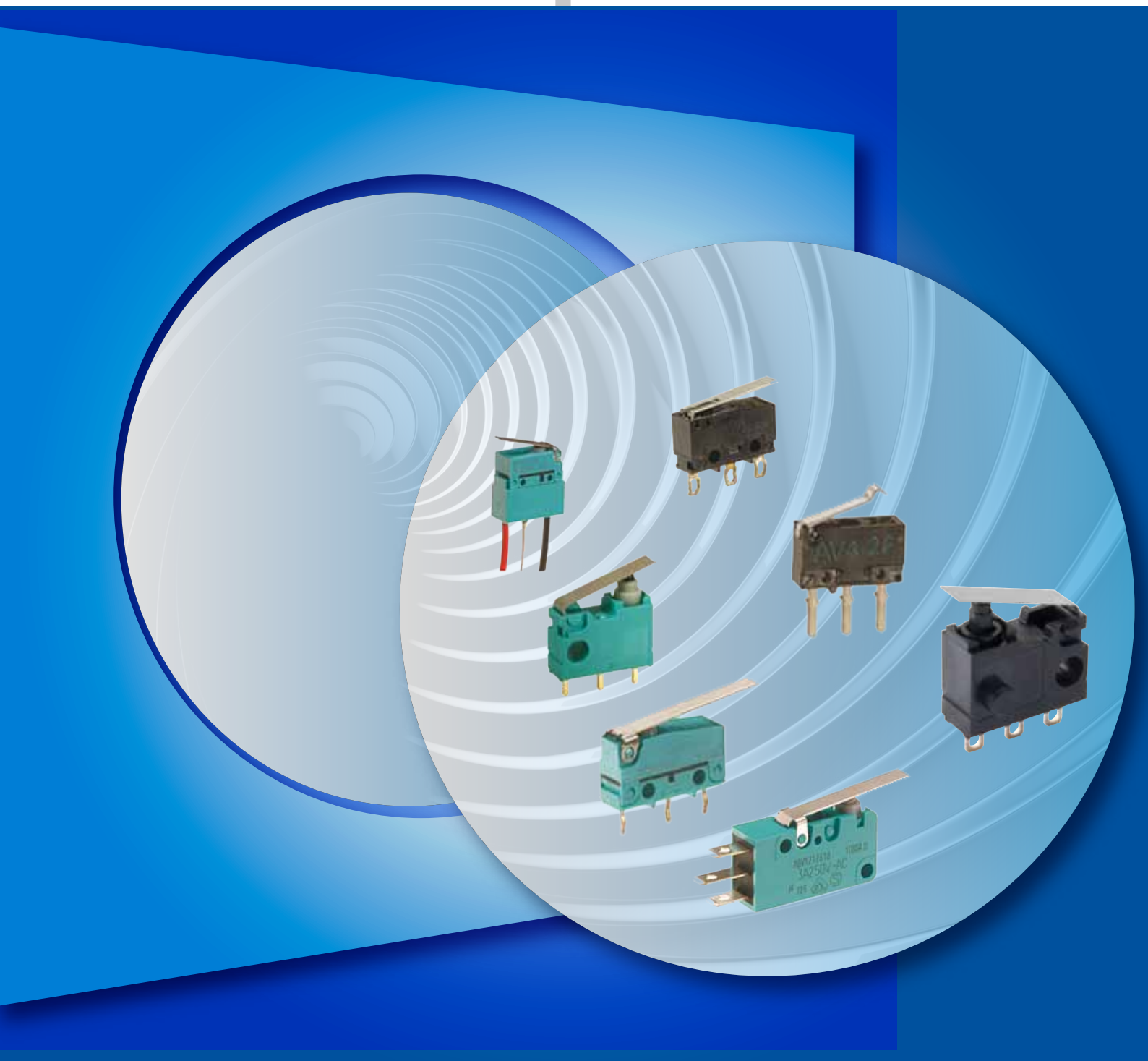
Panasonic
ideas for life

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.

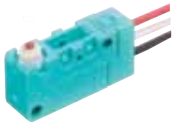
In addition, we concentrate on the development and implementation of customer-specific solutions: Does the cable have to be a little bit longer? Or is a pluggable solution necessary? With the engineering know-how at our European manufacturing sites, we guarantee flexible, on-time delivery and provide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

Product lineup

ASQ

ABJ

ABS



ABV

AV4 AH1

AEQ

AV3/AVM3/AVT3/AVL3

AV6

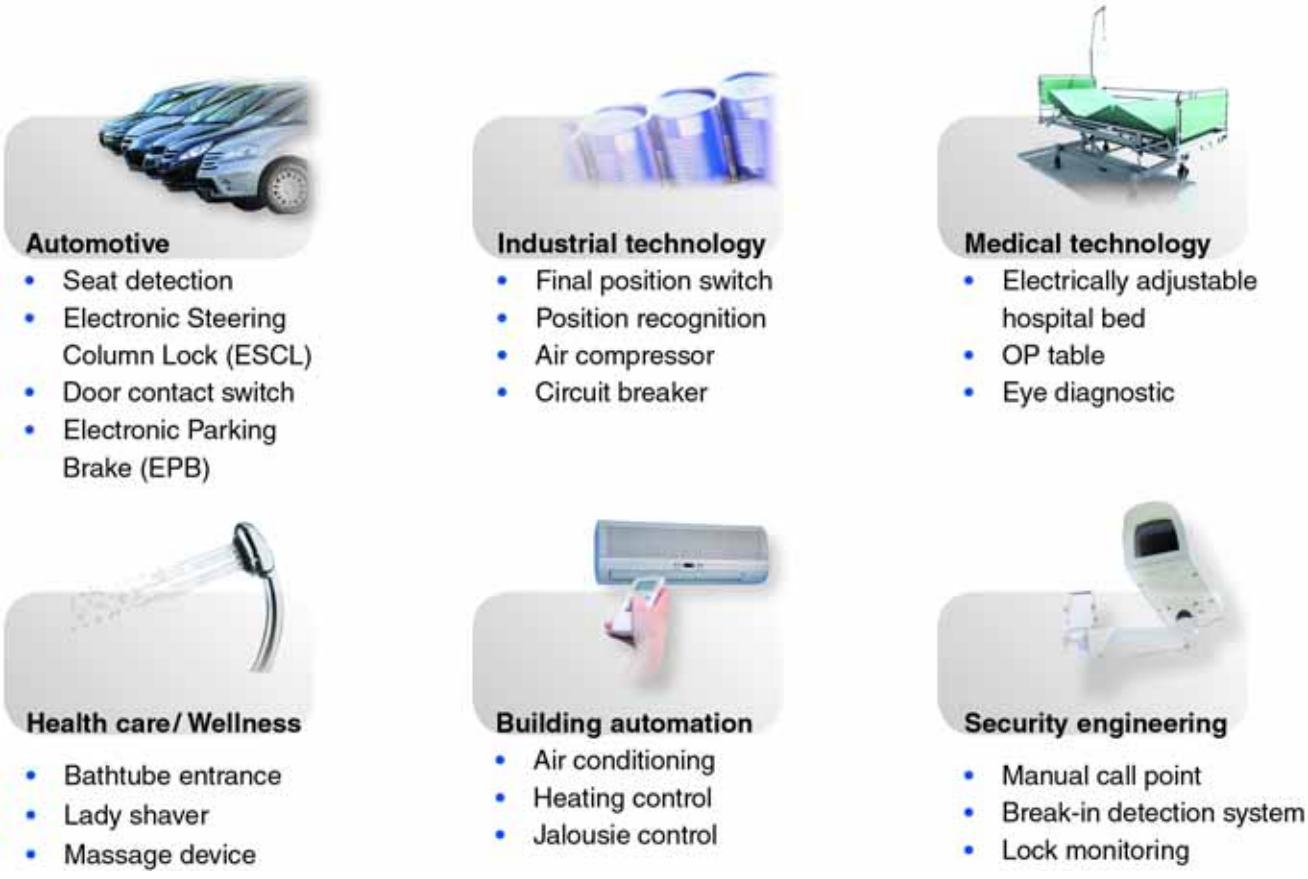
AM5

AM1 AV1 AGX AJ7/8 T Series

Tailoring equipment

Contents

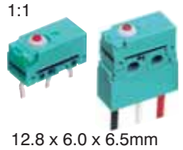
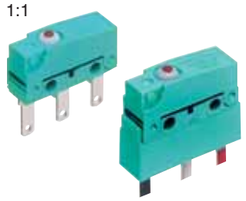
Application areas



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

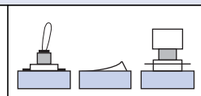
Type (Picture scale: DIN A4)	Features	Switching current	Contact types	Contact material	Switching voltage (max.)		Ambient temperature	Service life (min.)		Operating force on pin in N (max.)	Connection types	Actuator	Degree of protection	Page Approvals
					VDC	VAC		Mechanical	Electrical					
Micro switches IP67														
ASQ 1:1  13.3 x 5.4 x 10.1mm	• Ultra miniature design with slide contact • Over-travel 2.5mm • Noiseless switching • Side operation possible • 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 • PCB • Lead wire	• Pin plunger • Hinge lever • Simulated roller lever	IP67	18 —
ABJ 1:1  12.8 x 6.0 x 6.5mm 13.9 x 6.0 x 12.5mm	• Ultra miniature design • Highly resistant to environmental conditions • Frost-resistant	1mA to 2A	SPDT, SPST-NC, SPST-NO	Ag/Au	30	125	-40°C to +85°C	1,000,000	30,000/ 100,000	1.96	• Solder • PCB • Lead wire	• Pin plunger • Roller lever • Hinge lever • Simulated roller lever • Other	IP67	29 UL, CSA
ABS 1:1  19.8 x 6.4 x 11.1mm 21.2 x 6.4 x 16.9mm	• Subminiature design • Highly resistant to environmental conditions • 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/ 200,000	1.47	• Solder • PCB • Lead wire • Quick connect	• Pin plunger • Roller lever • Hinge lever • Simulated roller lever • Other	IP67	40 UL, CSA, VDE, SEMKO
ABV 1:1  33.0 x 15.9 x 13.0mm	• Miniature design • Highly resistant to environmental conditions • Frost-resistant	1mA to 5A	SPDT, SPST-NC, SPST-NO	Ag/Au	30	250	-40°C to +85°C	5,000,000	100,000/ 1,000,000	2.94	• Lead wire • Quick connect	• Pin plunger • Roller lever • Hinge lever • Simulated roller lever • Other	IP67	51 UL, CSA, 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 1:2  49.2 x 17.5 x 24.1mm	• End of travel limit switch • High precision and long service life • Oil-proof design available	10mA to 10A	SPDT	Ag	250	480	-25°C to +80°C	20,000,000	500,000	3.63	• Solder • Screw	• Standard plunger • Roller lever • Simulated roller lever • Straight lever • Other	IP40	60 UL, CSA
Miniature switches														
AM5 1:1  29.6 x 10.3 x 15.9mm	• Miniature design • Wide variety of types • Inrush current to 160 A • 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/ 2,000,000	3.92	• Solder • Quick connect	• Pin plunger • Roller lever • Hinge lever • Simulated roller lever • Other	IP40	68 UL, CSA, VDE, SEMKO, ENEC
Subminiature switches														
AV3, AVM3, AVT3, AVL3 1:1  19.8 x 6.4 x 11.1mm	• Subminiature design • Wide variety of types • High-capacity type available for 10A • Long service life	1mA to 5A	SPDT	Ag/Au 3-layer contact	125	250	-25°C to +85°C	500,000/ 30,000,000	50,000/ 200,000	1.47	• Solder • PCB • Quick connect	• Pin plunger • Roller lever • Simulated roller lever • Hinge lever • Other	IP40	86 UL, CSA, VDE, SEMKO
AV3 (FS) (Contact gap > 1mm) 1:1  19.8 x 6.4 x 11.1mm	• Contact gap more than 1mm • Subminiature design • Conforming to IEC60950-1	100mA to 3A	SPDT	Ag	30	—	-25°C to +85°C	500,000	10,000	1.47	• Solder • PCB • Quick connect	• Pin plunger • Short hinge lever • Hinge lever • Long hinge lever • Simulated roller lever • Roller lever • Other	IP40	99 UL, CSA, VDE, SEMKO under application
AV6 1:1  29.2 x 10.0 x 7.0mm	• Subminiature design • Connector type for simple connections	1mA to 100mA	SPST-NC SPST-NO	Au	30	—	-25°C to +85°C	500,000	200,000	1.50	• Connector	• Pin plunger • Roller lever • Simulated roller lever • Hinge lever • Other	IP40	101 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 1:1  13.3 x 5.4 x 10.1mm	• Subminiature design • 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 • PCB	• Pin plunger • Leaf lever • Simulated leaf lever	IP40	81 —
AH1 1:1  12.8 x 6.0 x 6.5mm	• Ultra miniature design • Flux-resistant • 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 • PCB	• Pin plunger • Simulated roller lever • Hinge lever	IP40	106 UL, CSA
AV4 1:1  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 • PCB	• Pin plunger • Simulated roller lever • Hinge lever	IP40	111 —
Interlock switches														
AGX 1:1  27.0 x 14.6/27.2 x 24.6mm	• Door interlock switch • Contact gap more than 4mm • Snap-in fixing • 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 UL, CSA, VDE, SEMKO, ENEC
AV1 1:1  30.0 x 12.4 x 34.0mm	• Door interlock switch • Snap-in/screw fixing • Contact gap 8mm for 2 Form A/3 Form A snap-in mounting type	10mA to 10.1A	SPST-NC SPST-NO	Ag	30	250	-25°C to +85°C	1,000,000	100,000	9.81	• Quick connect		IP40	121 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 1:1  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 —
Micro operator switches IP40														
Rocker switches														
AJ8S 1:1  29.8 x 21.7 x 29.5mm	• Power switch with a contact for low level current, i.e. HDD protection • Inrush current to 160A • Complies with EN61058-1 class II insulation grade • Insulation distance: 8mm • Contact gap: 3mm	10mA to 16A	ON - OFF	Power: Ag Signal: Au-plated	5 per signal section	250 per power section	-25°C to +85°C	50,000	10,000	—	• Quick connect		IP40	158 UL, C-UL, TÜV
AJ8R With trip function 1:1  29.8 x 21.7 x 29.5mm	• Power switch with coil operated reset function • Inrush current to 160A • Good feel of switch operation • 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 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 1:1  28.0 x 12.5/21.0 x 16.0mm	• Power switch for safety requirements • Standard and wide actuator types available • Insulation distance 8mm • Contact gap 3mm • Inrush current to 100A • TV-5 type available	10mA to 10A	ON - OFF	Ag	30	250	-25°C to +85°C	50,000	10,000	—	• Quick connect • Solder • PCB		IP40	167 UL, C-UL, ENEC, VDE
AJ8 1:1  28.0 x 12.5/21.0 x 16.0mm	• Power switch for safety requirements • Standard and wide actuator types available • Insulation distance 8mm • Contact gap 3mm • Inrush current to 160A • TV-8 type available	10mA to 16A	ON - OFF	Ag	30	250	-25°C to +85°C	50,000	10,000	—	• Quick connect • Solder • PCB		IP40	176 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 1:1  29.0 x 15.8 x 23.7mm	• Toggle, rocker and push-button switches with safety design • Contact gap more than 3mm • Degrees of protection up to IP67 • Rubber cap available for excellent weather resis-tance	10mA to 15A	• On-Off • On-On • On-Off-On • On-(On) • (On)-Off-(On) • On-Off-(On)	Ag	250	250	-25°C to +70°C	100,000	50,000	1-pole, 2-pole, 3-pole, 4-pole	• Solder • Screw • Quick connect • Lead wire		IP40 IP60 IP67	134 UL, C-UL
T10 1:1  29.0 x 15.8 x 23.7mm	• Toggle switches with safety design • Rubber cap available for excellent weather resis-tance • Terminal construction for easy soldering work	10mA to 10A	• On-Off • On-On	Ag	250	250	-25°C to +70°C	100,000	30,000	1-pole, 2-pole	• Solder		IP40	152 UL, C-UL
T-06, T-03 1:1  29.0 x 15.8 x 23.7mm	• Compact toggle switches for space-saving design • Rubber cap available for excellent weather resis-tance	10mA to 3A/6A	• On-Off • On-On	Ag	30	250	-25°C to +70°C	50,000	30,000/ 10,000	1-pole, 2-pole	• Solder		IP40	155 —

Micro Switches IP67

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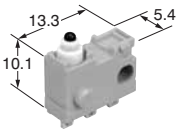
ULTRA-LONG STROKE, HIGH CONTACT RELIABILITY SEALED SWITCHES (SAME SIZE AS J TYPE)

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

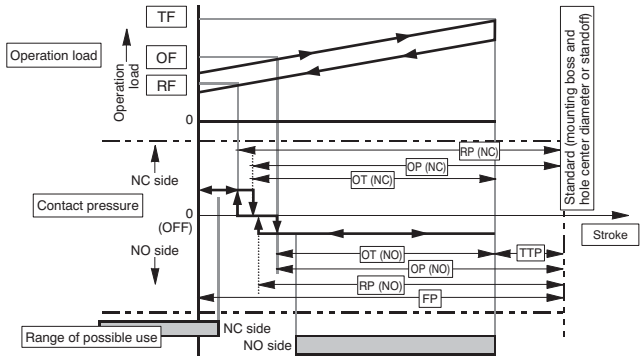
Ex. ASQ1 ☐ ☐ ☐ ☐

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

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

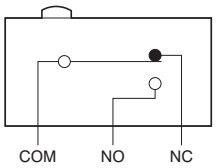
OPERATION CONCEPT DIAGRAM (reference)

Contact form: terminal type

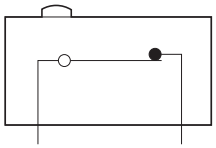


CONTACT ARRANGEMENT

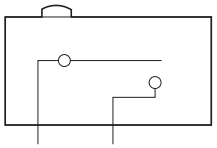
1. SPDT



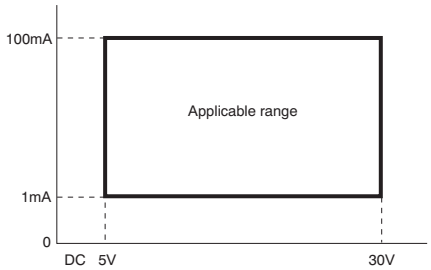
2. SPST-NC
(wire leads type only)



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. 5×10^5	Switching frequency: 20 times/min. Conduction ratio: 1:1 Push-button operation speed: 100 mm/s Push-button switching position: free position (FP) to operation limit position (TTP)
	16 V DC 50 mA (resistive load)	Min. 5×10^5	
	30 V DC 100 mA (resistive load)	Min. 2×10^5	
Vibration resistance (malfunction vibration resistance)		Single amplitude: 0.75 mm Amplitude of vibration: 10 to 55 Hz (4 minutes cycle) Direction and time: 30 minutes each in X, Y and Z directions	
		Amplitude of vibration: 5 to 200 Hz (10 minutes cycle) Acceleration: 43.1 m/s² Direction and time: 30 minutes each in X, Y and Z directions	
Shock resistance (malfunction shock resistance)		Shock value: 980 m/s² 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 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

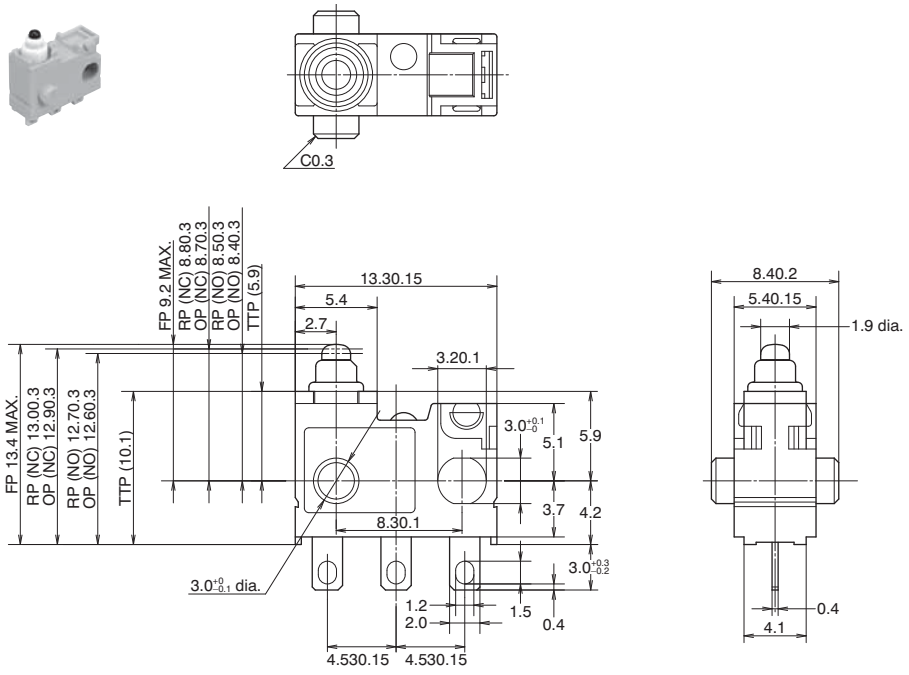
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

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

mm General tolerance: ±0.25

Pin plunger

CAD Data

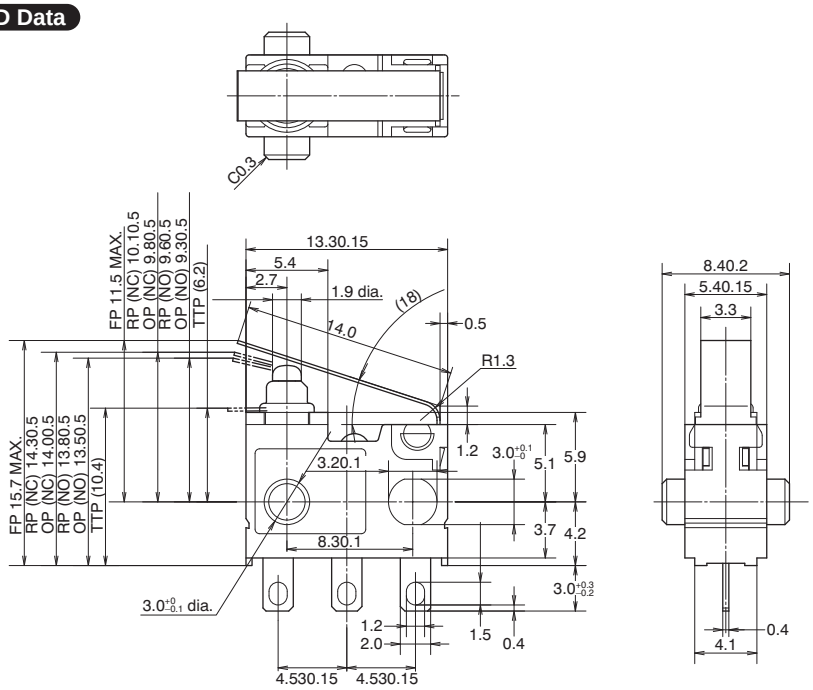


Operating Force (max. O.F.)		1.5N
Free Position (max. F.P.)	From mounting boss and hole center line	9.2mm
	From standoff	13.4mm
Operating Position on NC side O.P. (N.C.)	From mounting boss and hole center line	8.7±0.3mm
	From standoff	12.9±0.3mm
Operating Position on NO side O.P. (N.O.)	From mounting 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



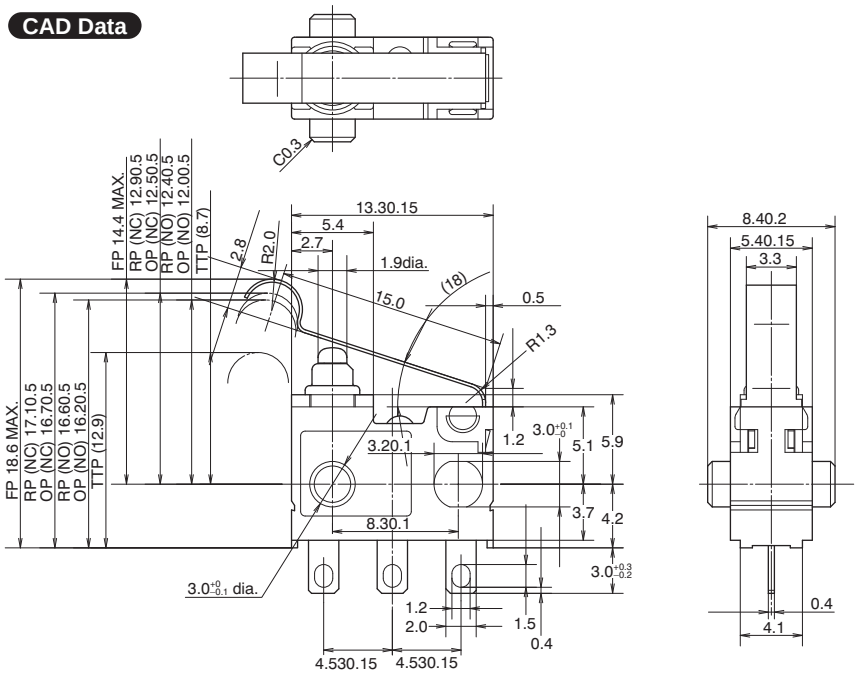
Operating Force (max. O.F.)		1.7N
Free Position (max. F.P.)	From mounting boss and hole center line	11.5mm
	From standoff	15.7mm
Operating Position on NC side O.P. (N.C.)	From mounting boss and hole center line	9.8±0.5mm
	From standoff	14.0±0.5mm
Operating Position on NO side O.P. (N.O.)	From mounting 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

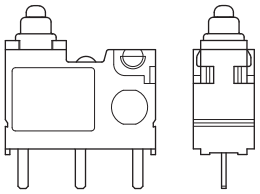


Operating Force (max. O.F.)		1.5N
Free Position (max. F.P.)	From mounting boss and hole center line	14.4mm
	From standoff	18.6mm
Operating Position on NC side O.P. (N.C.)	From mounting boss and hole center line	12.5±0.5mm
	From standoff	16.7±0.5mm
Operating Position on NO side O.P. (N.O.)	From mounting 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

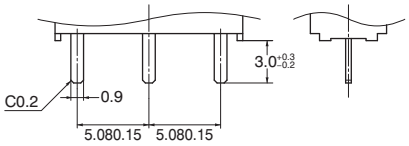
Note: When switching at high speed or under shock, lever endurance may drop. Therefore, please be sure to conduct an endurance evaluation under actual switching conditions.

Mounting hole: 3 mm without boss type

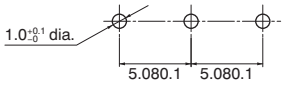
CAD Data



PC board terminal

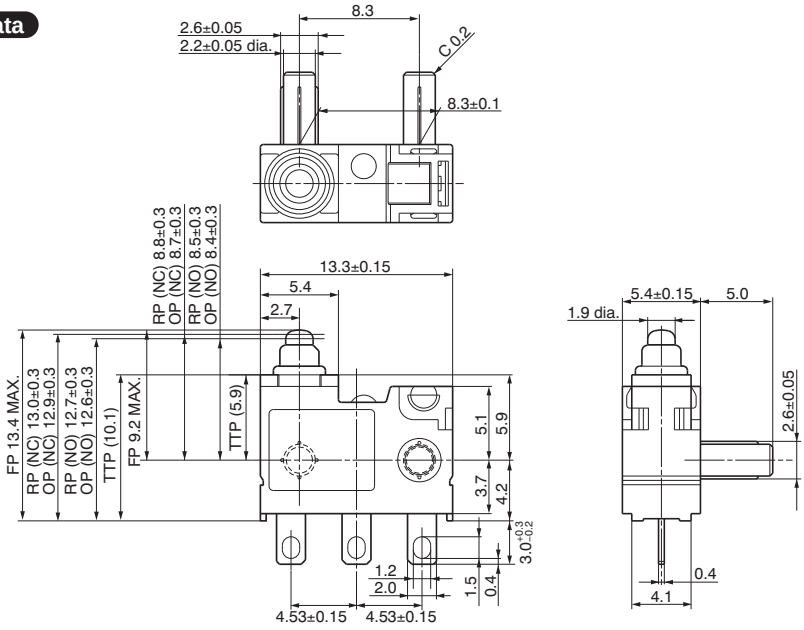


PC board pattern



2. Right side pin type (solder terminal only)

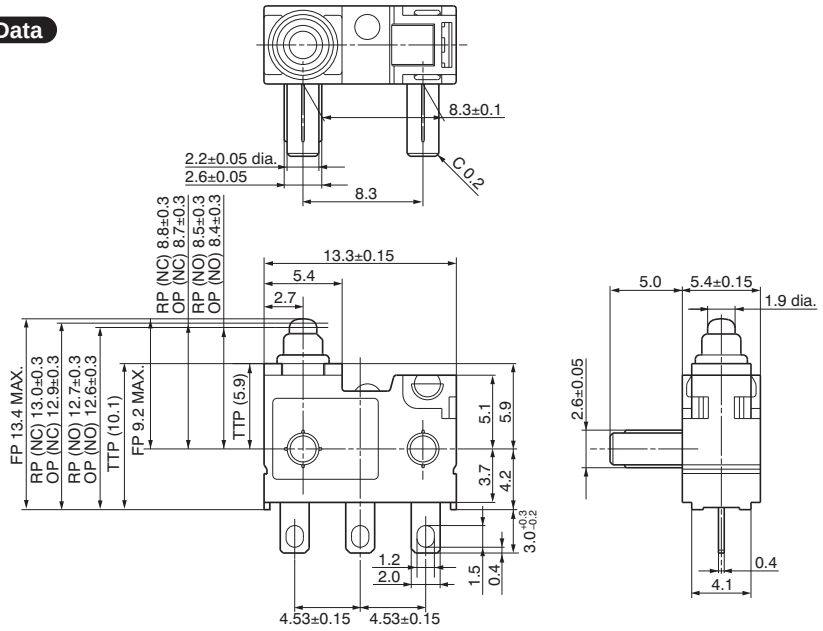
CAD Data



Left side pin type (solder terminal only)

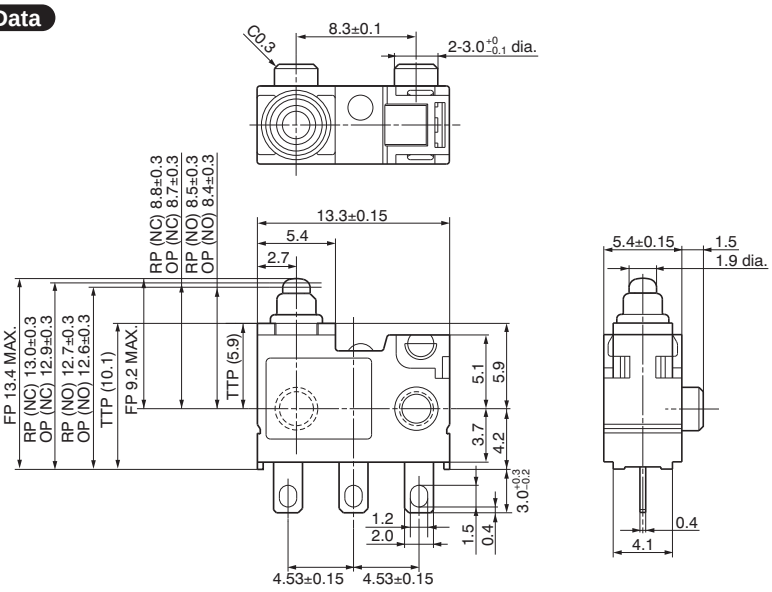
mm General tolerance: ±0.25

CAD Data



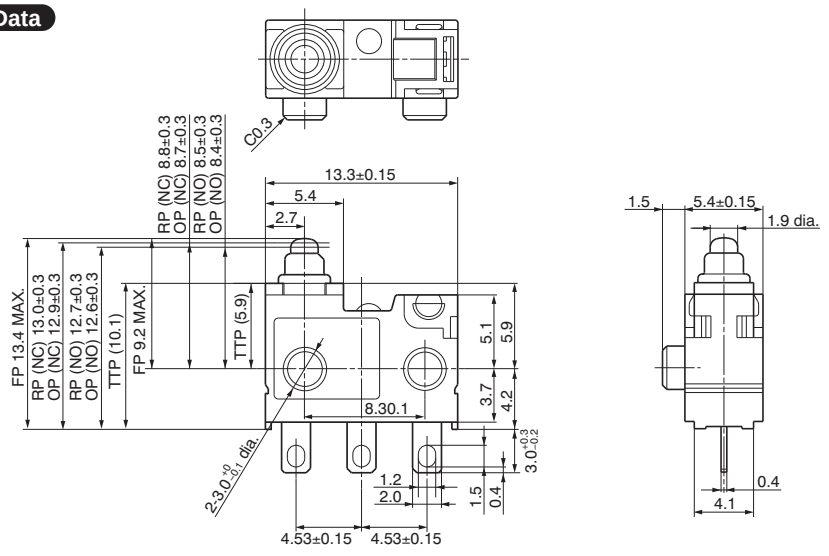
Right 2 boss type (solder terminal only)

CAD Data



Left 2 boss type (solder terminal only)

CAD Data

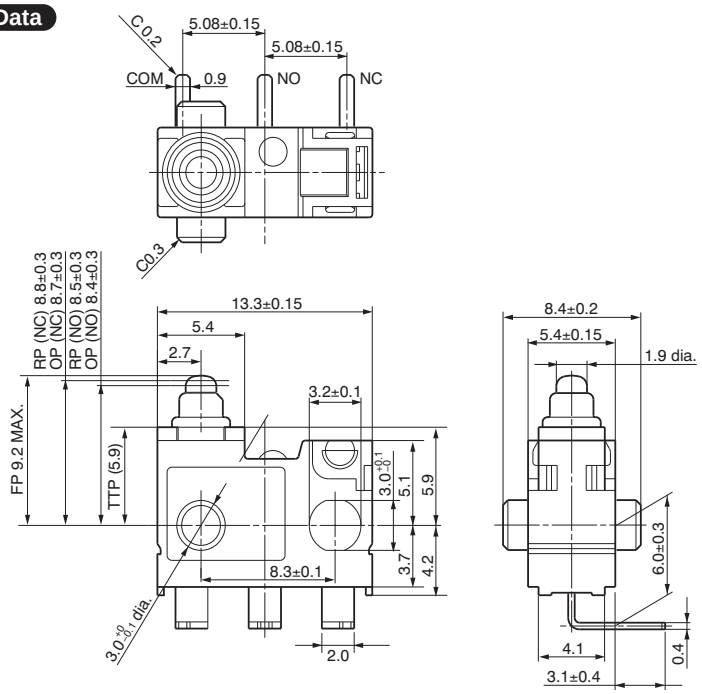


3. Angle terminal type: mounting hole 3 mm, standard type

mm General tolerance: ±0.25

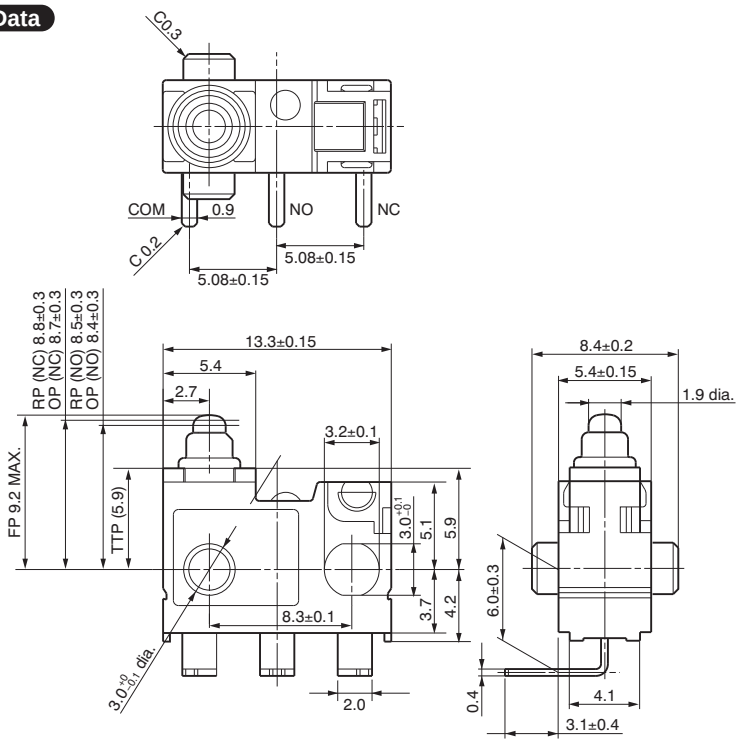
Right type

CAD Data



Left type: mounting hole 3 mm, standard type

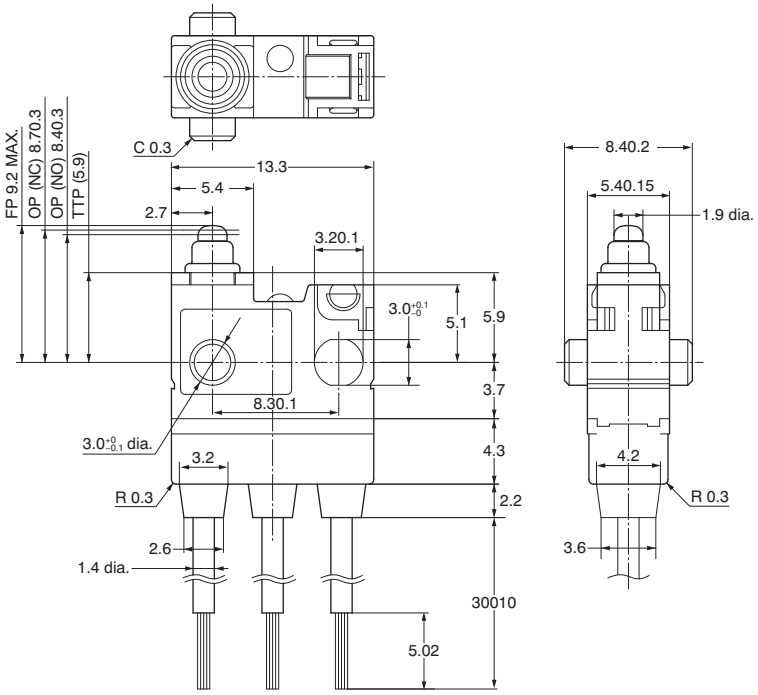
CAD Data



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

mm General tolerance: ±0.25

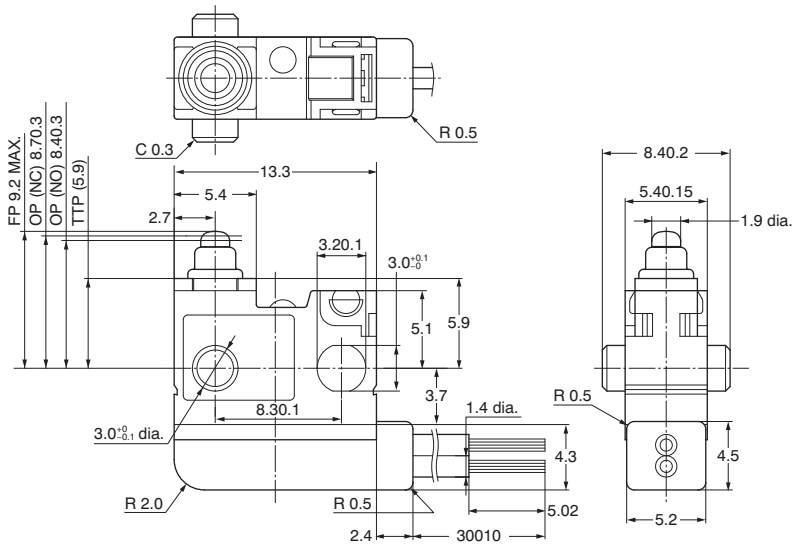
CAD Data



* 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

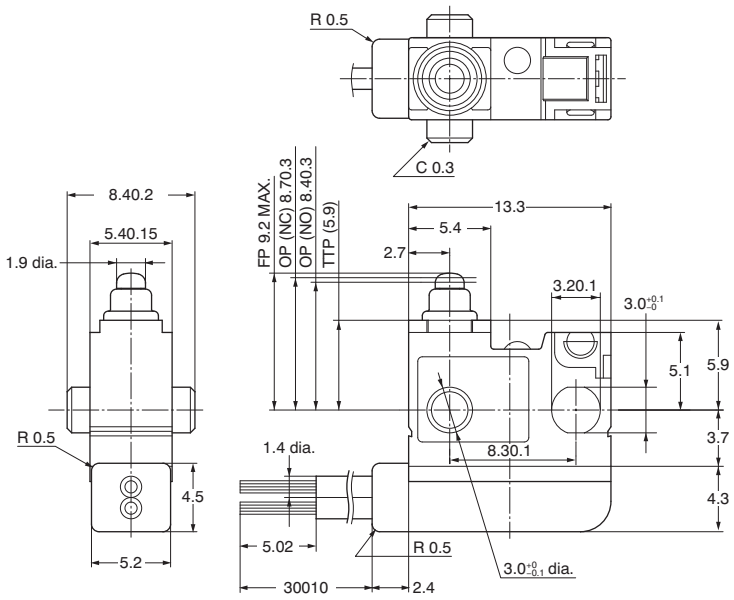


* Wire lead thickness : 0.3mm²
Wire lead color : COM ···· Black
: NC ····· Red
: NO ····· White

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.

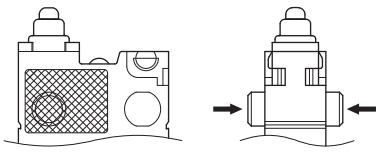
2) Automatic soldering: Soldering must be done as below;

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

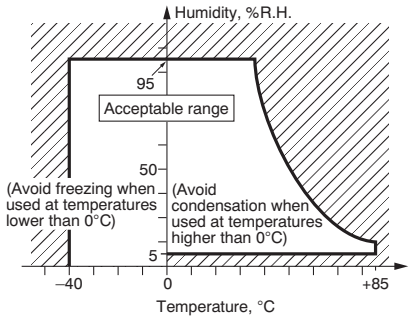
The rubber cap swells when exposed to oil and chemicals. The extent of swelling will vary widely depending on the type and amount of oil and chemicals. Check with the actual oil or chemicals used.

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

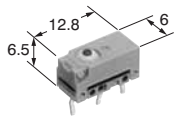
1) Please remember that this switch cannot be used under water. Also, please be warned that switching and sudden temperature changes with the presence of water droplets can cause seepage into the unit.

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.

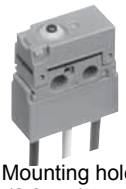
5) Please make considerations so that the switch does not become the stopper for the moving part.

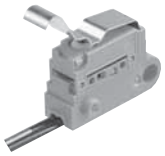


Dust protected type


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 2: 2.3 mm 3: 3 mm 4: Fixed pin (right side pin) type Fixed pin (left side pin) type	4: Solder terminal 5: PC board terminal 6: Wire leads (bottom type) 7: Wire leads (right side type) 8: Wire leads (left side type)	1: SPDT 2: SPST-NC (Wire leads type only) 3: SPST-NO (Wire leads type only)	0: Pin plunger 2: Hinge lever 4: Simulated roller lever 6: Roller lever 8: Leaf lever (Mounting hole 3 mm lead wire type only) L: Long stroke type	4: 1.23 N 6: 1.96 N 7: 2.45 N (Long stroke type only)	0: AgNi alloy 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

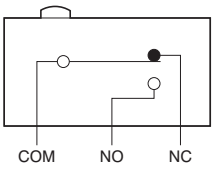
Ex. ABJ 1 4 1 0 4 0 9

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 2: 2.3 mm 3: 3 mm	4: Solder terminal 5: PC board terminal 6: Wire leads (bottom type)	1: SPDT 2: SPST-NC (Wire leads type only) 3: SPST-NO (Wire leads type only)	0: Pin plunger 2: Hinge lever 4: Simulated roller lever 6: Roller lever 8: Leaf lever (Mounting hole 3 mm lead wire type only)	4: 1.23 N 6: 1.96 N	0: AgNi alloy 1: AgNi alloy + Au-clad	9: UL/CSA 6×10^3 rated (Except wire leads type)

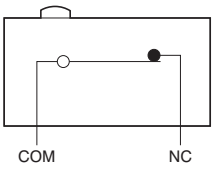
Remarks: 1. Standard packing: Dust protected type 100 pcs./carton, 2,000 pcs./case; Immersion protected type 50 pcs./case.
2. Not every combination is available. Please refer to the following table, “PRODUCT TYPES”.

CONTACT ARRANGEMENT

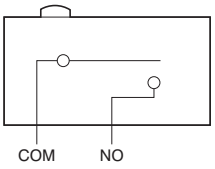
1. SPDT



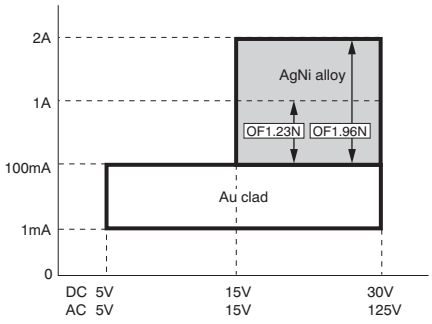
2. SPST-NC (wire leads type only)



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 2 A 30 V DC	—
	1.23 N, 1.27 N	1 A 125 V AC 1 A 30 V DC	—
Long stroke type AgNi alloy contact	2.45 N	1 A 125 V AC 1 A 30 V DC	—
AgNi alloy + Au-clad contact	1.23 N, 1.27 N 1.76 N, 1.96 N	0.1 A 125 V AC 0.1 A 30 V DC	5 mA 6 V DC 2 mA 12 V DC 1 mA 24 V DC
Long stroke type AgNi alloy + Au-clad contact	2.45 N	0.1 A 125 V AC 0.1 A 30 V DC	5 mA 6 V DC 2 mA 12 V DC 1 mA 24 V DC

2. Characteristics

Mechanical life (O.T.: Specified value)	Leaf lever, Long stroke type	Min. 5×10^5 (at 60 cpm)
	Wire leads (right & left side type)	Min. 3×10^5 (at 60 cpm)
	Other types	Min. 10^6 (at 60 cpm)
Electrical life at rated load (O.T.: max.)	AgNi alloy contact type	Min. 3×10^4 (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 Between non-continuous terminals Between each terminal and other exposed metal parts Between each terminal and ground		 600 Vrms 1,500 Vrms 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 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 Immersion protected type (IP67): Max. 150 mΩ (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 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 5.5±0.2 Mounting hole: 2.3 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 6.8±1.0 Mounting hole: 2.3 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 9.8±1.0 Mounting hole: 2.3 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 13.1 ±1.0 Mounting hole: 2.3 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 16.0±2.0
		6	1.27N	0.29N	6.0	1.0	2.5	Mounting hole: 3.0 16.0±2.0
	Wire leads side type	4	1.76N	0.26N	2.6	0.5	1.4	Fixed pin type 10.7±0.7 Mounting hole: 3.0 16.25±0.7
		6	1.27N	0.22N	2.6	0.5	1.4	Fixed pin type 10.7±0.7 Mounting hole: 3.0 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

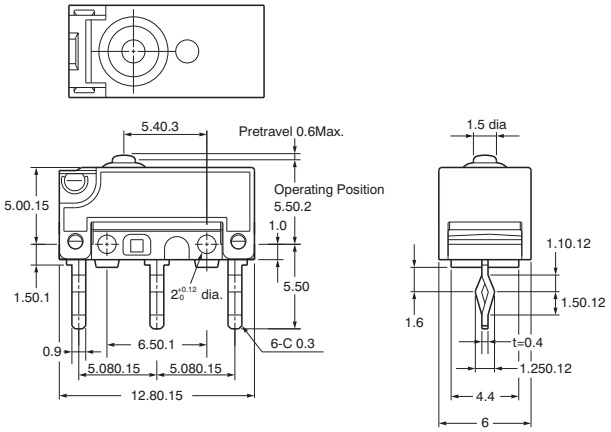
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

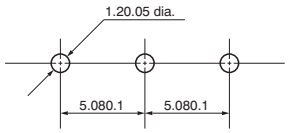
mm General tolerance: ±0.25

1. Dust protected type

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

CAD Data

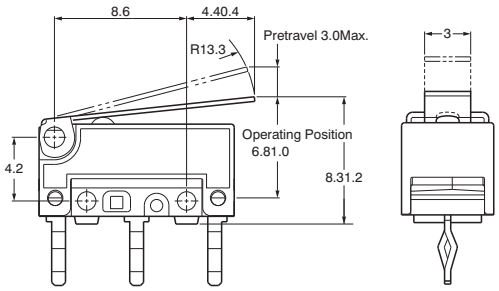


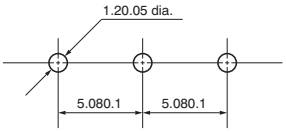


Pretravel, max. mm		0.6
Movement differential, max. mm		0.12
Overtravel, Min. mm		0.25
Operating position	Distance from mounting hole, mm	5.5±0.2
	Distance from stand-off, mm	7±0.3

Hinge lever

CAD Data

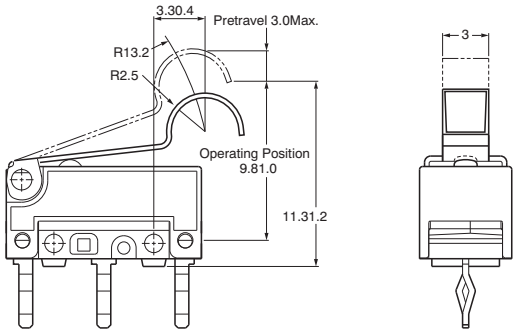


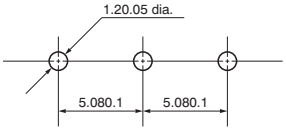


Pretravel, max. mm		3.0
Movement differential, max. mm		0.5
Overtravel, min. mm		0.5
Operating position	Distance from mounting hole, mm	6.8±1.0
	Distance from stand-off, mm	8.3±1.2

Simulated roller lever

CAD Data

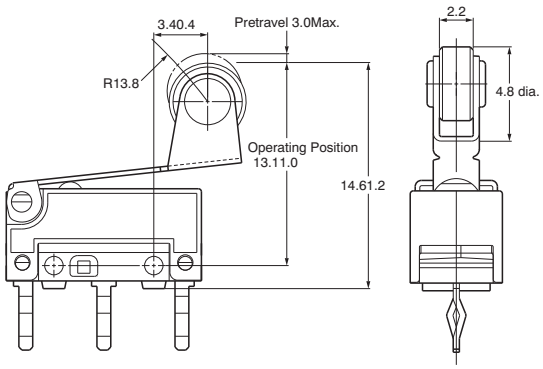


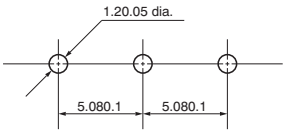


Pretravel, max. mm		3.0
Movement differential, max. mm		0.5
Overtravel, min. mm		0.5
Operating position	Distance from mounting hole, mm	9.8±1.0
	Distance from stand-off, mm	11.3±1.2

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

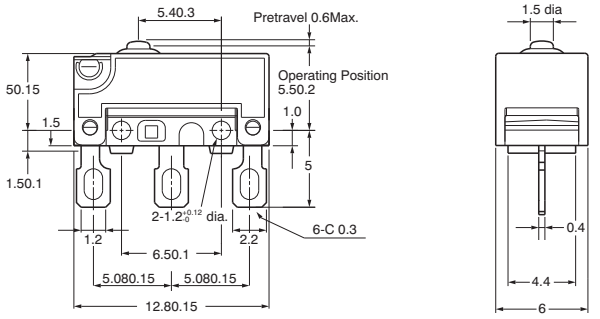
1-(2) Solder terminal

mm General tolerance: ±0.25

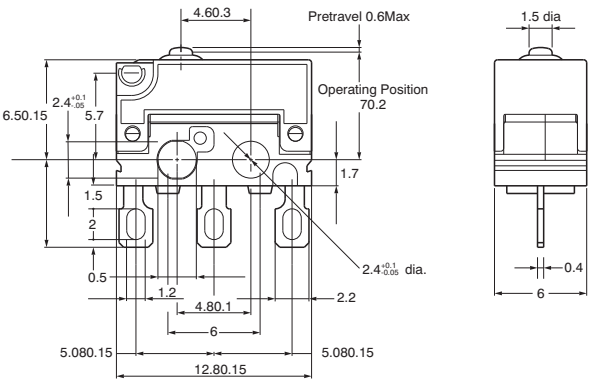
Pin plunger

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.

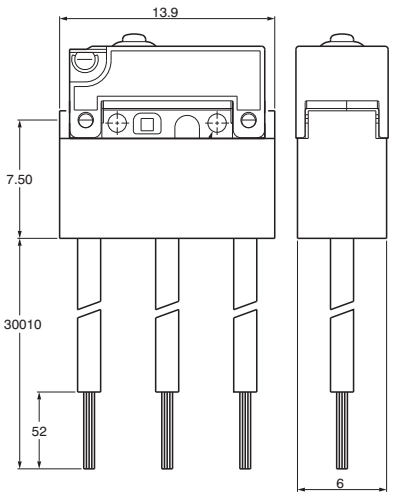
2. Immersion protected type

2-(1) Bottom wire leads type

Pin plunger

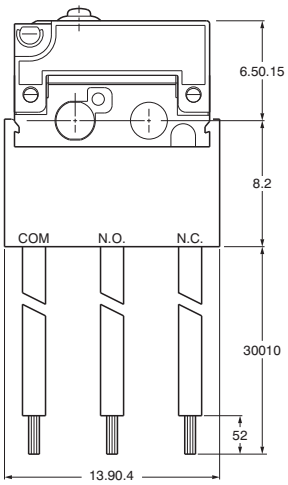
CAD Data

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

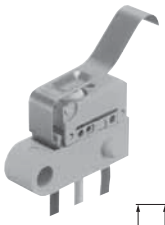
Remarks: 1. As for M1.2 type, other dimensions are the same as those of corresponding PC board terminal types.
As for M2.3 type, other dimensions are the same as those of corresponding solder terminal types.
2. Dimensions of the actuator type are the same as those of corresponding PC board terminal types.

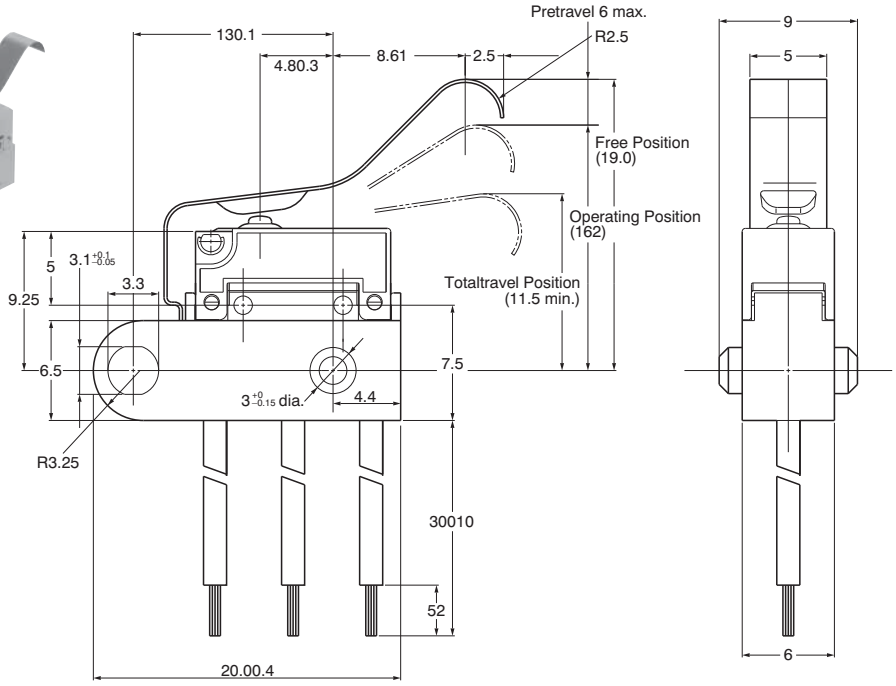
Leaf lever

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

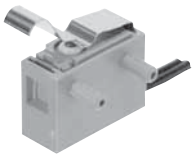
2-(2) Side wire leads type

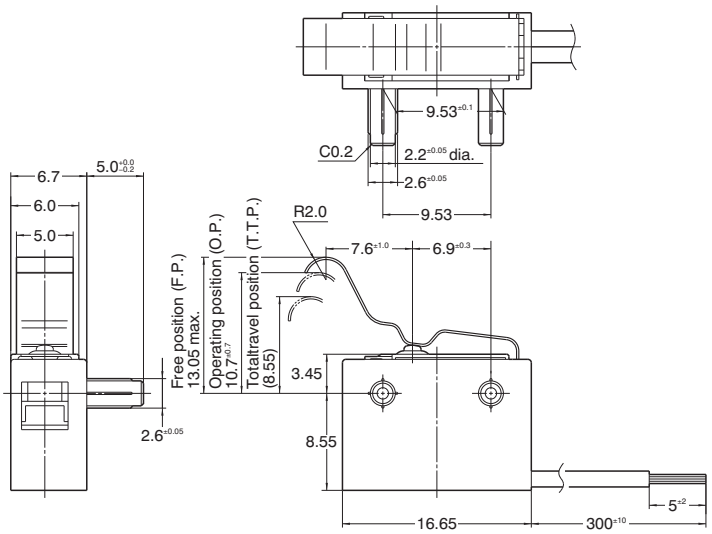
Fixed pin type

Right side pin type

Right wire leads type

CAD Data

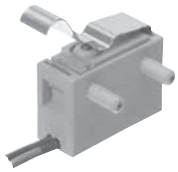




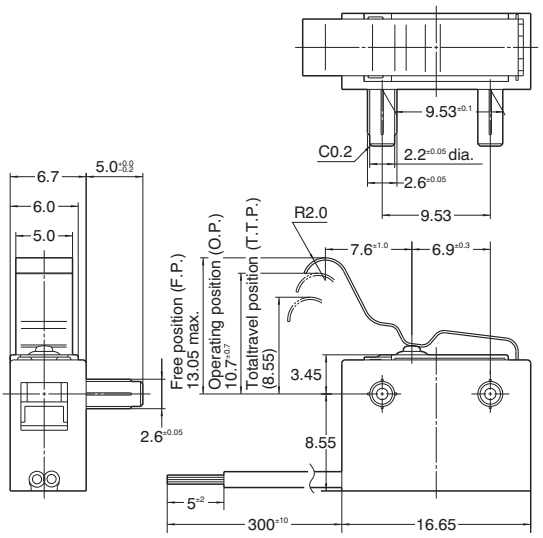
Pretravel, max. mm		2.6
Movement differential, max. mm		0.5
Overtravel, min mm		1.4
Operating position	Distance from mounting hole, mm	10.7±0.7

Right side pin type
Left wire leads type

CAD Data



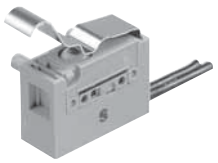
mm General tolerance: ±0.25

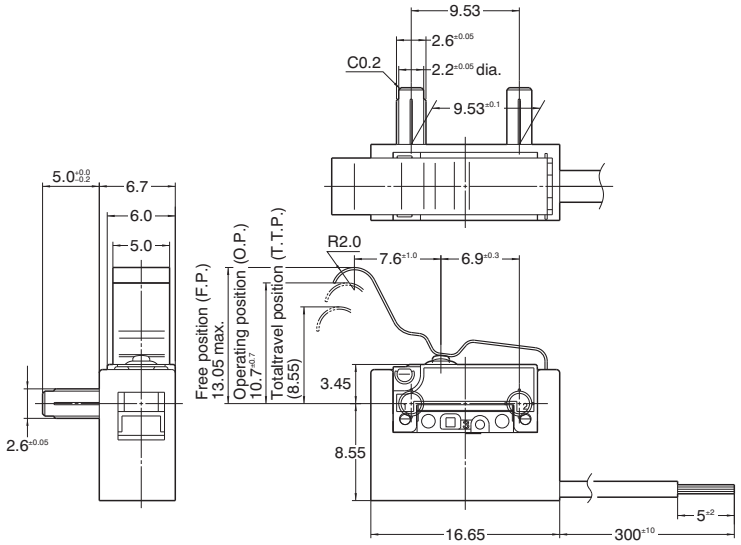


Pretravel, max. mm		2.6
Movement differential, max. mm		0.5
Overtravel, min mm		1.4
Operating position	Distance from mounting hole, mm	10.7±0.7

Left side pin type
Right wire leads type

CAD Data

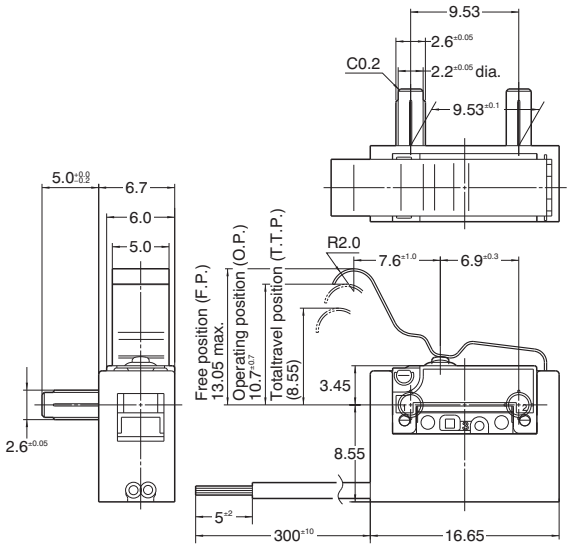




Pretravel, max. mm		2.6
Movement differential, max. mm		0.5
Overtravel, min mm		1.4
Operating position	Distance from mounting hole, mm	10.7±0.7

Left side pin type
Left wire leads type

CAD Data

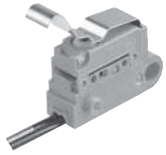


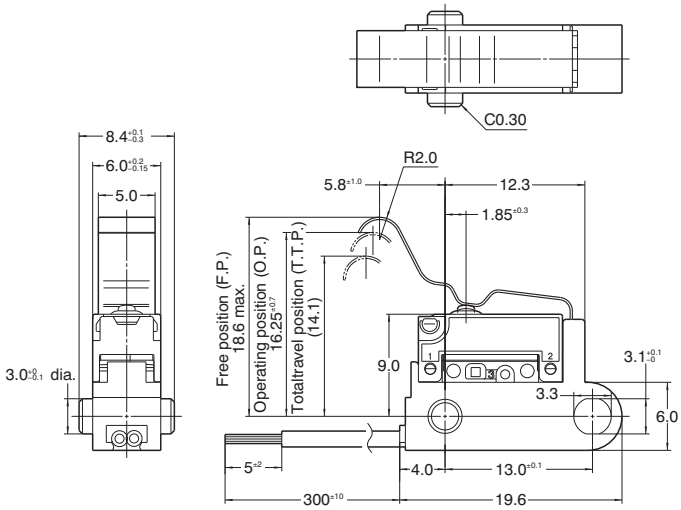
Pretravel, max. mm		2.6
Movement differential, max. mm		0.5
Overtravel, min mm		1.4
Operating position	Distance from mounting hole, mm	10.7±0.7

Mounting hole 3mm type

mm General tolerance: ±0.25

CAD Data



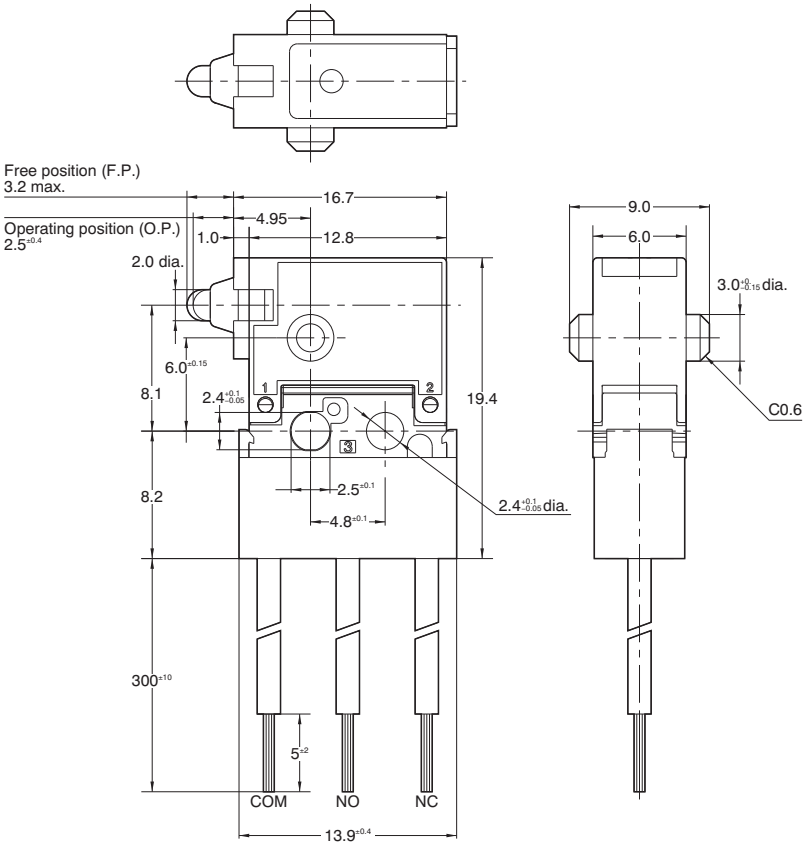


Pretravel, max. mm		2.6
Movement differential, max. mm		0.5
Overtravel, min mm		1.4
Operating position	Distance from mounting hole, mm	16.25±0.7

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

Mounting hole: 2.3 mm

CAD Data

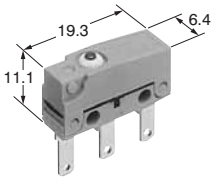


Movement differential, max. mm	0.5
Overtravel, min mm	2.0
Operating position	2.5 ±0.4

Panasonic
ideas for life

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

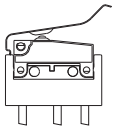
- **Automotive**
- **Home appliances (vacuum cleaner, air purifier)**
- **Others (gas cooking range)**

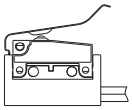
ORDERING INFORMATION

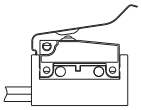
Ex. ABS 1 1 1 0 4 0 3

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 4: Right angle 5: Left angle	1: .110 quick-connect terminal 4: Solder terminal 5: PC board terminal 6: Wire leads	1: SPDT 2: SPST-NC 3: SPST-NO	0: Pin plunger 1: Short hinge lever 2: Hinge lever 3: Long hinge lever 4: Simulated roller lever 6: Roller lever 8: Leaf lever	4: 0.98 N 5: 1.47 N	0: AgNi alloy 1: Au-clad triple layer 4: Au-clad double layer	3: UL/CSA/VDE/SEMKO (AgNi alloy contact, Au-clad triple layer type) (Except wire leads type) 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)

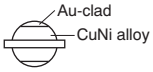
5. Not every combination is available. Please refer to the following table, “PRODUCT TYPES”.

* Contact

0: AgNi alloy

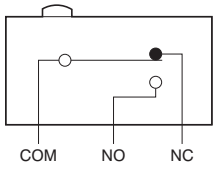
1: Au-clad triple layer

4: Au-clad double layer

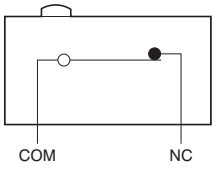


CONTACT ARRANGEMENT

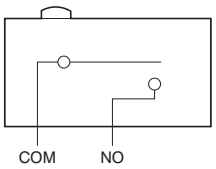
1. SPDT



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

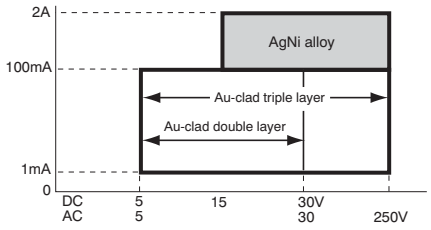
1. Contact rating

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 Between non-continuous terminals Between each terminal and other exposed metal parts Between each terminal and ground		 1,000 Vrms 1,500 Vrms 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 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 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.

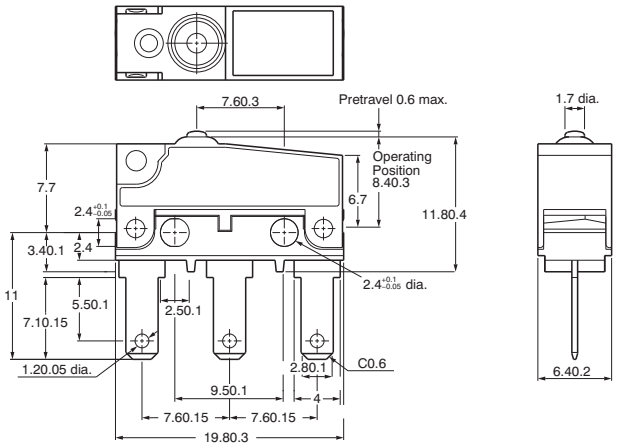
mm General tolerance: ±0.25

1. Dust protected type

1-(1) .110 quick-connect terminal

Pin plunger

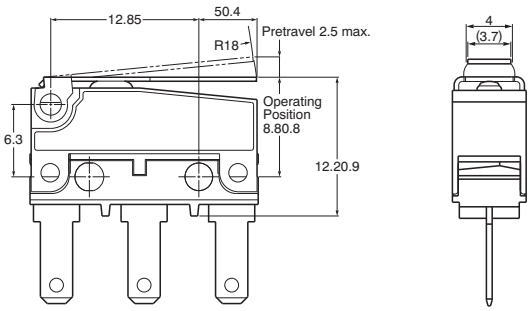
CAD Data



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

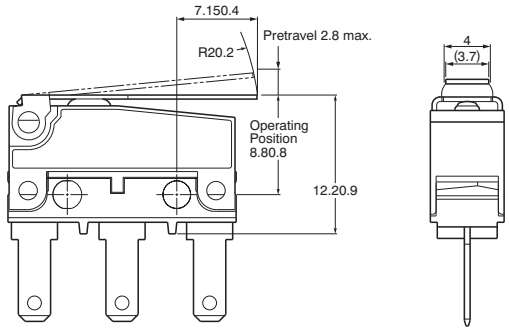
CAD Data



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

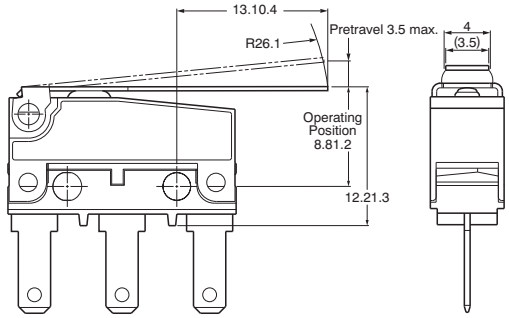
CAD Data



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



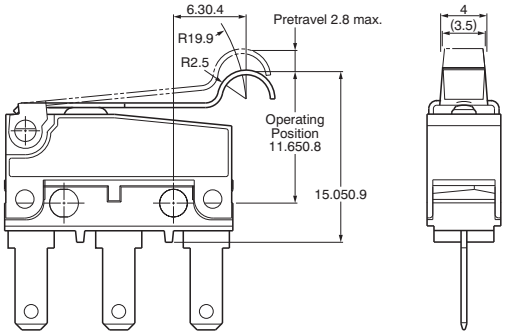
Pretravel, max. mm		3.5
Movement differential, max. mm		1
Overtravel, min. mm		1.6
Operating position	Distance from mounting hole, mm	8.8±1.2
	Distance from stand-off, mm	12.2±1.3

ABS1,4,5

Simulated roller lever

mm General tolerance: ±0.25

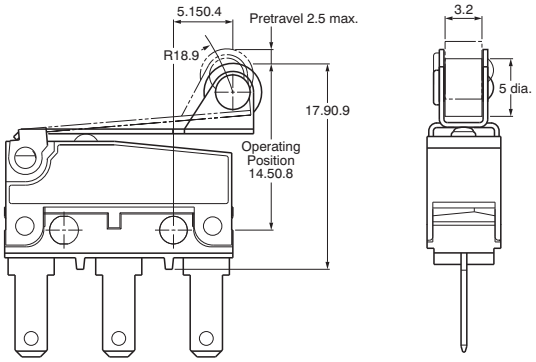
CAD Data



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

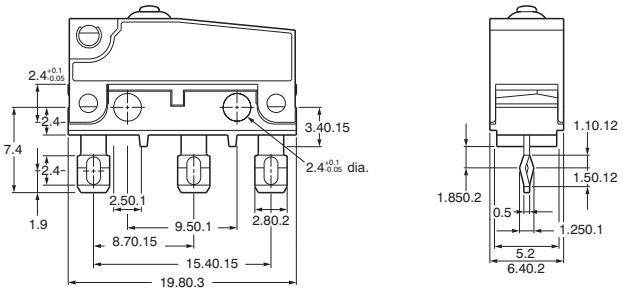
CAD Data



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

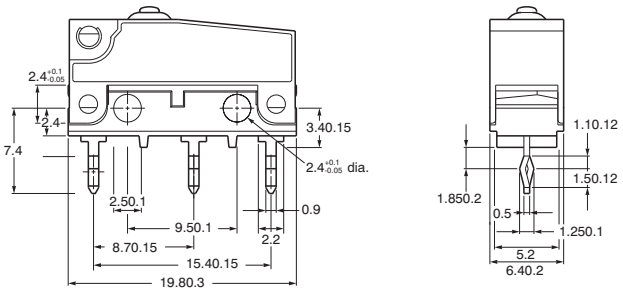
CAD Data

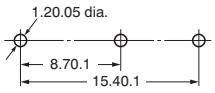


Remarks: Dimensions of the actuator types are the same as those of corresponding .110 quick-connect terminal types.

1-(3) PC board terminal
Straight type

CAD Data



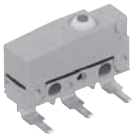


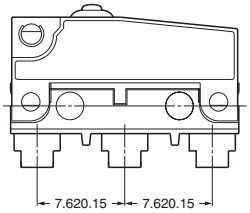
Remarks: Dimensions of the actuator types are the same as those of corresponding .110 quick-connect terminal types.

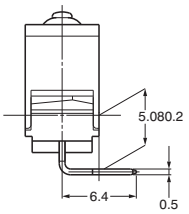
Right angle type

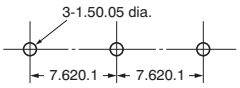
mm General tolerance: ±0.25

CAD Data





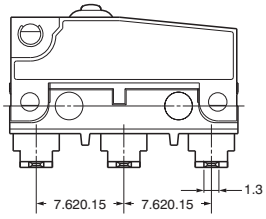


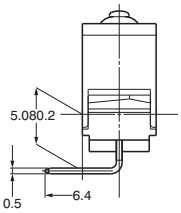


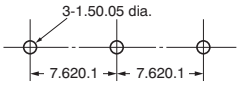
Remarks: Dimensions of the actuator types are the same as those of corresponding .110 quick-connect terminal types.

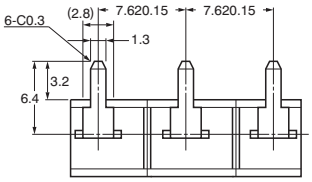
Left angle type

CAD Data









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

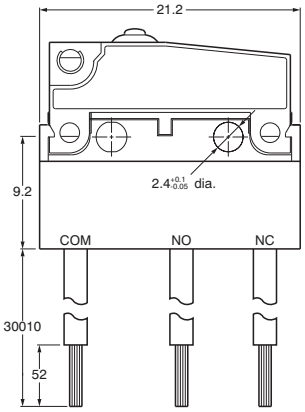
2. Immersion protected type

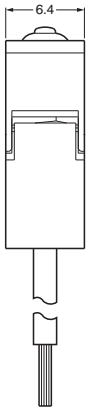
Wire leads

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

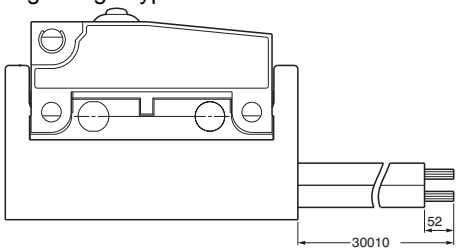
N.C. ... Red

N.O. ... White

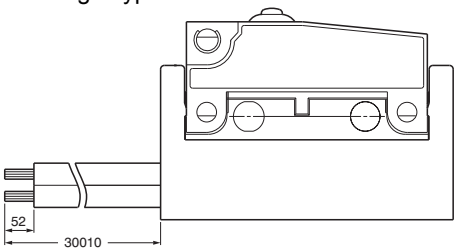
Remarks: 1. Other dimensions are the same as those of .110 quick-connect terminal types.

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

Right angle type



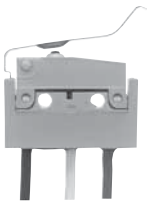
Left angle type

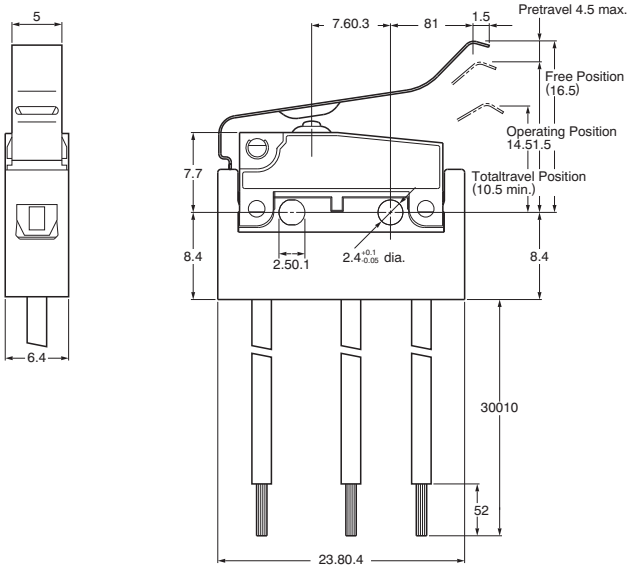


Leaf lever
Straight type

mm General tolerance: ±0.25

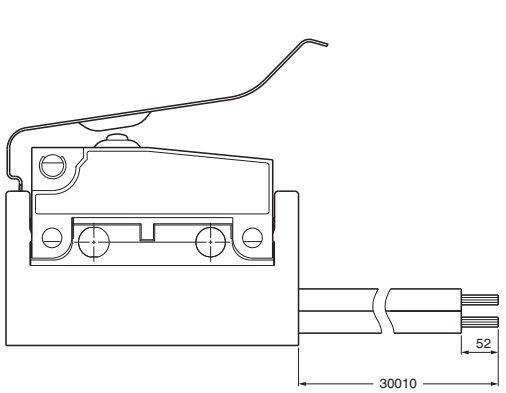
CAD Data

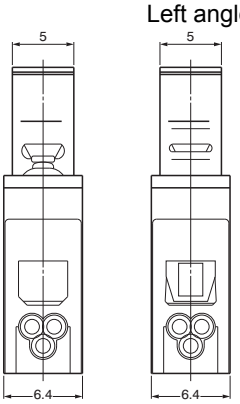




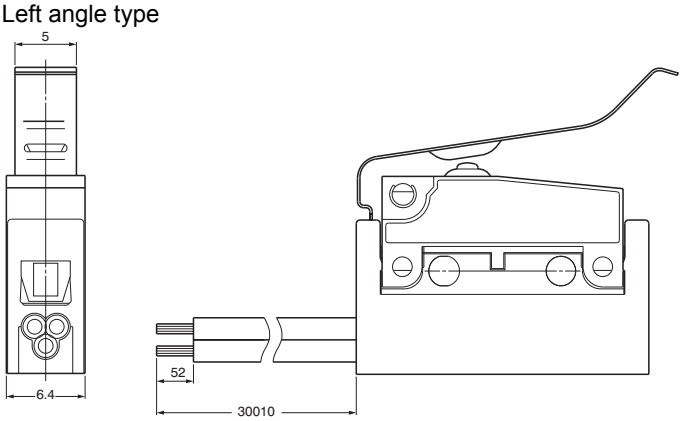
Thickness of the lead wire: 0.5 mm²
UL/CSA approved type and Right/Left angle type:
AWG #20
Color of the lead wire:
COM... Black
N.C. ... Red
N.O. ... White

Right angle type



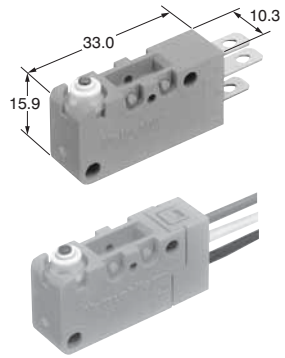


Left angle type



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

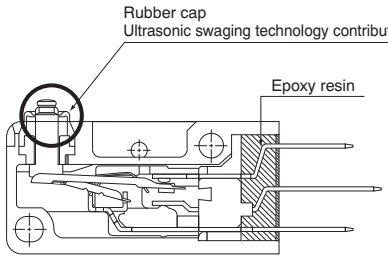
Ex. ABV1 | 2 | 1 | 0 | 4 | 1 | 3 | R

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 6: Wire leads	1: SPDT 2: SPST-NC 3: SPST-NO	0: Pin plunger 2: Hinge lever 4: Simulated roller lever 5: Short roller lever 6: Roller lever	4: 0.98 N 5: 1.96 N	0: AgNi alloy 1: AgNi alloy + Au-clad	3: UL/CSA/VDE/ SEMKO	R: Improved short roller lever

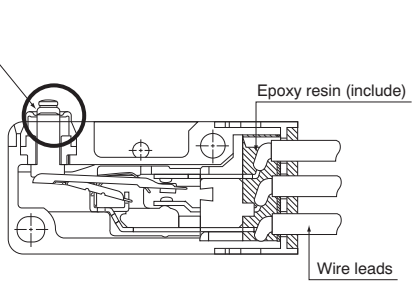
Remarks: 1. Standard packing: Dust protected type 50 pcs./carton, 500 pcs./case; Immersion protected type 50 pcs./case.
2. Not every combination is available. Please refer to the following table, “PRODUCT TYPES”.

CONSTRUCTION

.187 quick-connect terminal

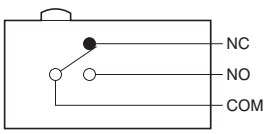


Wire leads

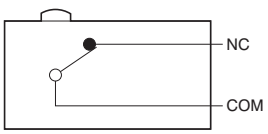


CONTACT ARRANGEMENT

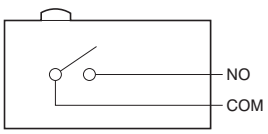
1. SPDT



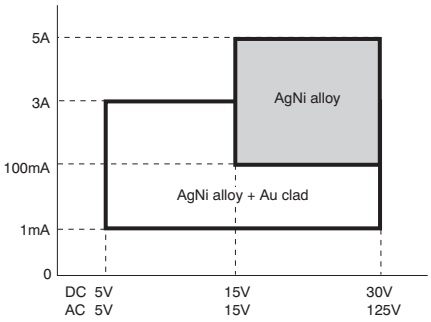
2. SPST-NC



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) 1 A 250 V AC (O.F. 0.98 N)	5 mA 6 V DC 2 mA 12 V DC 1 mA 24 V DC
AgNi alloy	5 A 250 V AC (O.F. 1.96 N) 3 A 250 V AC (O.F. 0.98 N)	—

2. Characteristics

Mechanical life (O.T.: Specified value)		Min. 5×10^6 (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 Between non-continuous terminals Between each terminal and other exposed metal parts Between each terminal and ground		 1,000 Vrms 2,000 Vrms 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 Immersion protected type (IP67): max. 100 mΩ (by voltage drop 1A 6 to 8V DC)
	AgNi alloy + Au-clad contact type	Dust protected type (IP50): max. 50 mΩ Immersion protected type (IP67): max. 100 mΩ (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 5×10^5 (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

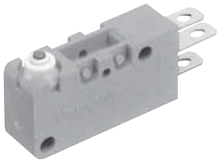
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

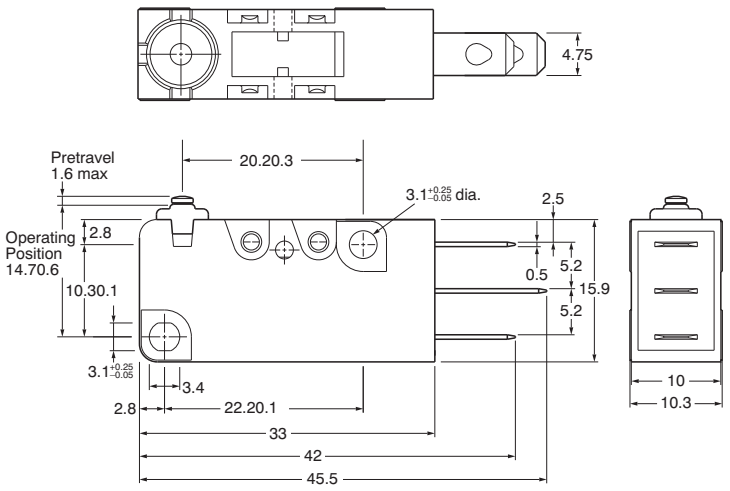
1. Dust protected type

mm General tolerance: ±0.4

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

CAD Data



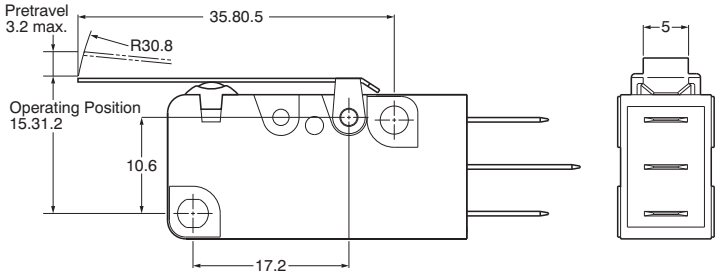


Pretravel, max. mm	1.6
Movement differential, max. mm	0.4
Overtravel, min. mm	0.8
Operating position, mm	14.7±0.6

Hinge lever

mm General tolerance: ±0.25

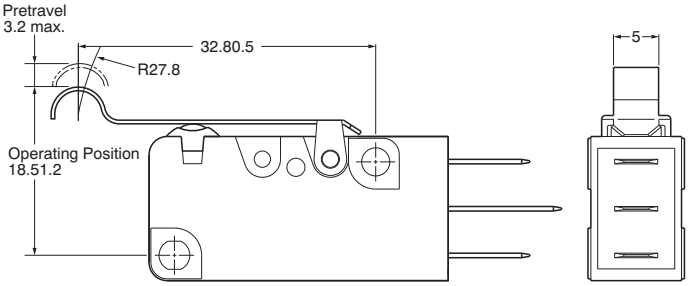
CAD Data



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

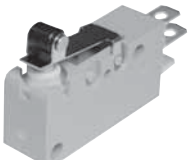
CAD Data

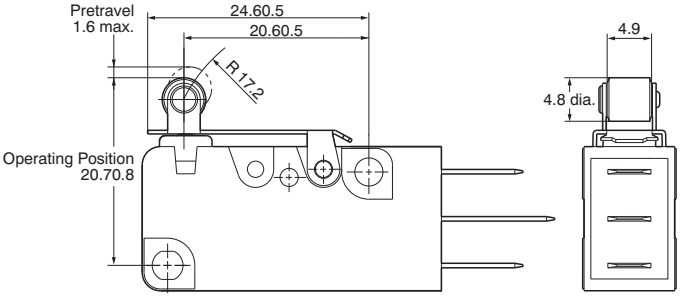


Pretravel, max. mm	3.2
Movement differential, max. mm	1.2
Overtravel, min. mm	1.2
Operating position, mm	18.5±1.2

Short roller lever

CAD Data

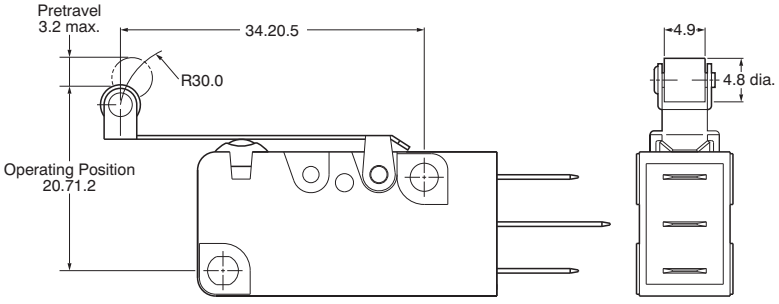




Pretravel, max. mm	1.6
Movement differential, max. mm	0.5
Overtravel, min. mm	0.8
Operating position, mm	20.7±0.8

Roller lever

CAD Data

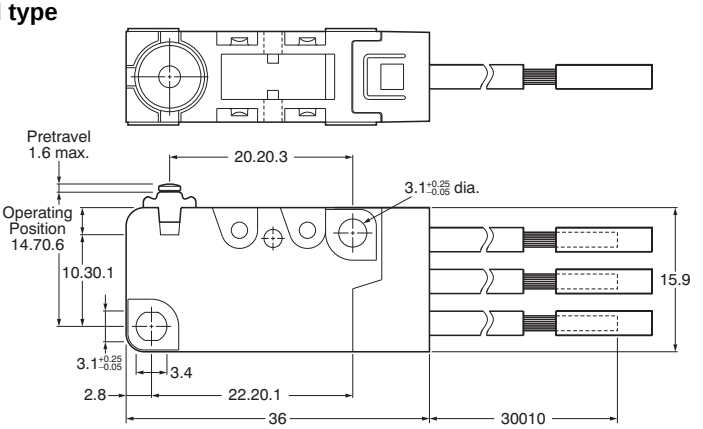


Pretravel, max. mm	3.2
Movement differential, max. mm	1.2
Overtravel, min. mm	1.2
Operating position, mm	20.7±1.2

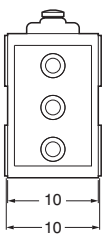
2. Immersion protected type

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

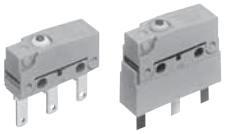
Turquoise switches

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

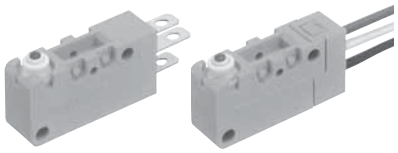
Against dust, gas and water

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

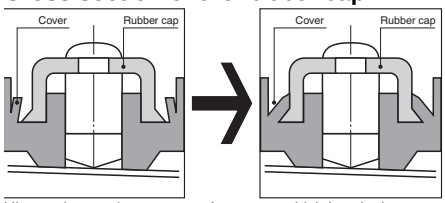
● Available

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

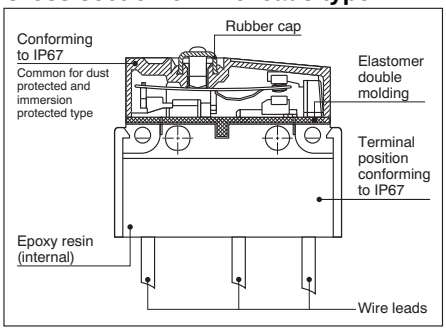
The rubber cap is securely sealed to the switch cover during an ultrasonic swaging process.

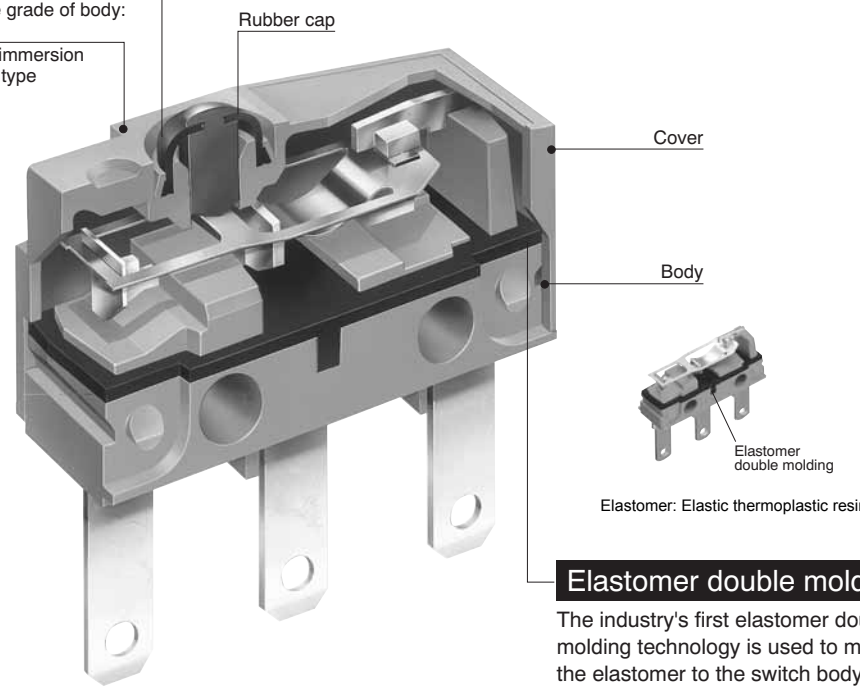
Cross section of the rubber cap



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.

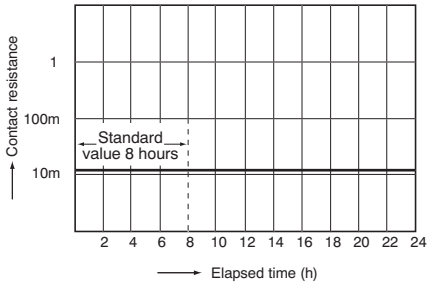
3) Keep away from environments where silicon based adhesives, oil or grease are present as faulty contacts may result from silicon oxide. Do not use in areas where flammable or explosive gases from gasoline and thinner, etc., may be present.

• 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.

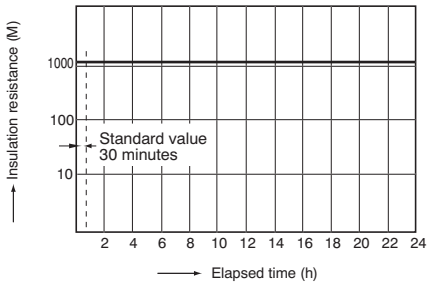


• Waterproof test

Test conditions:

Immersion protected IP67 switches ...

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



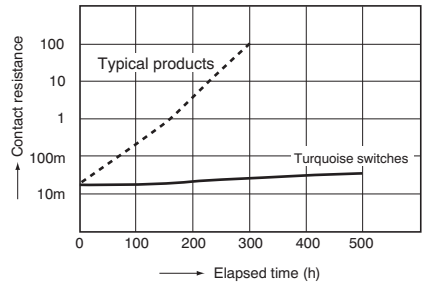
• Hydrogen sulfide exposure test

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)

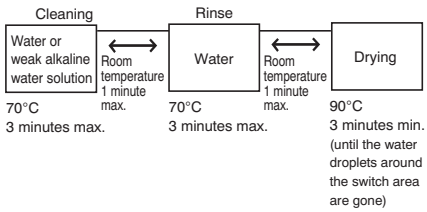
The Turquoise switch terminal with lead wires type and without lead wires typeshare the same main body. As a result, if the print board terminal type satisfies the set conditions, then it can undergo a complete cleaning after automatic soldering. After soldering is completed, perform cleaning within 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).

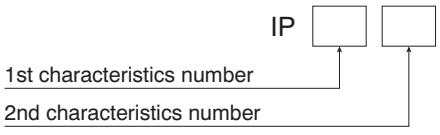
Test conditions: The switch is left for eight hours in a test chamber with a constant level of floating pure talc that has passed through a standard 75μm sieve, in a concentration of 2kg of talc per cubic meter of volume in the test chamber.

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 Prevents dust that is large enough to have an effect on operation from getting inside the unit
6	Dust-resistant type 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

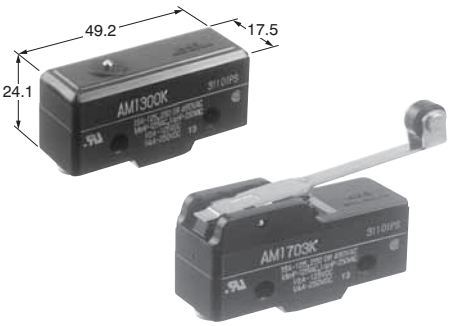
Note: Details of test conditions are the same as JIS C 0920. Please refer to them.

Micro Switches IP40

Panasonic
ideas for life

HIGH CONTACT CAPACITY, PRECISE OPERATION

AM1 (NZ BASIC) SWITCHES



FEATURES

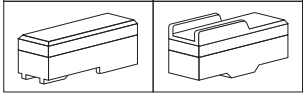
- **10 A High current switching capacity and high precision**
- **Wide allowance of operating speed**
- **Versatile variety of actuators**
- **UL/C-UL approved**

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 3: Flat, screw terminal 5: Grooved, solder terminal 7: Grooved, screw terminal Upper body cover shape: Flat / Grooved 	0: Standard type 1: Oil tight type 3: Reversed action type 4: One way type	0: Pin plunger 1: Hinge lever (leaf spring) 3: Hinge roller lever (roller, leaf, spring) 4: Hinge short roller lever 5: Overtravel plunger 6: Compact overtravel plunger 7: Panel mount plunger 811: Panel mount roller plunger 812: Panel mount cross roller plunger	F: Cadmium free

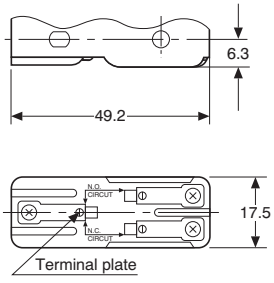
Remarks: Not every combination is available. Please refer to the following table, “PRODUCT TYPES”.

TERMINAL VARIATION

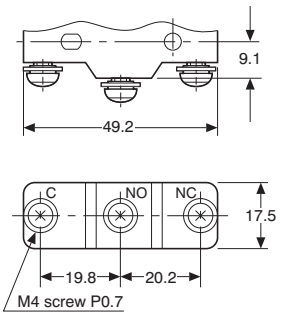
Standard types, reversed action types and oil tight types are available in two terminal designs, solder and screw terminals, as shown in the above columns:
Differences in dimension between solder and screw terminals are as follows;

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 ϕ = 1)	Inductive load (cos ϕ = 0.6 to 0.7)	Motor or lamp load	
				N.C.	N.O.
Standard types One way types 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. 2×10^7 (60 cpm) (at rated overtravel) (oil tight: Min. 1.5×10^6)
		Other types (O.T.: specified value)	Min. 5×10^6 (60 cpm) (at rated overtravel) (oil tight: Min. 1.5×10^6)
	Electrical (O.T.: Max.)		Min. 5×10^5 (20 cpm) (at rated load) (oil tight: Min. 1.5×10^5)
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.

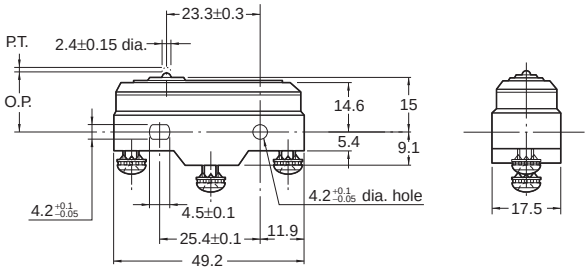
1. Standard types

mm General tolerance: ±0.4

Pin plunger

CAD Data

AM1100F (solder terminal)
AM1300F (screw terminal)

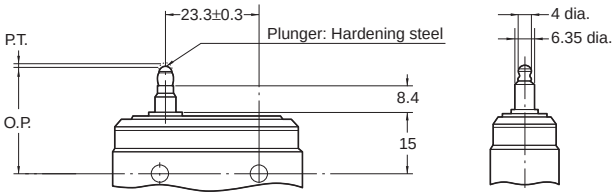


Operating force, max.	3.63 N
Release force, min.	1.12 N
Pretravel, max. mm	0.4
Movement differential, max. mm	0.05
Overtravel, min. mm	0.13
Operating position, mm	15.9±0.4

Overtravel plunger

CAD Data

AM1105F (solder terminal)
AM1305F (screw terminal)

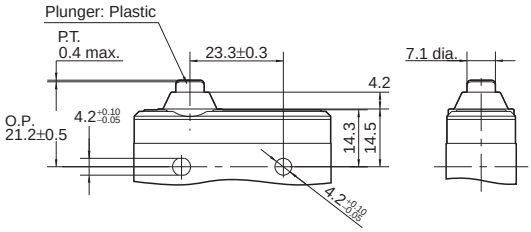


Operating force, max.	3.63 N
Release force, min.	1.12 N
Pretravel, max. mm	0.4
Movement differential, max. mm	0.05
Overtravel, min. mm	1.5
Operating position, mm	28.2±0.5

Compact over plunger

CAD Data

AM1106F (solder terminal)
AM1306F (screw terminal)

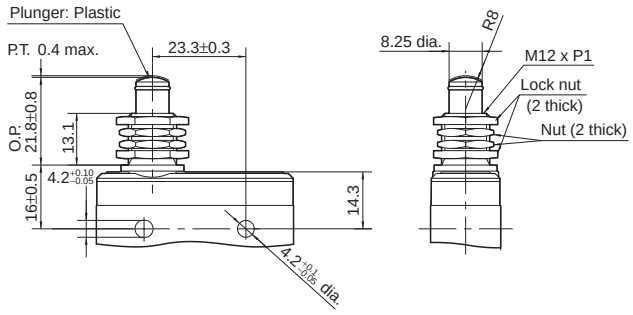


Operating force, max.	3.63 N
Release force, min.	1.12 N
Pretravel, max. mm	0.4
Movement differential, max. mm	0.05
Overtravel, min. mm	1.5
Operating position, mm	21.2±0.5

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

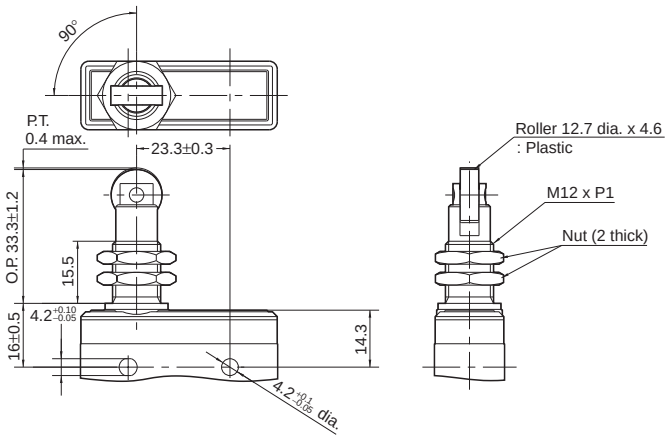
AM1

Panel mount roller plunger

mm General tolerance: ±0.4

CAD Data

AM110811F (solder terminal)
AM130811F (screw terminal)

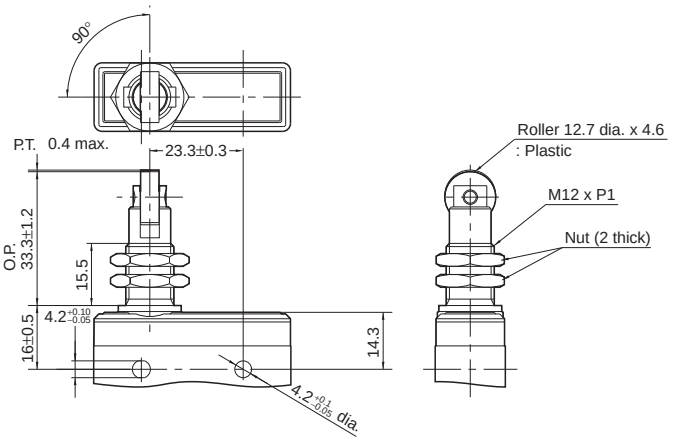


Operating force, max.	3.63 N
Release force, min.	1.12 N
Pretravel, max. mm	0.4
Movement differential, max. mm	0.05
Overtravel, min. mm	3.6
Operating position, mm	33.3±1.2

Panel mount cross roller plunger

CAD Data

AM110812F (solder terminal)
AM130812F (screw terminal)



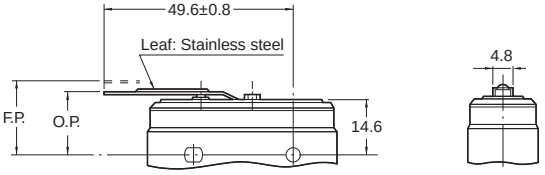
Operating force, max.	3.63 N
Release force, min.	1.12 N
Pretravel, max. mm	0.4
Movement differential, max. mm	0.05
Overtravel, min. mm	3.6
Operating position, mm	33.3±1.2

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)

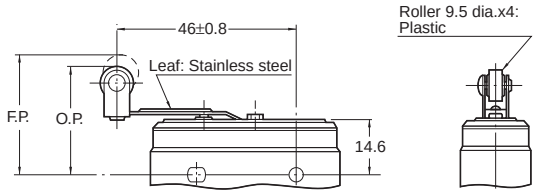


Operating force, max.	1.47 N
Release force, min.	0.14 N
Pretravel, max. mm	4
Movement differential, max. mm	1.3
Overtravel, min. mm	1.6
Operating position, mm	17.5±0.8

Flexible roller leaf lever

CAD Data

AM1103F (solder terminal)
AM1303F (screw terminal)

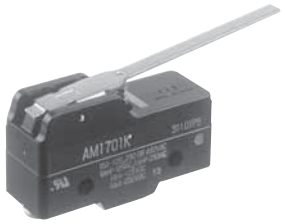


Operating force, max.	1.47 N
Release force, min.	0.14 N
Pretravel, max. mm	4
Movement differential, max. mm	1.3
Overtravel, min. mm	1.6
Operating position, mm	28.6±0.8

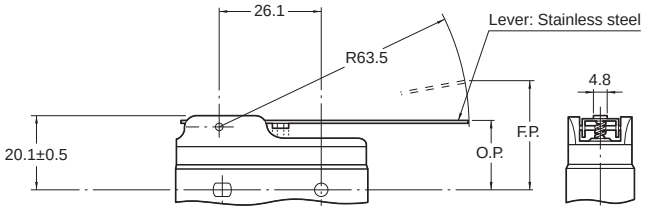
Hinge lever

mm General tolerance: ±0.4

CAD Data



AM1501F (solder terminal)
AM1701F (screw terminal)

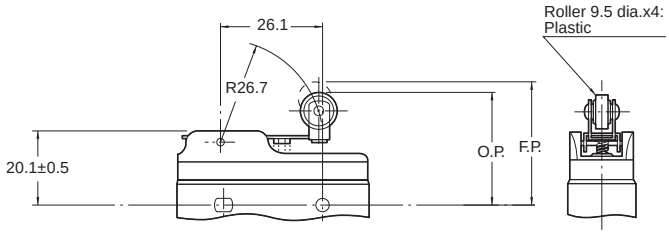


Operating force, max.	0.69 N
Release force, min.	0.14 N
Pretravel, max. mm	10
Movement differential, max. mm	1.3
Overtravel, min. mm	5.6
Operating position, mm	19.1±0.7

Hinge short roller lever

CAD Data

AM1504F (solder terminal)
AM1704F (screw terminal)

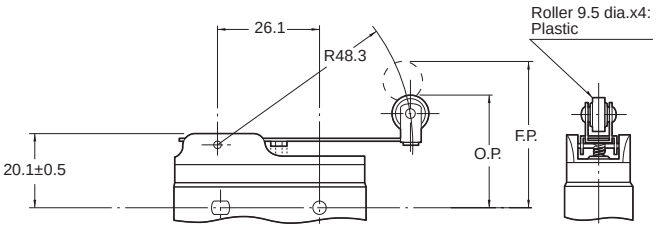


Operating force, max.	1.57 N
Release force, min.	0.42 N
Pretravel, max. mm	4.5
Movement differential, max. mm	0.7
Overtravel, min. mm	2.4
Operating position, mm	30.2±0.4

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

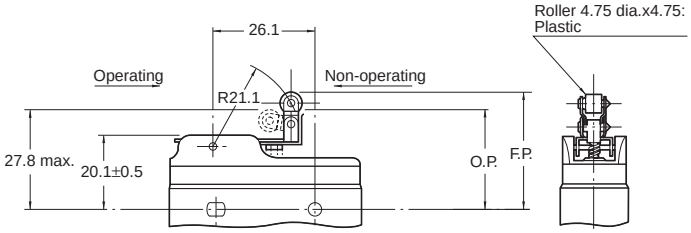
2. One way types

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)



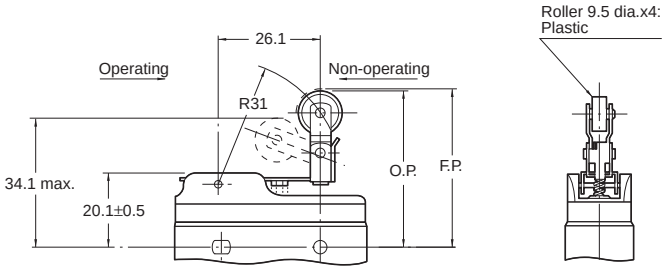
Operating force, max.	2.23 N
Release force, min.	0.42 N
Pretravel, max. mm	3.5
Movement differential, max. mm	0.4
Overtravel, min. mm	1.5
Operating position, mm	30.2±0.4

Hinge roller lever

mm General tolerance: ±0.4

CAD Data

AM1543F (solder terminal)
AM1743F (screw terminal)



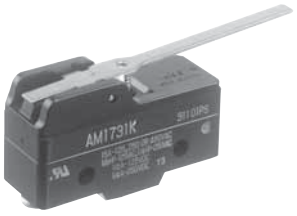
Operating force, max.	1.67 N
Release force, min.	0.42 N
Pretravel, max. mm	4.5
Movement differential, max. mm	0.5
Overtravel, min. mm	2.4
Operating position, mm	41.3±0.4

3. Reversed action types

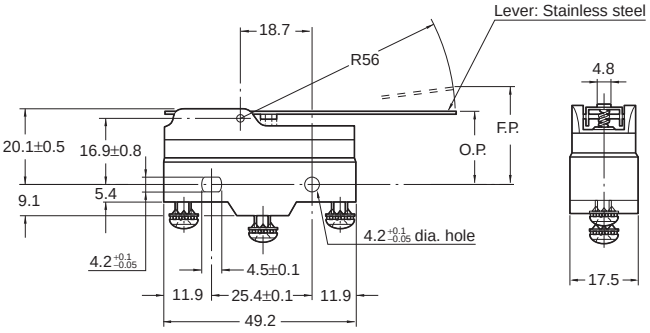
When the actuator is operated, the switching mechanism returns to the free position. Extraordinary force by pushing the plunger too much is not put on the switching mechanism, which means stability in life.

Hinge lever

CAD Data



AM1531F (solder terminal)
AM1731F (screw terminal)

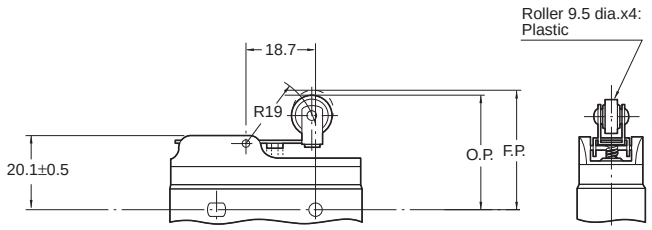


Operating force, max.	1.67 N
Release force, min.	0.27 N
Pretravel, max. mm	5.0
Movement differential, max. mm	0.9
Overtravel, min. mm	5.6
Operating position, mm	19.1±0.8

Hinge short roller lever

CAD Data

AM1534F (solder terminal)
AM1734F (screw terminal)

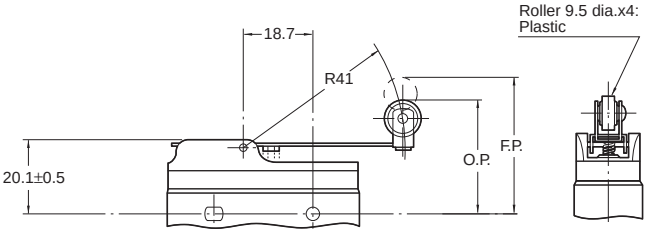


Operating force, max.	5.30 N
Release force, min.	1.67 N
Pretravel, max. mm	2.5
Movement differential, max. mm	0.4
Overtravel, min. mm	2.0
Operating position, mm	30.2±0.5

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

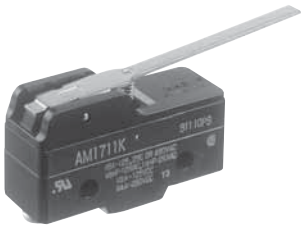
4. Oil tight types

mm General tolerance: ±0.4

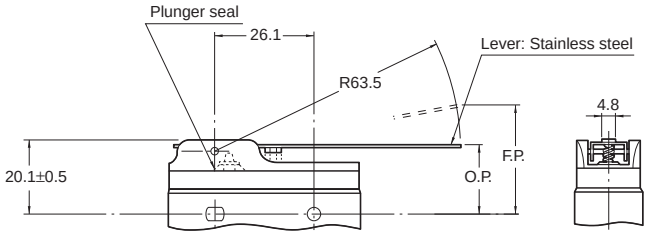
The push-button part is sealed with the rubber cap and the connected part between the cap and body is also coated with resin so that these parts are kept away from foreign matters. This type has resistance to oil.

Hinge lever

CAD Data



AM1511F (solder terminal)
AM1711F (screw terminal)

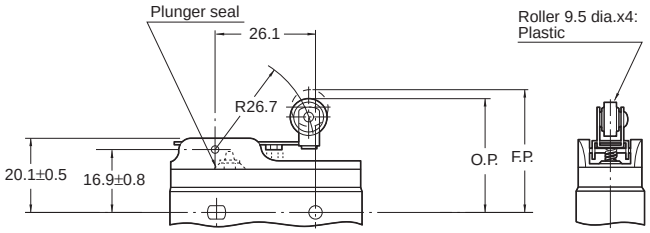


Operating force, max.	0.69 N
Release force, min.	0.14 N
Pretravel, max. mm	10
Movement differential, max. mm	1.5
Overtravel, min. mm	5.6
Operating position, mm	19.1±0.7

Hinge short roller lever

CAD Data

AM1514F (solder terminal)
AM1714F (screw terminal)

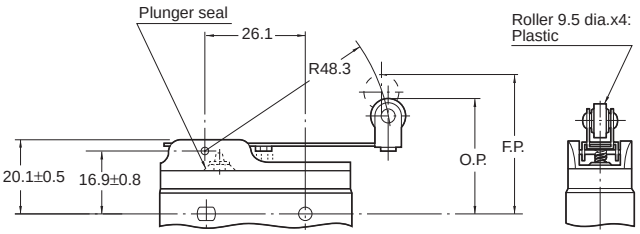


Operating force, max.	1.67 N
Release force, min.	0.42 N
Pretravel, max. mm	4.5
Movement differential, max. mm	0.7
Overtravel, min. mm	2.4
Operating position, mm	30.2±0.4

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.

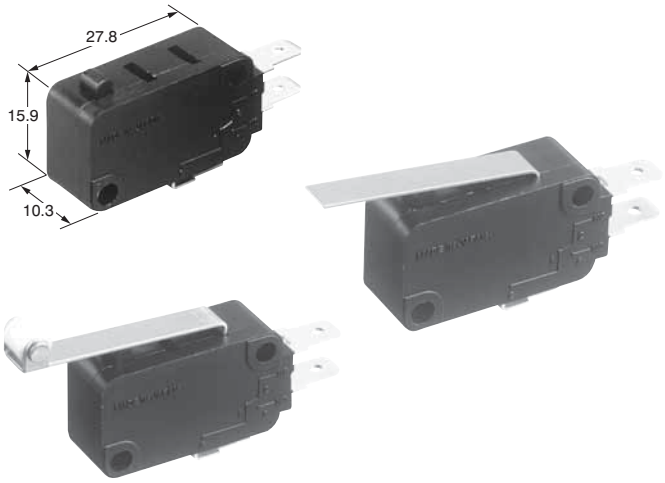
5. Others

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

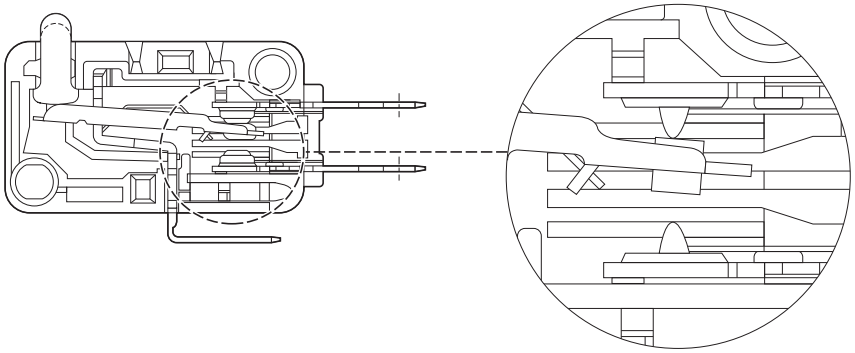
TYPICAL APPLICATION

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

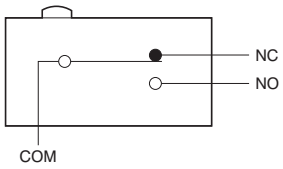
CONSTRUCTION

1. Ag alloy contact

2. Au-clad contact

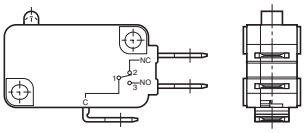


CONTACT ARRANGEMENT

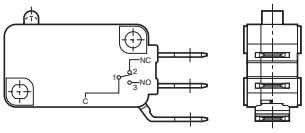


TERMINALS

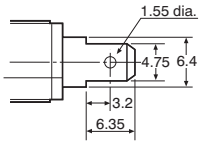
.187 Quick-connect terminal
.187 Quick-connect/solder terminal
Bottom COM terminal



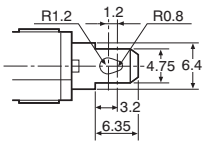
Side COM terminal



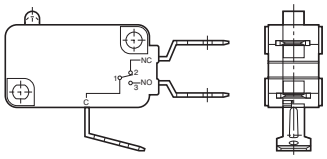
Dimensions
.187 Quick-connect terminal



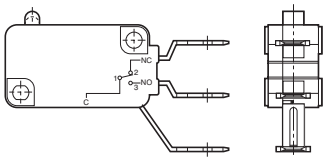
Dimensions
.187 Quick-connect/solder terminal



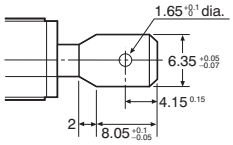
.250 Quick-connect terminal
Bottom COM terminal



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 2: Bottom COM, SPST-NC 3: Bottom COM, SPST-NO 4: Side COM, SPDT 5: Side COM, SPST-NC 6: Side COM, SPST-NO	0: Pin plunger 1: Short hinge lever 2: Hinge lever 3: Long hinge lever 4: Simulated roller lever 5: Short roller lever 6: Roller lever	A: .187 Quick-connect/solder terminal C: .187 Quick-connect terminal	3: 0.49 N 4: 0.98 N 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 2: Bottom COM, SPST-NC 3: Bottom COM, SPST-NO 4: Side COM, SPDT 5: Side COM, SPST-NC 6: Side COM, SPST-NO	0: Pin plunger 1: Short hinge lever 2: Hinge lever 3: Long hinge lever 4: Simulated roller lever 5: Short roller lever 6: Roller lever	A: .187 Quick-connect/solder terminal 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 2: Bottom COM, SPST-NC 3: Bottom COM, SPST-NO 4: Side COM, SPDT 5: Side COM, SPST-NC 6: Side COM, SPST-NO	0: Pin plunger 1: Short hinge lever 2: Hinge lever 3: Long hinge lever 4: Simulated roller lever 5: Short roller lever 6: Roller lever	A: .187 Quick-connect/solder terminal C: .187 Quick-connect terminal 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 2: Bottom COM, SPST-NC 3: Bottom COM, SPST-NO 4: Side COM, SPDT 5: Side COM, SPST-NC 6: Side COM, SPST-NO	0: Pin plunger 1: Short hinge lever 2: Hinge lever 3: Long hinge lever 4: Simulated roller lever 5: Short roller lever 6: Roller lever	A: .187 Quick-connect/solder terminal C: .187 Quick-connect terminal D: .250 Quick-connect terminal	5: 1.96 N 6: 2.94 N 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

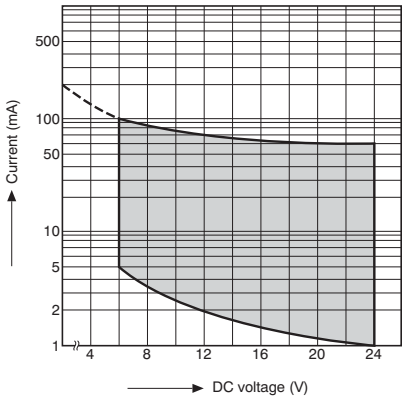
2 Side COM terminal

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 ϕ = 1)	Inductive load (cos ϕ ≈ 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) 2×10^6 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 O.F. 0.98N max. type Min. 196m/s² O.F. 1.96N to 3.92N max. type Min. 294m/s²	O.F. 0.49N max. type Min. 98m/s² O.F. 0.98N max. type Min. 196m/s² 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, 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.

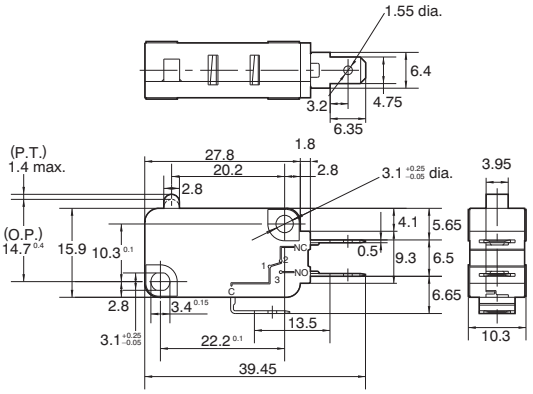
1. Pin plunger

mm General tolerance: ±0.25

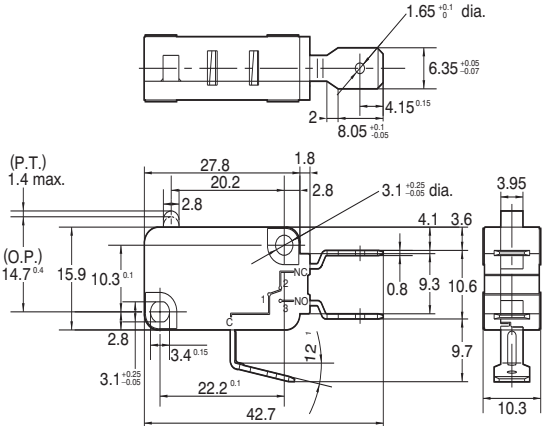
Bottom COM terminal

CAD Data

.187 Quick-connect terminal



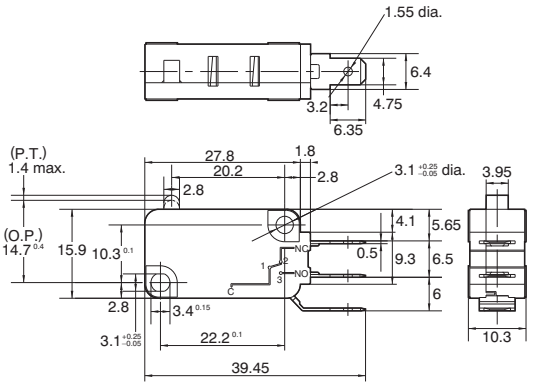
.250 Quick-connect terminal



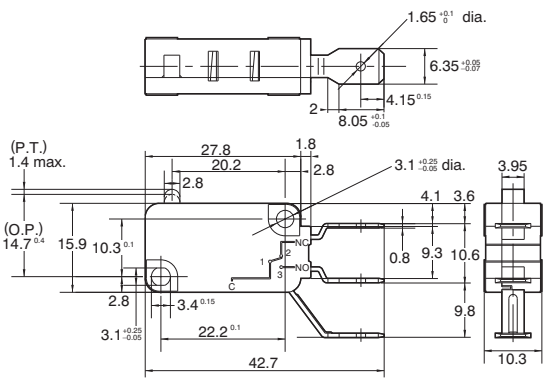
Side COM terminal

CAD Data

.187 Quick-connect terminal

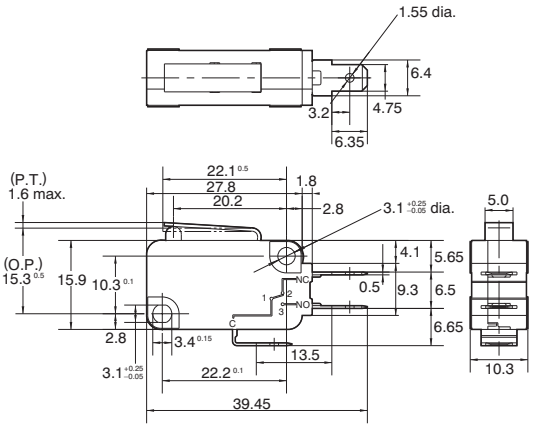


.250 Quick-connect terminal



2. Short hinge lever

CAD Data

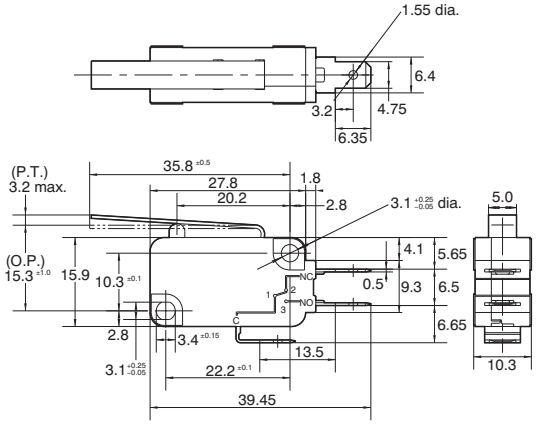


The dimensions other than drawn above are same as pin plunger type.

3. Hinge lever

mm General tolerance: ±0.25

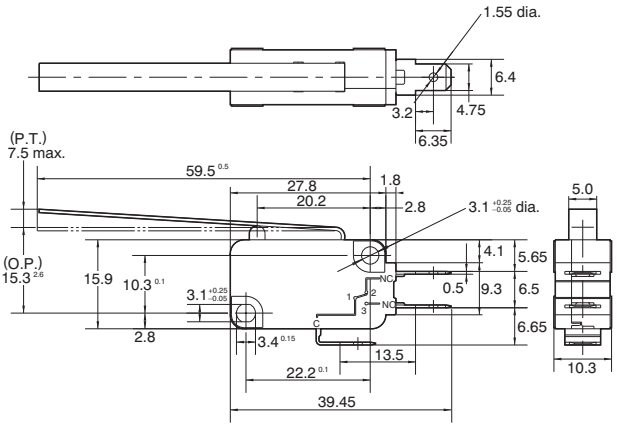
CAD Data



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

4. Long hinge lever

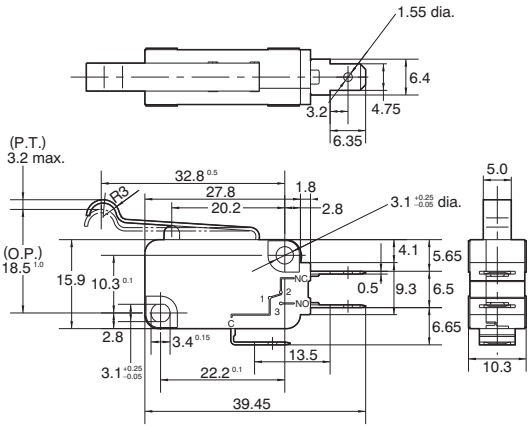
CAD Data



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

5. Simulated roller lever

CAD Data

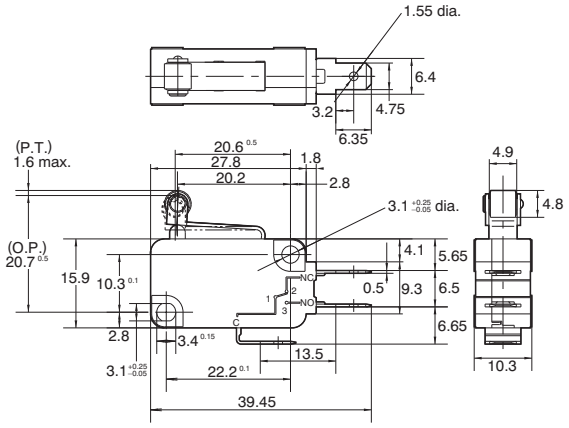


The dimensions other than drawn above are same as pin plunger type.

6. Short roller lever

mm General tolerance: ±0.25

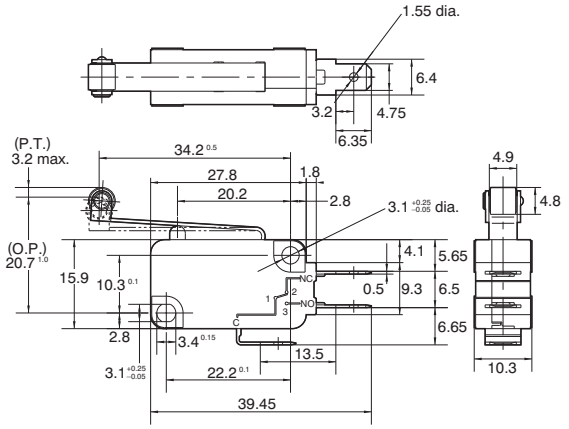
CAD Data



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.

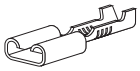
USE OF CONNECTOR

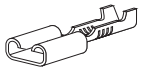
The .187 Quick-connect terminal and .250 Quick-connect terminal accept the all kinds of 1 polarity connectors and the “Positive Lock” connectors

Please contact the manufacturers directly.

• receptacle terminal

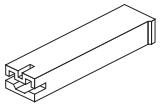
.250 series .187 series



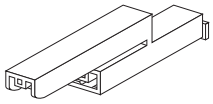


• “Positive Lock” connector. (equipped with the lock construction of low insertion type)

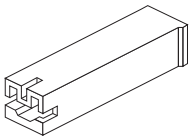
.187 type (1 polarity)



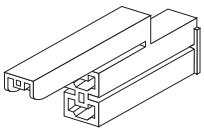
.187 type (2 polarities)



.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]

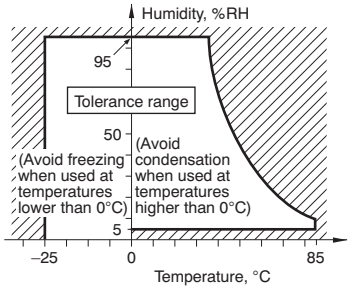
* This value is a rough indication of the lowest possible low level load at which switching is possible.
This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.

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. 2×10^5	Switching frequency: 20 times/min. Conduction ratio: 1:1 Push-button operation speed: 100 mm/s 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 Amplitude of vibration: 10 to 55 Hz (4 minutes cycle) Direction and time: 2 hours each in X, Y and Z directions	
Shock resistance (malfunction shock resistance)		Shock value: 294 m/s^2 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 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 % Temperature: 35°C each 100 hours At free position (F.P.) and total travel position (T.T.P.)	
Heat and cold resistance		–45 to –40°C 48 hours 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

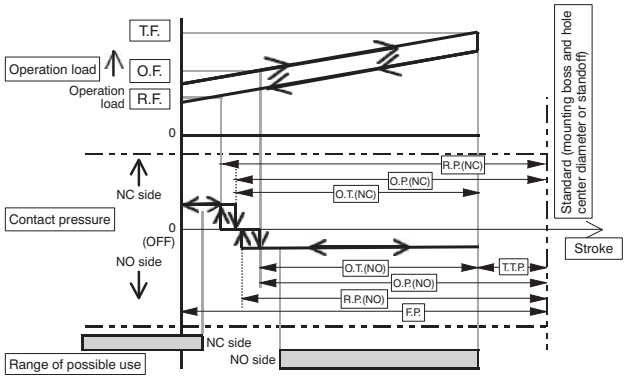
5. Operating characteristics

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.

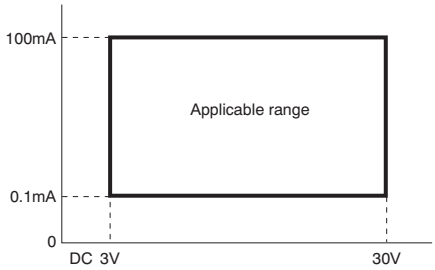
OPERATION CONCEPT DIAGRAM

Contact form: terminal type

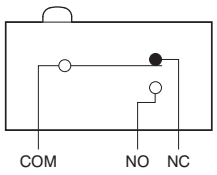


DATA

Applicable current range (reference)



CONTACT ARRANGEMENT



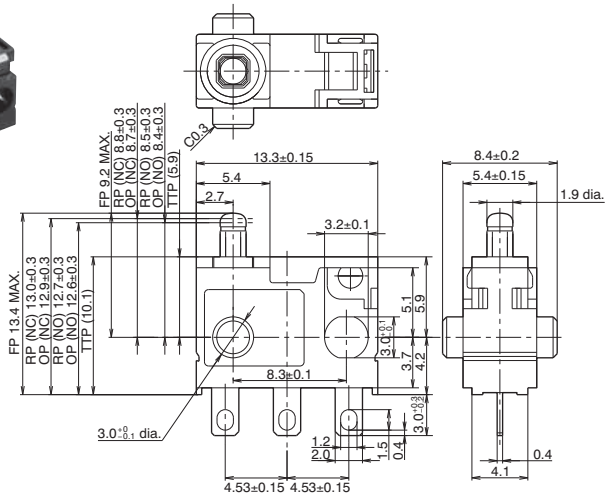
DIMENSIONS (unit: mm)

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

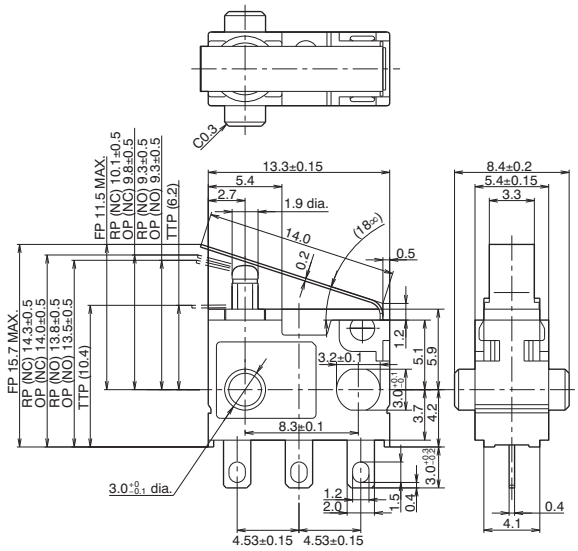
CAD Data



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

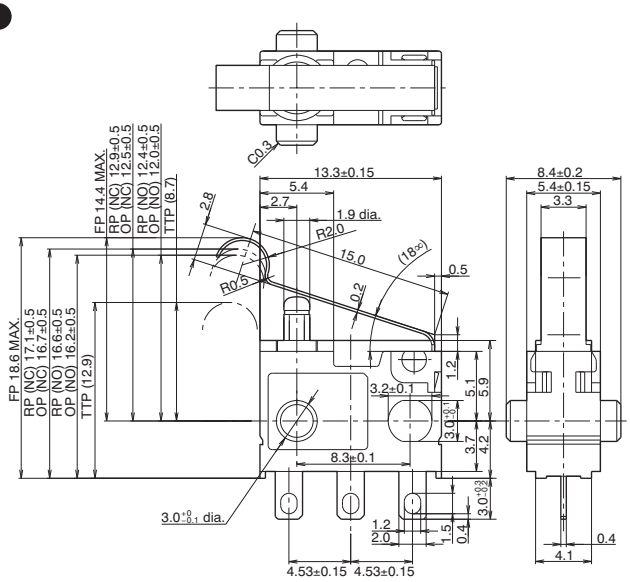


Operating Force (max. O.F.)		1.7 N
Total travel Force (max. T.F.) reference value		(3.1 N)
Free Position (F.P.)	From mounting boss and hole center line	11.5 mm max.
Operating Position on NC side [O.P. (N.C.)]	From mounting boss and hole center line	9.8±0.5 mm
Operating Position on NO side [O.P. (N.O.)]	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



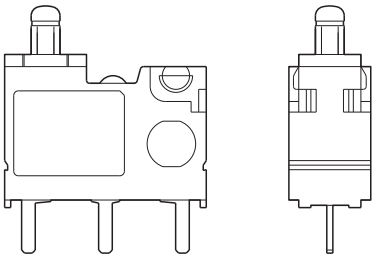
Operating Force (max. O.F.)		1.5 N
Total travel Force (max. T.F.) reference value		(2.8 N)
Free Position (F.P.)	From mounting boss and hole center line	14.4 mm max.
Operating Position on NC side [O.P. (N.C.)]	From mounting boss and hole center line	12.5±0.5 mm
Operating Position on NO side [O.P. (N.O.)]	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.

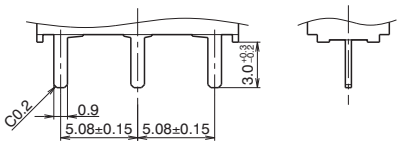
4. PC board terminal; Mounting hole: 3 mm, without boss type

Pin plunger

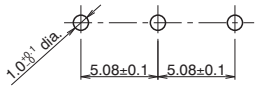
CAD Data



PC board terminal



PC board pattern



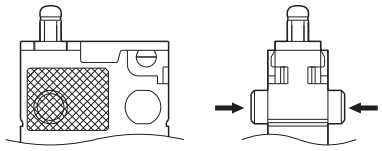
NOTES

■ **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

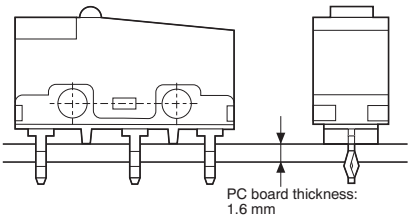
FS-T

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

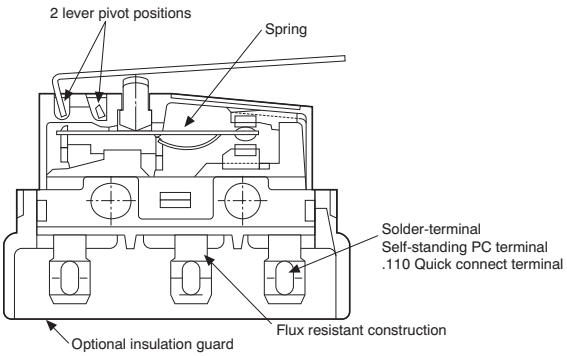
TYPICAL APPLICATIONS

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

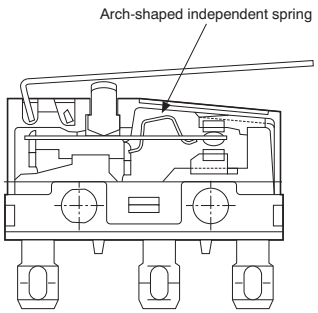


CONSTRUCTION (example: AV3/AVM3 type)

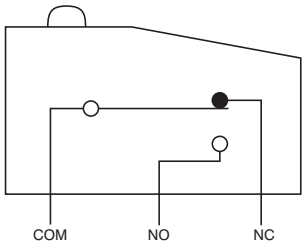
Standard version



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 4: Self-standing PC board terminal 5: Internationally common pitch PC board terminal 6: Right angle terminal 7: Left angle terminal 8: .110 Quick-connect terminal	0: Pin plunger 1: Short hinge lever 2: Hinge lever 3: Long hinge lever 4: Simulated roller lever 5: Roller lever	0: 0.25 N (Au-clad contact only) 2: 0.49 N 4: 0.98 N	Nil: Standard	Nil: AgNi alloy 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 4: Self-standing PC board terminal 5: Internationally common pitch PC board terminal 6: Right angle terminal 7: Left angle terminal 8: .110 Quick-connect terminal	0: Pin plunger 1: Short hinge lever 2: Hinge lever 3: Long hinge lever 4: Simulated roller lever 5: Roller lever	5: 1.47 N	Nil: Standard	Nil: AgNi alloy 61: Au-clad triple layer*	3: UL/C-UL, ENEC/ VDE

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

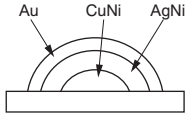
Ex. AV T3 2 0 2 ☐ ☐ 3

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 4: PC board terminal 8: .110 Quick-connect terminal	0: Pin plunger 1: Short hinge lever 2: Hinge lever 3: Long hinge lever 4: Simulated roller lever 5: Roller lever	0: 0.25 N (Au-clad contact only) 2: 0.49 N 4: 0.98 N	Nil: Standard	Nil: AgNi alloy (Not applicable to 0.25 N type) 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 4: PC board terminal 8: .110 Quick-connect terminal	0: Pin plunger 1: Short hinge lever 2: Hinge lever 3: Long hinge lever 4: Simulated roller lever 5: Roller lever	5: 1.47 N	Nil: Standard	Nil: AgNi alloy (Not applicable to 0.25 N type) 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.)	5×10^4 at 20 cpm	2×10^5 at 20 cpm	5×10^4 at 20 cpm	2×10^5 at 20 cpm
Mechanical life	5×10^5 at 60 cpm (O.T.max.)		3×10^7 (O.T.: Specified value) 10^7 (O.T.max.) at 60 cpm	
Insulation resistance	Min.100MΩ at 500V DC			
Dielectric strength Between non-continuous terminals Between each terminal and other exposed metal parts Between each terminal and ground	1,000 Vrms 1,500 Vrms 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) 147 m/s² min. (O.F. 0.49 N)	294 m/s² min. (O.F. 0.98 N) 147 m/s² min. (O.F. 0.49 N) 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 Distance from stand-off: FS 11.8±0.4 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 Distance from stand-off: FS 12.2±0.9 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 Distance from stand-off: FS 12.2±0.9 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 Distance from stand-off: FS 12.2±1.3 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 Distance from stand-off: FS 15.05±0.9 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 Distance from stand-off: FS 17.9±0.9 FS-T 17.8±0.9
2	0.20N	0.017N				
4	0.39N	0.034N				
5	0.59N	0.039N				

DIMENSIONS

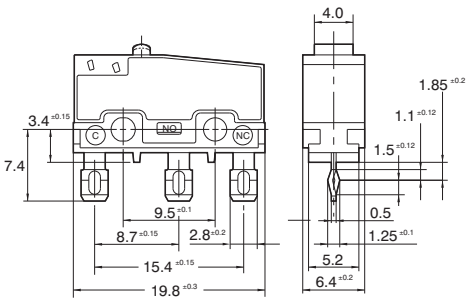
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

1. FS switches (In-line terminal type)

mm General tolerance: ±0.25

1-(1) Solder terminal (without guard)

CAD Data



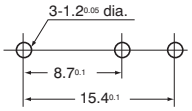
Dimensions other than drawn above is same as self-standing PC board terminal.

AV3,AVM3/AVT3,AVL3

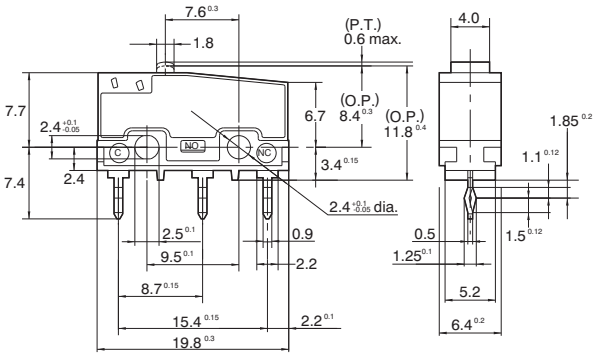
1-(2) Self-standing PC board terminal
Pin plunger

mm General tolerance: ±0.25

PC board pattern



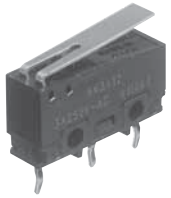
CAD Data

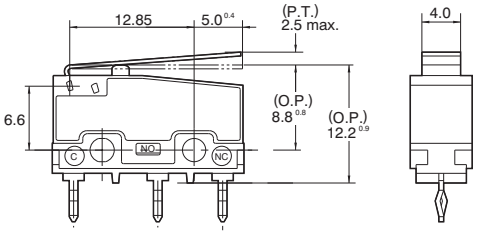


Pretravel, max. mm		0.6
Movement differential, max. mm		0.1
Overtravel, min. mm		0.4
Operating position	Distance from mounting hole, mm	8.4±0.3
	Distance from standoff, mm	11.8±0.4

Short hinge lever

CAD Data

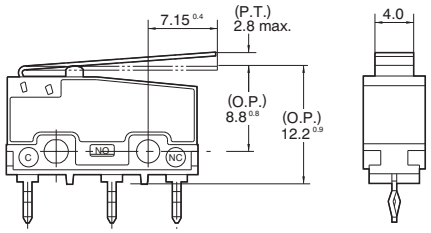




Pretravel, max. mm		2.5
Movement differential, max. mm		0.5
Overtravel, min. mm		0.8
Operating position	Distance from mounting hole, mm	8.8±0.8
	Distance from standoff, mm	12.2±0.9

Hinge lever

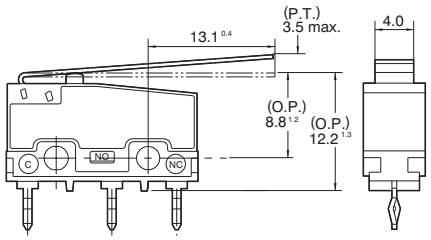
CAD Data



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

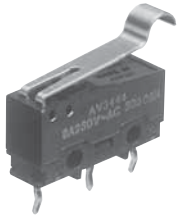
CAD Data

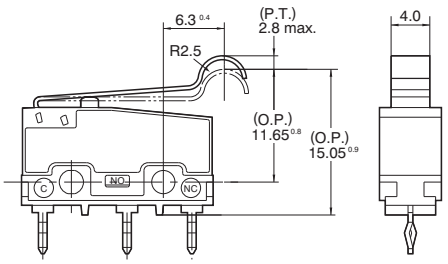


Pretravel, max. mm		3.5
Movement differential, max. mm		1.0
Overtravel, min. mm		1.6
Operating position	Distance from mounting hole, mm	8.8±1.2
	Distance from standoff, mm	12.2±1.3

Simulated roller lever

CAD Data



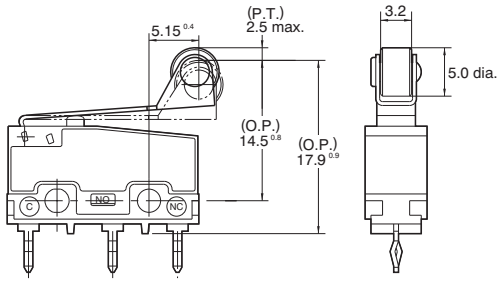


Pretravel, max. mm		2.8
Movement differential, max. mm		0.8
Overtravel, min. mm		1.2
Operating position	Distance from mounting hole, mm	11.65±0.8
	Distance from standoff, mm	15.05±0.9

Roller lever

mm General tolerance: ±0.25

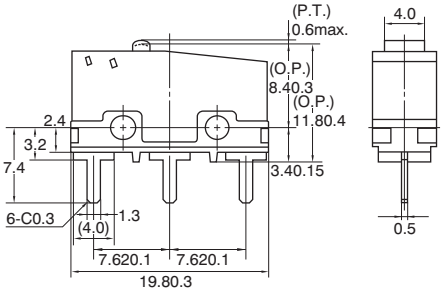
CAD Data



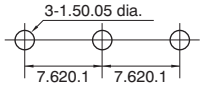
Pretravel, max. mm		2.5
Movement differential, max. mm		0.5
Overtravel, min. mm		0.8
Operating position	Distance from mounting hole, mm	14.5±0.8
	Distance from standoff, mm	17.9±0.9

1-(3) Internationally common pitch PC board terminal

CAD Data

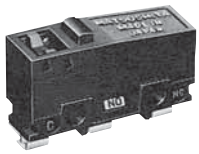


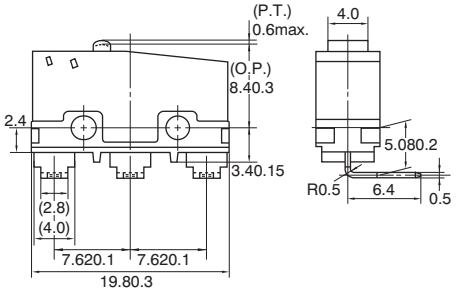
PC board pattern



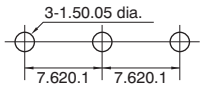
1-(4) Right angle terminal

CAD Data



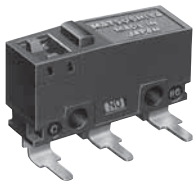


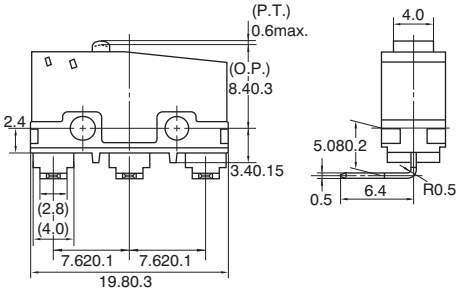
PC board pattern



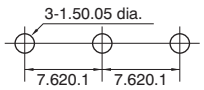
1-(6) Left angle terminal

CAD Data





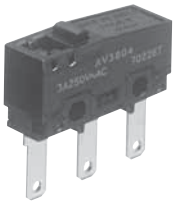
PC board pattern

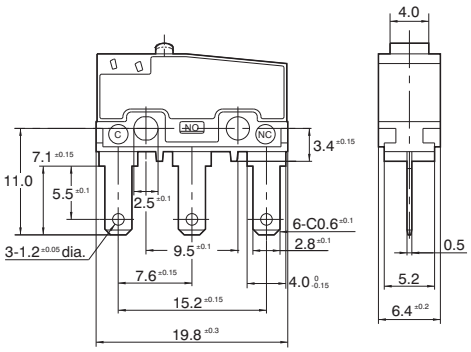


1-(6) .110 Quick-connect terminal

mm General tolerance: ±0.25

CAD Data





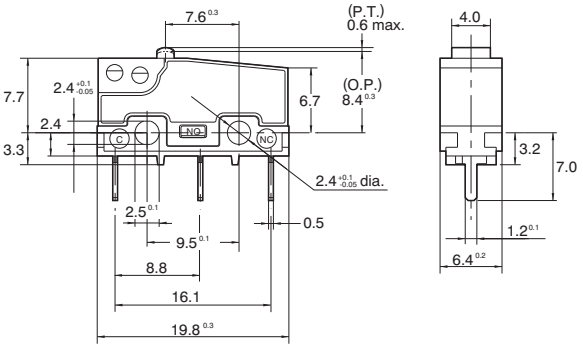
Dimensions other than drawn above is same as self-standing PC board terminal.

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

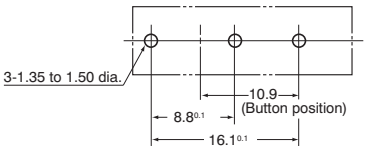
2-(1) PC board terminal

Pin plunger

CAD Data



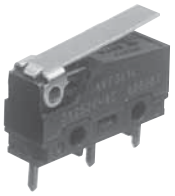
PC board pattern

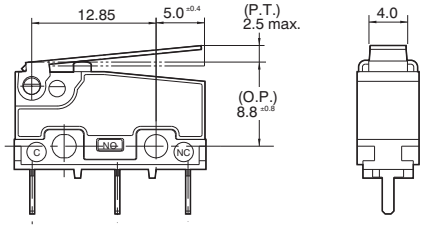


Pretravel, max. mm		0.6
Movement differential, max. mm		0.1
Overtravel, min. mm		0.4
Operating position	Distance from mounting hole, mm	8.4±0.3
	Distance from standoff, mm	11.7±0.4

Short hinge lever

CAD Data



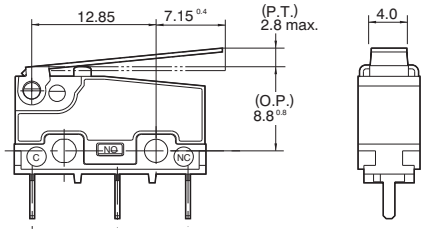


Pretravel, max. mm		2.5
Movement differential, max. mm		0.5
Overtravel, min. mm		0.8
Operating position	Distance from mounting hole, mm	8.8±0.8
	Distance from standoff, mm	12.1±0.9

Hinge lever

mm General tolerance: ±0.25

CAD Data

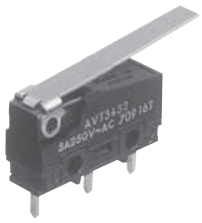


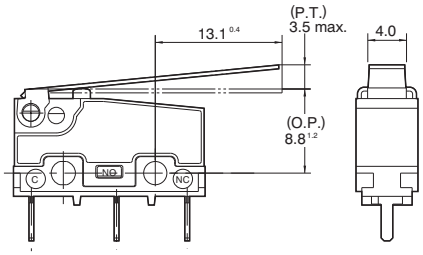
Pretravel, max. mm		2.8
Movement differential, max. mm		0.8
Overtravel, min. mm		1.2
Operating position	Distance from mounting hole, mm	8.8±0.8
	Distance from standoff, mm	12.1±0.9

Long hinge lever

mm General tolerance: ±0.25

CAD Data

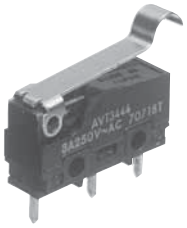


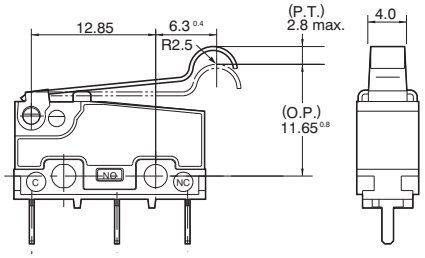


Pretravel, max. mm		3.5
Movement differential, max. mm		1.0
Overtravel, min. mm		1.6
Operating position	Distance from mounting hole, mm	8.8±1.2
	Distance from standoff, mm	12.1±1.3

Simulated roller lever

CAD Data

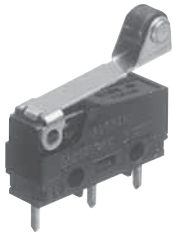


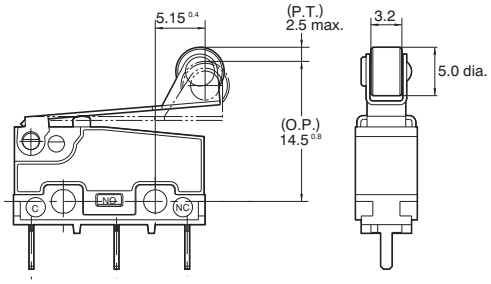


Pretravel, max. mm		2.8
Movement differential, max. mm		0.8
Overtravel, min. mm		1.2
Operating position	Distance from mounting hole, mm	11.65±0.8
	Distance from standoff, mm	14.95±0.9

Roller lever

CAD Data

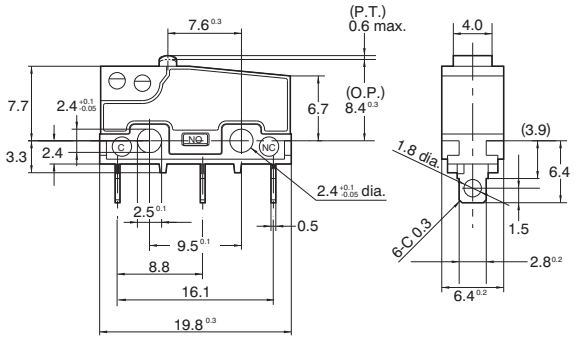




Pretravel, max. mm		2.5
Movement differential, max. mm		0.5
Overtravel, min. mm		0.8
Operating position	Distance from mounting hole, mm	14.5±0.8
	Distance from standoff, mm	17.8±0.9

2-(2) Solder terminal

CAD Data

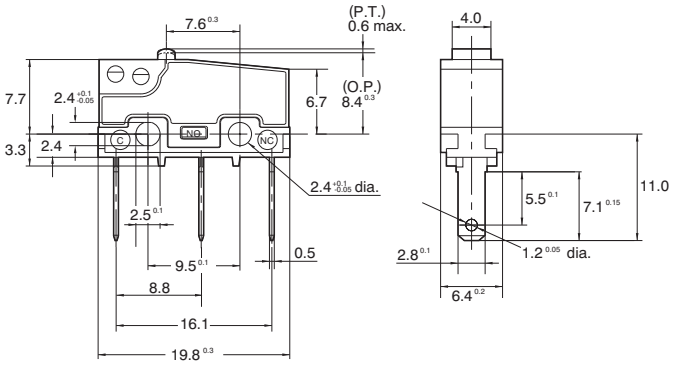


As for the dimensions of lever types, dimensions other than terminals are same as self-standing solder terminal.

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.

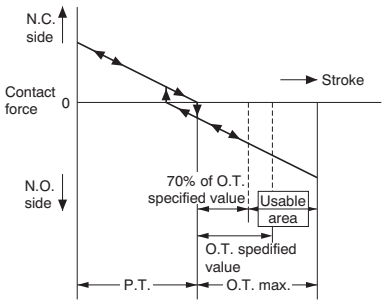
NOTES

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

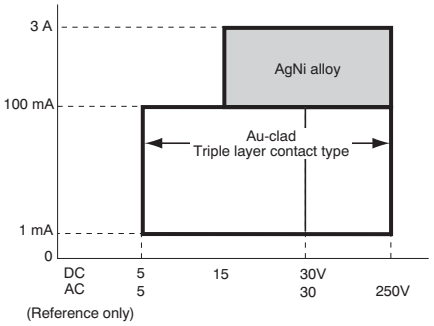
Consideration should be given to provide for no interference up to +20% variation of the standard characteristics values.

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

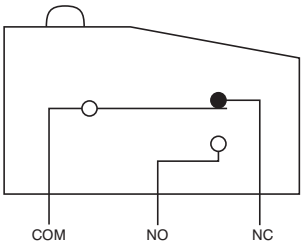
Type of switch	Version	Terminals	Actuators	Operating force by pin plunger, max.	Contact gap	Agency standard
FS switch	3: Standard	2: Solder terminal without guard 4: Self-standing PC board terminal 8: .110 Quick-connect terminal	0: Pin plunger 1: Short hinge lever 2: Hinge lever 3: Long hinge lever 4: Simulated roller lever 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. 5×10^5 (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

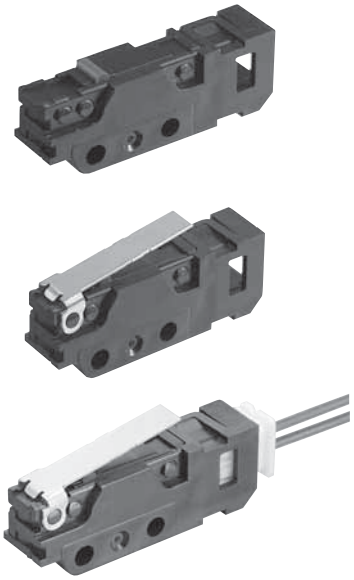
Actuator	Operating force, max.	Release force, min.	Pretravel, max. mm	Movement differential, max. mm	Overtravel, min. mm	Operating position, mm
Pin plunger	1.47 N	0.064 N	0.7	0.2	0.3	8.4±0.3
Short hinge lever	0.59 N	0.015 N	2.5	0.8	0.6	8.8±0.8
Hinge lever	0.54 N	0.013 N	2.8	1.0	0.8	8.8±0.8
Long hinge 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.)

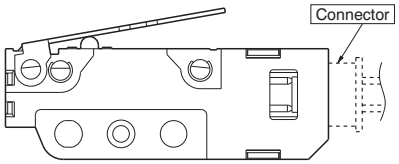
S MODEL SWITCH CONNECTOR TYPE

AV6 (CS) SWITCHES

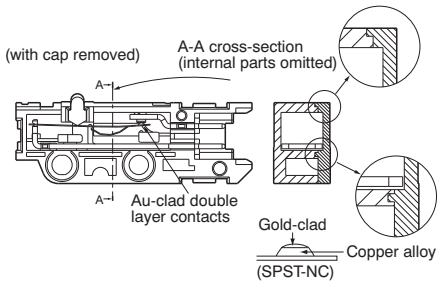


FEATURES

- **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



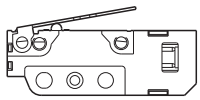
- **Contact reliability is achived by simple dust prevension guard and Au-clad double layer contacts**



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

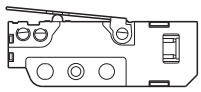
Standard lever position

"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

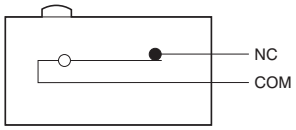
Ex. AV6 | 2 | 2 | 2 | 12 | 64

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

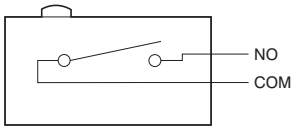
Remarks: 1. Standard packing Inner carton: 100 pcs. Outer carton: 1,000 pcs.
2. When ordering UL, CSA and TÜV approved types, please attach suffix "3" to the part no.

CONTACT ARRANGEMENT

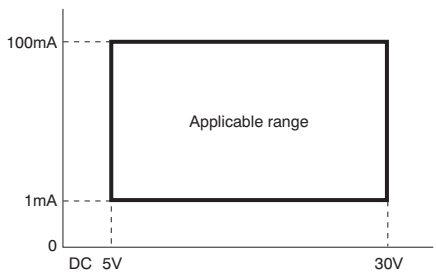
1) SPST-NC



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. 5×10^5 (at 60 cpm) (O.T. max.)
	Electrical (rated load)	Min. 2×10^5 (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) 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) 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				

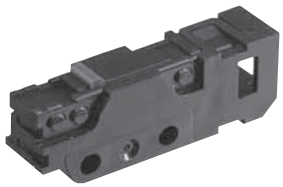
DIMENSIONS

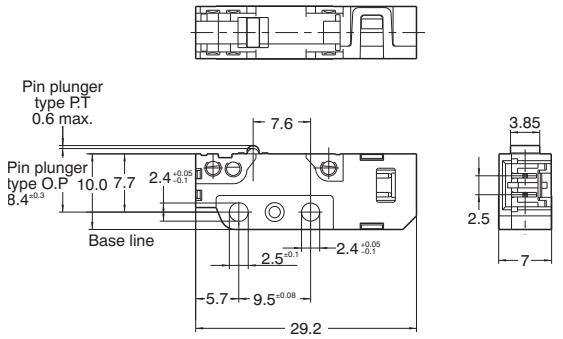
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

mm General tolerance: ±0.25

1. Pin plunger

CAD Data



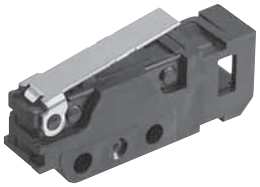


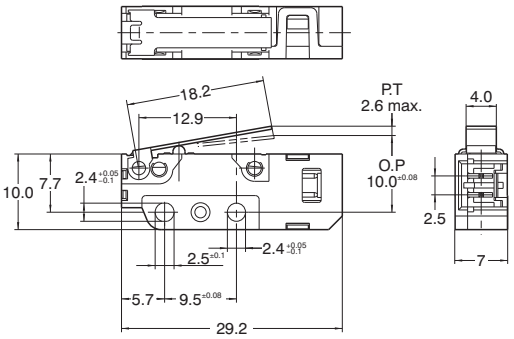
Pretravel, max. mm		0.6
Movement differential, max. mm		0.1
Overtravel, Min. mm		0.4
Operating position	Distance from mounting hole, mm	8.4±0.3

2. Hinge lever

Lever position: Standard

CAD Data

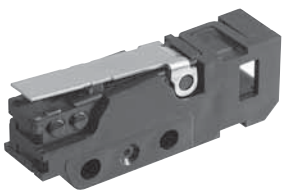


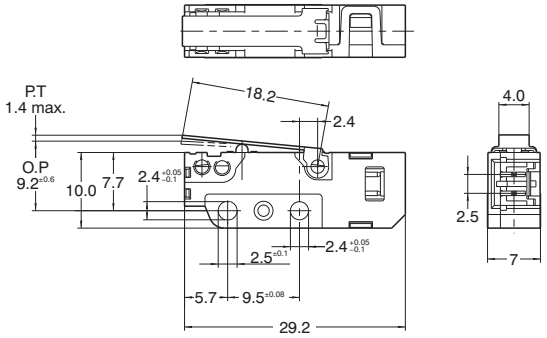


Pretravel, max. mm		2.6
Movement differential, max. mm		0.8
Overtravel, min. mm		1.2
Operating position	Distance from mounting hole, mm	10.0±0.8

Lever position: Backward

CAD Data





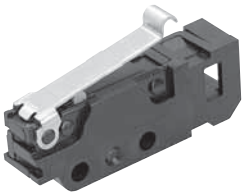
Pretravel, max. mm		1.4
Movement differential, max. mm		0.6
Overtravel, min. mm		0.7
Operating position	Distance from mounting hole, mm	9.2±0.6

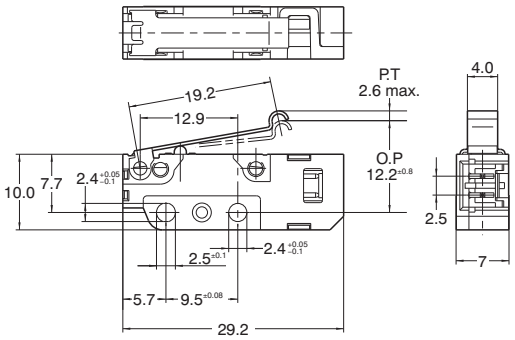
3. Simulated roller lever

mm General tolerance: ±0.25

Lever position: Standard

CAD Data

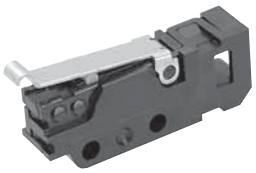


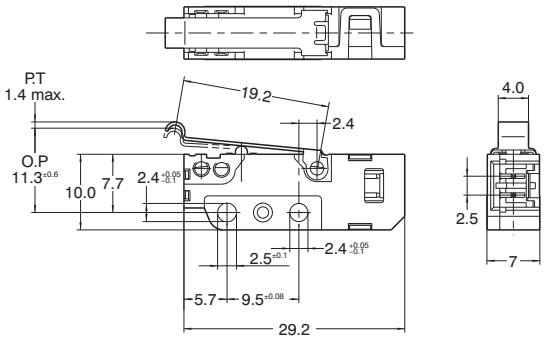


Pretravel, max. mm		2.6
Movement differential, max. mm		0.8
Overtravel, min. mm		1.2
Operating position	Distance from mounting hole, mm	12.2±0.8

Lever position: Backward

CAD Data



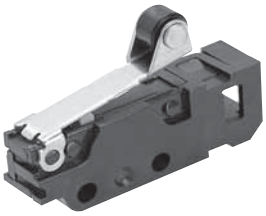


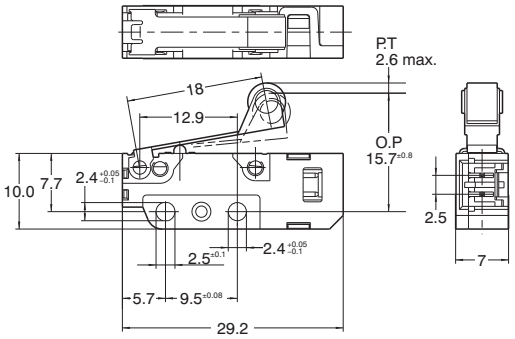
Pretravel, max. mm		1.4
Movement differential, max. mm		0.6
Overtravel, min. mm		0.7
Operating position	Distance from mounting hole, mm	11.3±0.6

4. Roller lever

Lever position: Standard

CAD Data

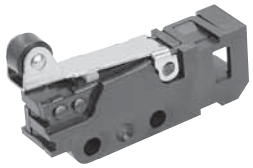


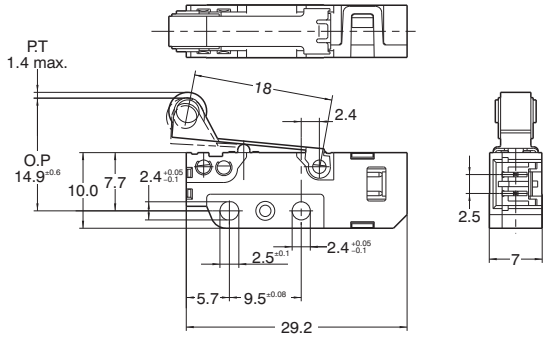


Pretravel, max. mm		2.6
Movement differential, max. mm		0.8
Overtravel, min. mm		1.2
Operating position	Distance from mounting hole, mm	15.7±0.8

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.

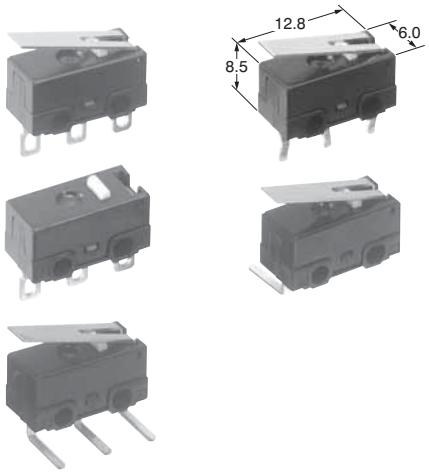
6. Quality check under actual loading conditions

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 5: Straight PC board terminal with stand off 6: 2.0 mm Solder terminal with stand off 7: 2.0 mm PC board right angle terminal 8: 2.0 mm PC board left angle terminal	6: 1.47 N with stand off 8: 0.74 N with stand off	0: Pin plunger 2: Hinge lever 4: Simulated roller lever	Nil: AgNi alloy 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.)	3×10^4	10^5
Expected life (min. operations) Mechanical (at 60 cpm) (O.T.: Specified value)	O.F. 0.74 N: 10^6 O.F. 1.47 N: 5×10^5	
Dielectric strength (initial) Between terminals Between terminals and other exposed parts Between terminals and ground	 600 Vrms for 1 min. 1,500 Vrms for 1 min. 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)

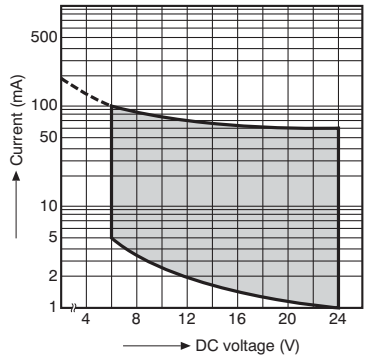
3) Simulated roller lever

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)

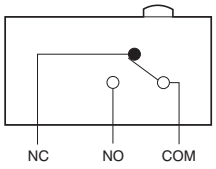
DATA

Low-level circuit type

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



CONTACT ARRANGEMENT



DIMENSIONS

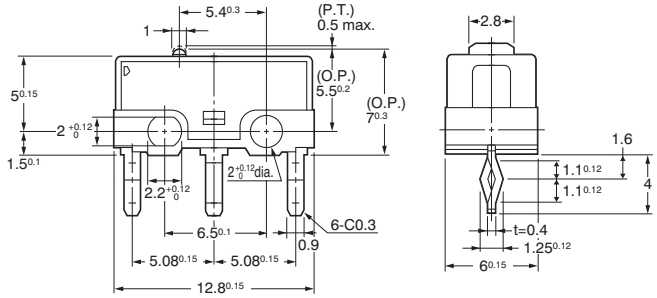
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

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

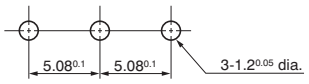
mm

Pin plunger

CAD Data



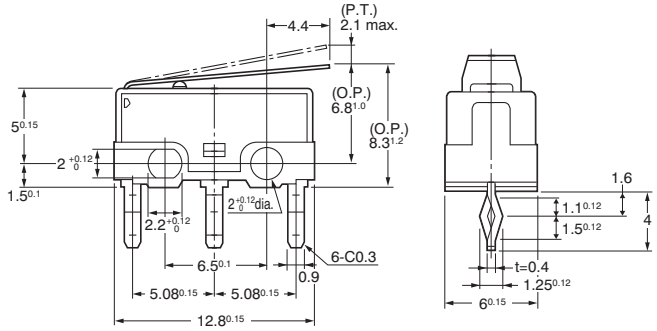
PC board pattern



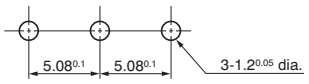
Pretravel, max. mm		0.5
Movement differential, max. mm		0.12
Overtravel, min. mm		0.25
Operating position	Distance from mounting hole, mm	5.5±0.2
	Distance from standoff, mm	7±0.3

Hinge lever

CAD Data



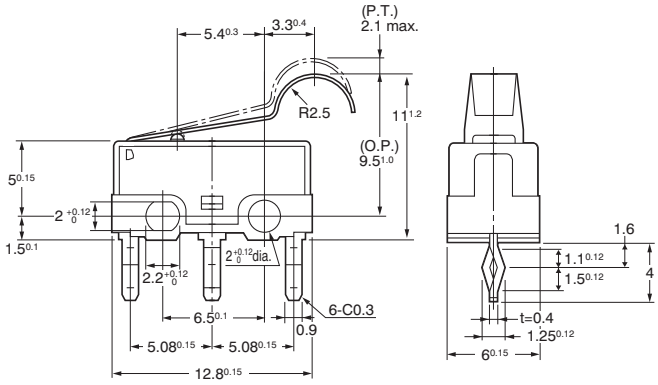
PC board pattern



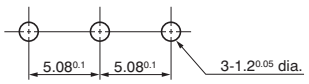
Pretravel, max. mm		2.1
Movement differential, max. mm		0.5
Overtravel, min. mm		0.55
Operating position	Distance from mounting hole, mm	6.8±1.0
	Distance from standoff, mm	8.3±1.2

Simulated roller lever

CAD Data



PC board pattern

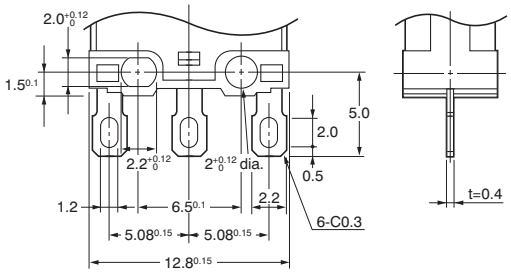


Pretravel, max. mm		2.1
Movement differential, max. mm		0.5
Overtravel, min. mm		0.5
Operating position	Distance from mounting hole, mm	9.5±1.0
	Distance from standoff, mm	11.0±1.2

2. Solder terminal mm

Pin plunger

CAD Data

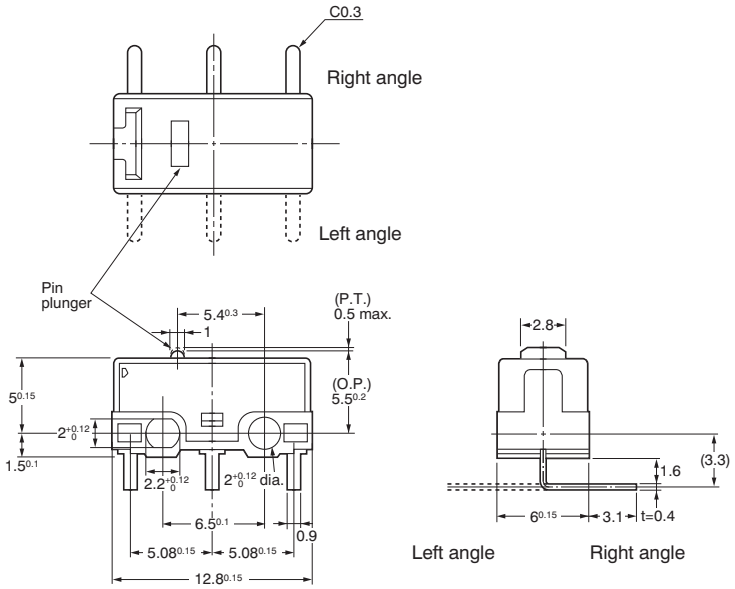


Remark: As for other actuator types, dimensions are the same as those of corresponding self-standing PC board terminal (standard type).

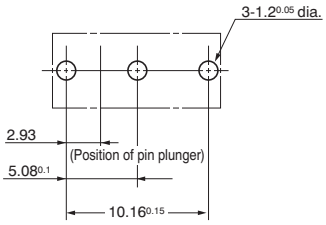
3. PC board right/left angle terminal

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
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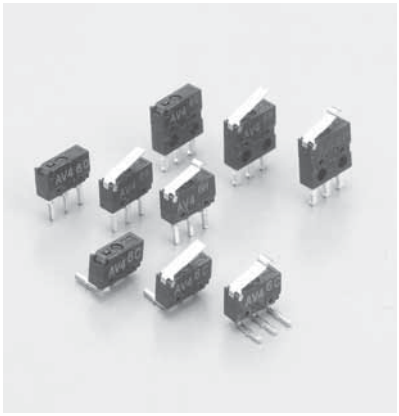
ONE OF THE SMALLEST SNAP-ACTION SWITCHES IN THE WORLD

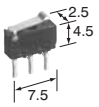
AV4 SWITCHES



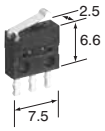
FEATURES

• Superminiature type, light-weight snap action switch

PC board terminal type (0.2g)



Solder terminal type with mounting holes (0.3g)

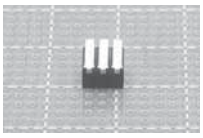


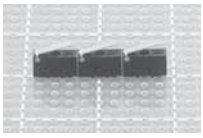
mm

• 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

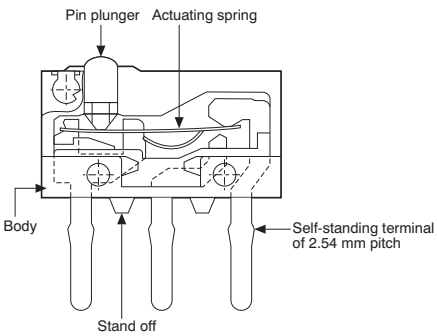
ORDERING INFORMATION

Ex. AV 4 4 0 4 61

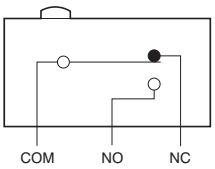
Product Name	Terminals	Actuators	Operating force, max. (by pin plunger)	Contacts
FU	0: Solder terminal with mounting holes (1.65 mm dia.) 4: PC board straight terminal 5: PC board angle terminal 6: PC board reverse angle terminal	0: Pin plunger 2: Hinge lever 4: Simulated roller lever	4: 0.98 N	Nil: Ag plated contact 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. 3×10^5 operations (at 60 cpm)
	Electrical	Ag plated contact	Min. 2×10^4 operations (0.5A 30V DC; at 20 cpm)
		Au plated contact	Min. 2×10^5 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 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

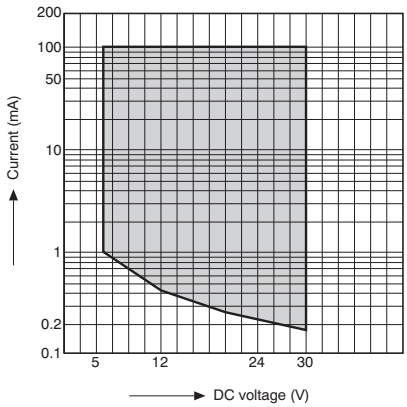
2) Solder terminal

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.

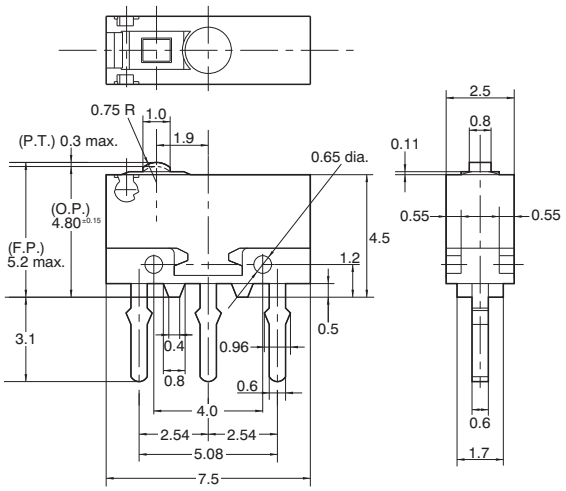
1. PC board terminal

Straight terminal

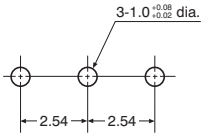
Pin plunger type

CAD Data

mm General tolerance: ±0.15



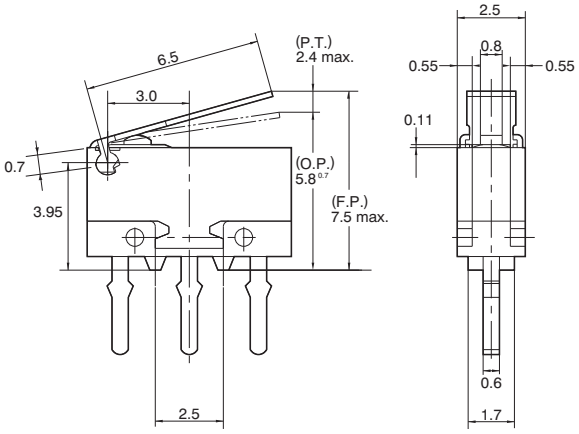
PC board pattern



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



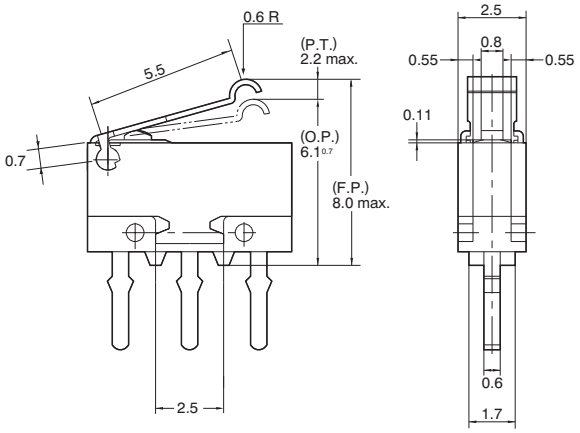
Pretravel, max. mm	2.4
Movement differential, max. mm	0.7
Overtravel, min. mm	0.4
Operating position, mm	5.8±0.7
Free position, mm	7.5

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

Simulated roller lever type

mm General tolerance: ±0.15

CAD Data

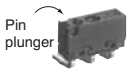


Pretravel, max. mm	2.2
Movement differential, max. mm	0.7
Overtravel, min. mm	0.3
Operating position, mm	6.1±0.7
Free position, mm	8.0

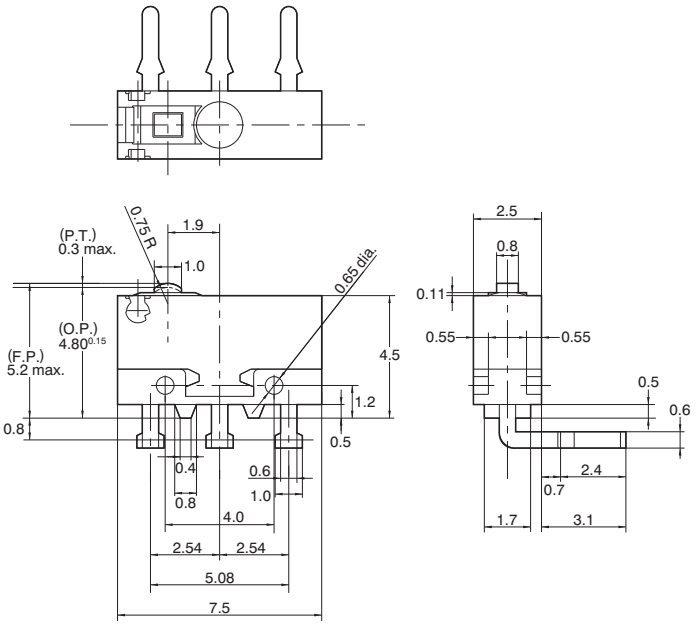
Remark: All other dimensions are the same as those of pin plunger type.

2. Angle terminal
Right angle terminal
Pin plunger type

CAD Data



Right angle terminal

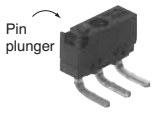


Pretravel, max. mm	0.3
Movement differential, max. mm	0.1
Overtravel, min. mm	0.1
Operating position, mm	4.8±0.15
Free position, mm	5.2

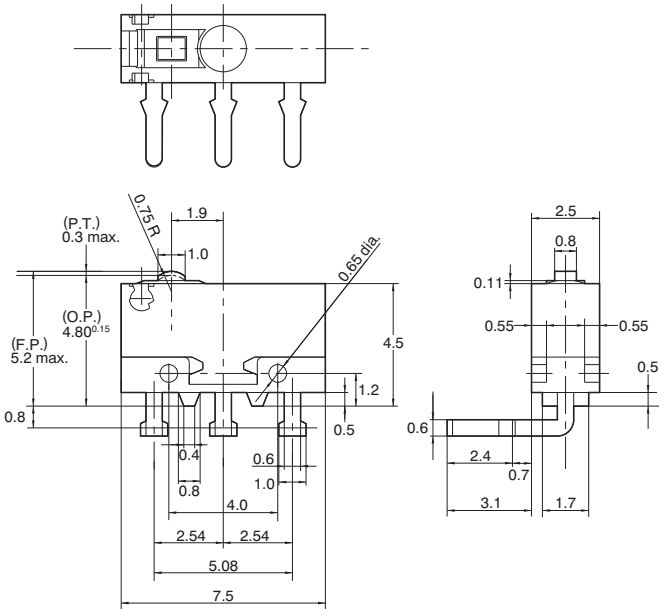
Remark: All other dimensions of hinge lever type and simulated roller lever type are the same as those of straight terminal types.

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

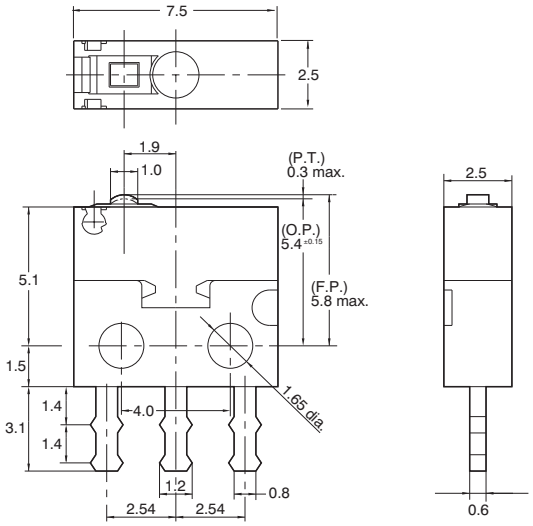
Remark: All other dimensions of hinge lever type and simulated roller lever type are the same as those of straight terminal types.

3. Solder terminal with mounting holes

mm General tolerance: ±0.15

Pin plunger type

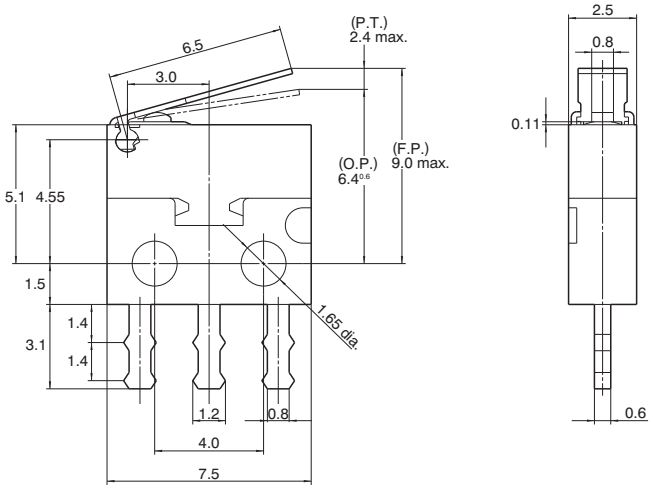
CAD Data



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

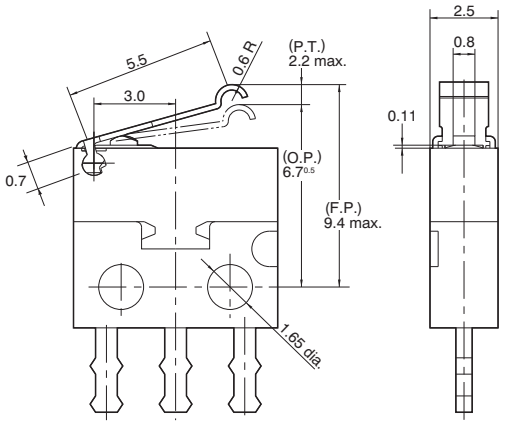


Pretravel, max. mm	2.4
Movement differential, max. mm	0.7
Overtravel, min. mm	0.4
Operating position, mm	6.4±0.6
Free position, mm	9.0

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
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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 2: 2 Form A Power switching contact 3: 3 Form A Power switching contact 6: 1 Form A Power switching contact and 2 Form A Signal switching contact 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) 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 10.1A 250V AC 6A 30V DC 3A 48V DC (3 Form A type only)	3A 125V AC 3A 250V AC
Signal switching contact (3 Form A only)	0.1A 48V DC 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”.

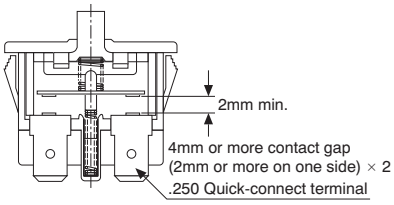
3. Operating characteristics

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

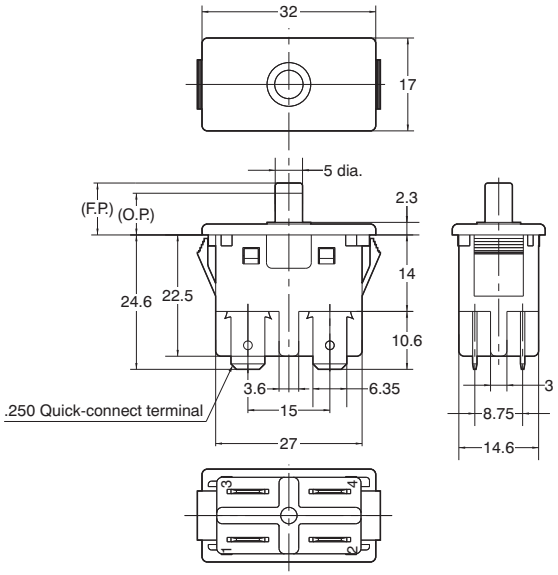
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

1 Form A

CAD Data

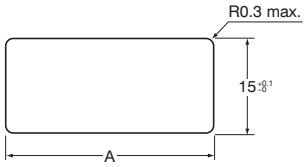
2 Form A

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.)

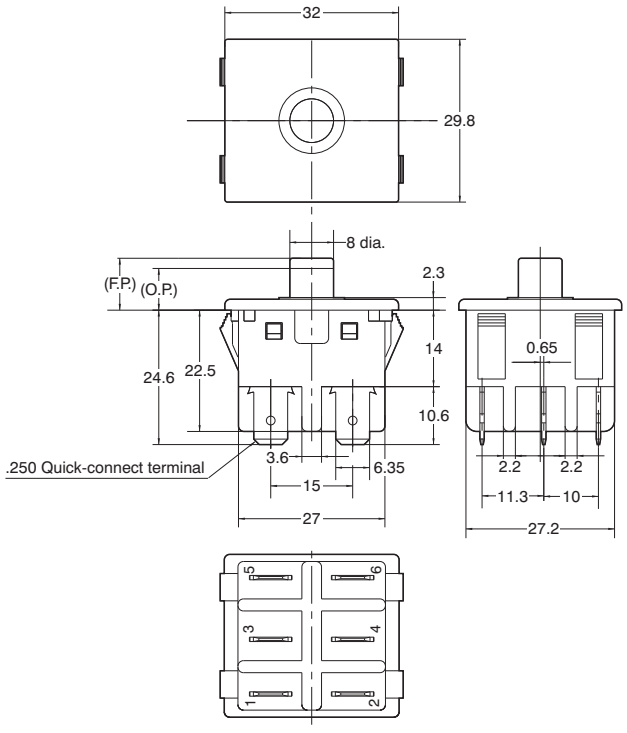
Remark: 1 Form A type does not have terminal no.1 nor no.2

3 Form A

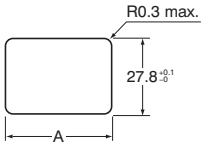
CAD Data

Signal switching contact

Power switching contact



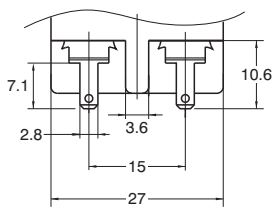
Hole cutting dimension



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

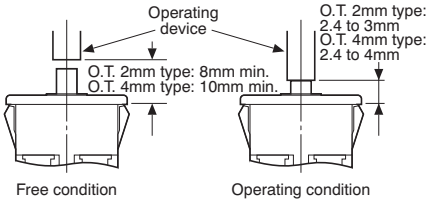


Remark: Power switching contact type has .250 Quick-connect terminal and signal switching contact type has .110 Quick-connect terminal.

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.

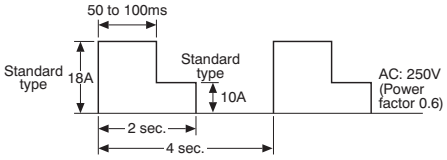
6. Quality check under actual loading conditions
To improve reliability, check the switch under actual loading conditions. Avoid any situation that may adversely affect switching performance.

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.

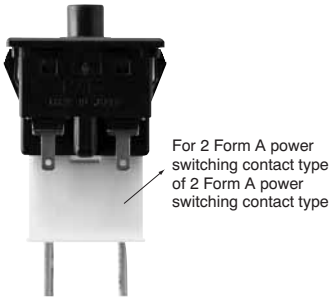


INTRODUCTION OF CONNECTORS (made by Nippon Tanshi Co., Ltd)

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) 2: 2 Form A (contact gap: 8 mm) 3: 2 Form A (contact gap: 6 mm) 4: 1 Form A 1 Form B 5: 1 Form B 6: 1 Form A	6: Screw mounting (10.1 A) 7: Snap-in mounting type (10.1 A) 8: Snap-in mounting type with button guard (10.1 A)	3: UL/C-UL, ENEC/VDE (10.1 A 250 V AC 1×10^5)	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) 5×10^4 (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

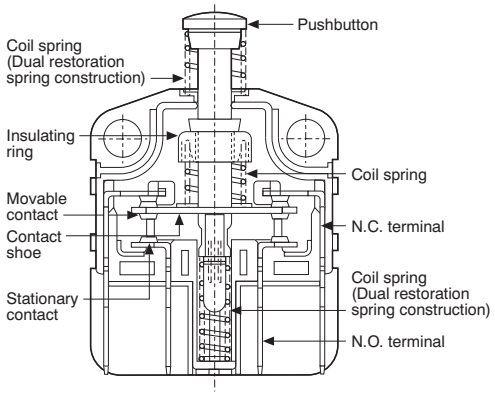
Contact arrangement	Operating force (O.F.) max.	Total operating force (T.F) max. Push-button position: 10mm	Free position (F.P.) max. mm	Operating position (O.P.) mm	Total travel position (T.T.P.) mm	Over travel (O.T.) min. mm
1 Form A	(N.O. contact to ON) 4.90N	6.37N	16.6	(N.O. contact to ON) 12.7±0.4	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

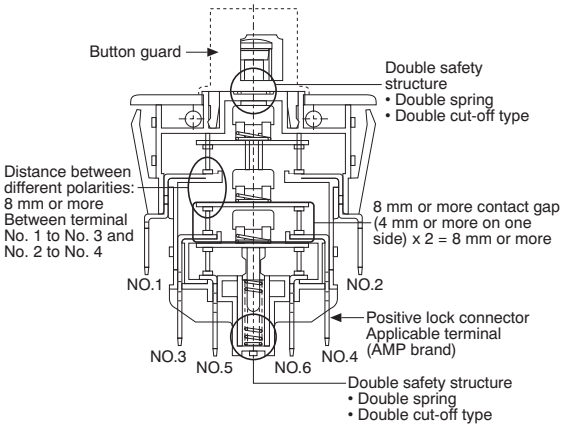
Contact arrangement	Operating force (O.F.) max.	Total operating force (T.F) max. Push-button position: 10mm	Free position (F.P.) max. mm	Operating position (O.P.) mm	Total travel position (T.T.P.) mm	Over travel (O.T.) min. mm
2 Form A	(N.O. contact to ON) 7.85N	9.81N	14	(N.O. contact to ON) 9.3±0.4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



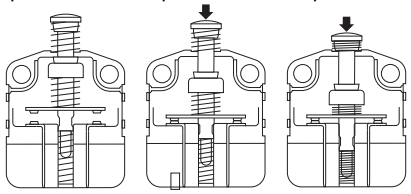
Snap-in mounting type (3 Form A)



CONTACT OPERATION CHART

• 1 Form A

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



DIMENSIONS

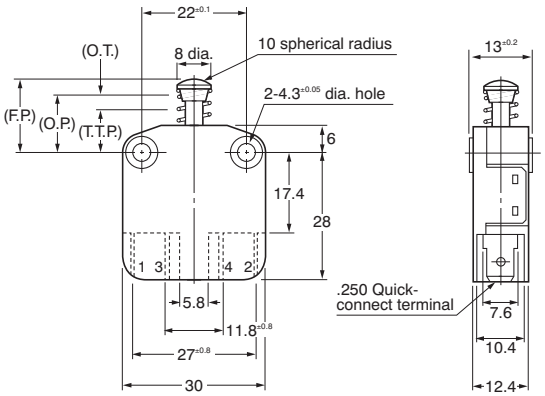
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

1. Screw mounting type

mm General tolerance: ±0.4

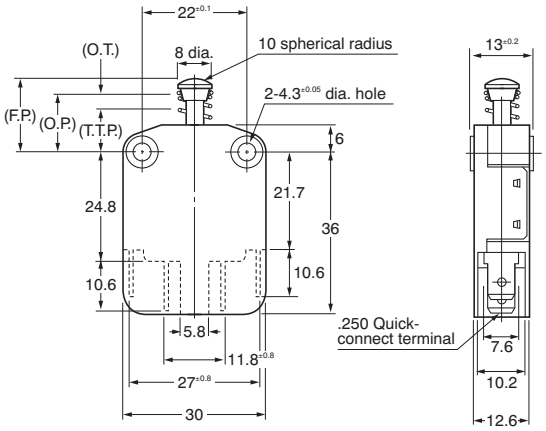
1 Form A, 1 Form B, 1 Form A 1 Form B

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**



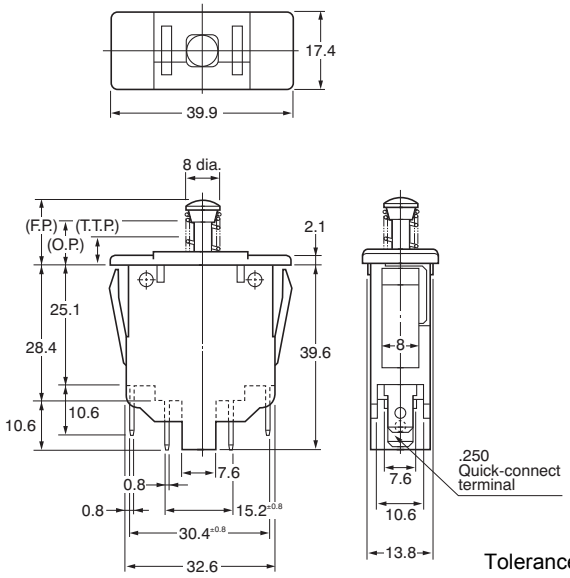
Contact gap
2 Form A: Min. 6mm

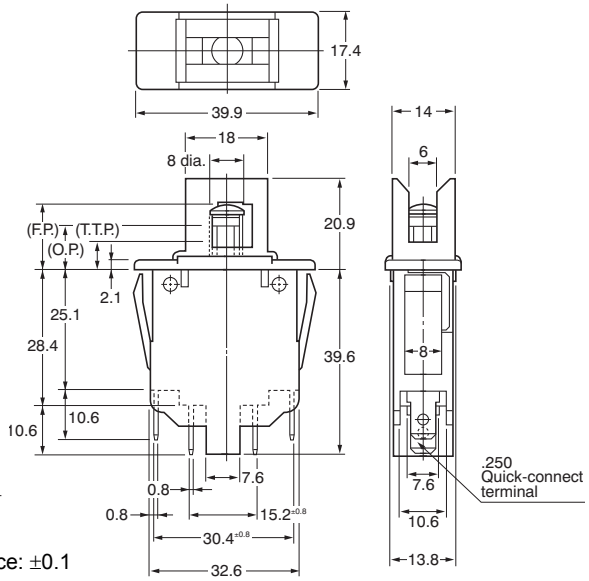
2. Snap-in mounting type

2 Form A type without button guard

2 Form A type with button guard

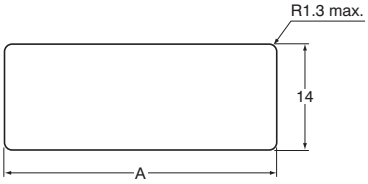
2 Form A **CAD Data**





Tolerance: ±0.1

Recommended panel opening dimensions (common)

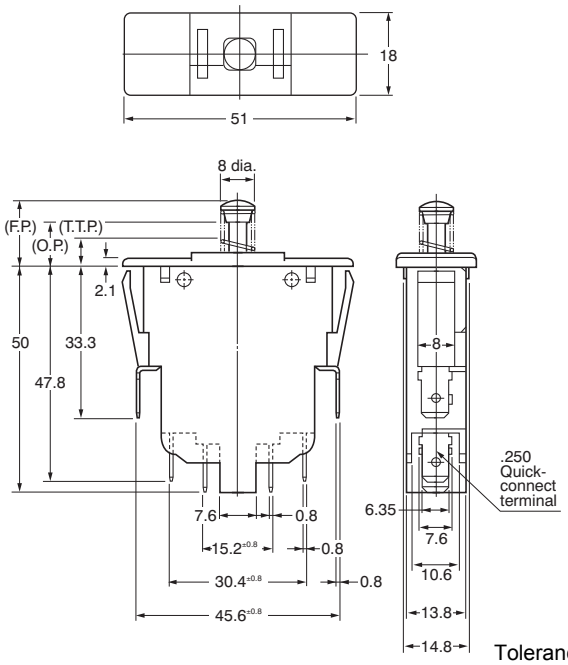


Panel thickness	1.0	2.5
Dimension A	36.7	37.7

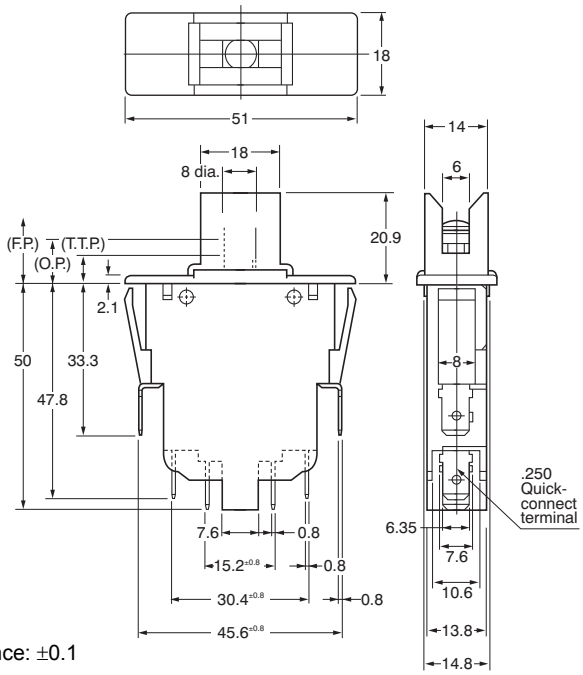
Contact gap
2 Form A: Min. 8mm

3 Form A **CAD Data**

3 Form A type without button guard

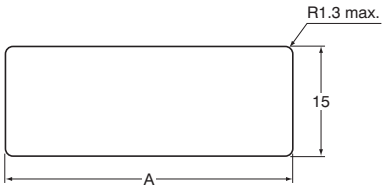


3 Form A type with button guard



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

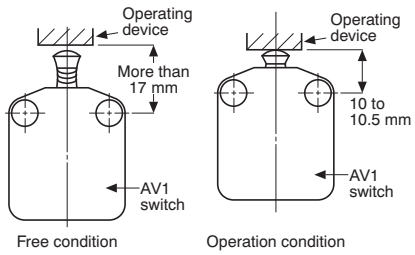
1. Switch mounting

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.

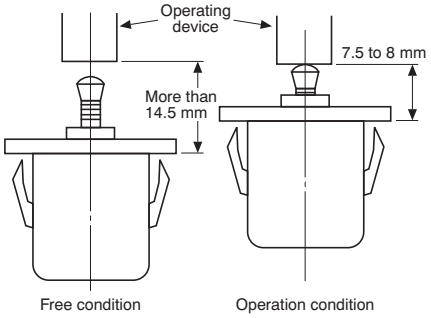
2. Adjustment of the operating device:

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
ideas for life

SMALL, HIGHLY RELIABLE TIP SENSOR CONTAINING A PHOTO SENSOR

AHF2 (TIP) SWITCHES

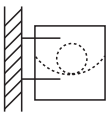
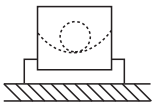
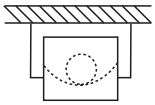
FEATURES

• 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			

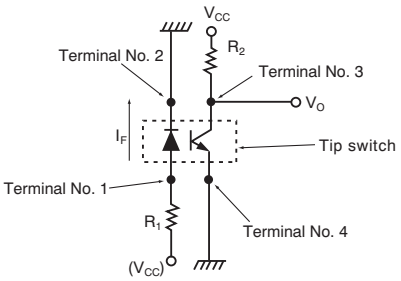
Remark: Standard Packaging: Tube 50 pcs.

CONTACT TYPE

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

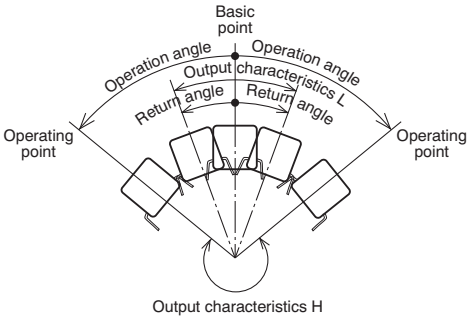
APPLICABLE CIRCUIT

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) 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, 5×10^5 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 (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)

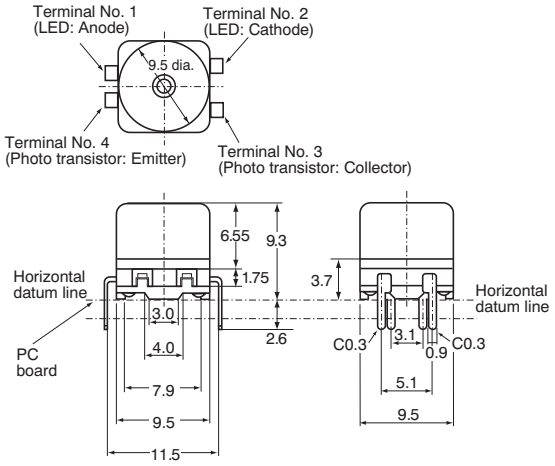
DIMENSIONS

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

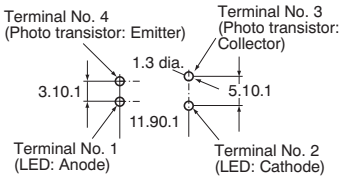
• Horizontal mounting type (AHF22)

mm

CAD Data

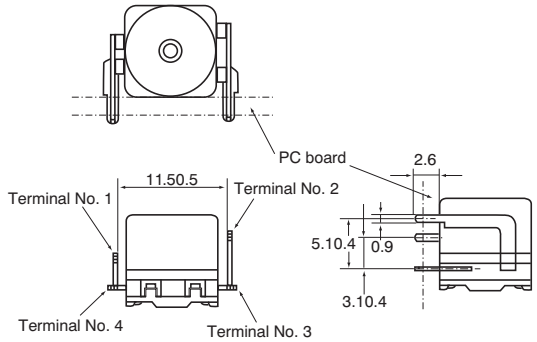


PC board pattern (bottom view)

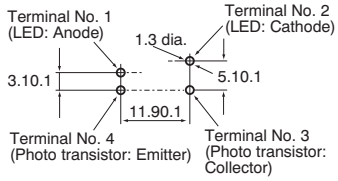


• Vertical mounting type (AHF23)

CAD Data

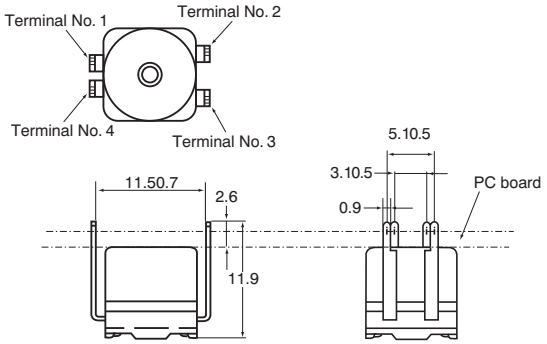


PC board pattern (bottom view)

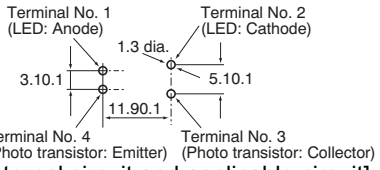


• Reverse mounting type (AHF23) mm

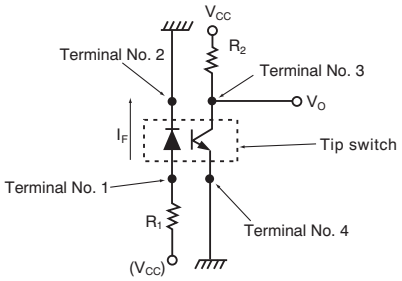
CAD Data



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.

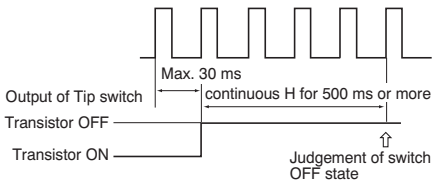
3) Be careful not to move the terminals for one minute after soldering them.

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.

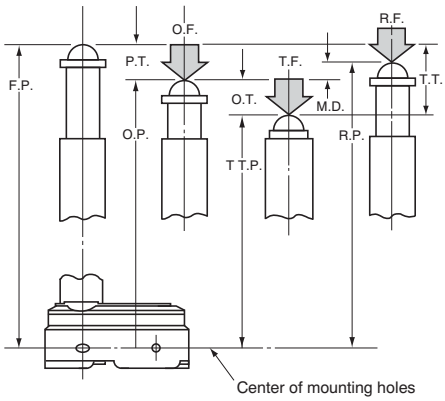
14. Movement Differential (M.D.)
The distance from operating to release position of the plunger or the actuator.

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.

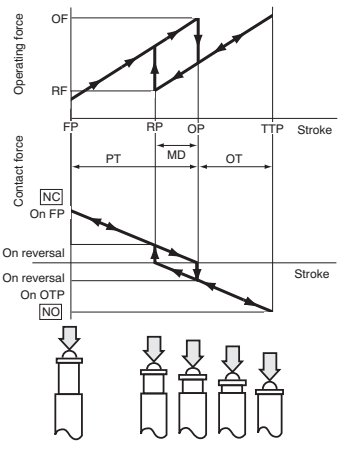
18. Release Position (R.P.)
The position of the plunger or the actuator when the traveling contact snaps back from operating position to its original position.
The following terminologies are applied to all our switches.



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.



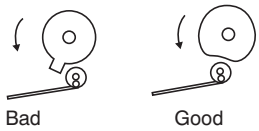
TECHNICAL TERMINOLOGY & CAUTIONS FOR USE

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.

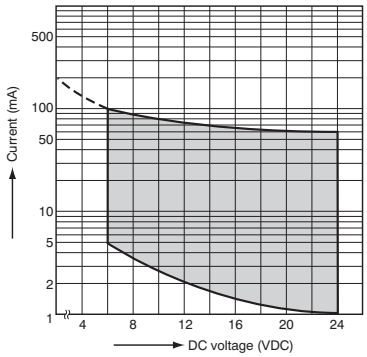
<Example>



■ 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)

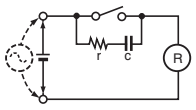
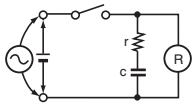
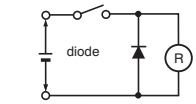
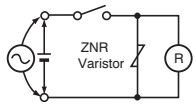


3. Application to Electronic Circuits
1) The snap-action switch contacts can sustain bounce or chatter when closed. Bounce or chatter can cause noise or pulse count errors when the snap action switch is used in electronic circuits.
2) If contact bounce or chatter poses problems in the vicinity of the 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.

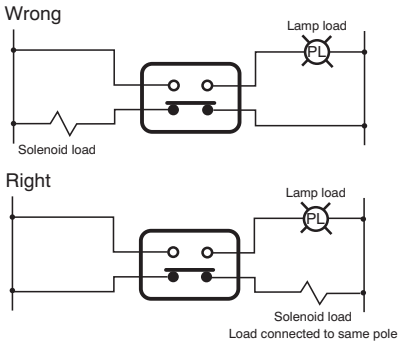
6. Ratings are measured under the following conditions:
Inductive load:
Power factor = 0.6 to 0.7
Time constant = 7 ms or less (DC)
7. To prevent contact fusion failure, be sure to use a serial resistance for each capacitive load.
8. If snap action switch operation is synchronized with the AC supply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

■ Cautions in a circuit

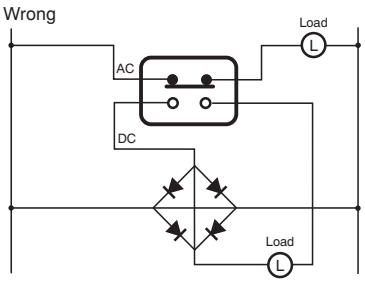
1. Contact protection is recommended when snap-action switches are used in an inductive load circuit. (except for NZ Basic Switches magnetic blow-out types for DC)

Circuit diagram	Notes
	1. r = more than 10 ohms 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.

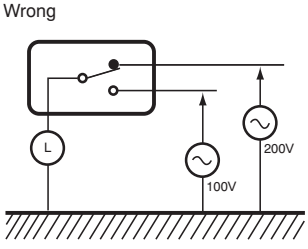
2. Do not connect the contacts on individual switches to different type or different poles of the power supply.
Examples of power supply connections (connection to different poles)



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.)



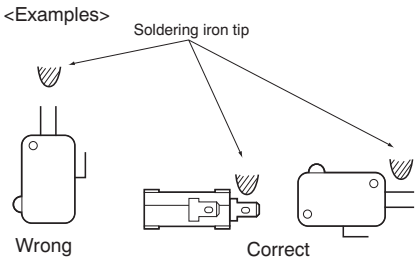
■ Mounting state and environment

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.

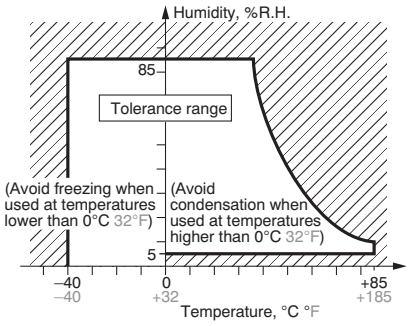


5. Avoid using in a silicon atmosphere
Avoid using organic silicon rubber, adhesives, sealing compounds, oil, grease, and wires in a silicon atmosphere.

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.

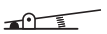
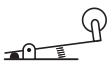
9. We reserve the right to modify without notice the materials, internal components, and other parts to improve product quality.

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

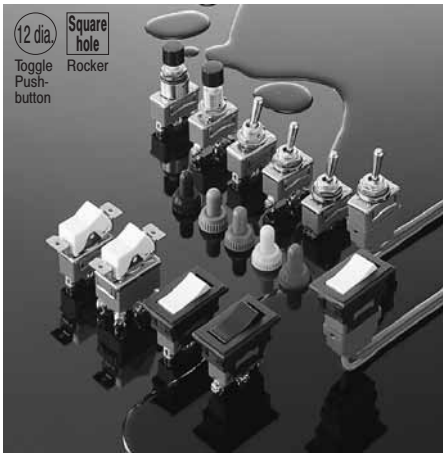
Shape	Class.	Pretravel (P.T.)	Overtravel (O. T.)	Operating Force (O. F.)	Vibration Shock	Features	
	Pin plunger	Small	Small	Large	Out-standing	Appropriate for linear short-stroke action. Pin plunger acts directly on snap action mechanism, enabling high-precision positioning. Amount of movement after 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. 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. 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. 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.

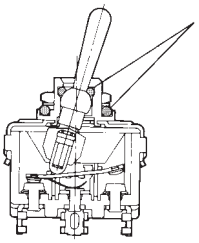
Based on the well-established T-15 Series switch, the mechanism is kept as is and a rocker type and push-button type have been added to the series. (Note that the push-button type is rated at 10 A.)

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.

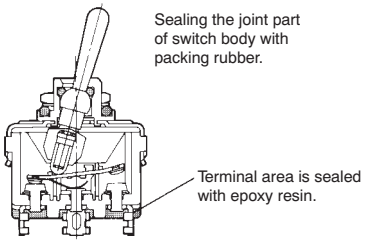
• Panel-sealed type

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



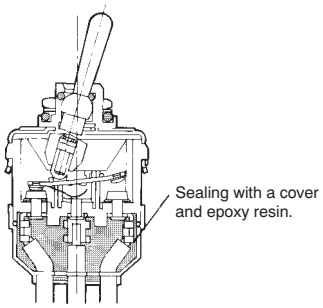
• Terminal-sealed type

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 < >: 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 < >: 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 < >: Momentary position	Solder terminal 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 < >: Momentary position	Screw terminal 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 < >: Momentary position	Solder terminal 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 < >: Momentary position	Screw terminal 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.

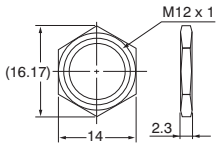
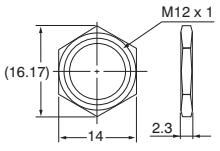
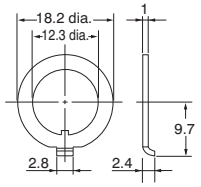
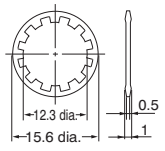
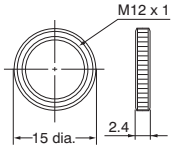
4. Wire lead type

Number of poles	Kind of operation < >: Momentary position	Wire lead type 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 (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: 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.

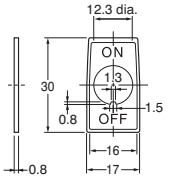
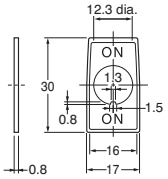
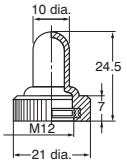
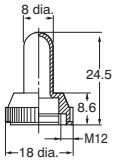
1) Silicon rubber caps

- 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 < >: 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 < >: 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 < >: 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 < >: 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 < >: 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 < >: 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 < >: 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

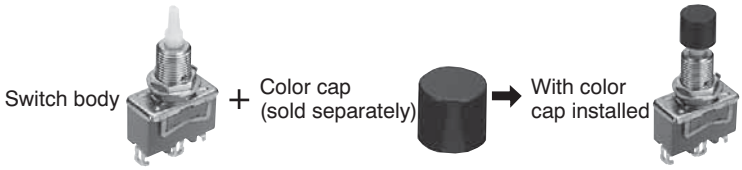
1) Solder terminal

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

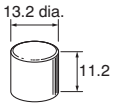
Number of poles	Kind of operation	Solder terminal
		Product no.
1-pole	Momentary	TBP110F-F
	Alternate	TBP115D-F
2-pole	Momentary	TBP210R-F
	Alternate	TBP215N-F

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

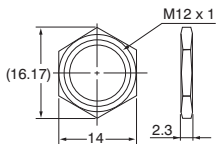
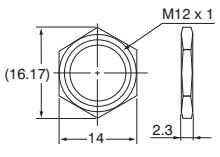
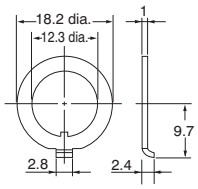
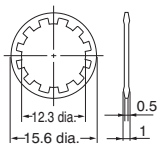
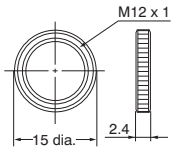
Remarks: 1. Please use switch body with a color cap (sold separately).
2. Standard installation accessories are included with the product.
3. For UL/C-UL certified products, please add “UL” before “F” at the end of part number when ordering.

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), 0.5A 125V (time constant: 8 ms) 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), 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)

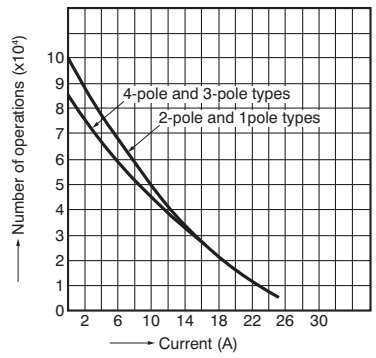
Kind of load	AC	DC
Resistive load	15A 250V	0.5A 250V, 0.9A 125V, 15A 30V

2. Characteristics

Shape of actuator	Toggle type		Rocker type	Push-button type
Protection grade *1: IP40 *2: IP64 *3: IP67	Standard type (*1)	Panel-sealed type (*3) Terminal-sealed type (*3) Wire leads type (*3)	Standard type (*1) Panel-sealed type (*2) Terminal-sealed type (*2) Wire leads type (*2)	Standard type (*1) Panel-sealed type (*3)
Mechanical expected life	1-pole and 2-pole: Min. 10^5 3-pole and 4-pole: Min. 8.5×10^4	Min. 5×10^4 (20 cpm) ON-OFF, ON-ON, ON-OFF-ON, Min. 3×10^4 (20 cpm) ON-(ON), (ON)-OFF-(ON), ON-OFF-(ON)	Min. 3×10^4 (20 cpm)	
Electrical expected life (10 cpm)	Standard and panel-sealed types: Min. 3×10^4 Terminal-sealed and wire leads types: Min. 1.5×10^4		Standard type: Min. 3×10^4 Panel-sealed, terminal-sealed and wire leads types: 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) 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

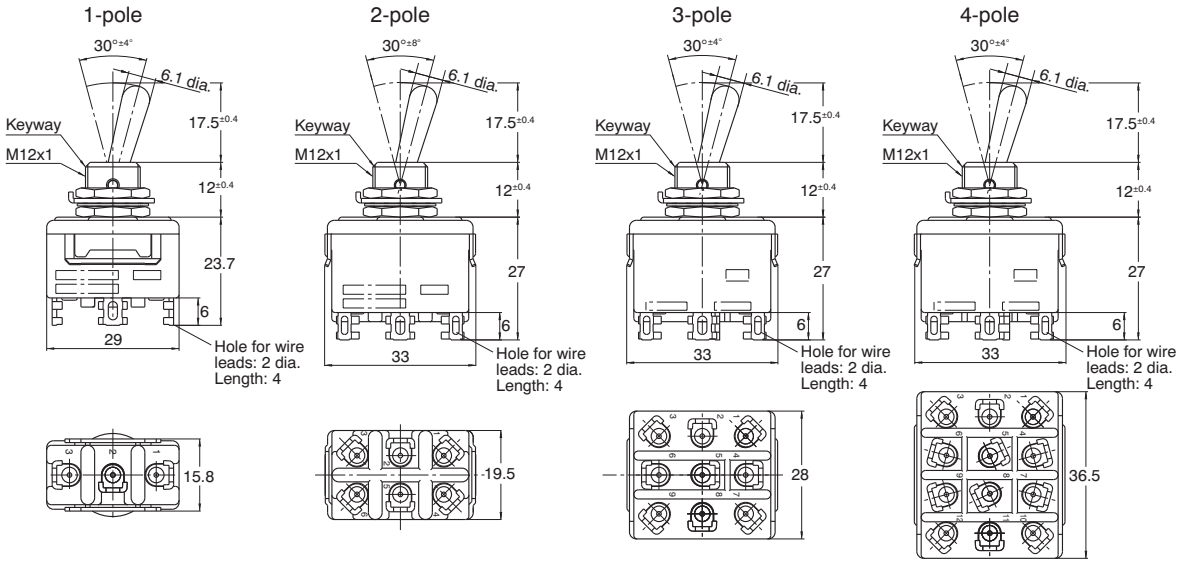
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

mm General tolerance: ±0.5

1. Standard type

1) Solder terminal

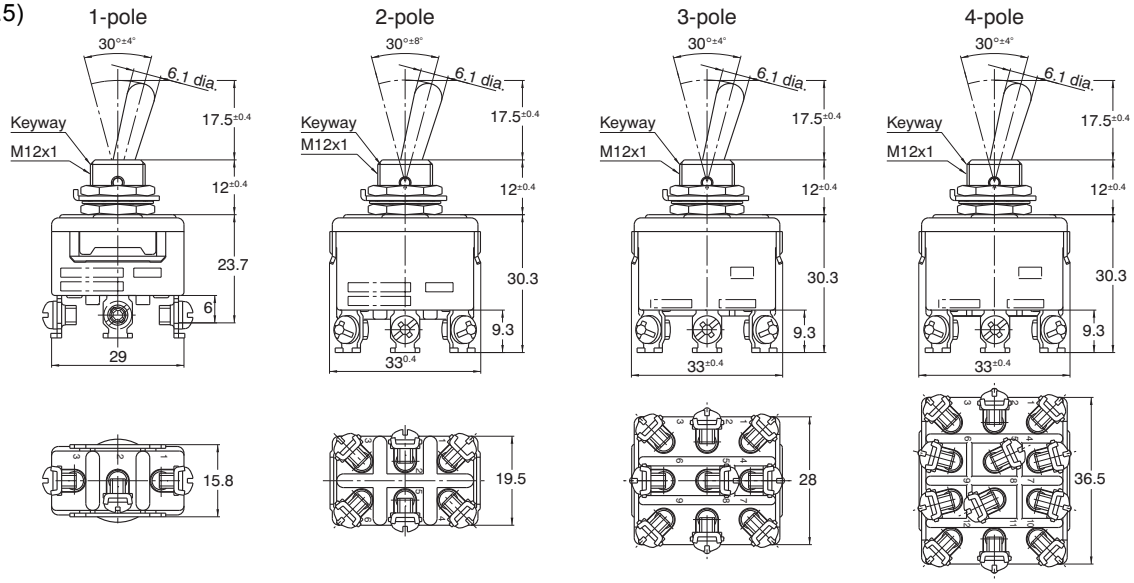
CAD Data



Remark: ON-OFF type does not have terminal no. 2, 5, 8 and 11.

2) Screw terminal (M3.5)

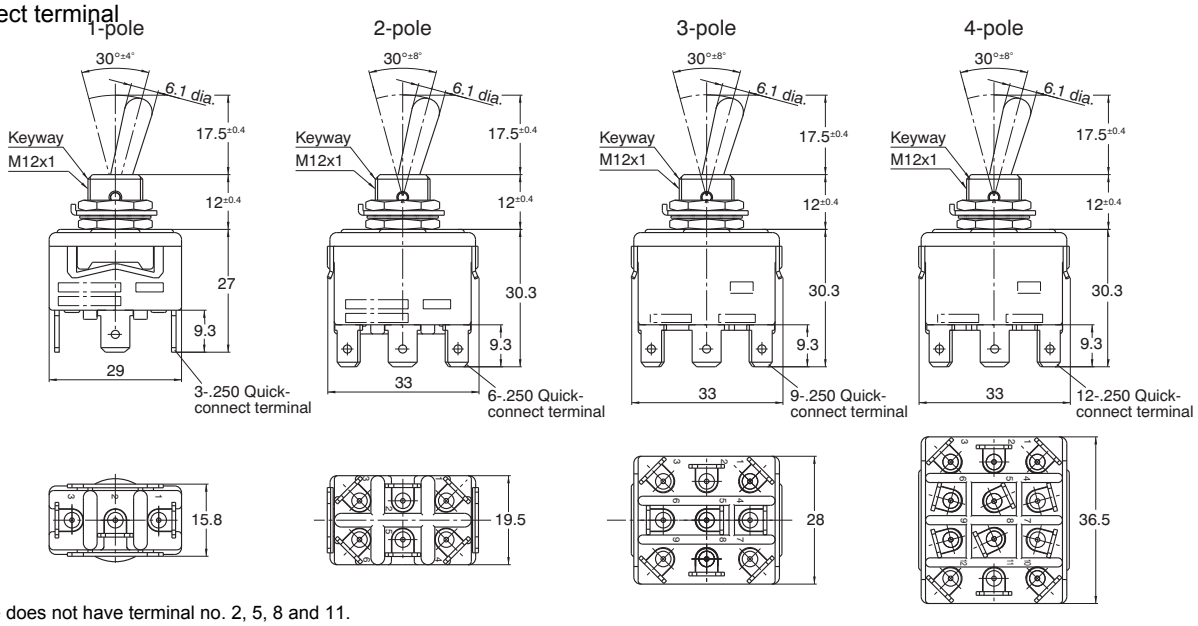
CAD Data



Remark: ON-OFF type does not have terminal no. 2, 5, 8 and 11.

3) .250 Quick-connect terminal

CAD Data

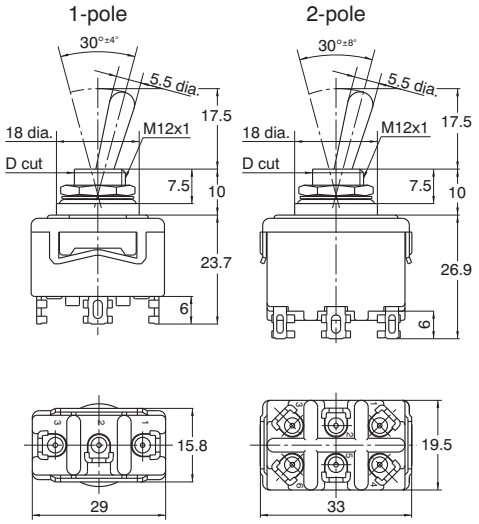


Remark: 1. ON-OFF type does not have terminal no. 2, 5, 8 and 11.
2. There is no through-hole on .250 Quick-connect terminals.

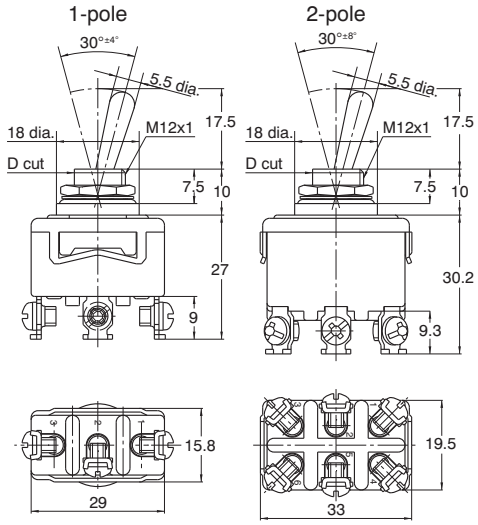
2. Panel-sealed type

1) Solder terminal

CAD Data



2) Screw terminal (M3.5)

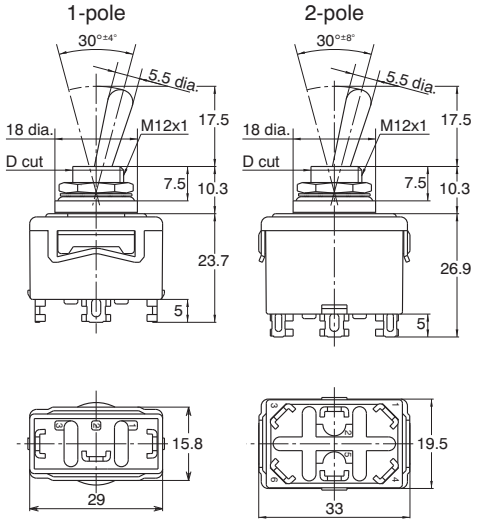


Remark: ON-OFF type does not have terminal no. 2 and 5.

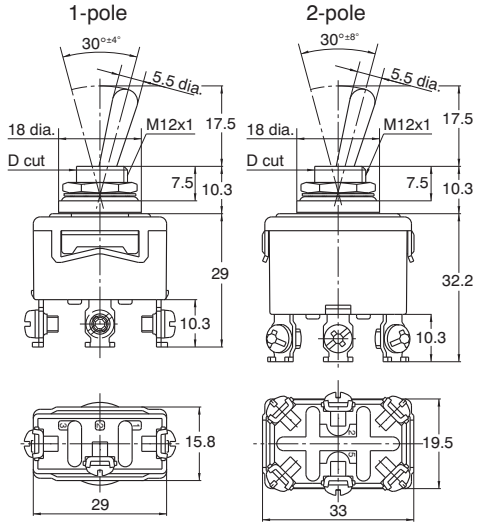
3. Terminal-sealed type

1) Solder terminal

CAD Data



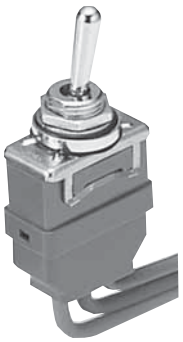
2) Screw terminal (M3.5)



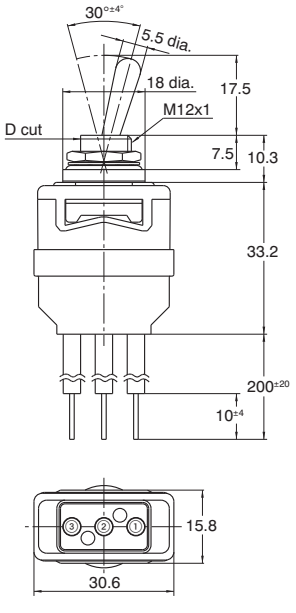
Remark: ON-OFF type does not have terminal no. 2 and 5.

4. Wire leads type

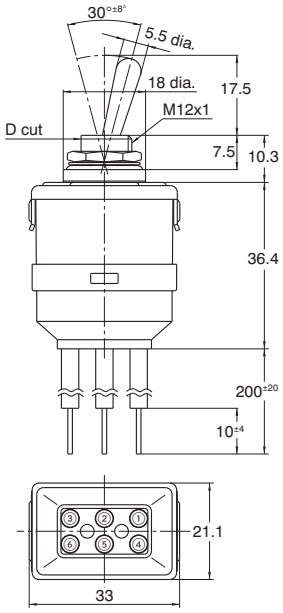
CAD Data



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

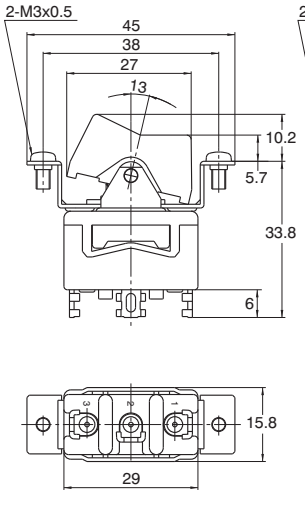
ROCKER TYPE DIMENSIONS (mm) (general tolerance: ±0.5)

1. Standard type

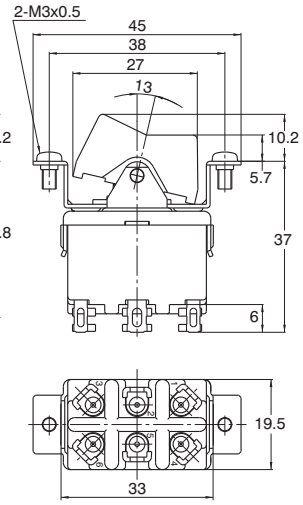
1) Solder terminal

CAD Data

1-pole

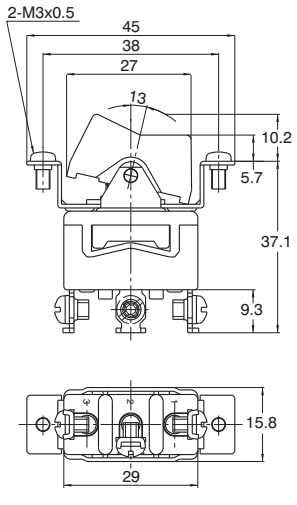


2-pole

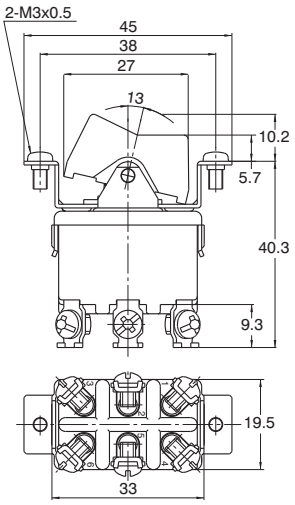


2) Screw terminal (M3.5)

1-pole



2-pole



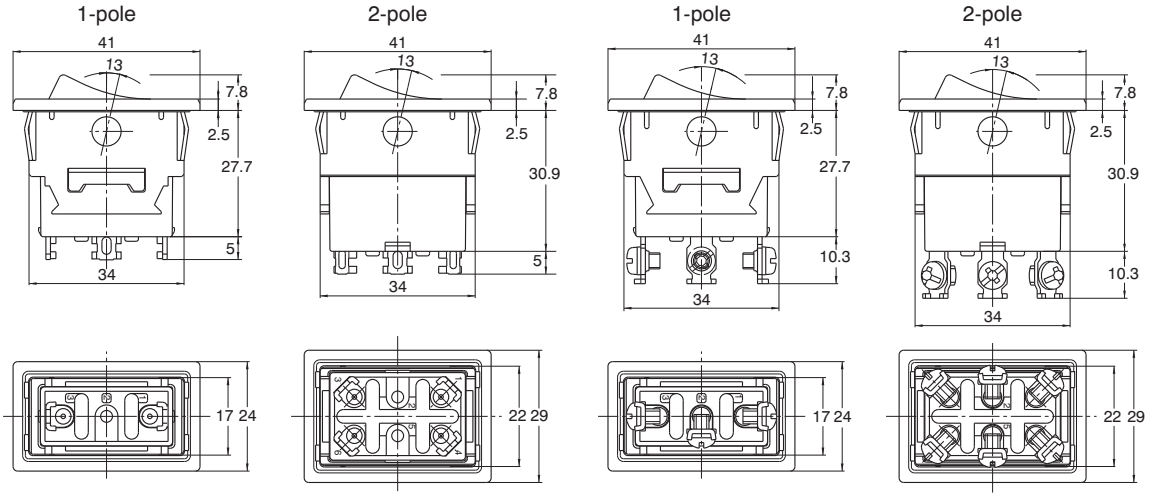
Remarks: 1. ON-OFF type does not have terminal no. 2 and 5.
2. Dimensions of actuator: 13.4 × 27

2. Panel-sealed type

1) Solder terminal

2) Screw terminal (M3.5)

CAD Data



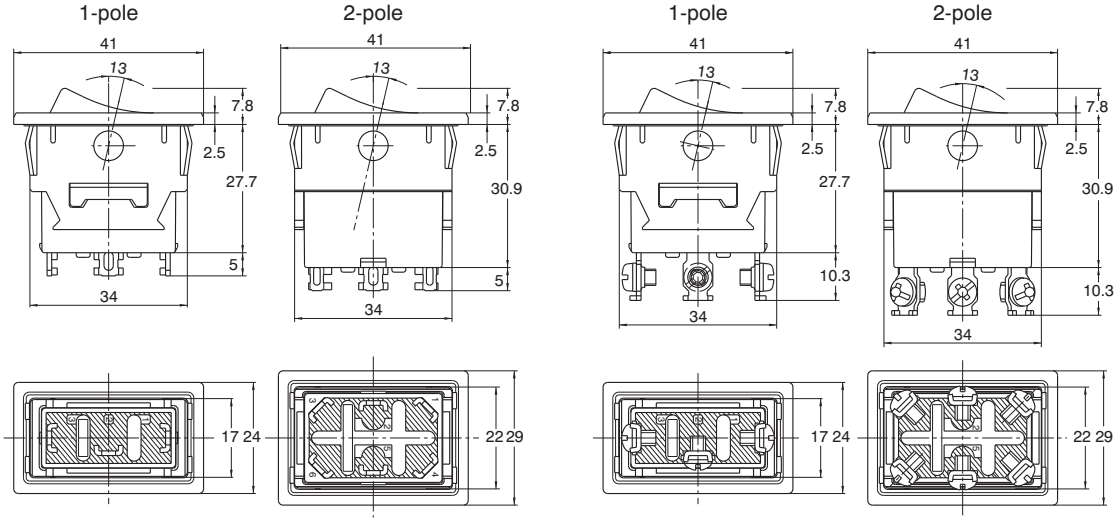
Remarks: 1. ON-OFF type does not have terminal no. 2 and 5.
2. Dimensions of actuator: 1-pole: 12.6 × 29, 2-pole: 17.4 × 29

3. Terminal-sealed type

1) Solder terminal

2) Screw terminal (M3.5)

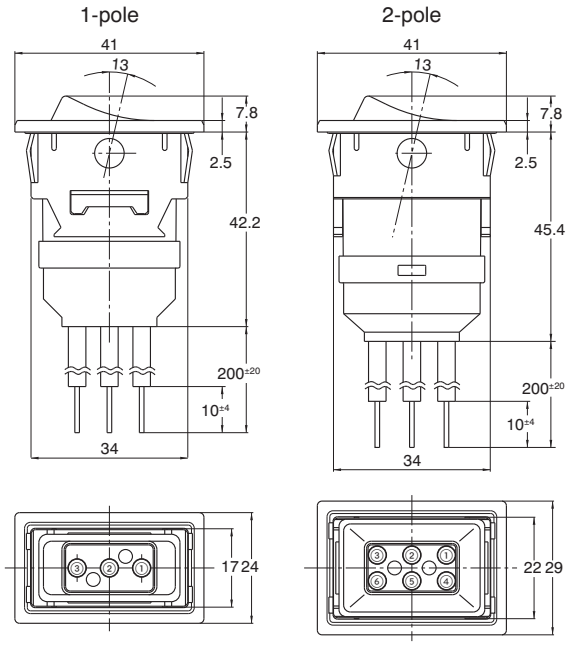
CAD Data



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.

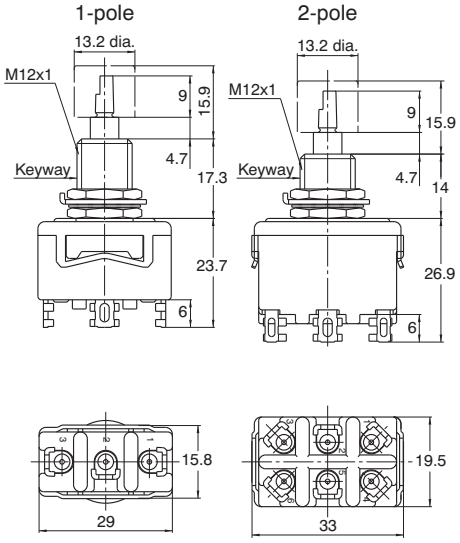
Color of wire leads

No.	Color
①	Brown
②	Red
③	Orange
④	Yellow
⑤	Green
⑥	Blue

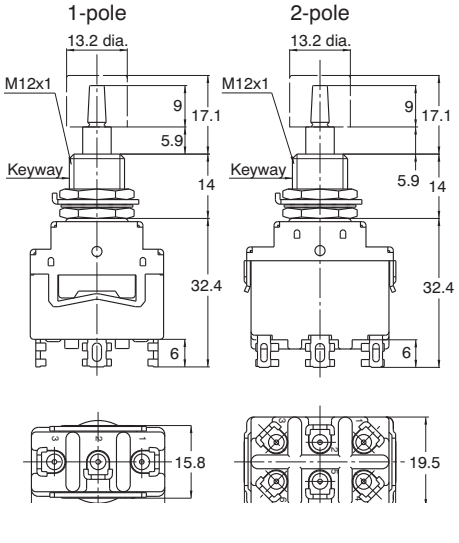
PUSH-BUTTON TYPE DIMENSIONS (mm) (general tolerance: ±0.5)

1. Standard type

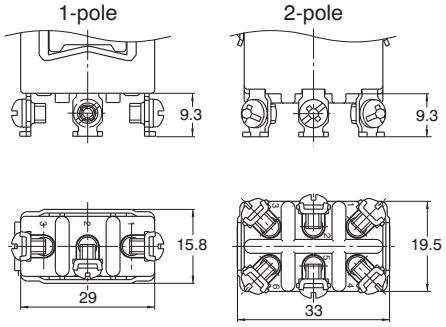
• Solder terminal, Momentary



• Solder terminal, Alternate

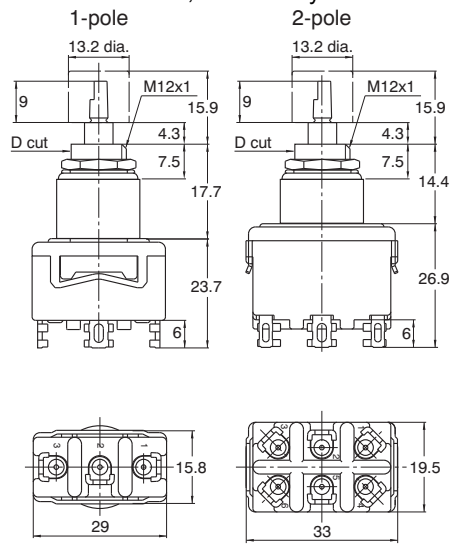


• Screw terminal (M3.5)
Dimensions other than listed below are same as those of solder terminal type.

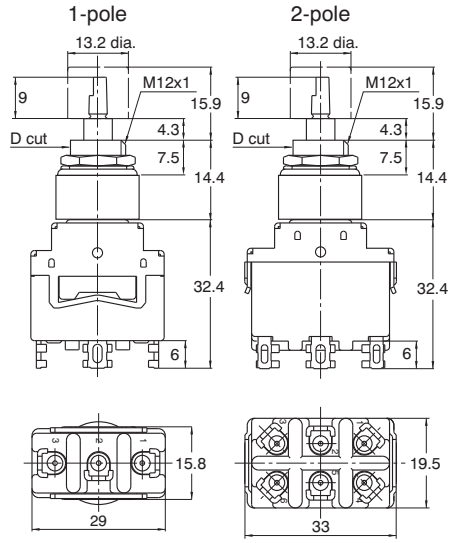


2. Panel-sealed type

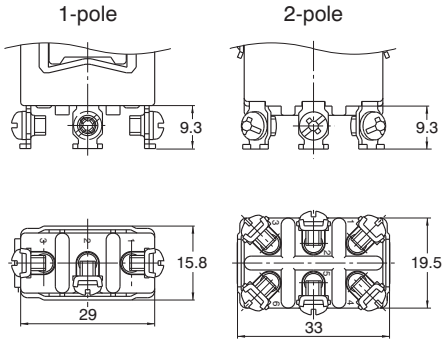
• Solder terminal, Momentary



• Solder terminal, Alternate

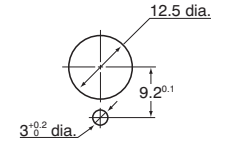
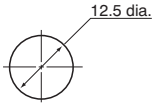
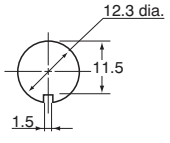


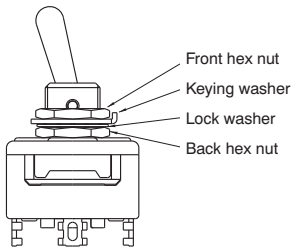
• Screw terminal (M3.5)
Dimensions other than listed below are same as those of solder terminal type.

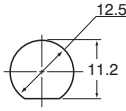
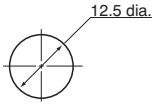


MOUNTING DIMENSIONS

1. Toggle type

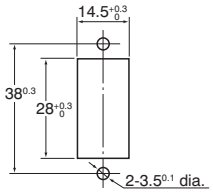
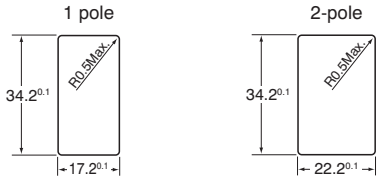
Type	Standard type		
Panel cutout (mm)			
Panel thickness	Max. 4.6 mm	Max. 5.6 mm (without keying washer)	Max. 5.6 mm (without keying washer)



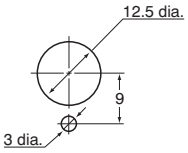
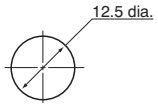
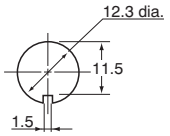
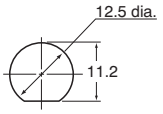
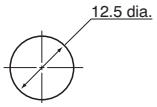
Type	Panel-sealed, Terminal-sealed and Wire leads types	
Panel cutout (mm)		
Panel thickness	Max. 4 mm	Max. 4 mm (without keying washer)

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

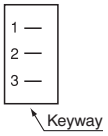
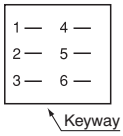
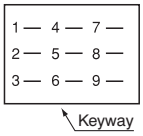
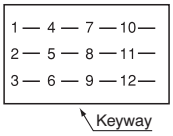
3. Push-button type

Type	Standard type		Panel-sealed type		
Panel cutout (mm)					
Panel thickness	Momentary, 1-pole: Max. 10 mm Momentary, 2-pole: Max. 6.5 mm Alternate: Max. 6.5 mm	Momentary, 1-pole: Max. 10 mm Momentary, 2-pole: Max. 7.5 mm Alternate: Max. 7.5 mm (without keying washer)	Momentary, 1-pole: Max. 11 mm Momentary, 2-pole: Max. 7.5 mm 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.

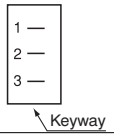
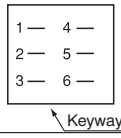
ELECTRICAL CIRCUIT DIAGRAM

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 ON-<ON> *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 <ON>-OFF-<ON> ON-OFF-<ON> *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

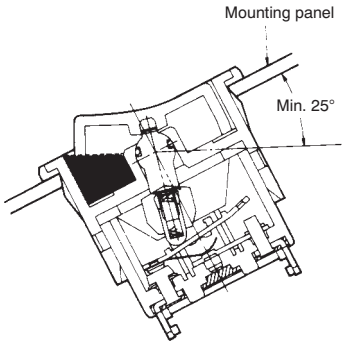
a. When installing the standard type switch, be sure to use a hex nut.

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

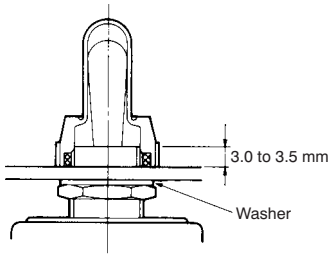
a. In case the panel-sealed, terminal-sealed or wire leads types are used in the condition where the water splash on, please install the switches tilt more than 25°. (90° recommended)



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

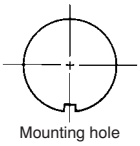
a. The washer should be used on the back side of the panel.



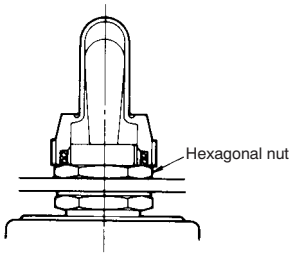
b. Enough screw pitch should be obtained being adjusted within 3 to 3.5mm (see figure above).

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

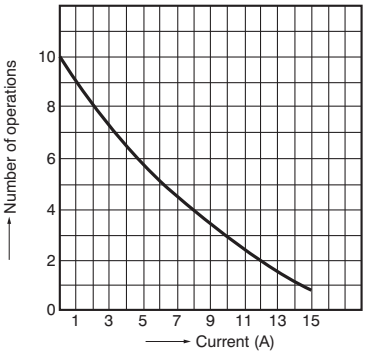
FEATURES

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

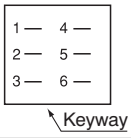
1. Contact rating

Kind of load	AC	DC
Resistive load	10A 250V AC 15A 125V AC	8A 30V DC 0.8A 125V DC 0.4A 250V DC
Inductive load	10A 250V AC (power factor: 0.6) 15A 125V AC (power factor: 0.6)	5A 30V DC (time constant: 7 m/s) 0.4A 125V DC (time constant: 7 m/s) 0.2A 250V DC (time constant: 7 m/s)
Lamp load (incandescent)	300W 100V AC 500W 200V AC Inrush current: Max. 30 A	—
Motor load (single phase)	200W 125V AC 300W 250V AC	—

2. Characteristics

Mechanical expected life	Min. 10^5
Electrical expected life	Min. 3×10^4 (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 (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.

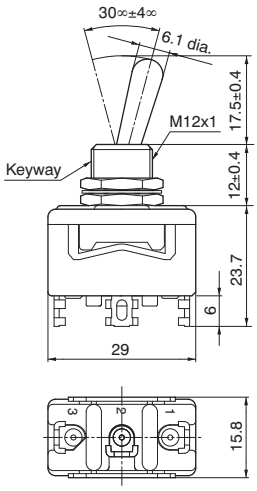
DIMENSIONS

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

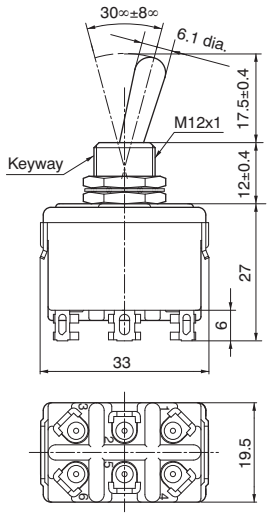
(mm) (general tolerance: ±0.5)

CAD Data

1 pole

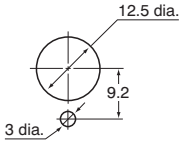
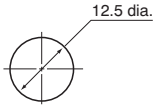
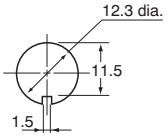


2-pole



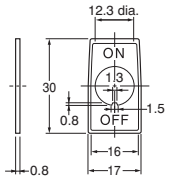
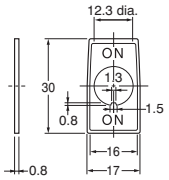
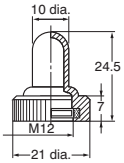
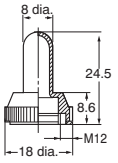
Remark: ON-OFF type does not have terminal no. 2 and 5.

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

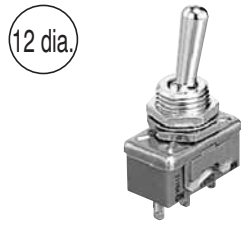
We recommend silicon rubber and EP rubber caps for the following applications.

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.

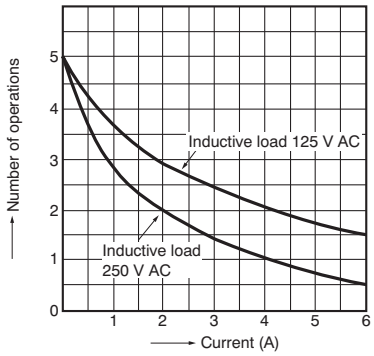


FEATURES

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

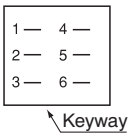
1. Contact rating

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), 3 A 250 V AC (power factor: 0.6)	3 A 125 V AC (power factor: 0.6), 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. 5×10^4
Electrical expected life	T-06 series: Min. 3×10^4 (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.

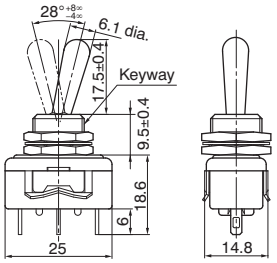
DIMENSIONS (for T-06 and T-03 series)

(mm) (general tolerance: ±0.5)

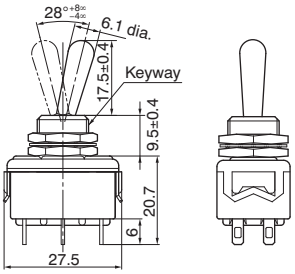
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

CAD Data

1 pole

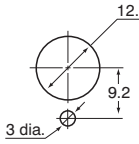
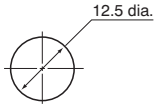
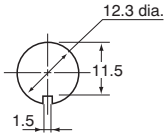


2-pole



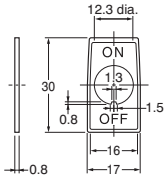
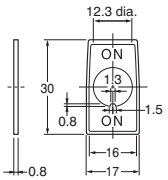
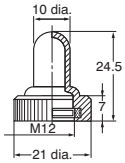
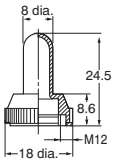
Remark: ON-OFF type does not have terminal no. 1 and 4.

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.

Panasonic
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POWER ROCKER SWITCH WITH A CONTACT FOR LOW LEVEL CURRENT

AJ8S (J8S) SWITCHES

FEATURES

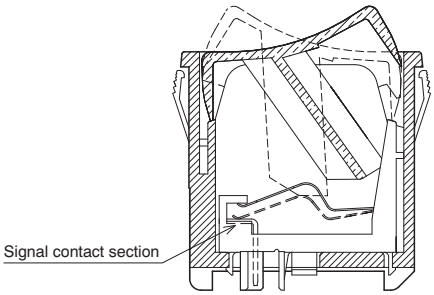
1. Incorporates a contact for low level circuit for the HDD protection circuit.
2. Power rocker switches for safety requirements.
All versions comply with ClassII
EN61058-1 insulation grade.
Insulation distance: 8mm Min.
(power contact section)
Contact gap: 3mm Min.
(power contact section)

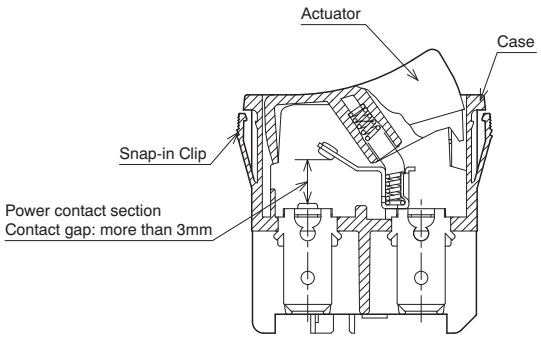
International Standard-approved Status
UL/C-UL, TÜV
3. High inrush current resistance is ideal for office automation equipment.
4. Operation that only requires a light touch
5. Cadmium-free contact compatibility.

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

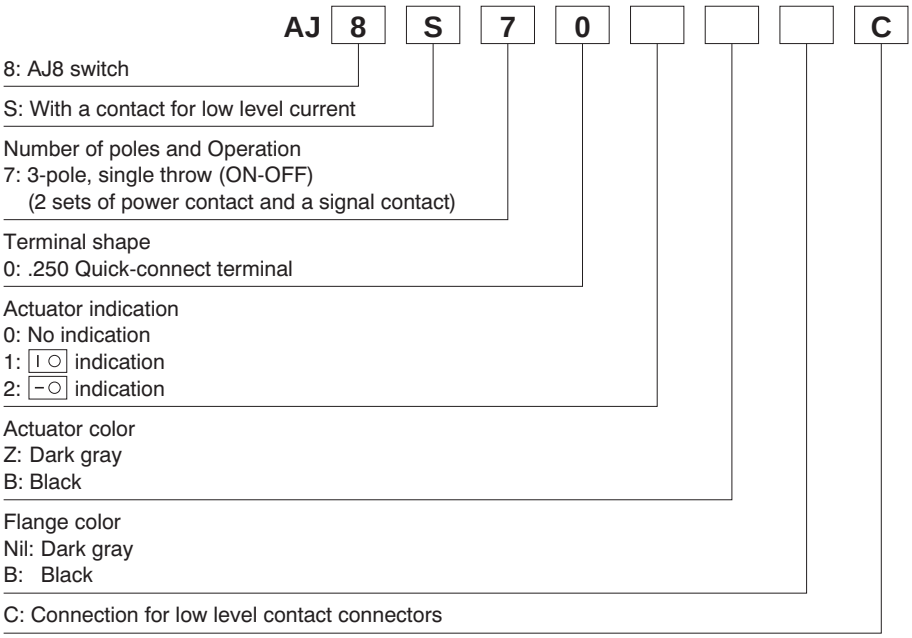
* The motor load is in accordance with EN61058-1. Inrush current can be switched up to the value of 6 times the indicated rating.

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

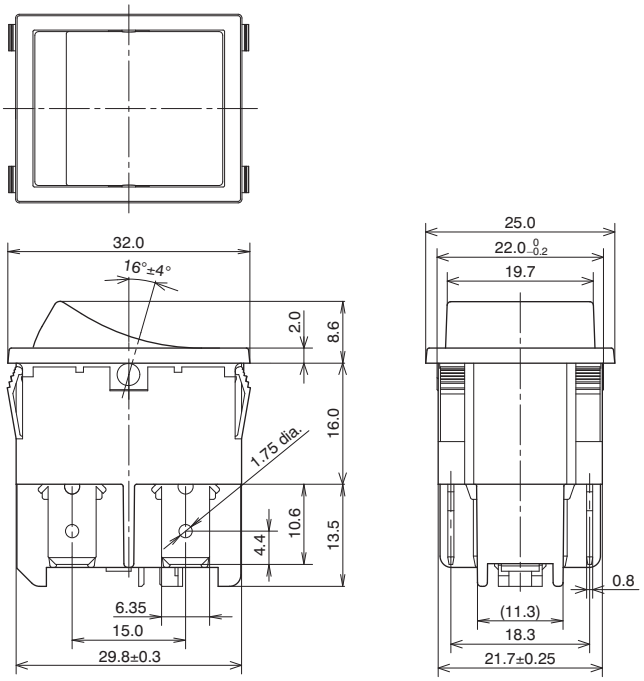
Item		Specifications
Electrical life		Min.10^4 (at 7 cpm.,at rated load)
Mechanical life		Min.5×10^4 (at 20 cpm.)
Contact resistance (initial)	Power contact	Max. 100mΩ (by voltage drop at 1A, 2 to 4V DC)
	Signal contact	Max. 1Ω (measured by a milliohm meter)
Dielectric strength (initial)	Power contact	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

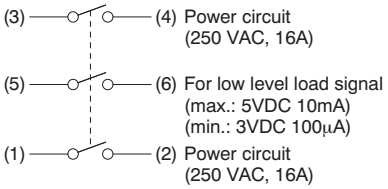
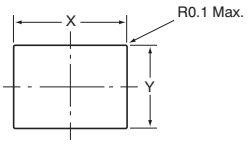


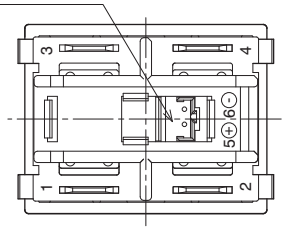
Diagram of recommended locations for panel mounting holes

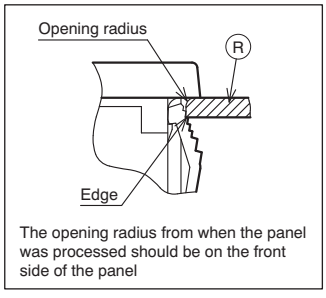


Panel thickness	X	Y
1 to less than 1.8	$30.4^{+0}_{-0.1}$	$22.0^{+0.1}_{-0}$
1.8 to 2.3	$31.1^{+0}_{-0.1}$	$22.0^{+0.1}_{-0}$

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.

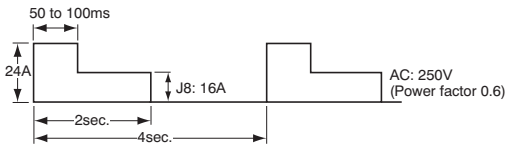
5. Take care not to drop the product as it may impair perfomance.

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.

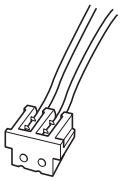
2. Outline of EN61058-1 test
After switching 5×10^3 times on the above load condition at both 85^{+5}_{0}°C and 25±10°C, temperature rise of terminals should be less than 55°C and no abnormality should be observed in characteristics.



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

Panasonic
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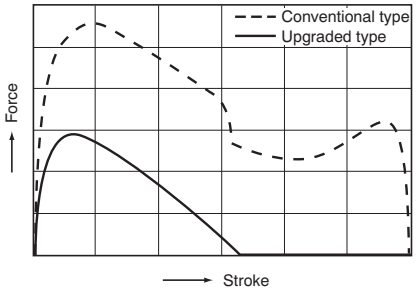
POWER ROCKER SWITCH

AJ8 SWITCHES WITH TRIP FUNCTION UPGRADED TYPE

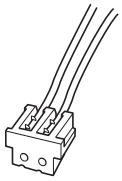
FEATURES

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

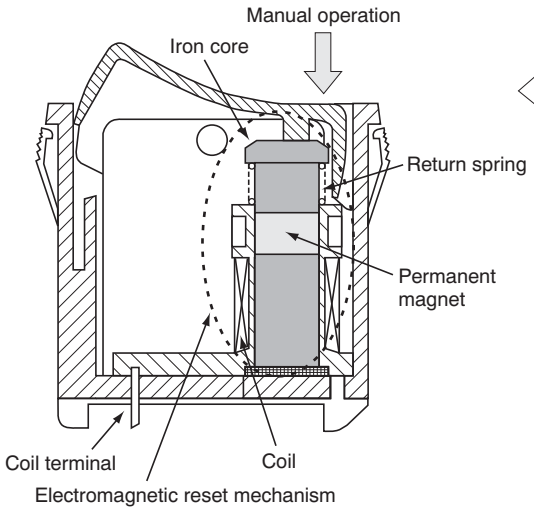


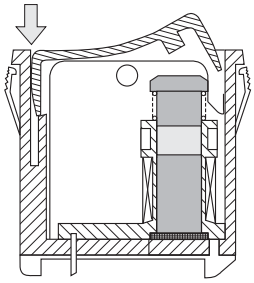
4. Prolonged electrical service life.
Coil operation provides an electrical life of at least 50,000 switching operations.
5. Approved under major international safety standards.
UL/C-UL, TÜV and SEMKO approved.

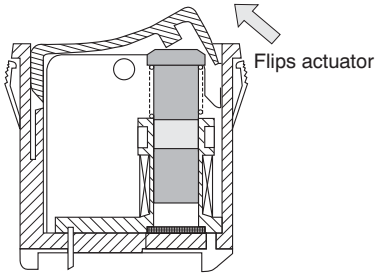
OPERATING PRINCIPLE

• 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)

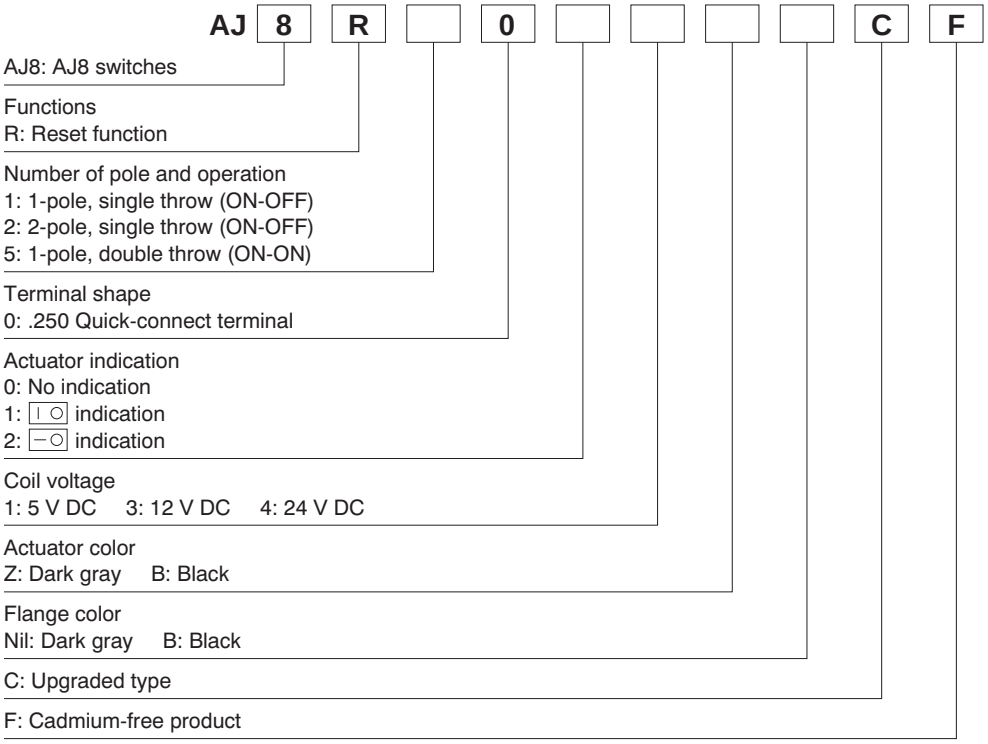
Contact	ON	OFF
Manual opening/closing	(A)	(B) Manual operation
Electromagnetic reset		(C)







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.5×10^4 (at 7 cpm. 5A 125V AC)
Mechanical life		Min.5×10^4 (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) 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.

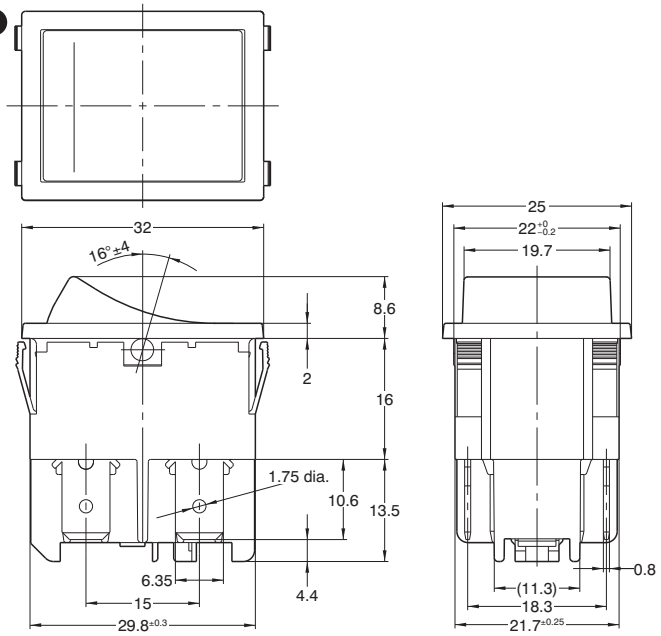
DIMENSIONS

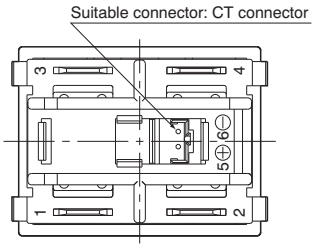
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

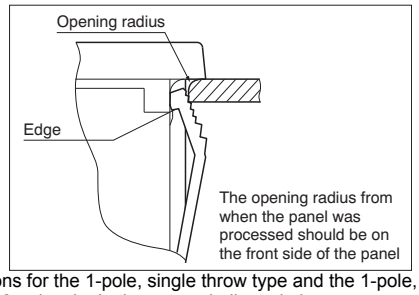
mm General tolerance: ±0.5

2-pole, single throw (ON-OFF)

CAD Data



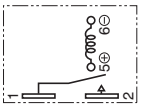




Remarks: 1. The external dimensions and mounting dimensions for the 1-pole, single throw type and the 1-pole, double throw type are the same as those for the 2-pole, single throw type indicated above.
2. The figures show the 2-pole, single throw (ON-OFF) type as an example.
The contact terminals are 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.

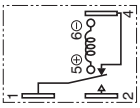
Wiring diagram (bottom view)

1-pole, single throw (ON-OFF)



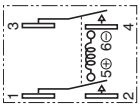
ON (set): 1-2 clo

1-pole, double throw (ON-ON)



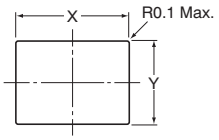
Reset: 1-4 closed
Set: 1-2 closed

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.

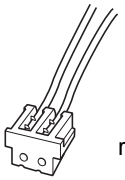
13. To assure reliability, check the switch under actual loading conditions. Avoid any situation that may adversely affect switching performance.

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

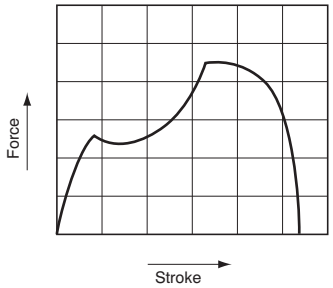
2. High inrush current resistance is ideal for office automation equipment.

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



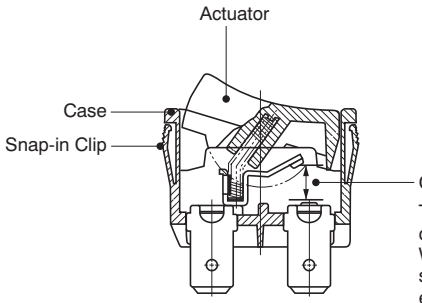
4. A broad product line

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)

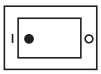
Actuator color
B: Black

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. 2.5×10^4
250V AC	10A	4A	100A (8.3ms)	—	Min. 10^4

3. Characteristics

Expected life (min. operations)	Mechanical	Min. 5×10^4 (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 6×10^3 ope. or less	Max. 30°C (UL1054)
	from 6×10^3 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

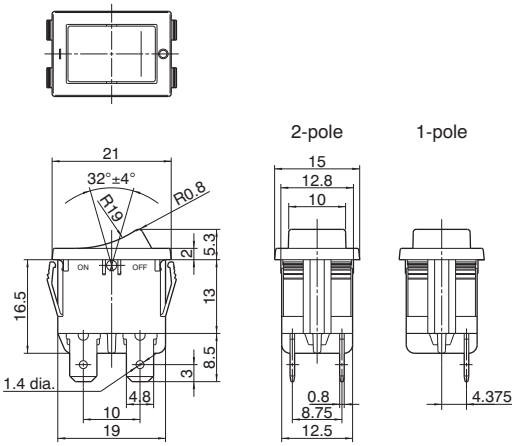
Interested in CAD data? You can obtain CAD data for all products with a **CAD Data** mark from your local Panasonic Electric Works representative.

mm General tolerance: ±0.5

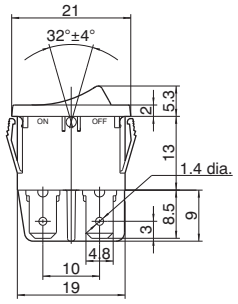
The dimension diagram for the standard actuator types is common to both the 10A type and the 6A type.

1. .187 Quick-connect terminal/Long guard type

CAD Data

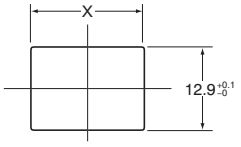


Long guard type
.187 Quick-connect terminal



Remark: As for soldering type, only terminal is different.

Diagram of recommended locations for panel mounting holes

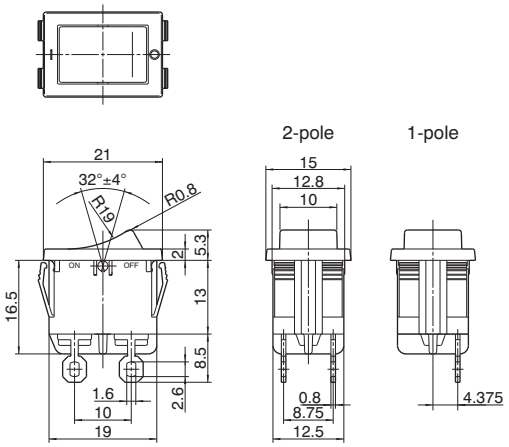


Panel thickness	X
0.75 to 1.25	$19.2^{+0}_{-0.1}$
1.25 to 2	$19.4^{+0}_{-0.1}$
2 to 3	$19.8^{+0}_{-0.1}$

2. Soldering terminal

mm General tolerance: ±0.5

CAD Data



Long guard type
Soldering terminal

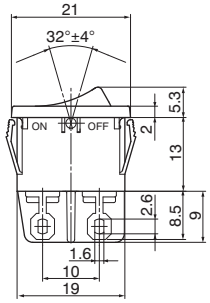
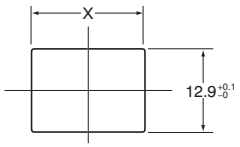


Diagram of recommended locations for panel mounting holes



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

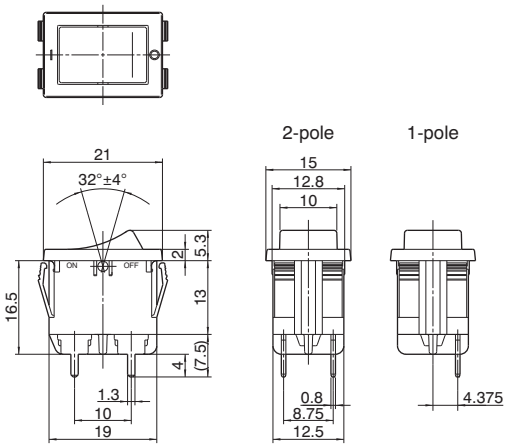
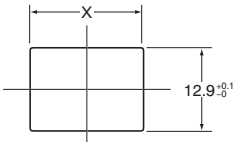
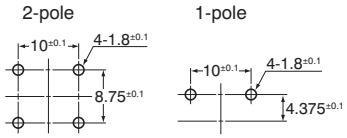


Diagram of recommended locations for panel mounting holes



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

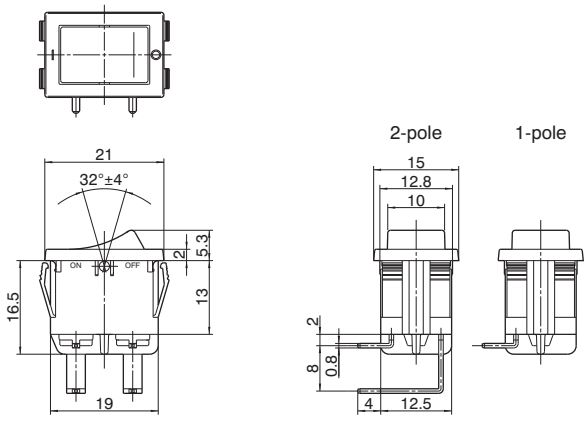
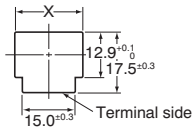
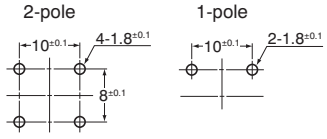


Diagram of recommended locations for panel mounting holes



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

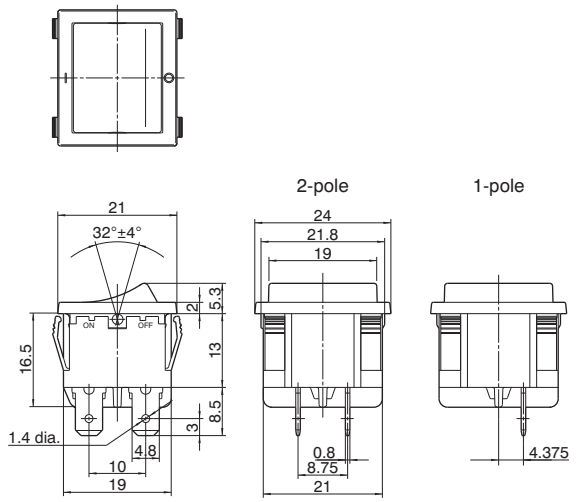
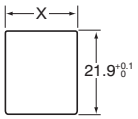


Diagram of recommended locations for panel mounting holes



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.

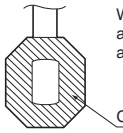
NOTES

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. 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.

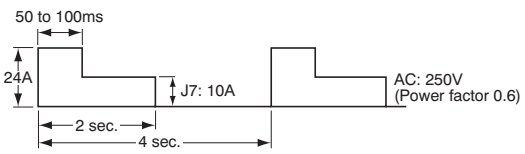
REFERENCE

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)
6×10^3 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 5×10^3 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

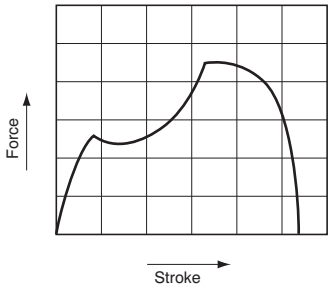
2. High inrush current resistance is ideal for office automation equipment.

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



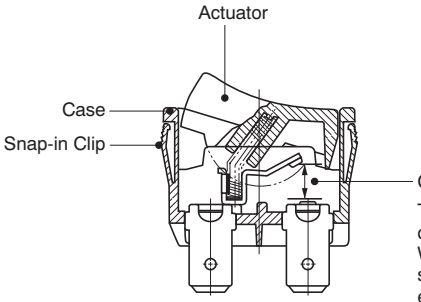
4. A broad product line

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.

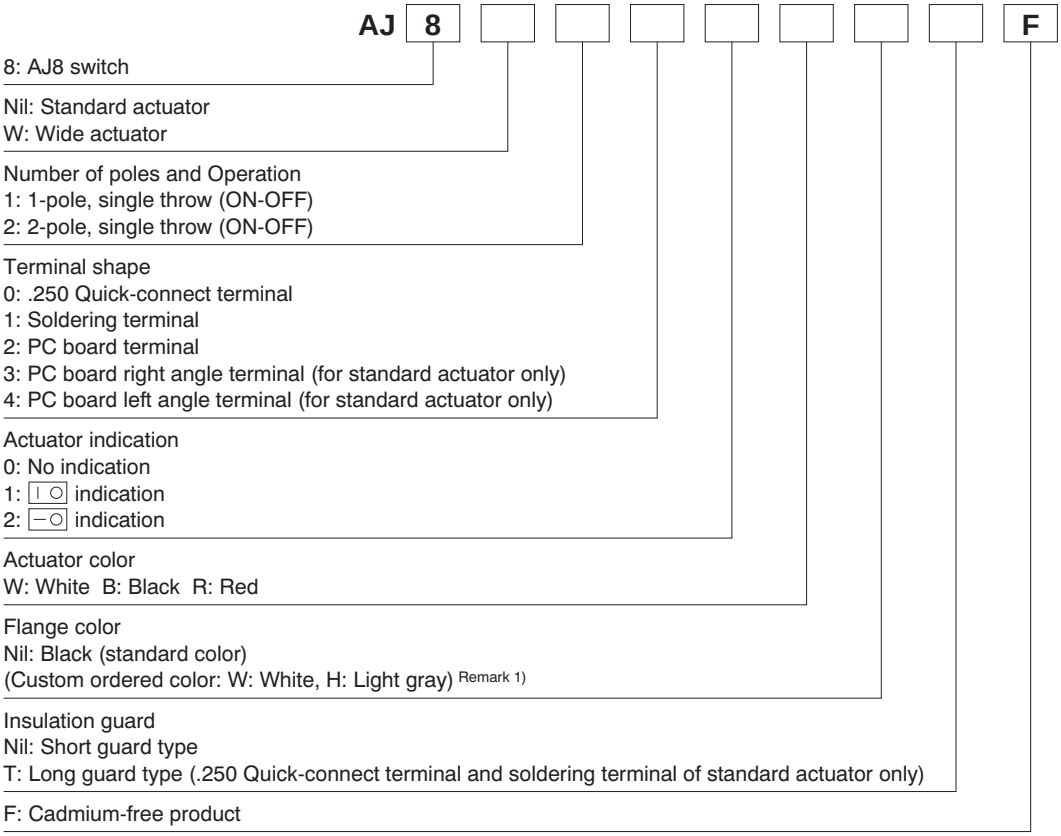
6. TV-8 rating type added to lineup.

CONSTRUCTION



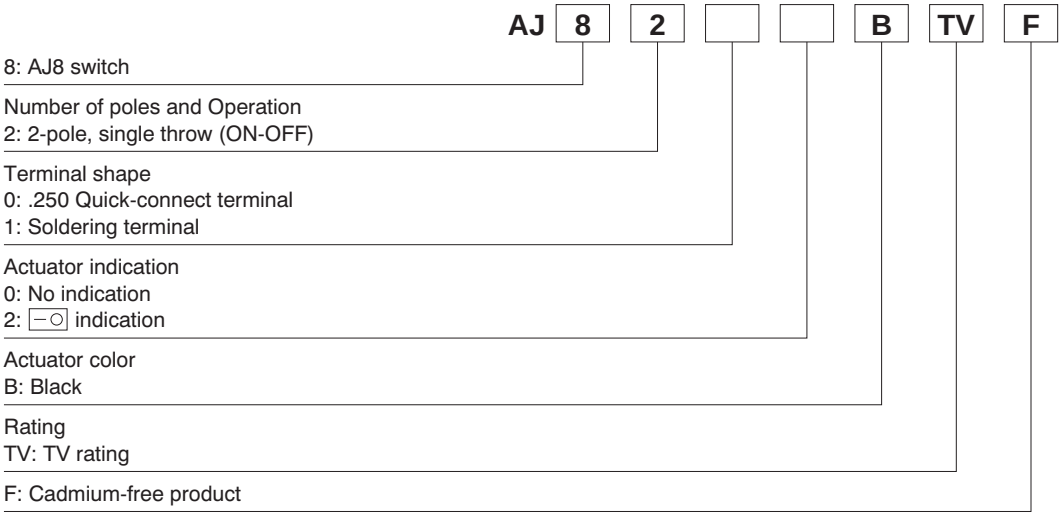
The EN60950 (intended for office automation equipment) conforms with a 3mm gap.
When directly opening or closing the primary power supply side, a contact gap of at least 3mm is required in order to ensure safety.

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. 2.5×10^4
250V AC	16A	4A	160A (8.3ms)	—	Min. 10^4

3. Characteristics

Expected life (min. operations)	Mechanical	Min. 5×10^4 (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 6×10^3 ope. or less	Max. 30°C (UL1054)
	from 6×10^3 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.

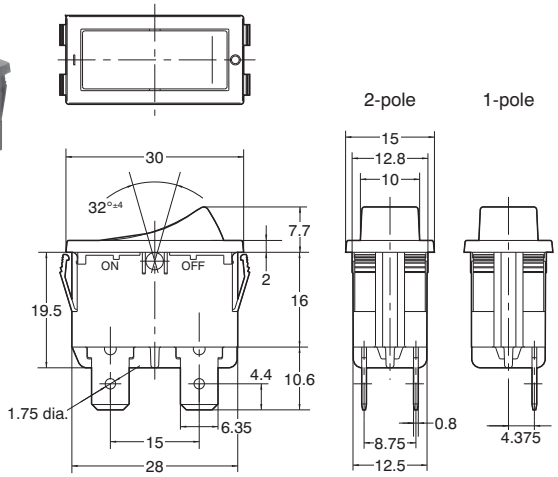
DIMENSIONS

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

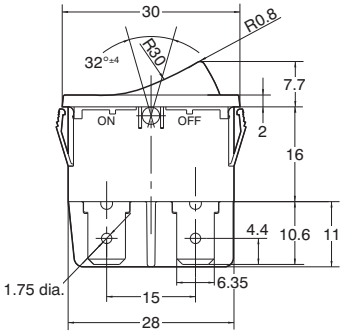
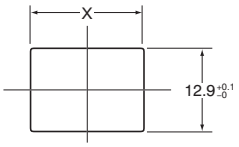


Diagram of recommended locations for panel mounting holes

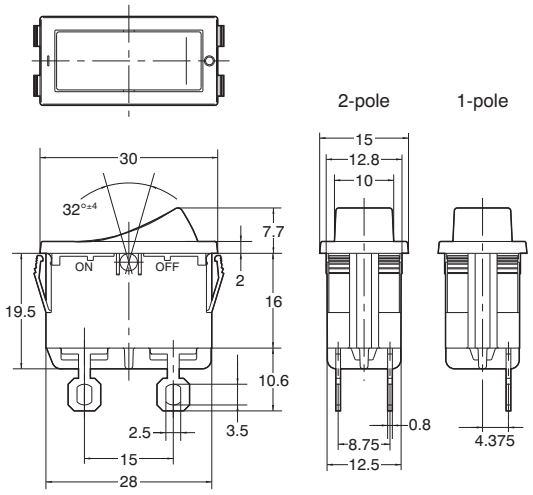


Panel thickness	X
0.75 to 1.25	$28.2^{+0}_{-0.1}$
1.25 to 2	$28.4^{+0}_{-0.1}$
2 to 3	$28.8^{+0}_{-0.1}$

2. Soldering terminal

mm General tolerance: ±0.5

CAD Data



Long guard type
Soldering terminal

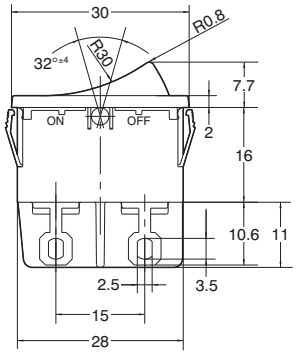
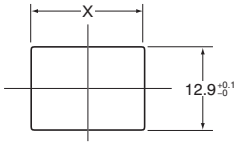


Diagram of recommended locations for panel mounting holes

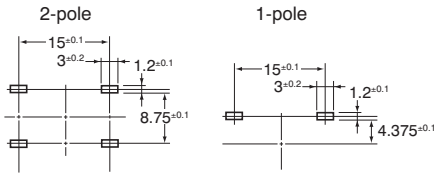


Panel thickness	X
0.75 to 1.25	$28.2^{+0}_{-0.1}$
1.25 to 2	$28.4^{+0}_{-0.1}$
2 to 3	$28.8^{+0}_{-0.1}$

3. PC board terminal

CAD Data

PC board pattern



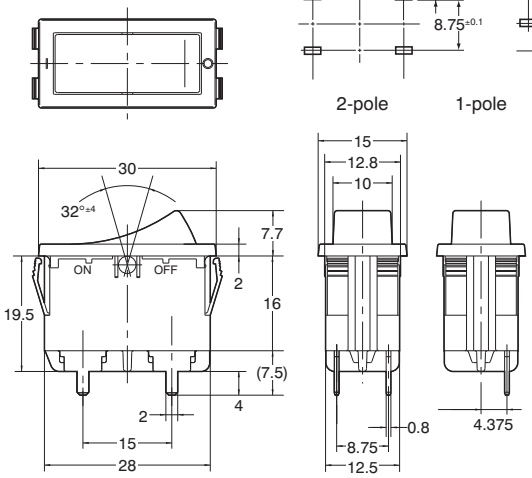
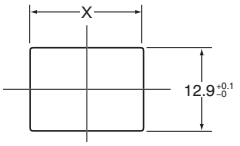


Diagram of recommended locations for panel mounting holes



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

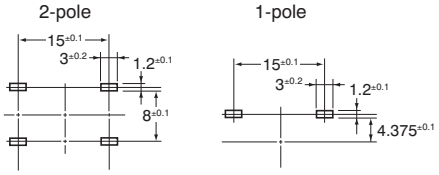
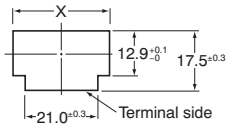
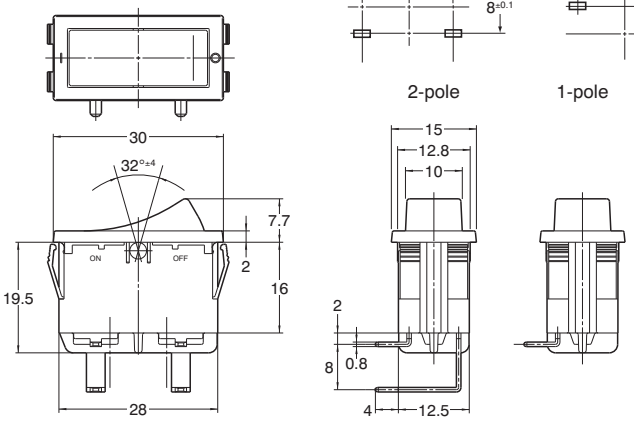


Diagram of recommended locations for panel mounting holes





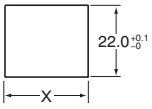
Panel thickness	X
0.75 to 1.25	$28.2^{+0}_{-0.1}$
1.25 to 2	$28.4^{+0}_{-0.1}$
2 to 3	$28.8^{+0}_{-0.1}$

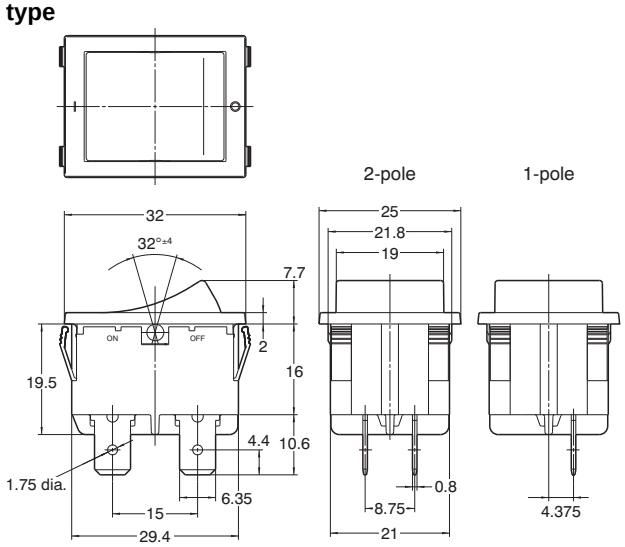
Remark: Left angle terminal type is also available.

5. Wide actuator type

CAD Data

Diagram of recommended locations for panel mounting holes





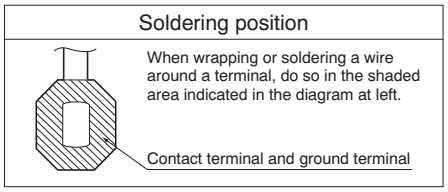
Panel thickness	X
1 to less than 1.8	$30.0^{+0}_{-0.1}$
1.8 to 2.3	$30.7^{+0}_{-0.1}$

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.

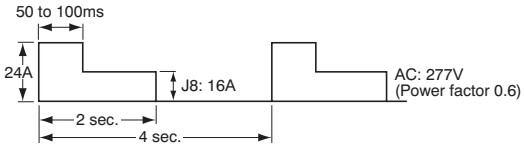
4. Environment
Avoid using and storing these switches in a location where they will be exposed to corrosive gases, silicon, or high dust levels, all of which can have an adverse effect on the contacts.

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)
6×10^3 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 5×10^3 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).

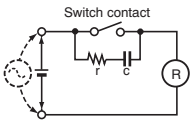
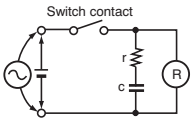
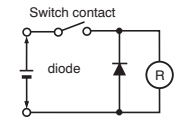
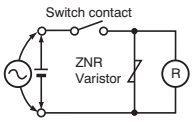
TYPES OF LOAD

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).

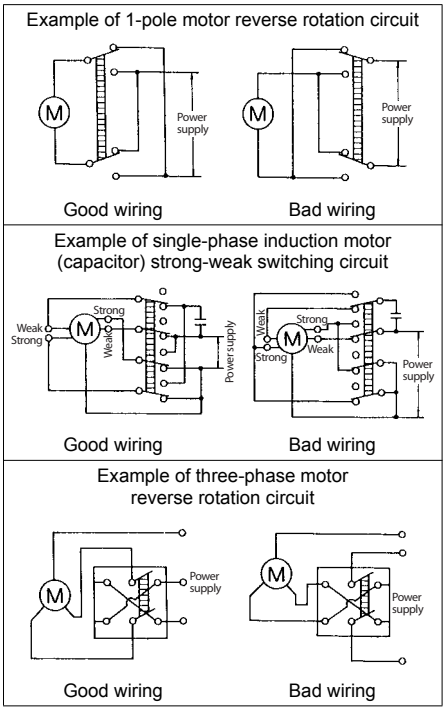
Circuit diagram	Notes
	1. r = more than 10 ohms 2. In an AC circuit, impedance of R is to be slightly smaller than impedance of r and c.
	Can be used for both AC and DC circuits. Impedance of r is nearly equal to impedance of R. C: 0.1 μF
	For DC circuits only.
	Can be used for both AC and DC circuits.

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.

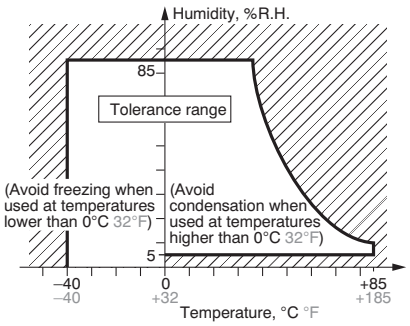
2) The allowable specifications for environments suitable for usage, storage, and transportation are given below.

(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.

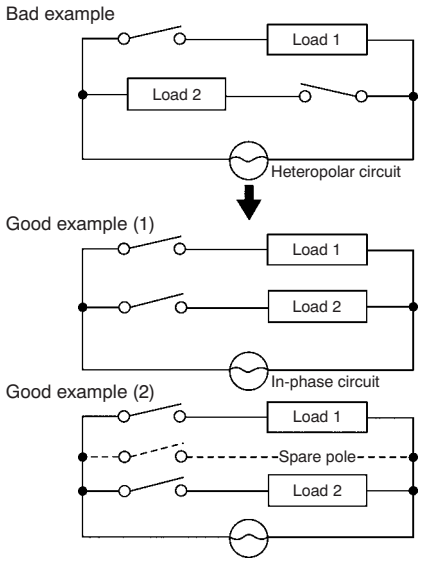
4. Others

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.

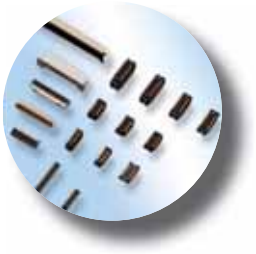
7) Use your hand to operate the actuator. (Operation using a tool such as a screwdriver or hammer can cause breakdown.)

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

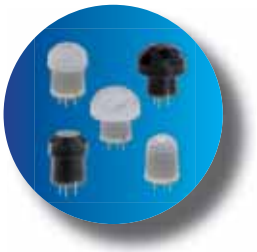
Today's electronic components are expected to meet stringent demands: They have to be as compact as possible and provide maximum reliability. To fulfill these requirements, Panasonic engineers have developed narrow-pitch connectors that utilize TOUGH CONTACT technology. In addition to their excellent 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

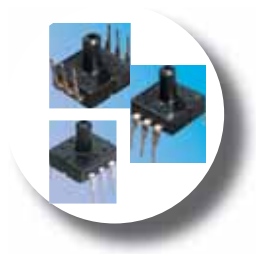
Intelligent automation solutions help increase energy efficiency, cost effectiveness and comfort significantly. With a power consumption as low as 1μA and a compact design in one package, PaPIRs open up a diverse range of possibilities to the lighting and building technology as well as battery-driven 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)

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Panasonic Electric Works

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