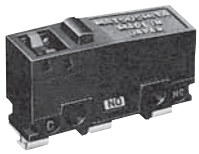


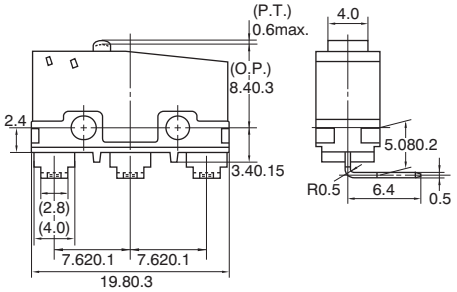

PC board pattern



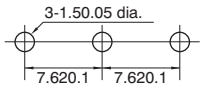

1-(4) Right angle terminal

**CAD Data**



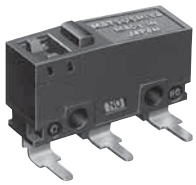


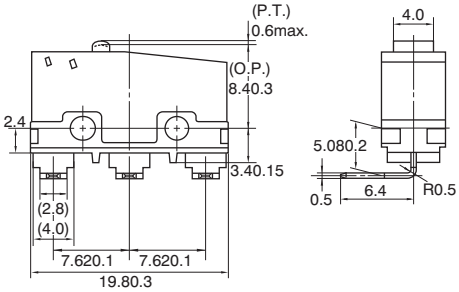

PC board pattern



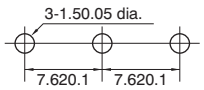

1-(6) Left angle terminal

**CAD Data**





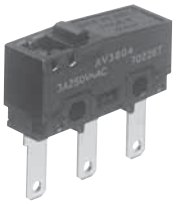

PC board pattern

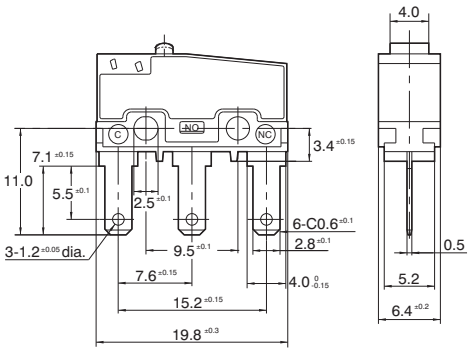


1-(6) .110 Quick-connect terminal

mm General tolerance: ±0.25

**CAD Data**





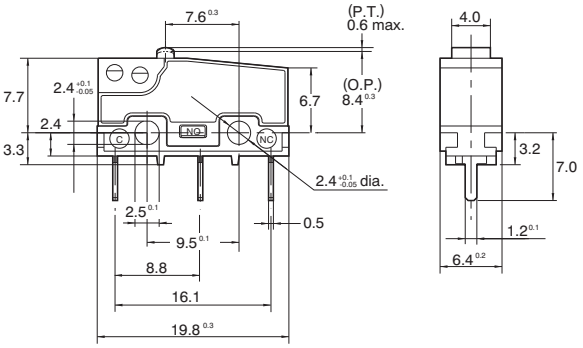

Dimensions other than drawn above is same as self-standing PC board terminal.

## 2.FS-T switches (cross-line terminal type)

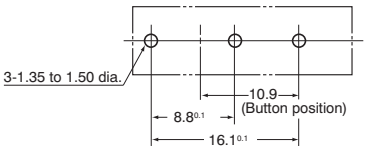
2-(1) PC board terminal

Pin plunger

**CAD Data**



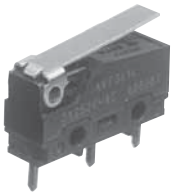

PC board pattern

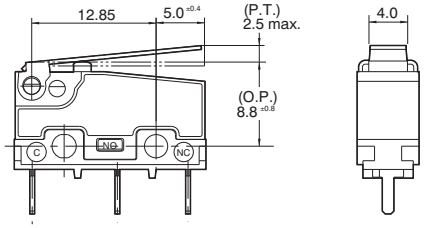



| | | |
|---|---|---|
| Pretravel, max. mm | | 0.6 |
| Movement differential, max. mm | | 0.1 |
| Overtravel, min. mm | | 0.4 |
| Operating position | Distance from mounting hole, mm | 8.4±0.3 |
| | Distance from standoff, mm | 11.7±0.4 |

Short hinge lever

**CAD Data**



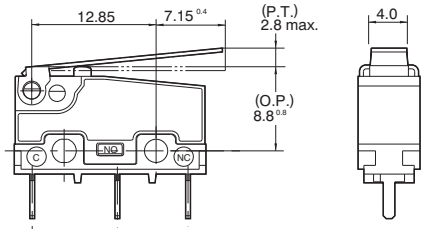



| | | |
|---|---|---|
| Pretravel, max. mm | | 2.5 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min. mm | | 0.8 |
| Operating position | Distance from mounting hole, mm | 8.8±0.8 |
| | Distance from standoff, mm | 12.1±0.9 |

Hinge lever

mm General tolerance: ±0.25

**CAD Data**

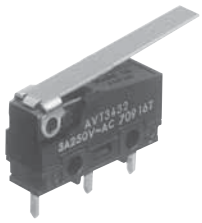


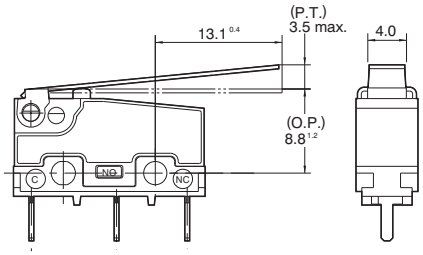

| | | |
|---|---|---|
| Pretravel, max. mm | | 2.8 |
| Movement differential, max. mm | | 0.8 |
| Overtravel, min. mm | | 1.2 |
| Operating position | Distance from mounting hole, mm | 8.8±0.8 |
| | Distance from standoff, mm | 12.1±0.9 |

## Long hinge lever

mm General tolerance: ±0.25

**CAD Data**

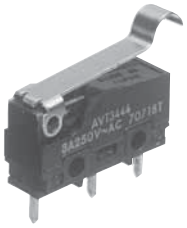


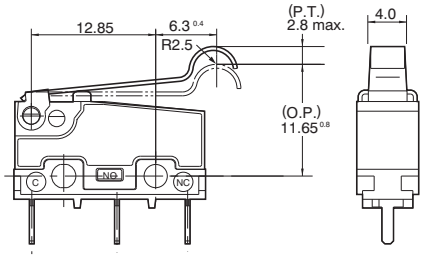



| | | |
|---|---|---|
| Pretravel, max. mm | | 3.5 |
| Movement differential, max. mm | | 1.0 |
| Overtravel, min. mm | | 1.6 |
| Operating position | Distance from mounting hole, mm | 8.8±1.2 |
| | Distance from standoff, mm | 12.1±1.3 |

## Simulated roller lever

**CAD Data**

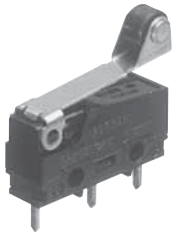


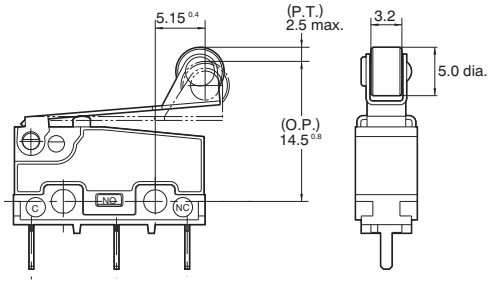



| | | |
|---|---|---|
| Pretravel, max. mm | | 2.8 |
| Movement differential, max. mm | | 0.8 |
| Overtravel, min. mm | | 1.2 |
| Operating position | Distance from mounting hole, mm | 11.65±0.8 |
| | Distance from standoff, mm | 14.95±0.9 |

## Roller lever

**CAD Data**

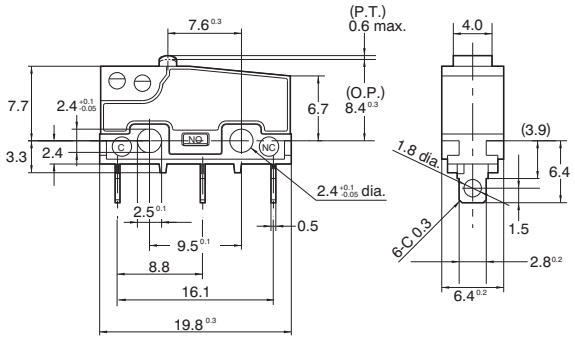





| | | |
|---|---|---|
| Pretravel, max. mm | | 2.5 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min. mm | | 0.8 |
| Operating position | Distance from mounting hole, mm | 14.5±0.8 |
| | Distance from standoff, mm | 17.8±0.9 |

## 2-(2) Solder terminal

**CAD Data**



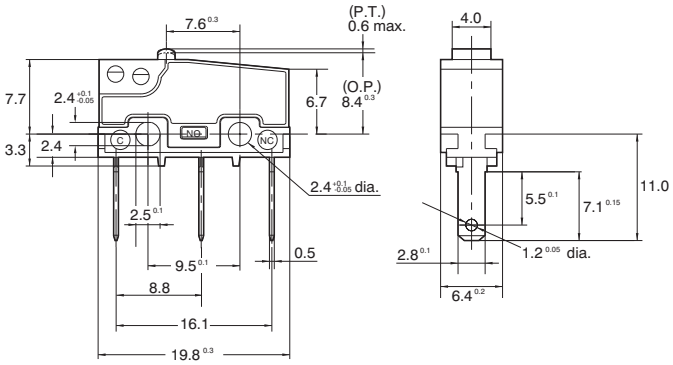

As for the dimensions of lever types, dimensions other than terminals are same as self-standing solder terminal.

2-(3) .110 Quick-connect terminal

mm General tolerance: ±0.25



**CAD Data**




As for the dimensions of lever types, dimensions other than terminals are same as self-standing solder terminal.

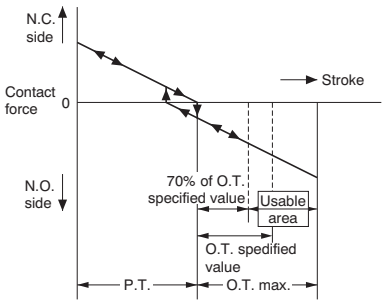
# NOTES

**1. Regarding fastening of switch body**

1) In fastening the switch body, use flat filister head M2.3 screws, with tightening torque of not more than 0.29N·m.To prevent loosening of the screws, it is recommended that spring washers be used with the screws and adhesive be applied to lock the screws.
After mounting the switch and making wiring connections, the insulation distance between ground and each terminal should be confirmed as sufficient.

2) The positioning of the switch should be such that the push-button or actuator for the switch should not directly apply force to the operating section in the free condition.For a push-button, the force from the push-button should be applied in a perpendicular direction.

3) In setting the movement after operation, the over-travel should be set not less than 70% as a standard.Setting the movement at less than 70% of O.T. may cause troubles such as mis-contact and welding due to small contact force of the switch.




**2. Soldering operation**

1) Manual soldering should be accomplished within 3 seconds with max. 350°C iron.

2) Care should be taken not to apply force to the terminals during soldering. Terminal portions must not be moved in min.1 minute after soldering.Also no tensile strength of lead wires should be applied to terminals.

**3. Regarding connector connections (.110 quick connect terminals)**

For making connections, a dedicated receptacle for .110 quick connect terminals should be used, and the terminals should be inserted parallel to the receptacle.Consideration should be given to mounting so that no tensile load is applied to the lead wires.

**4. In making the switch selection**

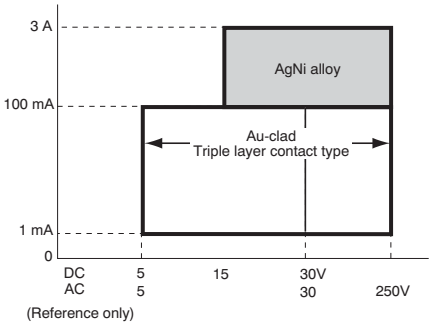
Consideration should be given to provide for no interference up to +20% variation of the standard characteristics values.

**5. Environment**

Locations where corrosive gases having a bad influence on contacts are present, and locations where there is an excessive amount of siliceous or other abrasive dust should be avoided.

**6. Cautions regarding use**

This subminiature switch has been designed as a dedicated switch for AC use, but it can be used for low capacity DC circuits.
Please select gold-clad contact types when loads are in the low-level area of 1mA up to 100mA and 5V up to 30V.




For switching of inductive loads (relays, solenoids, buzzers, etc.), in order to prevent damage to contacts due to the occurrence of arcing, an arc absorbing circuit should be applied

**7. Quality check under Actual Loading Condition**

To assure reliability, check the switch under actual loading conditions.Avoid any situation that may adversely affect switching performance.

**8. When using lever type switch, care should be taken not to apply undue force on the body from the opposite side or side ways to its operating direction.**

# SUBMINIATURE SWITCHES (CONTACT GAP: MORE THAN 1MM TYPE)

# AV3○○○G(FS) SWITCHES

## FEATURES

- **Conforming to IEC60950-1**
- **Contact gap of greater than 1mm**
- **UL/CSA/VDE/SEMKO under application**
- **Protection grade: IP40**

## TYPICAL APPLICATIONS

- **Office equiment (printers, copiers)**

## ORDERING INFORMATION

Ex. AV 3 2 5 5 G 3

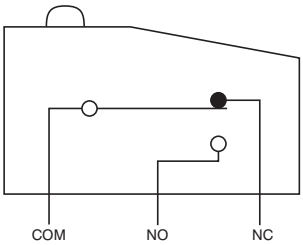
| Type of switch | Version | Terminals | Actuators | Operating force by pin plunger, max. | Contact gap | Agency standard |
|---|---|---|---|---|---|---|
| FS switch | 3: Standard | 2: Solder terminal without guard<br>4: Self-standing PC board terminal<br>8: .110 Quick-connect terminal | 0: Pin plunger<br>1: Short hinge lever<br>2: Hinge lever<br>3: Long hinge lever<br>4: Simulated roller lever<br>5: Roller lever | 5: 1.47 N | G: More than 1 mm type | 3: UL/C-UL, TÜV, ENEC/VDE |

## PRODUCT TYPES

| Actuator | Operating force max. | Solder terminal without guard | Self-standing PC board terminal | .110 Quick- connect terminal |
|---|---|---|---|---|
| Pin plunger | 1.47 N | AV3205G3 | AV3405G3 | AV3805G3 |
| Short hinge lever | 0.59 N | AV3215G3 | AV3415G3 | AV3815G3 |
| Hinge lever | 0.54 N | AV3225G3 | AV3425G3 | AV3825G3 |
| Long hinge lever | 0.44 N | AV3235G3 | AV3435G3 | AV3835G3 |
| Simulated roller lever | 0.54 N | AV3245G3 | AV3445G3 | AV3845G3 |
| Roller lever | 0.59 N | AV3255G3 | AV3455G3 | AV3855G3 |

Remark: Unless you request otherwise, the switch comes with a stamp indicating its conformance to standards.

## CONTACT ARRANGEMENT




## SPECIFICATIONS

**1. Contact rating**

- **AgNi alloy contact type**

| Voltage | Resistive road (cos $\phi \approx 1$) |
|---|---|
| 30 V DC | 3 A |

### 2. Characteristics

| Item | | Characteristics |
|---|---|---|
| Expected life | Mechanical (O.T.: Specified value) | Min. $5 \times 10^5$ (at 60cpm) |
| | Electrical (O.T. max.) | Min. $10^4$(at 20cpm) |
| Dielectric strength | Between non-continuous terminals | 1,000 Vrms for 1 min. (at detection current of 10mA) |
| | Between each terminal and other exposed metal parts | 2,000 Vrms for 1 min. (at detection current of 10mA) |
| | Between each terminal and ground | 2,000 Vrms for 1 min. (at detection current of 10mA) |
| Insulation resistance | | Min. 100MΩ (at 500 V DC) |
| Contact resistance (initial) | | Max. 50mΩ (by voltage drop 6 to 8 V DC 1A) |
| Vibration resistance | | 10 to 55 Hz at single amplitude of 0.75 mm (contact opening: Max. 1ms) |
| Shock resistance | Pin plunger type | 294m/s² (contact distance: Max. 1ms) |
| | Lever type | 147m/s² (contact distance: Max. 1ms) |
| Allowable operation speed (no load) | | 0.1 to 1,000 mm/s |
| Max. switching frequency (no load) | | 300 cpm. |
| Ambient temperature | | –25°C to +85°C (not freezing below 0°C) |
| Contact material | | AgNi alloy |

Remark: Test conditions are in accordance with JIS C 4505.

### 3. Operating characteristics

| Actuator | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max. mm | Overtravel, min. mm | Operating position, mm |
|---|---|---|---|---|---|---|
| Pin plunger | 1.47 N | 0.064 N | 0.7 | 0.2 | 0.3 | 8.4±0.3 |
| Short hinge lever | 0.59 N | 0.015 N | 2.5 | 0.8 | 0.6 | 8.8±0.8 |
| Hinge lever | 0.54 N | 0.013 N | 2.8 | 1.0 | 0.8 | 8.8±0.8 |
| Long hinge lever | 0.44 N | 0.0098 N | 3.5 | 1.2 | 1.2 | 8.8±1.2 |
| Simulated roller lever | 0.54 N | 0.013 N | 2.8 | 1.0 | 0.8 | 11.65±0.8 |
| Roller lever | 0.59 N | 0.015 N | 2.5 | 0.8 | 0.6 | 14.5±0.8 |

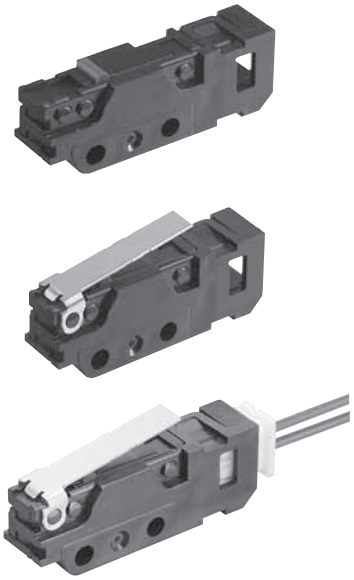
## DIMENSIONS

The same size as the standard FS/FS-T switches (see data sheet which begins on page 86.)

**S MODEL SWITCH CONNECTOR TYPE**

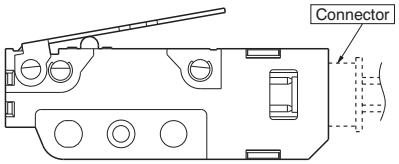
# AV6 (CS) SWITCHES



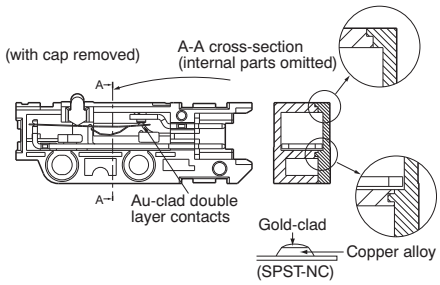


## FEATURES

- **Using a connector for connections significantly improves operation effectiveness.**
  Applicable connector:
  XA connector produced by JST Mfg. Co., Ltd.
  - Contact: SXA-001T-P0.6
  - Housing: XAP-02V-1



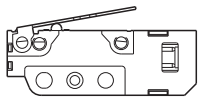

- **Contact reliability is achived by simple dust prevension guard and Au-clad double layer contacts**




- **The contact arrangement is available in two types, the SPST-NC and the SPST-NO.**
- **The lever position is available in two types.**

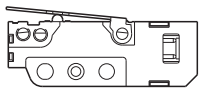
Standard lever position

"Standard lever position" refers to a position in which the lever is installed with the plunger close to the reference.



Backward lever position

"Backward lever position" refers to a position in which the lever is installed with the plunger far away from the reference.



## TYPICAL APPLICATIONS

- **Detection of vending machine condition whether cans are out of stock**
- **Ball detection of pinball game machine**
- **PPC (plain paper copier)**
- **LBP (laser beam printer)**

## ORDERING INFORMATION

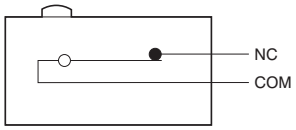
Ex. AV6 | 2 | 2 | 2 | 12 | 64

| Type of switch | Contact arrangement | Actuators | O.F. (by pin plunger) | Lever position | Contacts |
|---|---|---|---|---|---|
| AV6: CS switch | 2: SPST-NC<br>3: SPST-NO | 0: Pin plunger<br>2: Hinge lever<br>4: Simulated roller lever<br>5: Roller lever | 2: 0.50 N<br>5: 1.50 N | Nil: Standard<br>12: Backward | 64: Au-clad double layer |

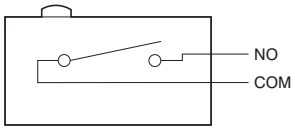
Remarks: 1. Standard packing Inner carton: 100 pcs. Outer carton: 1,000 pcs.
2. When ordering UL, CSA and TÜV approved types, please attach suffix "3" to the part no.

## CONTACT ARRANGEMENT

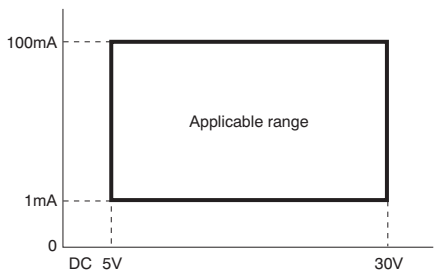
1) SPST-NC




2) SPST-NO




## CURRENT CAPACITY (reference)



# PRODUCT TYPES

### 1. Lever position: Standard

| Actuator | Operating force, max. | Contact arrangement | |
|---|---|---|---|
| | | SPST-NC | SPST-NO |
| Pin plunger | 0.50N | AV620264 | AV630264 |
| | 1.50N | AV620564 | AV630564 |
| Hinge lever | 0.20N | AV622264 | AV632264 |
| | 0.50N | AV622564 | AV632564 |
| Simulated roller lever | 0.20N | AV624264 | AV634264 |
| | 0.50N | AV624564 | AV634564 |
| Roller lever | 0.20N | AV625264 | AV635264 |
| | 0.50N | AV625564 | AV635564 |

Remarks: 1. When ordering UL, CSA and TÜV approved (under application) types, please attach suffix "3" to the part no.

### 2. Lever position: Backward

| Actuator | Operating force, max. | Contact arrangement | |
|---|---|---|---|
| | | SPST-NC | SPST-NO |
| Hinge lever | 0.35N | AV62221264 | AV63221264 |
| | 1.00N | AV62251264 | AV63251264 |
| Simulated roller lever | 0.35N | AV62421264 | AV63421264 |
| | 1.00N | AV62451264 | AV63451264 |
| Roller lever | 0.35N | AV62521264 | AV63521264 |
| | 1.00N | AV62551264 | AV63551264 |

Remarks: 1. When ordering UL, CSA and TÜV approved (under application) types, please attach suffix "3" to the part no.

# SPECIFICATIONS

### 1. Contact rating

| Contact | Voltage | Resistive load (cos $\phi \approx 1$) |
|---|---|---|
| Au-clad double layer | 30V DC | 0.1A |
| | 5V DC | 1mA Low-level circuit rating |

### 2. Characteristics

| | | |
|---|---|---|
| Expected life | Mechanical | Min. $5 \times 10^5$ (at 60 cpm) (O.T. max.) |
| | Electrical (rated load) | Min. $2 \times 10^5$ (at 20 cpm) (O.T. max.) |
| Insulation resistance | | Min. 100MΩ |
| Dielectric strength | Between terminals | 1,000 Vrms for 1 min. |
| | Between terminals and other exposed metal parts | 1,500 Vrms for 1 min. |
| | Between terminals and ground | 1,500 Vrms for 1 min. |
| Contact resistance (initial) | | 100MΩ max. (by voltage drop 0.1A 6 to 8 VDC)<br>Value includes the resistance between the connector and the lead (#AWG28, length: 50 mm) |
| Viblation resistance | | 10 to 55 Hz at single amplitude of 0.75mm (contact opening: max. 1ms) |
| Shock resistance | | Applied shock 1.50N type: Min.300m/s² (contact opening: max. 1ms)<br>0.50N type: Min.150m/s² (contact opening: max. 1ms) |
| Connector insertion force | | Max. 20N (inserted in removal direction) |
| Connector holding force | | Min. 20N (extracted by static load, in removal direction) |
| Connector removal operating times | | Max. 5 times (in removal direction) |
| Allowable operating speed (no load) | | 0.1 to 1,000 mm/s (at pin plunger) |
| Max. operating cycle rate (no load) | | 300 cpm |
| Ambient temperature | | –25 to +85°C (no freezing and condensing) |
| Unit weight | | Approx. 2.5g (pin plunger type) |
| Contact material | | Au-clad double layer (CuNi alloy + Au-clad) |

### 3. Operating characteristics

1) Lever position: Standard

| Type of actuator | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max., mm | Overtravel, min. mm | Operating position, mm |
|---|---|---|---|---|---|---|
| Pin plunger | 0.50N | 0.04N | 0.6 | 0.1 | 0.4 | 8.4±0.3 |
| | 1.50N | 0.25N | | | | |
| Hinge lever | 0.20N | 0.02N | 2.6 | 0.8 | 1.2 | 10.0±0.8 |
| | 0.50N | 0.06N | | | | |
| Simulated roller lever | 0.20N | 0.02N | 2.6 | 0.8 | 1.2 | 12.2±0.8 |
| | 0.50N | 0.06N | | | | |
| Roller lever | 0.20N | 0.02N | 2.6 | 0.8 | 1.2 | 15.7±0.8 |
| | 0.50N | 0.06N | | | | |

2) Lever position: Backward

| Type of actuator | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max., mm | Overtravel, min. mm | Operating position, mm |
|---|---|---|---|---|---|---|
| Hinge lever | 0.35N | 0.03N | 1.4 | 0.6 | 0.7 | 9.2±0.6 |
| | 1.00N | 0.10N | | | | |
| Simulated roller lever | 0.35N | 0.03N | 1.4 | 0.6 | 0.7 | 11.3±0.6 |
| | 1.00N | 0.10N | | | | |
| Roller lever | 0.35N | 0.03N | 1.4 | 0.6 | 0.7 | 14.9±0.6 |
| | 1.00N | 0.10N | | | | |

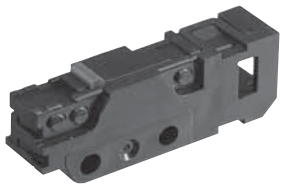
# DIMENSIONS

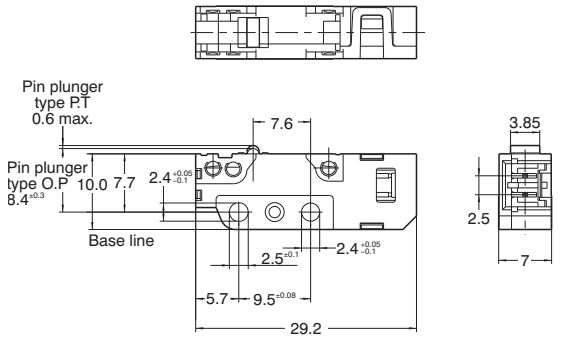
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

mm General tolerance: ±0.25

### 1. Pin plunger

**CAD Data**



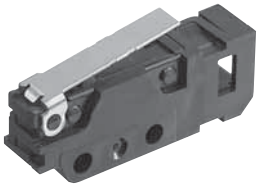


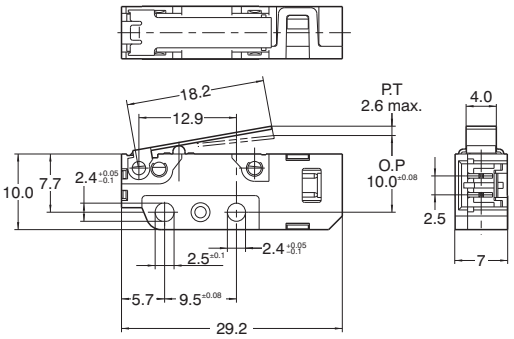

| | | |
|---|---|---|
| Pretravel, max. mm | | 0.6 |
| Movement differential, max. mm | | 0.1 |
| Overtravel, Min. mm | | 0.4 |
| Operating position | Distance from mounting hole, mm | 8.4±0.3 |

### 2. Hinge lever

Lever position: Standard

**CAD Data**

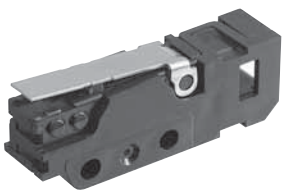


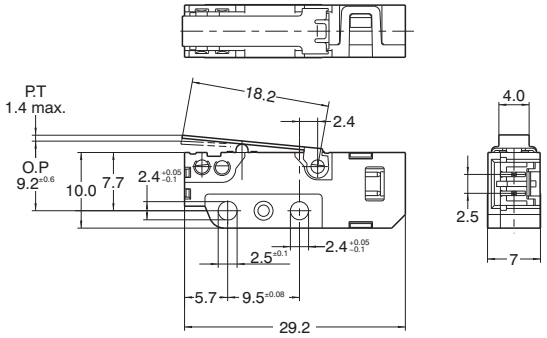



| | | |
|---|---|---|
| Pretravel, max. mm | | 2.6 |
| Movement differential, max. mm | | 0.8 |
| Overtravel, min. mm | | 1.2 |
| Operating position | Distance from mounting hole, mm | 10.0±0.8 |

Lever position: Backward

**CAD Data**





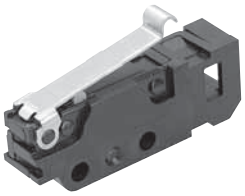

| | | |
|---|---|---|
| Pretravel, max. mm | | 1.4 |
| Movement differential, max. mm | | 0.6 |
| Overtravel, min. mm | | 0.7 |
| Operating position | Distance from mounting hole, mm | 9.2±0.6 |

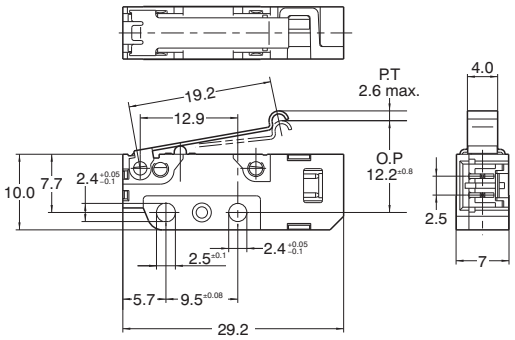
### 3. Simulated roller lever

mm General tolerance: ±0.25

Lever position: Standard

CAD Data

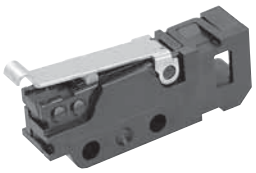


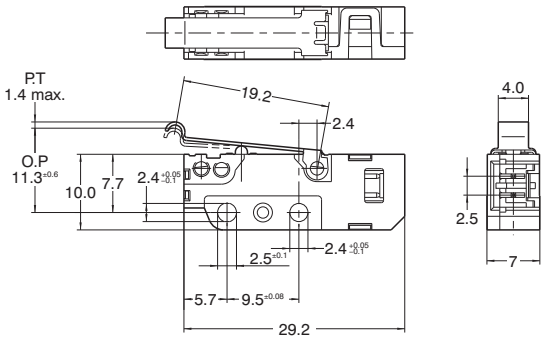



| | | |
|---|---|---|
| Pretravel, max. mm | | 2.6 |
| Movement differential, max. mm | | 0.8 |
| Overtravel, min. mm | | 1.2 |
| Operating position | Distance from mounting hole, mm | 12.2±0.8 |

Lever position: Backward

CAD Data



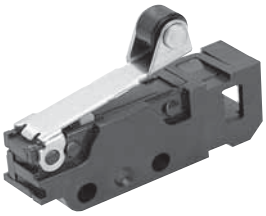


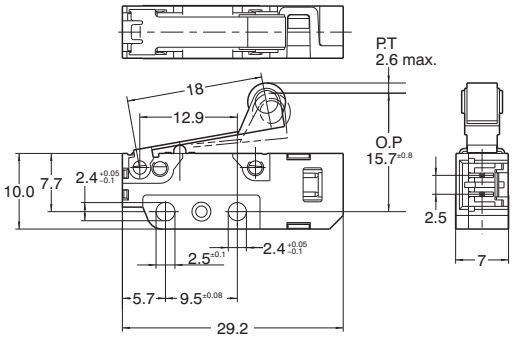

| | | |
|---|---|---|
| Pretravel, max. mm | | 1.4 |
| Movement differential, max. mm | | 0.6 |
| Overtravel, min. mm | | 0.7 |
| Operating position | Distance from mounting hole, mm | 11.3±0.6 |

### 4. Roller lever

Lever position: Standard

CAD Data

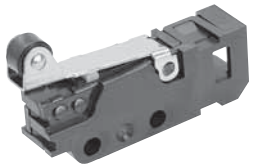


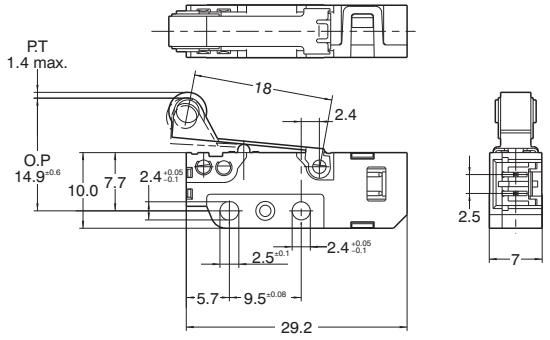



| | | |
|---|---|---|
| Pretravel, max. mm | | 2.6 |
| Movement differential, max. mm | | 0.8 |
| Overtravel, min. mm | | 1.2 |
| Operating position | Distance from mounting hole, mm | 15.7±0.8 |

Lever position: Backward

CAD Data






| | | |
|---|---|---|
| Pretravel, max. mm | | 1.4 |
| Movement differential, max. mm | | 0.6 |
| Overtravel, min. mm | | 0.7 |
| Operating position | Distance from mounting hole, mm | 14.9±0.6 |

# NOTES

**1. Fastening of the switch body**

1) Use flat filister head M2.3 screws to mount switches with less than a 0.29N·m torque. Use of screws washers or adhesive lock is recommended to prevent loosening of the screws.
2) Check insulation distance between ground and each terminal.
3) When the operation object is in the free position, force should not be applied directly to the actuator or pin plunger. Also force should be applied to the pin plunger from vertical direction to the switch.
4) In setting the movement after operation, the over-travel should be set more than 70% as a standard.
With the lever type, do not apply excessive force in the direction opposite to the movement, or from the horizontal direction.
5) For a lever type, the force from the reverse to the operation direction should not be applied.

**2. About the connector**

1) The connector on the AV6 switch is designed to fit with the XA connector produced by JST Mfg. Co., Ltd. Do not use any connector other than the specified connector, or solder the terminals directly.
2) Make sure leads are arranged so that no constant force is applied to them when the connectors are mated.
3) Keep the connector straight when inserting it. If it is inserted at an angle, it may snag near the entrance, or it may be inserted too forcefully.
4) Problems thought to be caused by the XA connector, which is specified as conforming to the AV6 switch connector, are not covered by the warranty. Please contact JST Mfg., Co., Ltd. and request cooperation in resolving the problem.

**3. Selection of the switch**

When specifying the switch, allow ±20% to the listed operating characteristics.

**4. Environment**

Avoid using the switches in the following conditions;
• In corrosive gases, such as silicon gas
• In a dusty environment
When cleaning the switch, use a diluted form of a neutral cleaning agent. Using acidic or alkali solvents can adversely affect the performance of the switch.

**5. Precautions concerning circuits**

The AV6 switch is designed specifically for low-voltage, low-current loads. Avoid using it at loads that exceed the resistive load.

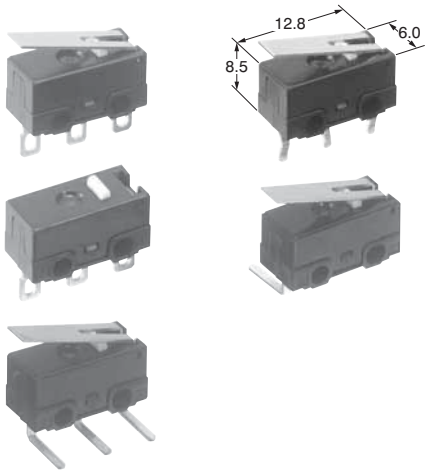
**6. Quality check under actual loading conditions**

To assure reliability, check the switch under actual loading conditions. Avoid any situation that may adversely affect switching performance.

Panasonic
ideas for life

**ULTRA-MINIATURE SWITCHES WITH HIGH PRECISION**

# AH1 (FJ) SWITCHES




## FEATURES

- **Integrally molded terminal block—prevents soldering flux from entering into housing**
- **Compact size —minimizes size of equipment**
- **Flat terminal shape—makes soldering easy**
- **Low-level circuit type available**
- **Self-standing PC board terminal type available**

## TYPICAL APPLICATIONS

- **Computer mouse**
- **Charger unit for mobile phone**
- **Detection of key position for automobiles**

## ORDERING INFORMATION

Ex. AH 1 4 8 0 61 9

| Product Name | Terminal | Operating force by pin plunger (max.) | Actuator | Contact | Agency standard |
|---|---|---|---|---|---|
| FJ | 4: 2.0 mm Self-standing PC board terminal with stand off<br>5: Straight PC board terminal with stand off<br>6: 2.0 mm Solder terminal with stand off<br>7: 2.0 mm PC board right angle terminal<br>8: 2.0 mm PC board left angle terminal | 6: 1.47 N with stand off<br>8: 0.74 N with stand off | 0: Pin plunger<br>2: Hinge lever<br>4: Simulated roller lever | Nil: AgNi alloy<br>61: AgNi alloy + Au-clad | 9: UL/CSA |

Remark: 2.0 mm PC board terminal straight type is available. For details, please consult us.

## PRODUCT TYPES

The color of:

| Type \ Color | Body | Cap | Plunger |
|---|---|---|---|
| Standard | Black | Black | White |
| Low-level circuit | Black | Black | Red |

**1. Self-standing PC board terminal**

| Actuators | Operating force, max. | Standard (AgNi alloy contact) | Low-level circuit (AgNi alloy + Au-clad contact) |
|---|---|---|---|
| | | SPDT | SPDT |
| Pin plunger | 0.74 N | AH14809 | AH1480619 |
| | 1.47 N | AH14609 | AH1460619 |
| Hinge lever | 0.25 N | AH14829 | AH1482619 |
| | 0.49 N | AH14629 | AH1462619 |
| Simulated roller lever | 0.26 N | AH14849 | AH1484619 |
| | 0.54 N | AH14649 | AH1464619 |

**2. Straight PC board terminal**

| Actuators | Operating force, max. | Standard (AgNi alloy contact) | Low-level circuit (AgNi alloy + Au-clad contact) |
|---|---|---|---|
| | | SPDT | SPDT |
| Pin plunger | 0.74 N | AH15809 | AH1580619 |
| | 1.47 N | AH15609 | AH1560619 |
| Hinge lever | 0.25 N | AH15829 | AH1582619 |
| | 0.49 N | AH15629 | AH1562619 |
| Simulated roller lever | 0.26 N | AH15849 | AH1584619 |
| | 0.54 N | AH15649 | AH1564619 |

**3. Solder terminal**

| Actuators | Operating force, max. | Standard (AgNi alloy contact) | Low-level circuit (AgNi alloy + Au-clad contact) |
|---|---|---|---|
| | | SPDT | SPDT |
| Pin plunger | 0.74 N | AH16809 | AH1680619 |
| | 1.47 N | AH16609 | AH1660619 |
| Hinge lever | 0.25 N | AH16829 | AH1682619 |
| | 0.49 N | AH16629 | AH1662619 |
| Simulated roller lever | 0.26 N | AH16849 | AH1684619 |
| | 0.54 N | AH16649 | AH1664619 |

**4. PC board right angle terminal**

| Actuators | Operating force, max. | Standard (AgNi alloy contact) | Low-level circuit (AgNi alloy + Au-clad contact) |
|---|---|---|---|
| | | SPDT | SPDT |
| Pin plunger | 0.74 N | AH17809 | AH1780619 |
| | 1.47 N | AH17609 | AH1760619 |
| Hinge lever | 0.25 N | AH17829 | AH1782619 |
| | 0.49 N | AH17629 | AH1762619 |
| Simulated roller lever | 0.26 N | AH17849 | AH1784619 |
| | 0.54 N | AH17649 | AH1764619 |

**5. PC board left angle terminal**

| Actuators | Operating force, max. | Standard (AgNi alloy contact) | Low-level circuit (AgNi alloy + Au-clad contact) |
|---|---|---|---|
| | | SPDT | SPDT |
| Pin plunger | 0.74 N | AH18809 | AH1880619 |
| | 1.47 N | AH18609 | AH1860619 |
| Hinge lever | 0.25 N | AH18829 | AH1882619 |
| | 0.49 N | AH18629 | AH1862619 |
| Simulated roller lever | 0.26 N | AH18849 | AH1884619 |
| | 0.54 N | AH18649 | AH1864619 |

Remarks: 1. The appearance of right and left angle types are as below.

Right angle

Left angle

2. Standard packing: 50 pcs./tube.
3. Please consult us for the delivery schedule of PC board terminal SPST-NO type.

# APPLICABLE CURRENT RANGE

| Contact | Applicable current range | | | | Max. operating force for operation (at pin plunger) | |
|---|---|---|---|---|---|---|
| | 1 mA | 0.1 A | 1 A | 3 A | 0.74 N | 1.47 N |
| Standard type (AgNi alloy) | | | | | ● | |
| | | | | | | ● |
| Low-level circuit type (AgNi alloy + Au-clad) | | | | | ● | |
| | | | | | | ● |

# SPECIFICATIONS

### 1. Contact rating (resistive load)

| | | Standard rating | Minimum rating |
|---|---|---|---|
| Standard type (AgNi alloy contact) | OF 0.74N | 1A 125V AC, 1A 30V DC | — |
| | OF 1.47N | 3A 125V AC, 2A 30V DC | — |
| Low-level circuit type (AgNi alloy + Au-clad contact) | | 0.1A 125V AC, 0.1A 30V DC | 5mA 6V DC, 2mA 12V DC, 1mA 24V DC |

### 2. Characteristics

| Contact arrangement | Standard type (AgNi alloy contact) | Low-level circuit type (AgNi alloy + Au-clad contact) |
|---|---|---|
| Expected life (min. operations) Electrical (at rated load, 20 cpm) (O.T.: Max.) | $3 \times 10^4$ | $10^5$ |
| Expected life (min. operations) Mechanical (at 60 cpm) (O.T.: Specified value) | O.F. 0.74 N: $10^6$<br>O.F. 1.47 N: $5 \times 10^5$ | |
| Dielectric strength (initial)<br>Between terminals<br>Between terminals and other exposed parts<br>Between terminals and ground | <br>600 Vrms for 1 min.<br>1,500 Vrms for 1 min.<br>1,500 Vrms for 1 min. | |
| Insulation resistance (min. at 500V DC) | 100 MΩ | |
| Contact resistance (initial) | Max. 30 mΩ (by voltage drop, 1A 6 to 8V DC) | Max. 100 mΩ (by voltage drop, 0.1A 6 to 8V DC) |
| Allowable operating speed (no load) | 1 to 500 mm/s | |
| Max. operating cycle rate (no load) | 120 cpm | |
| Ambient temperature | –25 to +85°C (not freezing below 0°C) | |
| Shock resistance (pin plunger type) | Min. 294 m/s² (contact opening: Max. 1ms) | |
| Vibration resistance (pin pluger type) | 10 to 55 Hz at single amplitude of 0.75mm (contact opening: max. 1ms) | |
| Unit weight | Approx. 0.5g | |

Remarks: 1. Test conditions and judgement are in accordance with NECA C 4505.
2. OF: Value of pin plunger type

### 3. Operating characteristics

1) Pin plunger

| 3th digit of part no. | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max. mm | Overtravel, min. mm | Operating position mm |
|---|---|---|---|---|---|---|
| 6 | 1.47 N | 0.20 N | 0.5 | 0.12 | 0.25 | 7±0.3 (distance from stand off) 5.5±0.2 (distance from mounting hole) |
| 8 | 0.74 N | 0.098 N | | | | 7±0.3 (distance from stand off) 5.5±0.2 (distance from mounting hole) |

2) Hinge lever

| 3th digit of part no. | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max. mm | Overtravel, min. mm | Operating position mm |
|---|---|---|---|---|---|---|
| 6 | 0.49 N | 0.049 N | 2.1 | 0.5 | 0.55 | 8.3±1.2 (distance from stand off) 6.8±1.0 (distance from mounting hole) |
| 8 | 0.25 N | 0.025 N | | | | 8.3±1.2 (distance from stand off) 6.8±1.0 (distance from mounting hole) |

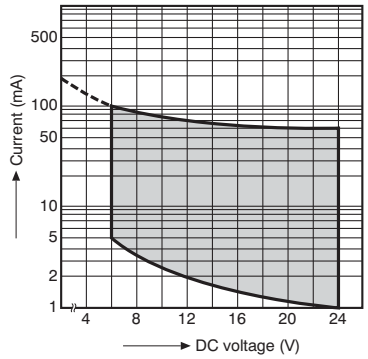
3) Simulated roller lever

| 3th digit of part no. | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max. mm | Overtravel, min. mm | Operating position mm |
|---|---|---|---|---|---|---|
| 6 | 0.54 N | 0.039 N | 2.1 | 0.5 | 0.5 | 11.0±1.2 (distance from stand off) 9.5±1.0 (distance from mounting hole) |
| 8 | 0.26 N | 0.020 N | | | | 11.0±1.2 (distance from stand off) 9.5±1.0 (distance from mounting hole) |

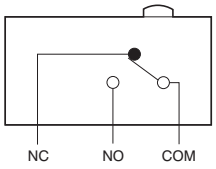
# DATA

**Low-level circuit type**

Range of low-level current and voltage (reference only)




# CONTACT ARRANGEMENT




# DIMENSIONS

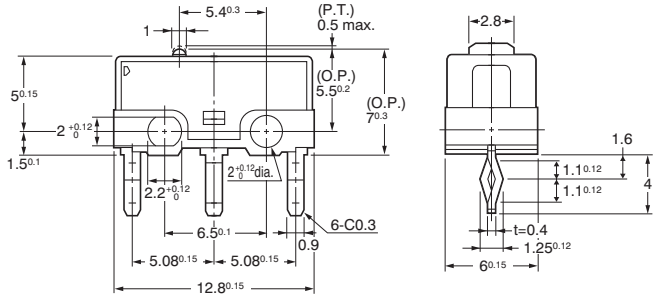
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

### 1. Self-standing PC board terminal (standard type)

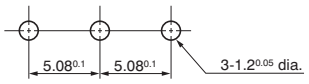
mm

Pin plunger

**CAD Data**



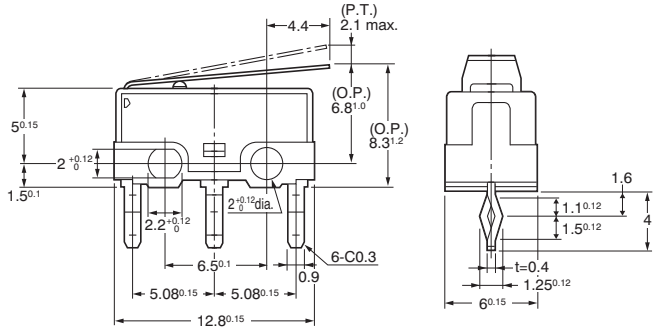

PC board pattern



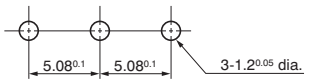

| | | |
|---|---|---|
| Pretravel, max. mm | | 0.5 |
| Movement differential, max. mm | | 0.12 |
| Overtravel, min. mm | | 0.25 |
| Operating position | Distance from mounting hole, mm | 5.5±0.2 |
| | Distance from standoff, mm | 7±0.3 |

Hinge lever

**CAD Data**



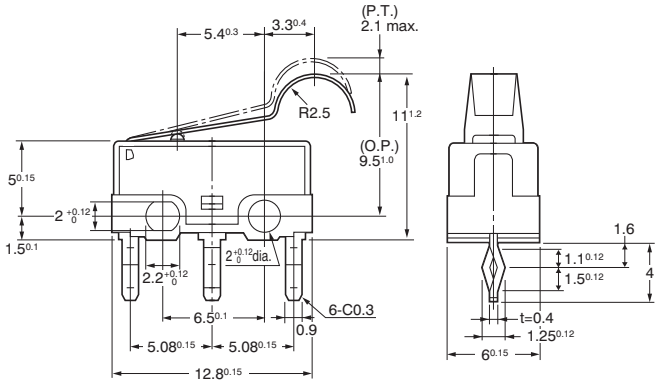

PC board pattern



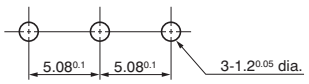

| | | |
|---|---|---|
| Pretravel, max. mm | | 2.1 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min. mm | | 0.55 |
| Operating position | Distance from mounting hole, mm | 6.8±1.0 |
| | Distance from standoff, mm | 8.3±1.2 |

Simulated roller lever

**CAD Data**




PC board pattern

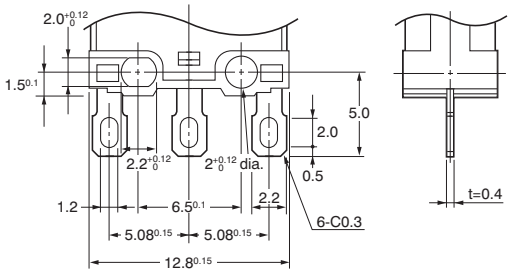



| | | |
|---|---|---|
| Pretravel, max. mm | | 2.1 |
| Movement differential, max. mm | | 0.5 |
| Overtravel, min. mm | | 0.5 |
| Operating position | Distance from mounting hole, mm | 9.5±1.0 |
| | Distance from standoff, mm | 11.0±1.2 |

**2. Solder terminal** mm

Pin plunger

**CAD Data**

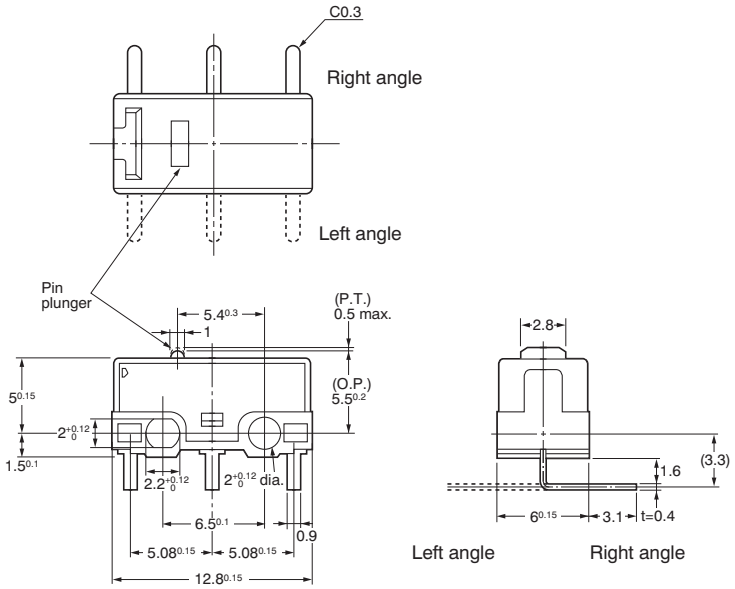



Remark: As for other actuator types, dimensions are the same as those of corresponding self-standing PC board terminal (standard type).

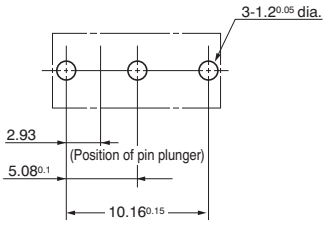
**3. PC board right/left angle terminal**

Pin plunger

**CAD Data**




Recommended PC board pattern
(top view)




Remark: As for other actuator types, dimensions are the same as those of corresponding self-standing PC board terminal (standard type).

# NOTES

**1. Fastening of the switch body**

1) Use M2 screws to attach switches with max. 0.098 N·m torque. Use of screw washers or adhesive lock is recommended.

2) When the operation object is in the free position, force should not be applied directly to the actuator or to the pin plunger. Also force should be applied to the pin plunger from vertical direction to the switch.

3) In setting the movement after operation, the over-travel should be set from 70% to 100%. Setting the movement less than 70% may cause degrading of the electrical mechanical performance.

**2. When specifying AH1 switches, allow ±20% to the listed operating and release forces.**

**3. Soldering operation**

Manual soldering should be accomplished within 3 seconds with max. 350°C iron.

Terminal portions must not be moved in min.1 minute after soldering.

Also no tensile strength of lead wires should be applied to terminals.

**4. When switching low-level circuits, AH1 low-level circuit type (Au-clad contact) is recommended.**

**5. Environment**

Avoid using the switches in the following conditions;

• In corrosive gases, such as silicon gas

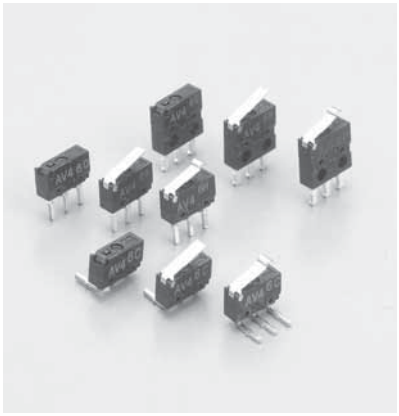
• In a dusty environment

When cleaning the switch, use a diluted form of a neutral cleaning agent. Using acidic or alkali solvents can adversely affect the performance of the switch.

Panasonic
ideas for life

**ONE OF THE SMALLEST SNAP-ACTION SWITCHES IN THE WORLD**

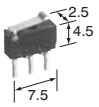
# AV4 SWITCHES



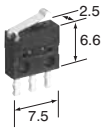
## FEATURES

**• Superminiature type, light-weight snap action switch**

PC board terminal type (0.2g)




Solder terminal type with mounting holes (0.3g)

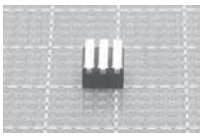


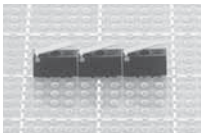

mm

**• Mechanical life of 300,000 operations minimum**

Stainless steel plated silver or gold is used for actuating spring

**• Switches can be mounted close together in any directions**





## TYPICAL APPLICATIONS

**• Compact visual equipment**

Camera, portable VCR

**• Small-sized audio equipment**

Cassette tape recorder, Car stereo

**• Office automation equipment**

Light pen for personal computer, floppy disc apparatus, printer, computer

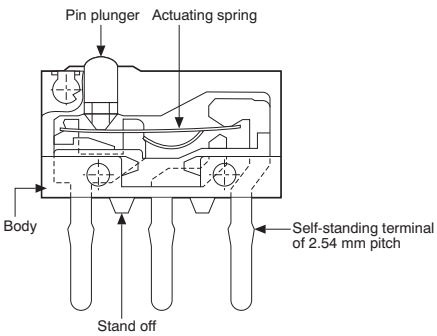
## ORDERING INFORMATION

Ex. AV 4 4 0 4 61

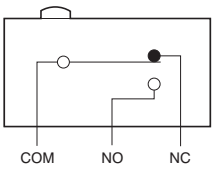
| Product Name | Terminals | Actuators | Operating force, max. (by pin plunger) | Contacts |
|---|---|---|---|---|
| FU | 0: Solder terminal with mounting holes (1.65 mm dia.)<br>4: PC board straight terminal<br>5: PC board angle terminal<br>6: PC board reverse angle terminal | 0: Pin plunger<br>2: Hinge lever<br>4: Simulated roller lever | 4: 0.98 N | Nil: Ag plated contact<br>61: Au plated contact |

## CONSTRUCTION

PC board straight terminal type




## CONTACT ARRANGEMENT



# PRODUCT TYPES

| Type of contacts | Actuator | Operating force, max. | Part no. | | | |
|---|---|---|---|---|---|---|
| | | | PC board terminal | | | Solder terminal with mounting holes |
| | | | Straight terminal | Angle terminal | Reverse angle terminal | |
| Ag plated contact type | Pin plunger | 0.98 N | AV4404 | AV4504 | AV4604 | AV4004 |
| | Hinge lever | 0.25 N | AV4424 | AV4524 | AV4624 | AV4024 |
| | Simulated roller lever | 0.29 N | AV4444 | AV4544 | AV4644 | AV4044 |
| Au plated contact type | Pin plunger | 0.98 N | AV440461 | AV450461 | AV460461 | AV400461 |
| | Hinge lever | 0.25 N | AV442461 | AV452461 | AV462461 | AV402461 |
| | Simulated roller lever | 0.29 N | AV444461 | AV454461 | AV464461 | AV404461 |

# SPECIFICATIONS

### 1. Contact rating

| Type of contact | Resistive load (cos $\phi \approx 1$) |
|---|---|
| Ag plated contact | 0.5A 30V DC |
| Au plated contact | 0.1A 30V DC |

The color of:

| Color / Type | Body | Cap | Plunger |
|---|---|---|---|
| Ag plated contact | Black | Black | Black |
| Au plated contact | Black | Black | Red |

### 2. Characteristics

| Items | | | Characteristics |
|---|---|---|---|
| Life | Mechanical | | Min. $3 \times 10^5$ operations (at 60 cpm) |
| | Electrical | Ag plated contact | Min. $2 \times 10^4$ operations (0.5A 30V DC; at 20 cpm) |
| | | Au plated contact | Min. $2 \times 10^5$ operations (0.1A 30V DC; at 20 cpm) |
| Insulation resistance | | | Min. 100 MΩ (250V DC by insulation resistance meter) |
| Dielectric strength | Between non-continuous terminals | | 500V AC for 1 min. |
| | Between each terminal and other exposed metal parts | | 500V AC for 1 min. |
| | Between each terminal and ground | | 500V AC for 1 min. |
| Vibration resistance | | Pin plunger type | 10 to 55 Hz at single amplitude of 0.75mm (contact opening: max. 1ms) |
| | | Lever type | 10 to 55 Hz at single amplitude of 0.15mm (contact opening: max. 1ms) |
| Shock resistance | | Pin plunger type | Min. 294m/s² (contact opening: max. 1ms) |
| | | Lever type | Min. 147m/s² (contact opening: max. 1ms) |
| Contact resistance (initial) | | | Max. 200 mΩ |
| Allowable operation speed | | | 0.1mm/s to 500mm/s (pin plunger type) |
| Mechanical max. switching frequency | | | 60 operations/min. |
| Ambient temperature | | | –25 to +80°C (not freezing below 0°C) |
| Unit weight | | | PC board terminal type: Approx. 0.2g<br>Solder terminal with mounting holes type: Approx. 0.3g |

### 3. Operating characteristics

1) PC board terminal

| Actuators | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max. mm | Overtravel, min. mm | Operating position mm |
|---|---|---|---|---|---|---|
| Pin plunger | 0.98 N | 0.098 N | 0.3 | 0.1 | 0.1 | 4.8±0.15 |
| Hinge lever | 0.25 N | 0.010 N | 2.4 | 0.7 | 0.4 | 5.8±0.7 |
| Simulated roller lever | 0.29 N | 0.010 N | 2.2 | 0.7 | 0.3 | 6.1±0.7 |

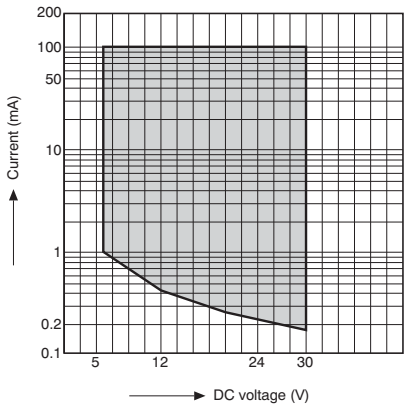
2) Solder terminal

| Actuators | Operating force, max. | Release force, min. | Pretravel, max. mm | Movement differential, max. mm | Overtravel, min. mm | Operating position mm |
|---|---|---|---|---|---|---|
| Pin plunger | 0.98 N | 0.098 N | 0.3 | 0.1 | 0.1 | 5.4±0.15 |
| Hinge lever | 0.25 N | 0.020 N | 2.4 | 0.7 | 0.4 | 6.4±0.6 |
| Simulated roller lever | 0.29 N | 0.020 N | 2.2 | 0.7 | 0.3 | 6.7±0.5 |

# DATA

**Au plated contact type**

Range of low-level current and voltage (reference only)




# DIMENSIONS

Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

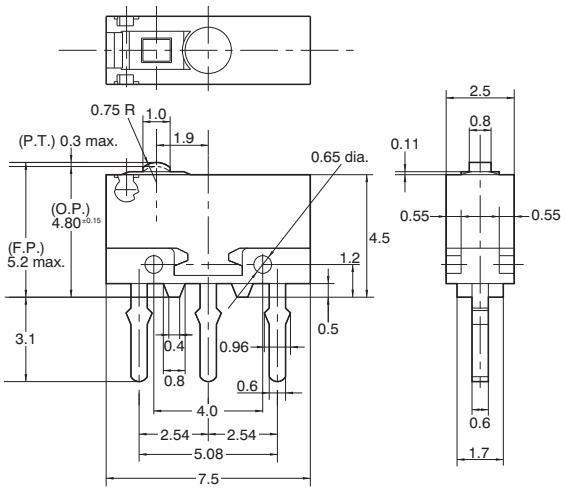
**1. PC board terminal**

Straight terminal

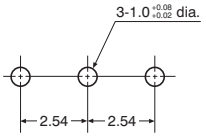
Pin plunger type

**CAD Data**

mm General tolerance: ±0.15



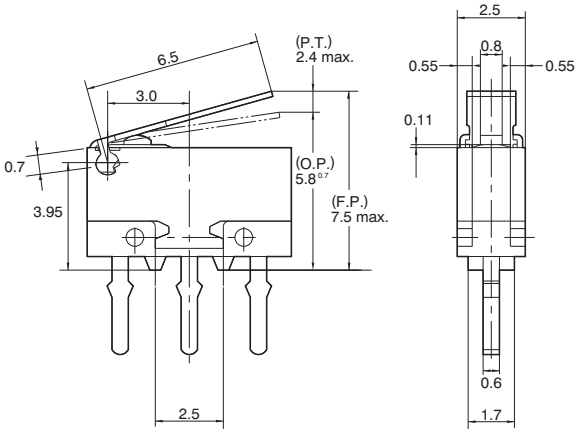

PC board pattern




| | |
|---|---|
| Pretravel, max. mm | 0.3 |
| Movement differential, max. mm | 0.1 |
| Overtravel, min. mm | 0.1 |
| Operating position, mm | 4.8±0.15 |
| Free position, mm | 5.2 |

Hinge lever type

**CAD Data**



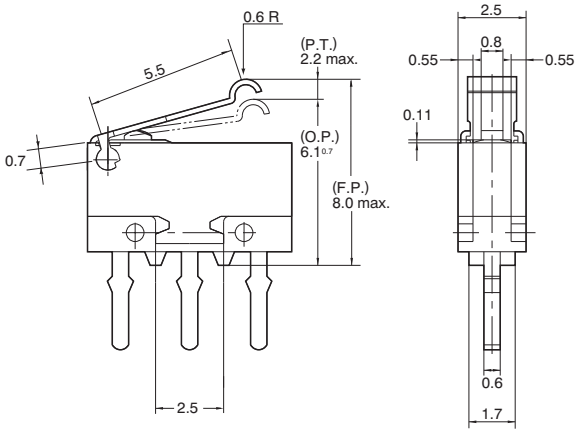

| | |
|---|---|
| Pretravel, max. mm | 2.4 |
| Movement differential, max. mm | 0.7 |
| Overtravel, min. mm | 0.4 |
| Operating position, mm | 5.8±0.7 |
| Free position, mm | 7.5 |

Remark: All other dimensions are the same as those of pin plunger type.

Simulated roller lever type

mm General tolerance: ±0.15

**CAD Data**

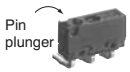



| | |
|---|---|
| Pretravel, max. mm | 2.2 |
| Movement differential, max. mm | 0.7 |
| Overtravel, min. mm | 0.3 |
| Operating position, mm | 6.1±0.7 |
| Free position, mm | 8.0 |

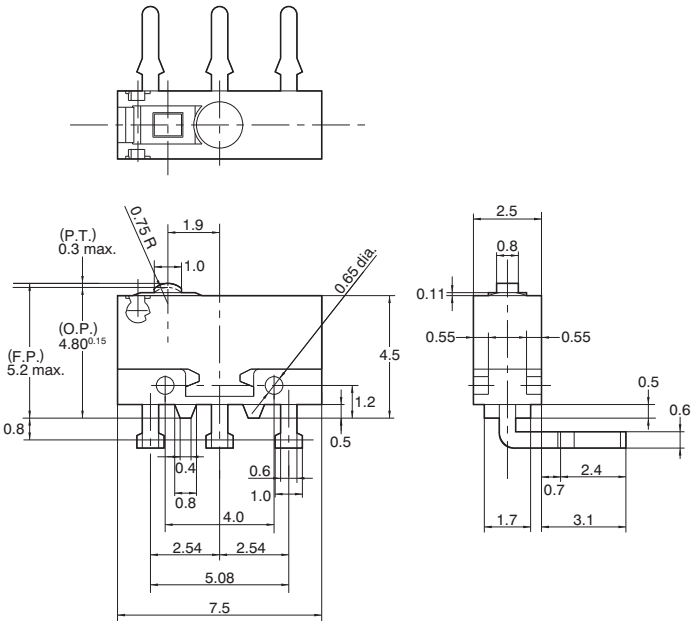
Remark: All other dimensions are the same as those of pin plunger type.

**2. Angle terminal**
Right angle terminal
Pin plunger type

**CAD Data**




Right angle terminal

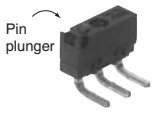



| | |
|---|---|
| Pretravel, max. mm | 0.3 |
| Movement differential, max. mm | 0.1 |
| Overtravel, min. mm | 0.1 |
| Operating position, mm | 4.8±0.15 |
| Free position, mm | 5.2 |

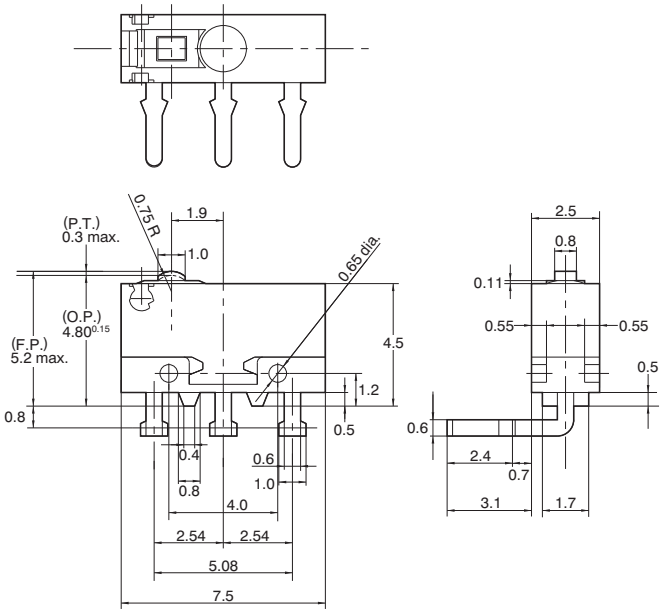
Remark: All other dimensions of hinge lever type and simulated roller lever type are the same as those of straight terminal types.

Left angle terminal
Pin plunger type

**CAD Data**




Left angle terminal




| | |
|---|---|
| Pretravel, max. mm | 0.3 |
| Movement differential, max. mm | 0.1 |
| Overtravel, min. mm | 0.1 |
| Operating position, mm | 4.8±0.15 |
| Free position, mm | 5.2 |

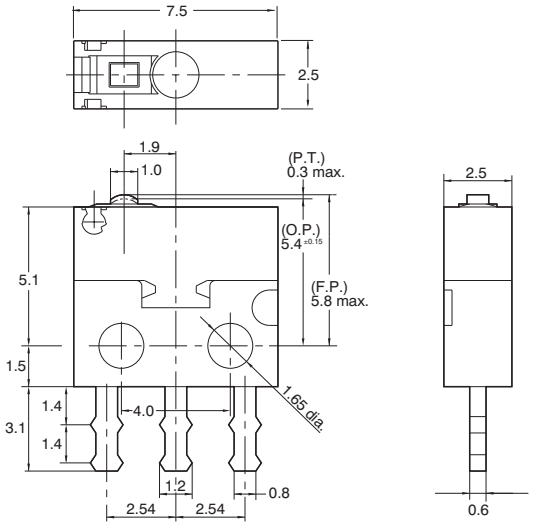
Remark: All other dimensions of hinge lever type and simulated roller lever type are the same as those of straight terminal types.

### 3. Solder terminal with mounting holes

mm General tolerance: ±0.15

Pin plunger type

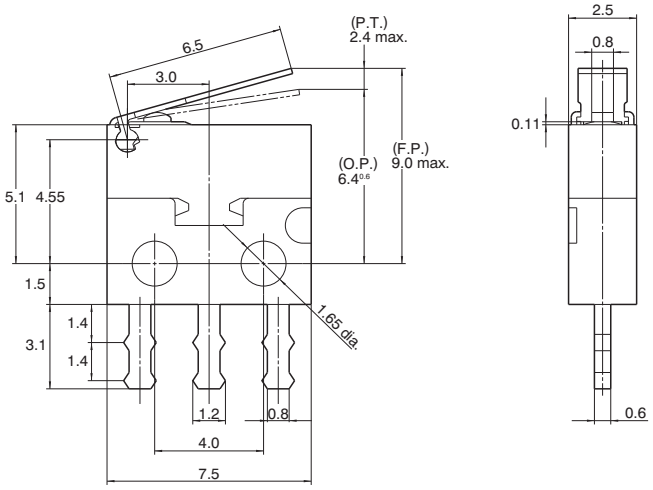
**CAD Data**




| | |
|---|---|
| Pretravel, max. mm | 0.3 |
| Movement differential, max. mm | 0.1 |
| Overtravel, min. mm | 0.1 |
| Operating position, mm | 5.4±0.15 |
| Free position, mm | 5.8 |

Hinge lever type

**CAD Data**

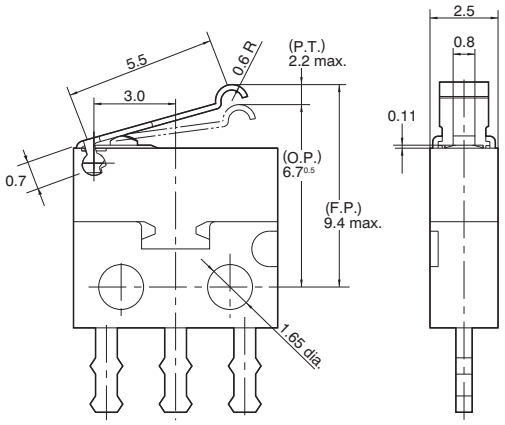



| | |
|---|---|
| Pretravel, max. mm | 2.4 |
| Movement differential, max. mm | 0.7 |
| Overtravel, min. mm | 0.4 |
| Operating position, mm | 6.4±0.6 |
| Free position, mm | 9.0 |

Remark: All other dimensions are the same as those of pin plunger type.

Simulated roller lever type

**CAD Data**




| | |
|---|---|
| Pretravel, max. mm | 2.2 |
| Movement differential, max. mm | 0.7 |
| Overtravel, min. mm | 0.3 |
| Operating position, mm | 6.7±0.5 |
| Free position, mm | 9.4 |

Remark: All other dimensions are the same as those of pin plunger type.

# NOTES

**1. Mounting**

1) After mounting and wiring, the insulation distance between ground and each terminal should be confirmed as sufficient.

2) When the operation object is in the free position, force should not be applied to the actuator or to the pin plunger. Also force should be applied to the pin plunger from vertical direction to the switch.

3) In setting the movement after operation, the over-travel should be set within the range of the specified O.T. value.

4) In fastening the switch body, use the M1.4 screw, with tightening torque of not more than 0.098 N·m.

**2. Soldering**

1) Manual soldering should be accomplished within 5 seconds with max. 320°C iron.

Care should be taken not to apply force to the terminals during soldering.

2) Terminal portion must not be moved within 1 minute after soldering. Also no tensile strength of lead wires should be applied to the terminals.

3) When using the angle terminal type, insert an insulation separator between the switch body and the printed circuit board (insulation separator 0.2 to 0.4mm thick) to prevent the soldering flux from flowing under the PC board.

**3. Cleaning**

As AV4 switch is not completely sealed construction, avoid cleaning.

**4. Selection of switch**

When specifying AV4 switches, allow ±20% to the listed operating characteristics.

**5. Avoid using and keeping switches in the following conditions:**

- In corrosive gases
- In a dusty environment
- Where silicon atmosphere prevails

**6. When switching low-level circuits (max. 100 mA), Au plated contact types are recommended.**

**7. When using the lever type, avoid applying force from the reverse and side direction of actuating.**

Panasonic
ideas for life

**SAFETY INTERLOCK SWITCH SMALL SIZE & LIGHT FORCE**

# AGX (GX) SWITCHES


1 Form A


3 Form A


2 Form A

## FEATURES

- **Constructed with dual restoration springs and double cut-off for safety**
- **Contact gap of greater than 4mm (conforming to IEC60950-1)**
- **As for 3 Form A type, combination of power contact and signal contact is available**
- **UL/C-UL/ENEC/VDE approved**

## TYPICAL APPLICATIONS

- **Door interlock of copiers, printers, facsimiles**
- **Door interlock of other compact appliances**

## ORDERING INFORMATION

Ex. AGX ☐ ☐ ☐ F

| Product Name | Contact arrangement | Capacity and mounting method | Terminals | Contact |
|---|---|---|---|---|
| GX | 1: 1 Form A Power switching contact<br>2: 2 Form A Power switching contact<br>3: 3 Form A Power switching contact<br>6: 1 Form A Power switching contact and 2 Form A Signal switching contact<br>7: 2 Form A Power switching contact and 1 Form A Signal switching contact | 0: Standard type 10.1 A (Snap-in mounting) | 5: .250 Quick-connect terminal (O.T. 2 mm)<br>6: .250 Quick-connect terminal (O.T. 4 mm) | F: Cadmium free |

## PRODUCT TYPES

| Rating | Overtravel (O.T.) Min. mm | Contact arrangement | | Switching timing | | Part number |
|---|---|---|---|---|---|---|
| | | | | 1st ON | 2nd ON | |
| Standard type 10.1A 250V AC | 2 | 1 Form A Power switching contact | | — | — | AGX105F |
| | | 2 Form A Power switching contact | | — | — | AGX205F |
| | 4 | 1 Form A Power switching contact | | — | — | AGX106F |
| | | 2 Form A Power switching contact | | — | — | AGX206F |
| | | 3 Form A | 3 Form A Power switching contact | 3 Form A power | — | AGX306F |
| | | | 1 Form A Power switching contact 2 Form A Signal switching contact | 1 Form A power | 2 Form A signal | AGX606F |
| | | | 2 Form A Power switching contact 1 Form A Signal switching contact | 2 Form A power | 1 Form A signal | AGX706F |

# SPECIFICATIONS



### 1. Contact rating

| Contact type | Resistive load (cos □≈ 1) | Motor load* (EN61058-1) (cos ϕ ≈ 0.6) |
|---|---|---|
| Standard type power switching contact | 10.1A 125V AC<br>10.1A 250V AC<br>6A 30V DC<br>3A 48V DC (3 Form A type only) | 3A 125V AC<br>3A 250V AC |
| Signal switching contact (3 Form A only) | 0.1A 48V DC<br>Contact Low-level circuit: 1mA 5V DC | — |

Remark: Motor load designates an inrush current switching capability of 6 times the indicated rating

### 2. Characteristics

| Type | | Standard type |
|---|---|---|
| Expected life | Mechanical (at 60 cpm) | $10^6$ min. |
| | Electrical (at 20 cpm, operating speed: 10mm/s) | $10^5$ (at 10.1A 250V AC) |
| Insulation resistance | | 100MΩ at 500V DC |
| Dielectric strength | Between terminals | 2,000Vrms for 1 minute |
| | Between terminals and other exposed metal parts | 2,500Vrms for 1 minute |
| | Between terminals and ground | 2,000Vrms for 1 minute |
| Initial contact resistance | | 100mΩ max. (by voltage drop at 1A, 6 to 8V DC) |
| Temperature rise (terminal portion) | | Initial 45°C max., After test 55°C max. |
| Vibration resistance | | 10 to 55Hz at single amplitude of 0.75mm (contact opening: 1ms max.) |
| Shock resistance | | Min. 294m/s² (contact opening: 1ms max.) |
| Actuator strength | | 49N for 1 minute (for operating direction) |
| Tensile terminal strength | | Min. 147N (pulling for operating direction) |
| Allowable operating speed | | Min. 10 to 300mm/s |
| Allowable operating cycle rate | | 60 cpm |
| Temperature resistance | | –40°C to –45°C: 48 hours, +80°C to +90°C: 48 hours |
| Ambient temperature | | –25°C to +85°C (not freezing nor condensing) |
| Flame retardancy | | Min. UL 94V-0 |
| Tracking resistance (CTI) | | Min. 175 |
| Contact material | | AgCuO alloy |

*Remark: Test condition and judgement are complying with “JIS C4505”, “EN61058” and “UL1054”.

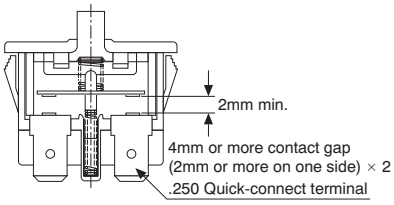
### 3. Operating characteristics

| Contact arrangement | | Part number | Operating force (O.F.) max. | Total operating force (T.F) max. Push button position: 2.4mm | Free position (F.P.) max. mm | Operating position (O.P.) mm | Total travel position (T.T.P.) mm | Over travel (O.T.) min. mm |
|---|---|---|---|---|---|---|---|---|
| Standard type 10.1A 250V AC | 1 Form A | AGX105F | 3.92 N | 4.90 N | 8 | 4.8±0.4 | 2.4 | 2.0 |
| | 2 Form A | AGX205F | 3.92 N | 4.90 N | 8 | 4.8±0.4 | 2.4 | 2.0 |
| | 1 Form A | AGX106F | 3.92 N | 6.86 N | 10 | 7.0±0.4 | 2.4 | 4.0 |
| | 2 Form A | AGX206F | 3.92 N | 6.86 N | 10 | 7.0±0.4 | 2.4 | 4.0 |
| | 3 Form A | AGX306F | 2.94 N | 5.88 N | 10 | 7.0±0.4 | 2.4 | 4.0 |

Remark: With the 3 Form A type sequence operation type, the specifications for the contact where the operation position turns ON first are as per the above table. However, the specifications for the contact where the operation position turns ON later are delayed by approximatery 0.8 mm compared with the above table.

# CONSTRUCTION

Dual safety construction
- Dual restoration spring
- Double cut-off type




# DIMENSIONS

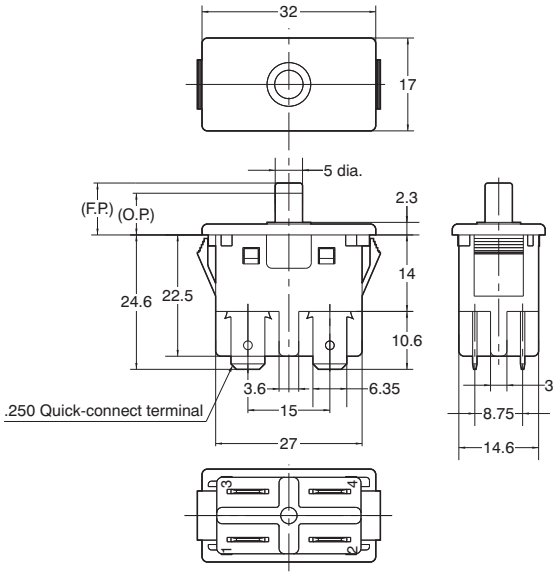
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

1 Form A

**CAD Data**

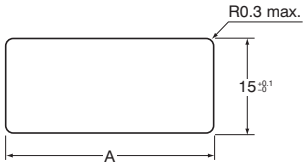
2 Form A

**CAD Data**




mm General tolerance: ±0.4

Hole cutting dimension




| Panel thickness | 1.0 to 1.75 | 1.75 to 2.5 |
|---|---|---|
| Dimension A | 30.2 +0.1 −0 | 30.5 +0.1 −0 |

(Copper is standard as panel material.)

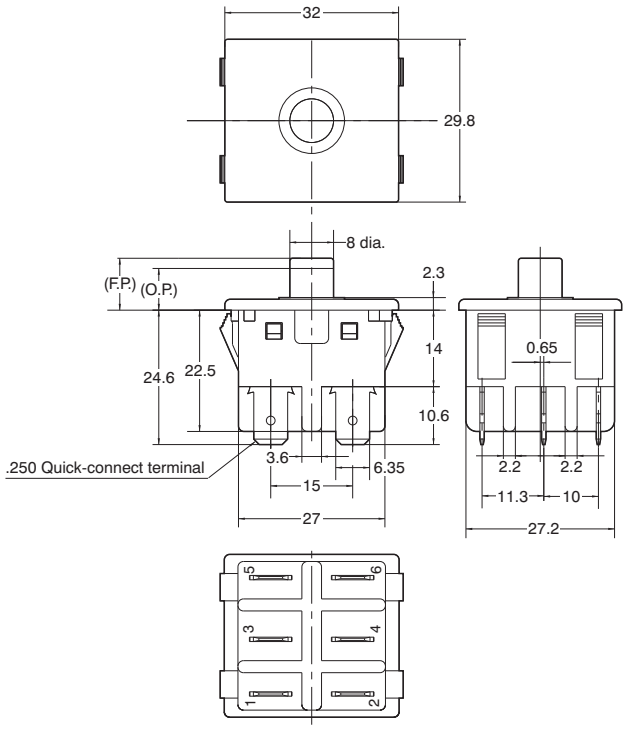
Remark: 1 Form A type does not have terminal no.1 nor no.2

3 Form A

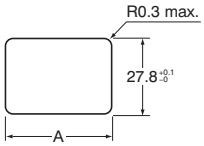
**CAD Data**

Signal switching contact

Power switching contact



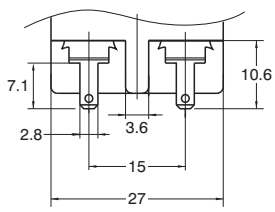

Hole cutting dimension




| Panel thickness | 0.8 to 1.75 | 1.75 to 2.5 |
|---|---|---|
| Dimension A | 30.2 +0.1 −0 | 30.5 +0.1 −0 |

(Copper is standard as panel material.)

• Signal switching contact

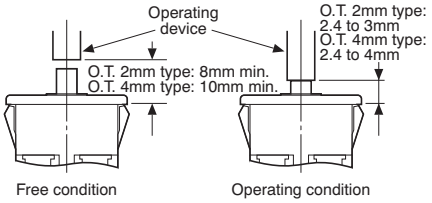



Remark: Power switching contact type has .250 Quick-connect terminal and signal switching contact type has .110 Quick-connect terminal.

## NOTES

**1. Switch mounting**
Mount the switch with the hole cutting dimensions shown in the drawing.

**2. Adjustment of the operating device:**
With respect to the position of the operating device and the switch body, set the position as indicated in the condition on the right. If this condition is exceeded, the mechanical and electrical performance will be impaired. In addition, the force applied by the operating device should be in a perpendicular direction. Even if the push-button is used in the full total travel position, there will be no influence on the life of the switch.




**3. Confirming insulating distance**
Before mounting and wiring, the insulating distance between terminals and between the terminals and ground should be checked for assurance of proper distance. With respect to the terminal connections, it is recommended that receptacles with insulating sleeves or “Positive Lock Connector*” be used. Also consideration should be given to the wiring not to apply force to the terminal section normally.
*Registered by AMP, Ltd.

**4. Regarding fastening lead wires to terminals**
Use .250 receptacle (terminal thickness 0.8mm) or .110 receptacle (terminal thickness 0.5mm) should be used for connection. Make sure the sockets are straight. If they are skewed, the terminals will require excessive insertion force. The insertion force varies according to manufacturer’s specifications. Check it for the sockets you are using.

**5. Material of the panel**
Steel sheet is recommended as the panel material. When using soft material, confirm the condition for actual use.

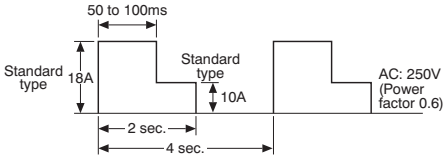
**6. Quality check under actual loading conditions**
To improve reliability, check the switch under actual loading conditions. Avoid any situation that may adversely affect switching performance.

**7. Avoid using and keeping switches in the following conditions.**
- In corrosive gases
- In a dusty environment
- Where silicon atomosphere prevails

## REFERENCE

**1. Outline of UL1054 test**
Overload test
Standard type: 12.625A 250V AC
(power factor 0.75 to 0.8)
Endurance test
Standard type: 10.1A 250V AC
(power factor 0.75 to 0.8)
After testing, temperature rise of terminals should be less than 30°C and no abnormality should be observed in characteristics.

**2. Outline of EN61058-1 test**
After switching 25,000 times on the above load condition at both $85^{+5}_{0}$°C and 25±10°C, temperature rise of terminals should be less than 55°C and no abnormality should be observed in characteristics.

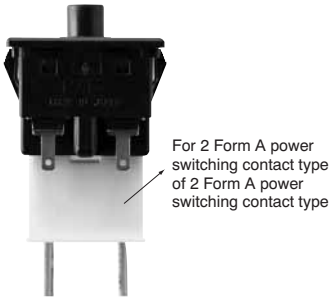



## INTRODUCTION OF CONNECTORS (made by Nippon Tanshi Co., Ltd)

**1. For 2 Form A power switching contact type**


Applicable AGX switch part no.:
AGX205F, AGX206F
* Housing
Model number: N1620-4204
* Receptacle
Model numbers
17168-2 (for narrow wires, post-plated product)
17168-M2 (for narrow wires, wood veneer plated product)
172131-M2 (for thick wires)

**2. For 2 Form A power switching contact type of 2 Form A power switching contact + 1 Form A signal switching contact**




Applicable AGX switch part no.:
AGX706F
* Housing
Model number: N3220-4204
* Receptacle
Model numbers
17901-M2, 17902-M2, 17903-M2 (wire size differences)

Remark: Please consult us if you need above connectors.

Panasonic
ideas for life

**SAFETY INTERLOCK SWITCH CONSTRUCTED WITH DUAL RESTORATION SPRINGS**

# AV1 (GW) SWITCHES

## FEATURES

- **8mm or more is assured as insulation distance between contacts (snap-in mounting 2 Form A and 3 Form A type)**
- **Durability of 100,000 times (10.1A 250V AC) is assured for UL interlock circuit**
- **Constructed with easy-to-connect terminals**
  **Terminal specifications is .250 Quick-Connect (based on DIN standards) Connection can be made with insulating sleeve on connecting lug**
- **UL/C-UL, ENEC (VDE) approved**

## TYPICAL APPLICATIONS

**1. Office equipment**
- Copiers
- Facsimiles
- Projectors

**2. Home appliances**
- Microwave ovens
- Refrigerators

## ORDERING INFORMATION

Ex. AV1 [4] [6] [5] [3] [F]

| Type of switch | Contact arrangement | Mounting method | Agency standard | Contact |
|---|---|---|---|---|
| AV1: GW switch | 1: 3 Form A (contact gap: 8 mm)<br>2: 2 Form A (contact gap: 8 mm)<br>3: 2 Form A (contact gap: 6 mm)<br>4: 1 Form A 1 Form B<br>5: 1 Form B<br>6: 1 Form A | 6: Screw mounting (10.1 A)<br>7: Snap-in mounting type (10.1 A)<br>8: Snap-in mounting type with button guard (10.1 A) | 3: UL/C-UL, ENEC/VDE (10.1 A 250 V AC $1 \times 10^5$) | F: Cadmium free |

## PRODUCT TYPES

| Type | | | | Part number |
|---|---|---|---|---|
| Mounting method | Button guard | Contact arrangement | Contact gap mm | |
| Screw mounting | Without | 1 Form A | Min. 6 | AV16653F |
| | | 1 Form B | Min. 3 | AV15653F |
| | | 1 Form A 1 Form B | Max. 3 | AV14653F |
| | | 2 Form A | Min. 6 | AV13653F |
| Snap-in mounting | Without | 2 Form A | Min. 8 | AV12753F |
| | | 3 Form A | Min. 8 | AV11753F |
| | With | 2 Form A | Min. 8 | AV12853F |
| | | 3 Form A | Min. 8 | AV11853F |

## SPECIFICATIONS

**1. Contact rating**

| Voltage | Resistive load (cos $\phi \approx 1$) | VDE motor load (cos $\phi \approx 0.6$) |
|---|---|---|
| 125V AC | 10.1A | 3A |
| 250V AC | 10.1A | 3A |

* The VDE motor load rating is in accordance with VDE 0630 motor load rating which designates an inrush current switching capability of 6 times the indicating rating.

## 2. Characteristics

| | | |
|---|---|---|
| Expected life | Mechanical (at 60 cpm) | $10^6$ |
| | Electrical (at 20 cpm, operating speed: 10mm/s) | $10^5$ (10.1A 250V AC)<br>$5 \times 10^4$ (10(3)A 250V~) |
| Insulation resistance | | Min. 100MΩ at 500V DC |
| Dielectric strength | Between terminals | 2,000 Vrms for 1 min. |
| | Between terminals and other exposed metal parts | 2,500 Vrms for 1 min. |
| | Between terminals and ground | 2,000 Vrms for 1 min. |
| Initial contact resistance | | Max. 100mΩ (by voltage drop at 1A 6 to 8V DC) |
| Temperature rise | | Initial 45°C max., After test 55°C max. |
| Vibration resistance | | 10 to 55Hz at double amplitude of 1.5mm (contact opening max. 1 ms) |
| Shock resistance | | Min. 294 m/s² (contact opening max. 1 ms) |
| Actuator strength | | 49 N for 1 minute (for operating direction) |
| Tensile terminal strength | | Min. 147 N (pulling for operating direction) |
| Allowable operating speed | | 10 to 300mm/s |
| Allowable operating cycle rate | | 60 cpm |
| Temperature resistance | | –40°C to –45°C: 48 hours, +80°C to +90°C: 48 hours |
| Ambient temperature | | –25 to +85°C (not freezing below 0°C) |
| Flame retardancy | | Min. UL 94V-1 |
| Tracking resistance (CTI) | | Min. 175 |
| Contact material | | AgCuO alloy |

*Remark:Test condition and judgement are complying with “NECA C4505”, “EN61058” and “UL1054”.

## 3. Operating characteristics

1) Screw mounting type

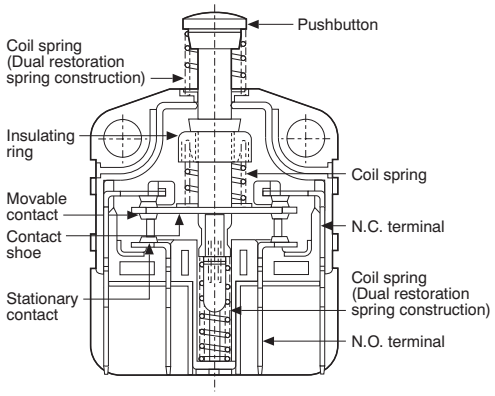
| Contact arrangement | Operating force (O.F.) max. | Total operating force (T.F) max. Push-button position: 10mm | Free position (F.P.) max. mm | Operating position (O.P.) mm | Total travel position (T.T.P.) mm | Over travel (O.T.) min. mm |
|---|---|---|---|---|---|---|
| 1 Form A | (N.O. contact to ON) 4.90N | 6.37N | 16.6 | (N.O. contact to ON) 12.7±0.4 | 10 | 2.1 |
| 1 Form B | (N.C. contact to OFF) 2.94N | 7.35N | 15.3 | (N.C. contact to OFF) 14.9±0.4 | 10 | 4.3 |
| 1 Form A 1 Form B | (N.O. contact to ON) 5.88N | 7.35N | 15.3 | (N.O. contact to ON) 12.7±0.4 | 10 | 2.1 |
| 1 Form A 1 Form B | (N.C. contact to OFF) 2.94N | 7.35N | 15.3 | (N.C. contact to OFF) 14.9±0.4 | 10 | 2.1 |
| 2 Form A | (N.O. contact to ON) 7.85N | 9.81N | 16.6 | (N.O. contact to ON) 12.7±0.4 | 10 | 2.1 |

2) Snap-in mounting type

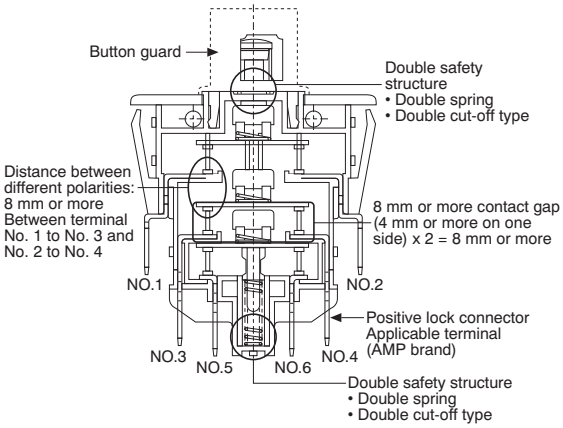
| Contact arrangement | Operating force (O.F.) max. | Total operating force (T.F) max. Push-button position: 10mm | Free position (F.P.) max. mm | Operating position (O.P.) mm | Total travel position (T.T.P.) mm | Over travel (O.T.) min. mm |
|---|---|---|---|---|---|---|
| 2 Form A | (N.O. contact to ON) 7.85N | 9.81N | 14 | (N.O. contact to ON) 9.3±0.4 | 7.5 | 2.1 |
| 3 Form A | (N.O. contact to ON) 9.81N | 14.7N | 14 | (N.O. contact to ON) 9.3±0.4 | 7.5 | 2.1 |

# CONSTRUCTION

Screw mounting type (1 Form A 1 Form B)



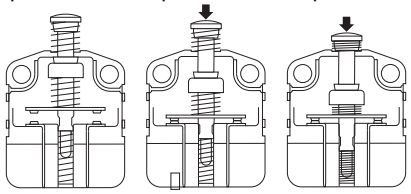

Snap-in mounting type (3 Form A)




# CONTACT OPERATION CHART

• 1 Form A

1. Free position
2. Operating position
3. Total travel position



# DIMENSIONS

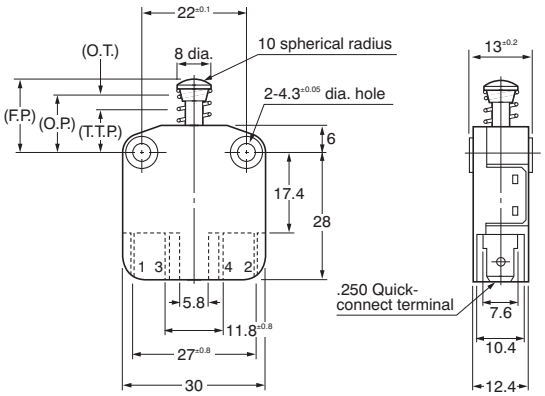
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

**1. Screw mounting type**

mm General tolerance: ±0.4

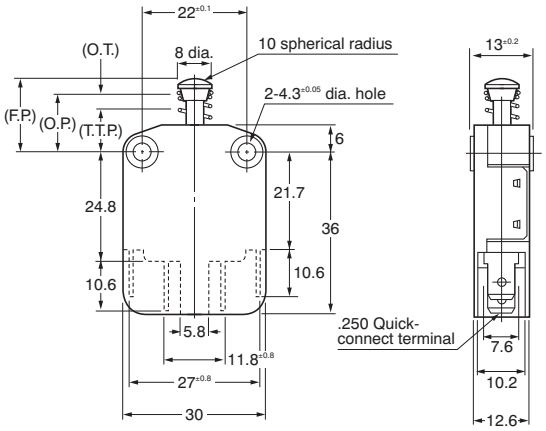
1 Form A, 1 Form B, 1 Form A 1 Form B

**CAD Data**


Contact gap
1 Form A: Min. 6mm
1 Form B: Min. 3mm
1 Form A 1 Form B: Max. 3mm
Remarks: Terminal no. 3 & 4 are for 1 Form A. Terminal no. 1 & 2 are for 1 Form B.

2 Form A **CAD Data**

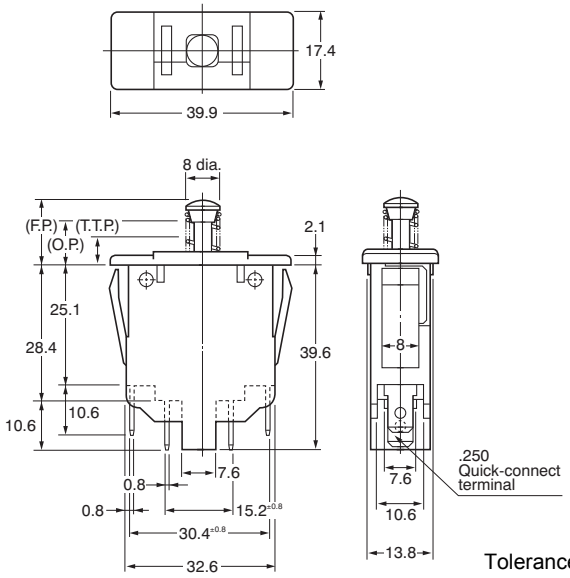

Contact gap
2 Form A: Min. 6mm

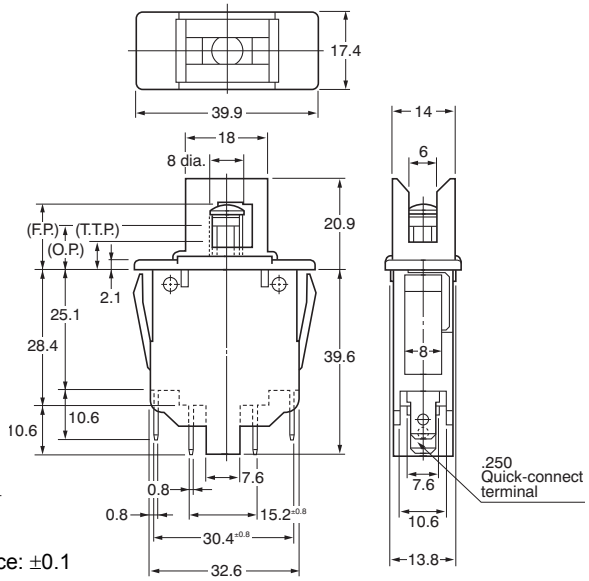
**2. Snap-in mounting type**

2 Form A type without button guard

2 Form A type with button guard

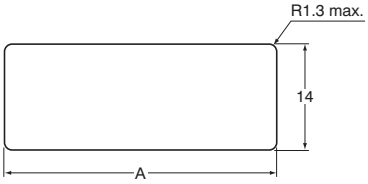
2 Form A **CAD Data**


Tolerance: ±0.1

Recommended panel opening dimensions (common)

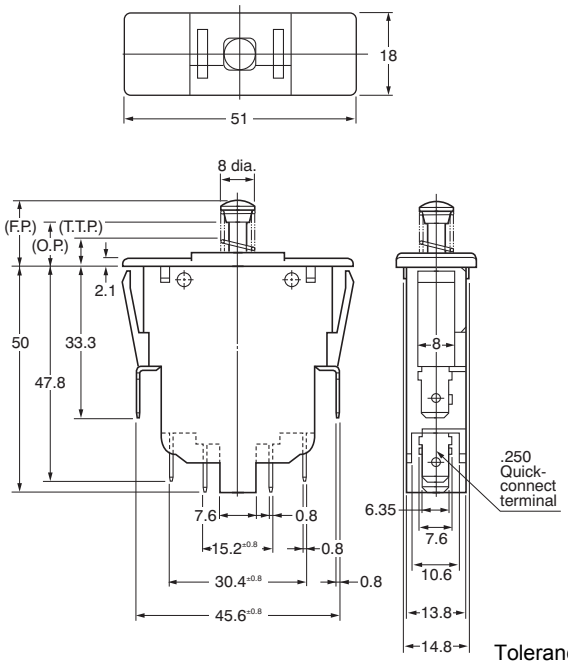



| Panel thickness | 1.0 | 2.5 |
|---|---|---|
| Dimension A | 36.7 | 37.7 |

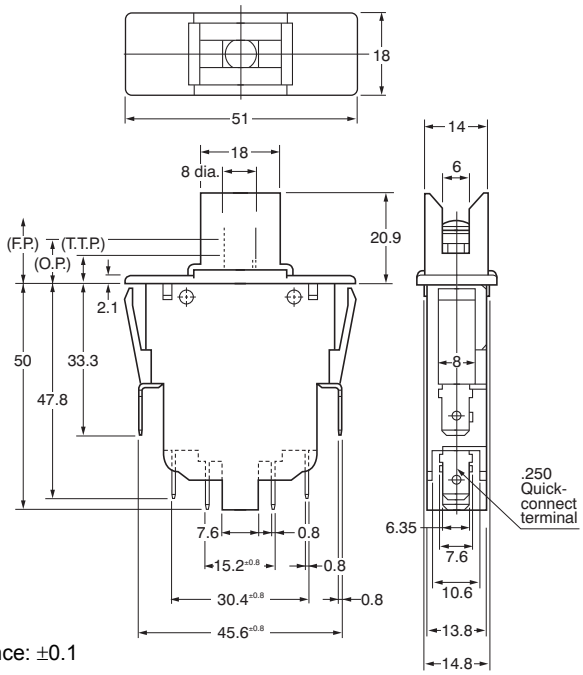
Contact gap
2 Form A: Min. 8mm

3 Form A **CAD Data**

3 Form A type without button guard

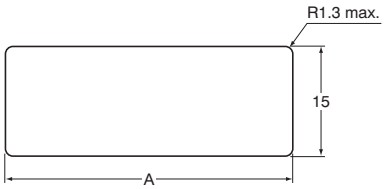



3 Form A type with button guard




Tolerance: ±0.1

Recommended panel opening dimensions (common)




Contact gap
3 Form A: Min. 8mm

| Panel thickness | 1.0 | 2.5 |
|---|---|---|
| Dimension A | 47.0 | 47.3 |

# NOTES

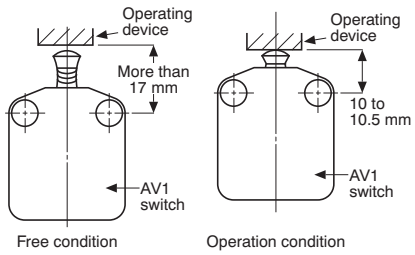
**1. Switch mounting**

Mount the switch to a smooth surface using M4 screws. Tighten the screws with 0.3 to 0.5 N·m {3 to 5 kg·cm} torque. To prevent loosening of the mounting screws, it is recommended that spring washers be used in combination with adhesive material for locking the screws.

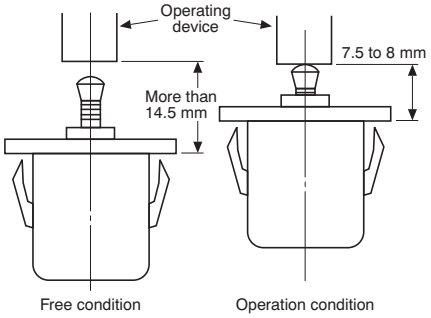
**2. Adjustment of the operating device:**

With respect to the position of the operating device and the switch body, set the position as indicated in the condition on the right. If this condition is exceeded, the mechanical and electrical performance will be impaired. In addition, the force applied by the operating device should be in a perpendicular direction. Even if the push-button is used in the full total travel position, there will be no influence on the life of the switch.

Screw mounting type




Snap-in mounting type




**3. Confirming insulating distance:**

Before mounting and wiring, the insulating distance between terminals and between terminals and ground should be checked for assurance of proper distance. With respect to the terminal connections, it is recommended that receptacles with insulating sleeves be used.

Also, consideration should be given to the wiring not to apply force to the terminal section normally.

**4. Avoid using AV1 switches in the following conditions:**

- Locations where hydrogen sulfide gas or other corrosive gases exist.
- Locations where gasoline, thinner, or other inflammable or explosive gases exist.
- Locations where there is dust and refuse.
- For operation where the perpendicular operating speed is less than 10mm/s
- For operation frequency of make/break exceeding 60 cpm.
- For ambient temperatures exceeding the range of –25°C to +85°C.
- For ambient humidity exceeding 85% R.H.
- For use in a silicon atmosphere.

**5. For use of AV14653F (1 Form A 1 Form B type):**

For the AV14653F, the air distance between the N.O. and N.C. contacts is less than the required value of VDE. The N.O. and the N.C. contacts can carry only the same electric potential.

Panasonic
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**SMALL, HIGHLY RELIABLE TIP SENSOR CONTAINING A PHOTO SENSOR**

# AHF2 (TIP) SWITCHES

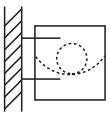
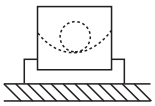
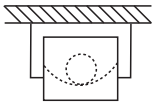
## FEATURES

• Realizes miniaturization of equipment and spaces saving. Size of body: 9.5×9.5×9.3 mm
• The contact type is equivalent to normally closed contacts, which satisfies the PL Act.
• The internal sphere can be used over an operation angle of 360 degrees in the circumferential direction.
• There are three standard terminal profiles which can be selected according to the mounting direction of the PCB.
• The terminals are tin-plated for long-term solderability.

## TYPICAL APPLICATIONS

• Gas heaters
• Electric fans
• Water vallet
• Infrared treatment device
• Electric pots with warming function

## ORDERING INFORMATION

| Mounting direction | Vertical mounting | Horizontal mounting | Reverse mounting |
|---|---|---|---|
| Part no. | AHF21 | AHF22 | AHF23 |
| PC board mounting condition |  |  |  |

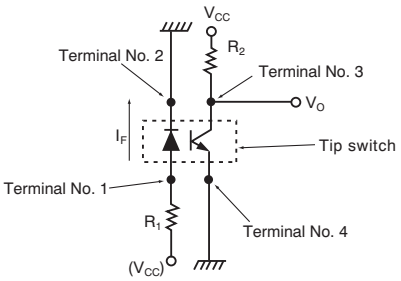
Remark: Standard Packaging: Tube 50 pcs.

## CONTACT TYPE

Normally closed type (The photo transistor is ON when the sensor is being used.)

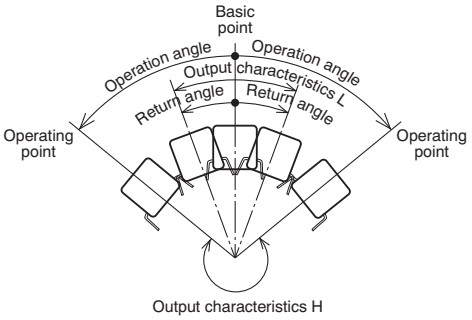
## APPLICABLE CIRCUIT

Refer to the dimensional diagram for the terminal nos.
• $V_{CC}$ = 5 V
• $R_2$ = 100 kΩ
• Forward current,
$I_F$, of the LED: 19 mA
($V_{CC}$ = 5 V, $R_1$ = 200 Ω)
• Forward voltage,
$V_F$, of the LED: Typ = 1.2 V




## BASIC CHARACTERISTICS

For $T_a$ = 25°C and applicable circuit conditions
1) Operation characteristics
(operation speed 6 degrees/second)
• Operation angle (output: $V_{OL} \rightarrow V_{OH}$): 25 to 60 degrees
• Return angle (output: $V_{OH} \rightarrow V_{OL}$): Min. 20 degrees




2) Output ($V_O$) characteristics (The sphere must be stationary.)
• $V_{OL}$ (photo transistor ON): Max. 1.0 V (horizontal)
• $V_{OH}$ (photo transistor OFF): Min. 4.0 V (inclined at an angle of at least 60 degrees)

# SPECIFICATIONS

| Item | Specificaitons |
|---|---|
| Electrical and mechanical life | Min. $10^5$ (using the applicable circuit)<br>At 6 cpm; Opening and closing position: 0 deg. ↔ 90 deg. (The internal shpere must be stationary for at least 500 ms at angles of 0 and 90 deg. respectively.) |
| Vibration resistance | 10 to 400 Hz acceleration 2.9 m/s² applied for 7 days |
| | 5 to 10 Hz at single amplitude of 5 mm, $5\times10^5$ cycles |
| Shock resistance | 588 m/s² applied 3 times in each of 6 directions |
| Terminal strength | Min. 9.8 N (each direction) |
| Dropping individual part | Three times from height of 100 cm |
| High temperature, high humidity storage ability | Leave for 500 hours at 85°C and 85% RH<br>(no freezing at low temperature) |
| High temperature storage ability | Leave for 500 hours at 85°C |
| Low temperature storage ability | Leave for 500 hours at –25°C (no freezing at low temperature) |
| Shock and heat resistance | Subject to 100 cycles each consisting of 30 minutes at –25°C and 30 minutes at 85°C. |
| Resistance to hydrogen sulfide | Leave for 500 hours in an atmosphere containing 3 ppm of hydrogen sulfide at 40°C and 75% RH. |
| Resistance to sulfur dioxide gas | Leave for 500 hours in an atmosphere containing 10 ppm of sulfur dioxide at 40°C and 95% RH |
| Resistance to ammonia gas | Leave for 96 hours in an atmosphere containing 3% of ammonia gas at normal temperature and humidity. |
| Resistance to dust | Mix with 2 kg/m³ talcum powder or fly ash and leave to stand for 8 hours |
| Ambient temperature | –20 to +80°C (no freezing nor condensation at low temperature) |

Remarks:
1.Without any indications, specifications are measured at following conditions
• Temperature: 15 to 35°C
• Humidity: 25 to 85% RH
• Atmospheric pressure: 86 to 106 kpa.
2.The evaluation criteria for performance are as follows:
Basic characteristics – $T_a$ = 25°C and applicable circuit conditions
1) Operation characteristics (operation speed 6 degrees/s)
• Operation angle (output: $V_{OL} \rightarrow V_{OH}$): 25 to 60 degrees
• Return angle (output: $V_{OH} \rightarrow V_{OL}$): 20 degrees min.
2) Output ($V_O$) characteristics (The sphere must be stationary.)
• $V_{OL}$ (photo transistor ON): 1.2 V max. (horizontal)
• $V_{OH}$ (photo transistor OFF): 3.8 V min. (inclined at an angle of at least 60 degrees)

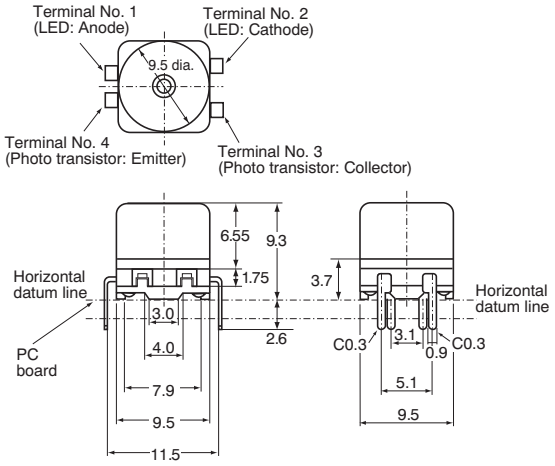
# DIMENSIONS

Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

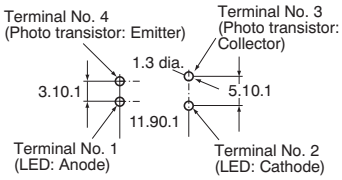
• Horizontal mounting type (AHF22)

mm

**CAD Data**

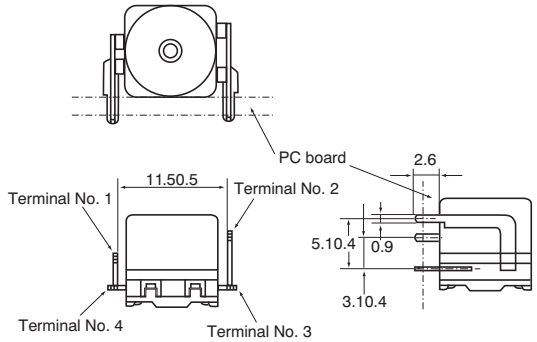



PC board pattern (bottom view)

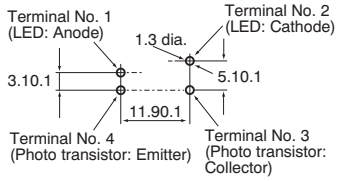



• Vertical mounting type (AHF23)

**CAD Data**

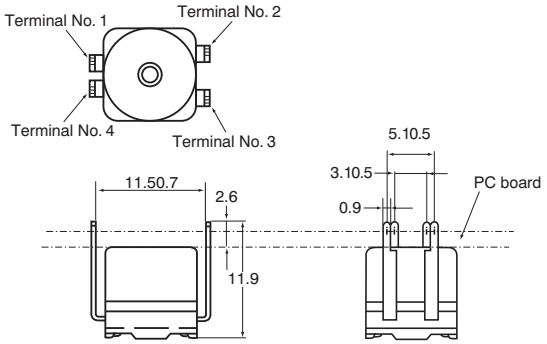



PC board pattern (bottom view)

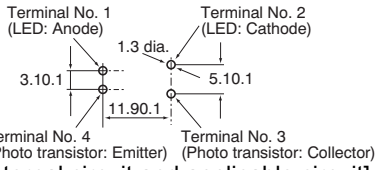


• Reverse mounting type (AHF23) mm

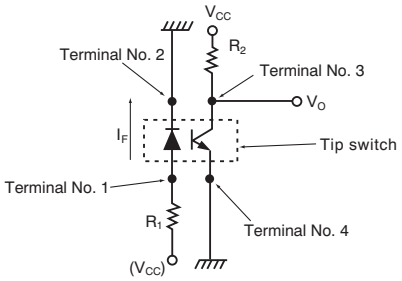
**CAD Data**




PC board pattern (bottom view)




[Internal circuit and applicable circuit]




# NOTES

**1. Handling**

1) In the enent that a voltage or current that exceeds the maximum rating is applied to, or passed between the terminals, the photo-transistor will no longer function normally. In such a case, do not reuse the photo-transistor but discard it.

2) Be careful not to apply an excessively large load to the terminals because this may damage the photo-transistor.

**2. Soldering**

1) When soldering by hand, use a 18W soldering iron that has a temperature regulator (iron tip temperature must be no more than 350°C) and apply the tip to the joint for no more than 3 seconds.

2) When performing automatic soldering, ensure that the board does not remain in the solder bath for more than 10 seconds at 260°C, or more than 3 seconds at 350°C.

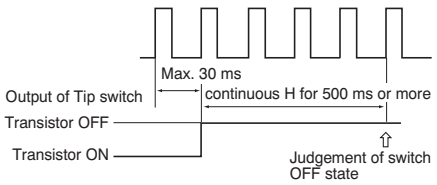
3) Be careful not to move the terminals for one minute after soldering them.

**3. Environment**

This product is a non-contact type tip detection switch containing a photo-interrupter. It is intended for installation in equipment. Because of the nature of a semiconductor, if this product is used continuously for a long period in a high temperature, low temperature and/or humid environment, according to the optic quantities decrease of luminescent diode output characteristics may be significantly affected. In such a case, take suitable measures, such as inserting a comparator at the output side, to provide a greater degree of margin with respect to change in the output characteristics, and thereby improve the reliability of the product.

**4. Preventing a malfunction**

1) The tip sensor uses an internal sphere, hence chattering occurs if it is subjected to vibration or shock. To prevent chattering, continuously read pulses of 30 ms max. using a microprocessor, and set the microprocessor so that the switch goes L (ON) or H (OFF) if the output level exceeds 500 ms continuously. Also, take steps to keep induction and RF noise away from the sensor.




2) The switch should be mounted keeping away from the vibration generator such as motor. Fix the PC board firmly in order to prevent resonance with the vibration generator, or the contact chattering of a switch may occur by the movement of a ball inside. The allowable vibration level which the chattering does not occur would be less than 2.94m/s² {0.3G} at 10 to 260Hz and 320 to 400Hz. The range 260 to 320Hz may have a resonance point and the level should be less than 0.98m/s² {0.1G}.

**5. Others**

1) Depending on the circuitry and the environmental conditions, solder migration may occur and short a circuit. Please confirm that the insulation distance is large enough in the actual application.

2) To prevent a malfunction, the switch should be kept away from the direct sunlight and any other light sources.

3) The noises caused by electrostatics, surge voltage and inductives may break the photo-interruptor.

4) The reflow soldering and cleaning are not allowed.

5) The switch should be mounted with the tolerance ±3 degree.

**6. Confirmations in the actual use.**

Each items in this spec sheet was tested and confirmed independently at a certain duration. To get a higher reliability of the equipment, please confirm the switch quality with the actual load and environmental conditions before using.

# Technical Terminology & Cautions for Use



## TECHNICAL TERMINOLOGY

**1. Rated values**
Values indicating the characteristics and performance guarantee standards of the snap-action switches. The rated current and rated voltage, for instance, assume specific conditions (type of load, current, voltage, frequency, etc.).

**2. Mechanical life**
The service life when operated at a preset operating frequency without passing electricity through the contacts. (The life test is performed at a switching frequency of 60 times/minute and operating speed of 100 mm/second at the regular cam.)

**3. Electrical life**
The service life when the rated load is connected to the contact and switching operations are performed. (The life test is performed at a switching frequency of 20 times/minute and operating speed of 100 mm/second at the regular cam.)

**4. Contact form**
This refers to the components determining the type of application which make up the electrical input/output circuits in the contact.

| | |
|---|---|
| Switching type | COM — NC / NO |
| Normally closed type | COM — NC |
| Normally open type | COM — NO |

Terminal symbols
COM: Common terminal
NC: Normally closed terminal
NO: Normally open terminal

**5. Insulation resistance**
Resistance between noncontinuous terminals, terminals and metal parts not carrying current, and between terminals and the ground.

**6. Withstand voltage**
Threshold limit value that a high voltage can be applied to a predetermined measuring location for one minute without causing damage to the insulation.

**7. Contact resistance**
This indicates the electrical resistance at the contact part. Generally, this resistance includes the conductor resistance of the spring and terminal portions.

**8. Vibration resistance**
Malfunction vibration ... Vibration range where a closed contact does not open for longer than a specified time due to vibrations during use of the snap-action switches.

**9. Shock resistance**
Shock durability ... Shock range where the mechanical shocks received during snap-action switches transport and installation do not damage the parts or harm the operating characteristics.
Malfunction shock ... Shock range where a closed contact does not open for longer than a specified time due to shocks during use of the snap-action switches.

**10. Operating Force (O.F.)**
The force required to cause contact snap-action. It is expressed terms of force applied to the plunger or the actuator.

**11. Release Force (R.F.)**
The force to be applied to the plunger or the actuator at the moment contact snaps back from operated position to unoperated position.

**12. Pretravel (P.T.)**
Distance of the plunger or the actuator movement from free position to operating position.

**13. Overtravel (O.T.)**
The distance which the plunger or the actuator is permitted to travel after actuation without any damage to the switching mechanism.

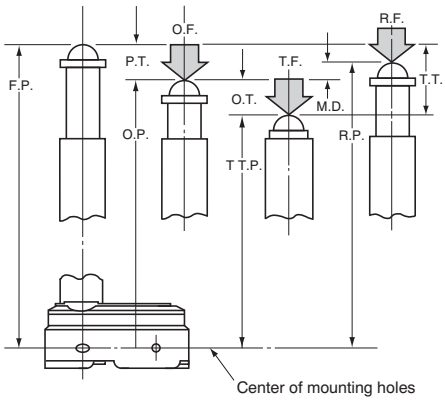
**14. Movement Differential (M.D.)**
The distance from operating to release position of the plunger or the actuator.

**15. Operating Position (O.P.)**
The position of the plunger or the actuator when the traveling contacts snaps with the fixed contact.

**16. Free Position (F.P.)**
Position of the switch plunger or the actuator when no force is applied to.

**17. Overtravel Position (O.T.P.)**
The stopping position of the plunger or the actuator after total travel.

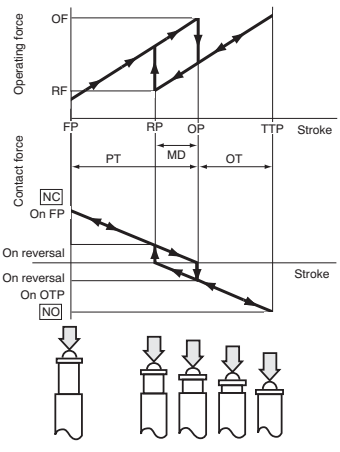
**18. Release Position (R.P.)**
The position of the plunger or the actuator when the traveling contact snaps back from operating position to its original position.
The following terminologies are applied to all our switches.




## CAUTIONS FOR USE

### ■ Technical Notes on Mechanical Characteristics

**1. Actuation Force and Stroke**
Adequate stroke setting is the key to high reliability. It is also important that adequate contact force be 'maintained to ensure high reliability. For a normally closed circuit, the driving mechanism should be set so that the actuator is normally in the free position. For a normally open circuit, the actuator should be pressed to 70% to 100% of the specified stroke to absorb possible errors.
If the stroke is set too close to the operating point (O.P.), this may cause unstable contact, and in the worst case may cause actuator damage due to inertia of the drive mechanism. It is advisable that the stroke be adjusted with the mounting plate or driving mechanism. The figure at right shows a typical example of activation and contact forces varying with stroke. In the vicinity of the O.P. and R.P., the contact force is diminished, causing chatter and contact bounce immediately before or after reversal. For this reason, use the switch while giving due consideration to this. This also causes the snap action switch to be sensitive to vibration or physical impact.



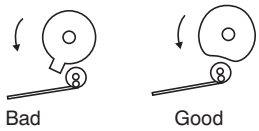
# TECHNICAL TERMINOLOGY & CAUTIONS FOR USE

**2. Changes in Operation Characteristics**
Exercise design care so that malfunctions will not occur if the snap action switch characteristics vary by as much as 20% from, rated values.

**3. Mechanical Conditions for Type Selection**
Actuator type should be selected according to activation method, activation speed, activation rate, and activation frequency.
1) An extremely slow activation speed may cause unstable contact transfer, possibly resulting in contact failures or contact fusion.
2) An extremely high activation speed may cause damage to contacts or contact response failure.

**4. Driving Mechanism**
Use of a driving mechanism which will cause physical impact to the actuator should be avoided.

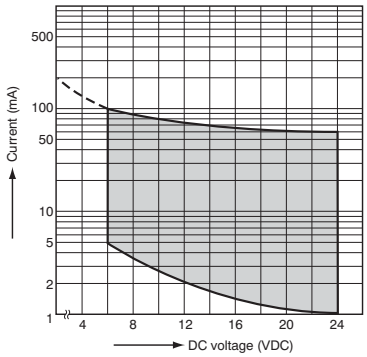
<Example>




## ■ Technical Notes on Electrical Characteristics

**1.** The snap-action switch is designed for AC operations. While it has small contact gaps and no arc absorber, it may be used for low-capacity DC operations. (However, a DC magnetic blow-out switch is available in the NZ Basic switches.)
**2.** For applications with very small switching voltage or current, choose the dry circuit type.

Small current and voltage Application Range (Dry Circuit type)

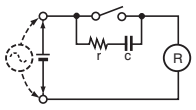
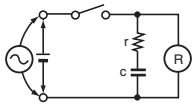
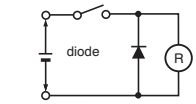
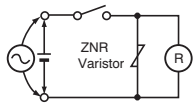



**3.** Application to Electronic Circuits
1) The snap-action switch contacts can sustain bounce or chatter when closed. Bounce or chatter can cause noise or pulse count errors when the snap action switch is used in electronic circuits.
2) If contact bounce or chatter poses problems in the vicinity of the O.P. and R.P., use a suitable absorption network, such as a C/R network.
**4.** Check the surge current, normal current and surge duration.
**5.** Contact resistance given in performance specifications is measured with a voltage drop method using 6 to 8 V DC, 1 A (except for low-level load type). Contact resistance across COM and NC terminals is measured in the open position, while contact resistance across COM and NO terminals is measured in the closed position.

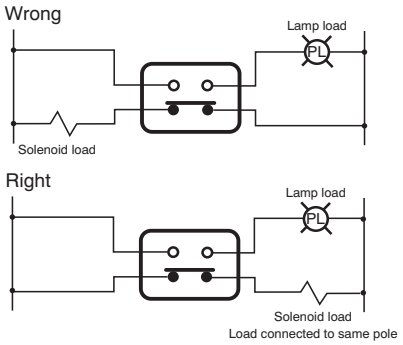
**6.** Ratings are measured under the following conditions:
Inductive load:
Power factor = 0.6 to 0.7
Time constant = 7 ms or less (DC)
**7.** To prevent contact fusion failure, be sure to use a serial resistance for each capacitive load.
**8.** If snap action switch operation is synchronized with the AC supply phase, this may cause: shortened electrical life, contact fusion failure, contact transfer, or other reliability problems.

## ■ Cautions in a circuit

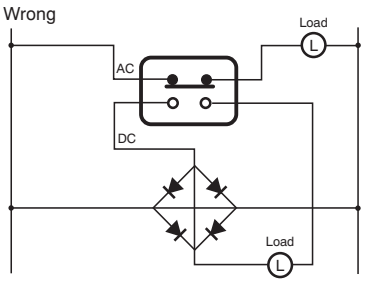
**1.** Contact protection is recommended when snap-action switches are used in an inductive load circuit. (except for NZ Basic Switches magnetic blow-out types for DC)

| Circuit diagram | Notes |
|---|---|
|   | 1. r = more than 10 ohms<br>2. In an AC circuit. Impedance of L is to be slightly smaller than impedance of r and c. |
|   | Can be used for both AC and DC circuits. Impedance of r is nearly equal to impedance of L. C: 0.1 F |
|   | For DC circuits only. |
|   | Can be used for both AC and DC circuits. |

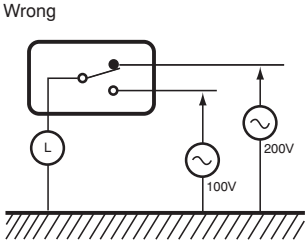
**2.** Do not connect the contacts on individual switches to different type or different poles of the power supply.
**Examples of power supply connections (connection to different poles)**




**Example of wrong power supply connection (connection to different poles of power supply)**
This may lead to mixed DC and AC.




**3.** Avoid circuits which apply voltage between contacts. (This may lead to mixed deposition.)



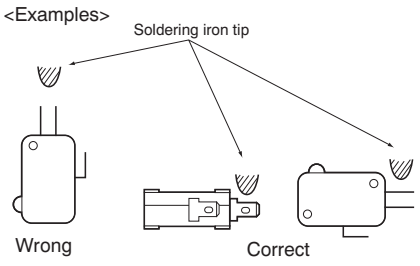
## ■ Mounting state and environment

**1. Checking the insulation distance**
After mounting and wiring, check the insulation distance between terminals and the ground. If the insulation distance is inadequate, mount insulating material between as required.

**2. Fastening the snap-action switch body**
See the Section “NOTES” for the individual switch.

**3. Position adjustment with effector**
The effector should be positioned so that direct force is not applied to the push-button or actuator in its free position. The operating force to the push-button should only be applied in a perpendicular direction.

**4. Soldering precautions**
1) For manual soldering, lay the terminals flat (horizontal with the ground) and quickly perform the soldering operation using a soldering iron with the appropriate heat capacity and the proper amount of solder. Take care that the flux does not flow into the switch interior by using a ventilation fan to discharge flux gas and to prevent contact of the switch body with the soldering iron tip. Be careful not to apply force to the lead wires or the terminal portions immediately after soldering.
The temperature setting and time conditions vary depending on the product. See the Section “NOTES” for each product.
2) For automatic soldering also, see the Section “NOTES” for each product.

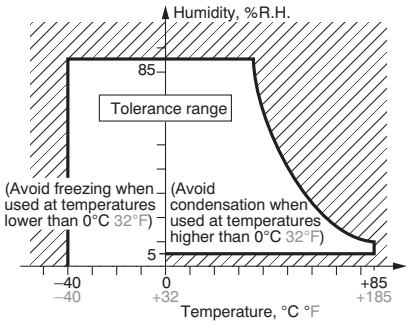



**5. Avoid using in a silicon atmosphere**
Avoid using organic silicon rubber, adhesives, sealing compounds, oil, grease, and wires in a silicon atmosphere.

**6. Please consult us when using under the following conditions:**
1) Environments where hydrogen sulfide or other corrosive gases are present.
2) Environments where gasoline, thinner or other flammable, explosive gases are present.
3) Dusty environments (for non-seal type snap action switches).
4) The perpendicular operating speed exceeds the allowable operating speed.
5) Switching between different poles.
6) Use in environments not in the prescribed temperature or humidity range.

**7. Storage precautions**
To prevent discoloration due to sulfurization of the terminals (silver-plated), store the switches in a polyethylene bag or other suitable airtight container.

**8. Usage, storage, and transport conditions**
1) During usage, storage, or transportation, avoid locations subject to direct sunlight and maintain normal temperature, humidity, and pressure conditions. The allowable specifications for environments suitable for usage, storage, and transportation are given below.
• Temperature: The allowable temperature range differs for each switch, so refer to the switch’s individual specifications. In addition, when transporting or storing switches while they are tube packaged, there are cases when the temperature may differ from the allowable range. In this situation, be sure to consult the individual specifications.
• Humidity: 5 to 85% R.H.




• Pressure: 86 to 106 kPa
The humidity range varies with the temperature. Use within the range indicated in the graph below.
2) Condensation
Condensation forms when there is a sudden change in temperature under high temperature, high humidity conditions Condensation will cause deterioration of the switch insulation.
3) Freezing
Condensation or other moisture may freeze on the switch when the temperatures is lower than 0°C 32°F. This causes problems such as sticking of movable parts or operational time lags.
4) Low temperature, low humidity environments
The plastic becomes brittle if the switch is exposed to a low temperature, low humidity environment for long periods of time.
5) Storage for extended periods of time (including transportation periods) at high temperatures or high humidity levels or in atmospheres with organic gases or sulfide gases may cause a sulfide film or oxide film to form on the surfaces of the contacts and/or it may interfere with the functions. Check out the atmosphere in which the units are to be stored and transported.
6) In terms of the packing format used, make every effort to keep the effects of moisture, organic gases and sulfide gases to the absolute minimum.

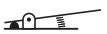
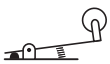
**9. We reserve the right to modify without notice the materials, internal components, and other parts to improve product quality.**

**10. Handling precautions**
When handling the switches, be careful not to drop them on the floor since this may damage them.
For items 5. and 6., select contact sulfurization (clipping) prevention products (FS and Au clad 2-layer contacts) for use with extremely small loads or an environment-resistant Turquoise switch.

**11. Others**
1) Failure modes of switches include short-circuiting, open-circuiting and temperature rises. If this switch is to be used in equipment where safety is a prime consideration, examine the possible effects of these failures on the equipment concerned, and ensure safety by providing protection circuits or protection devices. In terms of the systems involved, make provision for redundancy in the design and take steps to achieve safety design.
2) The ambient operating temperature (and humidity) range quoted is the range in which the switch can be operated on a continuous basis: it does not mean that using the switch within the rating guarantees the durability performance and environment withstanding performance of the switch. For details on the performance guarantee, check the specifications of each product concerned.

# TECHNICAL TERMINOLOGY & CAUTIONS FOR USE

## ■ Types of actuators

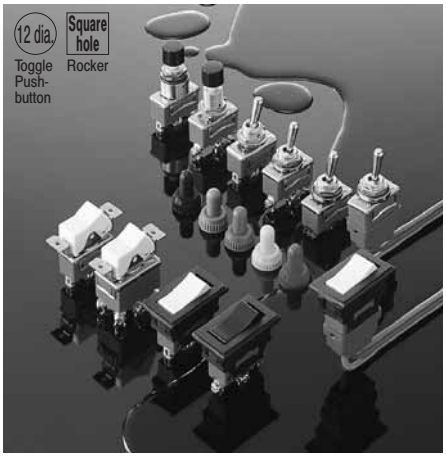
| Shape | Class. | Pretravel (P.T.) | Overtravel (O. T.) | Operating Force (O. F.) | Vibration Shock | Features | |
|---|---|---|---|---|---|---|---|
|  | Pin plunger | Small | Small | Large | Out-standing | Appropriate for linear short-stroke action. Pin plunger acts directly on snap action mechanism, enabling high-precision positioning. Amount of movement after operation is smallest among all of the actuators, however, so reliable stopper is required. | |
|  | Spring small plunger | Small | Medium | Large | Excellent | Used in much the same way as the pin plunger, but is easier to use because the amount of movement after operation is larger. | |
|  | Spring short plunger | Small | Medium | Large | Good | Pin plunger is short, with large plunger diameter that makes centering easier. Like small spring plunger, amount of movement after operation is large. | |
|  | Panel attachment plunger | Small | Large | Large | Good | Secured to panel with hex or lock nut; used as manual or mechanical plunger. Amount of movement after operation is extremely large and operation point can be adjusted by changing attachment position. Can be used in combination with low-speed cam. | |
|  | Panel attachment roller plunger | Small | Large | Large | Possible | This is the panel attachment type with a roller, and can be used with fast-moving cams and dogs.. | |
|  | Hinge lever | Large | Medium | Small | Possible | Little force required for operation. Appropriate for use with low-speed cams and dogs; has large stroke.<br>Lever available in various shapes to fit operating unit. | |
|  | Simulated roller lever | Large | Medium | Small | Possible | Tip of hinge lever is bent into a semi-circle, enabling use as a simple roller type. | |
|  | Leaf lever | Large | Large | Small | Excellent | Play in lever is used to assure maximum stroke. Construction provides for space where lever is attached, for outstanding resistance to freezing. | |
|  | Hinge roller lever | Large | Medium | Small | Possible | This is a hinge lever with a roller, and can be used with high-speed cams and dogs.<br>The force required for pin plunger action is lighter than that of the lever, and the stroke is longer. | |
|  | One way action hinge roller lever | Medium | Medium | Medium | Possible | This is hinge roller lever type, and can operate in relation to an operating unit from a one way direction, but the roller is bent from the opposite direction and cannot move.<br>This can be used to prevent reverse-direction action. | |
|  | Leaf spring | Medium | Medium | Medium | Good | This has a leaf spring with offset yield force and has a large stroke. Ideal for driving low-speed cams and cylinders. Fulcrum is fixed for high precision. To prevent leaf damage, movement after operation must be within specified value. | |
|  | Roller leaf spring | Medium | Medium | Medium | Good | This is a leaf spring with a roller, and can be used with high-speed cams. | |
|  | (O.C. reversed action groove type) Reverse-action hinge lever | Large | Small | Medium | Excellent | This is used for low-speed, low-torque cams. The lever comes in various shapes to fit the operating body. | The plunger is constantly pressed down by a coiled spring, and operating the lever induces reverse action. Because the plunger is depressed when not engaged, vibration and shock resistance are excellent. Pressing the plunger too far does not cause abnormal force to be applied to the switch mechanism, so a stable service life is assured. |
|  | (O.C. reversed action groove type) Reverse-action hinge roller lever | Medium | Medium | Medium | Excellent | This is a reverse-action hinge lever with a roller and is appropriate for cam operation. Excellent resistance to vibration and impact when not engaged. | |
|  | (O.C. reversed action groove type) Reverse-action hinge roller short lever | Small | Medium | Large | Excellent | This is a shorter version of the reverse-action hinge lever with a roller and has a larger action force, but is appropriate for cam operation with a short stroke. Excellent resistance to vibration and impact when not engaged. | |
|  | Rotating-action type | Large | Large | Small | Possible | This is a rotating, light-action type that is ideal for detecting paper, coins, and similar objects. | |

# Operation Switches

Panasonic
ideas for life

**15A HIGH SNAP SWITCHES TOGGLE, ROCKER AND PUSH-BUTTON TYPES**

# T-15 SERIES SWITCHES




## FEATURES

**1. Series now includes rocker and push-button switches.**

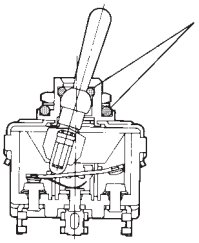
Based on the well-established T-15 Series switch, the mechanism is kept as is and a rocker type and push-button type have been added to the series. (Note that the push-button type is rated at 10 A.)

**2. Sealed type added for use in different environments.**

Packing is used where parts join and an O-ring is used to seal moving parts. New to the series, this type can be used in harsh environments such as those with water, oil, dust, and gas.

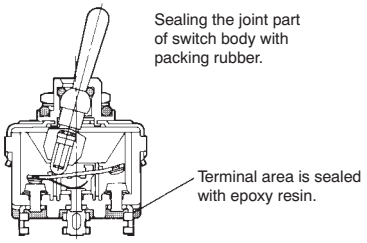
• Panel-sealed type

Entry of water, oil, dust and gas from the front of the panel is prevented.
(Panel front: IP67*; Inside of panel: IP40)



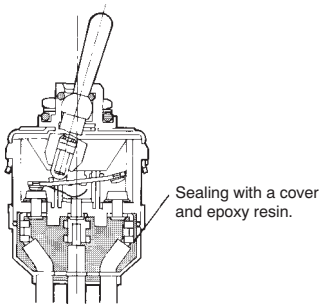

• Terminal-sealed type

Both switch body and terminals have been sealed to protect from dust and gas that enters from the panel.
(panel front: IP67*; inside of panel: IP60)




• Wire lead type

Furthermore, a cover is provided for the terminals to keep out water and oil that enters from the panel.
(panel front: IP67*; inside of panel: IP67)




Remark: The asterisk in "Panel front: IP67*" means this only applies to toggle and push-button types.
The panel surface for the rocker type is IP64.
Please see NOTES 1 and 2 regarding use of the sealed type.

**3. Rubber cap also available in silicon type for excellent weather resistance.**

• 5 colors available so you can distinguish switches by purpose.

<Example>
Black: For main power supply
Gray: For setting and switching
Red: For resetting

• With a usable ambient temperature range of –25°C to +85°C, use is possible in environments that require resistance against heat and cold.

## ASSORTMENT

| Kind of actuator | Standard type | Sealed type | | | Number of pole | | | | Shape of terminal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Panel-sealed type | Terminal-sealed type | Wire leads type | 1P | 2P | 3P | 4P | Solder terminal | Screw terminal | .250 Quick-connect terminal | Wire lead |
| Toggle type | Available | Available | Available | Available | Available | Available | Available*1 | Available*1 | Available | Available | Available*1 | Available*2 |
| Rocker type | Available | Available | Available | Available | Available | Available | — | — | Available | Available | — | Available*2 |
| Push-button type | Available | Available | — | — | Available | Available | — | — | Available | Available | — | — |

Remarks: *1: Only standard type
*2: Only wire leads type

# TOGGLE PRODUCT TYPES

**1. Standard type**

1) Solder terminal and .250 Quick-connect terminal

| Number of poles | Kind of operation<br>< >: Momentary position | Solder terminal | .250 Quick-connect terminal |
|---|---|---|---|
| | | Product no. | Product no. |
| 1-pole | ON-OFF | T115A-F | T115A-AF |
| | ON-ON | T115D-F | T115D-AF |
| | ON-OFF-ON | T115E-F | T115E-AF |
| | ON-<ON> | T115F-F | T115F-AF |
| | <ON>-OFF-<ON> | T115G-F | T115G-AF |
| | ON-OFF-<ON> | T115H-F | T115H-AF |
| 2-pole | ON-OFF | T215K-F | T215K-AF |
| | ON-ON | T215N-F | T215N-AF |
| | ON-OFF-ON | T215P-F | T215P-AF |
| | ON-<ON> | T215R-F | T215R-AF |
| | <ON>-OFF-<ON> | T215S-F | T215S-AF |
| | ON-OFF-<ON> | T215T-F | T215T-AF |
| 3-pole | ON-OFF | T315K-F | T315K-AF |
| | ON-ON | T315N-F | T315N-AF |
| | ON-OFF-ON | T315P-F | T315P-AF |
| 4-pole | ON-OFF | T415K-F | T415K-AF |
| | ON-ON | T415N-F | T415N-AF |
| | ON-OFF-ON | T415P-F | T415P-AF |

2) Screw terminal

| Number of poles | Kind of operation<br>< >: Momentary position | Screw terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | T115A-SF |
| | ON-ON | T115D-SF |
| | ON-OFF-ON | T115E-SF |
| | ON-<ON> | T115F-SF |
| | <ON>-OFF-<ON> | T115G-SF |
| | ON-OFF-<ON> | T115H-SF |
| 2-pole | ON-OFF | T215K-SF |
| | ON-ON | T215N-SF |
| | ON-OFF-ON | T215P-SF |
| | ON-<ON> | T215R-SF |
| | <ON>-OFF-<ON> | T215S-SF |
| | ON-OFF-<ON> | T215T-SF |
| 3-pole | ON-OFF | T315K-SF |
| | ON-ON | T315N-SF |
| | ON-OFF-ON | T315P-SF |
| 4-pole | ON-OFF | T415K-SF |
| | ON-ON | T415N-SF |
| | ON-OFF-ON | T415P-SF |

Remarks: 1. Standard installation accessories are included with the product.
2. For UL/C-UL certified products, please add “UL” before “F” at the end of part number when ordering.

**2. Panel-sealed type**

1) Solder terminal

| Number of poles | Kind of operation<br>< >: Momentary position | Solder terminal<br>Product no. |
|---|---|---|
| 1-pole | ON-OFF | TP115A-F |
| | ON-ON | TP115D-F |
| | ON-OFF-ON | TP115E-F |
| | ON-<ON> | TP115F-F |
| | <ON>-OFF-<ON> | TP115G-F |
| | ON-OFF-<ON> | TP115H-F |
| 2-pole | ON-OFF | TP215K-F |
| | ON-ON | TP215N-F |
| | ON-OFF-ON | TP215P-F |
| | ON-<ON> | TP215R-F |
| | <ON>-OFF-<ON> | TP215S-F |
| | ON-OFF-<ON> | TP215T-F |

2) Screw terminal

| Number of poles | Kind of operation<br>< >: Momentary position | Screw terminal<br>Product no. |
|---|---|---|
| 1-pole | ON-OFF | TP115A-SF |
| | ON-ON | TP115D-SF |
| | ON-OFF-ON | TP115E-SF |
| | ON-<ON> | TP115F-SF |
| | <ON>-OFF-<ON> | TP115G-SF |
| | ON-OFF-<ON> | TP115H-SF |
| 2-pole | ON-OFF | TP215K-SF |
| | ON-ON | TP215N-SF |
| | ON-OFF-ON | TP215P-SF |
| | ON-<ON> | TP215R-SF |
| | <ON>-OFF-<ON> | TP215S-SF |
| | ON-OFF-<ON> | TP215T-SF |

Remarks: 1. Of the standard installation accessories that come with the product, the front hex nut and lock washer are included.
2. For UL/C-UL certified products, please add “UL” before “F” at the end of part number when ordering.

**3. Terminal-sealed type**

1) Solder terminal

| Number of poles | Kind of operation<br>< >: Momentary position | Solder terminal<br>Product no. |
|---|---|---|
| 1-pole | ON-OFF | TD115A-F |
| | ON-ON | TD115D-F |
| | ON-OFF-ON | TD115E-F |
| | ON-<ON> | TD115F-F |
| | <ON>-OFF-<ON> | TD115G-F |
| | ON-OFF-<ON> | TD115H-F |
| 2-pole | ON-OFF | TD215K-F |
| | ON-ON | TD215N-F |
| | ON-OFF-ON | TD215P-F |
| | ON-<ON> | TD215R-F |
| | <ON>-OFF-<ON> | TD215S-F |
| | ON-OFF-<ON> | TD215T-F |

Remarks: 1. Of the standard installation accessories that come with the product, the front hex nut and lock washer are included.
2. For UL/C-UL certified products, please add “UL” before “F” at the end of part number when ordering.

2) Screw terminal

| Number of poles | Kind of operation<br>< >: Momentary position | Screw terminal<br>Product no. |
|---|---|---|
| 1-pole | ON-OFF | TD115A-SF |
| | ON-ON | TD115D-SF |
| | ON-OFF-ON | TD115E-SF |
| | ON-<ON> | TD115F-SF |
| | <ON>-OFF-<ON> | TD115G-SF |
| | ON-OFF-<ON> | TD115H-SF |
| 2-pole | ON-OFF | TD215K-SF |
| | ON-ON | TD215N-SF |
| | ON-OFF-ON | TD215P-SF |
| | ON-<ON> | TD215R-SF |
| | <ON>-OFF-<ON> | TD215S-SF |
| | ON-OFF-<ON> | TD215T-SF |

Remarks: 1. Of the standard installation accessories that come with the product, the front hex nut and lock washer are included.
2. For UL/C-UL certified products, please add “UL” before “F” at the end of part number when ordering.

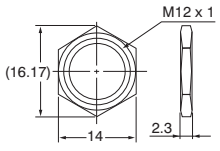
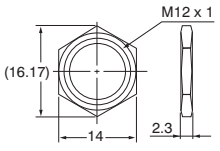
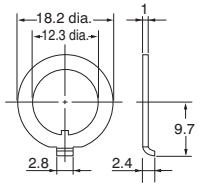
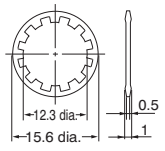
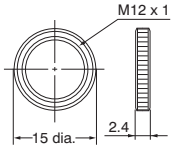
### 4. Wire lead type

| Number of poles | Kind of operation<br>< >: Momentary position | Wire lead type<br>Product no. |
|---|---|---|
| 1-pole | ON-OFF | TC115A-F |
| | ON-ON | TC115D-F |
| | ON-OFF-ON | TC115E-F |
| | ON-<ON> | TC115F-F |
| | <ON>-OFF-<ON> | TC115G-F |
| | ON-OFF-<ON> | TC115H-F |
| 2-pole | ON-OFF | TC215K-F |
| | ON-ON | TC215N-F |
| | ON-OFF-ON | TC215P-F |
| | ON-<ON> | TC215R-F |
| | <ON>-OFF-<ON> | TC215S-F |
| | ON-OFF-<ON> | TC215T-F |

Remarks: 1. Standard installation accessories are included with the product.
2. 600 V vinyl wire (VSF, thick: 2 mm², length: 200 mm) is used. Please inquire about type and different length of lead wire.

### 5. Accessories

1) Installation accessories (repair parts)

| Product name | Standard installation accessories | | | | Optional installation accessories |
|---|---|---|---|---|---|
| | Front hex nut<br>(nickel plated) | Back hex nut<br>(uni-chrome plated) | Keying washer | Lock washer | Front Knurl nut<br>(nickel plated) |
| Dimensions<br>(mm) |  |  |  |  |  |
| Part no. | AJ3081 | AJ3082 | AJ3083 | AJ3084 | AJ3080 |

Remark: A selling unit of each accessory is 10 pieces.

**• Using the different rubber caps**

We recommend silicon rubber and EP rubber caps for the following applications.

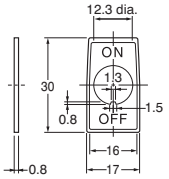
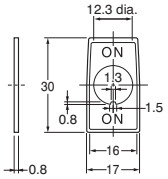
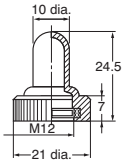
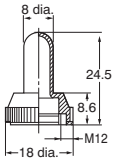
**1) Silicon rubber caps**

- When it is necessary to differentiate by color.
- When using in applications that require resistance to heat and cold. Ambient temperature: –25°C to +85°C (EP rubber type is 0°C to +40°C.)
- When compactness is required.

**2) EP rubber type**

When cost is the primary consideration.

2) Accessories (option)

| Product name | Indication plate (aluminum)*3 | | Rubber cap*1, 2, 4 | |
|---|---|---|---|---|
| | ON-OFF | ON-ON | EP rubber type | Silicone rubber type |
| Dimensions (mm) |  |  |  |  |
| Part no. | WD1901 | WD1902 | WD1911 | WD1811* |

Remarks: 1. The asterisk in the part number WD1811* for the silicon rubber type rubber cap is where the letter representing the color should be inserted. (standard models: B: black; R: red; Z: gray, Y: yellow; G: green.)
2. EP rubber cap is available in black only.
3. Letters on the display panel are aluminum colored and the area surrounding the letters is black.
4. Indication plate and rubber caps are compatible with the T-15 series switch, T-10 series switch, and T-03/T-06 series switches when plate thickness is 2.7 mm or less).

# ROCKER PRODUCT TYPES

**1. Standard type**

1) Solder terminal, without indication on actuator

| Number of poles | Kind of operation < >: Momentary position | Solder terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TR115A-∗F |
| | ON-ON | TR115D-∗F |
| | ON-OFF-ON | TR115E-∗F |
| | ON-<ON> | TR115F-∗F |
| | <ON>-OFF-<ON> | TR115G-∗F |
| | ON-OFF-<ON> | TR115H-∗F |
| 2-pole | ON-OFF | TR215K-∗F |
| | ON-ON | TR215N-∗F |
| | ON-OFF-ON | TR215P-∗F |
| | ON-<ON> | TR215R-∗F |
| | <ON>-OFF-<ON> | TR215S-∗F |
| | ON-OFF-<ON> | TR215T-∗F |

2) Screw terminal, without indication on actuator

| Number of poles | Kind of operation < >: Momentary position | Screw terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TR115A-S∗F |
| | ON-ON | TR115D-S∗F |
| | ON-OFF-ON | TR115E-S∗F |
| | ON-<ON> | TR115F-S∗F |
| | <ON>-OFF-<ON> | TR115G-S∗F |
| | ON-OFF-<ON> | TR115H-S∗F |
| 2-pole | ON-OFF | TR215K-S∗F |
| | ON-ON | TR215N-S∗F |
| | ON-OFF-ON | TR215P-S∗F |
| | ON-<ON> | TR215R-S∗F |
| | <ON>-OFF-<ON> | TR215S-S∗F |
| | ON-OFF-<ON> | TR215T-S∗F |

3) Solder terminal, with ON-OFF indication on actuator

| Number of poles | Kind of operation < >: Momentary position | Solder terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TR115A-∗F |
| 2-pole | ON-OFF | TR215K-∗F |

Remarks: 1. Please specify the actuator color by replacing the asterisk in the product number with appropriate letter. (B: black; W: white; R: red; Z: dark gray)
2. For UL/C-UL certified products, please add “UL” before “F” at the end of part number when ordering.

4) Screw terminal, with ON-OFF indication on actuator

| Number of poles | Kind of operation<br>< >: Momentary position | Screw terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TR115A-S∗F |
| 2-pole | ON-OFF | TR215K-S∗F |

Remarks: 1. Please specify the actuator color by replacing the asterisk in the product number with appropriate letter. (B: black; W: white; R: red; Z: dark gray)
2. For UL/C-UL certified products, please add “UL” before “F” at the end of part number when ordering.

**2. Panel-sealed type**

1) Solder terminal, without indication on actuator

| Number of poles | Kind of operation<br>< >: Momentary position | Solder terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TRP115A-∗F |
| | ON-ON | TRP115D-∗F |
| | ON-OFF-ON | TRP115E-∗F |
| | ON-<ON> | TRP115F-∗F |
| | <ON>-OFF-<ON> | TRP115G-∗F |
| | ON-OFF-<ON> | TRP115H-∗F |
| 2-pole | ON-OFF | TRP215K-∗F |
| | ON-ON | TRP215N-∗F |
| | ON-OFF-ON | TRP215P-∗F |
| | ON-<ON> | TRP215R-∗F |
| | <ON>-OFF-<ON> | TRP215S-∗F |
| | ON-OFF-<ON> | TRP215T-∗F |

2) Screw terminal, without indication on actuator

| Number of poles | Kind of operation<br>< >: Momentary position | Screw terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TRP115A-S∗F |
| | ON-ON | TRP115D-S∗F |
| | ON-OFF-ON | TRP115E-S∗F |
| | ON-<ON> | TRP115F-S∗F |
| | <ON>-OFF-<ON> | TRP115G-S∗F |
| | ON-OFF-<ON> | TRP115H-S∗F |
| 2-pole | ON-OFF | TRP215K-S∗F |
| | ON-ON | TRP215N-S∗F |
| | ON-OFF-ON | TRP215P-S∗F |
| | ON-<ON> | TRP215R-S∗F |
| | <ON>-OFF-<ON> | TRP215S-S∗F |
| | ON-OFF-<ON> | TRP215T-S∗F |

3) Solder terminal, with ON-OFF indication on actuator

| Number of poles | Kind of operation<br>< >: Momentary position | Solder terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TRP115A-∗1F |
| 2-pole | ON-OFF | TRP215K-∗1F |

4) Screw terminal, with ON-OFF indication on actuator

| Number of poles | Kind of operation<br>< >: Momentary position | Screw terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TRP115A-S∗1F |
| 2-pole | ON-OFF | TRP215K-S∗1F |

Remarks: 1. Please specify the actuator color by replacing the asterisk in the product number with appropriate letter. (B: black; W: white; R: red; Z: dark gray)
2. For UL/C-UL certified products, please add “UL” before “F” at the end of part number when ordering.

**3. Terminal-sealed type**

1) Solder terminal, without indication on actuator

| Number of poles | Kind of operation < >: Momentary position | Solder terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TRD115A-∗F |
| | ON-ON | TRD115D-∗F |
| | ON-OFF-ON | TRD115E-∗F |
| | ON-<ON> | TRD115F-∗F |
| | <ON>-OFF-<ON> | TRD115G-∗F |
| | ON-OFF-<ON> | TRD115H-∗F |
| 2-pole | ON-OFF | TRD215K-∗F |
| | ON-ON | TRD215N-∗F |
| | ON-OFF-ON | TRD215P-∗F |
| | ON-<ON> | TRD215R-∗F |
| | <ON>-OFF-<ON> | TRD215S-∗F |
| | ON-OFF-<ON> | TRD215T-∗F |

2) Screw terminal, without indication on actuator

| Number of poles | Kind of operation < >: Momentary position | Screw terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TRD115A-S∗F |
| | ON-ON | TRD115D-S∗F |
| | ON-OFF-ON | TRD115E-S∗F |
| | ON-<ON> | TRD115F-S∗F |
| | <ON>-OFF-<ON> | TRD115G-S∗F |
| | ON-OFF-<ON> | TRD115H-S∗F |
| 2-pole | ON-OFF | TRD215K-S∗F |
| | ON-ON | TRD215N-S∗F |
| | ON-OFF-ON | TRD215P-S∗F |
| | ON-<ON> | TRD215R-S∗F |
| | <ON>-OFF-<ON> | TRD215S-S∗F |
| | ON-OFF-<ON> | TRD215T-S∗F |

3) Solder terminal, with ON-OFF indication on actuator

| Number of poles | Kind of operation < >: Momentary position | Solder terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TRD115A-∗1F |
| 2-pole | ON-OFF | TRD215K-∗1F |

4) Screw terminal, with ON-OFF indication on actuator

| Number of poles | Kind of operation < >: Momentary position | Screw terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TRD115A-S∗1F |
| 2-pole | ON-OFF | TRD215K-S∗1F |

Remarks: 1. Please specify the actuator color by replacing the asterisk in the product number with appropriate letter. (B: black; W: white; R: red; Z: dark gray)
2. For UL/C-UL certified products, please add “UL” before “F” at the end of part number when ordering.

**4. Wire lead type**

1) Without indication on actuator

| Number of poles | Kind of operation<br>< >: Momentary position | Wire lead type |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TRC115A-∗F |
| | ON-ON | TRC115D-∗F |
| | ON-OFF-ON | TRC115E-∗F |
| | ON-<ON> | TRC115F-∗F |
| | <ON>-OFF-<ON> | TRC115G-∗F |
| | ON-OFF-<ON> | TRC115H-∗F |
| 2-pole | ON-OFF | TRC215K-∗F |
| | ON-ON | TRC215N-∗F |
| | ON-OFF-ON | TRC215P-∗F |
| | ON-<ON> | TRC215R-∗F |
| | <ON>-OFF-<ON> | TRC215S-∗F |
| | ON-OFF-<ON> | TRC215T-∗F |

2) With ON-OFF indication on actuator

| Number of poles | Kind of operation<br>< >: Momentary position | Wire lead type |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | TRC115A-∗1F |
| 2-pole | ON-OFF | TRC215K-∗1F |

Remarks: 1. Please specify the actuator color by replacing the asterisk in the product number with appropriate letter. (B: black; W: white; R: red ; Z: dark gray)
2. 600 V vinyl wire (VSF, thick: 2 mm$^2$, length: 200 mm) is used. Please inquire about type and different length of lead wire.

# PUSH-BUTTON PRODUCT TYPES

**1. Standard type**

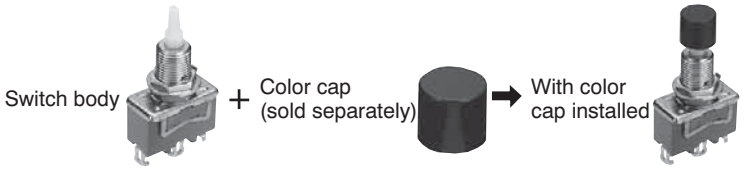
1) Solder terminal

| Number of poles | Kind of operation | Solder terminal |
|---|---|---|
| | | Product no. |
| 1-pole | Momentary | TB110F-F |
| | Alternate | TB115D-F |
| 2-pole | Momentary | TB210R-F |
| | Alternate | TB215N-F |

2) Screw terminal

| Number of poles | Kind of operation | Screw terminal |
|---|---|---|
| | | Product no. |
| 1-pole | Momentary | TB110F-SF |
| | Alternate | TB115D-SF |
| 2-pole | Momentary | TB210R-SF |
| | Alternate | TB215N-SF |

Remarks: 1. Please use switch body with a color cap (sold separately).
2. Standard installation accessories are included with the product.
3. For UL/C-UL certified products, please add “UL” before “F” at the end of part number when ordering.



## 2. Panel-sealed type

1) Solder terminal

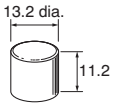
| Number of poles | Kind of operation | Solder terminal |
|---|---|---|
| | | Product no. |
| 1-pole | Momentary | TBP110F-F |
| | Alternate | TBP115D-F |
| 2-pole | Momentary | TBP210R-F |
| | Alternate | TBP215N-F |

2) Screw terminal

| Number of poles | Kind of operation | Screw terminal |
|---|---|---|
| | | Product no. |
| 1-pole | Momentary | TBP110F-SF |
| | Alternate | TBP115D-SF |
| 2-pole | Momentary | TBP210R-SF |
| | Alternate | TBP215N-SF |

Remarks: 1. Please use switch body with a color cap (sold separately).
2. Standard installation accessories are included with the product.
3. For UL/C-UL certified products, please add “UL” before “F” at the end of part number when ordering.

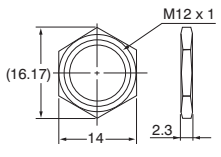
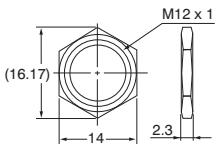
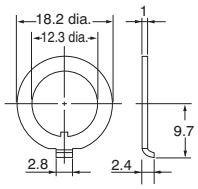
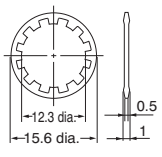
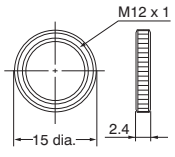

## 3. Color cap for push-button (option)

| Product name | Color cap (sold separately) |
|---|---|
| Dimensions (mm) |  |
| Part no. | WDB1821∗ |



Remark: Please specify the color cap color by replacing the asterisk in the part number with the appropriate letter
(B: black; W: white; R: red; Z: dark gray; H: light gray; Y: yellow; G: green; L: blue).

## 4. Installation accessories (repair parts)

| Product name | Standard installation accessories | | | | Optional installation accessories |
|---|---|---|---|---|---|
| | Front hex nut (nickel plated) | Back hex nut (uni-chrome plated) | Keying washer | Lock washer | Front Knurl nut (nickel plated) |
| Dimensions (mm) |  |  |  |  |  |
| Part no. | AJ3081 | AJ3082 | AJ3083 | AJ3084 | AJ3080 |



Remark: Accessories are sold in units of 10 pieces.

# SPECIFICATIONS

**1. Contact rating**

1) Toggle type and Rocker type

| Kind of load | AC | DC |
|---|---|---|
| Resistive load | 15A 250V | 0.5A 250V, 0.9A 125V, 15A 30V |
| Inductive load | 15A 250V (power factor: 0.6) | 0.3A 250V (time constant: 8 ms),<br>0.5A 125V (time constant: 8 ms)<br>15A 30V (time constant: 8 ms) |
| Lamp load (incandescent) | 400W 100V, 800W 200V, Inrush current: Max. 40 A | 7A 30V |
| Motor load | 400 W 125 V (single phase), 550 W 250 V (single phase),<br>750 W 250 V (three-phase) | — |

2) Push-button type (momentary)

| Kind of load | AC | DC |
|---|---|---|
| Resistive load | 10A 250V | 0.4A 250V, 0.8A 125V, 8A 30V |

3) Push-button type (alternate)

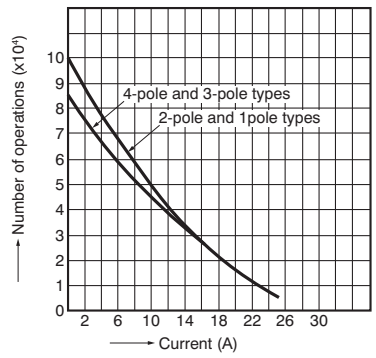
| Kind of load | AC | DC |
|---|---|---|
| Resistive load | 15A 250V | 0.5A 250V, 0.9A 125V, 15A 30V |

**2. Characteristics**

| Shape of actuator | Toggle type | | Rocker type | Push-button type |
|---|---|---|---|---|
| Protection grade<br>*1: IP40<br>*2: IP64<br>*3: IP67 | Standard type (*1) | Panel-sealed type (*3)<br>Terminal-sealed type (*3)<br>Wire leads type (*3) | Standard type (*1)<br>Panel-sealed type (*2)<br>Terminal-sealed type (*2)<br>Wire leads type (*2) | Standard type (*1)<br>Panel-sealed type (*3) |
| Mechanical expected life | 1-pole and 2-pole:<br>Min. $10^5$<br>3-pole and 4-pole:<br>Min. $8.5\times10^4$ | Min. $5\times10^4$ (20 cpm)<br>ON-OFF, ON-ON,<br>ON-OFF-ON,<br>Min. $3\times10^4$ (20 cpm)<br>ON-(ON), (ON)-OFF-(ON),<br>ON-OFF-(ON) | Min. $3\times10^4$ (20 cpm) | |
| Electrical expected life (10 cpm) | Standard and panel-sealed types: Min. $3\times10^4$<br>Terminal-sealed and wire leads types: Min. $1.5\times10^4$ | | Standard type: Min. $3\times10^4$<br>Panel-sealed, terminal-sealed and wire leads types:<br>Min. $10^4$ | Min. $10^4$ |
| Dielectric strength | 1500 Vrms (at detection current: 10mA) | | | |
| Insulation resistance | Min. 100 MΩ (at 500 V DC measured by insulation resistive meter) | | | |
| Contact resistance | Initial, max. 10 mΩ (by voltage drop at 1 A, 2 to 4 V DC)<br>Wire leads type only: Initial, max. 30 mΩ (by voltage drop at 1 A, 2 to 4 V DC) | | | |
| Actuator strength | 112.7N for 1 min. (for operating direction) | | | |
| Vibration resistance | 10 to 55 Hz at double amplitude of 1.5 mm (contact opening: max. 10 ms) | | | |
| Terminal strength (static load) | 24.5N for 1 min. | | | |
| Ambient temperature | –25°C to +70°C (not freezing below 0°C) | | | |
| Contact material | AgZnO alloy | | | |

# DATA (electrical life, for toggle standard type)

Tested condition: 250 V AC, Power factor: 0.6 and 10 cpm



# TOGGLE TYPE DIMENSIONS

Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

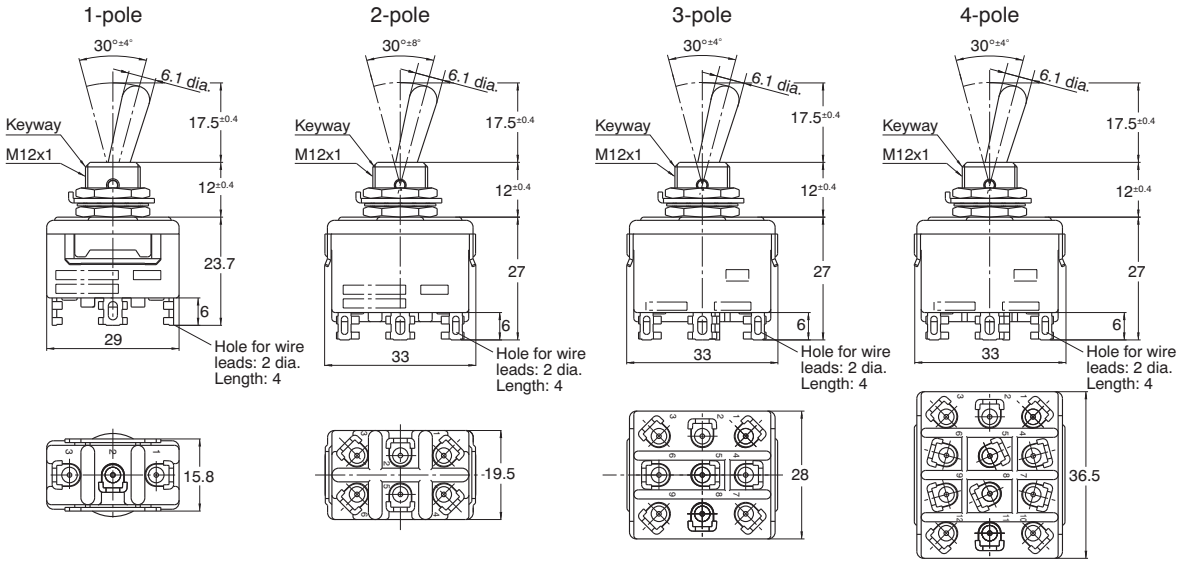
mm General tolerance: ±0.5



## 1. Standard type

1) Solder terminal

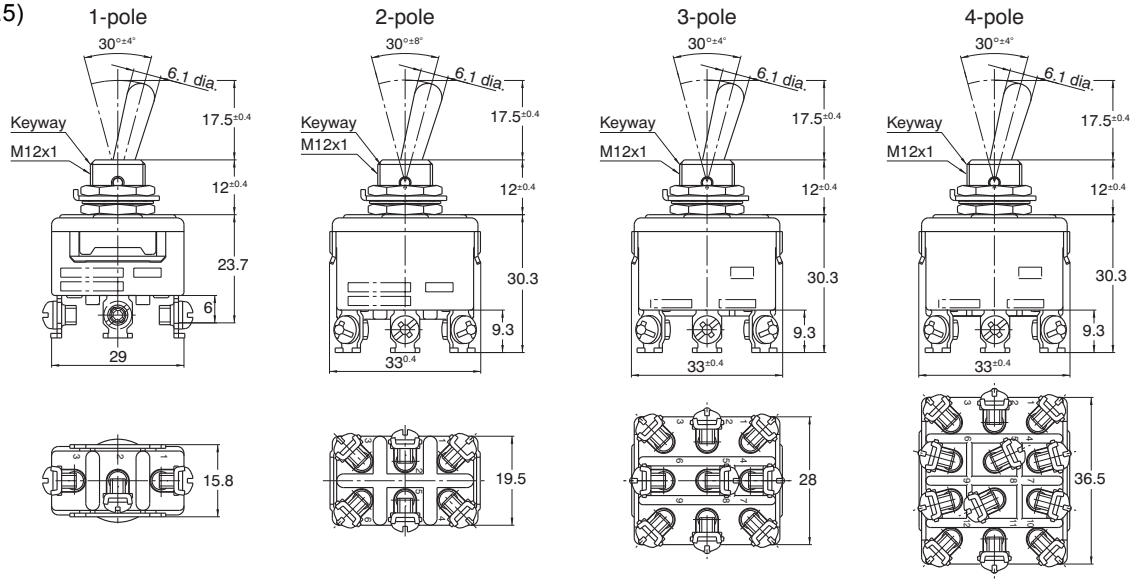
**CAD Data**




Remark: ON-OFF type does not have terminal no. 2, 5, 8 and 11.

2) Screw terminal (M3.5)

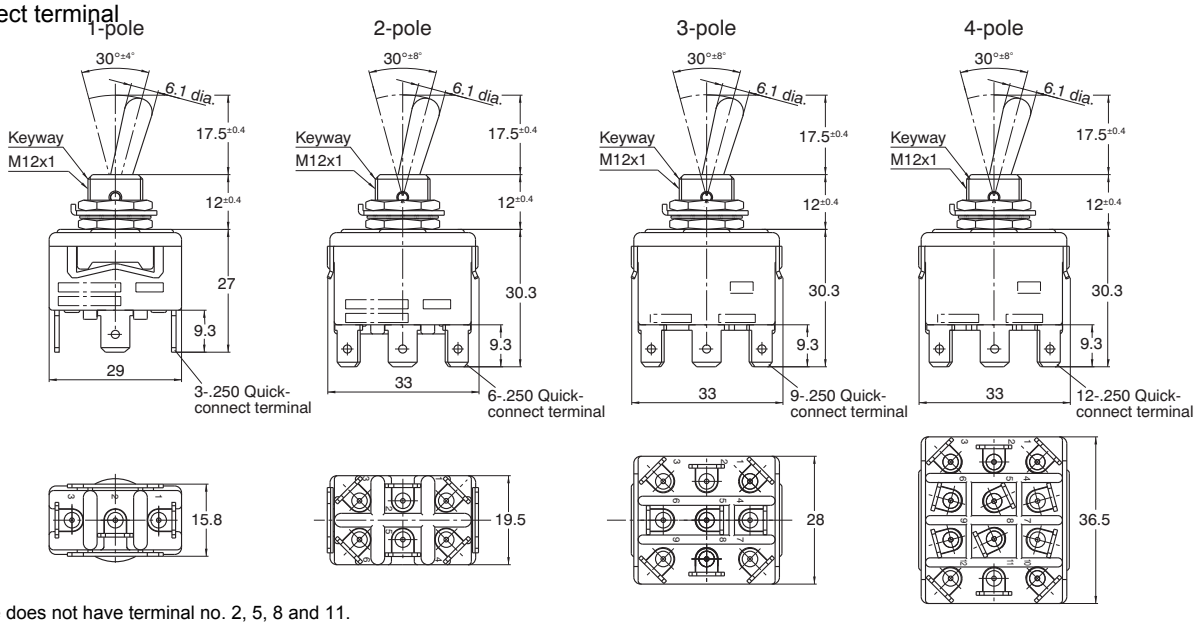
**CAD Data**




Remark: ON-OFF type does not have terminal no. 2, 5, 8 and 11.

3) .250 Quick-connect terminal

**CAD Data**

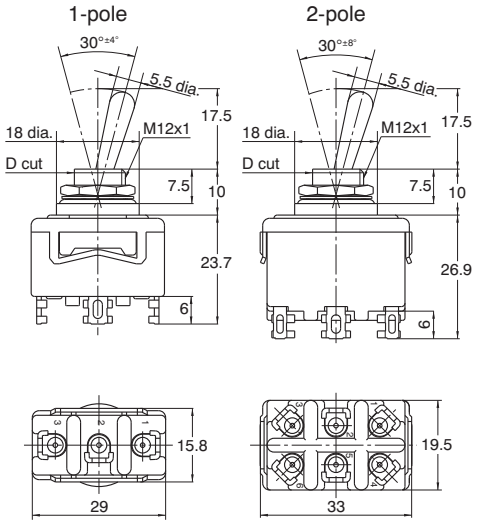



Remark: 1. ON-OFF type does not have terminal no. 2, 5, 8 and 11.
2. There is no through-hole on .250 Quick-connect terminals.

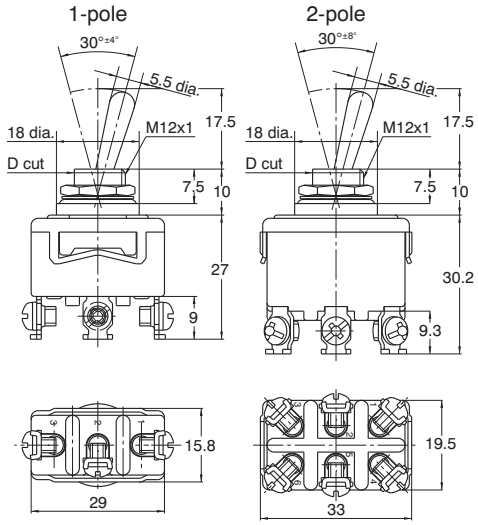
## 2. Panel-sealed type

1) Solder terminal

**CAD Data**




2) Screw terminal (M3.5)

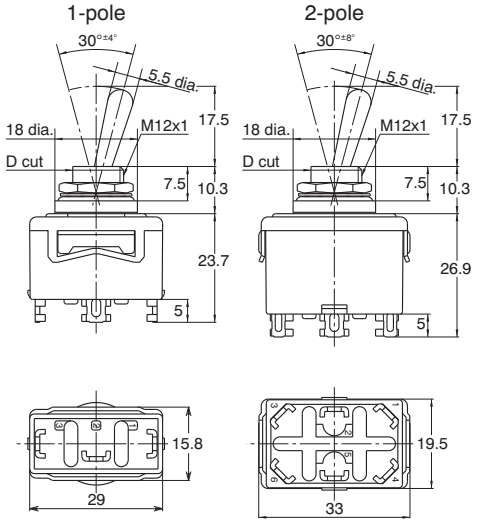



Remark: ON-OFF type does not have terminal no. 2 and 5.

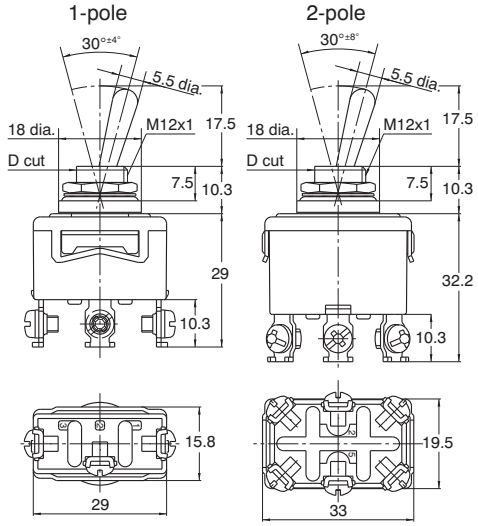
## 3. Terminal-sealed type

1) Solder terminal

**CAD Data**



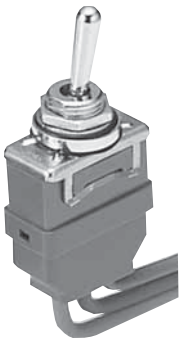

2) Screw terminal (M3.5)



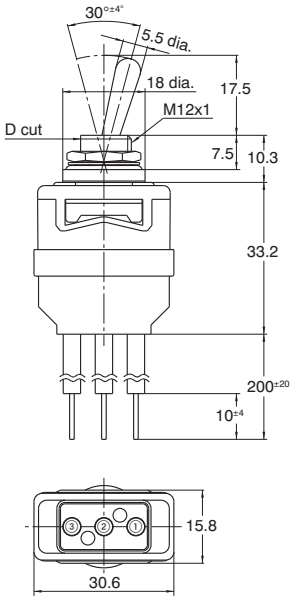

Remark: ON-OFF type does not have terminal no. 2 and 5.

### 4. Wire leads type

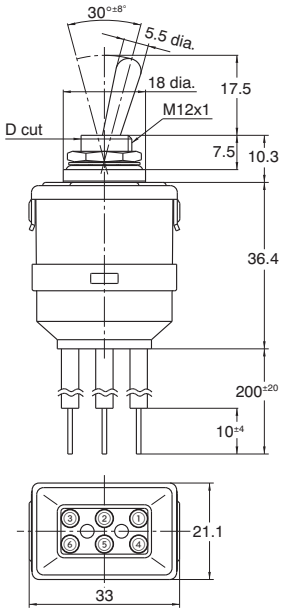
CAD Data



1-pole




2-pole




Remarks: 1. ON-OFF type does not have wire lead no. 2 and 5.
2. 600 V vinyl wire (VSF, thick: 2 mm², length: 200 mm) is used. Please inquire about type and different length of lead wire.

Color of wire leads

| No. | Color |
|---|---|
| ① | Brown |
| ② | Red |
| ③ | Orange |
| ④ | Yellow |
| ⑤ | Green |
| ⑥ | Blue |

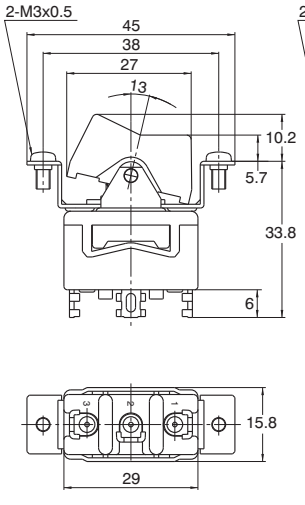
## ROCKER TYPE DIMENSIONS (mm) (general tolerance: ±0.5)

### 1. Standard type

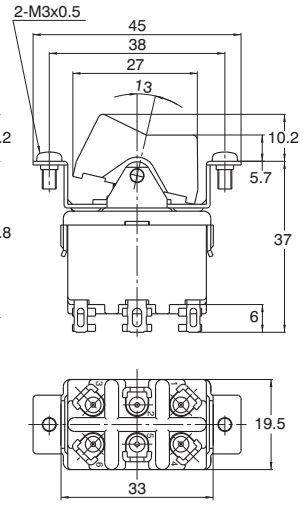
1) Solder terminal

CAD Data

1-pole

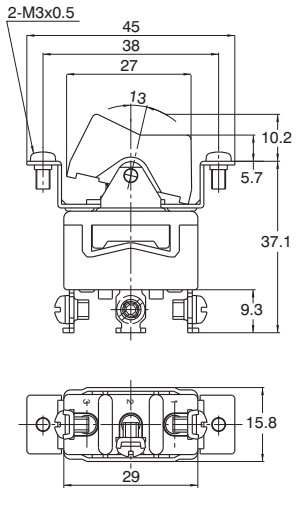



2-pole

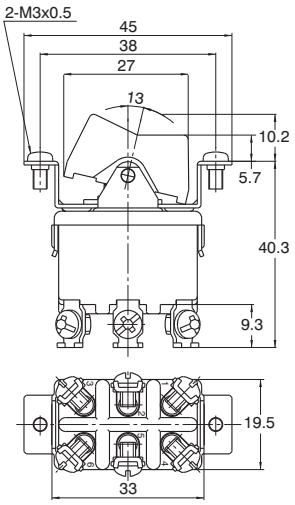



2) Screw terminal (M3.5)

1-pole




2-pole



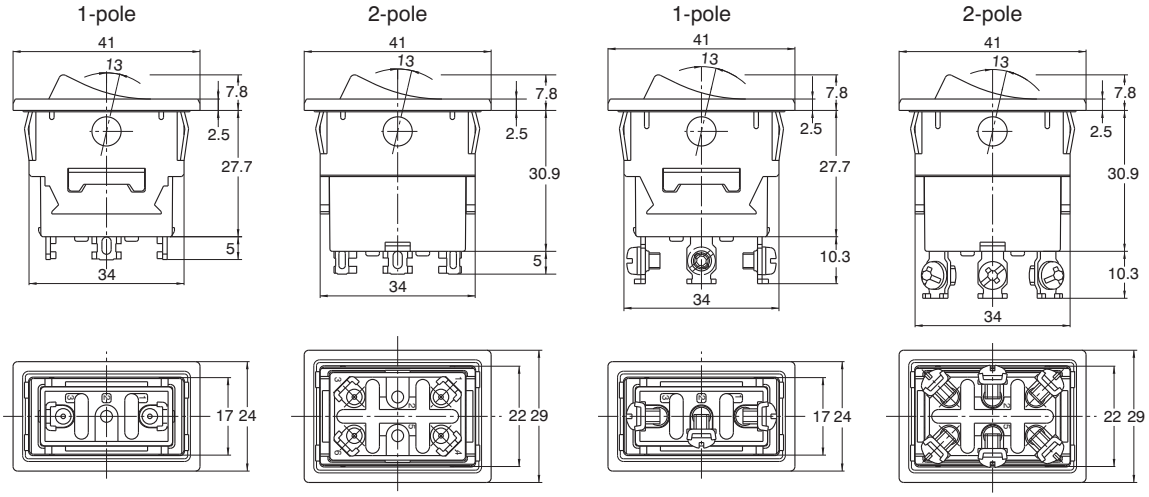

Remarks: 1. ON-OFF type does not have terminal no. 2 and 5.
2. Dimensions of actuator: 13.4 × 27

## 2. Panel-sealed type

1) Solder terminal

2) Screw terminal (M3.5)

**CAD Data**



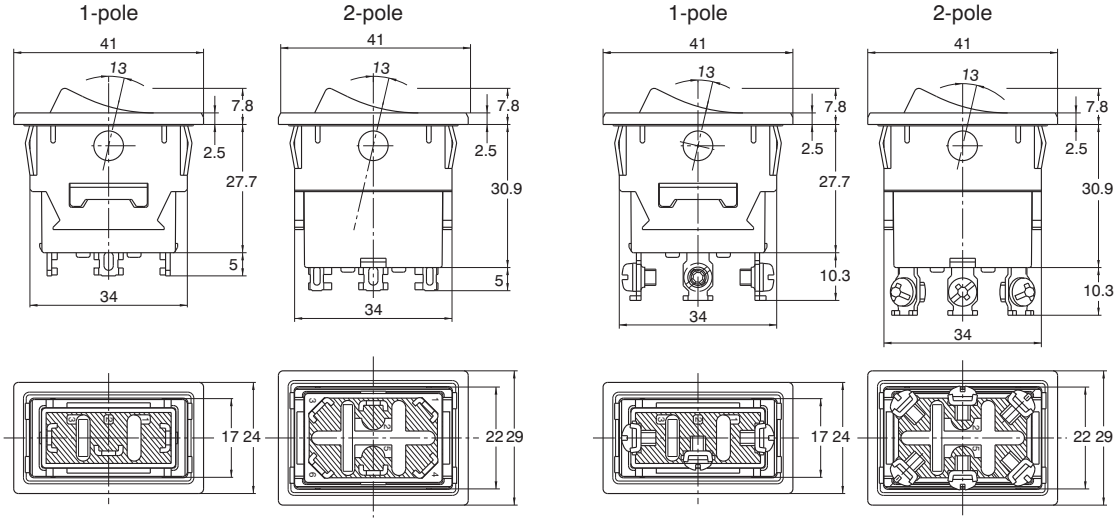

Remarks: 1. ON-OFF type does not have terminal no. 2 and 5.
2. Dimensions of actuator: 1-pole: 12.6 × 29, 2-pole: 17.4 × 29

## 3. Terminal-sealed type

1) Solder terminal

2) Screw terminal (M3.5)

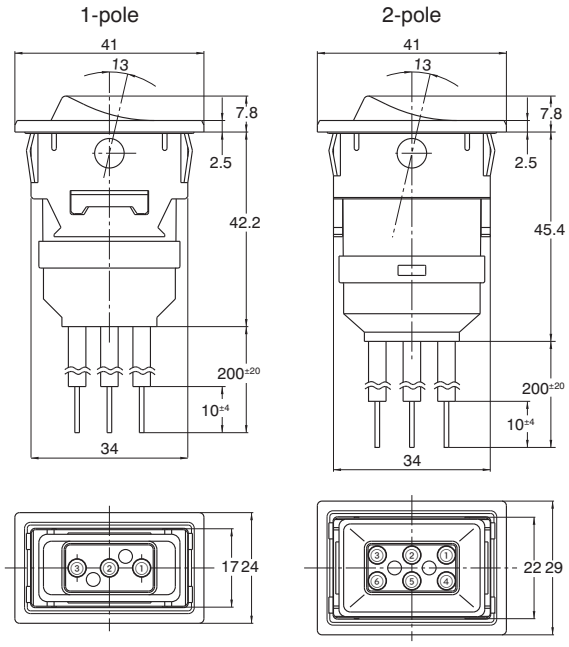
**CAD Data**




Remarks: 1. ON-OFF type does not have terminal no. 2 and 5.
2. Dimensions of actuator: 1-pole: 12.6 × 29, 2-pole: 17.4 × 29

## 4. Wire leads type

**CAD Data**




Remarks: 1. ON-OFF type does not have terminal no. 2 and 5.
2. Dimensions of actuator: 1-pole: 12.6 × 29, 2-pole: 17.4 × 29
3. 600 V vinyl wire (VSF, thick: 2 mm², length: 200 mm) is used. Please inquire about type and different length of lead wire.

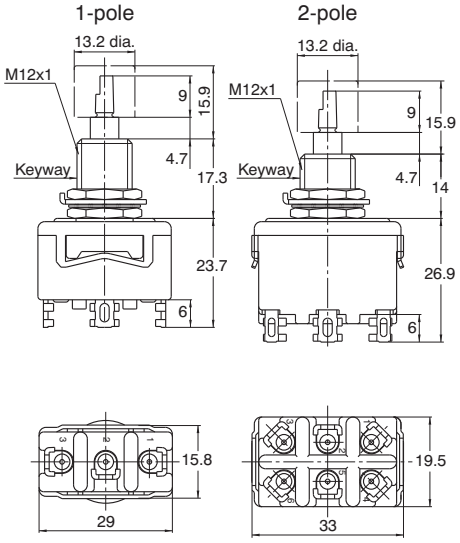
Color of wire leads

| No. | Color |
|---|---|
| ① | Brown |
| ② | Red |
| ③ | Orange |
| ④ | Yellow |
| ⑤ | Green |
| ⑥ | Blue |

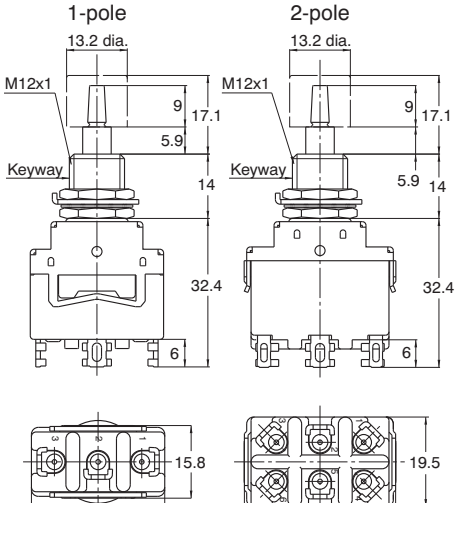
# PUSH-BUTTON TYPE DIMENSIONS (mm) (general tolerance: ±0.5)

**1. Standard type**

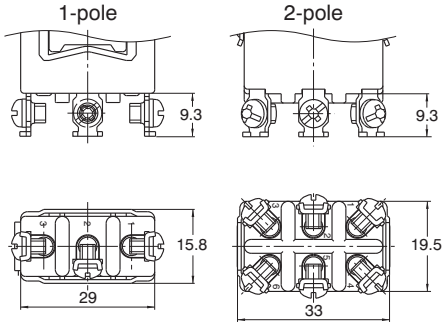
• Solder terminal, Momentary




• Solder terminal, Alternate

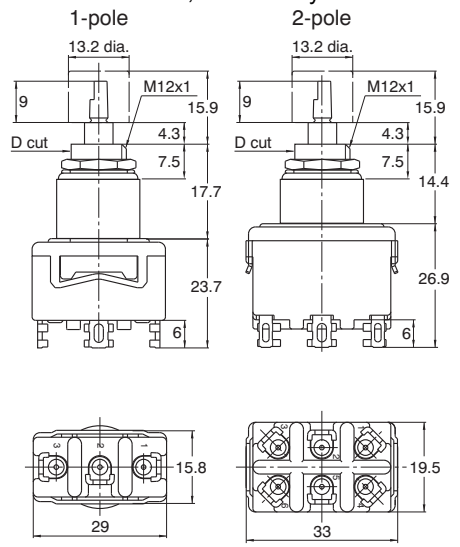



• Screw terminal (M3.5)
Dimensions other than listed below are same as those of solder terminal type.

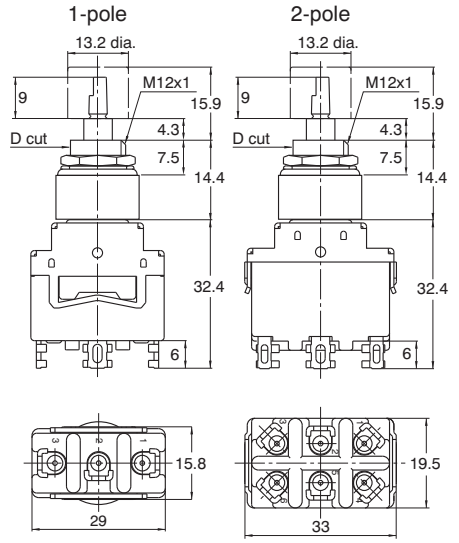



**2. Panel-sealed type**

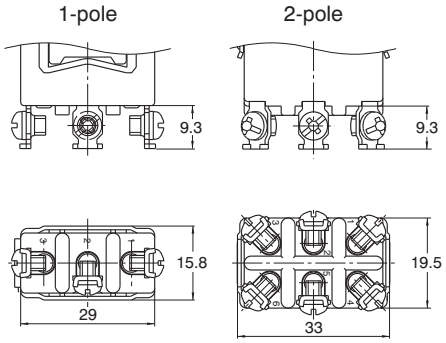
• Solder terminal, Momentary




• Solder terminal, Alternate

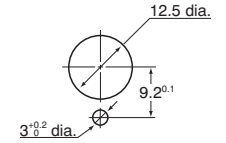
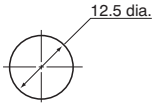
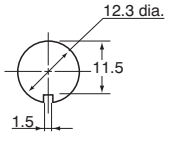


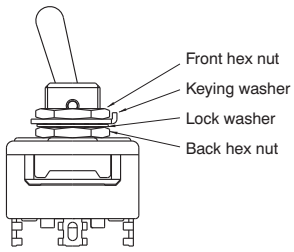

• Screw terminal (M3.5)
Dimensions other than listed below are same as those of solder terminal type.

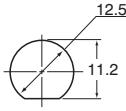
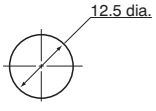



# MOUNTING DIMENSIONS

**1. Toggle type**

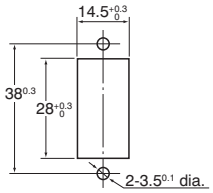
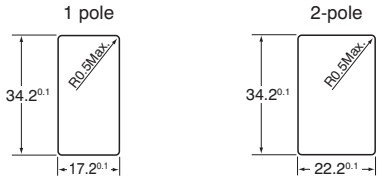
| Type | Standard type | | |
|---|---|---|---|
| Panel cutout (mm) |   |   |   |
| Panel thickness | Max. 4.6 mm | Max. 5.6 mm (without keying washer) | Max. 5.6 mm (without keying washer) |



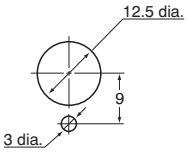
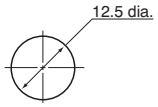
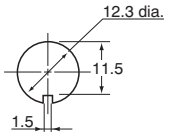
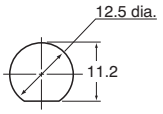
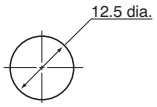

| Type | Panel-sealed, Terminal-sealed and Wire leads types | |
|---|---|---|
| Panel cutout (mm) |   |   |
| Panel thickness | Max. 4 mm | Max. 4 mm (without keying washer) |

Remark: For panel installations of standard type, be use to use the back hex nut.

## 2. Rocker type

| Type | Standard type | Panel-sealed, Terminal-sealed and Wire leads types |
|---|---|---|
| Panel cutout (mm) |  |  |
| Panel thickness | Max. 4.5 mm | 1.2 to 3.2 mm |

## 3. Push-button type

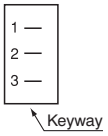
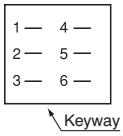
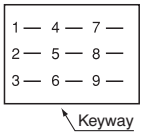
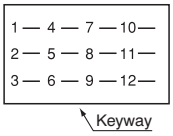
| Type | Standard type | | Panel-sealed type | | |
|---|---|---|---|---|---|
| Panel cutout (mm) |  |  |  |  |  |
| Panel thickness | Momentary, 1-pole: Max. 10 mm<br>Momentary, 2-pole: Max. 6.5 mm<br>Alternate: Max. 6.5 mm | Momentary, 1-pole: Max. 10 mm<br>Momentary, 2-pole: Max. 7.5 mm<br>Alternate: Max. 7.5 mm (without keying washer) | Momentary, 1-pole: Max. 11 mm<br>Momentary, 2-pole: Max. 7.5 mm<br>Alternate: Max. 7.5 mm (without keying washer) | Max. 4 mm | Max. 4 mm (without keying washer) |

Remark: For panel installations of standard type, be use to use the back hex nut.

# ELECTRICAL CIRCUIT DIAGRAM

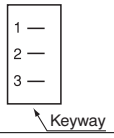
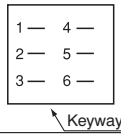


### 1. Toggle type and Rocker type

| Number of pole | | | | 1-pole | 2-pole | 3-pole | 4-pole |
|---|---|---|---|---|---|---|---|
| Toggle type | | | | Available | Available | Available *3 | Available *3 |
| Rocker type | | | | Available | Available | — | — |
| Terminal arrangement (as seen from terminal side) | | | |  |  |  |  |
| Actuator position and contact terminal number | Actuator shape | Toggle type | Rocker type | | | | |
| | ON-OFF | Keyway | Right Part No. | 1-3 | 1-3, 4-6 | 1-3, 4-6, 7-9 | 1-3, 4-6, 7-9, 10-12 |
| | | — | — | — | — | — | — |
| | | Keyway | Left | — | — | — | — |
| | ON-ON<br>ON-<ON><br>*1 | Keyway | Right Part No. | 2-3 | 2-3, 5-6 | 2-3, 5-6, 8-9 | 2-3, 5-6, 8-9, 11-12 |
| | | — | — | — | — | — | — |
| | | Keyway | Left *2 | 1-2 | 1-2, 4-5 | 1-2, 4-5, 7-8 | 1-2, 4-5, 7-8, 10-11 |
| | ON-OFF-ON<br><ON>-OFF-<ON><br>ON-OFF-<ON><br>*1 | Keyway | Right Part No. | 2-3 | 2-3, 5-6 | 2-3, 5-6, 8-9 | 2-3, 5-6, 8-9, 11-12 |
| | | Keyway | Center | — | — | — | — |
| | | Keyway | Left *2 | 1-2 | 1-2, 4-5 | 1-2, 4-5, 7-8 | 1-2, 4-5, 7-8, 10-11 |
| Remarks | | | | ON-OFF type does not have a terminal no. 2. | ON-OFF type does not have terminal no. 2 and 5. | ON-OFF type does not have terminal no. 2, 5 and 8. | ON-OFF type does not have terminal no. 2, 5, 8 and 11. |

Remarks: *1. For ON-<ON>, ON-OFF-<ON> type of toggle, if the lever turns to the keyway side, it takes momentary position.
*2. For the rocker type, if the actuator turns to the left side in view of the side where a part number is marked, it takes momentary position.
*3. Only standard type

### 2. Push-button type

| | | 1-pole | 2-pole |
|---|---|---|---|
| Terminal arrangement (as seen from terminal side) | |  |  |
| Push-button position and contact terminal number | | 2-3 | 2-3, 5-6 |
| | Operated | 1-2 | 1-2, 4-5 |

# NOTES

**1. Dustproof, waterproof, anticorrosive gas, and oil-proof designs**

The panel-sealed type/terminal-sealed type/wire lead type switch has a protection level of IP67 on the outer side of the mounting panel and a level of IP40, IP60, or IP67 on the inner side of the panel.

For actual application, note the following points:

1) Avoid immersion in water or oil during installation.

2) Avoid immersion in water or oil during operation.

3) Oils or gases impose varying degrees of impact on the switch's sealing performance depending on type or quantity.

4) While the switch has a immersion and dust-protected design, its sealing performance or operabillity may be adversely affected in an environment where in the switch's movable parts can be contaminated with dust, oil, or other foreign objects. For the toggle type, use of a rubber cap is recommended.

5) The standard toggle switch, when used with a rubber cap, provides a protection level of IP54.
It should be used in an environment where it will not be subject to frequent water splashes.

6) As the sealing performance of the rocker type switch is affected by the panel processing accuracy or mounted panel thickness, check the switch under actual loading conditions. (While water or dust will not enter the switch's internal structure, it may enter the panel.)

7) Do not operate the rocker type switch when water accumulates in the actuator.

**2. Installation**

1) For the toggle and push-button type

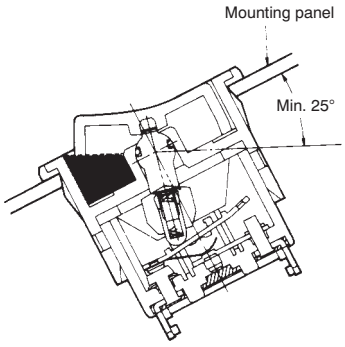
a. When installing the standard type switch, be sure to use a hex nut.

b. For the panel-sealed, terminal-sealed and wire lead types, use a lock washer on the front side of the panel, and an O-ring on the back side of it.

c. Do not install the switch by rotating it.

2) For the rocker type

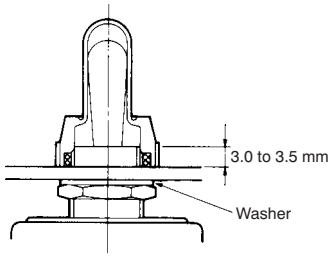
a. In case the panel-sealed, terminal-sealed or wire leads types are used in the condition where the water splash on, please install the switches tilt more than 25°. (90° recommended)




b. In case water inside the switch case may freeze, please install the switch vertically to avoid the water remain inside the switch.

3) Rubber cap installation

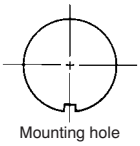
a. The washer should be used on the back side of the panel.



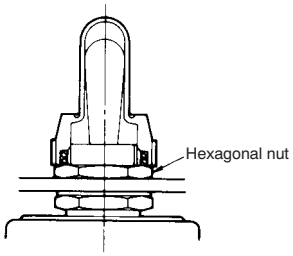

b. Enough screw pitch should be obtained being adjusted within 3 to 3.5mm (see figure above).

c. Install a rubber cap on the switch knob before securing the switch with the hex nut.

d. The mounting hole in the panel should preferably be provided with an anti-rotation projection.




e. If the rubber cap is installed over the hex nut, the waterproof performance will be impaired although the dustproof performance will not be affected.




**3. Soldering**

1) By using 350°C soldering iron, soldering should be completed within 5 seconds.

2) Exercise care so as not to touch the switch body with a soldering iron.

**4. Load type and ratings**

1) When the switch is loaded with a lamp, motor or capacitive load, a surge current higher than the stationary current passes through the switch contacts.
Measure the surge with the actual load and, if needed, take necessory action so that the surge will not exceed the switch's rated current.

2) When the switch is loaded with an inductive load (relay, solenoid, buzzer, etc.), a contact failure may result from arc discharge caused by a counterelectromotive force. It is advisable that you use an adequate anti-spark circuit across the switch contacts.

**5. Others**

1) Do not apply an excessive static load exceeding 112.7N {11.5kgf} perpendicular to the direction of operation.

2) Operate the switch knob by hand.

3) Take care not to drop the product as it may impair performance.

Panasonic
ideas for life

**TOGGLE SWITCH**

# T-10 SERIES SWITCHES

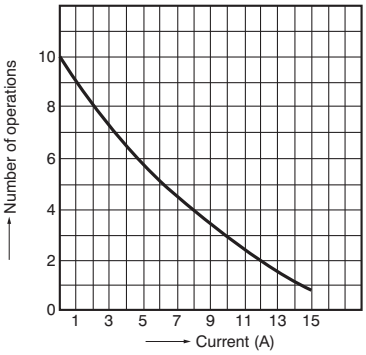

## FEATURES

**1. Capable of high capacity switching (10 A 250 V AC and 15 A 125 V AC)**
Ag alloy contacts are used to prevent temperature rises and allow high capacity switching.

**2. Terminals constructed for easy implementation**
A unique terminal construction facilitates soldering.

## DATA (Life curve)

Tested condition: 250 V AC, Power factor: 0.6 and 10 cpm




## PRODUCT TYPES

| Number of poles | Kind of operation | | Solder terminal |
|---|---|---|---|
| | Left | Right | Product no. |
| 1-pole | ON | OFF | T110A-F |
| | ON | ON | T110D-F |
| 2-pole | ON | OFF | T210K-F |
| | ON | ON | T210N-F |

Remarks: 1. The product comes with standard installation accessories. However, keying washer is sold separately.
2. For UL/C-UL certified products, please add “UL” before the “F” at the end of the part number when ordering.

# SPECIFICATIONS

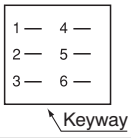
### 1. Contact rating

| Kind of load | AC | DC |
|---|---|---|
| Resistive load | 10A 250V AC<br>15A 125V AC | 8A 30V DC<br>0.8A 125V DC<br>0.4A 250V DC |
| Inductive load | 10A 250V AC (power factor: 0.6)<br>15A 125V AC (power factor: 0.6) | 5A 30V DC (time constant: 7 m/s)<br>0.4A 125V DC (time constant: 7 m/s)<br>0.2A 250V DC (time constant: 7 m/s) |
| Lamp load (incandescent) | 300W 100V AC<br>500W 200V AC<br>Inrush current: Max. 30 A | — |
| Motor load (single phase) | 200W 125V AC<br>300W 250V AC | — |

### 2. Characteristics

| | |
|---|---|
| Mechanical expected life | Min. $10^5$ |
| Electrical expected life | Min. $3\times10^4$ (10 cpm) at rated load |
| Overload life | Min. 50 (5 cpm) (rated load×1.5) |
| Insulation resistance | Min. 100 MΩ (at 500 V DC measured by insulation resistive meter) |
| Dielectric strength | 1500 Vrms (at detection current: 10mA) |
| Vibration resistance | 10 to 55 Hz at double amplitude of 1.5 mm (contact opening: Max. 1 ms) |
| Contact resistance | Initial, Max. 20 mΩ (by voltage drop at 1 A, 2 to 4 V DC) |
| Actuator strength (static load) | 112.7N for 1 min. |
| Terminal strength (static load) | 24.5N for 1 min. |
| Ambient temperature | –25°C to +70°C (not freezing below 0°C) |
| Contact material | AgZnO alloy |

# ELECTRICAL CIRCUIT DIAGRAM

| | | | 1-pole | 2 pole |
|---|---|---|---|---|
| Terminal arrangement (as seen from terminal side) | | |  |  |
| Actuator position and contact terminal number | ON-OFF | Keyway | 1-3 | 1-3, 4-6 |
| | | — | — | — |
| | | Keyway | — | — |
| | ON-ON | Keyway | 2-3 | 2-3, 5-6 |
| | | — | — | — |
| | | Keyway | 1-2 | 1-2, 4-5 |
| Remark | | | ON-OFF type does not have a terminal no. 2. | ON-OFF type does not have terminal no. 2 and 5. |

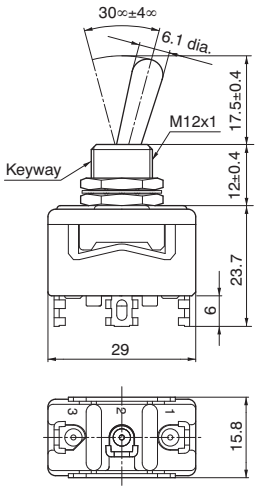
# DIMENSIONS

Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

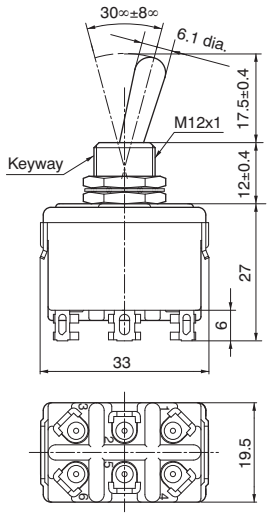
(mm) (general tolerance: ±0.5)

**CAD Data**

1 pole

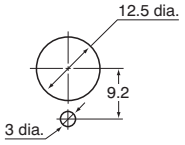
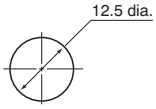
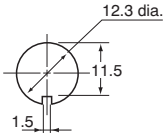



2-pole



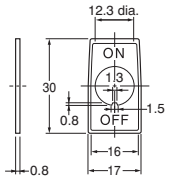
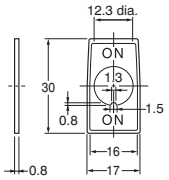
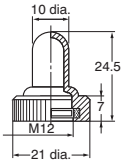
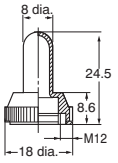

Remark: ON-OFF type does not have terminal no. 2 and 5.

## MOUNTING DIMENSIONS

| | | | |
|---|---|---|---|
| Panel cutout (mm) |   |   |   |
| Panel thickness | Max. 4.6 mm* (Use separately sold keying washer.) | Max. 5.6 mm | Max. 5.6 mm |

Remarks: 1. For panel installations, use the back hex nut.
2. * Keying washer (separately sold) Part no.: AJ3083

## Accessories (option)

| Product name | Indication plate (aluminum)*3 | | Rubber cap*1, 2, 4 | |
|---|---|---|---|---|
| | ON-OFF | ON-ON | EP rubber type | Silicone rubber type |
| Dimensions (mm) |   |   |   |   |
| Part no. | WD1901 | WD1902 | WD1911 | WD1811∗ |

Remarks: 1. The asterisk in the part number WD1811∗ for the silicon rubber type rubber cap is where the letter representing the color should be inserted. (B: black; R: red; Z: gray; Y: yellow; G: green.)
2. EP rubber cap is available in black only.
3. Letters on the display panel are aluminum colored and the area surrounding the letters is black.
4. Indication plate and rubber cap are compatible with the T-15 series switch, T-10 series switch, and T-03/T-06 series switches (when plate thickness is 2.7 mm or less).

**• Using the different rubber caps**

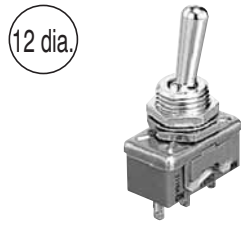
We recommend silicon rubber and EP rubber caps for the following applications.

**1) Silicon rubber caps**

- When it is necessary to differentiate by color.
- When using in applications that require resistance to heat and cold. Ambient temperature: –25°C to +85°C (EP rubber type is 0°C to +40°C.)
- When compactness is required.

**2) EP rubber type**

When cost is the primary consideration.

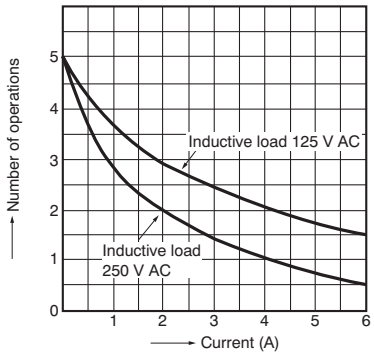



## FEATURES

**Depth of 18.6 mm saves space.**
This space-saving switch has body dimensions of 25 (W) x 14.8 (D) x 18.6 (H). (63% that of our previous T-15 series switch.)

## DATA (life curve)

Tested sample: T-06 series
Tested condition: 125 V AC, 250 V AC, Power factor: 0.6 and 10 cpm




## PRODUCT TYPES

**1) T-06 series**

| Number of poles | Kind of operation | Solder terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | T106A-F |
| | ON-ON | T106D-F |
| 2-pole | ON-OFF | T206K-F |
| | ON-ON | T206N-F |

Remark: The product comes with standard installation accessories. However, keying washer is sold separately.

**2) T-03 series**

| Number of poles | Kind of operation | Solder terminal |
|---|---|---|
| | | Product no. |
| 1-pole | ON-OFF | T103A-F |
| | ON-ON | T103D-F |
| 2-pole | ON-OFF | T203K-F |
| | ON-ON | T203N-F |

Remark: The product comes with standard installation accessories. However, keying washer is sold separately.

# SPECIFICATIONS

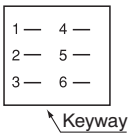
### 1. Contact rating

| Kind of load | T-06 series | T-03 series |
|---|---|---|
| Resistive load | 6A 125V AC,6A 30V DC, 3A 250V AC | 3A 125V AC, 2A 250V AC |
| Inductive load | 6 A 125 V AC (power factor: 0.6),<br>3 A 250 V AC (power factor: 0.6) | 3 A 125 V AC (power factor: 0.6),<br>2 A 250 V AC (power factor: 0.6) |
| Motor load (single phase) | 100W 125V AC, 100W 250V AC | — |

### 2. Characteristics

| | |
|---|---|
| Mechanical expected life | Min. $5\times10^4$ |
| Electrical expected life | T-06 series: Min. $3\times10^4$ (10 cpm) at rated load, T-03 series: Min. $10^4$ (10 cpm) at rated load |
| Overload life | Min. 50 (5 cpm) (rated load×1.5) |
| Insulation resistance | Min. 100 MΩ (at 500 V DC measured by insulation resistive meter) |
| Dielectric strength | 1500 Vrms (at detection current: 10mA) |
| Vibration resistance | 10 to 55 Hz at double amplitude of 1.5 mm (contact opening: Max. 1 ms) |
| Contact resistance | Initial, max. 20 mΩ (by voltage drop at 1 A, 2 to 4 V DC) |
| Actuator strength (static load) | 112.7N for 1 min. |
| Terminal strength (static load) | 24.5N for 1 min. |
| Ambient temperature | –25°C to +70°C |
| Contact material | AgZnO alloy |

# ELECTRICAL CIRCUIT DIAGRAM (for T-06 and T-03 series)

| | | | 1-pole | 2-pole |
|---|---|---|---|---|
| Terminal arrangement (as seen from terminal side) | | |  |  |
| Actuator position and contact terminal number | ON-OFF | Keyway | 2-3 | 2-3, 5-6 |
| | | — | — | — |
| | | Keyway | — | — |
| | ON-ON | Keyway | 2-3 | 2-3, 5-6 |
| | | — | — | — |
| | | Keyway | 1-2 | 1-2, 4-5 |
| Remark | | | ON-OFF type does not have a terminal no. 1. | ON-OFF type does not have terminal no. 1 and 4. |

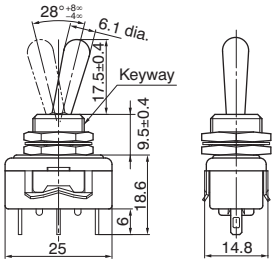
# DIMENSIONS (for T-06 and T-03 series)

(mm) (general tolerance: ±0.5)

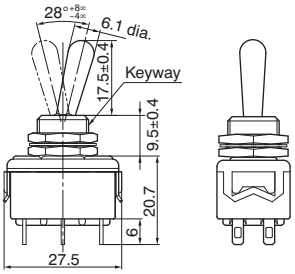
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

**CAD Data**

1 pole

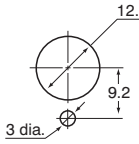
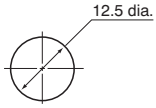
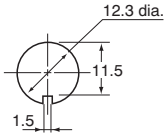



2-pole



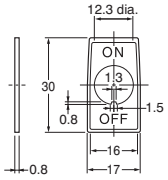
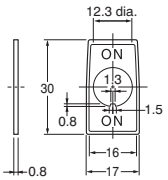
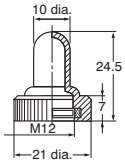
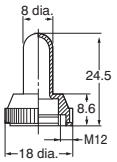

Remark: ON-OFF type does not have terminal no. 1 and 4.

## MOUNTING DIMENSIONS (for T-06 and T-03 series)

| | | | |
|---|---|---|---|
| Panel cutout (mm) |   |   |   |
| Panel thickness | Max. 2.5 mm* (Use separately sold keying washer.) | Max. 3.5 mm | Max. 3.5 mm |

Remarks: 1. For panel installations, use the back hex nut.
2. * Keying washer (separately sold) Part no.: AJ3083

## Accessories (option)

| Product name | Indication plate (aluminum)*3 | | Rubber cap*1, 2, 4 | |
|---|---|---|---|---|
| | ON-OFF | ON-ON | EP rubber type | Silicone rubber type |
| Dimensions (mm) |   |   |   |   |
| Part no. | WD1901 | WD1902 | WD1911 | WD1811∗ |

Remarks: 1. The asterisk in the part number WD1811∗ for the silicon rubber type rubber cap is where the letter representing the color should be inserted. (B: black; R: red; Z: gray; Y: yellow; G: green.)
2. EP rubber cap is available in black only.
3. Letters on the display panel are aluminum colored and the area surrounding the letters is black.
4. Indication plate and rubber cap are compatible with the T-15 series switch, T-10 series switch, and T-03/T-06 series switches (when plate thickness is 2.7 mm or less).

**• Using the different rubber caps**

We recommend silicon rubber and EP rubber caps for the following applications.

**1) Silicon rubber caps**

- When it is necessary to differentiate by color.
- When using in applications that require resistance to heat and cold. Ambient temperature: –25°C to +85°C (EP rubber type is 0°C to +40°C.)
- When compactness is required.

**2) EP rubber type**

When cost is the primary consideration.

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**POWER ROCKER SWITCH WITH A CONTACT FOR LOW LEVEL CURRENT**

# AJ8S (J8S) SWITCHES

## FEATURES

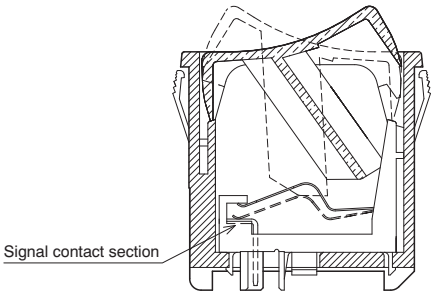
**1. Incorporates a contact for low level circuit for the HDD protection circuit.**
**2. Power rocker switches for safety requirements.**
All versions comply with ClassII
EN61058-1 insulation grade.
Insulation distance: 8mm Min.
(power contact section)
Contact gap: 3mm Min.
(power contact section)

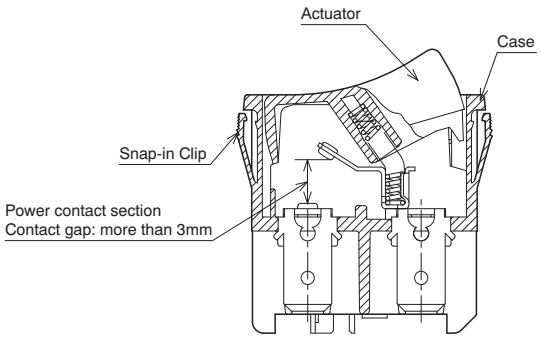
International Standard-approved Status
UL/C-UL, TÜV
**3. High inrush current resistance is ideal for office automation equipment.**
**4. Operation that only requires a light touch**
**5. Cadmium-free contact compatibility.**

| Type | | Inrush current | Motor load* (EN61058-1) (pf = 0.6) | Contact rating | Expected life |
|---|---|---|---|---|---|
| AJ8S (J8S) | Power section | 160A | 4A | 16A 250V AC | Min.$10^4$ |

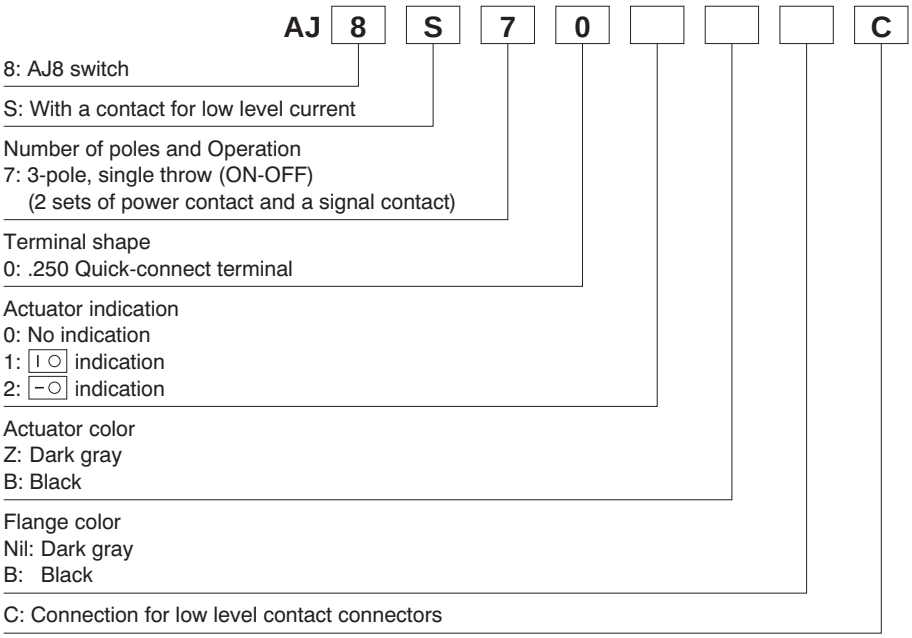
* The motor load is in accordance with EN61058-1. Inrush current can be switched up to the value of 6 times the indicated rating.

## CONSTRUCTION



# ORDERING INFORMATION




Remarks: 1. They come with a stamp indicating international standards without your request.
2. The color of indication on the actuator is white.

# PRODUCT TYPES

### 1. Without indication on actuator (actuator color: dark gray)

| Terminal | Number of pole | Operation | Ordering part number | |
|---|---|---|---|---|
| | | | Flange color: Dark gray | Flange color: Black |
| .250 Quick connect terminal | 3 poles | ON – OFF | AJ8S700ZC | AJ8S700ZBC |

### 2. With indication on actuator

1) With I ○ indication (actuator color: dark gray)

| Terminal | Number of pole | Operation | Ordering part number | |
|---|---|---|---|---|
| | | | Flange color: Dark gray | Flange color: Black |
| .250 Quick connect terminal | 3 poles | ON – OFF | AJ8S701ZC | AJ8S701ZBC |

### 3. With indication on actuator

1) With – ○ indication (actuator color: dark gray)

| Terminal | Number of pole | Operation | Ordering part number | |
|---|---|---|---|---|
| | | | Flange color: Dark gray | Flange color: Black |
| .250 Quick connect terminal | 3 poles | ON – OFF | AJ8S702ZC | AJ8S702ZBC |

Remarks: Standard actuator color is dark gray and black.
To order switches with a black actuator, replace the letter “Z” with “B” in the ordering part number above.
EX) AJ8S701ZC (actuator color: dark gray, flange color: dark gray)
→ AJ8S701BC (actuator color: black, flange color: dark gray)

# SPECIFICATIONS

### 1. Contact rating

| Type | Voltage | Resistive load (power factor = 1) | Motor load* (EN61058-1) (power factor = 0.6) | Inrush load |
|---|---|---|---|---|
| Power section | 250V AC | 16A | 4A | 160A (8.3ms) |
| Signal section | 5V DC | 10mA | — | — |

Remark: The motor load is in accordance with EN61058-1. Inrush current can be switched up to the value of 6 times the indicated rating.

## 2. Characteristics

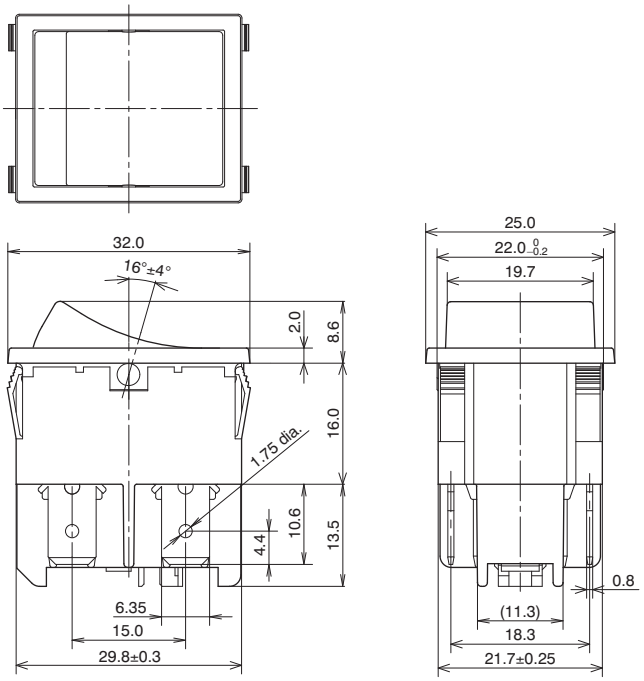
| Item | | Specifications |
|---|---|---|
| Electrical life | | Min.$10^4$ (at 7 cpm.,at rated load) |
| Mechanical life | | Min.$5\times10^4$ (at 20 cpm.) |
| Contact resistance (initial) | Power contact | Max. 100mΩ (by voltage drop at 1A, 2 to 4V DC) |
| | Signal contact | Max. 1Ω (measured by a milliohm meter) |
| Dielectric strength (initial) | Power contact | 2,000 Vrms (detection current: 10mA) |
| | Signal contact | 100 Vrms (detection current: 10mA) |
| Ambient temperature | | –25°C to +85°C (not freezing below 0°C) |
| Vibration resistance | | 10 to 55 Hz at single amplitude of 0.75mm, 2 hours each in X, Y and Z directions, (contact opening max. 1ms) |
| Shock resistance | Functional | Min. 294m/s² {30G} (contact opening max. 1ms) |
| | Destructive | Min. 980m/s² {100G} |
| Terminal strength | | .250 Quick-connect terminal Min. 98N{10kgf}/min. (pull & push direction) |
| Actuator strength | | 39.2N{4kgf} for 1min. operating direction |
| Operating force (initial) *Reference value | | 4.9N or less (max. 500gf or less) |
| Flame retardancy | | UL94V-0 |
| Tracking resistance | | Min. 175 |
| Unit weight | | Approx. 13g |
| Contact material | | $AgSnO_2$ alloy (power section), Cu alloy and Au plating (signal section) |

# DIMENSIONS

CAD Data

Interested in CAD data? You can obtain CAD data for all products with a CAD Data mark from your local Panasonic Electric Works representative.

(unit: mm)




Wiring diagram

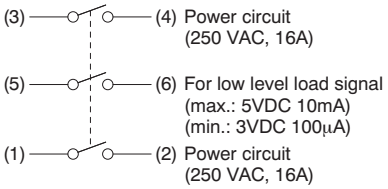
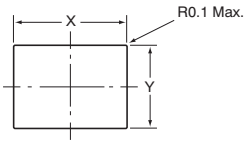


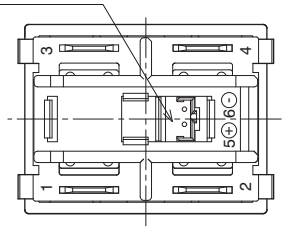

Diagram of recommended locations for panel mounting holes

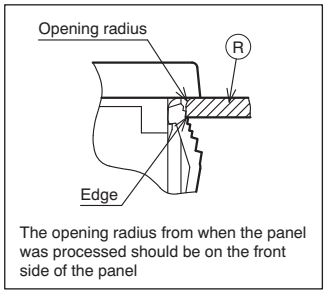



| Panel thickness | X | Y |
|---|---|---|
| 1 to less than 1.8 | $30.4^{+0}_{-0.1}$ | $22.0^{+0.1}_{-0}$ |
| 1.8 to 2.3 | $31.1^{+0}_{-0.1}$ | $22.0^{+0.1}_{-0}$ |

Remark: Contact us if you are considering using a panel of other than the recommended size and shape.

Suitable connector: CT connector




The opening radius from when the panel was processed should be on the front side of the panel

# NOTES

**1. Switch mounting**
Mount the switch with the hole cutting dimensions shown in the dimensions. Contact us if you are considering using a panel of other than the recommended size and shape.

**2. Regarding fastening lead wires to terminals**
1) When connecting the tab terminals, use a .250 Quick-connect and insert the terminals straight in. If they are skewed, the terminals will require excessive insertion force. In addition, there is some variation in the insertion force required for different receptacles from different manufacturers, so confirm how much force is needed under actual conditions. Do not solder wires onto tab terminals.
2) The terminals should be connected in such a way that they are not under constant stress from the connecting wires.
3) Terminal material is copper alloy which may discolor due to finger's oil or after a long time. But that discoloration does not effect actual performance.

**3. Resistance to chemicals**
To clean the switch unit, use a neutral detergent diluted with water. Do not use acidic or alkaline solvents as they may damage the switch. Furthermore, be careful not to get any of the detergent solution inside of the switch while cleaning it.

**4. Environment**
Avoid using and storing these switches in a location where they will be exposed to corrosive gases, silicon, or high dust levels, all of which can have an adverse effect on the contacts.

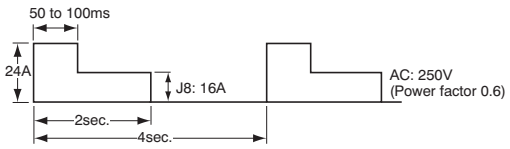
**5. Take care not to drop the product as it may impair perfomance.**

**6. For general precautions for operation switches, please visit our website.**

# REFERENCE

**1. Outline of UL1054 test**
Overload test:
20A 250V AC
(power factor 0.75 to 0.8)
50 operation
Endurance test:
16A 250V AC
(power factor 0.75 to 0.8)
10,000 operation
After testing, temperature rise of terminals should be less than 30°C and no abnormality should be observed in characteristics.

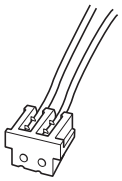
**2. Outline of EN61058-1 test**
After switching $5\times10^3$ times on the above load condition at both $85^{+5}_{0}$°C and 25±10°C, temperature rise of terminals should be less than 55°C and no abnormality should be observed in characteristics.




# COIL TERMINAL CONNECTOR

Because CT terminals are used for the coil terminals, AMP's CT connector can be used.
Remark: We do not sell this type of connector. Questions concerning this connector should be directed to the manufacturer.

**AMP's CT connector**



receptacle socket

**Pressure welding type:**
173977-2: for AWG26, 28
2-179694-2: for AWG24
**Crimping type:**
179228-2

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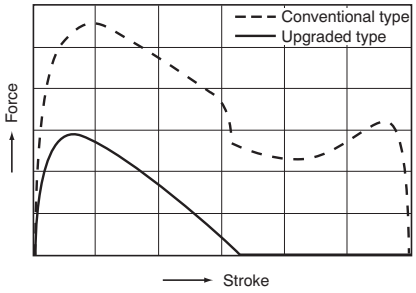
**POWER ROCKER SWITCH**

# AJ8 SWITCHES WITH TRIP FUNCTION UPGRADED TYPE

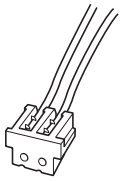
## FEATURES

**1. Power switches with an electromagnetic reset function which meet the need for energy savings in equipment and for safety.**
Applications for these switches include promoting energy savings in equipment (by reducing power consumption when OA equipment is in standby mode, for example), preventing fires caused by overheating of a heater inside equipment, preventing electrical leaks, and automatically turning off the power if the unit tips over or is shaken. These switches feature a built-in electromagnetic reset function that shuts off the main power supply in response to a signal that is received from an external sensor.

**2. Improved feel of switch operation. These switches provide the same comfortable operation of our conventional AJ8 switches.**
Comparison of force through operating stroke




**3. CT terminals adopted for coil terminals**
These switches can be used with AMP's CT connectors, which are widely used for wiring connections in OA equipment, making it possible to achieve greater efficiency in wiring work.
Receptacle socket
for AMP's CT connector

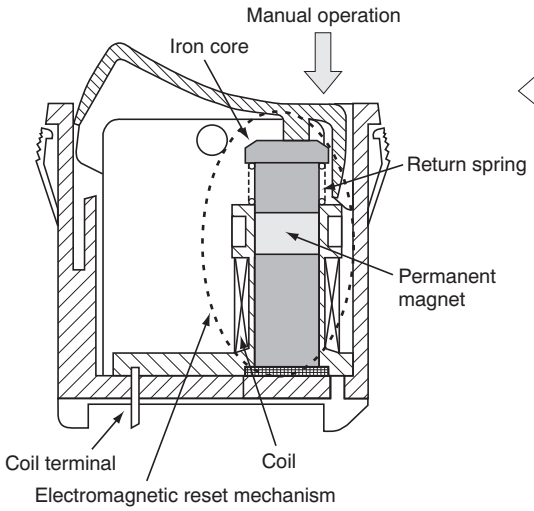


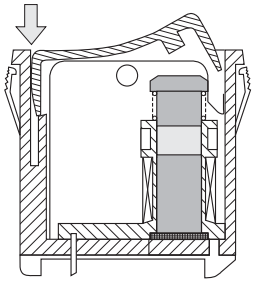
**4. Prolonged electrical service life.**
Coil operation provides an electrical life of at least 50,000 switching operations.
**5. Approved under major international safety standards.**
UL/C-UL, TÜV and SEMKO approved.

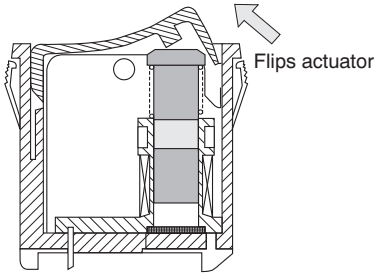
## OPERATING PRINCIPLE

• Manual operation is a repetition of (A) and (B). This operation is independent of the electromagnetic reset function.
• The reset mechanism operates only when an electromagnetic reset has occurred. (C)

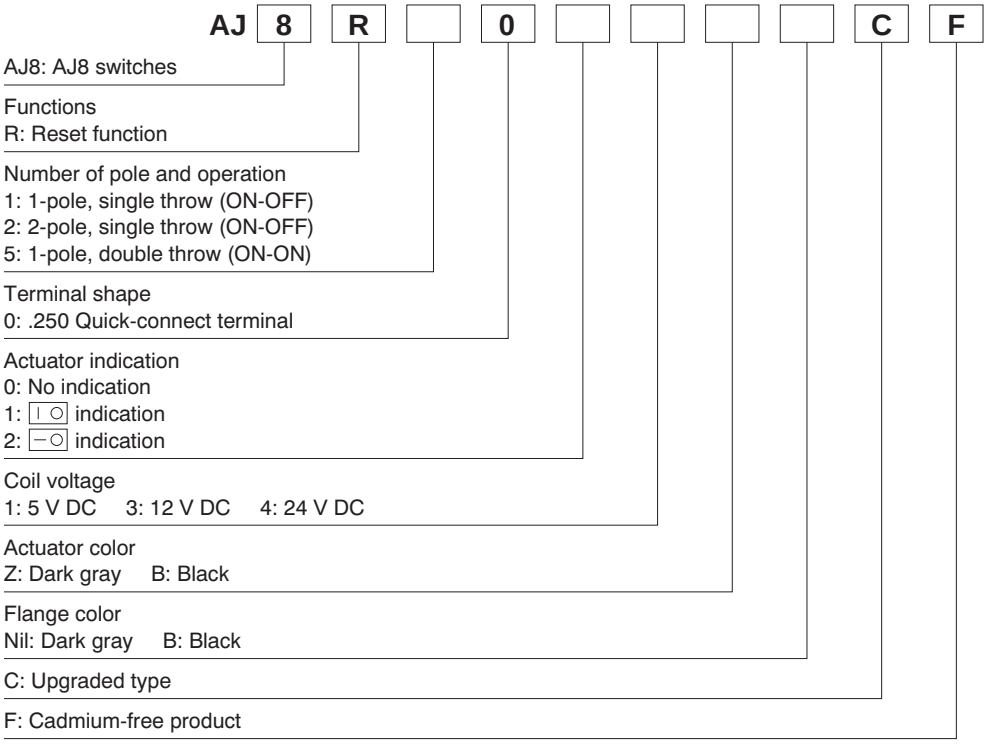
| Contact | ON | OFF |
|---|---|---|
| Manual opening/closing | (A) | (B) Manual operation |
| Electromagnetic reset | | (C) |





## ORDERING INFORMATION




Remarks: 1. They come with a stamp indicating international standards without your request.
2. The color of indication on the actuator is white.

## PRODUCT TYPES

Remarks: Standard actuator color is dark gray and black.
To order switches with a black actuator, replace the letter “Z” with “B” in the product numbers shown below when ordering.
(ex.) AJ8R1001ZC (actuator color: dark gray flange color: dark gray)
→ AJ8R1001BC (actuator color: black flange color: dark gray)

**1. Without indication on actuators (actuator color: dark gray)**

| Poles | Operation type | Coil voltage | Part no. | |
|---|---|---|---|---|
| | | | Flange color: dark gray | Flange color: black |
| 1-pole | Single throw (ON-OFF) | 5V DC | AJ8R1001ZCF | AJ8R1001ZBCF |
| | | 12V DC | AJ8R1003ZCF | AJ8R1003ZBCF |
| | | 24V DC | AJ8R1004ZCF | AJ8R1004ZBCF |
| | Double throw (ON-ON) | 5V DC | AJ8R5001ZCF | AJ8R5001ZBCF |
| | | 12V DC | AJ8R5003ZCF | AJ8R5003ZBCF |
| | | 24V DC | AJ8R5004ZCF | AJ8R5004ZBCF |
| 2-pole | Single throw (ON-OFF) | 5V DC | AJ8R2001ZCF | AJ8R2001ZBCF |
| | | 12V DC | AJ8R2003ZCF | AJ8R2003ZBCF |
| | | 24V DC | AJ8R2004ZCF | AJ8R2004ZBCF |

**2. With indication on actuator**

1) With I O indication (actuator color: dark gray)

| Poles | Operation type | Coil voltage | Part no. | |
|---|---|---|---|---|
| | | | Flange color: dark gray | Flange color: black |
| 1-pole | Single throw (ON-OFF) | 5V DC | AJ8R1011ZCF | AJ8R1011ZBCF |
| | | 12V DC | AJ8R1013ZCF | AJ8R1013ZBCF |
| | | 24V DC | AJ8R1014ZCF | AJ8R1014ZBCF |
| | Double throw (ON-ON) | 5V DC | AJ8R5011ZCF | AJ8R5011ZBCF |
| | | 12V DC | AJ8R5013ZCF | AJ8R5013ZBCF |
| | | 24V DC | AJ8R5014ZCF | AJ8R5014ZBCF |
| 2-pole | Single throw (ON-OFF) | 5V DC | AJ8R2011ZCF | AJ8R2011ZBCF |
| | | 12V DC | AJ8R2013ZCF | AJ8R2013ZBCF |
| | | 24V DC | AJ8R2014ZCF | AJ8R2014ZBCF |

2) With I O indication (actuator color: dark gray)

| Poles | Operation type | Coil voltage | Part no. | |
|---|---|---|---|---|
| | | | Flange color: dark gray | Flange color: black |
| 1-pole | Single throw (ON-OFF) | 5V DC | AJ8R1021ZCF | AJ8R1021ZBCF |
| | | 12V DC | AJ8R1023ZCF | AJ8R1023ZBCF |
| | | 24V DC | AJ8R1024ZCF | AJ8R1024ZBCF |
| | Double throw (ON-ON) | 5V DC | AJ8R5021ZCF | AJ8R5021ZBCF |
| | | 12V DC | AJ8R5023ZCF | AJ8R5023ZBCF |
| | | 24V DC | AJ8R5024ZCF | AJ8R5024ZBCF |
| 2-pole | Single throw (ON-OFF) | 5V DC | AJ8R2021ZCF | AJ8R2021ZBCF |
| | | 12V DC | AJ8R2023ZCF | AJ8R2023ZBCF |
| | | 24V DC | AJ8R2024ZCF | AJ8R2024ZBCF |

# SPECIFICATIONS

### 1. Contact rating

| Voltage | Resistive load (power factor = 1) | Motor load (EN61058-1) (power factor = 0.6) | Inrush load |
|---|---|---|---|
| 125V AC | 16A | — | 100A (8.3ms) |
| 250V AC | 10A | 4A | — |

Remark: The motor load is in accordance with EN61058-1. Inrush current can be switched up to the value of 6 times the indicated rating.

### 2. Coil rating

| Nominal Voltage *(max. 10 sec) | Drop-out voltage (at 20°C) | Nominal operating current [±10%] (at 20°C) | Coil resistance [±10%] (at 20°C) | Maximum voltage (max. 1 s) |
|---|---|---|---|---|
| 5V DC | Max.4.5V Min.0.5V | 725mA | 6.9Ω | 5.5V |
| 12V DC | Max.10.8V Min.1.2V | 300mA | 40Ω | 13.2V |
| 24V DC | Max.21.6V Min.2.4V | 150mA | 160Ω | 26.4V |

Remark: If the rated voltage is applied to the coil for more than ten seconds or the maximum voltage is applied for more than one second, coil performance will deteriorate.

### 3. Characteristics

| | | |
|---|---|---|
| Electrical life | Manual operation | Min.$10^4$ (at 7 cpm.,at rated load) |
| | Coil operation | Min.$10^3$ (at 7 cpm.,at rated load), Min.$5\times10^4$ (at 7 cpm. 5A 125V AC) |
| Mechanical life | | Min.$5\times10^4$ (at 20 cpm.) |
| Contact resistance (initial) | | Max. 100mΩ (by voltage drop at 1A, 2 to 4V DC) |
| Insulation resistance (initial) | | Min. 100MΩ (at 500V DC measured by insulation resistive meter) |
| Dielectric strength (initial) | Between contacts | 2,000 Vrms (detection current: 10mA) |
| | Between coil and contact | 4,000 Vrms (detection current: 10mA) |
| Ambient temperature | | 0°C to +60°C (not freezing below 0°C) |
| Vibration resistance | | 10 to 55 Hz at single amplitude of 0.75mm, 2 hours each in X, Y and Z directions, (contact opening max. 1ms) |
| Shock resistance | Functional | Min.294m/s$^2${30G} (contact opening max. 1ms) |
| | Destructive | Min.980m/s$^2${100G} |
| Terminal strength | | .250 Quick-connect terminal: Min. 98N{10kgf}/min. (pull & push direction) |
| Actuator strength | | 39.2N{4kgf} for 1min. operating direction |
| Contact release time | | Max. 100ms (at rated voltage) |
| Operating force (initial) * Reference value | | 4.9N or less (max. 500gf or less)<br>Setting force after reset has been released: max. 6.86N or less (max. 700gf or less) |
| Flame retardancy | | UL94V-0 |
| Tracking resistance | | Min. 175 |
| Unit weight | | 1-pole, single throw: Approx. 17g; 1-pole, double throw: Approx. 19g; 2-pole, single throw: Approx. 20g |
| Contact material | | $AgSnO_2$ alloy |

Remark: Test conditions are in accordance with EN61058-1, UL1054 and JIS C 6571.

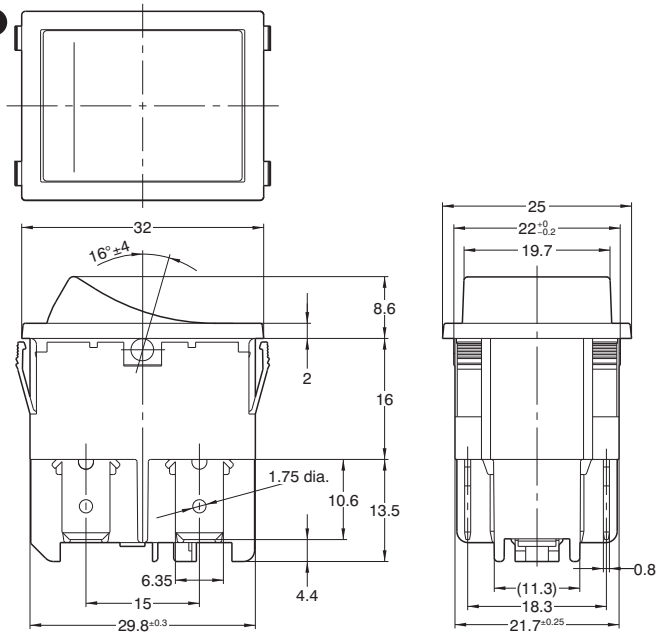
## DIMENSIONS

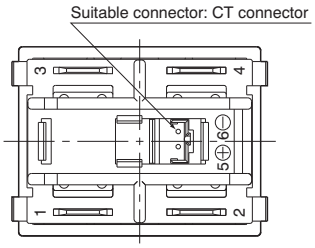
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

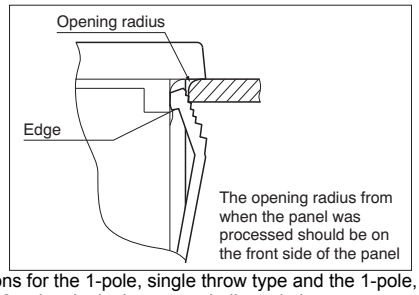
mm General tolerance: ±0.5

### 2-pole, single throw (ON-OFF)

**CAD Data**



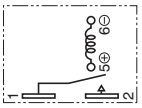




Remarks: 1. The external dimensions and mounting dimensions for the 1-pole, single throw type and the 1-pole, double throw type are the same as those for the 2-pole, single throw type indicated above.
2. The figures show the 2-pole, single throw (ON-OFF) type as an example.
The contact terminals are 1, 2, 3, and 4.
In the case of the 1-pole, single throw (ON-OFF) type, the contact terminals are 1 and 2.
In the case of the 1-pole, double throw (ON-ON) type, the contact terminals are 1, 2, and 4.
There are no other terminals. Refer to the internal wiring diagram.
3. The coil is a polarized coil; coil terminal 5 is positive and coil terminal 6 is negative.

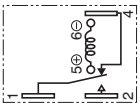
Wiring diagram (bottom view)

1-pole, single throw (ON-OFF)



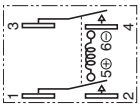

ON (set): 1-2 clo

1-pole, double throw (ON-ON)



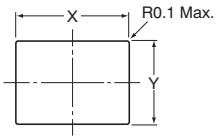

Reset: 1-4 closed
Set: 1-2 closed

2-pole, single throw (ON-OFF)




ON (set): 1-2 closed
3-4 closed

Diagram of recommended locations for panel mounting holes




| Panel thickness | X | Y |
|---|---|---|
| 1 to less than 1.8 | $30.4^{+0}_{-0.1}$ | $22.0^{+0.1}_{0}$ |
| 1.8 to 2.3 | $31.1^{+0}_{-0.1}$ | $22.0^{+0.1}_{0}$ |

Remark: Contact us if you are considering using a panel of other than the recommended size and shape.

# NOTES

**1. Operating voltage application time**
If the rated voltage is applied to the coil for more than 10 seconds or the maximum voltage is applied for more than 1 second, coil performance may deteriorate.

**2. The shape of the mounting panel should be as recommended in the dimensions diagram.**
Contact us if you are considering using a panel of other than the recommended size and shape.

**3. The mounting panel should be made of SPCC. If a different material is used, its adhesion to the switch unit may not be as strong. Check this on site if necessary.**

**4. Note that the actuator could pop out of the switch housing if 19.6N (2kgf) or more of force is applied to the side of the actuator.**

**5. Regarding fastening lead wires to terminals**
(1) When connecting the .250 Quick-connect terminals, use a .250 receptacle and insert the terminals straight in.
If you insert them at an angle, the terminals could catch on the opening and will require greater insertion force.
(2) The coil terminals have specific polarities. Make sure you connect them correctly.
(3) Use a receptacle that is compliant with JIS C 2809.
In addition, there is some deviation regarding the insertion force depending on the model used from different manufacturers, so the insertion force should be checked under realistic conditions.
(4) Use AMP's CT connector for the coil terminals.

**6. Because special receptacle terminals are used for the contact terminals and the common terminals, do not attempt to solder them. Doing so could melt plastic components and otherwise harm the performance of the switch**

**7. The terminals should be connected in such a way that they are not under constant stress from the connecting wires.**

**8. Take care not to drop the product as it may impair performance.**

**9. Resistance to chemicals**
To clean the switch unit, use a neutral detergent diluted with water.
Do not use acidic or alkaline solvents as they may damage the switch.
Furthermore, be careful not to get any of the detergent solution inside of the switch while cleaning it.

**10. This product is not hermetically sealed, so its performance could deteriorate under certain ambient conditions. Avoid using and storing these switches in a location where they will be exposed to corrosive gases, silicon, or high dust levels, all of which can have an adverse effect on the contacts. In addition, because these switches contain permanent magnets, avoid using and storing these switches in a location where metallic dust, etc., is present.**

**11. When these switches are used with weak currents of 500mA or less, a layer of material on the surface of the contacts may cause contact instability. Check and evaluate this possibility before using these switches under such conditions.**

**12. When using an ON-OFF type switch with no (I O) indication on the actuator, the "OFF" position should be indicated on the set in which the switch is installed.**

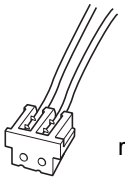
**13. To assure reliability, check the switch under actual loading conditions. Avoid any situation that may adversely affect switching performance.**

# COIL TERMINAL CONNECTOR

Because CT terminals are used for the coil terminals, AMP's CT connector can be used.

Remark: We do not sell this type of connector. Questions concerning this connector should be directed to the manufacturer.

**AMP's CT connector**



receptacle socket

**Pressure welding type:**
173977-2: for AWG26, 28
2-179694-2: for AWG24
**Crimping type:**
179228-2

**Small size**
AJ7 switch 10A type
Standard actuator

AJ7 switch 10A type
Wide actuator

AJ7 switch 6A type

## FEATURES

**1. Power rocker switches for safety requirements.**

• All versions comply with ClassⅡ EN61058-1 insulation grade.
Insulation distance: 8mm Min.
Contact gap: 3mm Min.

**• International Standard-approved status**

| | | Already approved |
|---|---|---|
| AJ7 switch 10A type | Standard actuator type | UL/C-UL, ENEC/VDE |
| | Wide actuator type | UL/C-UL, ENEC/VDE |
| AJ7 switch 6A type | | UL/C-UL, ENEC/VDE |

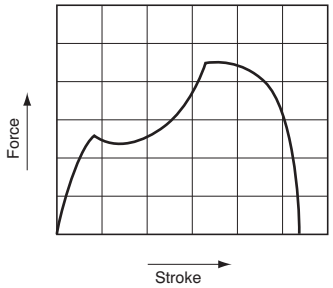
**2. High inrush current resistance is ideal for office automation equipment.**

| Type | Inrush | Contact rating | Expected life |
|---|---|---|---|
| 10A type | 100A | 10A 250V AC | Min.$10^4$ |
| 6A type | 60A | 6A 250V AC | |

**3. Operation that only requires a light touch**

The best operation characteristics were sought by analyzing touch data gathered by monitoring 1,500 people.

• Power Rocker Switch touch curve



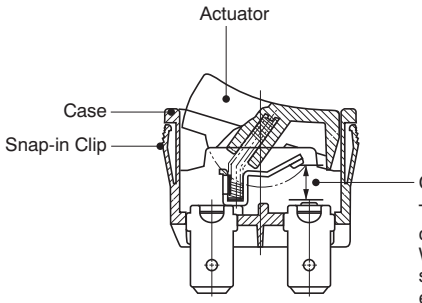

**4. A broad product line**

The AJ7 switches are available with five different types of terminals: quick-connect terminals, soldering terminals, PC board terminals, right angle terminals and left angle terminals.

**5. Cadmium-free contact compatibility.**

**6. TV-5 rating type added to lineup**

## CONSTRUCTION




The EN60950 (intended for office automation equipment) conforms with a 3mm gap.
When directly opening or closing the primary power supply side, a contact gap of at least 3mm is required in order to ensure safety.

## ORDERING INFORMATION



**AJ 7 □ □ □ □ □ □ □ F**

7: AJ7 switch

Rating & size of actuator
Nil: 10A standard size
W: 10A wide size
6: 6A standard size

Number of poles and Operation
1: 1-pole, single throw (ON-OFF)
2: 2-pole, single throw (ON-OFF)

Terminal shape
0: .187 Quick-connect terminal
1: Soldering terminal
2: PC board terminal
3: PC board right angle terminal (for standard actuator only)
4: PC board left angle terminal (for standard actuator only)

Actuator indication
0: No indication
1: I O indication (Indication on top)
2: — O indication (Indication on top)
3: I O indication (Side indication)
4: · indication (Indication on top)
5: I indication (Side indication)

Actuator color Remark 1)
W: White B: Black R: Red

Flange color
Nil: Black (standard color)
(Custom ordered color: W: White, H: Light gray) Remark 1, 5)

Insulation guard
Nil: Short guard type
T: Long guard type (.187 Quick-connect terminal and soldering terminal only)

F: Cadmium-free product

Remarks: 1. The 10A type has indication on the actuator.
2. The correspondence between actuator colors and flange colors marked with an asterisk differs according to the type; refer to the remark for the PRODUCT TYPES.
3. "I O" is engraved on all flanges.
4. The color of indication on the actuator:
• White actuator: black
• Others: white
5. The flange color of 6A type is black only.
6. They come with a stamp indicating international standards without your request.

### TV rating type

**AJ 7 2 □ □ B TV F**

7: AJ7 switch

Number of poles and Operation
2: 2-pole, single throw (ON-OFF)

Terminal shape
0: .187 Quick-connect terminal
1: Soldering terminal

Actuator indication
0: No indication
2: — O indication (Indication on top)

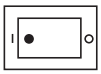
Actuator color
B: Black

Rating
TV: TV rating

F: Cadmium-free product

# ACTUATOR INDICATIONS ON PRODUCTS MADE TO ORDER

With indication on top



With side indication
(When the " I " indication is visible on the side of the actuator, it indicates that the switch is in the "ON" state.)

With | I | O | indications:
The I and O symbols are located on each side, respectively.
With | I | indications:
The I symbols is located on the side.

# PRODUCT TYPES

**1. 10 A type**

**1) Standard actuator type**

(1) Without indication on actuators

| Terminal shape | Poles | Operating types | Part no. |
|---|---|---|---|
| | | | Without indication |
| .187 Quick-connect terminal | 1-pole | ON-OFF | AJ7100∗F |
| | 2-pole | | AJ7200∗F |
| Soldering terminal | 1-pole | | AJ7110∗F |
| | 2-pole | | AJ7210∗F |
| PC board terminal | 1-pole | | AJ7120∗F |
| | 2-pole | | AJ7220∗F |
| PC board right angle terminal | 1-pole | | AJ7130∗F |
| | 2-pole | | AJ7230∗F |
| PC board left angle terminal | 1-pole | | AJ7140∗F |
| | 2-pole | | AJ7240∗F |

Remarks: 1. A letter indicating the actuator color is entered in place of asterisk. (Regarding the color, please refer to ORDERING INFORMATION.)
Standard flange color is black. For other colors type, they are custom ordered. For requests of other flange color, please refer to ORDERING INFORMATION.
2. Long guard type is available for .187 Quick-connect terminal and soldering terminal type. When ordering, please add a "T" before the "F" at the end of the part number.
3. The color of indication on the actuator:
• For white actuator: black
• For others: white
4. They come with a stamp indicating international standards without your request.
5. Note that the position of the I mark on the flange is used as a reference for left angle and right angle terminals as shown in the diagram below. This also applies to the 6A type.


Right angle terminal


Left angle terminal

(2) With indication on actuators

| Terminal shape | Poles | Operating types | Part no. | |
|---|---|---|---|---|
| | | | With I O indication | With — O indication |
| .187 Quick-connect terminal | 1-pole | ON-OFF | AJ7101∗F | AJ7102∗F |
| | 2-pole | | AJ7201∗F | AJ7202∗F |
| Soldering terminal | 1-pole | | AJ7111∗F | AJ7112∗F |
| | 2-pole | | AJ7211∗F | AJ7212∗F |
| PC board terminal | 1-pole | | AJ7121∗F | AJ7122∗F |
| | 2-pole | | AJ7221∗F | AJ7222∗F |
| PC board right angle terminal | 1-pole | | AJ7131∗F | AJ7132∗F |
| | 2-pole | | AJ7231∗F | AJ7232∗F |
| PC board left angle terminal | 1-pole | | AJ7141∗F | AJ7142∗F |
| | 2-pole | | AJ7241∗F | AJ7242∗F |

Remarks: 1. A letter indicating the actuator color is entered in place of asterisk. (Regarding the color, please refer to ORDERING INFORMATION.)
Standard flange color is black. For other colors type, they are custom ordered. For requests of other flange color, please refer to ORDERING INFORMATION.
2. Long guard type is available for .187 Quick-connect terminal and soldering terminal type. When ordering, please add a "T" before the "F" at the end of the part number.
3. The color of indication on the actuator:
• For white actuator: black
• For others: white
4. They come with a stamp indicating international standards without your request.
5. Note that the position of the I mark on the flange is used as a reference for left angle and right angle terminals as shown in the diagram below. This also applies to the 6A type.

Right angle terminal

Left angle terminal

**2) Wide actuator type**

(1) Without indication on actuators

| Terminal shape | Poles | Operating types | Part no. |
|---|---|---|---|
| | | | Without indication |
| .187 Quick-connect terminal | 1-pole | ON-OFF | AJ7W100∗F |
| | 2-pole | | AJ7W200∗F |
| Soldering terminal | 1-pole | | AJ7W110∗F |
| | 2-pole | | AJ7W210∗F |
| PC board terminal | 1-pole | | AJ7W120∗F |
| | 2-pole | | AJ7W220∗F |

(2) With indication on actuators

| Terminal shape | Poles | Operating types | Part no. | |
|---|---|---|---|---|
| | | | With I O indication | With — O indication |
| .187 Quick-connect terminal | 1-pole | ON-OFF | AJ7W101∗F | AJ7W102∗F |
| | 2-pole | | AJ7W201∗F | AJ7W202∗F |
| Soldering terminal | 1-pole | | AJ7W111∗F | AJ7W112∗F |
| | 2-pole | | AJ7W211∗F | AJ7W212∗F |
| PC board terminal | 1-pole | | AJ7W121∗F | AJ7W122∗F |
| | 2-pole | | AJ7W221∗F | AJ7W222∗F |

Remarks: 1. A letter indicating the actuator color is entered in place of asterisk. (Regarding the color, please refer to ORDERING INFORMATION.)
Standard flange color is black. For other colors type, they are custom ordered. For requests of other flange color, please refer to ORDERING INFORMATION.
2. The color of indication on the actuator:
• For white actuator: black
• For others: white
3. They come with a stamp indicating international standards without your request.

**2. 6 A type**

**1) Standard actuator type**

(1) Without indication on actuators

| Terminal shape | Poles | Operating types | Part no. |
|---|---|---|---|
| | | | Without indication |
| .187 Quick-connect terminal | 1-pole | ON-OFF | AJ76100∗F |
| | 2-pole | | AJ76200∗F |
| Soldering terminal | 1-pole | | AJ76110∗F |
| | 2-pole | | AJ76210∗F |
| PC board terminal | 1-pole | | AJ76120∗F |
| | 2-pole | | AJ76220∗F |
| PC board right angle terminal | 1-pole | | AJ76130∗F |
| | 2-pole | | AJ76230∗F |
| PC board left angle terminal | 1-pole | | AJ76140∗F |
| | 2-pole | | AJ76240∗F |

(2) With indication on actuators

| Terminal shape | Poles | Operating types | Part no. | |
|---|---|---|---|---|
| | | | With I O indication | With — O indication |
| .187 Quick-connect terminal | 1-pole | ON-OFF | AJ76101∗F | AJ76102∗F |
| | 2-pole | | AJ76201∗F | AJ76202∗F |
| Soldering terminal | 1-pole | | AJ76111∗F | AJ76112∗F |
| | 2-pole | | AJ76211∗F | AJ76212∗F |
| PC board terminal | 1-pole | | AJ76121∗F | AJ76122∗F |
| | 2-pole | | AJ76221∗F | AJ76222∗F |
| PC board right angle terminal | 1-pole | | AJ76131∗F | AJ76132∗F |
| | 2-pole | | AJ76231∗F | AJ76232∗F |
| PC board left angle terminal | 1-pole | | AJ76141∗F | AJ76142∗F |
| | 2-pole | | AJ76241∗F | AJ76242∗F |

(Standard color is black. For other color type, they are custom ordered.)

Remarks: 1. Replace the asterisk with a code that indicates the actuator color.
B: Black (standard), W: White (custom ordered), R: Red (custom ordered)
2. The color of I O indication on the actuator: White actuator: black Others: white
3. They come with a stamp indicating international standards without your request.

**3. TV rating type**

| Terminal shape | Poles | Operating types | Part no. | |
|---|---|---|---|---|
| | | | Without indication | With — O indication |
| .187 Quick-connect terminal | 2-pole | ON-OFF | AJ7200BTVF | — |
| | | | — | AJ7202BTVF |
| Soldering terminal | | | AJ7210BTVF | — |
| | | | — | AJ7212BTVF |

# SPECIFICATIONS

**1. Contact rating**

| Type | Voltage | Resistive load (power factor = 1) | Motor load (EN61058-1) (power factor = 0.6) | Inrush load |
|---|---|---|---|---|
| 10A type | 250V AC | 10A | 4A | 100A (8.3ms) |
| 6A type | | 6A | 3A | — |

Remark: The motor load is in accordance with EN61058-1. Inrush current can be switched up to the value of 6 times the indicated rating.

**2. TV rating**

| Voltage | Resistive load | Motor load (EN6105801) | Capacitor load (EN61058-1) | Lamp load (UL1054) | Expected electrical life |
|---|---|---|---|---|---|
| | (power factor = 1) | (power factor = 0.6) | (inrush load) | (TV-5) | (at 7 cpm) |
| 120V AC | — | — | — | 5/78A | Min. $2.5 \times 10^4$ |
| 250V AC | 10A | 4A | 100A (8.3ms) | — | Min. $10^4$ |

### 3. Characteristics

| | | |
|---|---|---|
| Expected life (min. operations) | Mechanical | Min. $5 \times 10^4$ (at 20 cpm.) |
| | Electrical* | Min. $10^4$ (at 7 cpm., at rated load) |
| Insulation resistance (initial) | | Min. 100 MΩ (at 500V DC measured by insulation resistive meter) (between terminals) |
| Dielectric strength (initial) | | 2,000 Vrms (detection current: 10 mA) (between terminals) |
| Contact resistance (initial) | | Max. 100mΩ (by voltage drop at 1A, 2 to 4V DC) |
| Temperature rise | at $6 \times 10^3$ ope. or less | Max. 30°C (UL1054) |
| | from $6 \times 10^3$ ope. to $10^4$ | Max. 55°C (EN61058-1) |
| Vibration resistance | | 10 to 55 Hz at double amplitude of 1.5mm (contact opening max. 1 ms) |
| Shock resistance | | Min. 490m/s²{50 G} |
| Actuator strength | | 40 N {4.08kgf} for 1 minute (operating direction) |
| Tensile terminal strength | | 100 N {10.2kgf} for 1 minute or more (pull & push direction) |
| Ambient temperature | | –25°C to +85°C (not freezing below 0°C) |
| Flame retardancy | | UL94V-0 |
| Tracking resistance | | Min. 175 |
| Operating force (reference characteristics) | 1-pole | 2.2 ± 1.2N {0.22 ±0.12kgf} |
| | 2-pole | 4 ± 2.5N {0.41 ±0.25kgf} |
| Contact material | | $AgSnO_2$ alloy |

Remark: Test conditions are in accordance with EN61058-1, UL1054 and JIS C 6571.

## DIMENSIONS

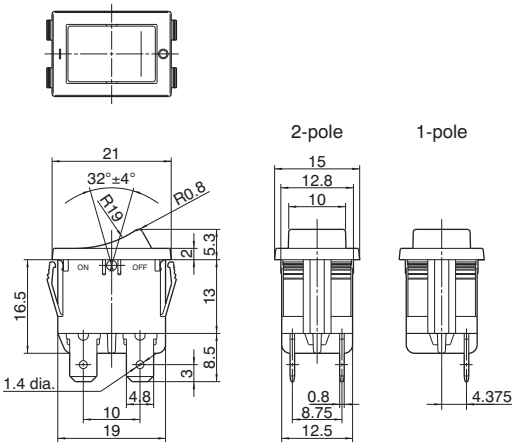
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

mm General tolerance: ±0.5

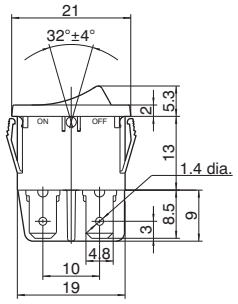
The dimension diagram for the standard actuator types is common to both the 10A type and the 6A type.

**1. .187 Quick-connect terminal/Long guard type**

**CAD Data**

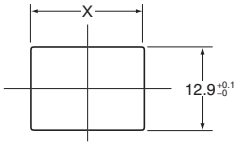



Long guard type
.187 Quick-connect terminal




Remark: As for soldering type, only terminal is different.

Diagram of recommended locations for panel mounting holes

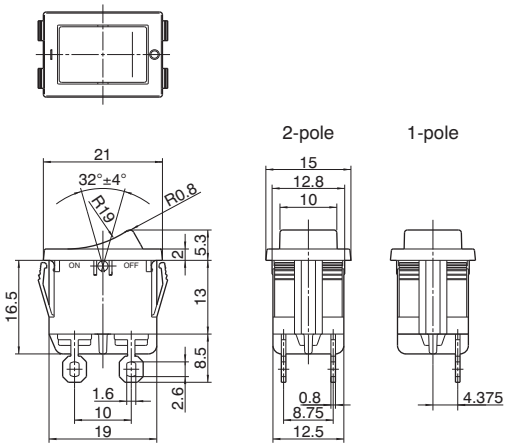



| Panel thickness | X |
|---|---|
| 0.75 to 1.25 | $19.2^{+0}_{-0.1}$ |
| 1.25 to 2 | $19.4^{+0}_{-0.1}$ |
| 2 to 3 | $19.8^{+0}_{-0.1}$ |

## 2. Soldering terminal

mm General tolerance: ±0.5

**CAD Data**




Long guard type
Soldering terminal

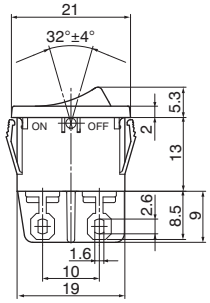
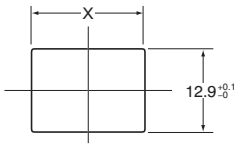



Diagram of recommended locations for panel mounting holes




| Panel thickness | X |
|---|---|
| 0.75 to 1.25 | $19.2^{+0}_{-0.1}$ |
| 1.25 to 2 | $19.4^{+0}_{-0.1}$ |
| 2 to 3 | $19.8^{+0}_{-0.1}$ |

## 3. PC board terminal

**CAD Data**

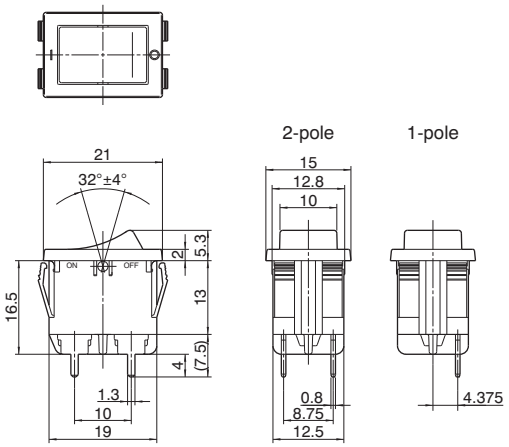
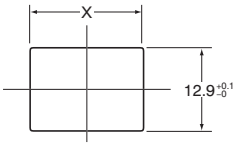
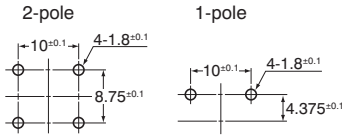



Diagram of recommended locations for panel mounting holes




PC board pattern




| Panel thickness | X |
|---|---|
| 0.75 to 1.25 | $19.2^{+0}_{-0.1}$ |
| 1.25 to 2 | $19.4^{+0}_{-0.1}$ |
| 2 to 3 | $19.8^{+0}_{-0.1}$ |

## 4. PC board right angle terminal

**CAD Data**

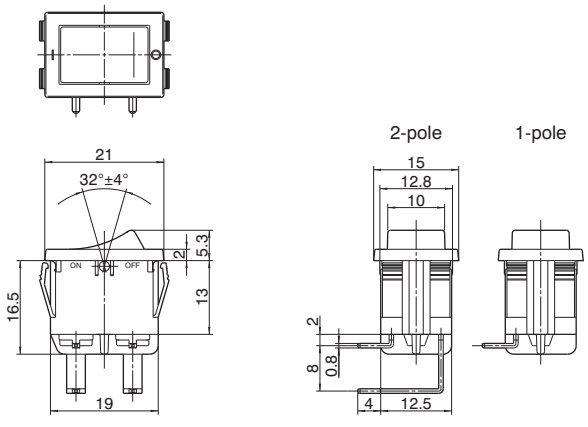
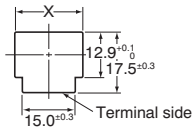
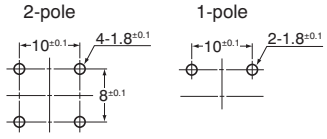



Diagram of recommended locations for panel mounting holes




PC board pattern




| Panel thickness | X |
|---|---|
| 0.75 to 1.25 | $19.2^{+0}_{-0.1}$ |
| 1.25 to 2 | $19.4^{+0}_{-0.1}$ |
| 2 to 3 | $19.8^{+0}_{-0.1}$ |

Remark: A type left angle terminals is also available.

**5. Wide actuator type**

mm General tolerance: ±0.5

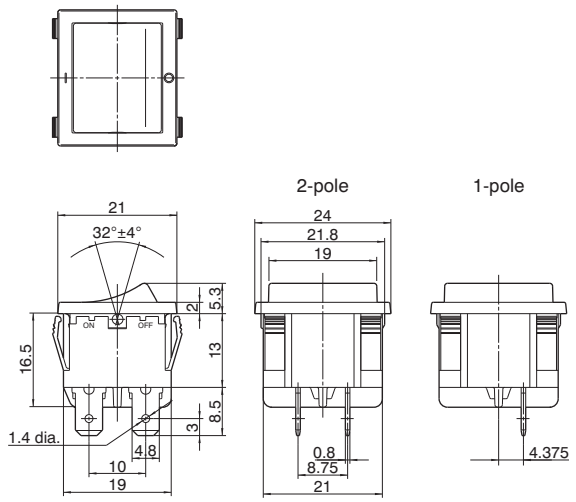
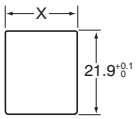



Diagram of recommended locations for panel mounting holes




| Panel thickness | X |
|---|---|
| 1 to less than 1.8 | $19.2^{+0}_{-0.1}$ |
| 1.8 to 2.3 | $19.9^{+0}_{-0.1}$ |

Remark: Dimensions for the terminals of soldering terminal type and PC board terminal type are the same as those of standard size type.

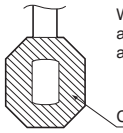
# NOTES

**1. Switch mounting**

Mount the switch with the hole cutting dimensions shown in the dimensions. Contact us if you are considering using a panel of other than the recommended size and shape.

**2. Regarding fastening lead wires to terminals**

1) When connecting the tab terminals, use a .187 Quick-connect and insert the terminals straight in.
If they are skewed, the terminals will require excessive insertion force.
In addition, there is some variation in the insertion force required for different receptacles from different manufacturers, so confirm how much force is needed under actual conditions.
Do not solder wires onto tab terminals.
2) With manual soldering: Complete the soldering connection work within 3 seconds with the tip of the soldering iron (60W soldering iron) at a temperature of 420°C or lower, and take care not to apply any force to the terminal area.
Avoid touching the switch with soldering iron.

| Soldering position | |
|---|---|
|  | When wrapping or soldering a wire around a terminal, do so in the shaded area indicated in the diagram at left.<br>Contact terminal and ground terminal |

Refer to the diagram above, “soldering position,” for details on the position where a wire should be soldered to a terminal.
When soldering PC board terminals, keep soldering time to within 5 s at 270°C soldering bath or within 3 s at 350°C soldering bath.
3) The terminals should be connected in such a way that they are not under constant stress from the connecting wires.
4) Terminal material is copper alloy which may discolor due to finger’s oil or after a long time. But that discoloration does not effect actual performance.

**3. Resistance to chemicals**

To clean the switch unit, use a neutral detergent diluted with water.
Do not use acidic or alkaline solvents as they may damage the switch.
Furthermore, be careful not to get any of the detergent solution inside of the switch while cleaning it.

**4. Environment**

Avoid using and storing these switches in a location where they will be exposed to corrosive gases, silicon, or high dust levels, all of which can have an adverse effect on the contacts.

**5. Take care not to drop the product as it may impair perfomance.**

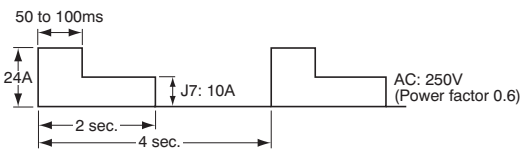
# REFERENCE

**1. Outline of UL1054 test**

Overload test AJ7: 12.5A 250V AC (power factor 0.75 to 0.8)
50 operation
Endurance test AJ7: 10A 250V AC (power factor 0.75 to 0.8)
$6\times10^3$ operation
After testing, temperature rise of terminals should be less than 30°C and no abnormality should be observed in characteristics.

**2. Outline of EN61058-1 test**

After switching $5\times10^3$ times on the below load condition at both $85^{+5}_{0}$°C and 25±10°C, temperature rise of terminals should be less than 55°C and no abnormality should be observed in characteristics.



# INTRODUCTION TO 4P CONNECTORS FOR THE AJ7 SWITCH (produced by Nippon Tanshi Co., Ltd)


Remark: This AJ7 switch connector is not available from Panasonic.
Contact us for further details on this connector.

**Suitable switches: AJ7 switch, .187 Quick-connect terminal**
(Note: Terminal guard long type switches are not suitable for this connector.)

**Housing**
Product number: 4120-4204

**Receptacle**
Product number: 171901-M2

Panasonic
ideas for life

**POWER ROCKER SWITCH**

# AJ8 (J8) SWITCHES

AJ8 switch Standard actuator

AJ8 switch Wide actuator

## FEATURES

**1. Power rocker switches for safety requirements.**

• All versions comply with ClassⅡ EN61058-1 insulation grade.
Insulation distance: 8mm Min.
Contact gap: 3mm Min.

**• International Standard-approved status**

| | | Already approved |
|---|---|---|
| AJ8 switch | Standard actuator type | UL/C-UL, ENEC/VDE |
| | Wide actuator type | UL/C-UL, ENEC/VDE |

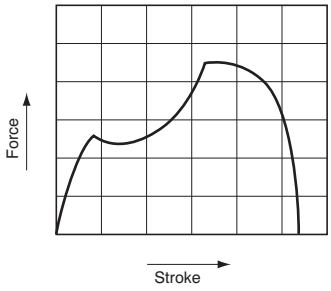
**2. High inrush current resistance is ideal for office automation equipment.**

| Type | Inrush | Contact rating | Expected life |
|---|---|---|---|
| AJ8 | 160A | 16A 250V AC | Min.$10^4$ |

**3. Operation that only requires a light touch**

The best operation characteristics were sought by analyzing touch data gathered by monitoring 1,500 people.

• Power Rocker Switch touch curve



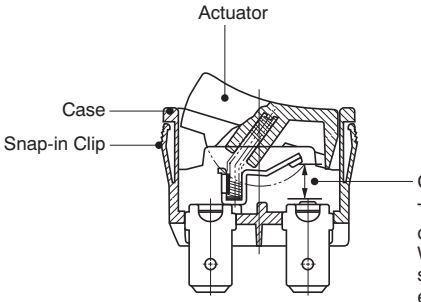

**4. A broad product line**

The AJ8 switches are available with five different types of terminals:quick-connect terminals, soldering terminals, PC board terminals, right angle terminals and left angle terminals.

**5. Cadmium-free contact compatibility.**

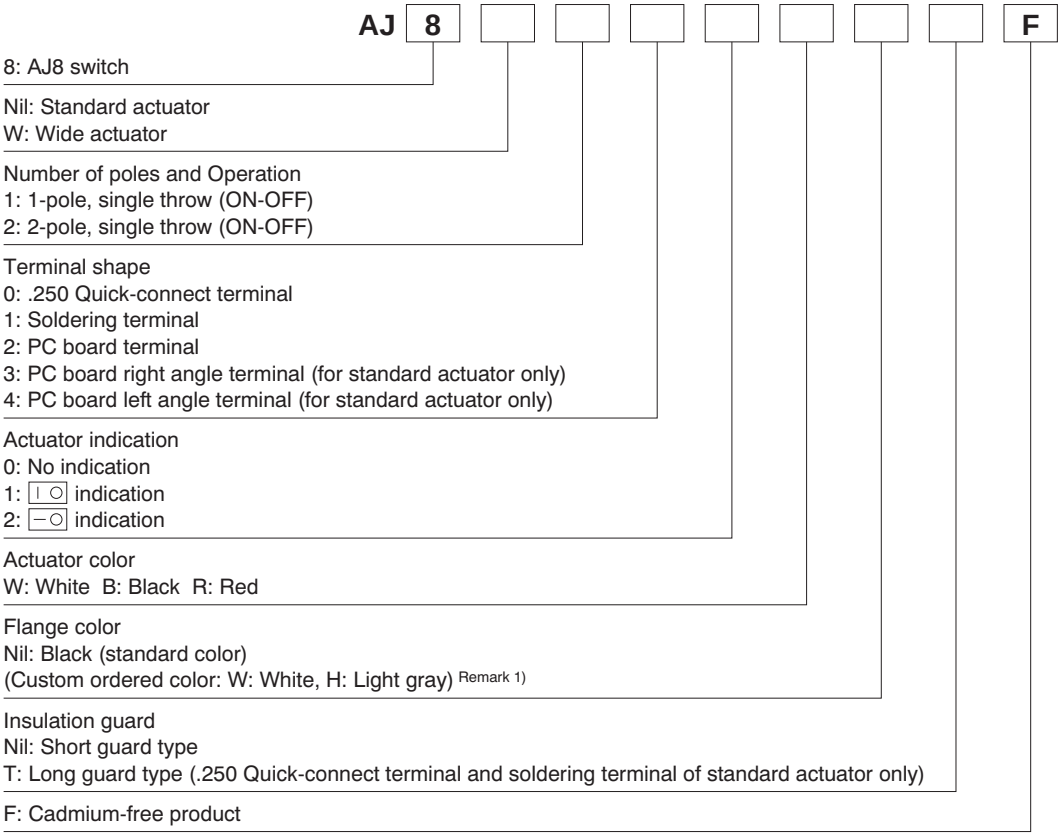
**6. TV-8 rating type added to lineup.**

## CONSTRUCTION



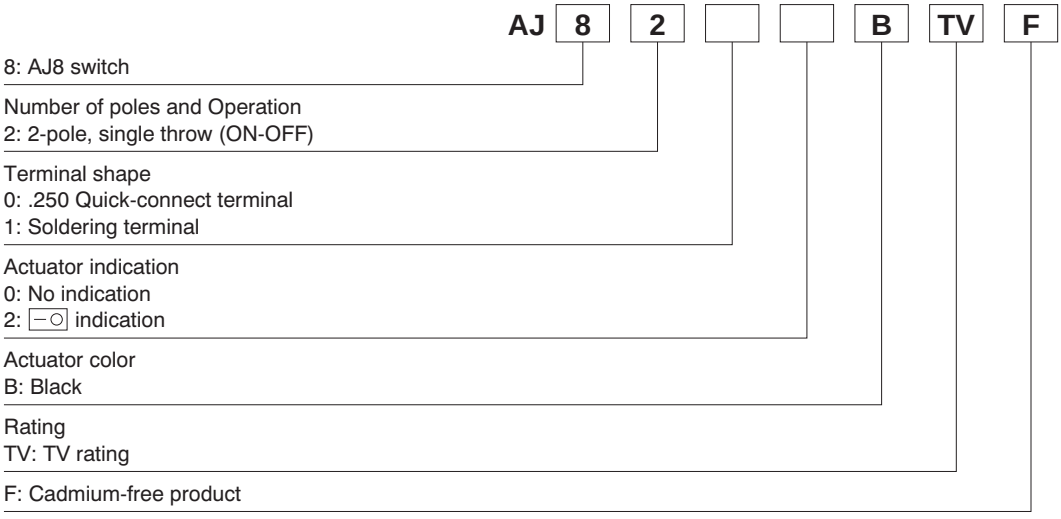

The EN60950 (intended for office automation equipment) conforms with a 3mm gap.
When directly opening or closing the primary power supply side, a contact gap of at least 3mm is required in order to ensure safety.

# ORDERING INFORMATION




Remarks: 1. Please consult us for details concerning different flange colors.
2. "I ○" is engraved on all flanges.
3. The color of indication on the actuator:
• White actuator: black
• Others: white
4. They come with a stamp indicating international standards without your request.

**TV rating type**



# PRODUCT TYPES



**1. Standard actuator type**

(1) Without indication on actuators

| Terminal shape | Poles | Operating types | Part no. |
|---|---|---|---|
| | | | Without indication |
| .250 Quick-connect terminal | 1-pole | ON-OFF | AJ8100∗F |
| | 2-pole | | AJ8200∗F |
| Soldering terminal | 1-pole | | AJ8110∗F |
| | 2-pole | | AJ8210∗F |
| PC board terminal | 1-pole | | AJ8120∗F |
| | 2-pole | | AJ8220∗F |
| PC board right angle terminal | 1-pole | | AJ8130∗F |
| | 2-pole | | AJ8230∗F |
| PC board left angle terminal | 1-pole | | AJ8140∗F |
| | 2-pole | | AJ8240∗F |

Remarks: 1. A letter indicating the actuator color is entered in place of asterisk. (Regarding the color, please refer to ORDERING INFORMATION.)
Standard flange color is black. For other colors type, they are custom ordered. For requests of other flange color, please refer to ORDERING INFORMATION.
2. Long guard type is available for .250 Quick-connect terminal and soldering terminal type. When ordering, please add a “T” before the “F” at the end of the part number.
3. The color of indication on the actuator:
• For white actuator: black
• For others: white
4. They come with a stamp indicating international standards without your request.
5. Note that the position of the I mark on the flange is used as a reference for left angle and right angle terminals as shown in the diagram below.


Right angle terminal


Left angle terminal

(2) With indication on actuators

| Terminal shape | Poles | Operating types | Part no. | |
|---|---|---|---|---|
| | | | With I O indication | With — O indication |
| .250 Quick-connect terminal | 1-pole | ON-OFF | AJ8101∗F | AJ8102∗F |
| | 2-pole | | AJ8201∗F | AJ8202∗F |
| Soldering terminal | 1-pole | | AJ8111∗F | AJ8112∗F |
| | 2-pole | | AJ8211∗F | AJ8212∗F |
| PC board terminal | 1-pole | | AJ8121∗F | AJ8122∗F |
| | 2-pole | | AJ8221∗F | AJ8222∗F |
| PC board right angle terminal | 1-pole | | AJ8131∗F | AJ8132∗F |
| | 2-pole | | AJ8231∗F | AJ8232∗F |
| PC board left angle terminal | 1-pole | | AJ8141∗F | AJ8142∗F |
| | 2-pole | | AJ8241∗F | AJ8242∗F |

Remarks: 1. A letter indicating the actuator color is entered in place of asterisk. (Regarding the color, please refer to ORDERING INFORMATION.)
Standard flange color is black. For other colors type, they are custom ordered. For requests of other flange color, please refer to ORDERING INFORMATION.
2. Long guard type is available for .250 Quick-connect terminal and soldering terminal type. When ordering, please add a “T” before the “F” at the end of the part number.
3. The color of indication on the actuator:
• For white actuator: black
• For others: white
4. They come with a stamp indicating international standards without your request.
5. Note that the position of the I mark on the flange is used as a reference for left angle and right angle terminals as shown in the diagram below.


Right angle terminal


Left angle terminal

**2.Wide actuator type**

(1) Without indication on actuators

| Terminal shape | Poles | Operating types | Part no. |
|---|---|---|---|
| | | | Without indication |
| .250 Quick-connect terminal | 1-pole | ON-OFF | AJ8W100∗F |
| | 2-pole | | AJ8W200∗F |
| Soldering terminal | 1-pole | | AJ8W110∗F |
| | 2-pole | | AJ8W210∗F |
| PC board terminal | 1-pole | | AJ8W120∗F |
| | 2-pole | | AJ8W220∗F |

(2) With indication on actuators

| Terminal shape | Poles | Operating types | Part no. | |
|---|---|---|---|---|
| | | | With I O indication | With — O indication |
| .250 Quick-connect terminal | 1-pole | ON-OFF | AJ8W101∗F | AJ8W102∗F |
| | 2-pole | | AJ8W201∗F | AJ8W202∗F |
| Soldering terminal | 1-pole | | AJ8W111∗F | AJ8W112∗F |
| | 2-pole | | AJ8W211∗F | AJ8W212∗F |
| PC board terminal | 1-pole | | AJ8W121∗F | AJ8W122∗F |
| | 2-pole | | AJ8W221∗F | AJ8W222∗F |

Remarks: 1. A letter indicating the actuator color is entered in place of asterisk. (Regarding the color, please refer to ORDERING INFORMATION.)
Standard flange color is black. For other colors type, they are custom ordered. For requests of other flange color, please refer to ORDERING INFORMATION.
2. The color of indication on the actuator:
• For white actuator: black
• For others: white
3. They come with a stamp indicating international standards without your request.

**3. TV rating type**

| Terminal shape | Poles | Operating types | Part no. | |
|---|---|---|---|---|
| | | | Without indication | With — O indication |
| .250 Quick-connect terminal | 2-pole | ON-OFF | AJ8200BTVF | — |
| | | | — | AJ8202BTVF |
| Soldering terminal | | | AJ8210BTVF | — |
| | | | — | AJ8212BTVF |

# SPECIFICATIONS

**1. Contact rating**

| Type | Voltage | Resistive load (power factor = 1) | Motor load (EN61058-1) (power factor = 0.6) |
|---|---|---|---|
| AJ8 switch | 250V AC | 16A | 4A |

Remark: The motor load is in accordance with EN61058-1. Inrush current can be switched up to the value of 6 times the indicated rating.

**2. TV rating**

| Voltage | Resistive load | Motor load (EN6105801) | Capacitor load (EN61058-1) | Lamp load (UL1054) | Expected electrical life |
|---|---|---|---|---|---|
| | (power factor = 1) | (power factor = 0.6) | (inrush load) | (TV-8) | (at 7 cpm) |
| 120V AC | — | — | — | 8/117A | Min. $2.5 \times 10^4$ |
| 250V AC | 16A | 4A | 160A (8.3ms) | — | Min. $10^4$ |

### 3. Characteristics

| | | |
|---|---|---|
| Expected life (min. operations) | Mechanical | Min. $5 \times 10^4$ (at 20 cpm.) |
| | Electrical* | Min. $10^4$ (at 7 cpm., at rated load) |
| Insulation resistance (initial) | | Min. 100 MΩ (at 500V DC measured by insulation resistive meter) (between terminals) |
| Dielectric strength (initial) | | 2,000 Vrms detection current: 10 mA (between terminals) |
| Contact resistance (initial) | | Max. 100mΩ (by voltage drop at 1A, 2 to 4V DC) |
| Temperature rise | at $6 \times 10^3$ ope. or less | Max. 30°C (UL1054) |
| | from $6 \times 10^3$ ope. to $10^4$ | Max. 55°C (EN61058-1) |
| Vibration resistance | | 10 to 55 Hz at double amplitude of 1.5mm (contact opening max. 1 ms) |
| Shock resistance | | Min. 490m/s²{50 G} |
| Actuator strength | | 40 N {4.08kgf} for 1 minute (operating direction) |
| Terminal strength (.250 Quick-connect terminal) | | 100 N {10.2kgf} for 1 minute or more (pull & push direction) |
| Ambient temperature | | –25°C to +85°C (not freezing below 0°C) |
| Flame retardancy | | UL94V-0 |
| Tracking resistance | | Min. 175 |
| Operating force (reference characteristics) | 1-pole | 2.45 ± 1.47N {0.25 ±0.15kgf} |
| | 2-pole | 4.5 ± 2.5N {0.46 ±0.25kgf} |
| Contact material | | $AgSnO_2$ alloy |

Remark: Test conditions are in accordance with EN61058-1, UL1054 and JIS C 6571.

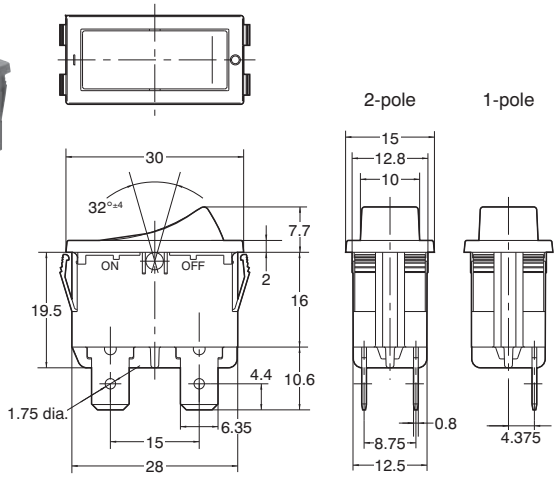
## DIMENSIONS

Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

mm General tolerance: ±0.5

### 1. .250 Quick-connect terminal/Short guard type

**CAD Data**




Long guard type
.250 Quick-connect terminal

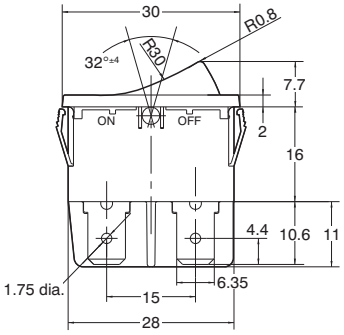
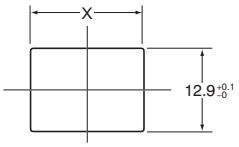



Diagram of recommended locations for panel mounting holes

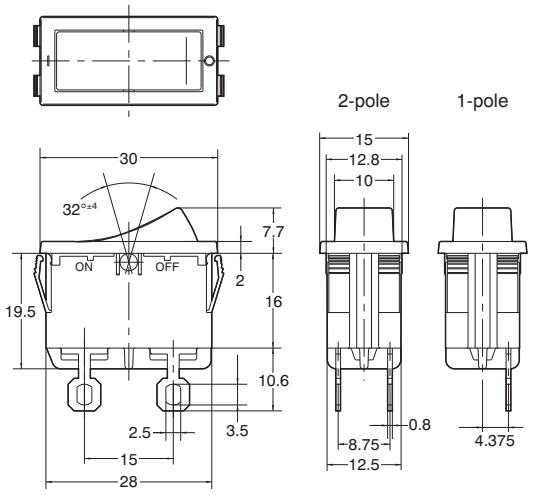



| Panel thickness | X |
|---|---|
| 0.75 to 1.25 | $28.2^{+0}_{-0.1}$ |
| 1.25 to 2 | $28.4^{+0}_{-0.1}$ |
| 2 to 3 | $28.8^{+0}_{-0.1}$ |

## 2. Soldering terminal

mm General tolerance: ±0.5

CAD Data




Long guard type
Soldering terminal

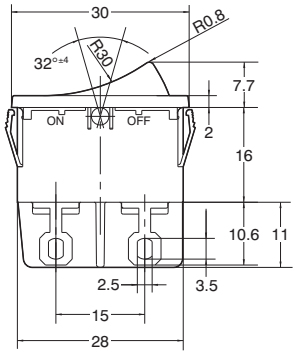
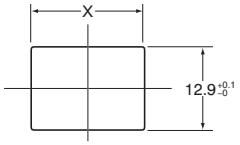



Diagram of recommended locations for panel mounting holes

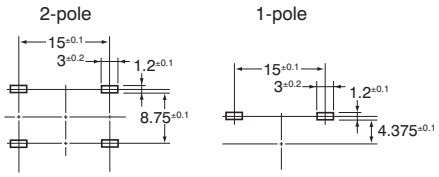



| Panel thickness | X |
|---|---|
| 0.75 to 1.25 | $28.2^{+0}_{-0.1}$ |
| 1.25 to 2 | $28.4^{+0}_{-0.1}$ |
| 2 to 3 | $28.8^{+0}_{-0.1}$ |

## 3. PC board terminal

CAD Data

PC board pattern



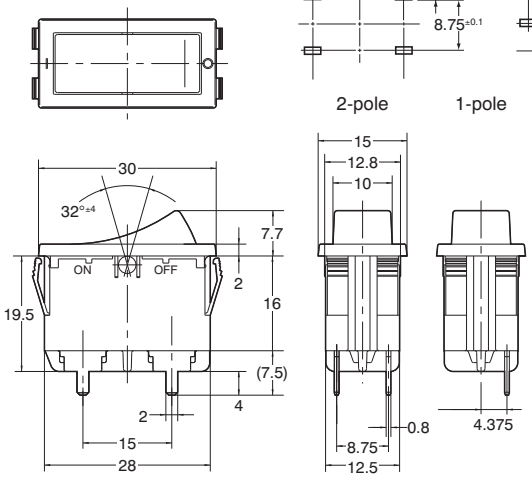
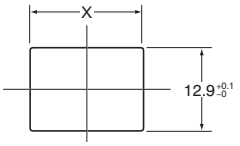




Diagram of recommended locations for panel mounting holes




| Panel thickness | X |
|---|---|
| 0.75 to 1.25 | $28.2^{+0}_{-0.1}$ |
| 1.25 to 2 | $28.4^{+0}_{-0.1}$ |
| 2 to 3 | $28.8^{+0}_{-0.1}$ |

## 4. PC board right angle terminal

mm General tolerance: ±0.5

**CAD Data**

PC board pattern

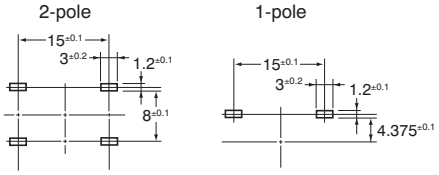
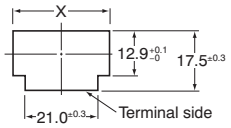
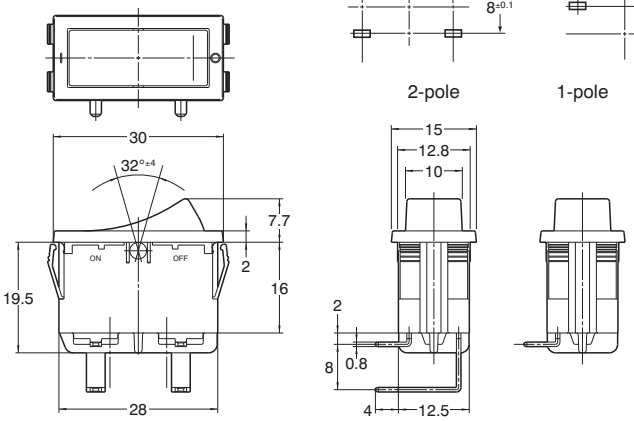



Diagram of recommended locations for panel mounting holes



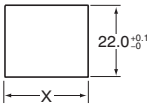

| Panel thickness | X |
|---|---|
| 0.75 to 1.25 | $28.2^{+0}_{-0.1}$ |
| 1.25 to 2 | $28.4^{+0}_{-0.1}$ |
| 2 to 3 | $28.8^{+0}_{-0.1}$ |

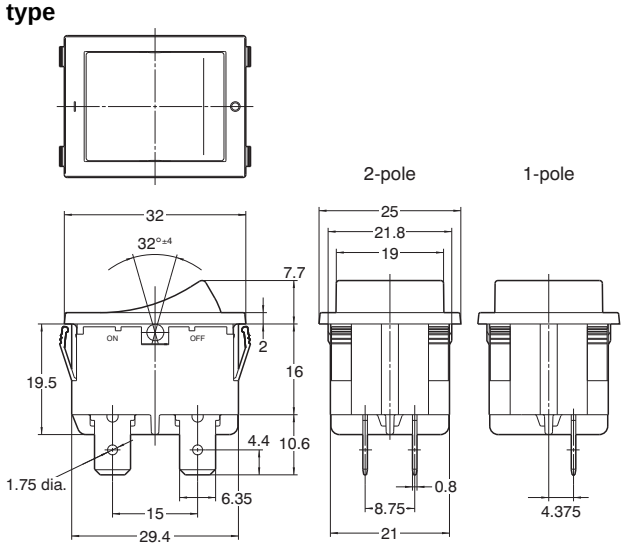
Remark: Left angle terminal type is also available.

## 5. Wide actuator type

**CAD Data**

Diagram of recommended locations for panel mounting holes



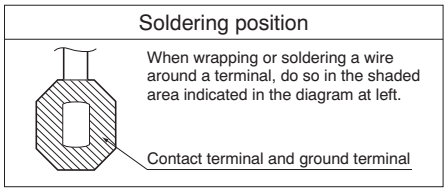

| Panel thickness | X |
|---|---|
| 1 to less than 1.8 | $30.0^{+0}_{-0.1}$ |
| 1.8 to 2.3 | $30.7^{+0}_{-0.1}$ |

Remark: Dimensions for the terminals of soldering terminal type and PC board terminal type are the same as those of standard actuator type.

# NOTES

**1. Switch mounting**
Mount the switch with the hole cutting dimensions shown in the dimensions. Contact us if you are considering using a panel of other than the recommended size and shape.

**2. Regarding fastening lead wires to terminals**
1) When connecting the tab terminals, use a .250 Quick-connect and insert the terminals straight in.
If they are skewed, the terminals will require excessive insertion force.
In addition, there is some variation in the insertion force required for different receptacles from different manufacturers, so confirm how much force is needed under actual conditions.
Do not solder wires onto tab terminals.
2) With manual soldering: Complete the soldering connection work within 3 seconds with the tip of the soldering iron (60W soldering iron) at a temperature of 420°C or lower, and take care not to apply any force to the terminal area.
Avoid touching the switch with soldering iron.




Refer to the diagram above, “soldering position,” for details on the position where a wire should be soldered to a terminal.
When soldering PC board terminals, keep soldering time to within 5 s at 270°C soldering bath or within 3 s at 350°C soldering bath.
3) The terminals should be connected in such a way that they are not under constant stress from the connecting wires.
4) Terminal material is copper alloy which may discolor due to finger’s oil or after a long time. But that discoloration does not effect actual performance.

**3. Resistance to chemicals**
To clean the switch unit, use a neutral detergent diluted with water.
Do not use acidic or alkaline solvents as they may damage the switch.
Furthermore, be careful not to get any of the detergent solution inside of the switch while cleaning it.

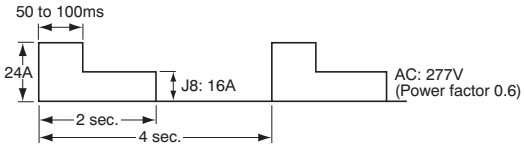
**4. Environment**
Avoid using and storing these switches in a location where they will be exposed to corrosive gases, silicon, or high dust levels, all of which can have an adverse effect on the contacts.

**5. Take care not to drop the product as it may impair perfomance.**

# REFERENCE

**1. Outline of UL1054 test**
Overload test AJ8: 20A 250V AC
(power factor 0.75 to 0.8)
50 operation
Endurance test AJ8: 16A 250V AC
(power factor 0.75 to 0.8)
$6\times10^3$ operation
After testing, temperature rise of terminals should be less than 30°C and no abnormality should be observed in characteristics.

**2. Outline of EN61058-1 test**
After switching $5 \times 10^3$ times on the above load condition at both $85^{+5}_{0}$°C and 25±10°C, temperature rise of terminals should be less than 55°C and no abnormality should be observed in characteristics.




# INTRODUCTION TO 4P CONNECTORS FOR THE AJ8 SWITCH (produced by Nippon Tanshi Co.,Ltd)


Remark: This AJ8 switch connector is not available from Panasonic.
Contact us for further details on this connector.

**Suitable switches: AJ8 switch, .250 Quick-connect terminal**
(Note: Terminal guard long type switches are not suitable for this connector.)

**Housing**
Product number: N1620-4204

**Receptacle**
Product number: 17168-2 (post-plated product for fine wires)
17168-M2 (material plated product for fine wires)
172131-M2 (for thick wires)

# Technical terminology & cautions for use

## TECHNICAL TERMINOLOGY

**1. Rated values**
Values indicating the characteristics and performance guarantee standards of the switches. The rated current and rated voltage, for instance, assume specific conditions.

**2. Electrical life**
The service life when the rated load is connected to the contact and switching operations are performed.

**3. Mechanical life**
The service life when operated at a preset operating frequency without passing electricity through the contacts.

**4. Withstand voltage**
Threshold limit value that a high voltage can be applied to a predetermined measuring location for one minute without causing damage to the insulation.

**5. Insulation resistance**
This is the resistance value at the same place the withstand voltage is measured.

**6. Contact resistance**
This indicates the electrical resistance at the contact part. Generally, this resistance includes the conductor resistance of the spring and terminal portions.

**7. Vibration resistance**
Vibration range where a closed contact does not open for longer than a specified time due to vibrations during use of the snap-action switches.

**8. Shock resistance**
Max. shock value where a closed contact does not open for longer than a specified time due to shocks during use of the switches.

**9. Allowable switching frequency**
This is the maximum switching frequency required to reach the end of mechanical life (or electrical life).

**10. Temperature rise value**
This is the maximum temperature rise value that heats the terminal portion when the rated current is flowing through the contacts.

**11. Actuator strength**
When applying a static load for a certain period on the actuator in the operation direction, this is the maximum load it can withstand before the switch loses functionality.

**12. Terminal strength**
When applying a static load for a certain period (in all directions if not stipulated) on a terminal, this is the maximum load it can withstand before the terminal loses functionality (except when the terminal is deformed).

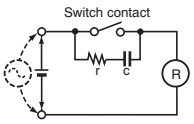
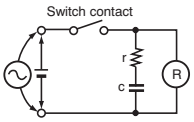
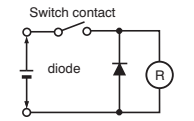
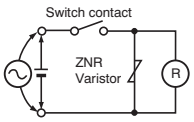
## TYPES OF LOAD

**1. Resistance load**
Resistance load is a power factor of 1 ($\cos\phi = 1$) where the load is only for the resistance portion. The displayed switch rating indicates the current capacity when using alternating current.

**2. DC load**
Differing from AC, since the direction of current is fixed for DC, the continuous arc time lengthens when the same voltage is applied.

**3. Incandescent lamp load**
Since an inrush current of 10 to 15 times the rated current flows for an instant when the switch is turned on for the lamp, adhesion of the contacts may occur. Therefore, please take into consideration this transient current when selecting a switch.

**4. Induction load**
Since arc generation due to reverse voltage can cause contact failure to occur when there is an induction load (in relays, solenoids and buzzers, etc.), we recommend you insert a suitable spark quenching circuit (see figure below).

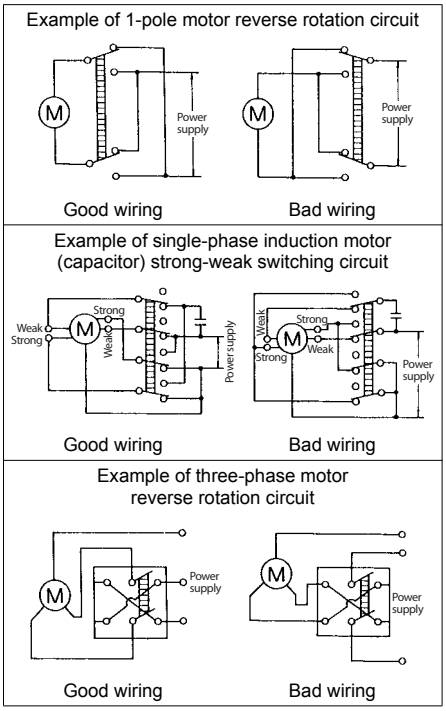
| Circuit diagram | Notes |
|---|---|
|  | 1. r = more than 10 ohms<br>2. In an AC circuit, impedance of R is to be slightly smaller than impedance of r and c. |
|  | Can be used for both AC and DC circuits. Impedance of r is nearly equal to impedance of R. C: 0.1 μF |
|  | For DC circuits only. |
|  | Can be used for both AC and DC circuits. |

**5. Motor load**

Contacts may adhere due to the starting current at the start of motor operation which is three to eight times the steady-state current. Although it differs depending on the motor, since a current flows that is several times that of the nominal current, please select a switch taking into consideration the values in the table below. To make the motor rotate in reverse, use an ON-OFF-ON switch and take measures to prevent a multiplier current (starting current + reverse current) from flowing.

| Motor type | Type | Starting current |
|---|---|---|
| Three-phase induction motor | Squirrel-cage | Approx. 5 to 8 times current listed on nameplate |
| Single-phase induction motor | Split-phase-start | Approx. 6 times current listed on nameplate |
| | Capacitor-start | Approx. 4 to 5 times current listed on nameplate |
| | Repulsion-start | Approx. 3 times current listed on nameplate |

A current that is approximately two times that of the starting current will flow when reverse rotation is caused during operation. Also, when using for a load that will cause transient phenomena such as when operating the motor in reverse rotation or switching the poles, an arc short (circuit short) may occur due to the time lag between poles when switching. Please be careful.




**6. Capacitor load**

In the case of mercury lamps, florescent lamps and the capacitor loads of capacitor circuits, since an extremely large inrush current flows when the switch is turned on, please measure that transient value with the actual load and then either use the product keeping within the range of the rated current or after verifying the actual load.

## PRECAUTIONS WHEN USING

**1. Environment of use**

1) Please consult us when using under the following conditions:

- Environments where hydrogen sulfide or other corrosive gases are present.
- Environments where gasoline, thinner or other flammable, explosive gases are present.
- Dusty environments (for non-seal type snap action switches).
- Use in environments not in the prescribed temperature or humidity range.
- Places with low air pressure.

2) Unless specified the product will not be constructed to withstand water, oil or explosions. Please inquire if you intend to use the product in special applications.

**2. Usage, storage, and transport conditions**

1) During usage, storage, or transportation, avoid locations subject to direct sunlight and maintain normal temperature, humidity, and pressure conditions.

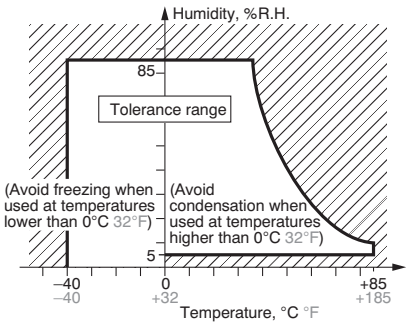
2) The allowable specifications for environments suitable for usage, storage, and transportation are given below.

(1) Temperature: The allowable temperature range differs for each switch, so refer to the switch's individual specifications.

(2) Humidity: 5 to 85% R.H.

(3) Pressure: 86 to 106 kPa

The humidity range varies with the temperature. Use within the range indicated in the graph below




(The allowable temperature depends on the switch.)

- Condensation will occur inside the switch if there is a sudden change in ambient temperature when used in an atmosphere of high temperature and high humidity. This is particularly likely to happen when being transported by ship, so please be careful of the atmosphere when shipping. Condensation is the phenomenon whereby steam condenses to cause water droplets that adhere to the switch when an atmosphere of high temperature and humidity rapidly changes from a high to low temperature or when the switch is quickly moved from a low humidity location to one of high temperature and humidity. Please be careful because condensation can cause adverse conditions such as deterioration of insulation, coil cutoff, and rust.
- Condensation or other moisture may freeze on the switch when the temperatures is lower than 0°C 32°F. This causes problems such as sticking of movable parts or operational time lags.
- The plastic becomes brittle if the switch is exposed to a low temperature, low humidity environment for long periods of time.
- Storage for extended periods of time (including transportation periods) at high temperatures or high humidity levels or in atmospheres with organic gases or sulfide gases may cause a sulfide film or oxide film to form on the surfaces of the contacts and/or it may interfere with the functions. Check out the atmosphere in which the units are to be stored and transported.
- In terms of the packing format used, make every effort to keep the effects of moisture, organic gases and sulfide gases to the absolute minimum.

**3. Wiring**

1) When using a PC board terminal switch as soldering terminals, use thin lead wires and be sure to wind them on the terminals before soldering.

2) Cautions when soldering

Perform soldering quickly in accordance with the specified conditions. Be careful not to let flux flow into the product. When no instruction is specified, use a 60 W soldering iron (350°C) and complete soldering within five seconds. Do not pull on the lead wires immediately after soldering. Wait some time before verifying.

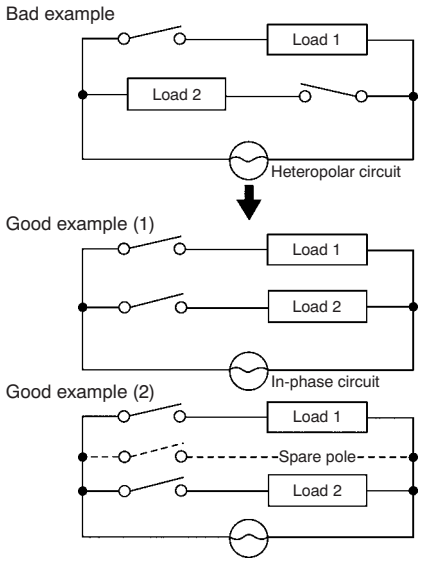
**4. Others**

1) Failure modes of switches include short-circuiting, open-circuiting and temperature rises. If this switch is to be used in equipment where safety is a prime consideration, examine the possible effects of these failures on the equipment concerned, and ensure safety by providing protection circuits or protection devices. In terms of the systems involved, make provision for redundancy in the design and take steps to achieve safety design.

2) The ambient operating temperature (and humidity) range quoted is the range in which the switch can be operated on a continuous basis: it does not mean that using the switch within the rating guarantees the durability performance and environment withstanding performance of the switch. For details on the performance guarantee, check the specifications of each product concerned.

3) Even if 2-pole, 3-pole or 4-pole switches are used as single-pole switches in order to increase contact reliability, please keep the maximum current no higher than the rated value.

4) If there is the possibility of a short between poles, please use an in-phase circuit as shown below or provide a spare pole.




Due to their super miniature size, please be particularly careful with AJ1 (J1) and AJ2 (J2) toggle and rocker switches since sufficient distance between poles cannot be achieved.

5) Be careful not to drop the product as this may cause loss of functionality.

6) Do not apply an unreasonable vertical force against the direction of operation of the product.

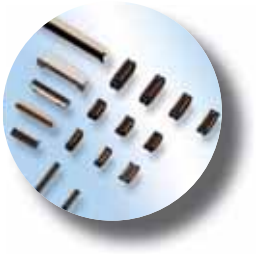
7) Use your hand to operate the actuator. (Operation using a tool such as a screwdriver or hammer can cause breakdown.)

# Memos

# Memos

# Further Panasonic products

Panasonic Electric Works offers a wide product range from one source, from individual components to complete systems. Technology support for advice, design-in, installation and commissioning by our qualified application engineers round off the Panasonic service profile.



## Connectors

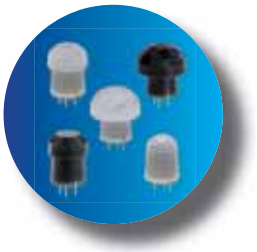
Today's electronic components are expected to meet stringent demands: They have to be as compact as possible and provide maximum reliability. To fulfill these requirements, Panasonic engineers have developed narrow-pitch connectors that utilize TOUGH CONTACT technology. In addition to their excellent shock and vibration resistance, these connectors feature an ultra-slim profile, which makes them ideally suited for applications where space is at a premium. Our versatile board-to-board and board-to-FPC connector product range offers the appropriate solution for practically any scenario.

## Relays

Panasonic offers one of the world's most comprehensive ranges of electromechanical and semiconductor relays. Currently the product range extends from ultra-miniature SMD semiconductor types to robust, compact industrial devices. Load switching capability ranges from low-level signals to double-digit ampere values. Panasonic relays are available for all common mounting configurations with screw, PCB, solder or surface mount terminals to meet most demands.

## PaPIR motion sensors

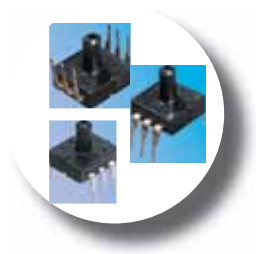
Intelligent automation solutions help increase energy efficiency, cost effectiveness and comfort significantly. With a power consumption as low as 1$\mu$A and a compact design in one package, PaPIRs open up a diverse range of possibilities to the lighting and building technology as well as battery-driven applications.



## NaPiOn motion sensors

NaPiOn motion sensors are ideal for efficient lighting and energy management.

- Small size: Ø10 x 13.5mm (thimble size)
- Integrated amplifier
- 2 lens colors: white and black



## Pressure sensors

Panasonic's pressure sensors contain built-in amplification and temperature compensation circuits. Users need not be concerned with circuit design or customization.
State-of-the-art technology allows us to achieve high-level precision and reliability, yet without compromising compactness.

- Footprint 7.0mm (W) x 7.2mm (D)
- 10.4mm (W) x 10.4mm (D) (low pressure type)

# Global Network

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## Panasonic Electric Works

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| Switzerland | Panasonic Electric Works Schweiz AG | Grundstrasse 8, 6343 Rotkreuz, Tel. +41 (0) 41 7997050, Fax +41 (0) 41 7997055, www.panasonic-electric-works.ch |
| United Kingdom | Panasonic Electric Works UK Ltd. | Sunrise Parkway, Linford Wood, Milton Keynes, MK14 6LF, Tel. +44 (0) 1908 231555, Fax +44 (0) 1908 231599, www.panasonic-electric-works.co.uk |

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