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QR код



**Panasonic**

**General Catalog**  
**LIMIT SWITCHES**



## The ideal Limit Switch

- › Compact (reduced attachment space)
- › Contact reliability (DC, low-level loads)
- › Maintenance and safety guaranteed
- › Expanded detection functions (different kinds of actuators)
- › Improved construction easy wiring and mounting (wiring and attachments)

### ■ Installation and maintenance

- › Easy wiring
- › Installation work standardized
- › Operating checks easy

### ■ Flexible output

- › PC control
- › Controls switching of low-level loads
- › Flexible load control

### ■ Easy to use

- › Improved machine accuracy  
(repeat detection accuracy improved)
- › Responds to detected object  
(abundant variety of actuators)

### ■ Reliability

- › Stout (prevents external damage)
- › Environment-resistant (dust-proof, drip-proof, oil-proof)
- › Longevity (need for maintenance and parts replacement reduced)

## IP64

Terminal mold model

### AZ7 limit switches



## IP64

### AZ8 limit switches



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## IP67

### AZD1 limit switches



  
Industrie  
Forum  
Design  
Hannover

### AZC1 Magnelimit



## Standard glossary

### ■ Fixed rating values

The values that guarantee the standards for the limit switch characteristics and functions. For example, the rated current and rated voltage, which are preset conditions (load type, current, voltage, frequency, etc.)

### ■ Operating object

The mechanism and mountings that operate the limit switch actuator. Used for mechanical operators such as cams and dogs.

### ■ Detective object

The unit other than mechanical mountings that operate the limit switch. Products, parts, jigs, etc.

### ■ Reaction spring (movable spring)

The mechanical part that switches the limit switch contact is called either the reaction spring or the moveable spring.

### ■ Contact

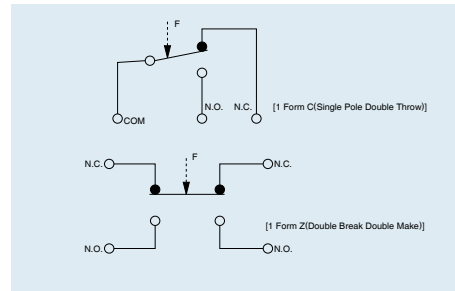
When the counter-spring revolves, power is switched on and off through the contact between metal parts.

### ■ Contact gap

The effective clearance between the fixed contact and the moveable contact. Also called breaking distance.

### ■ Contact arrangement

The construction of the electrical input/output circuit depending on use. For example, the following two applications:



### ■ Contact type

Used in opposition to a semiconductor switch that has switching characteristics. Fulfills switch functions through a mechanical ON/OFF contact.

### ■ Terminal mold

After wiring, the connecting part is molding by epoxy resin for waterproof, oil-resistant and dust-proof capabilities.

## Construction

### ■ Actuator

This part directly detects movement of the dog, cam, and so forth in the operating unit, and transmits external force to the changeover mechanism, thereby engaging the moveable contact and operating the switch.

### ■ Headblock

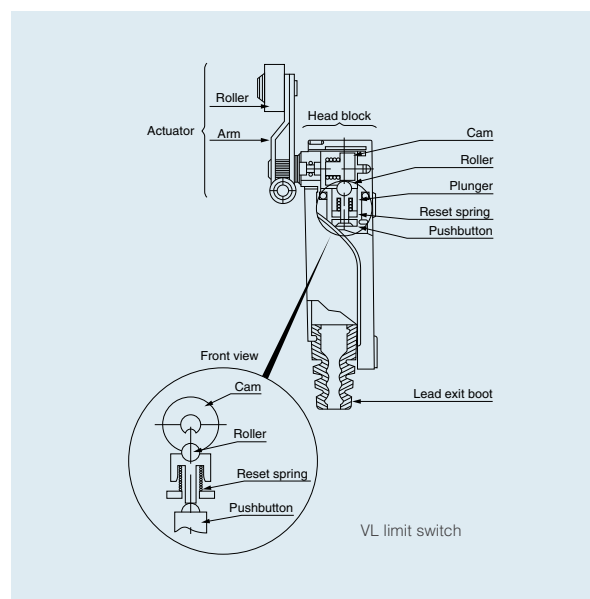
An independent part of the actuator mechanism of the Limit Switch.

### ■ Wiring vent (cord vent)

The seal on the wiring at the mouth of the wiring vent. Also called the conduit vent for the screw hole used in the wiring.

### ■ Terminals

The part of the wiring work in the wiring that forms the circuit for electrical input and output.



## Operating characteristics

### ■ Operating Force (O.F.)

The force required to cause contact snap-action. It is expressed in terms of force applied to the actuator.

### ■ Release Force (R.F.)

The force to be applied to the actuator, at the moment contact snaps back from the operated position to unoperated position.

### ■ Total Force (T.F.)

The force required to make the actuator travel to overtravel position.

### ■ Pretravel (P.T.)

Distance of the actuator movement from free position to operating position.

### ■ Overtravel (O.T.)

The distance which the actuator is permitted to travel after actuation without any damage to the switching mechanism.

### ■ Total Travel (T.T.)

The distance which the actuator is permitted to travel from free position without any damage to the switching mechanism.

### ■ Movement Differential (M.D.)

The distance from operating to release position of the actuator.

### ■ Operating Position (O.P.)

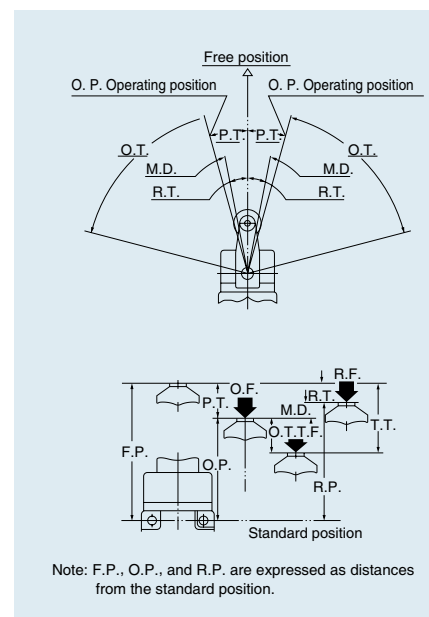
The position of the actuator when the traveling contact snaps to the fixed contact.

### ■ Release Position (R.P.)

The position of the actuator when the traveling contact snaps back from the operating position to its original position.

### ■ Free Position (F.P.)

Position of the actuator when no force is applied to it.



## Glossary relating to the EN60947-5-1

### ■ EN60947-5-1

EN standard same as IEC947-5-1

### ■ Utilization categories

The following examples express the classification of switches by category of use.

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

### ■ Rated operational voltage (Ue)

The maximum rated voltage for switch operation. This must never exceed the maximum ratings insulation voltage (Ui).

### ■ Rated operational current (Ie)

The maximum rated current for switch operation.

### ■ Switching overvoltage

The surge momentarily generated when a circuit is closed. Must be lower than the Uimp value.

### ■ Pollution degree

Expresses in levels the environment in which the switch is used. The four levels are shown below.

Limit switches come under contamination level 3.

### ■ Rated insulation voltage (Ui)

The maximum rated current value which guards the switch's insulation functions, forming the parameters for the resistance values and the mounting distance.

### ■ Rated impulse withstand voltage (Uimp)

The peak impulse current value which enables the switch to resist without insulation breakdown.

### ■ Rated enclosed thermal current (Ithe)

The current value that enables current to flow without exceeding the specified maximum temperature in the recharging contact switch. If the pins are made of brass,

the maximum temperature limit is 65°C 149°F.









### ■ Conditional short circuit current

The current the switch can resist until the short circuit protection device is activated.

### ■ Short circuit protection device

A device that protects the switch from short circuits through a circuit break (breakers, fuses, etc.)


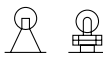
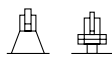




Pollution degree	Contents
1	No contamination or, even if contamination is present, only non-conducting contamination is generated.
2	Normally, only non-conducting contamination is generated, but there remains the possibility of temporary conducting contamination when the circuit is formed.
3	Conducting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



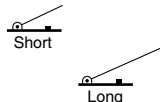
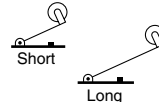
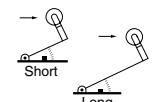

Classification		Compact size			Door switch	
Product name		AZ7 limit switches	AZD1 limit switches	AZ8 limit switches	AZC1 Magnelimit	
Appearance						
Head code		AZ7	AZD1	AZ8	AZC1	
Feature		<ul style="list-style-type: none"> <li>Switches installed with both economical and compact Z-basic microswitches and Limit Switch protective construction.</li> <li>Coil spring system provides long life.</li> </ul>	<ul style="list-style-type: none"> <li>Excellent safety even if the contact point is welded, due to the forced contact opening mechanism.</li> <li>Block mount system makes parts replacement easy.</li> <li>Conforms to DIN standards.</li> </ul>	<ul style="list-style-type: none"> <li>In addition to the characteristics of stand mounted limit switches, is compact, easily installable, highly reliable, light weight and economical.</li> </ul>	<ul style="list-style-type: none"> <li>Secured by magnet.</li> <li>Built-in switch detection.</li> <li>Dual-role switch in one unit.</li> <li>Construction possible with 100V AC power.</li> </ul>	
Protective construction	Dust-proof type	IP60	■	■	■	—
	Abrasion-proof type	IP64	■	■	■	—
	Surge-proof type	IP65	—	■	■	—
	Corrosion-proof type	IP67	—	■	—	—
	Oil-resistant type	—	—	—	—	—
Ratings (load resistance)		10A250V AC 10A125V AC 0.4A115V DC	6A250V AC 6A380V AC 5A24V DC	[Standard type] 5A250V AC 5A125V AC 0.4A125V DC	5A 125V AC 5A 250V AC 5A 30V DC	
Life (Min. ope.)	Mechanical	10 <sup>7</sup>	10 <sup>7</sup>	10 <sup>7</sup>	10 <sup>5</sup>	
	Electrical	2x10 <sup>5</sup>	1.5x10 <sup>5</sup>	3x10 <sup>5</sup>	3x10 <sup>4</sup>	
Operating force (max.) (hinge lever type)		1.47N {150gf}, 1.77N {180gf}, 1.96N {200gf}, 2.16N {220gf}, 2.35N {240gf}, 2.75N {280gf}, 5.88N {600gf} max.	6.37N {650gf} 4.90N {500gf} 3.29N {400gf}	0.88N {90gf}, 5.88N {600gf}, 8.83N {900gf}, 9.16N {200gf}	3.43N {350gf}	
Available actuators						
Terminals		Screw terminal	Screw terminal (Conduit connectors: PF: 1/2, PG: 13.5 types)	Screw terminal	Screw terminal	
Wiring		Cabtire cable	Cabtire code	Cabtire cord Cabtire cable	Cabtire cord	
Mounting pitch (Applicable screw)		25.4mm 1.000inch (M4 screw)	22 u (47mm) .866 u 1.850inch	21 u 56mm .827 u 2.205inch (M4 screws)	52mm 2.047inch (M4)	
Available standards		UL, CSA, TÜV, CE	UL, CSA, TÜV, CE	UL, CSA, TÜV, CE	UL, CSA, CE	
Page		22	33	26	41	

## Notes:

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

## Actuators

<b>1</b> Push plunger 	<b>2</b> Roller plunger 	<b>3</b> Cross-roller plunger 	<b>4</b> Roller arm 	<b>5</b> Adjustable roller arm 	<b>6</b> Adjustable rod 	<b>7</b> Fork 
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<b>8</b> Spring wire 	<b>9</b> Flexible rod 	<b>10</b> Hinge lever 	<b>11</b> Roller lever 	<b>12</b> One-way roller lever 	<b>13</b> Roller lever 
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# AZ7

## compact size side limit switches



- › Long life
- › More than 107 mechanical operations
- › Great mechanical strength while being compact and lightweight
- › Strong plastic outer cover cap with excellent mechanical characteristics
- › M4 bolt can be used for mounting
- › The overtravel (O.T.) is large with great shock absorption
- › Dust-proof and oil resistant
- › Flushed with the diaphragm and the compressed rubber ring
- › Conforms to UL/CSA TÜV standards

## PRODUCT TYPE

### 1. Standard type

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

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

## FOREIGN STANDARDS

Standards	Applicable product	Part No.
UL	File No. : E-122222 Ratings : 10A 250V AC Product type : Standard type only	Order by standard part No.
CSA	File No. : LR55880 Ratings : 10A 250V AC Product type : Standard type only	
TÜV	File No. : J9551204 Ratings : AC-15 2A/250V~ Product type : Standard type only	

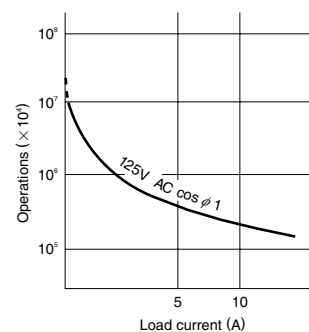
## SPECIFICATIONS

### 1. Rating

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

## DATA

### Life curve



## 2. Characteristics

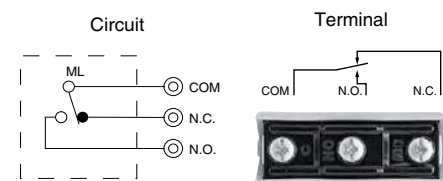
Contact arrangement		1 Form C
Initial contact resistance, max.		15mΩ* (By voltage drop 6 to 8V DC at rated current)
Initial insulation resistance (At 500V DC)		Min. 100 mΩ
Initial breakdown voltage		1,500 Vrms for 1 min between non-consecutive terminals 2,000 Vrms for 1 min between dead metal parts and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

\*The resistance of a copper wire is not included.

## 3. EN60947-5-1 performance

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

## WIRING DIAGRAM



## 4. Operating characteristics

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

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

## 5. Protective characteristics

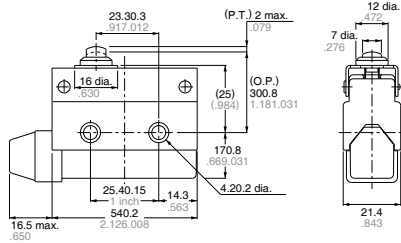
Protective construction IEC	Screw terminal type	Epoxy-sealed terminal type
IP60	■	■
IP64	-	■

## Cautions

- When the switch is to be used in places where oil is abundant, bore a drain hole in the bottom of the terminal cover.
- Avoid places where highly acid or alkaline fluids are used or high temperatures prevail.
- Wiring
  - Remove the terminal cover with a ⊖ driver. Insert the lead wire through the knock-out of the terminal cover. Connect the lead wire to the terminal. When connecting the terminals with the fasten lug, those with the insulation sleeve are recommended. The terminal cover can be mounted in both directions. In this case, fasten the terminal cover in the opposite direction. For epoxy-sealed terminal types, there are two types by the cord outlet direction; N.C. side and COM side.
  - Flexible rod type
    - Put the detective object to the tip of plastic part.
    - Avoid pushing the tip of actuating spring in the direction of axis. In the places of oil or water splashes and much dust area, use the limit switch with keeping the actuating spring in the vertical direction.

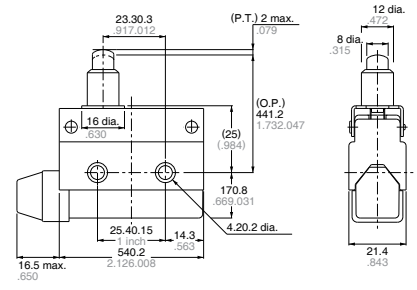
Short push plunger type

AZ7100



Push plunger type

AZ7110

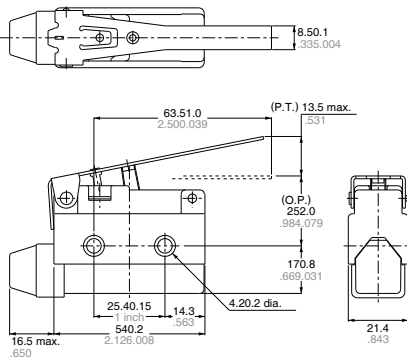


mm inch

General tolerance:  $\pm 0.4 \pm .016$

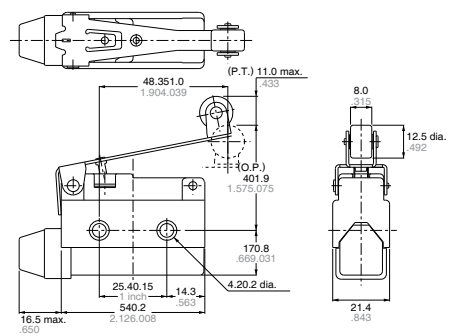
Hinge lever type

AZ7120



Roller lever type

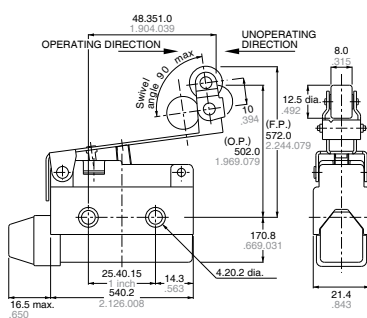
AZ7121



General tolerance:  $\pm 0.4 \pm .016$

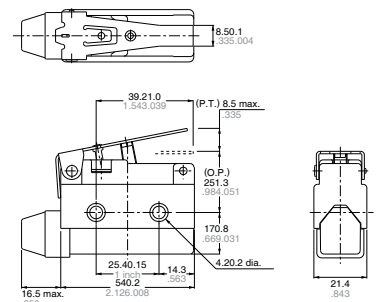
One-way roller lever type

AZ7124



Hinge short lever type

AZ7140

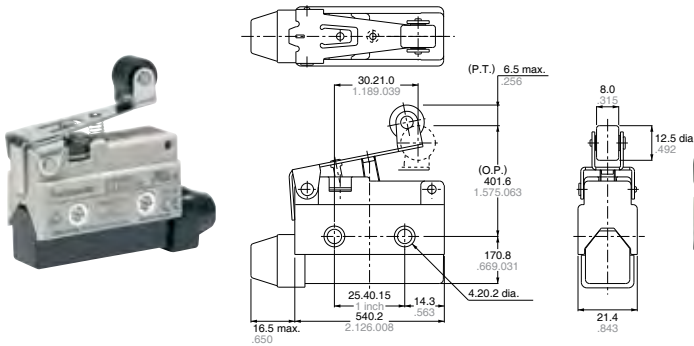


General tolerance:  $\pm 0.4 \pm .016$

Short roller lever type

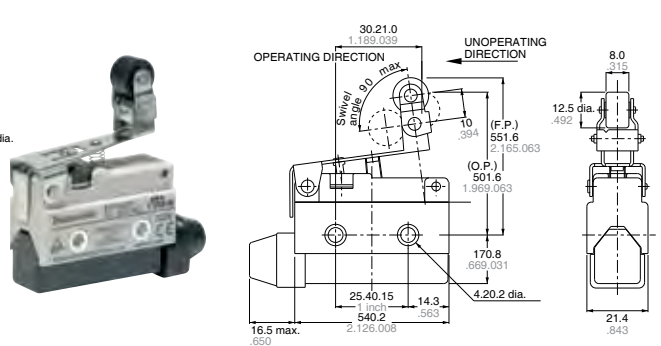
mm inch

AZ7141



One-way short roller lever type

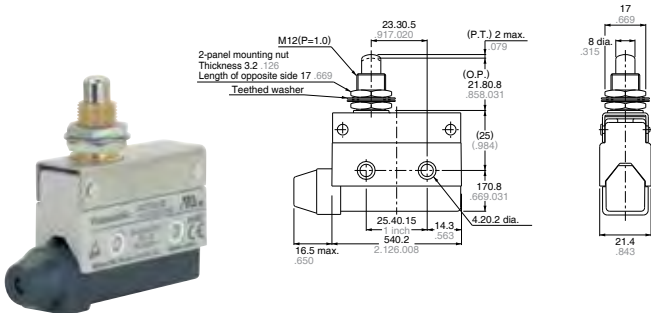
AZ7144



General tolerance:  $\pm 0.4 \pm .016$

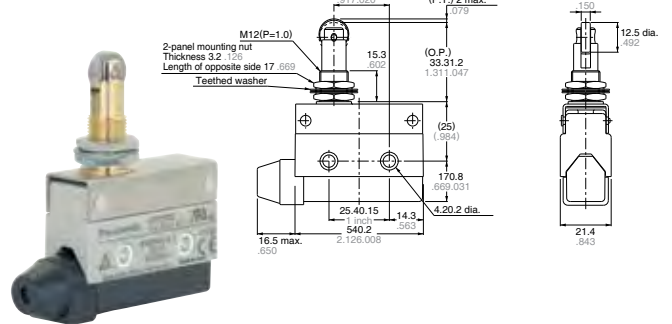
Panel mount push plunger type

AZ7310



Panel mount roller plunger type

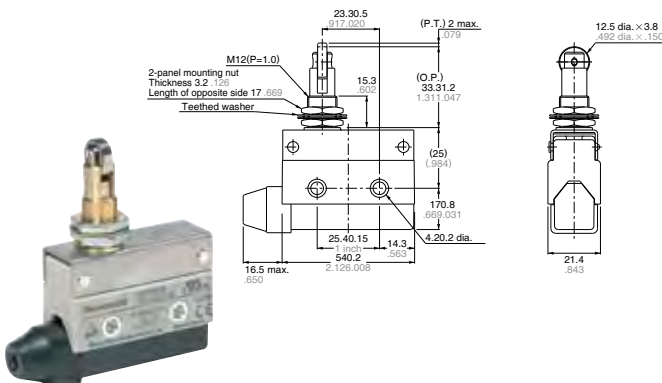
AZ7311



General tolerance:  $\pm 0.4 \pm .016$

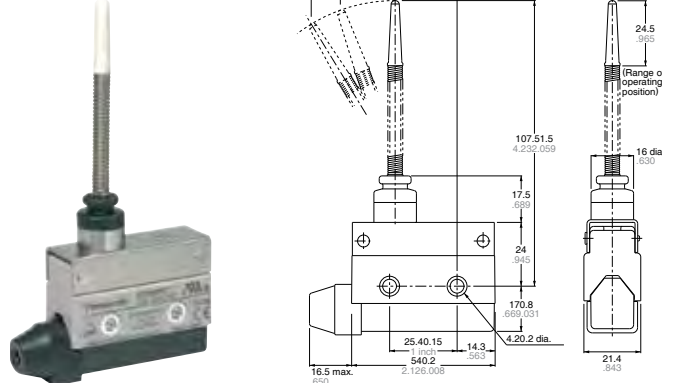
Panel mount cross roller plunger type

AZ7312



Flexible rod type

AZ7166



General tolerance:  $\pm 0.4 \pm .016$



# AZ8

## compact size limit switches

- › Compact design
- › Au-clad contacts that can even use low level circuit and little chattering and bouncing
- › Easy wiring with full-open terminals
- › Mounting are possible to both front and back
- › Dust-proof, waterproof, oil resistant con-struction (IP64)
- › Zinc coated\* type available (bolts and nuts)

\*roller arm type

## Product type

### ■ Standard Type

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

Note: When ordering an overseas-specified product, refer to the Overseas Standards given below.

### Foreign standards

Standard	Applicable product	Part No.
UL	File No. : E122222 Ratings : 5A 250V AC Pilot duty B300 Product type : Standard model	Order by standard part No. However, add "9" to the end of the part No.
CSA	File No. : LR55880 Ratings : 5A 250V AC Pilot duty B300 Product type : Standard model	
TÜV	File No. : J9551203 Ratings : AC-15 2A/250V~ Product type : Standard model only	Order by standard part No.

### Option

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

### Protective construction

Protective construction	VL Mini Limit SW	VL Mini Limit SW (with indicator)
IEC		
IP60	■	■
IP64	■	■

## 1. Rating

### ■ Standard type

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

## 2. Characteristics

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

## 3. EN60947-5-1 performance

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

## 4. Operating characteristics

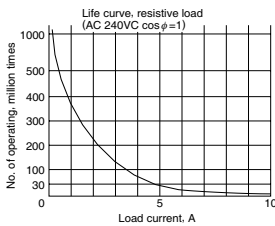
Characteristics Actuator	O.F. (N {gfl}) max.	R.F. (N {gfl}) min.	Pretravel (P.T.), max. mm inch	Movement Differential (M.D.), max. mm inch	Overtravel (O.T.), min. mm inch	Totaltravel (T.T.), min. mm inch
Push plunger	8.83 {900}	1.47 {150}	1.5 .059	0.7 .028	4 .028	5.5 .217
Roller plunger						
Cross roller plunger						
Roller arm	5.88 {600}	0.49 {50}	20°	10°	75°	95°
Adjustable roller arm	7.84 {800}~3.35 {342}	0.49 {50}~0.21 {21}	20°	10°	75°	95°
Adjustable rod	7.84 {800}~1.99 {203}	0.49 {50}~0.12 {12}	20°	10°	75°	95°
Flexible spring wire	0.88 {90}	-	30 (1.181)	-	20 (.787)	50 (1.969)
Remote wire control plunger	19.61 {2,000}~ 24.52 {2,500}*	1.96 {200}~ 1.96 {200}*	1.5 .059 4 .157*	0.7 .028 2.0 .079*	4.5 .177 2.0 .079*	6 .236 6 .236*

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

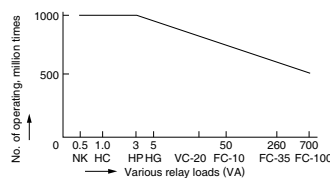
- Notes:
1. Keep the total travel values in the specified range. Otherwise the actuator force may rise to several times the operating force, resulting in a mechanical failure or much shorter service life.
  2. For the operating characteristics, refer to the TECHNICAL INFORMATION.

## Data

### 1. Life curve



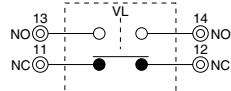
### 2. Actual load life curve (relay coil load)



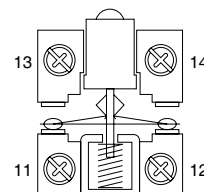
Note: The FC magnetic contactor series is 200V AC. The K is 2 Form C 24V DC type.

## Wiring diagramm

### Output circuit



### Terminal



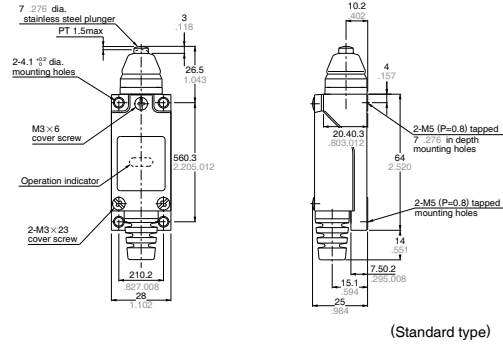
Push plunger type

■ Standard type

AZ8111CEJ



mm inch General tolerance:  $\pm 0.4 \pm .016$



(Standard type)

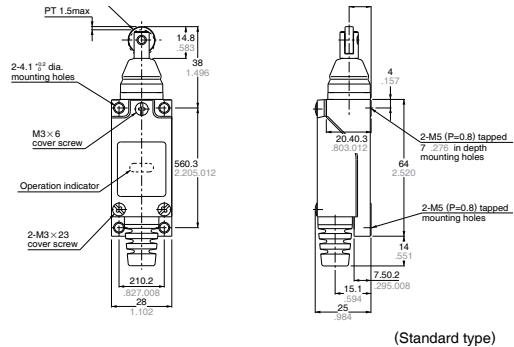
Roller plunger type

■ Standard type

AZ8112CEJ



mm inch General tolerance:  $\pm 0.4 \pm .016$



(Standard type)

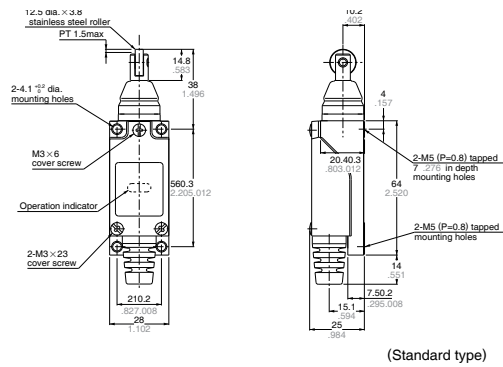
Cross roller plunger type

■ Standard type

AZ8122CEJ



mm inch General tolerance:  $\pm 0.4 \pm .016$



(Standard type)

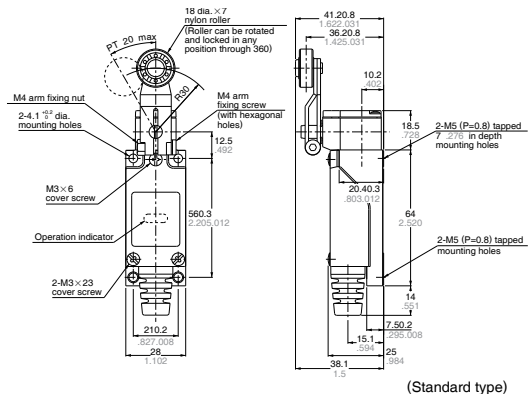
Roller arm type

■ Standard type

AZ8104CEJ



mm inch General tolerance:  $\pm 0.4 \pm .016$



(Standard type)

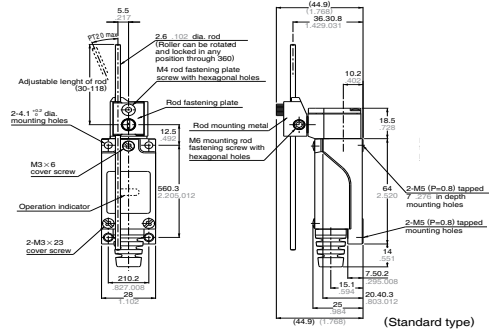
**Adjustable rod type**

**Standard type**

AZ8107CEJ



mm inch General tolerance:  $\pm 0.4 \pm .016$



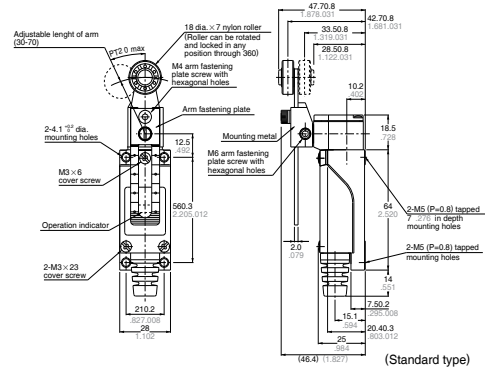
**Adjustable roller arm type**

**Standard type**

AZ8108CEJ



mm inch General tolerance:  $\pm 0.4 \pm .016$



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

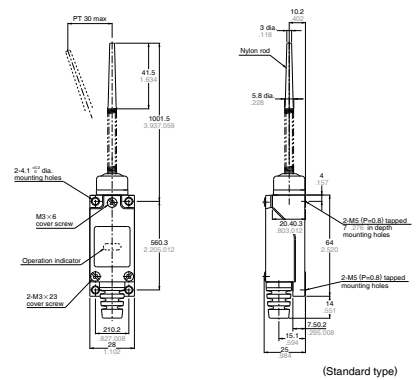
**Flexible rod type**

**Standard type**

AZ8169CEJ



mm inch General tolerance:  $\pm 0.4 \pm .016$



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

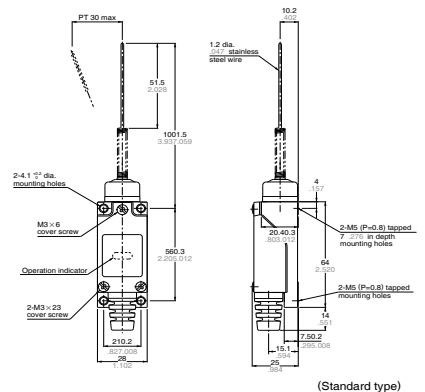
**Spring wire type**

**Standard type**

AZ8169CEJ



mm inch General tolerance:  $\pm 0.4 \pm .016$



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



### Option

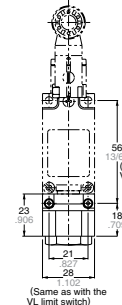
#### VL conduit adaptor



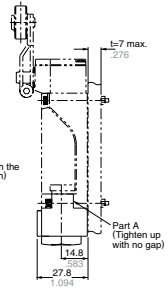
AZ8801



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



(Front)



(Side)

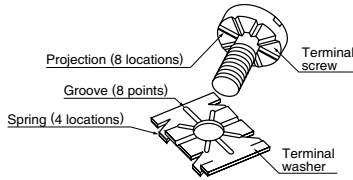
Cable treatment  
Ordinary terminal

#### Applicable wire

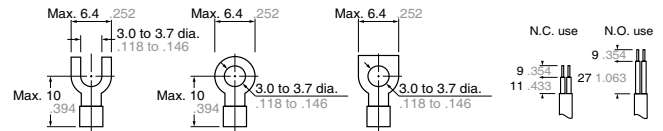
Electric wire name	Finished outside diameter
Vinyl cabtire cord (VCTF)	8.7 to 11 dia.
Vinyl cabtire cable (VCT)	.343 to .433 dia.

#### Wiring mm inch

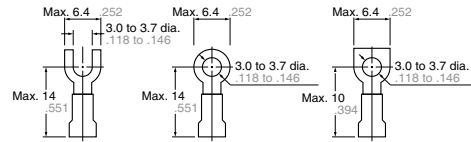
- › Insulation distance more than 6.4mm 252inch for wiring and live parts
- › Special assembly screws
- › Grounding is available



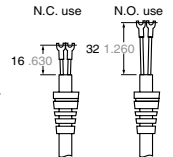
#### Applicable fasten terminal



#### With insulated grip

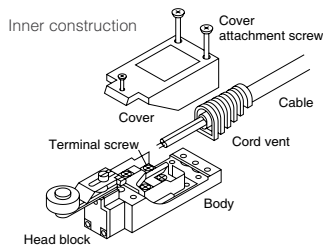


#### Fasten terminal



#### Applicable wire

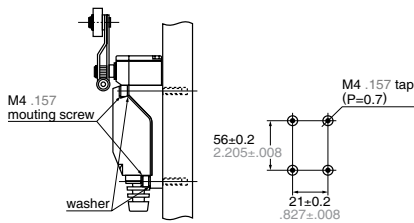
Wire name	Applicable wire		
	Wire-strand	Conductor	Finished outside diameter
Vinyl cabtire cord (VCTF)	2-wire	0.75mm <sup>2</sup> •1.25mm <sup>2</sup>	Round shape 6 dia. to 9 dia.
	3-wire	2.0mm <sup>2</sup>	
	4-wire	0.75mm <sup>2</sup> •1.25mm <sup>2</sup>	
Vinyl cabtire cable (VCT)	2-wire	0.75mm <sup>2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



## Mounting dimensions

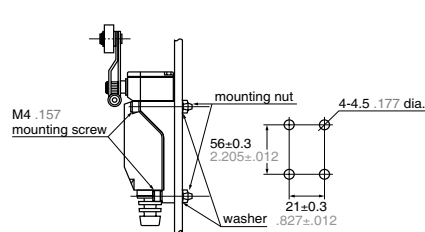
mm inch

### Surface mounting



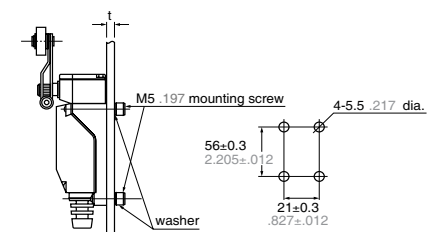
Depth of screw holes &gt; 15mm .591inch

### Through hole mounting



Thickness of panel &lt; 5mm .197inch

### Rear mounting

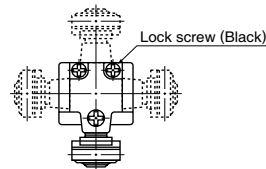


Length of bolt &lt; panel thickness t+7mm .276inch

## Head direction change

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

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



## Cautions

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

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

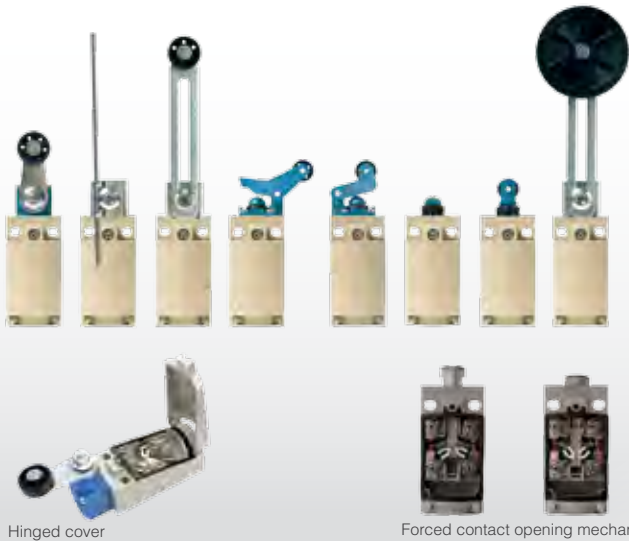
- › Because these switches are not of immersion protected construction, their use in water or oil should be avoided. Also, locations where water or oil can normally impinge upon the switch or where there is an excessive accumulation of dust should be avoided.

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

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

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

- › Mounting  
Three cover screws should be fasten uniformly. The rubber for opening cord should be corrected as normal condition after connecting the wire.



Hinged cover

Forced contact opening mechanism

# AZD1

## compact size limit switches

- Forced contact opening mechanism  
When the limit switch is ON, the contact is forced open by the N.C. contact through the cam movement.
- Conforms to EN standard (EN50047)
- Uses a unit system  
Any combination of actuator, head block, and unit block is possible. The units are also sold separately, making maintenance easy.
- Hinged cover for easy wiring
- Protective construction (IP67)
- Wide operating temperature range (-30°C to +80°C -22°F to +176°F)
- Conforms to UL/CSA, CE, TÜV standards

## Product type

### 1. Basic products

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

- Notes:
1. Type of conduit size: PF type (G1/2), PG type (PG13.5)
  2. PG is a size standard used in Europe.
  3. The roller arm and adjustable roller arm are available with metal rollers on a custom-made basis. Please inquire.
  4. Cadmium free contact types are available on a custom-made basis. Please add an "F" to the end of the part number when ordering.

### 3. Conduit connector

Product name	Part No.
PF type conduit connector	AZD1830

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

## Foreign standards

### 1. Rating

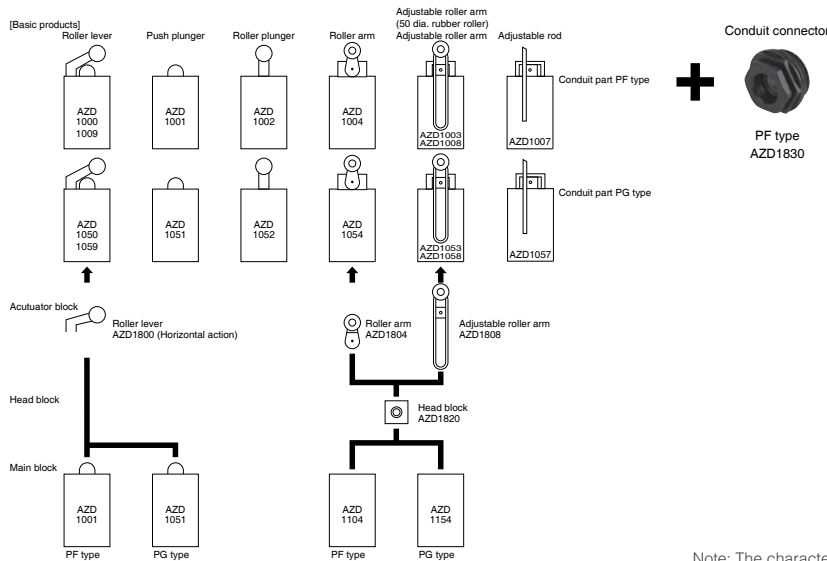
Standards	Applicable product	Part No.
UL	File No. : E122222 Ratings : 6A 380V AC Pilot duty A300 Product type : All models	Order by standard part No.
CSA	File No. : LR55880 Ratings : 6A 380V AC Pilot duty A300 Product type : All models	
TÜV	File No. : J9551205 Ratings : AC-15 2A/250V~ Pilot duty A300 Product type : All models	

## Data

### 2. Blocks

Product name		Part No.	
Type of actuators	Roller lever	AZD1800	
	Roller arm	AZD1804	
	Adjustable roller arm	AZD1808	
Head block		AZD1820	
Main block	For plunger	PF type	AZD1001
		PG type	AZD1051
	For arm type	PF type	AZD1104
		PG type	AZD1154

## Product combination



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

## Specifications

### 1. Rating

Voltage	Load	Resistive load (cos φ ≈ 1)	Inductive load (cos φ ≈ 0.4)
	AC	125V	6A
	250V	6A	6A
	380V	6A	3A
DC	24V	5A	2.5A
	60V	1.5A	1.5A
	220V	0.3A	0.3A

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

### 3. EN60947-5-1 performance

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

Note) \* The ratings, performance and operating characteristics are based on the basic model.

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

### 5. Protective characteristics

Protective construction	DL mini limit switches
IEC	
IP60	■
IP64	■
IP67	■ (Note 1)

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

The switches are compatible with DIN EN50047.

### 2. Characteristics

Contact arrangement	1a1b	
Initial contact resistance, max.	25mΩ (By voltage drop of 5 to 6 V DC 1A)	
Contact material	Silver alloy	
Initial insulation resistance (At 500V DC)	Min. 100MΩ	
Initial breakdown voltage	1,000Vrms for 1 min between non-consecutive terminals 2,500Vrms for 1 min between dead metal parts and each terminal 2,500Vrms for 1 min between ground and each terminal	
Shock resistance	Functional	Max. 294 m/s <sup>2</sup> (equivalent 30G) (Note 1)
	Destructive	Max. 980 m/s <sup>2</sup> (equivalent 100G)
Vibration resistance	10 to 55Hz, double amplitude of 1.5mm	
Expected life (min. operations)	Mechanical	10 <sup>7</sup> (at 120 cpm)
	Electrical	1.5×10 <sup>5</sup> (at 20 cpm, 6A 380V AC resistive load)
Ambient temperature	-30 to +80°C -22°F to +176°F (but not in a frozen environment)	
Ambient humidity	Max. 95%R.H. (without dew at 40°C 104°F)	
Max. operating speed	120 cpm	

Note: The ratings, performance and operating characteristics are based on the basic model.

Note 1: This value applies when the arm length of the adjustable roller arm (50 dia. rubber roller) is 70 mm or less.

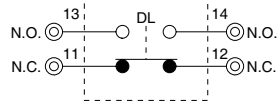
### 4. Operating characteristics

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

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

WIRING DIAGRAM

Internal circuit



Terminals



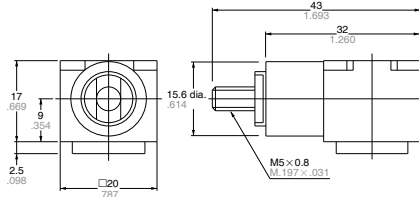
mm inch

DIMENSIONS

Head block



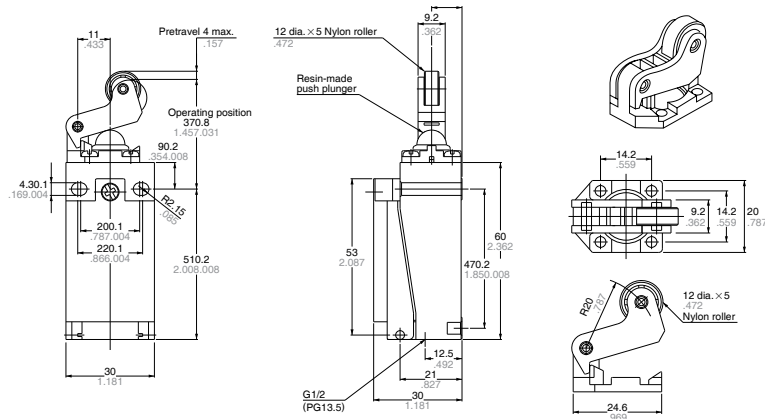
AZD1820



General tolerance:  $\pm 0.4 \pm .016$

Roller lever type

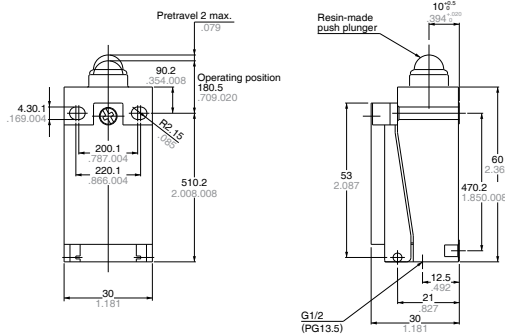
AZD1000  
AZD1050



General tolerance:  $\pm 0.4 \pm .016$

Push plunger type

AZD1001  
AZD1051

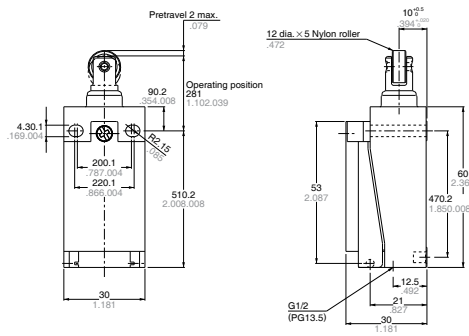


General tolerance:  $\pm 0.4 \pm .016$

Roller plunger type

mm inch

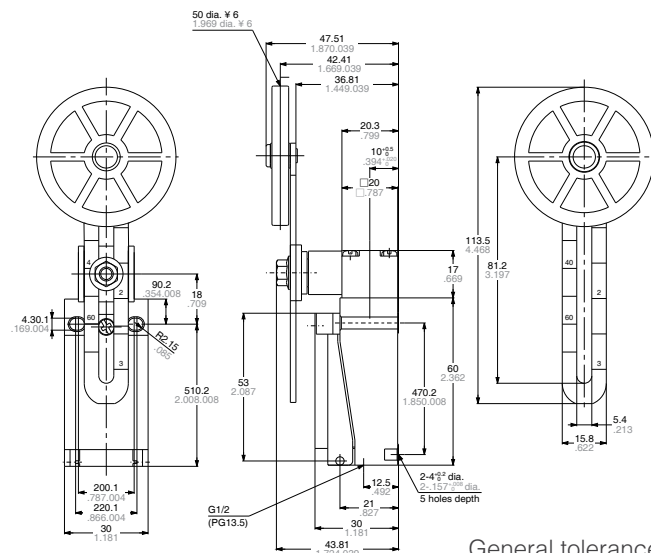
AZD1002  
AZD1052



General tolerance: ±0.4 ±.016

Adjustable roller arm (50 dia. rubber roller)

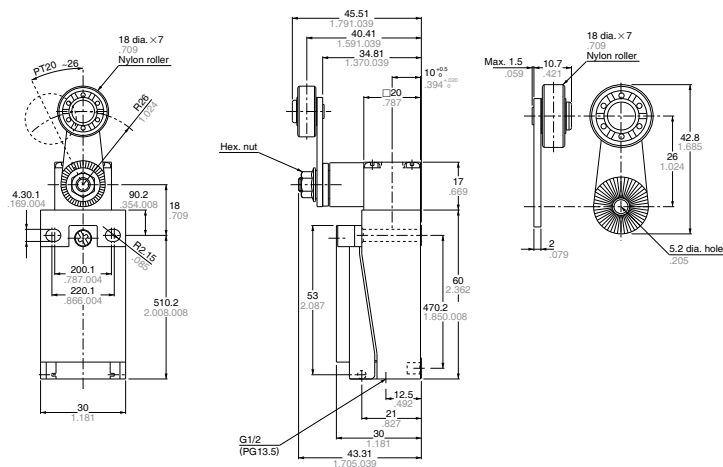
AZD1003  
AZD1053



General tolerance: ±0.4 ±.016

Roller arm type

AZD1004  
AZD1054

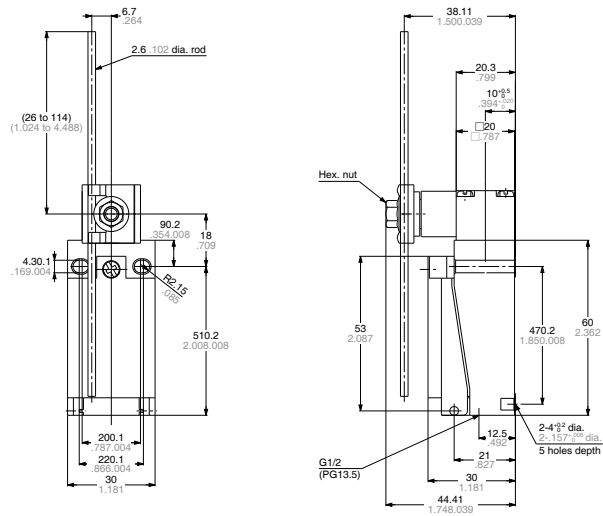


General tolerance: ±0.4 ±.016

Adjustable rod (2.6 dia.)

mm inch

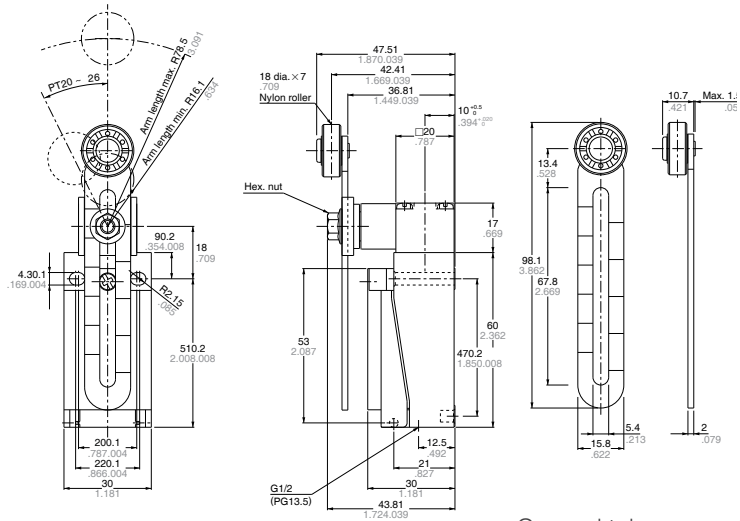
AZD1007  
AZD1057



General tolerance:  $\pm 0.4 \pm .016$

Adjustable roller arm type

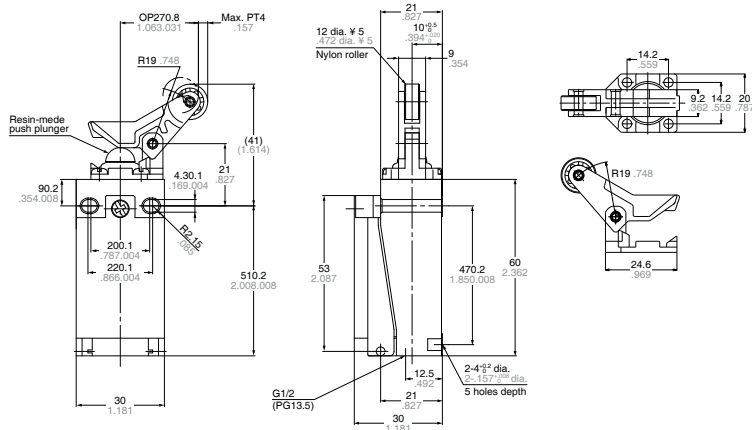
AZD1008  
AZD1058



General tolerance:  $\pm 0.4 \pm .016$

Roller lever (vertical action)

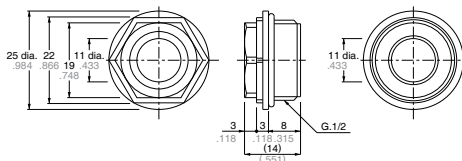
AZD1009  
AZD1059



General tolerance:  $\pm 0.4 \pm .016$

### Conduit connector (PF type)

AZD1830

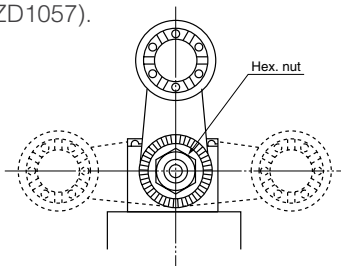


Rubber seal in-side diameter	Adaptable cable outer diameter	
	Min.	Max.
9 dia. (.354)	7.5 dia. (.295)	9.5 dia. (.374)
11 dia. (.433)	9 dia. (.354)	11 dia. (.433)

General tolerance:  $\pm 0.5 \pm .020$

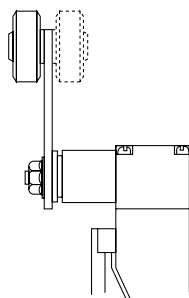
### Arm Setting Position

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



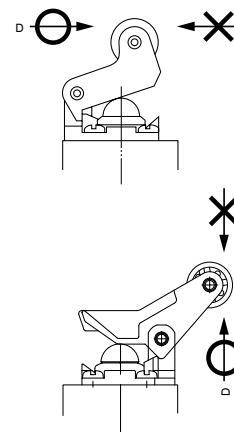
### Roller Direction

The roller of the arm types (AZD1004, AZD1008, AZD1054 and AZD1058) can be mounted on the front and rear (dotted line in the figure) sides of the switch, as shown below. (Positioned on the front side at delivery.) To set the roller on the rear side, remove the arm fastening hex. nut, and reinsert the arm so as to face the roller in the rear direction. Then, retighten the hex. nut.



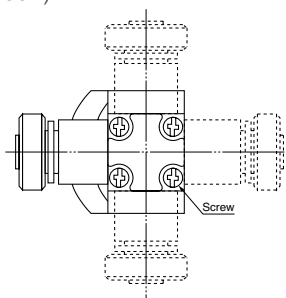
### Roller Lever Direction

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



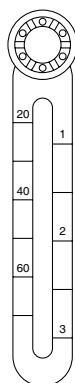
### Head Direction

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

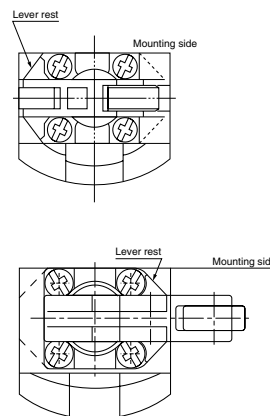


### Adjustable Arm Length

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



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





### Open and close the cover

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

### Adjustable Rod Length

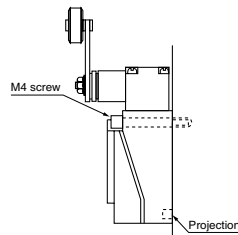
To adjust the length of the variable rod, slightly loosen the hex. nut that is securing the rod and then change the length. After making the change, tighten the hex. nut keeping within a tightening torque of 0.98 and 1.37 Nm. Over tightening might damage the rod presser plate.

### CAUTIONS

- 1) This model uses silver terminals. Therefore, if used at relatively low frequencies for long periods of time, or if used with very small loads, the oxidation that forms on the contact surfaces will not wear away and eventually cause improper contact. For such applications, use limit switches with gold/metal contacts (e.g. VL limit switches) or ones meant for small loads (e.g. HL limit switches).
- 2) This switch is not designed for under-water use. Do not use the unit under-water.

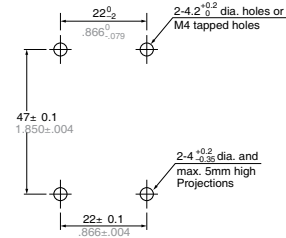
### Mounting

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



(Terminal with insulating grip)

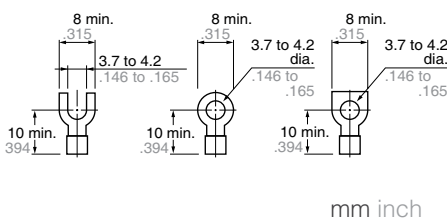
### Mounting dimensions



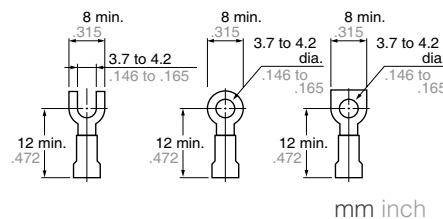
- 3) Do not use the switch where it may come in direct contact with organic solvents, strong acids, strong alkaline liquids or steam, or in atmospheres containing flammable or corrosive gases.
- 4) For the arm type (roller arm type, adjustable roller arm type), the arm can only be set at 15° interval.
- 5) To improve reliability during actual use, it is recommended that the operation be checked under installation conditions.
- 6) If O.T. is too big, the life of limit switch will be shortened switching fric-

- tion. Use it with enough margin of O.T. 70% of O.T. standard value will be good for use.
- 7) Do not use the switch in a silicon atmosphere. Case should be taken where organic silicon rubber, adhesive, sealing material, oil, grease or lead wire generates silicon.
- 8) When wiring, do not connect the lead wires directly to the terminals, but use the crimp terminals and tighten them to a torque of 0.39 to 0.59 Nm.

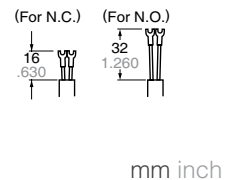
Adaptable crimp terminal  
(Bare terminal)



(Terminal with insulating grip)



When crimp terminals are used.



## CAUTIONS

9) After wiring, when attaching the cover to the switch body, be careful that the cover seal rubber is set normally on it and tighten the screw to a torque of 0.20 to 0.39 Nm. If you tighten the screw strongly, the thread is broken.

10) Safety mechanism is adopted which secures positive break under such abnormal conditions like contact welding, spring break, etc. In case of using the safety mechanism which breaks welded N.C. contact, conform to the conditions as shown below.

(For the value below of adjustable rod, the length of the rod shows the value when length of rod is set at 26 mm same as the roller arm. The value of adjustable roller arm (50 dia. rubber roller) type shows the value when arm length is set at 40 mm.)

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

11) To protect against entry of foreign matter from the outside, we recommend sealing as much as possible using conduit connectors.

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

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

you intend to use a switch in environments such as these.

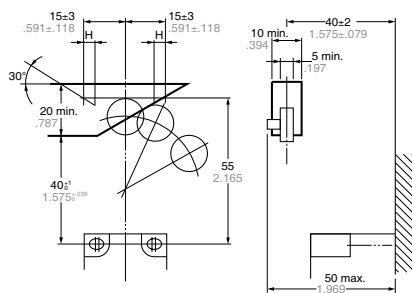
14) Do not store in places where organic gas might be generated or in places of high dust content or high humidity.

15) Since the roller section of the roller arm (50 mm dia. rubber roller type) (AZD1003 and AZD1053) is heavy, the contacts may reverse due to inertia of the roller section which easily leads to erroneous operation.

If there is a possibility of exposure to shock, please make considerations for safety, for example, by providing a redundant circuit so that danger can be avoided in the event that the contacts reverse and cause erroneous operation.

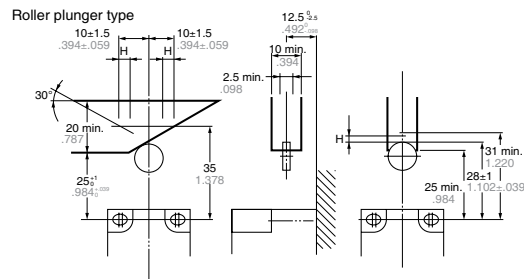
## Design of operation dog

### Roller arm type



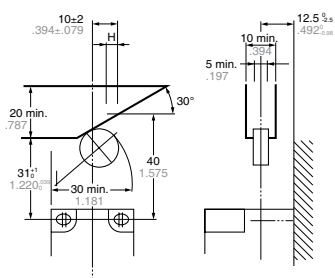
(H: Hysteresis)

### Roller plunger type



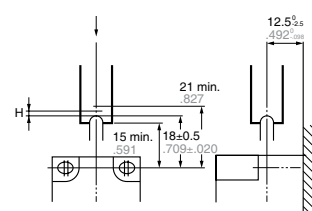
(H: Hysteresis)

### Roller lever type



(H: Hysteresis)

### Push plunger type



(H: Hysteresis)

# AZC1

safeguarded by magnet built-in detector switch



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

## Product type

Product name	Specifications				Part No.
	Contact construction	Case color	Sustainable weight sustainability	Packaging	
Magnetlimit 1 Form A (ON when gate is closed)	1a	Yellow	3kg type (29.4N {3kgf}) (Note: 1)	-	AZC11013Y
		Brown		-	AZC11013A
		Gray		-	AZC11013H
Magnetlimit 1 Form B (ON when gate is open)	Yellow	-		AZC11113Y	
	Brown	-		AZC11113A	
	Gray	-		AZC11113H	
Options	Metal plate	Metal plate (13mm u 60mm u 1.6mm .512inch u 2.362inch u .063inch)		AZC1801	

Notes: 1. The unit comes with an metal plate enclosed.

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

## Specifications

### 1. Ratings

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

Notes: 1. Inductive load is a minimum 0.4 (AC) and time duration is maximum 7ms (DC).

2. Lamp load has 10 times the inrush current.  
3. Minute load ratings: 5mA 6V DC, 1mA 24V DC.

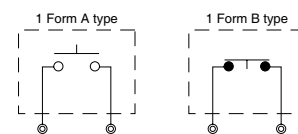
### 2. Switch operating features

Operating force (O.F.) (N{gf})	3.43 {350} max.
Return force (R.F.) (N{gf})	0.49 {50} min.
Pretravel (P.T.)	1.8mm .071inch max.
Movement differential (M.D.)	0.2 to 0.8
Release position (R.P.)	4.0mm .157inch max.

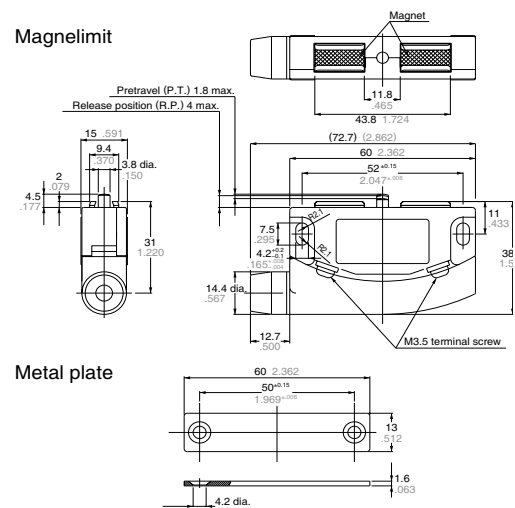
### 3. Capabilities overview

Electrical capabilities	Insulation resistance (initial)	Min. 100Ω (measured at 500V DC insulation resistance)
	Voltage resistance	Contact distance: AC 1000V/1 min. (initial) Distance between each pin and uncharged metal parts: AC 2100V/1 min. Distance between each pin and earth: AC 2100V/1 min.
Life	Mechanical life	Min. 100 thousand times (ON/OFF frequency 60 times/min.)
	Electrical life	Min. 50 thousand times (resistance load AC 250V 5A) Min. 30 thousand times (lamp load AC 125V 1.5V) ON/OFF frequency 20 times/min.
Protective capabilities		IP40
Usage conditions	Ambient temperature	-20 to +80°C -4 to 176°F (but not in a frozen environment.)
	Ambient humidity	Max. 95% RH
	Tolerable operating frequency	Mechanical: 60 times/min. Electrical: 20 times/min.

## Output circuit diagramm



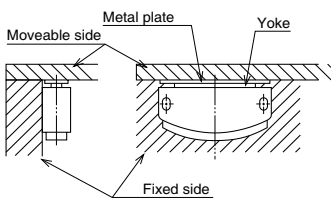
## Dimensions mm inch



## Metal plate attachment

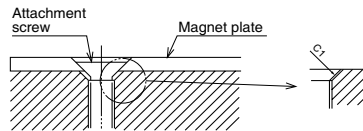
### ■ Attaching the main unit

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

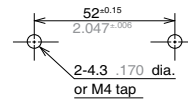


### ■ Attaching the metal plate

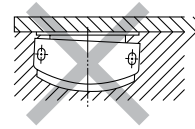
1. Using an M3 dish screw, attach to the side opposite from the yoke. Pay particular attention that the head of the attached screw does not protrude further than the surface of the metal plate (if using wooden screws, a call of 2.7 is optimum).
2. If the adhesive side is magnetic (metal plate), the adhesion may prove ineffective. Further, since the sustainability varies depending on the board thickness and the surface processing (paint, etc.), it is best to check beforehand.



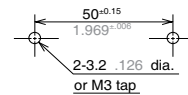
Unit attachment hole processing dimensions



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



Adhesion board hole processing dimensions



(Fit a C1 panel to the inlet vent)

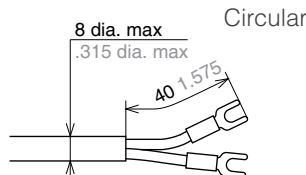
## SUITABLE WIRING

### ■ Maximum external dimensions upon completion

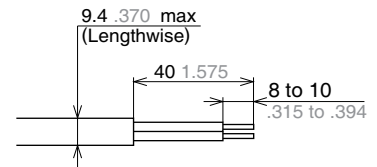
Circular: 8mm dia. .315 inch dia. max.  
 Flat: Lengthwise 9.4mm .370inch max.  
 (VVF 2 cores, conductor radius 1.6 dia.)

### ■ Wiring processing dimensions

Refer to the diagram below for the wiring processing dimensions



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

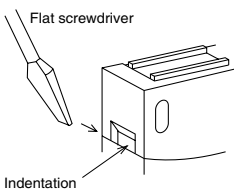


## WIRING

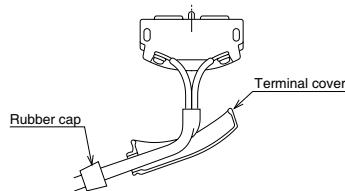
- Terminal uses a M3.5 angle washer attachment.
- During wiring work, do not connect the lead wire directly to the terminal, but via a crimp contact. However, this excludes single wiring.
- Wiring by solder should be avoided.

### 1. Wiring method

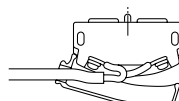
Insert a flat screwdriver into the indentation of the product side, and remove the terminal cover.



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



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



## CAUTIONS FOR USE

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

## 1. UL specifications



UL is an abbreviation of Underwriter's Laboratories Inc., a non-profit organization that was established by an American disaster insurance conference in 1894. At UL, products that meet the requirements of the manufacturers are inspected,

and the announcing of specifications and safety standards for products across a wide range of fields such as crime prevention, radiation exposure prevention, automatic controls, scientific safety levels, safety of electrical equipment, fire prevention, and gas and oil are announced. UL publishes a list of those products which pass their specifications and work to facilitate ease of use on the part of the users. The safety standards set by UL cover all events that may occur during the use of a product, across a very wide range, thoroughly. The reliability of products bearing the UL mark is extremely high, and in many American states and cities, there are legal restrictions on the sale of products not bearing the mark, and even in unregulated states, such products are treated as inferior.



## 2. CSA specifications



An abbreviation for the Canadian Standard Association, this body possesses the authority to determine whether or not electrical products conform to their standards and to set standards for manufacturing products that are used by the general public. The CSA has enormous public trust and authority, and nearly all of the Canadian provinces are required to receive CSA approval in order to sell electrical products within their province, which the CSA enforces. Consequently, electrical products exported from Japan to Canada must receive CSA approval and display the CSA mark; if not, the product in question will not be legally approved valid as VDE approval.

## 3. TÜV (Technischer Überwachungs-Verein)



The "German Boiler Monitoring Association" which was inaugurated in 1875 with the aim of preventing boiler accidents, is the parent body of this civil non-profit, independent organization. The TÜV has the unique characteristic of existing as an independent body in each of Germany 14 states (TÜV Rheinland, TÜV Bayern's etc.) The TÜV conducts wide-ranging inspections of factory plants, facilities, etc. and is entrusted by the government to conduct inspection and approval work on electrical products as well, mainly based upon EN specifications.

TÜV approval is valid in all of Germany's 14 states regardless of which TÜV body issued it, and this approval is as equally valid as VDE approval.

## 4. Pilot Duty

One of the specifications in the "UL508 Industrial Control Equipment" regulations at UL (Underwriters Laboratories Inc.), has to do with the grade of contact control capacity by NEMA (National Electrical Manufacturers Association) standards. By obtaining both UL and CSA approval for this grade, the product becomes authorized publicly.

### Pilot Duty A300

AC applied voltage [V]	Electrification current [A]	Input power [A]	Breaker power [A]	[VA]	
				During input	During breaker
120	10	60	6	7,200	720
240		30	3	7,200	720

### Pilot Duty B300


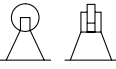

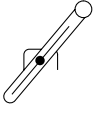


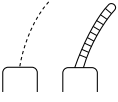
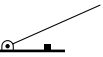
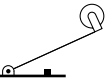


AC applied voltage [V]	Electrification current [A]	Input power [A]	Breaker power [A]	[VA]	
				During input	During breaker
120	5	30	3	3,600	360
240		15	1.5	3,600	360

### Pilot Duty C300

AC applied voltage [V]	Electrification current [A]	Input power [A]	Breaker power [A]	[VA]	
				During input	During breaker
120	2.5	1.5	1.5	1,800	180
240		7.5	0.7	1,800	180

## SUMMARY OF SAFETY STANDARDS RECOGNITION: LIMIT SWITCHES

Product name		UL recognized		CSA certified		TÜV approval	
		File No.	Approved ratings	File No.	Approved ratings	File No.	Approved ratings
ML limit switches	Standard model	E122222	10A 250V AC	LR55880	10A 250V AC	J9551204	AC-15 2A 250V~
	Terminal mold model	-	-	-	-	-	-
QL limit switches		E122222	5A 250V AC	LR55880	5A 250V AC	-	-
VL limit switches	Standard model	E122222	5A 250V AC Pilot duty B300	LR55880	5A 250V AC Pilot duty B300	J9551203	AC-15 2A 250V~
DL limit switches		E122222	6A 380V AC Pilot duty A300	LR55880	6A 380V AC Pilot duty A300	J9551205	AC-15 2A 250V~
Magnelimit		E122222	5A 250V AC Pilot duty B300	LR55880	5A 250V AC Pilot duty B300	-	-

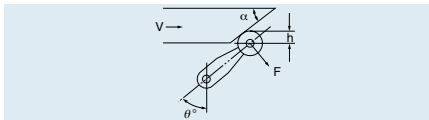
Type	Classification	Pretravel (P.T.)	Overtravel (O.T.)	Operating force (O.F.)	Accuracy	Vibration shock	Characteristics
	Push plunger type	Small	Medium	Large	Excellent	Excellent	High-level accuracy gives firm detection for position fixing, etc., by using perpendicular movement.
	Roller plunger type (includes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

## Design of operating dog and operating speed

Pay attention to the following points when designing the dog for limit switch operation.

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

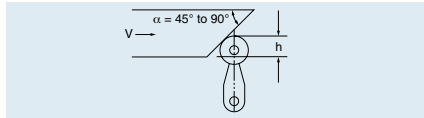
### 3. $0.5m/s < V \leq 2m/s$



$\alpha$	$V_{max}$ (m/s)
40°	0.7
35°	0.9
30°	1.3
25°	2.0

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

### 1. $V \leq 0.2m/s$

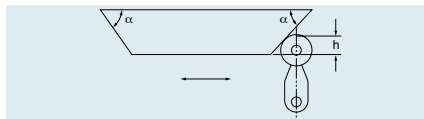


$\alpha$	$V_{max}$ (m/s)
45°	0.2
65°	0.1
60 to 90°	0.05

When  $V \leq 0.2m/s$ , set the arm to perpendicular and set the arm rise angle to between 45° and 90°. If the dog rise angle is reduced, the maximum tolerable speed is increased.

As a rule,  $\alpha = 45^\circ$  is optimum.

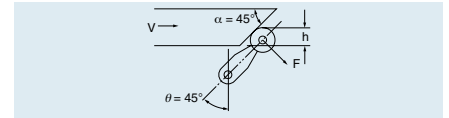
### 4. Overriding the dog ( $V \leq 0.2m/s$ )



$\alpha$	$V_{max}$ (m/s)
45°	0.2
65°	0.1
60 to 90°	0.05

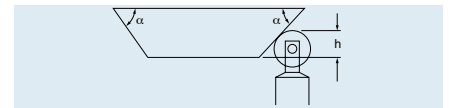
If overriding the dog, set the arm perpendicular, so that  $\alpha = 45^\circ$ . If the dog angle is reduced, the tolerable speed is increased.

### 2. $V \leq 0.5m/s$



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

### 5. Roller plunger type



$\alpha$	$V_{max}$ (m/s)	$V_{max}$ (m/s)
45°	0.2	(0.5 to 0.7) T.T.
65°	0.1	(0.6 to 0.8) T.T.

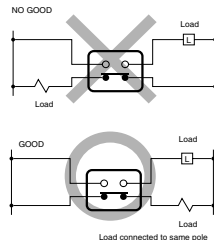
Even if overriding the dog, set the forwards and rearwards motion exactly the same, and avoid any settings that make the actuator accelerate rapidly from the dog.

## Protection circuit

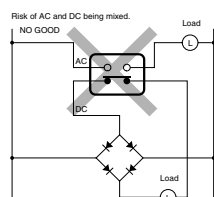
- 1) The ON/OFF circuit for the guidance load may suffer contact damage due to surges or inrushes when the power is turned either ON or OFF. Consequently, insertion of a protective circuit as per the following diagram is recommended, in order to protect the contacts.

Circuit	Caution for use
	(1) r must be a minimum of 10Ω; (2) When using AC power: ○ Impossible when R impedance is large. W Possible when c, r impedance is sufficiently small compared with R impedance.
	Can be used with both AC and DC as appropriate. r: R C: 0.1 μF
	(1) Dedicated DC use. (2) AC is impossible
	Can be used with both AC and DC as appropriate.

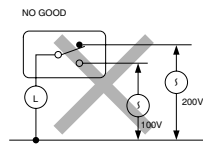
- 2) Do not connect either irregular poles or power sources to a switch contact. Power connection examples (irregular pole connection)



Example of unsuitable power connection (abnormal power connection)



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



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

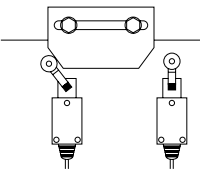
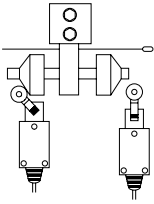
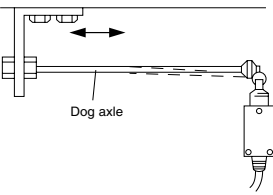
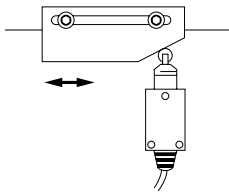
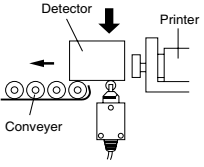
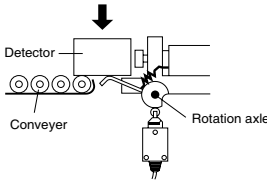
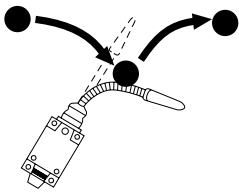
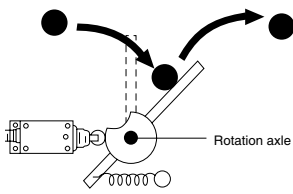
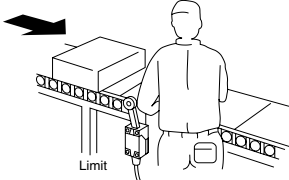
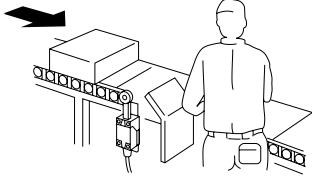
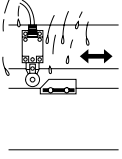
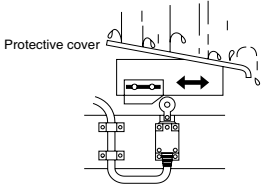
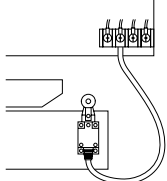
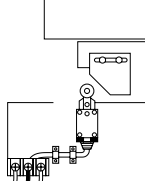
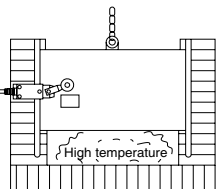
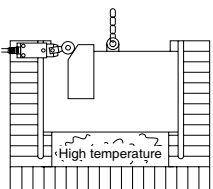
## Cautions for use

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

## Precautions relating to the installation environment

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



Poor design	Improved design	Explanation
		<ul style="list-style-type: none"> <li>› Problem <ul style="list-style-type: none"> <li>» Dog adjustment is difficult.</li> </ul> </li> <li>› Solution <ul style="list-style-type: none"> <li>» Separate each one until the dog can be adjusted.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>› Problem <ul style="list-style-type: none"> <li>» The dog axle is too long, and slips out during operation.</li> <li>» For this reason, the limit switch operating position slips.</li> </ul> </li> <li>› Solution <ul style="list-style-type: none"> <li>» Firmly fix the dog plate to the base.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>› Problem <ul style="list-style-type: none"> <li>» The detector sinks, applying force to the limit switch.</li> <li>» The limit switch O.T. cannot be set.</li> </ul> </li> <li>› Solution <ul style="list-style-type: none"> <li>» Relieve the pressure using an additional actuator, and the O.T. can also be set.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>› Problem <ul style="list-style-type: none"> <li>» The area around the actuator coil is easily damaged.</li> <li>» Friction generated during operation.</li> </ul> </li> <li>› Solution <ul style="list-style-type: none"> <li>» Relieve the friction by installing an additional actuator.</li> <li>» Change the type of limit switch.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>› Problem <ul style="list-style-type: none"> <li>» Workers keep bumping the actuator.</li> </ul> </li> <li>› Solution <ul style="list-style-type: none"> <li>» Fit a protective cover to the side of the limit switch.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>› Problem <ul style="list-style-type: none"> <li>» Because the cord vent for the limit switch faces upwards, water droplets and so forth can easily penetrate the interior.</li> <li>» The cord is constantly moving and thus easily damaged.</li> </ul> </li> <li>› Solution <ul style="list-style-type: none"> <li>» Fix the limit switch position on the stationary board.</li> <li>» Fit a protective cover, so that water and oil cannot come into direct contact with the limit switch.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>› Problem <ul style="list-style-type: none"> <li>» The cord is not fixed, and gets pulled during work.</li> </ul> </li> <li>› Solution <ul style="list-style-type: none"> <li>» Change the limit switch position, and fix the cord.</li> <li>» Attach an adjustment mechanism to the dog.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>› Problem <ul style="list-style-type: none"> <li>» The limit switch is near a high-temperature area.</li> <li>» Dog adjustment is ineffective, and the dog keeps bumping the lever.</li> </ul> </li> <li>› Solution <ul style="list-style-type: none"> <li>» Move the limit switch further away.</li> <li>» Make dog adjustment possible, and change the shape of the unit.</li> </ul> </li> </ul>

Poor design	Improved design	Explanation
		<ul style="list-style-type: none"> <li>› Problem                             <ul style="list-style-type: none"> <li>» The detector is scratched.</li> <li>» Limit attachment adjustments are difficult.</li> <li>» The actuator is damaged.</li> <li>» Specimen transfer is impeded.</li> </ul> </li> <li>› Solution                             <ul style="list-style-type: none"> <li>» Fix the limit position to behind the dumper to solve the above problems.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>› Problem                             <ul style="list-style-type: none"> <li>» The transfer path of the detector is not fixed, and it keeps bumping the actuator.</li> <li>» The operating position is unstable.</li> <li>» The actuator is damaged.</li> </ul> </li> <li>› Solution                             <ul style="list-style-type: none"> <li>» Stabilize the operating position by fitting an additional actuator.</li> <li>» Make limit switch adjustment possible.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>› Problem                             <ul style="list-style-type: none"> <li>» Stroke adjustment ineffective.</li> <li>» Release the limit switch position, and ensure that the dog does not bump the lever.</li> </ul> </li> <li>› Solution                             <ul style="list-style-type: none"> <li>» Make dog adjustment possible.</li> <li>» Change the limit switch position, and sure that the dog does not bump the lever.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>› Problem                             <ul style="list-style-type: none"> <li>» The rubber shape is unsuitable (especially during release and strike release.)</li> <li>» Direction of limit switch attachment is unsuitable.</li> </ul> </li> <li>› Solution                             <ul style="list-style-type: none"> <li>» Render the rubber shape smooth.</li> <li>» Change the limit switch position.</li> </ul> </li> </ul>

## CE MARKINGS OVERVIEW

### LIMIT SWITCHES CONFORMING TO IE/IEC STANDARDS

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

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

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

### WHAT ARE EN STANDARDS?

An abbreviation of Norme Europeenne (in French), and called European Standards in English. Approval is by vote among the CEN/CENELEC member countries, and is a unified standards limited to EU member countries, but the contents conform to the international ISO/IEC standards. If the relevant EN standard does not exist, it is necessary to obtain approval based on the relevant IEC standard or, if the relevant IEC standard does not exist, the relevant standard from each country, such as VDE, BS, SEMKO, and so forth.

### CE MARKINGS & EC DIRECTIVES

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

and to maximize the merits of EU unification, the EC directives were issued concomitant to the birth of the EU.

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

### APPROPRIATE EC DIRECTIVES FOR CONTROL EQUIPMENT PRODUCTS

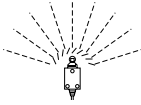
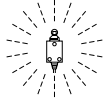
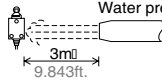
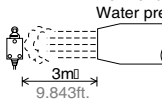
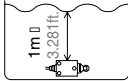
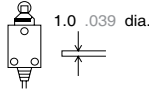
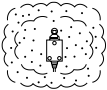

The main EC directives that are to do with machinery and electrical equipment are the machinery directive, the EMC directive, the low voltage directive, and the telecom directive. Although these directives have already been issued, the date of their enactment is different for each one. The machinery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

## Protective construction

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

### Protection against both water and solid objects

IP-

Level	Protection level	Protection level and test methods
0	No particular protection	—
3	Protection against sprays to 60° from the vertical.	 No damage incurred when sprayed with water continuously for 10 minutes at angles of up to 60° from the vertical.
4	Protection against water splashed from all directions	 No damage incurred when sprayed with water continuously for 10 minutes at angles of up to 180° from the perpendicular across a wide area.
5	Protection against jets of water	 Nozzle radius 6.3mm .248inch Water pressure 30kPa 3m 9.843ft. No damage incurred when sprayed with a jet of water for 3 minutes from all directions, as per the diagram on the left.
6	Protection against strong jets of water	 Nozzle radius 12.5mm .492inch Water pressure 100kPa 3m 9.843ft. Water does not invade the interior when sprayed with a jet of water for 3 minutes from all directions, as per the diagram on the left.
7	Protection against the effects of immersion	 1m 3.281ft. Water does not invade the interior during immersion for 30 minutes at a depth of 1m 3.281ft..
Level	Protection level	Protection level and test methods
4	Protection against solid objects exceeding 1mm .039inch in size.	 1.0 .039 dia. A hard wire 1mm dia. .039 inch dia. across cannot penetrate the inside.
5	Protection against dust. Limited ingress of dust permitted. (no harmful deposit)	 The unit is left for 8 hours in an atmosphere in which 2kg of talcum powder per 1m³ is floating. No damage incurred from talcum powder penetrating the inside.
6	Totally protected against ingress of dust	 The unit is left for 8 hours in an atmosphere in which 2kg of talcum powder per 1m³ is floating. The talcum powder does not penetrate the inside.

Notes:

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

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.



## Eco POWER METER

Panasonic Eco components help you to save energy and protect the environment, maintain and manage your energy-saving and environmental measures. Guards against wasted electricity.



## Timers and Counters

Panasonic's precision timers, counters, preset type counters and time switches are flexible, reliable and affordable. Moreover, you can be sure that the wide product range will always include the right device for your application.



## MAC-I safety switches

Panasonic's product portfolio of MAC-I switches contains a wide range of safety devices, all of which fulfill the newest safety standards and offer the best possible solutions for an increasingly demanding market.



## MAC-I standard switches

The MAC-I standard switches complete the Panasonic limit switch product range. They come in plastic or metal casings and in a large array of different widths and depths. The MAC-I standard switches are suitable for all types of applications, can even be used in harsh environments and in all types of industries (food, packing, lifting, automotive).



## Sensors

As a pioneering manufacturer of sensors, Panasonic provides high performance sensors for a wide range of applications, facilitating factory automation in various types of production lines, such as those used for the manufacturing of semiconductors.



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▶ <b>Austria</b>	<b>Panasonic Electric Works Austria GmbH</b>	Josef Madersperger Str. 2, 2362 Biedermannsdorf, Tel. +43 (0) 2236-26846, Fax +43 (0) 2236-46133 <a href="http://www.panasonic-electric-works.at">www.panasonic-electric-works.at</a>
	<b>Panasonic Industrial Devices Materials Europe GmbH</b>	Ennshafenstraße 30, 4470 Enns, Tel. +43 (0) 7223 883, Fax +43 (0) 7223 88333, <a href="http://www.panasonic-electronic-materials.com">www.panasonic-electronic-materials.com</a>
▶ <b>Benelux</b>	<b>Panasonic Electric Works Sales Western Europe B.V.</b>	De Rijn 4, (Postbus 211), 5684 PJ Best, (5680 AE Best), Netherlands, Tel. +31 (0) 499 372727, Fax +31 (0) 499 372185, <a href="http://www.panasonic-electric-works.nl">www.panasonic-electric-works.nl</a>
▶ <b>Czech Republic</b>	<b>Panasonic Electric Works Europe AG, organizační složka</b>	Administrative centre PLATINIUM, Veveří 3163/111, 616 00 Brno, Tel. +420 541 217 001, Fax +420 541 217 101, <a href="http://www.panasonic-electric-works.cz">www.panasonic-electric-works.cz</a>
▶ <b>France</b>	<b>Panasonic Electric Works Sales Western Europe B.V.</b>	Succursale française, 10, rue des petits ruisseaux, 91370 Verrières Le Buisson, Tél. +33 (0) 1 6013 5757, Fax +33 (0) 1 6013 5758, <a href="http://www.panasonic-electric-works.fr">www.panasonic-electric-works.fr</a>
▶ <b>Germany</b>	<b>Panasonic Electric Works Europe AG</b>	Robert-Koch-Straße 100, 85521 Ottobrunn, Tel. +49 89 45354-1000, Fax +49 89 45354-2111, <a href="http://www.panasonic-electric-works.de">www.panasonic-electric-works.de</a>
▶ <b>Hungary</b>	<b>Panasonic Electric Works Europe AG</b>	Magyarországi Közvetlen Kereskedelmi Képviselet, 1117 Budapest, Neumann János u. 1., Tel. +43 2236 26846-25, Mobile: +36 20 264 9896, Fax +43 2236 46133, <a href="http://www.panasonic-electric-works.hu">www.panasonic-electric-works.hu</a>
▶ <b>Ireland</b>	<b>Panasonic Electric Works UK Ltd.</b>	Irish Branch Office, Dublin, Tel. +353 (0) 14600969, Fax +353 (0) 14601131, <a href="http://www.panasonic-electric-works.co.uk">www.panasonic-electric-works.co.uk</a>
▶ <b>Italy</b>	<b>Panasonic Electric Works Italia srl</b>	Via del Commercio 3-5 (Z.I. Ferlina), 37012 Bussolengo (VR), Tel. +39 0456752711, Fax +39 0456700444, <a href="http://www.panasonic-electric-works.it">www.panasonic-electric-works.it</a>
▶ <b>Nordic Countries</b>	<b>Panasonic Electric Works Europe AG Panasonic Eco Solutions Nordic AB</b>	Filial Nordic, Knarrarnäsgatan 15, 164 40 Kista, Sweden, Tel. +46 859476680, Fax +46 859476690, <a href="http://www.panasonic-electric-works.se">www.panasonic-electric-works.se</a>
▶ <b>Poland</b>	<b>Panasonic Electric Works Polska sp. z o.o</b>	Jungmansgatan 12, 21119 Malmö, Tel. +46 40 697 7000, Fax +46 40 697 7099, <a href="http://www.panasonic-fire-security.com">www.panasonic-fire-security.com</a>
▶ <b>Spain</b>	<b>Panasonic Electric Works España S.A.</b>	ul. Wotoska 9A, 02-583 Warszawa, Tel. +48 22 338-11-33, Fax +48 22 338-12-00, <a href="http://www.panasonic-electric-works.pl">www.panasonic-electric-works.pl</a>
▶ <b>Switzerland</b>	<b>Panasonic Electric Works Schweiz AG</b>	Barajas Park, San Severo 20, 28042 Madrid, Tel. +34 913293875, Fax +34 913292976, <a href="http://www.panasonic-electric-works.es">www.panasonic-electric-works.es</a>
▶ <b>United Kingdom</b>	<b>Panasonic Electric Works UK Ltd.</b>	Grundstrasse 8, 6343 Rotkreuz, Tel. +41 (0) 41 7997050, Fax +41 (0) 41 7997055, <a href="http://www.panasonic-electric-works.ch">www.panasonic-electric-works.ch</a>
		Sunrise Parkway, Linford Wood, Milton Keynes, MK14 6 LF, Tel. +44 (0) 1908 231555, Fax +44 (0) 1908 231599, <a href="http://www.panasonic-electric-works.co.uk">www.panasonic-electric-works.co.uk</a>
North & South America		
▶ <b>USA</b>	<b>Panasonic Industrial Devices Sales Company of America</b>	Two Riverfront Plaza, 7th Floor, Newark, NJ 07102-5490, Tel. 1-8003-442-112, <a href="http://www.pewa.panasonic.com">www.pewa.panasonic.com</a>
Asia Pacific / China / Japan		
▶ <b>China</b>	<b>Panasonic Electric Works Sales (China) Co. Ltd.</b>	Tower C 3rd Floor, Office Park, NO.5 Jinghua South Street, Chaoyang District, Beijing 100020, Tel. +86-10-5925-5988, Fax +86-10-5925-5980
▶ <b>Hong Kong</b>	<b>Panasonic Industrial Devices Sales (HK) Co., Ltd.</b>	Suite 301, 3/F, Chinachem Golden Plaza, 77 Mody Road, TST East, Kowloon, Hong Kong, Tel. +852-2529-3956, Fax +852-2528-6991
▶ <b>Japan</b>	<b>Panasonic Corporation</b>	1006, Oaza Kadoma, Kadoma-shi, Osaka 571-8501, Japan, Tel. +81-6-6908-1121, <a href="http://www.panasonic.net">www.panasonic.net</a>
▶ <b>Singapore</b>	<b>Panasonic Industrial Devices Automation Controls Sales Asia Pacific</b>	No.3 Bedok South Road, Singapore 469269, Tel. +65-6299-9181, Fax +65-6390-3953

## GENERAL CATALOG

### MAC-I LIMIT SWITCHES



## Installation and maintenance

- Easy wiring
- Standardized installation
- Easy operation

## Flexible output

- PC control
- Controls switching of low-level loads
- Flexible load control

## The ideal limit switch

- Compact (reduced attachment space)
- Contact reliability (DC, low-level loads)
- Maintenance and safety guaranteed (with lamps and contact functions)
- Expanded detection functions (different kinds of actuators)
- Improved construction easy wiring and mounting (wiring and attachments)

## Easy to use

- Improved machine accuracy (repeat detection accuracy improved)
- Responds to detected object (abundant variety of actuators)

## Reliability

- Stout (prevents external damage)
- Environment-resistant (dust-proof, drip-proof, oil-proof)
- Longevity (need for maintenance and parts replacement reduced)

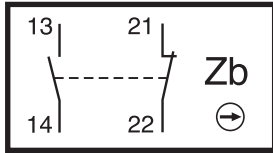


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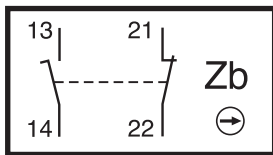




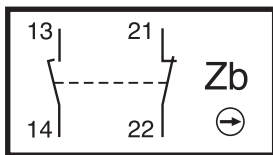
**Z11:** Snap action, 1 N.O. + 1 N.C.



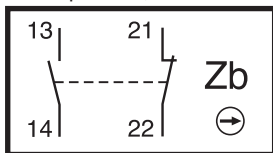
**X11:** Slow action, break before make, 1 N.O. + 1 N.C.



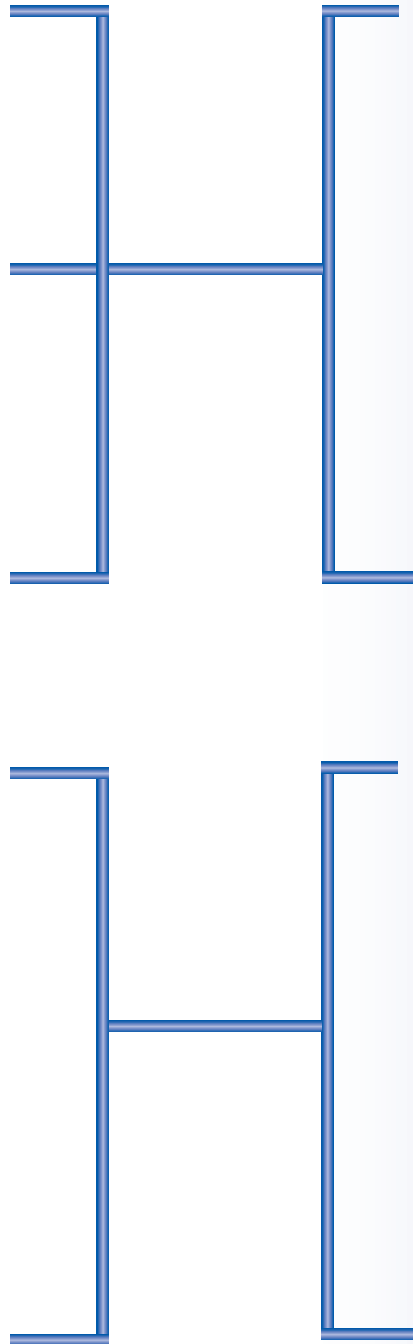
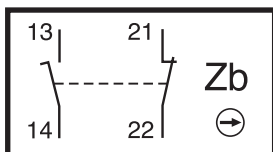
**Y11:** Slow action, make before break, 1 N.O.+1 N.C.



**Z:** Snap action, 1 N.O. + 1 N.C.



**X:** Slow action, break before make, 1 N.O. + 1 N.C.



## MAP series



## MAM series



## MEP1G series



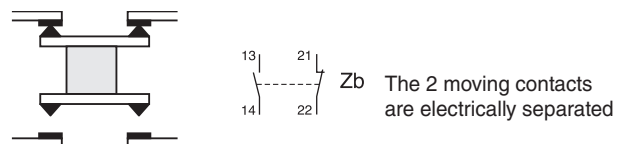
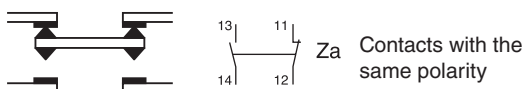
## MEM1G series



Technical information	Symbol	Description
<b>Double insulation</b>		Class II materials, according to IEC 536, are designed with double insulation. The functional insulation is doubled with an additional layer of insulation so as to eliminate the risk of electric shock and the need for protection elsewhere. It is not allowed to connect any conductive part of "double insulated" material to a protective conductor.
<b>Positive opening operation</b>		A control switch with one or more break-contact elements has a positive opening operation when the switch actuator ensures full contact opening of the break contact. For the part of travel that separates the contacts, there must be a positive drive with no resilient member (e.g. springs) between the moving contacts and the point of the actuator to which the actuating force is applied. The positive opening operation does not deal with N.O. contacts. Control switches with positive opening operation may be provided with either snap action or slow action contact elements. To use several contacts on the same control switch with positive opening operation, they must be electrically separated from each other, if not, only one may be used. Every control switch with positive opening operation must be indelibly marked on the outside with the symbol
<b>Snap action</b>	<p>State of rest</p> <p>Contact change</p> <p>Positive opening</p>	Snap action contacts are characterized by a release position that is distinct from the operating position (differential travel). Snap breaking of moving contacts is independent of the switch actuator's speed and contributes to regular electric performance even for slow switch actuator speeds.
<b>Slow action</b>	<p>State of rest</p> <p>Completely closed</p>	Slow action contacts are characterized by a release position that is the same as the operating position. The switch actuator's speed directly conditions the travel speed of contacts.

## Classification of the contact blocks according to the standard IEC 60947-5-1

Change-over contact elements with 4 terminals must be indelibly marked with the corresponding Za or Zb symbol as in the diagrams below.



### Utilization category

AC-15: switching of electromagnetic loads of electromagnets using an alternating current (>72VA).

DC-13: switching of electromagnets using a direct current.

### Terminals

Limit switches with metal casings must have a terminal for a protective conductor that is placed inside the casing very close to the cable inlet and must be indelibly marked.

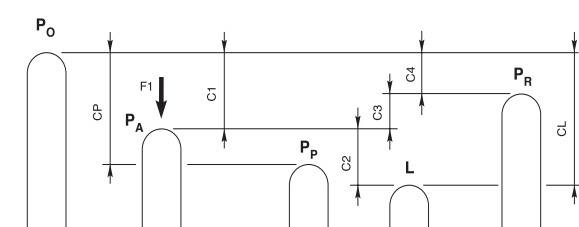
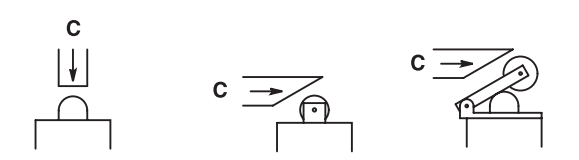
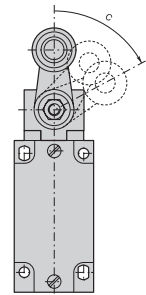
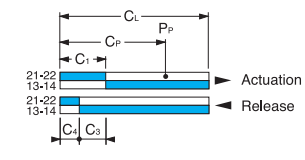
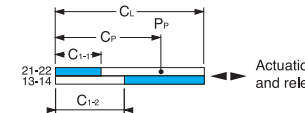
### Minimum actuation force/torque

The minimum amount of force/torque that is to be applied to the switch actuator to produce a change in contact position.

### Minimum force/torque to achieve positive opening operation

The minimum amount of force/torque that is to be applied to the switch actuator to ensure positive opening operation of the N.C. contact.

# Travel and operation diagrams

Travel and operation	Classification	Term	Abbreviation	Definition	
 <p>Note: for slow action contacts, C3 = 0, C1-1 = pre-travel of contact 21-22, C1-2 = pre-travel of contact 13-14</p>	Position	Free position	$P_O$	Position of the switch actuator when no external force is exerted on it.	
		Operating position	$P_A$	Position of the switch actuator, under the effect of force $F_1$ , when the contacts leave their initial free position.	
		Positive opening position	$P_P$	Position of the switch actuator from which positive opening is ensured.	
		Max. travel position	$L$	Maximum acceptable travel position of the switch actuator under the effect of a force $F_1$ .	
		Release position	$P_R$	Position of the switch actuator when the contacts return to their initial free position.	
	 <p>Diagram in millimeters</p>	Travel	Pre-travel	$C_1$	Distance between the free position $P_O$ and the operating position $P_A$ .
			Positive opening travel	$C_P$	Minimum travel of the switch actuator from the free position to ensure positive opening operation of the normally closed contact.
			Over-travel (O.T.)	$C_2$	Distance between the operating position $P_A$ and the max. travel position $L$ .
			Max. travel	$C_L$	Distance between the free position $P_O$ and the max. travel position $L$ .
			Differential travel (C1-C4)	$C_3$	Travel difference of the switch actuator between the operating position $P_A$ and the release position $P_R$
Release travel			$C_4$	Distance between the release position $P_R$ and the free position $P_O$	
 <p>Diagram in degrees</p>		 <p>Diagram for snap action contacts</p>			
		 <p>Diagram for non-overlapping slow action contacts</p>			

## Examples:

MAP1T12Z11  
(snap action contacts)

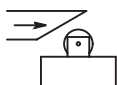
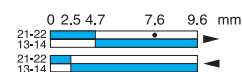


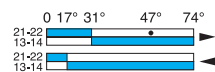
Diagram in millimeters/cam travel



MAP1T41Z11  
(snap action contacts)



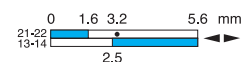
Diagram in degrees/lever rotation

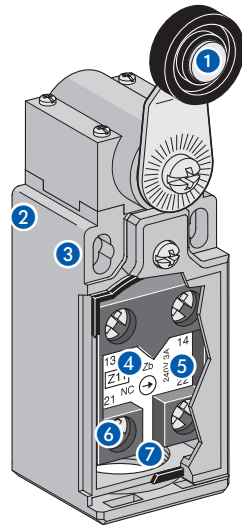


MAP1T10X11  
(non-overlapping slow action contacts)



Diagram in millimeters/plunger travel





- 1 A variety of operating heads:
  - Plain plunger
  - Roller plunger
  - Roller lever, adjustable or not, etc.
 Assembled using 4 x  $\varnothing$  3 screws for 30
- 2 Casing
  - 30mm width with standardized dimensions acc. to EN 50047
- 3 Mounting the casing
  - 2 x M4 screws on top part for 30mm width
- 4 Contact Block:
  - Contact configuration: NO + NC
  - Positive opening operation
  - Snap action or slow action
  - Zb shape: the 2 contacts are electrically separated
- 5 Cover:
  - Closed using  $\varnothing$  3 screw for 30 and 50 mm width.
- 6 Connecting terminals:
  - Block of 2 contacts: M3.5 (+, -) pozidriv 2 screw
- 7 Electrical connection:
  - 1 x PG13.5 cable gland for AP series



- 1 A variety of operating heads:
  - Plain plunger
  - Roller plunger
  - Roller lever, adjustable or not, etc.
 Assembled using 2 x  $\varnothing$  3 screws (EP series) or 2 x M3 screws (EM series)
- 2 Casing
  - 30mm width casings
- 3 Mounting the casing
  - 2 x M4 screws on top part
- 4 Contact block
  - Contact configuration: 1 N.O. + 1 N.C.
  - Positive opening operation
  - Snap action or slow action
  - Zb shape: the 2 contacts are electrically separated
- 5 Electrical connection:
  - cable: PVC 4 x 0,75 mm<sup>2</sup> (EP..) / 5 x 0,75 mm<sup>2</sup> (EM...)
  - length: 1 m (different cables or lengths)
  - optional: M12 connector
- 6 • Epoxy resin for IP67 protection degree

## Glossary relating to the standard EN 60947-5-1

- **EN 60947-5-1**  
Identical with standard IEC 947-5-1
- **Categories of use**  
The following examples express the classification of switches by category of use.

Current type	Category	Contents
AC	AC-15	Controls electromagnetic loads in excess of 72VA (Volt Amperes)
DC	DC-13	Control of DC electromagnetics





- **Rated operational voltage (Ue)**  
The maximum rated voltage for switch operation. This must never exceed the maximum rated insulation voltage (Ui).
- **Rated operational current (Ie)**  
The maximum rated current for switch operation.

- **Rated insulation voltage (Ui)**  
The maximum rated current value which guards the switch's insulation functions, forming the parameters for the resistance values and the mounting distance.
- **Rated impulse withstand voltage (Uimp)**  
The peak impulse current value which enables the switch to resist without insulation breakdown.
- **Rated enclosed thermal current (Ithe)**  
The current value that enables current to flow without exceeding the specified maximum temperature in the recharging contact switch. If the pins are made of brass, the maximum temperature limit is 65°C
- **Conditional short circuit current**  
The current the switch can resist until the short circuit protection device is activated.
- **Short circuit protection device**  
A device that protects the switch from short circuits through a circuit break (breakers, fuses, etc.)

- **Switching overvoltage**  
The surge momentarily generated when a circuit is closed. Must be lower than the Uimp value.
- **Pollution degree**  
Expresses in levels the environment in which the switch is used. The four levels are shown below.  
Limit switches come under pollution degree 3.

Pollution degree	Contents
1	No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.
2	Only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected.
3	Conducting contamination is generated or else dry non-conducting contamination is generated by circuits which can be anticipated.
4	Permanent conducting contamination is generated by dust, rain, snow, and other conductors.

# Limit switch selector chart

Series	MAP-T series**	MAM-F/T series**	MEP1G series	MEM1G series
Product image				
Casing	Plastic casing, 30mm width, with standardized dimensions acc. to EN 50047	Metal casing, 30mm width, with standardized dimensions acc. to EN 50047	Plastic casing, 30mm width	Metal casing, 30mm width
Mounting	2 x M4 screws on top part for 30mm width		2 x M4 screws on top part	
Rated insulation voltage $U_i$	500V (pollution degree 3) (400V for contacts type X12P, X21P, W03P)		400V (pollution degree 3)	
Rated impulse withstand voltage $U_{imp}$	6kV		4kV	
Rated operational current $I_o$ / AC-15 (according to IEC 947-5-1)	24V - 50/60Hz: 10A 120V - 50/60Hz: 6A 230V - 50/60Hz: 3.1A 240V - 50/60Hz: 3A 400V - 50/60Hz: 1.8A		24V - 50/60Hz: 5.0A 120V - 50/60Hz: 3.0A 240V - 50/60Hz: 1.5A	
Rated operational current $I_o$ / DC-13 (according to IEC 947-5-1)	24V DC: 2.8A 125V DC: 0.55A 250V DC: 0.27A		24V DC: 1.1A 125V DC: 0.22A 250V DC: 0.1A	
Contact blocks	<ul style="list-style-type: none"> <li>• Contact configuration: N.O. + N.C.</li> <li>• Positive opening operation</li> <li>• Snap action or slow action</li> <li>• Zb shape: the 2 contacts are electrically separated</li> </ul>		<ul style="list-style-type: none"> <li>• Contact configuration: 1 N.O. + 1 N.C.</li> <li>• Positive opening operation</li> <li>• Snap action or slow action</li> <li>• Zb shape: the 2 contacts are electrically separated</li> </ul>	
Electrical connection	Cable inlets for PG13.5 cable gland*		Cable: PVC 4 x 0.75mm <sup>2</sup> Length: 1m*	Cable: PVC 5 x 0.75mm <sup>2</sup> Length: 1m*
Switching frequency	3600 cycles/h		3600 cycles/h	
Resistance between contacts	< 25mΩ		< 25mΩ	
Mechanical durability	>5 - 15 millions of operations (depending on actuator type, see page with details on each series)		10 millions of operations	
Standards	CULus, CE	UL, CE	CULus, CE (for details see page 40)	
Degree of protection	IP65	IP66	IP67	

\* For other cable inlets and cable lengths, please contact your local sales office.

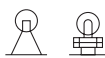
\*\* For other contact blocks and electrical connections please contact your local sales office.

## Actuators

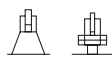
Push plunger



Roller plunger



Cross-roller plunger



Roller arm



Adjustable roller arm



Adjustable rod



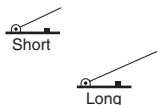
Spring wire



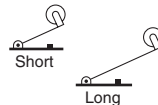
Flexible rod



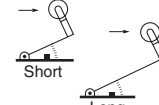
Hinge lever



Roller lever



One-way roller lever

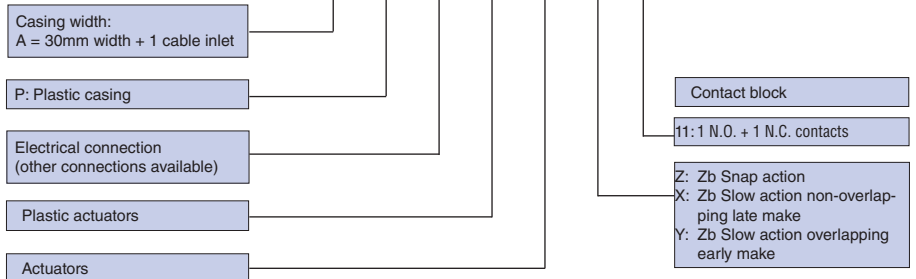


Roller lever



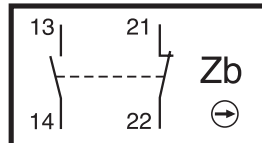
## Ordering information

Example: **M A P 1 T 41 Z 1 1**

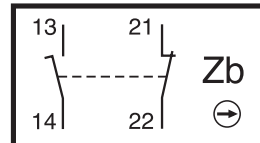


## Contacts blocks

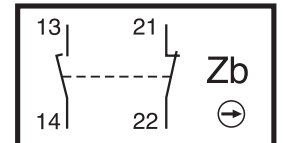
**Z11:** Snap action  
1 N.O. + 1 N.C.



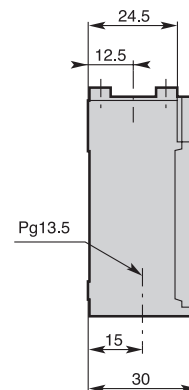
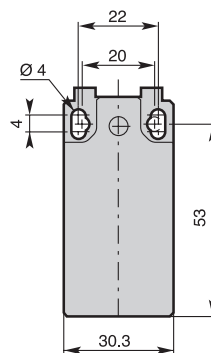
**X11:** Slow action break before  
make 1 N.O. + 1 N.C.



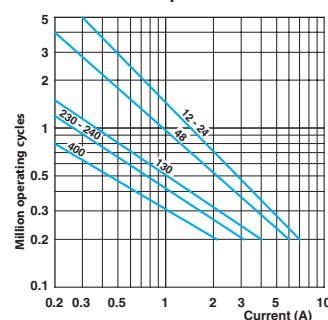
**Y11:** Slow action make before  
break 1 N.O. + 1 N.C.



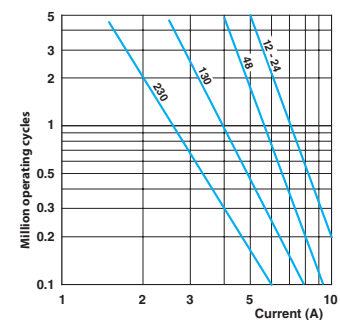
## Dimensions (basic)



AC-15 - Snap action

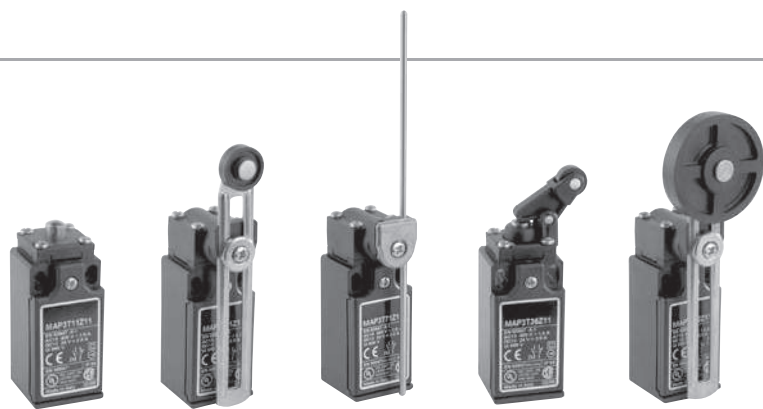


AC-15 - Slow action



DC-13		Snap action	Slow action
		Power breaking for a durability of 5 million operating cycles	
Voltage	24V	9.5W	12W
Voltage	48V	6.8W	9W
Voltage	110V	3.6W	6W

# MAP-T series



## Features

- Double insulation
- 30mm width
- Casing made of polymeric
- Visible operation
- Able to switch strong currents (10A conventional thermal current)
- Electrically separated contacts
- Precise operating points (consistency)
- Immune to electromagnetic disturbances
- Degree of protection: IP65

## General technical data

		Plastic casing	
Standards	Devices conform with international IEC 947-5-1 and European EN 60 947-5-1 standards		
Certifications - Approvals	CUL <sub>US</sub>		
Ambient temperature			
– during operation	-25 to +70°C		
– for storage	-30 to +80°C		
Climatic withstand	According to IEC 68-2-3 and salty mist according to IEC 68-2-11		
Mounting positions	All positions are authorised		
Shock withstand (acc. to IEC 68-2-27 and EN 60 068-2-27)	50g* (1/2 sinusoidal shock for 11ms) no change in contact position		
Resistance to vibrations (acc. to IEC 68-2-6 and EN 60 068-2-6)	25g (10 ... 500Hz) no change in position of contacts greater than 100 µs		
Protection against electrical shocks (acc. to IEC 536)	Class II		
Degree of protection (according to IEC 529 and EN 60 529)	IP65		
Consistency (measured over 1 million operations)	0.1mm (upon closing point)		
Minimum actuation speed	m/s	Slow action contacts 0.060 / Snap action contacts 0.001	
<b>Electrical Data</b>			
Rated insulation voltage U <sub>i</sub>	500V (pollution degree 3)		
- according to IEC 947-1 and EN 60-947-1	A 600, Q 600		
- according to UL 508 and CSA C22-2 n° 14			
Rated impulse withstand voltage U <sub>imp</sub>	kV	6	
(according to IEC 947-1 and EN 60 947-1)			
Conventional free-air thermal current I <sub>th</sub>	A	10	
(according to IEC 947-5-1) w < 40 °C			
Short-circuit protection	A	10	
U <sub>e</sub> < 500V a.c. - gG (gl) type fuses			
Rated operational current			
I <sub>e</sub> / AC-15 (according to IEC 947-5-1)	24V - 50/60Hz	A	10
	120V - 50/60Hz	A	6
	230V - 50/60Hz	A	3.1
	240V - 50/60Hz	A	3
	400V - 50/60Hz	A	1.8
I <sub>e</sub> / DC-13 (according to IEC 947-5-1)	24V DC	A	2.8
	125V DC	A	0.55
	250V DC	A	0.27
Switching frequency	Cycles/h	3600	
Load factor		0.5	
Resistance between contacts	mΩ	<25	
Connecting terminals	M3.5 (+, -) pozidriv 2 screw with cable clamp		
Terminal for protective conductor	-		
Connecting capacity	1 or 2 x mm <sup>2</sup>	0.75 to 2.5	
Terminal marking	According to EN 50 013		
Mechanical durability	Millions of operations	15 10 >5	MAP•T { 10...12; 30...34; 38 13; 41...48; 51...55; 61...75 14; 35; 36; 39; 91...93; 98
Electrical durability (according to IEC 947-5-1)	Utilization categories AC-15 and DC-13 (Load factor of 0.5 according to curves)		

\* except for MAP T42, T52, T5200, T55 and T5500: 25g.

For the complete list of approved products, please contact our technical department.

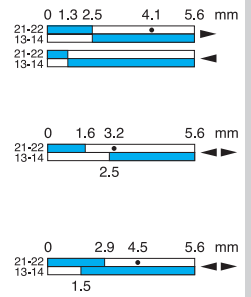
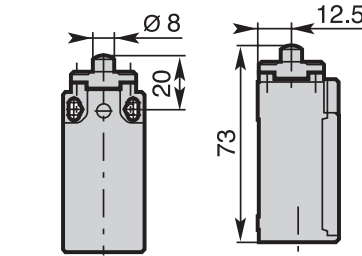
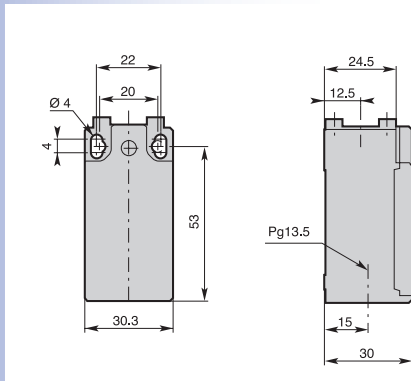
**Product number**   **Dimensions (basic)**

**Dimensions (head)**

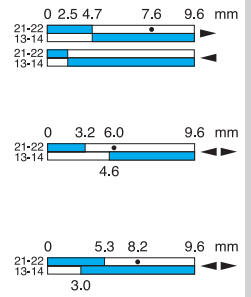
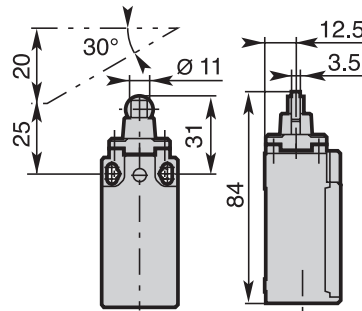
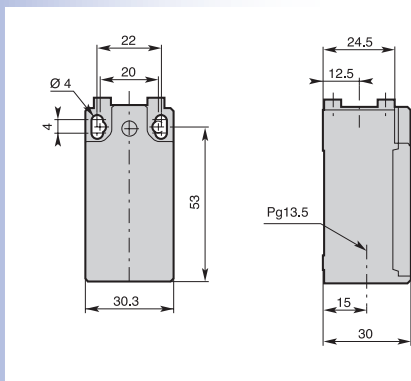
**Operation diagram**



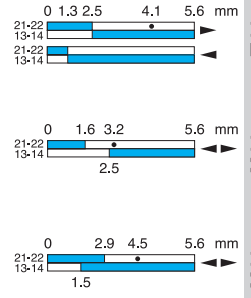
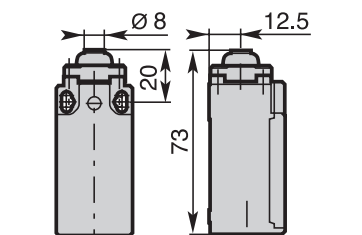
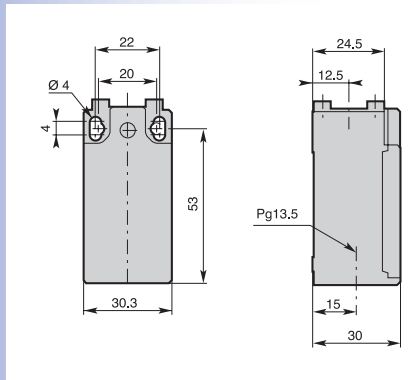
**Plain plunger**  
 MAP1T10•••\*  
 T10: nylon plunger  
 T11: metal plunger



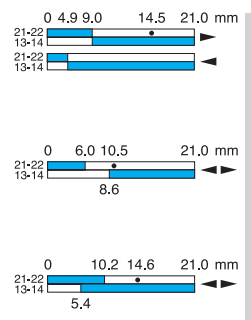
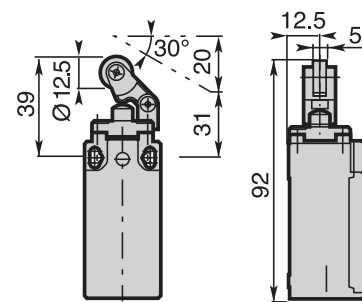
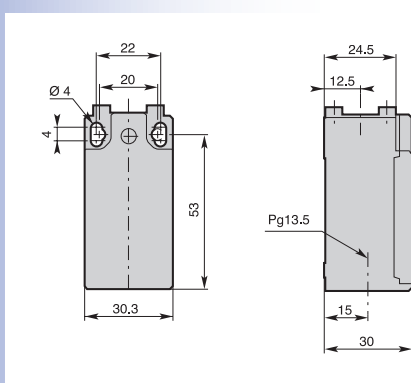
**Roller plunger**  
 MAP1T12•••\*  
 T12: metal roller  
 T13: nylon roller



**Metal plunger with dust protection cap**  
 MAP1T14•••\*



**Plastic roller lever**  
 MAP1T30•••\*  
 T30: plastic plunger  
 T31: metal plunger



\* Snap action: Z11, X11 or Y11



# MAP-T series

## Product number

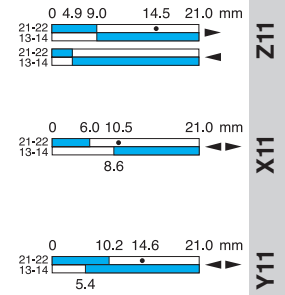
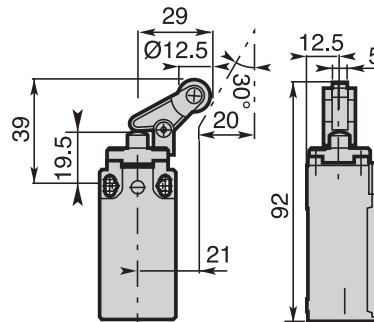
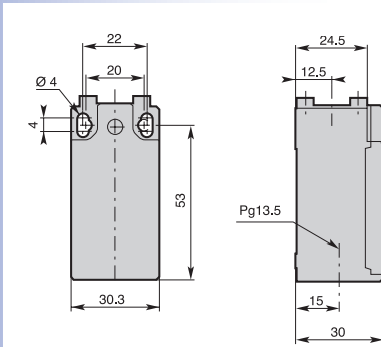
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## Dimensions (head)

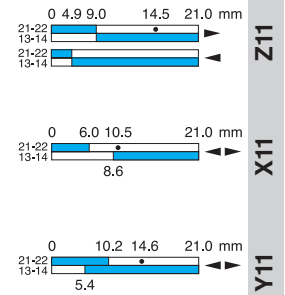
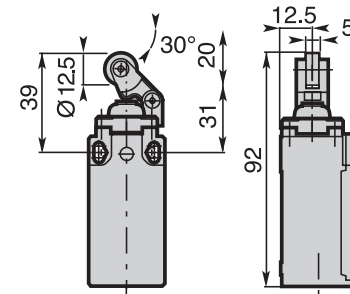
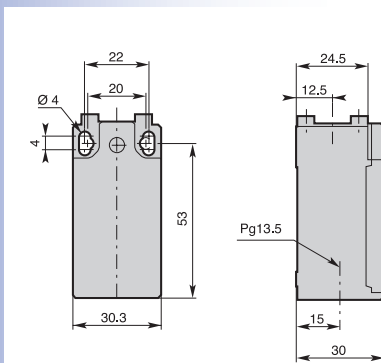
## Operation diagram



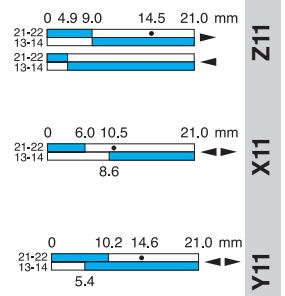
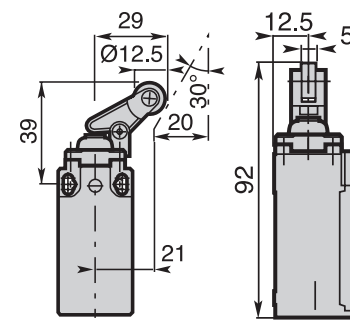
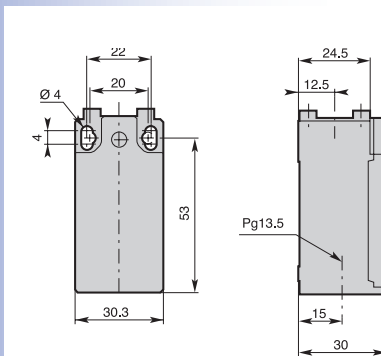
**Plastic roller lever**  
MAP1T32\*\*\*  
T32: metal plunger  
T34: plastic plunger



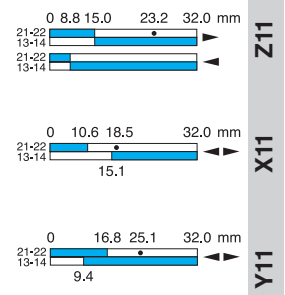
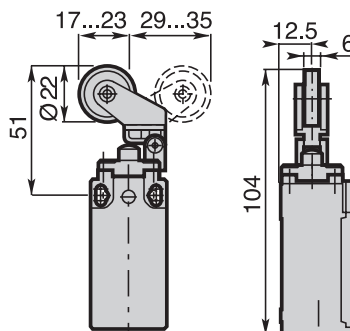
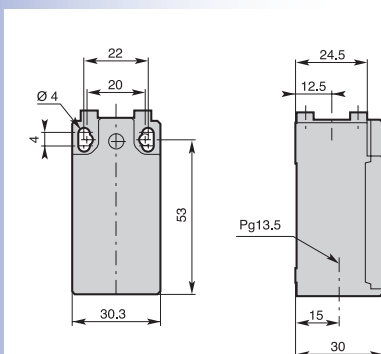
**Plastic roller lever on metal plunger with dust protection cap**  
MAP1T35\*\*\*



**Plastic roller lever on metal plunger with dust protection cap**  
MAP1T36\*\*\*



**Adjustable plastic roller lever**  
MAP1T38\*\*\*  
T38: on metal plunger  
T39: on metal plunger with dust protection cap



\* Snap action: Z11, X11 or Y11

**Product number**

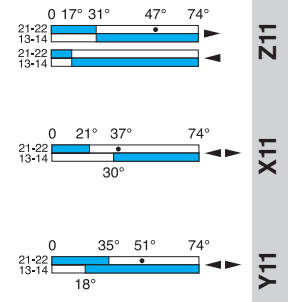
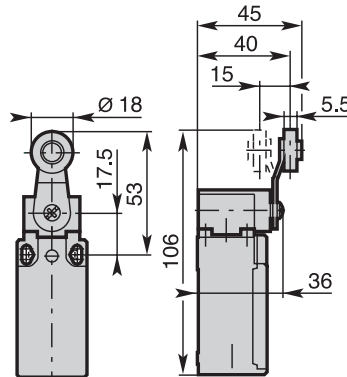
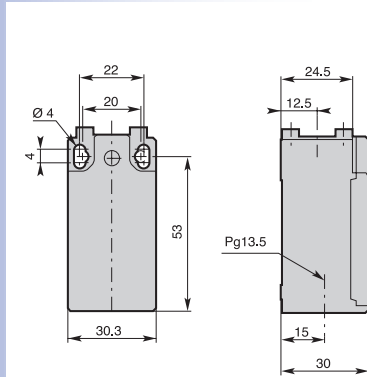
**Dimensions (basic)**

**Dimensions (head)**

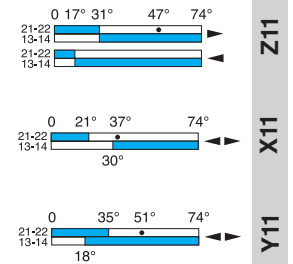
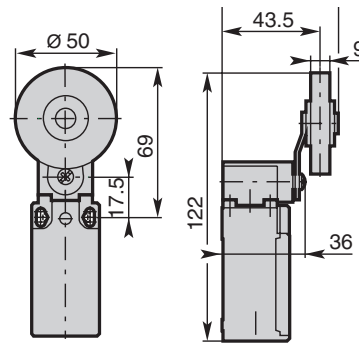
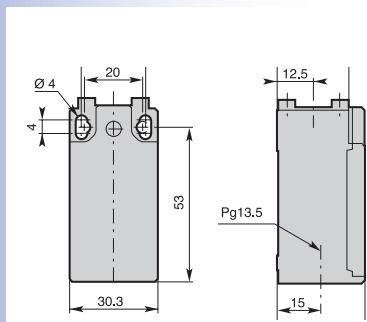
**Operation diagram**



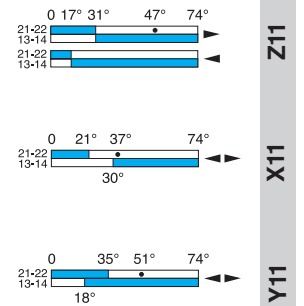
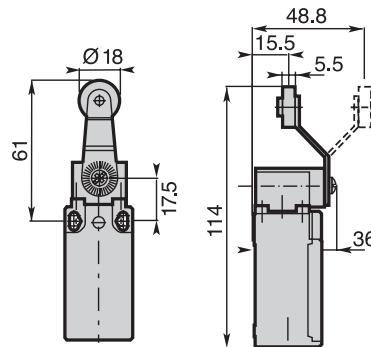
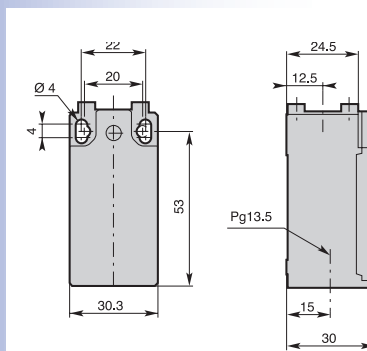
**Roller lever**  
 MAP1T41...\*  
 T41: nylon roller  
 T43: metal roller



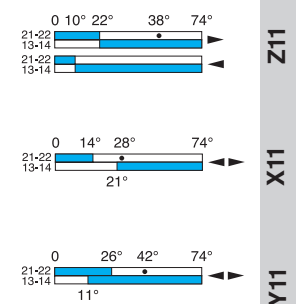
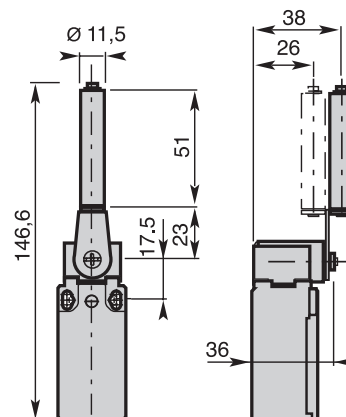
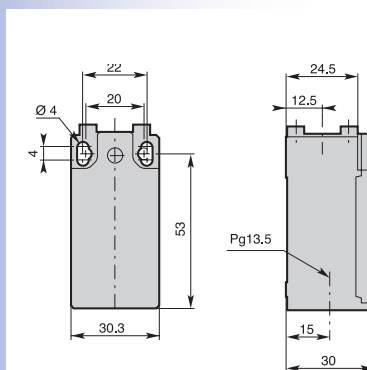
**Rubber roller lever**  
 MAP1T42...\*



**Roller lever**  
 MAP1T45...\*  
 T45: nylon roller  
 T46: metal roller



**Ceramic rod lever**  
 MAP1T48...\*



\* Snap action: Z11, X11 or Y11

# MAP-T series

Product number

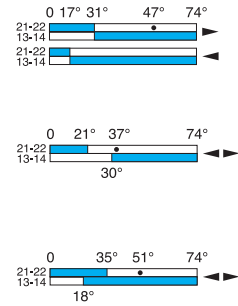
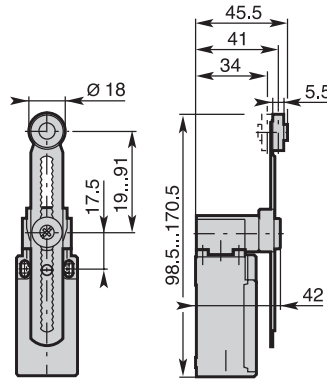
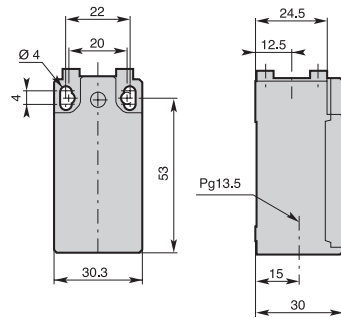
Dimensions (basic)

Dimensions (head)

Operation diagram



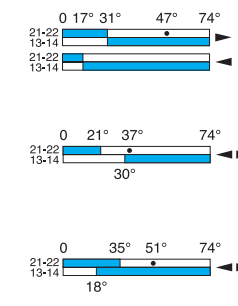
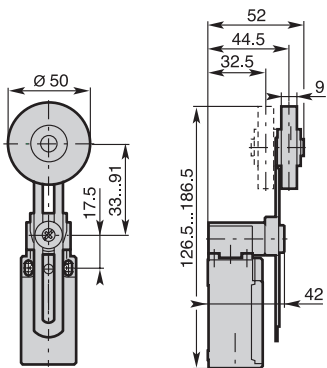
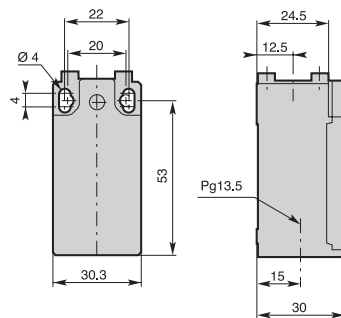
Adjustable toothed lever (step 2mm) with nylon roller  
MAP1T5100\*\*\*



Z11  
X11  
Y11



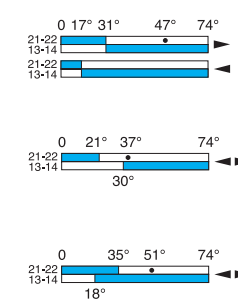
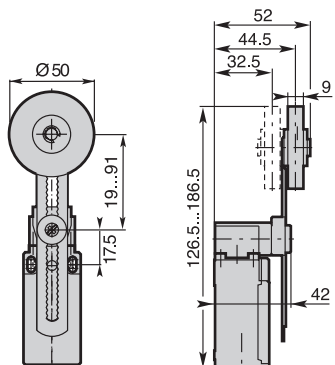
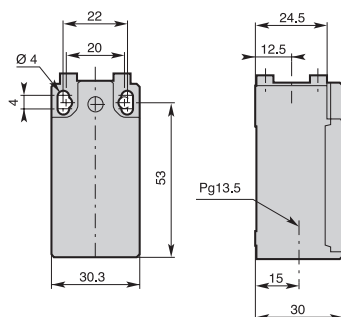
Adjustable lever with rubber roller  
MAP1T5200\*\*\*



Z11  
X11  
Y11



Adjustable toothed lever (step 2mm) with rubber roller  
MAP1T5200\*\*\*



Z11  
X11  
Y11

\* Snap action: Z11, X11 or Y11

**Product number**

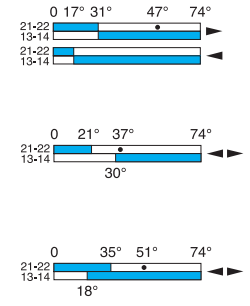
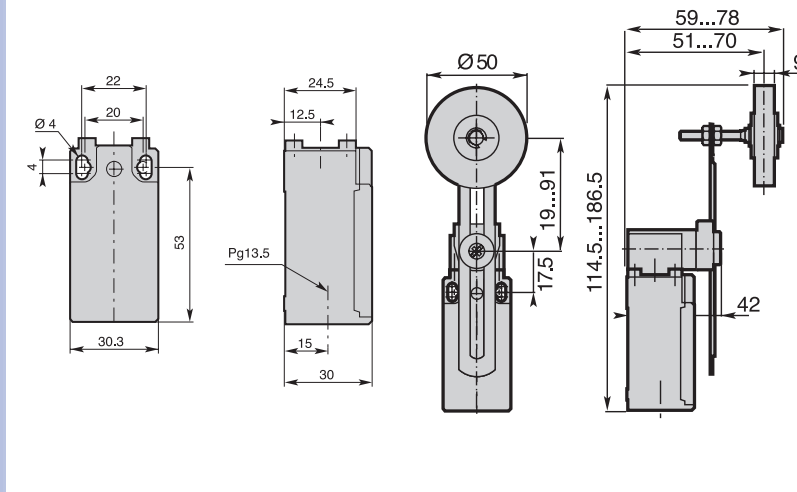
**Dimensions (basic)**

**Dimensions (head)**

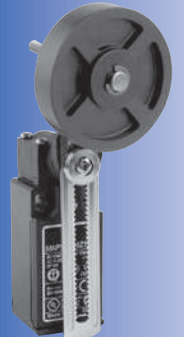
**Operation diagram**



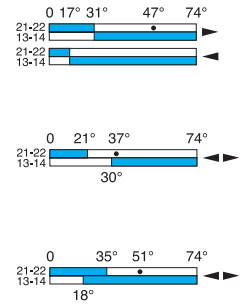
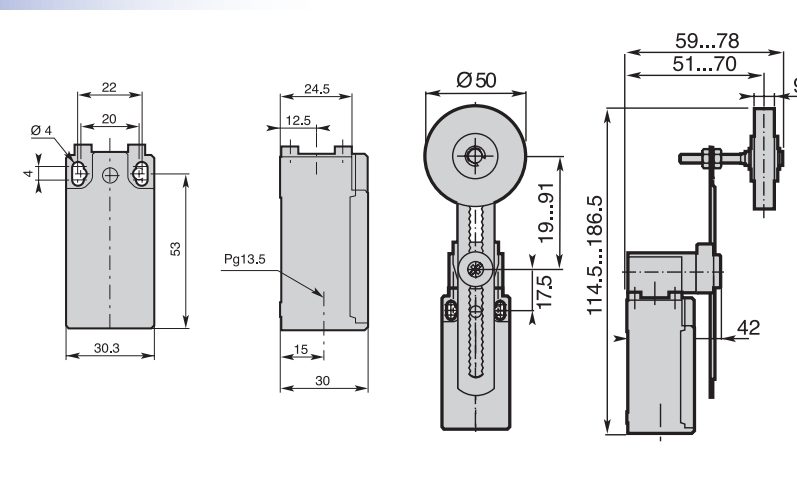
Adjustable lever with adjustable rubber roller  
MAP1T55\*\*\*



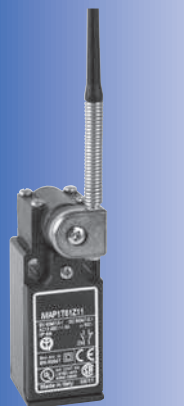
Z11  
X11  
Y11



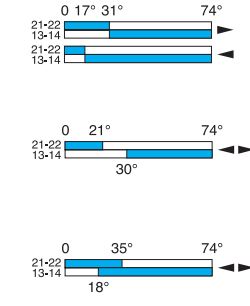
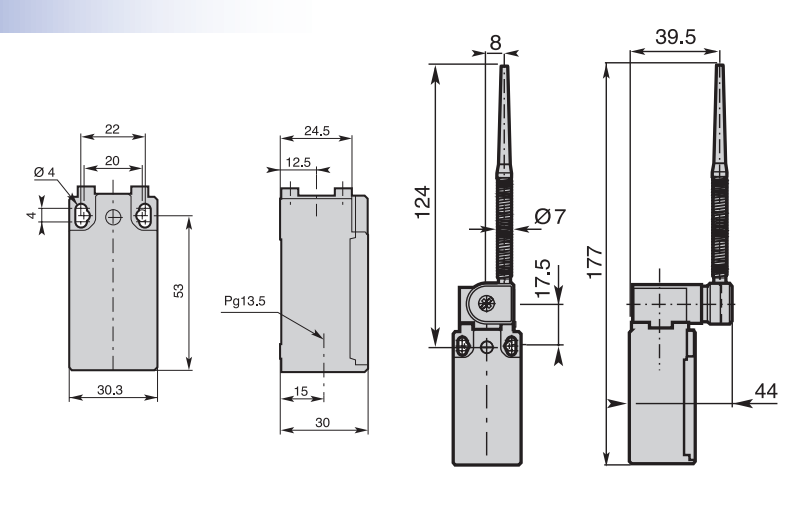
Adjustable toothed lever (step 2mm) with adjustable rubber roller  
MAP1T550\*\*\*



Z11  
X11  
Y11



Nylon actuator with stainless steel spring  
MAP1T61\*\*\*



Z11  
X11  
Y11

\* Snap action: Z11, X11 or Y11

# MAP-T series

Product number

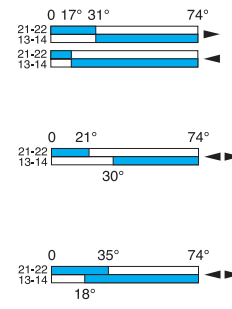
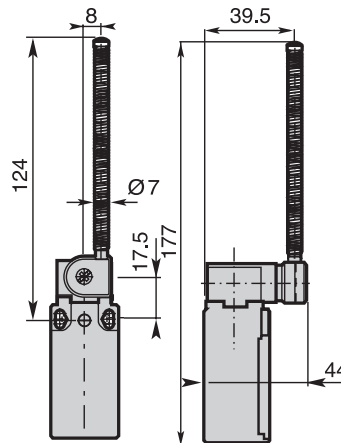
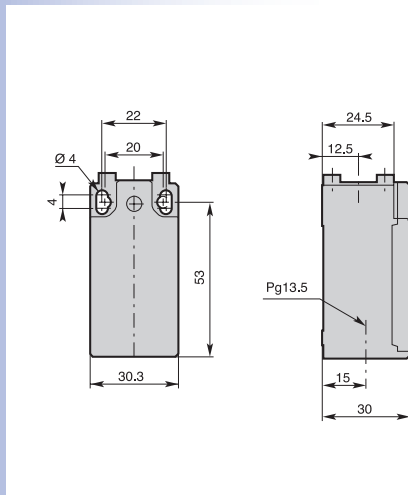
Dimensions (basic)

Dimensions (head)

Operation diagram



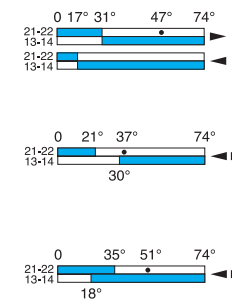
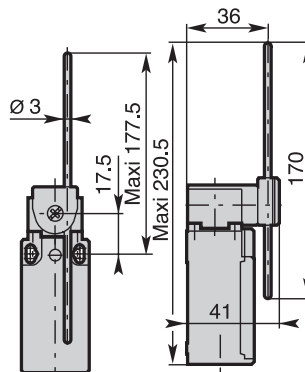
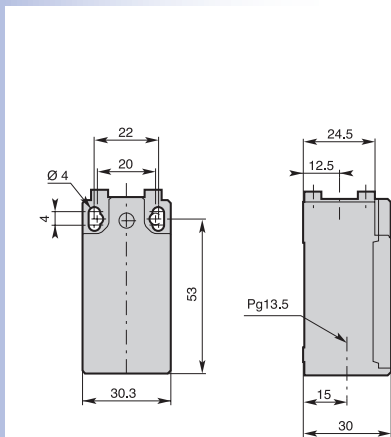
**Stainless steel spring actuator**  
MAP1T62\*\*\*



Z11  
X11  
Y11



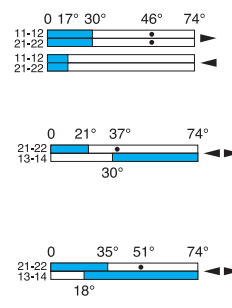
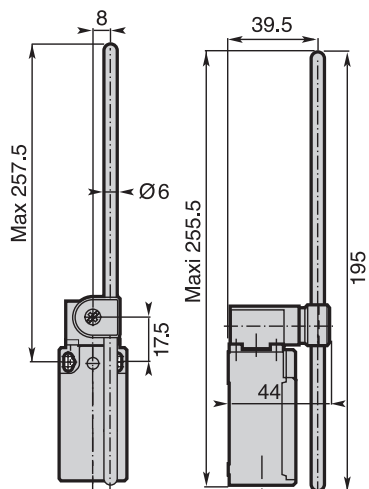
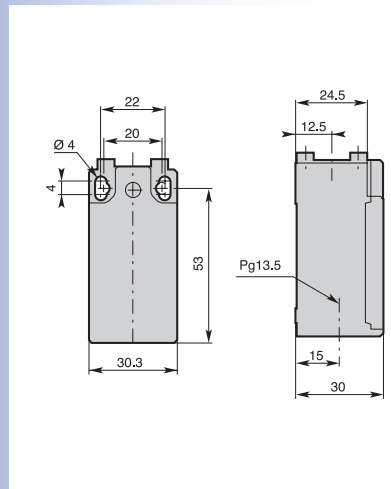
**Adjustable rod lever**  
MAP1T71\*\*\*  
T71: stainless steel rod  
T72: fiberglass rod



Z11  
X11  
Y11



**Adjustable rod lever**  
MAP1T73\*\*\*  
T73: nylon rod  
T74: fiberglass rod



Z11  
X11  
Y11

\* Snap action: Z11, X11 or Y11

**Product number**

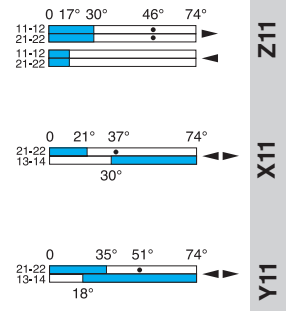
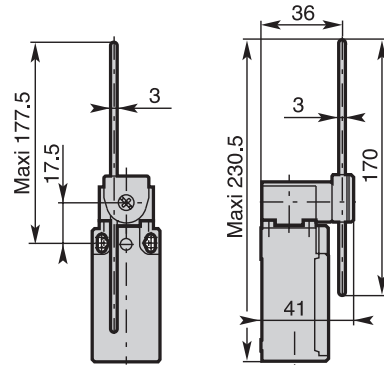
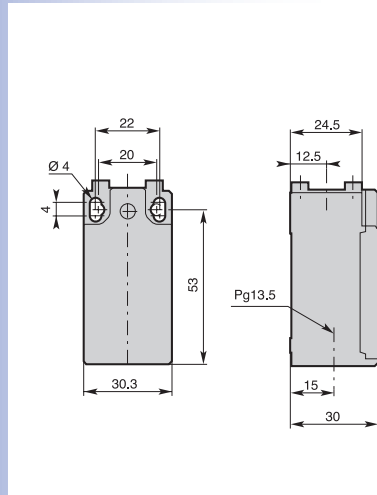
**Dimensions (basic)**

**Dimensions (head)**

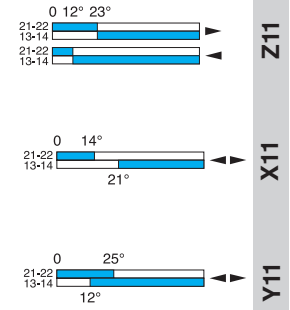
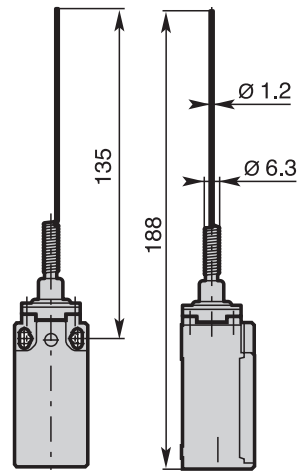
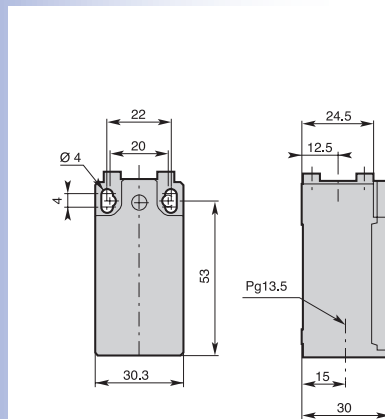
**Operation diagram**



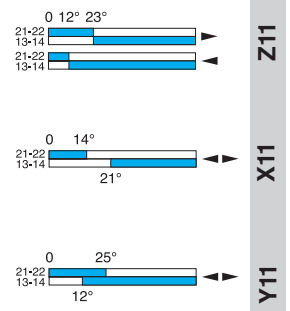
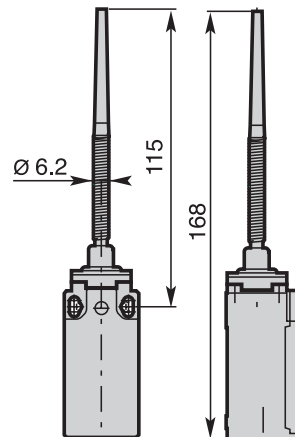
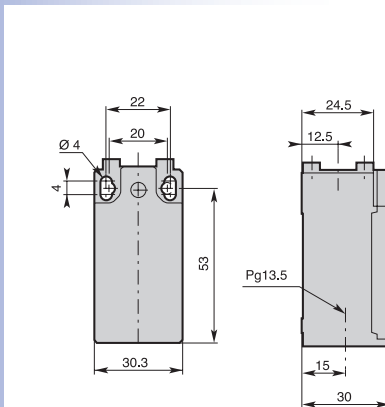
Adjustable square steel rod lever  
MAP1T75\*\*\*



Stainless steel spring multidirectional actuator  
MAP1T91\*\*\*



Multidirectional nylon actuator with stainless steel spring  
MAP1T92\*\*\*



# MAP-T series

Product number

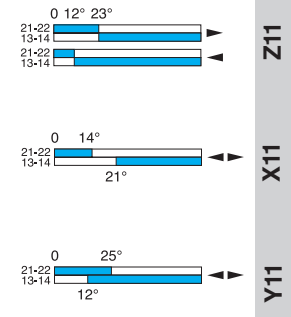
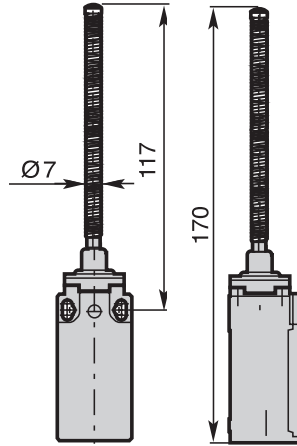
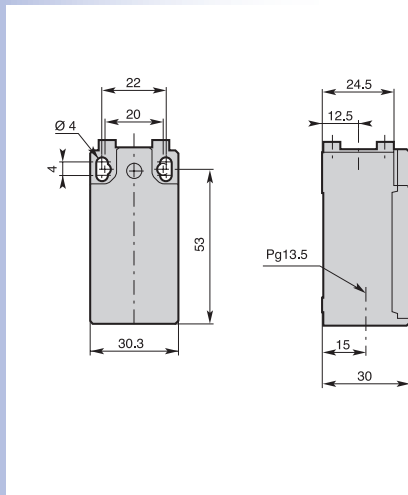
Dimensions (basic)

Dimensions (head)

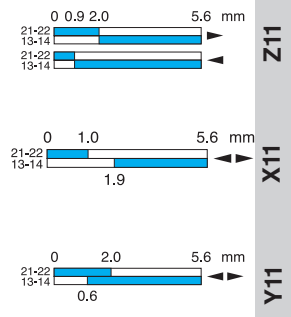
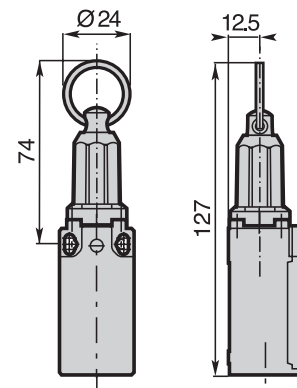
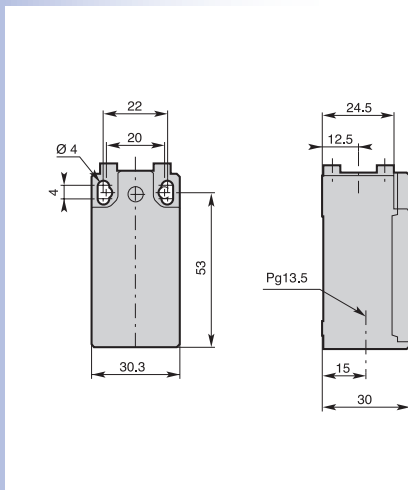
Operation diagram



Stainless steel  
spring multidirectional  
actuator  
MAP1T93...\*



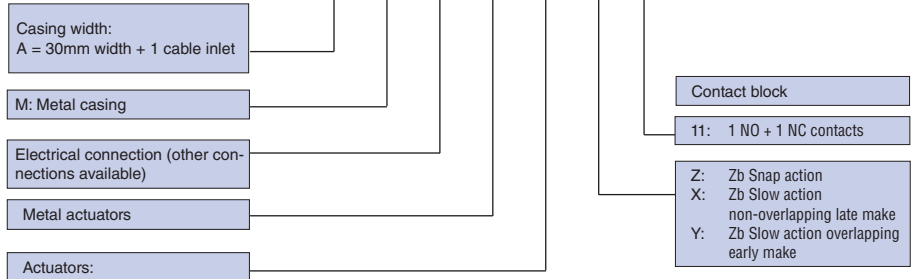
Pull action with ring  
MAP1T98...\*



\* Snap action: Z11, X11 or Y11

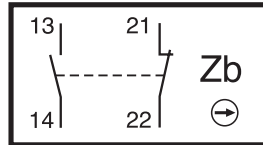
## Ordering information

Example: **M A M 1 T 41 Z 1 1**

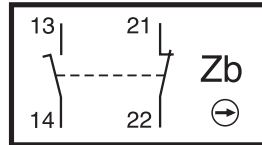


## Contact blocks

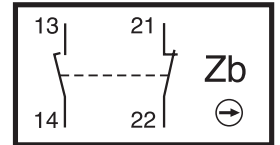
**Z11:** Snap action  
1 N.O. + 1 N.C.



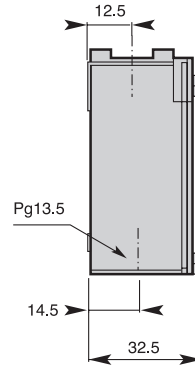
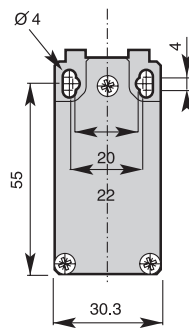
**X11:** Slow action break before  
make 1 N.O. + 1 N.C.



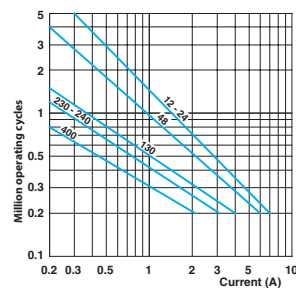
**Y11:** Slow action make before  
break 1 N.O.+1 N.C.



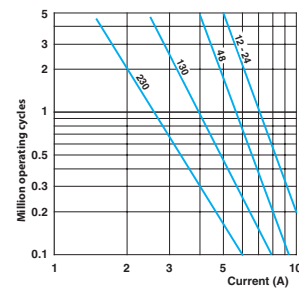
## Dimensions (basic)



AC-15 - Snap action



AC-15 - Slow action



DC-13	Snap action	Slow action
Power breaking for a durability of 5 million operating cycles		
Voltage 24V	9.5W	12W
Voltage 48V	6.8W	9W
Voltage 110V	3.6W	6W





## Features

- Double insulation
- 30mm width
- Metal casing
- Visible operation
- Able to switch strong currents (10A conventional thermal current)
- Electrically separated contacts
- Precise operating points (consistency)
- Immune to electromagnetic disturbances
- Degree of protection: IP66

## General technical data

		Metal casing	
Standards	Devices conform with international IEC 947-5-1 and European EN 60 947-5-1 standards		
Certifications - Approvals	CUL <sub>US</sub>		
Ambient temperature			
- during operation	°C	- 25 ... + 70	
- for storage	°C	- 30 ... + 80	
Climatic withstand	According to IEC 68-2-3 and salty mist according to IEC 68-2-11		
Mounting positions	All positions are authorised		
Shock withstand (according to IEC 68-2-27 and EN 60 068-2-27)	50g* (1/2 sinusoidal shock for 11ms) no change in contact position		
Resistance to vibrations (acc. to IEC 68-2-6 and EN 60 068-2-6)	25g (10 ... 500Hz) no change in position of contacts greater than 100 µs		
Protection against electrical shocks (acc. to IEC 536)	Class I		
Degree of protection (according to IEC 529 and EN 60 529)	IP66**		
Consistency (measured over 1 million operations)	0.05mm (upon closing point)		
Minimum actuation speed	m/s	Slow action contacts 0.060 / Snap action contacts 0.001	
<b>Electrical Data</b>			
Rated insulation voltage U <sub>i</sub>	500V (pollution degree 3)		
- according to IEC 947-1 and EN 60-947-1	A 300, Q 300		
- according to UL 508 and CSA C22-2 n° 14			
Rated impulse withstand voltage U <sub>imp</sub>	kV	6	
(according to IEC 947-1 and EN 60 947-1)			
Conventional free-air thermal current I <sub>th</sub>	A	10	
(according to IEC 947-5-1) σ < 40 °C			
Short-circuit protection	A	10	
U <sub>e</sub> < 500V a.c. - gG (gl) type fuses			
Rated operational current			
I <sub>e</sub> / AC-15 (according to IEC 947-5-1)	24V - 50/60Hz	A	10
	120V - 50/60Hz	A	6
	230V - 50/60Hz	A	3.1
	240V - 50/60Hz	A	3
	400V - 50/60Hz	A	1.8
I <sub>e</sub> / DC-13 (according to IEC 947-5-1)	24V DC	A	2.8
	125V DC	A	0.55
	250V DC	A	0.27
Switching frequency	Cycles/h	3600	
Load factor	0.5		
Resistance between contacts	mΩ	<25	
Connecting terminals	M3.5 (+, -) pozidriv 2 screw with cable clamp		
Terminal for protective conductor	M3.5 (+, -) pozidriv 2 screw with cable clamp		
Connecting capacity	1 or 2 x mm <sup>2</sup>	0.75 ... 2.5	
According to EN 50 013			
Mechanical durability	Millions of operations	15 10 >5	MAM•T { 10...12; 30...34; 38 13; 41...48; 51...75 14; 35; 36; 39; 98
Electrical durability (according to IEC 947-5-1)	Utilization categories AC-15 and DC-13 (Load factor of 0.5 according to curves)		

\* except for MAM•F42, F52, F55: \*\* except for MAM•F52, F55, F73, F74 and the degree of protection is IP65.

For the complete list of approved products, please contact our technical department.

Product number

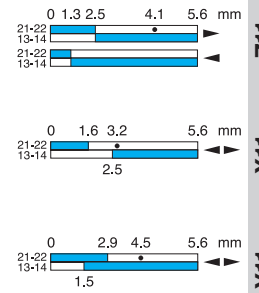
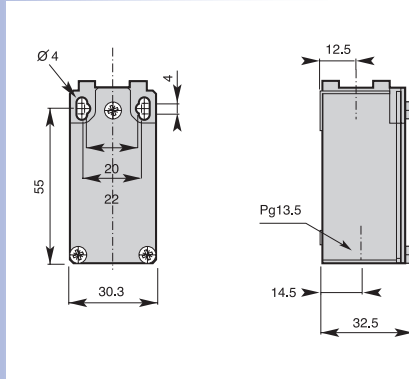
Dimensions (basic)

Dimensions (head)

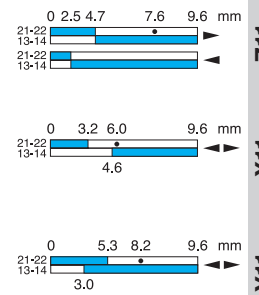
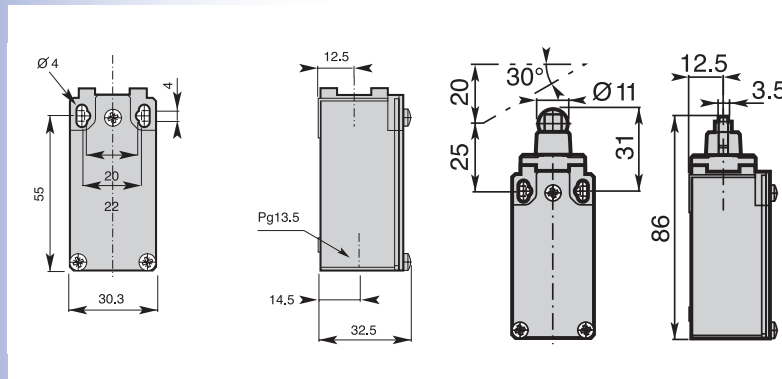
Operation diagram



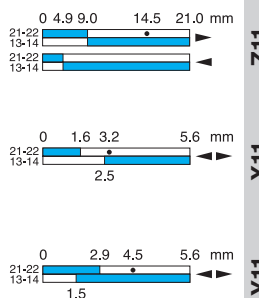
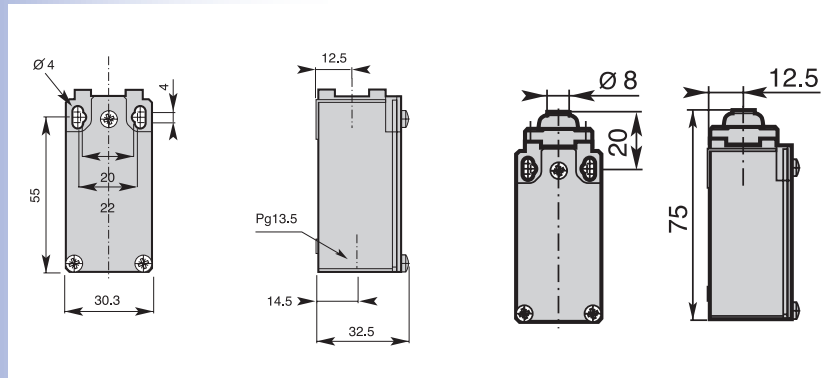
Plain plunger  
MAM1F11\*\*\*



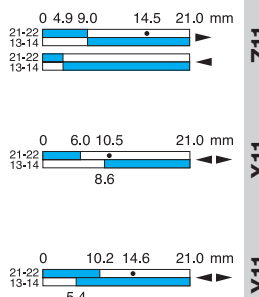
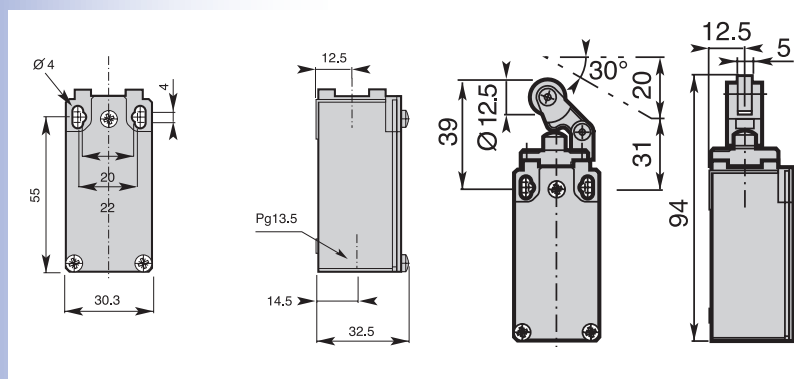
Metal roller plunger  
MAM1F12\*\*\*



Metal plunger with dust protection cap  
MAM1T14\*\*\*



Plastic roller lever  
MAM1T30\*\*\*  
T30: on plastic plunger  
T31: on metal plunger



\* Snap action: Z11, X11 or Y11

# MAM F/T series

Product number

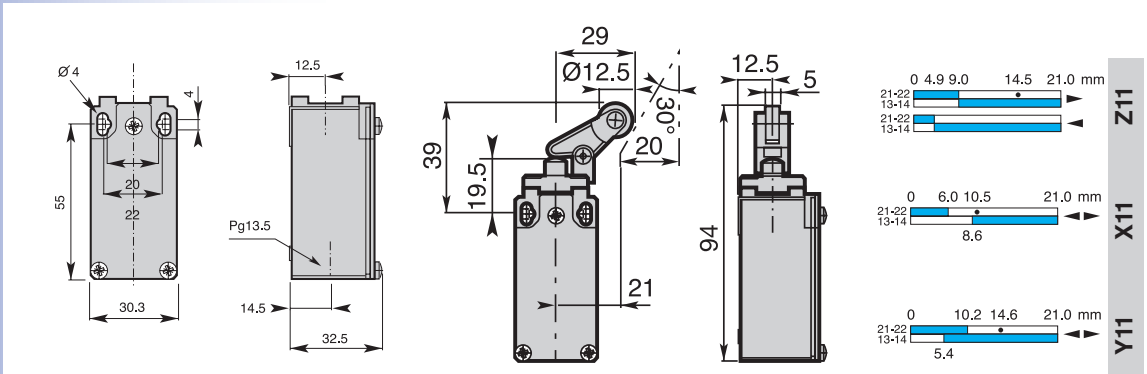
Dimensions (basic)

Dimensions (head)

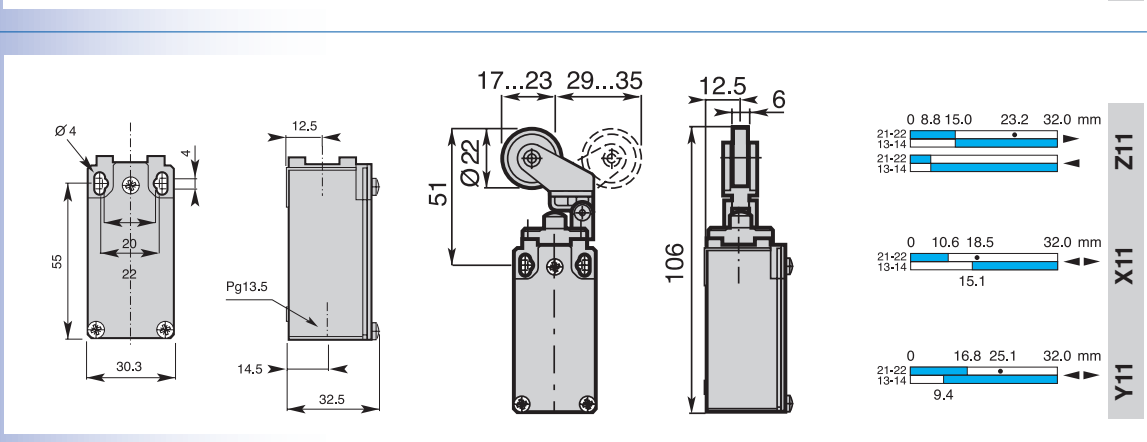
Operation diagram



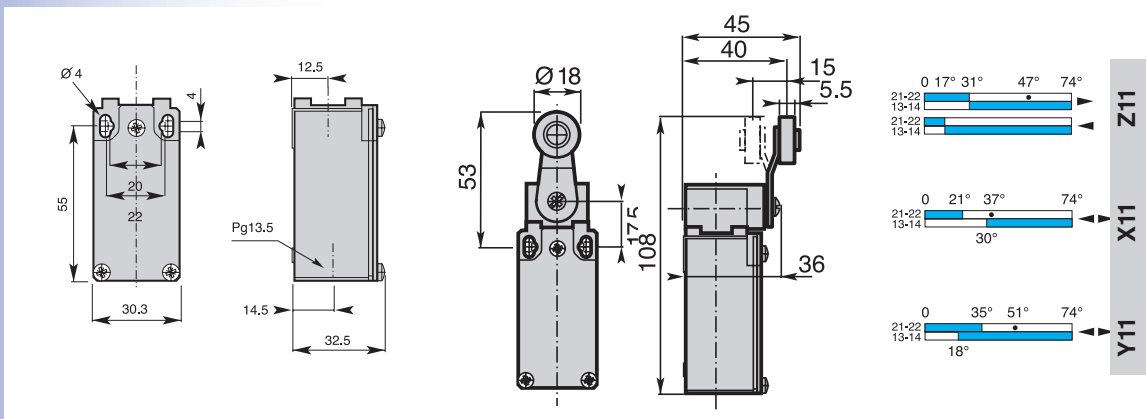
**Plastic roller lever**  
MAM1T32...\*  
T32: on metal plunger  
T34: on plastic plunger



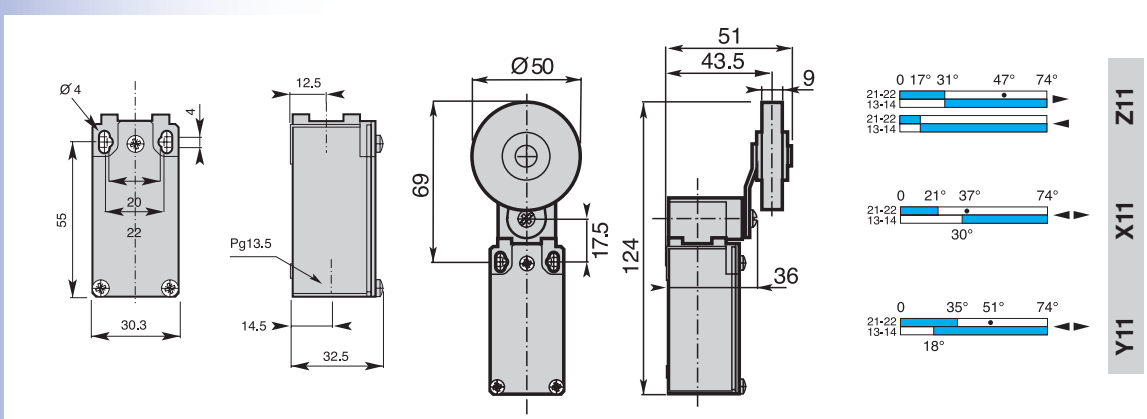
**Adjustable plastic roller lever**  
MAM1T38...\*  
T38: on metal plunger  
T39: on metal plunger with dust protection cap



**Roller lever**  
MAM1F41...\*  
F41: nylon roller  
F43: metal roller



**Rubber roller lever**  
MAM1F42...\*



\* Snap action: Z11, X11 or Y11

**Product number**

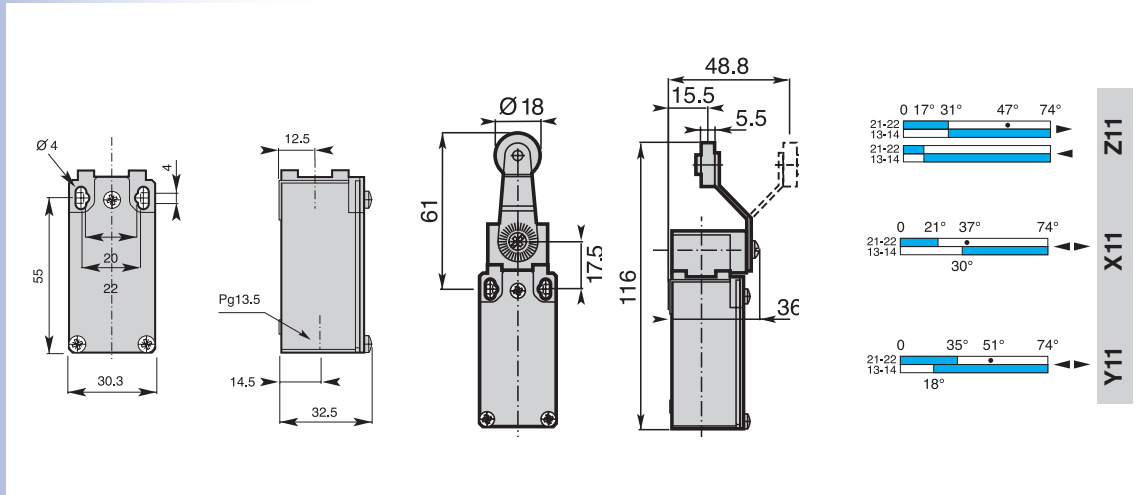
**Dimensions (basic)**

**Dimensions (head)**

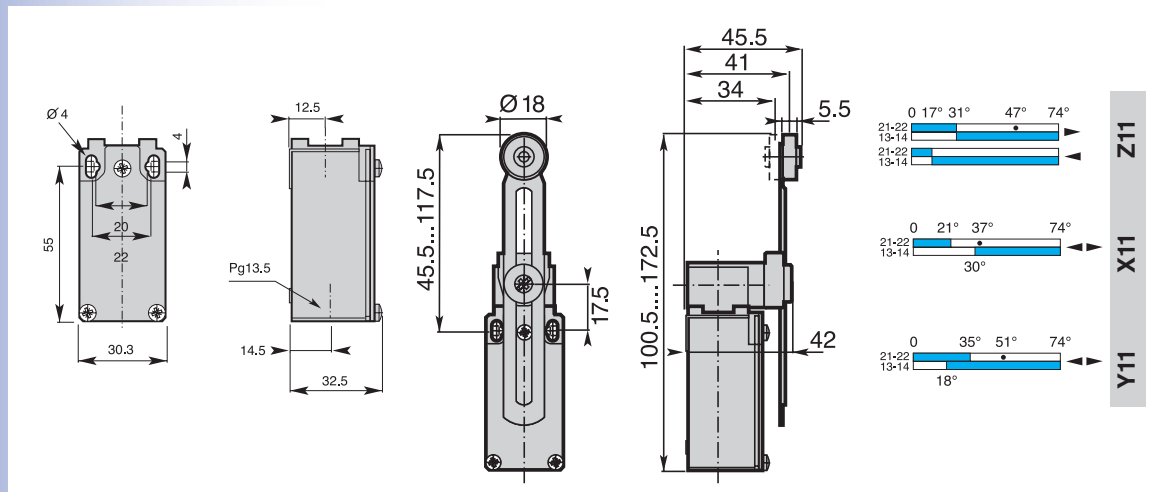
**Operation diagram**



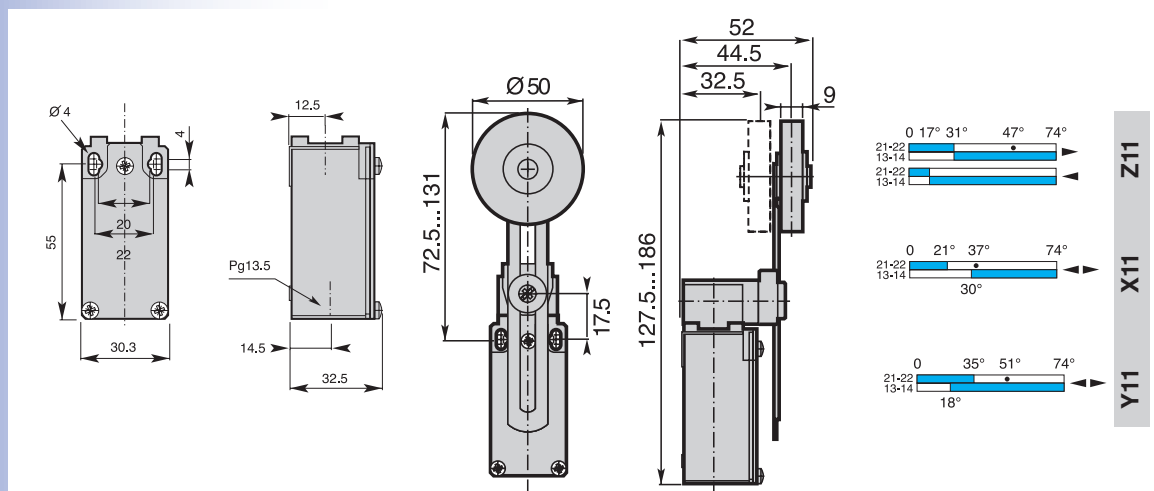
**Plastic roller lever**  
MAM1F45...\*  
F45: nylon roller  
F46: metal roller



**Adjustable lever with roller**  
MAM1F51...\*  
F51: nylon roller  
F53: metal roller



**Adjustable rubber roller lever**  
MAM1F52...\*



\* Snap action: Z11, X11 or Y11

# MAM F/T series

## Product number

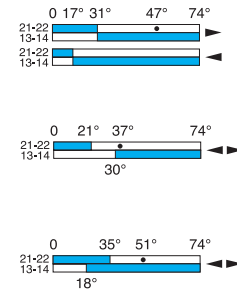
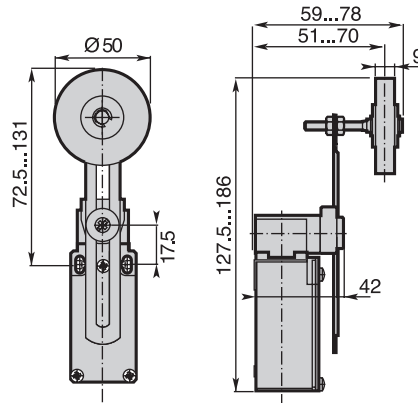
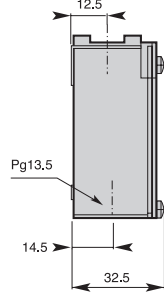
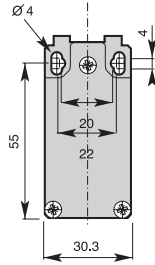
## Dimensions (basic)

## Dimensions (head)

## Operation diagram



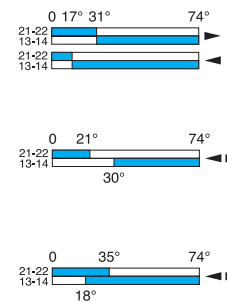
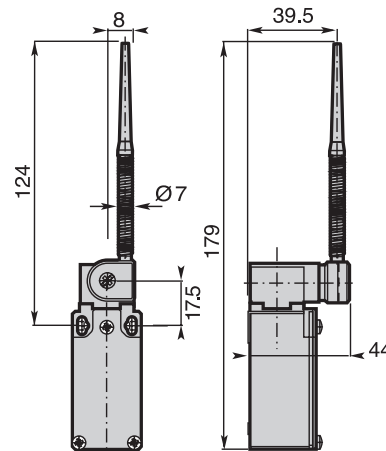
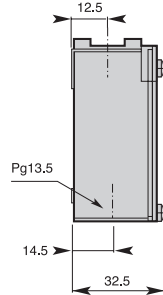
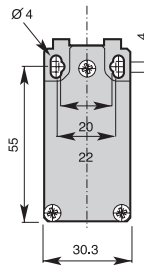
Adjustable lever with adjustable rubber roller  
MAM1F55...\*



Z11  
X11  
Y11



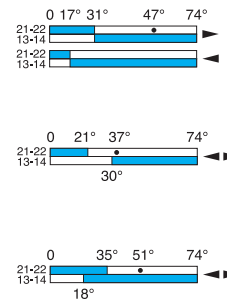
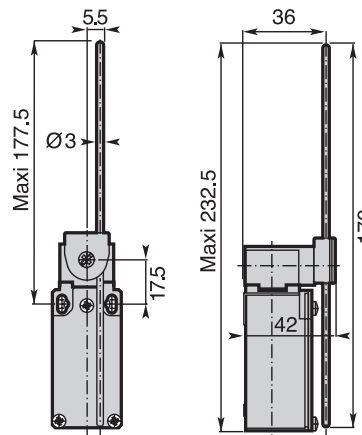
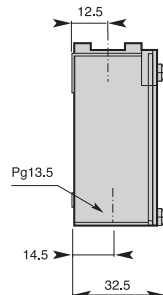
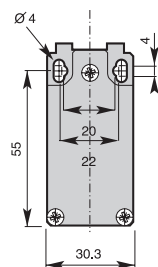
Nylon actuator with stainless steel spring  
MAM1F61...\*



Z11  
X11  
Y11



Adjustable rod lever  
MAM1F71...\*  
F71: stainless steel rod  
F72: fiberglass rod  
F75: square steel rod



Z11  
X11  
Y11

\* Snap action: Z11, X11 or Y11

**Product number**

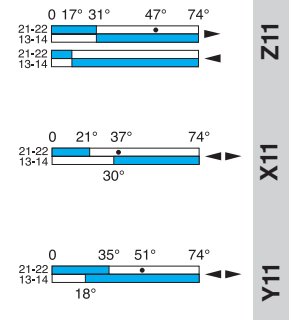
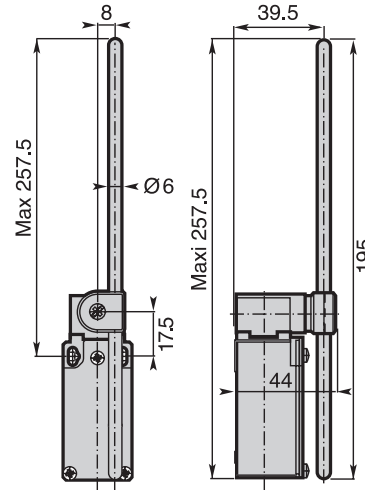
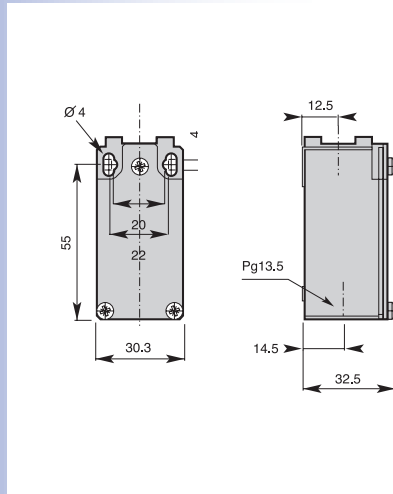
**Dimensions (basic)**

**Dimensions (head)**

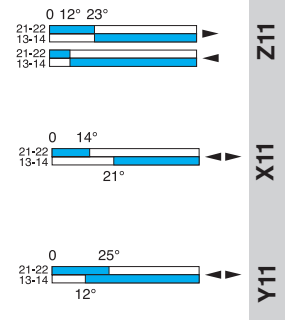
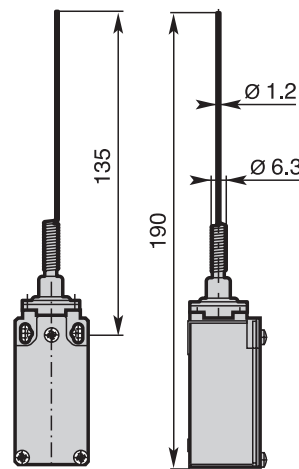
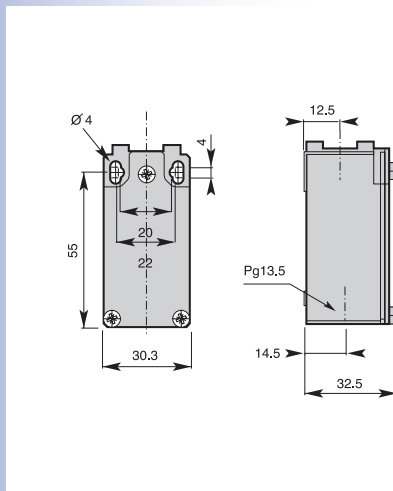
**Operation diagram**



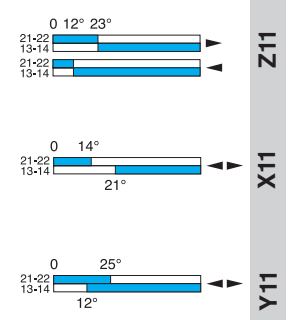
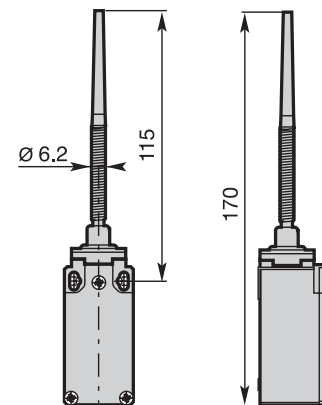
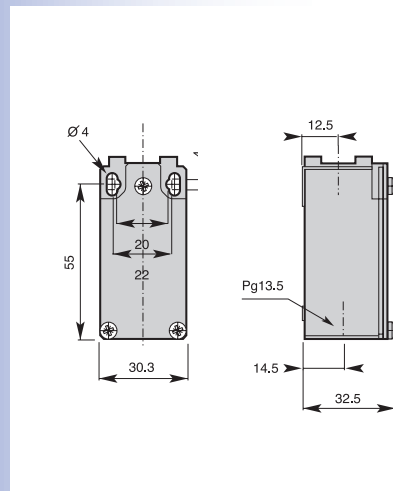
**Adjustable rod lever**  
MAM1F73...\*  
F73: nylon rod  
F74: fiberglass rod



**Stainless steel spring multidirectional actuator**  
MAM1T91...\*



**Multidirectional nylon actuator with stainless steel spring**  
MAM1T92...\*



\* Snap action: Z11, X11 or Y11

# MAM F/T series

Product number

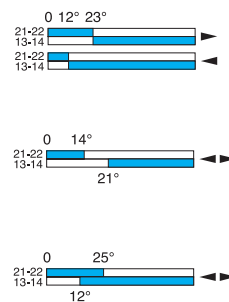
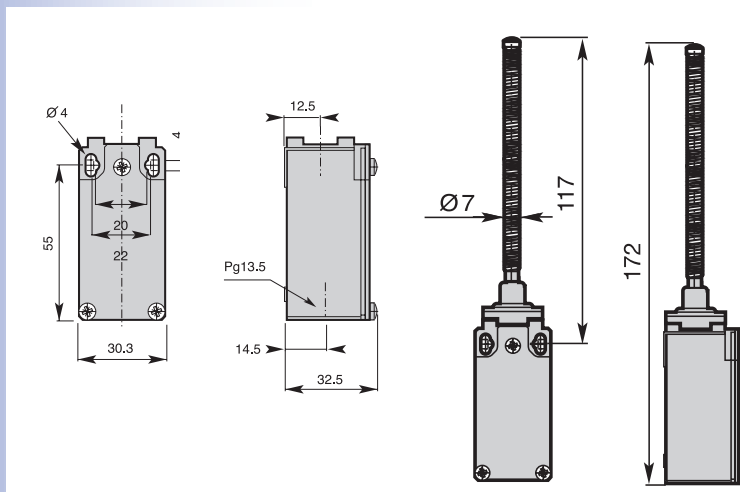
Dimensions (basic)

Dimensions (head)

Operation diagram



Stainless steel spring multidirectional actuator MAM1T93...\*



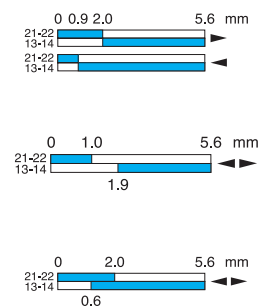
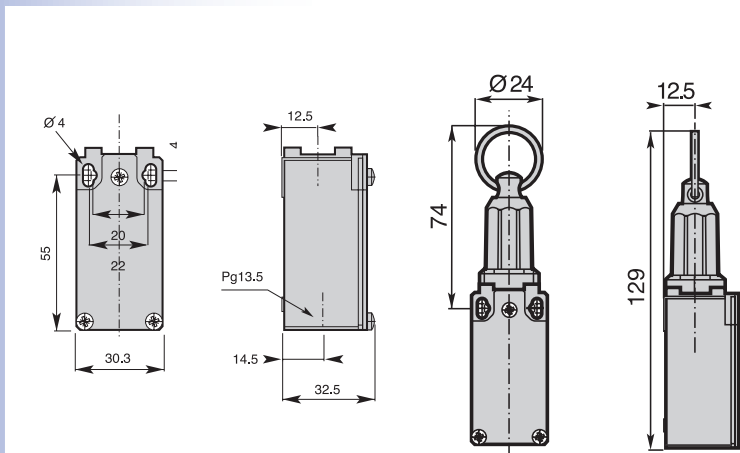
Z11

X11

Y11



Pull action with ring MAM1T98...\*



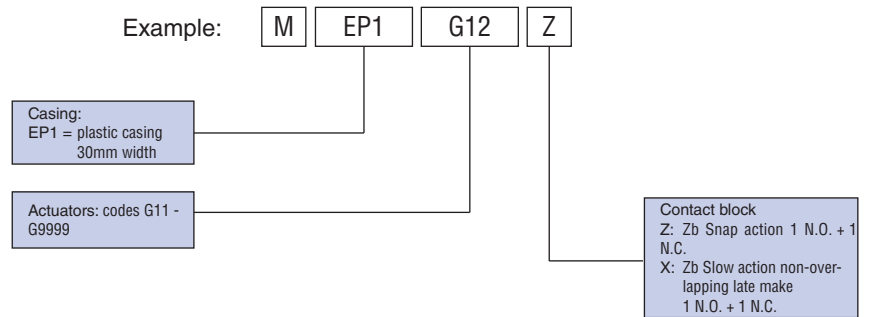
Z11

X11

Y11

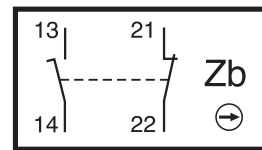
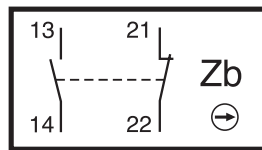
\* Snap action: Z11, X11 or Y11

### Ordering information

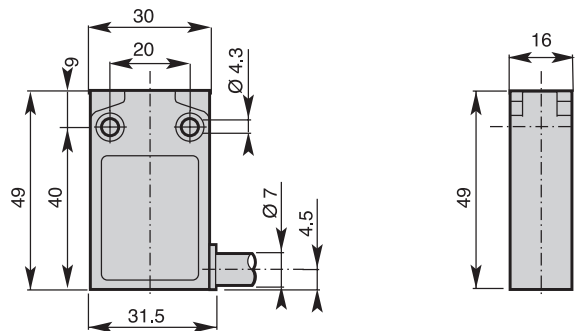


### Contacts

Z: Snap action 1 N.O. + 1 N.C.    X: Slow action break before make 1 N.O. + 1 N.C.



### Dimensions (basic)







## Features

- Double insulation
- 30mm width
- Casing made of plastic
- Visible operation.
- Able to switch strong currents (10A conventional thermal current).
- Electrically separated contacts.
- Precise operating points (consistency).
- Immune to electromagnetic disturbances.
- Degree of protection: IP67
- Standard cable length 1m\*

## General technical data

Standards	Plastic casing Devices conform with international IEC 947-5-1 and European EN 60 947-5-1 standards	
Certifications - Approvals	UL (upon request)	
Ambient temperature		
– during operation	°C	– 25 ... + 70
– for storage	°C	– 40 ... + 70
Mounting positions	All positions are authorised	
Protection against electrical shocks (acc. to IEC 536)	Class II	
Degree of protection (according to IEC 529 and EN 60 529)	IP67	
Degree of protection (according to UL50)	Type 1 enclosure ("indoor use only")	
<b>Electrical Data</b>		
Rated insulation voltage $U_i$ - according to IEC 947-1 and EN 60-947-1 - according to UL 508 and CSA C22-2 n° 14	400V (pollution degree 3) (250V for M12 connector) B 300, R 300	
Rated impulse withstand voltage $U_{imp}$ (according to IEC 947-1 and EN 60 947-1)	kV	4
Conventional free-air thermal current $I_{th}$ (according to IEC 947-5-1) $\sigma < 40$ °C	A	5 (4A for M12 connector)
Short-circuit protection $U_e < 500V$ a.c. - gG (gl) type fuses	A	6
Rated operational current $I_e$ / AC-15 (according to IEC 947-5-1)	24V - 50/60Hz A 120V - 50/60Hz A 240V - 50/60Hz A	5.0 3.0 1.5
$I_e$ / DC-13 (according to IEC 947-5-1)	24V DC A 125V DC A 250V DC A	1.1 0.22 0.1
Switching frequency	Cycles/h	3600
Load factor		0.5
Resistance between contacts	mΩ	25
Mechanical durability		10 millions of operations

\* For other cable inlets and cable lengths, please contact your local sales office.

**Product number**

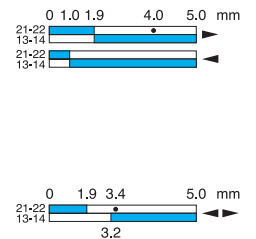
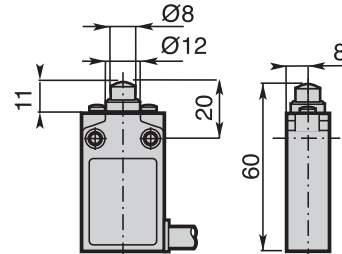
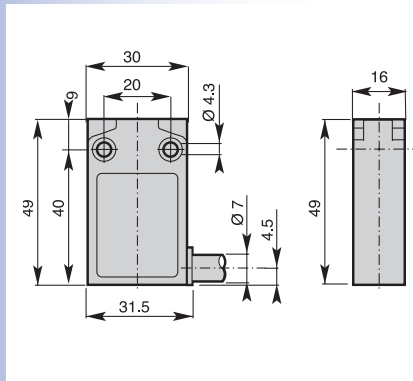
**Dimensions (basic)**

**Dimensions (head)**

**Operation diagram**



**Plain plunger**  
MEP1G11\*

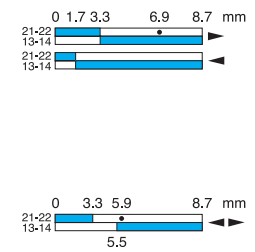
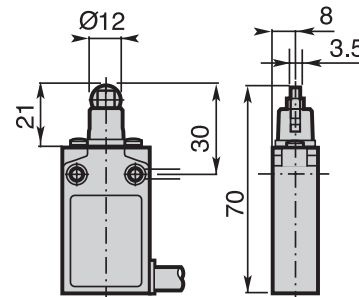
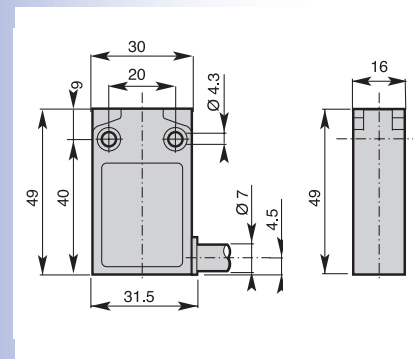


Z

X



**Roller plunger**  
MEP1G12\*  
G12: metal roller  
G13: nylon roller

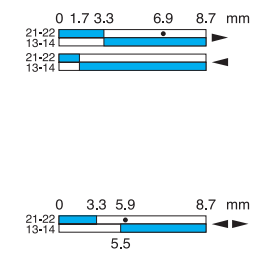
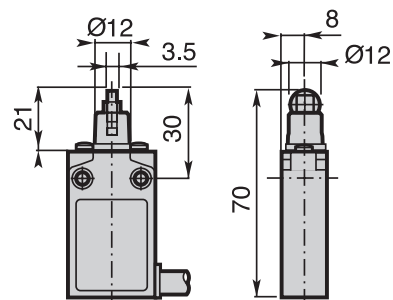
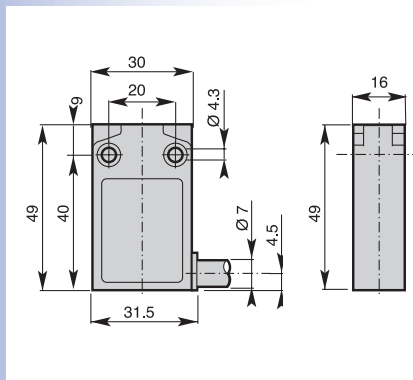


Z

X



**Cross roller plunger**  
MEP1G14\*  
G14: metal roller  
G15: nylon roller

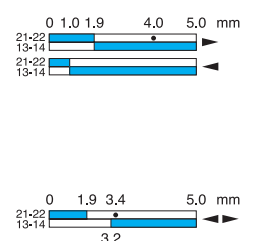
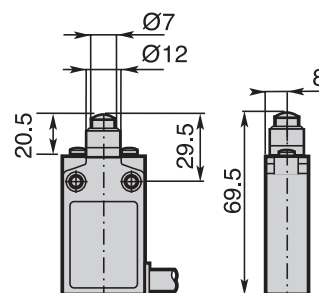
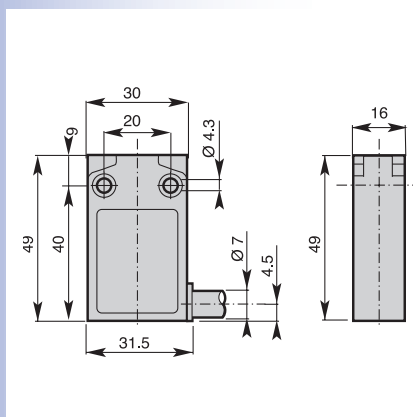


Z

X



**Plain plunger with dust protection cap**  
MEP1G16\*



Z

X

\* Snap action: Z11, X11 or Y11

**Product number**

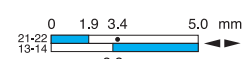
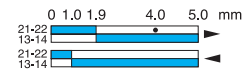
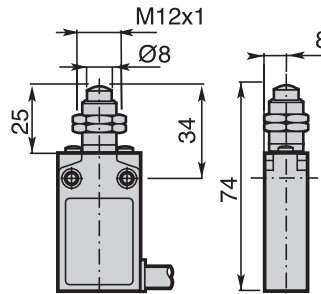
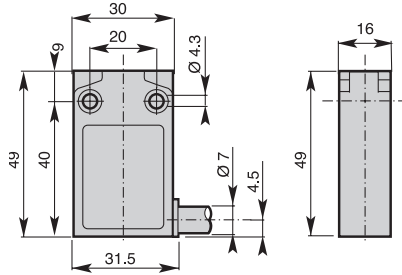
**Dimensions (basic)**

**Dimensions (head)**

**Operation diagram**



Plain plunger with fixing nuts  
MEP1G21\*

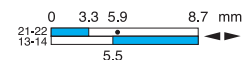
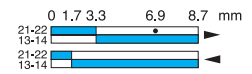
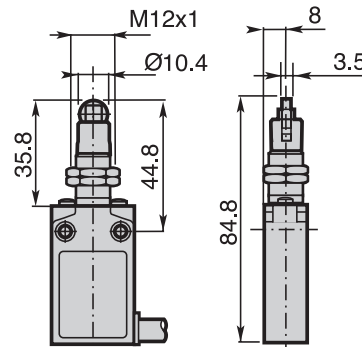
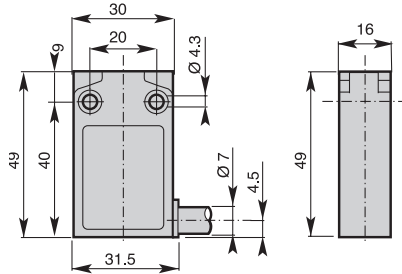


Z

X



Roller plunger with fixing nuts  
MEP1G22\*  
G22: metal roller  
G23: nylon roller

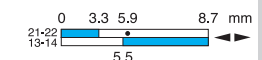
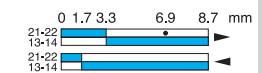
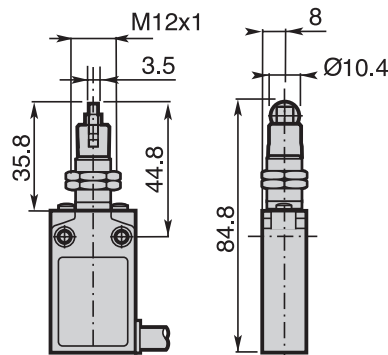
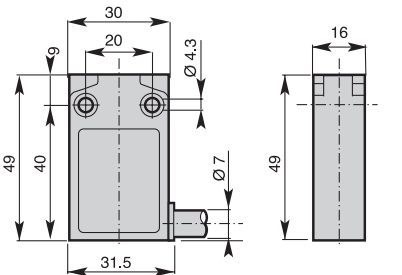


Z

X



Cross roller plunger with fixing nuts  
MEP1G24\*  
G24: metal roller  
G25: nylon roller

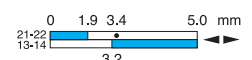
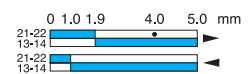
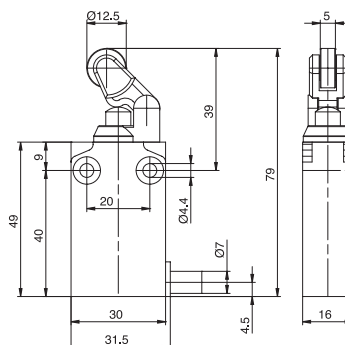
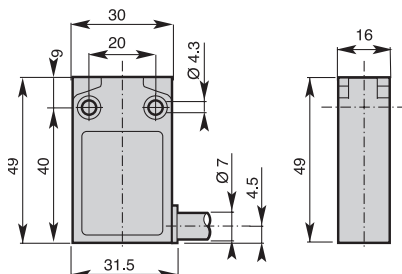


Z

X



Plain plunger with fixing nuts  
MEP1G31\*



Z

X

\* Snap action: Z or X  
\*\* Snap action: Z

Product number

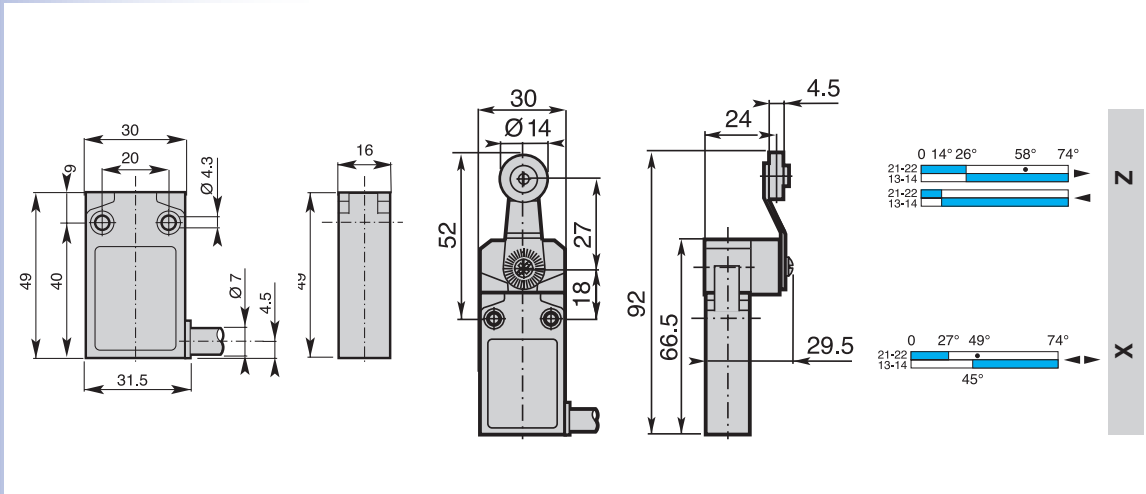
Dimensions (basic)

Dimensions (head)

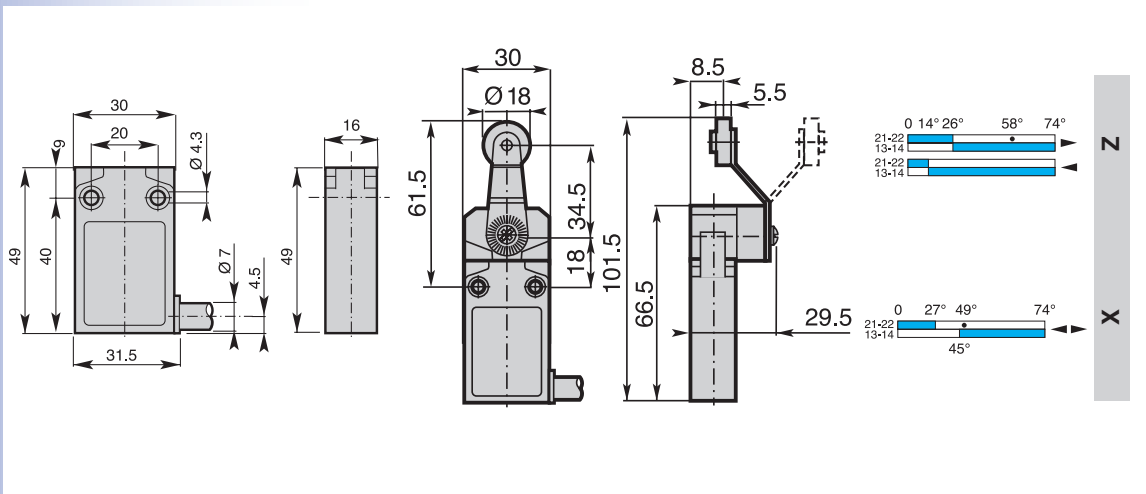
Operation diagram



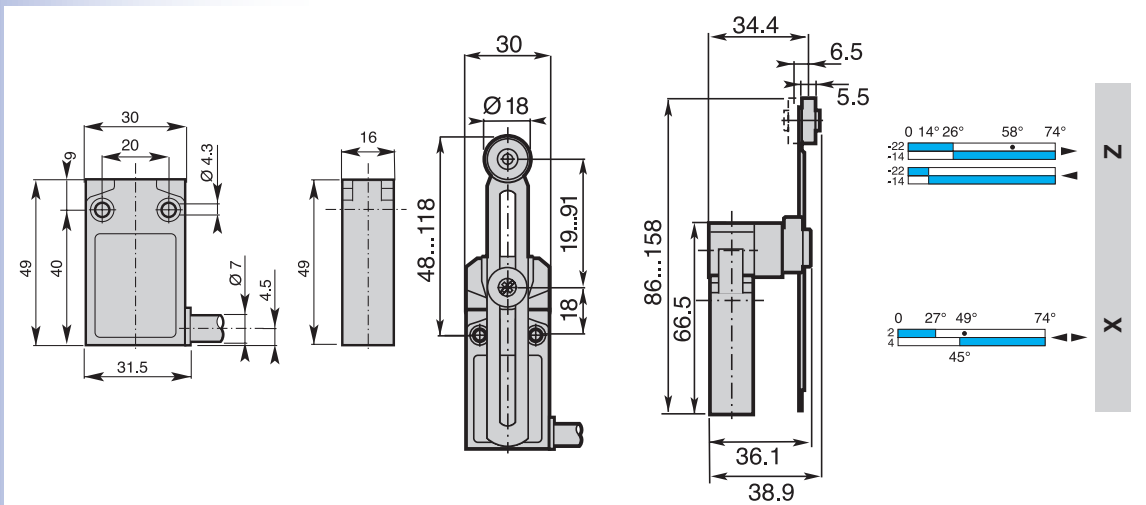
**Roller lever**  
MEP1G41\*  
G41: nylon roller  
G42: metal roller  
G43: ball bearing



**Nylon roller lever**  
MEP1G45\*  
G41: nylon roller  
G42: metal roller  
G43: ball bearing



**Adjustable lever with nylon roller**  
MEP1G51\*  
G41: nylon roller  
G42: metal roller  
G43: ball bearing



\* Snap action: Z or X  
\*\* Snap action: Z

## Product number

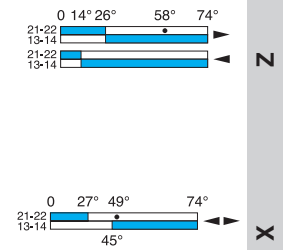
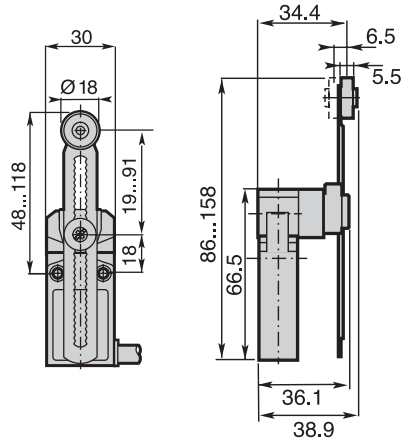
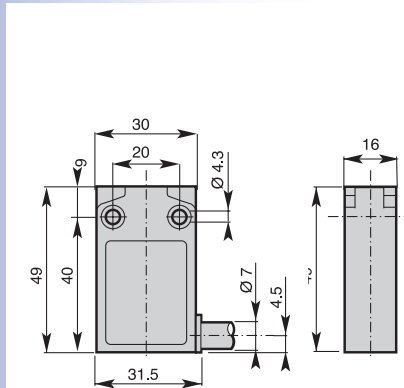
## Dimensions (basic)

## Dimensions (head)

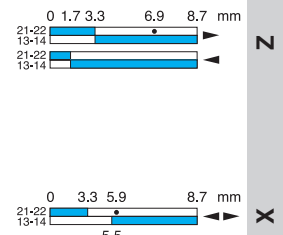
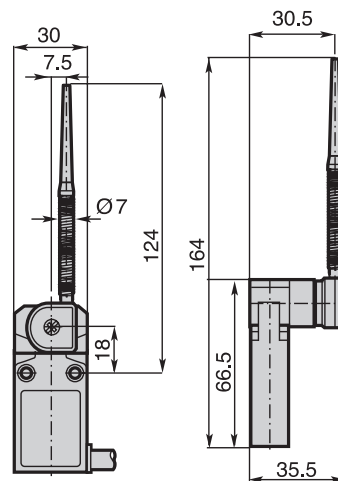
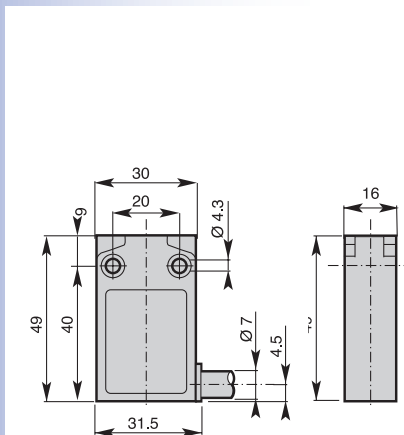
## Operation diagram



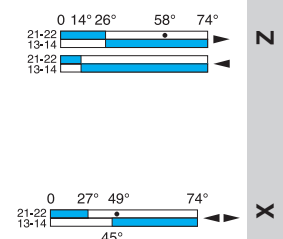
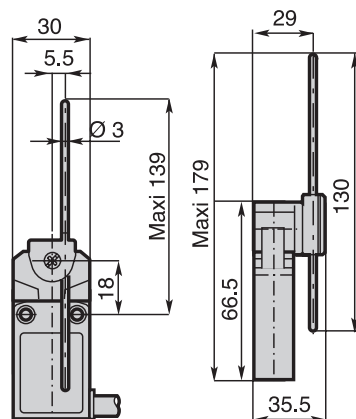
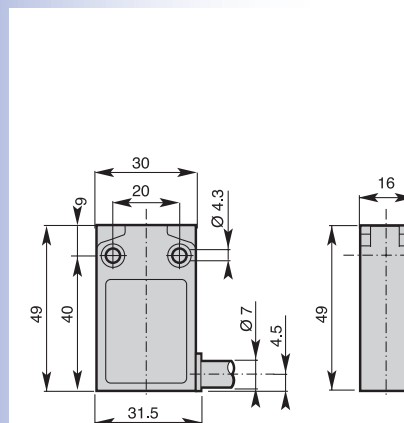
Adjustable toothed lever (step 2mm) with nylon roller  
MEP1G5100\*



Nylon actuator with stainless steel spring  
MEP1G61\*



Adjustable rod lever  
MEP1G71\*  
G71: stainless steel rod  
G72: fiberglass rod  
G75: square steel rod



\* Snap action: Z or X  
\*\* Snap action: Z

**Product number**

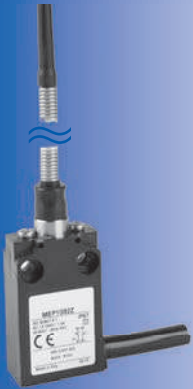
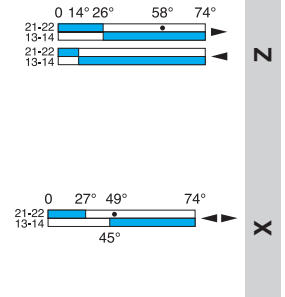
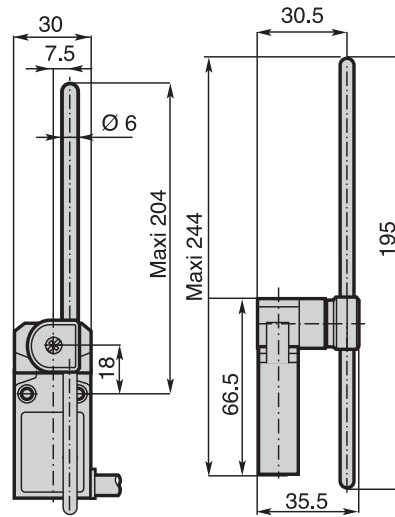
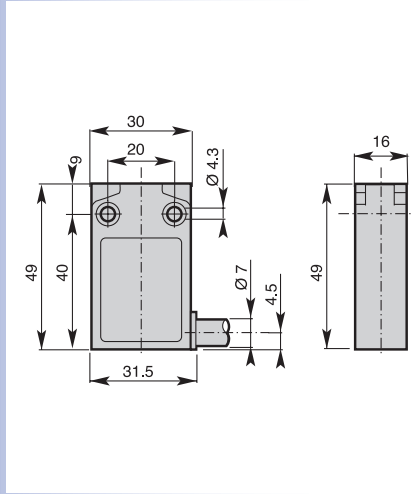
**Dimensions (basic)**

**Dimensions (head)**

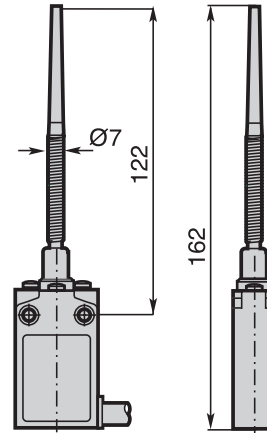
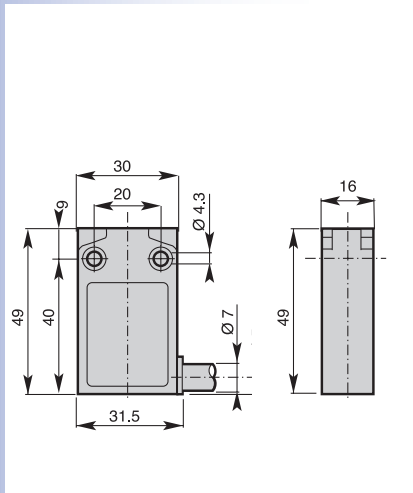
**Operation diagram**



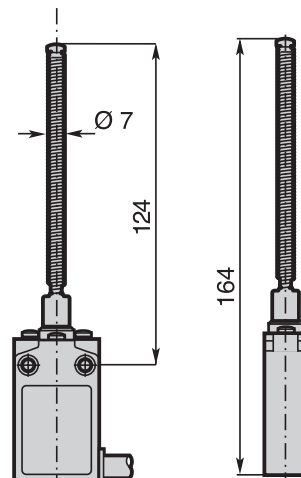
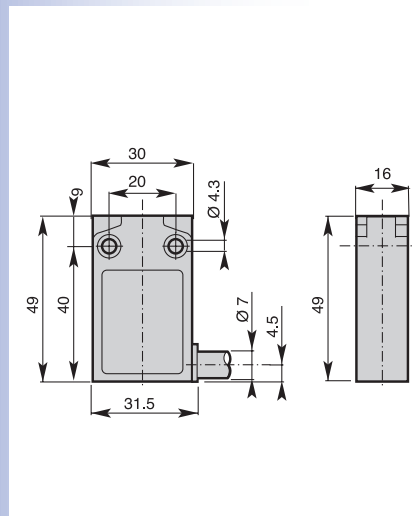
**Adjustable rod lever**  
MEP1G73\*\*  
G73: nylon rod  
G74: fiberglass rod



**Multidirectional nylon actuator with stainless steel spring**  
MEP1G92\*\*

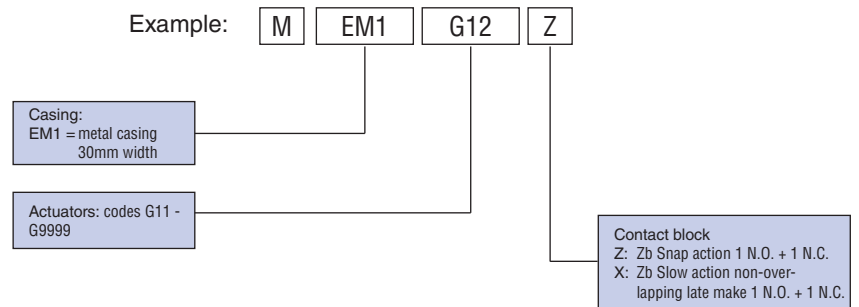


**Multidirectional actuator with stainless steel spring**  
MEP1G93\*\*



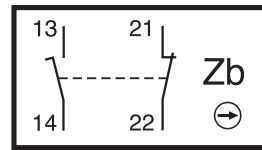
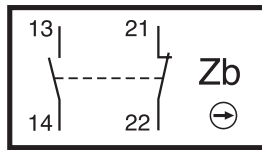
\* Snap action: Z or X  
\*\* Snap action: Z

## Ordering information

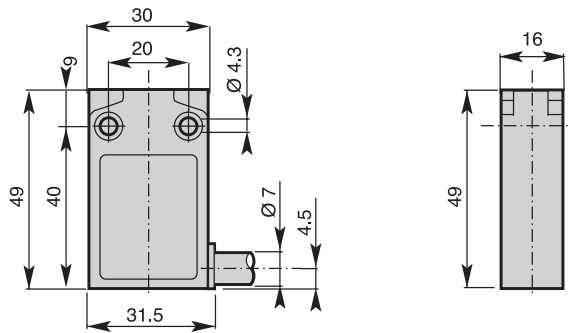


## Contacts

Z: Snap action 1 N.O. + 1 N.C.    X: Slow action break before make 1 N.O. + 1 N.C.



## Dimensions (basic)





## Features

- Double Insulation
- 30mm width
- Casing made of metal
- Visible operation
- Able to switch strong currents (10A conventional thermal current)
- Electrically separated contacts
- Precise operating points (consistency)
- Immune to electromagnetic disturbances
- Degree of protection: IP67
- Standard cable length 1m\*..

## General technical data

Standards	Metal casing Devices conform with international IEC 947-5-1 and European EN 60 947-5-1 standards		
Certifications - Approvals	UL (upon request)		
Ambient temperature	°C	- 25 ... + 70	
- during operation	°C	- 40 ... + 70	
- for storage			
Mounting positions	All positions are authorised		
Protection against electrical shocks (acc. to IEC 536)	Class I		
Degree of protection (according to IEC 529 and EN 60 529)	IP67		
Degree of protection (according to UL50)	Type 4 - 4X - 6 enclosure ("outdoor use - raintight - water tight corrosion resistant")		
<b>Electrical Data</b>			
Rated insulation voltage $U_i$ - according to IEC 947-1 and EN 60-947-1 - according to UL 508 and CSA C22-2 n° 14	400V (pollution degree 3) (250V for M12 connector) B 300, R 300		
Rated impulse withstand voltage $U_{imp}$ (according to IEC 947-1 and EN 60 947-1)	kV	4	
Conventional free-air thermal current $I_{th}$ (according to IEC 947-5-1) $\sigma < 40$ °C	A	5 (4A for M12 connector)	
Short-circuit protection $U_e < 500V$ a.c. - gG (gl) type fuses	A	6	
Rated operational current			
$I_e$ / AC-15 (according to IEC 947-5-1)	24V - 50/60Hz	A	5.0
	120V - 50/60Hz	A	3.0
	240V - 50/60Hz	A	1.5
$I_e$ / DC-13 (according to IEC 947-5-1)	24V DC	A	1.1
	125V DC	A	0.22
	250V DC	A	0.1
Switching frequency	Cycles/h	3600	
Load factor		0.5	
Resistance between contacts	mΩ	25	
Mechanical durability		10 millions of operations	

\* For other cable inlets and cable lengths, please contact your local sales office.



## Product number

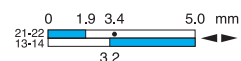
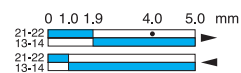
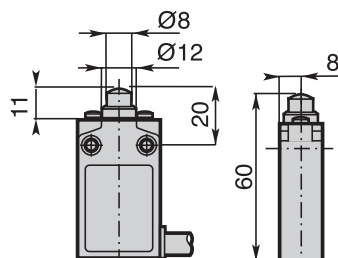
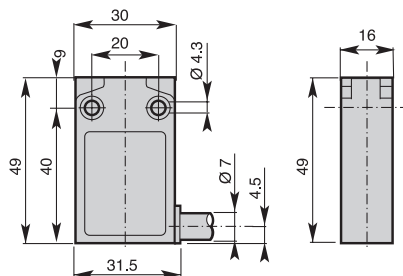
## Dimensions (basic)

## Dimensions (head)

## Operation diagram



Plain plunger  
MEM1G11\*\*

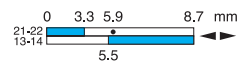
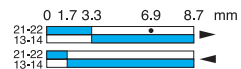
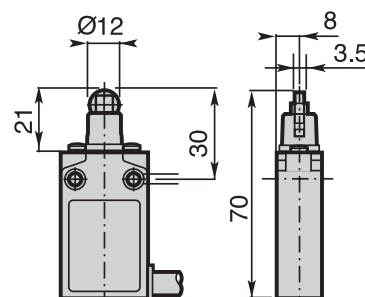
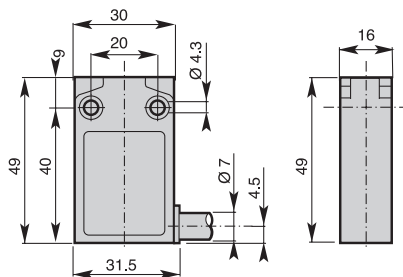


Z

X



Roller plunger  
MEM1G12\*  
G12: metall roller  
G13: nylon roller

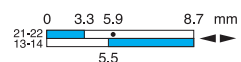
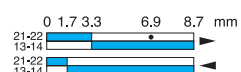
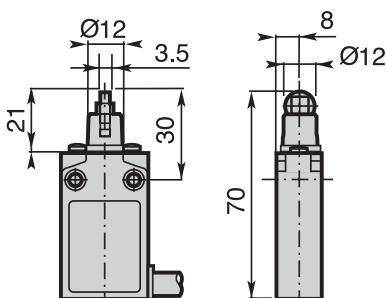
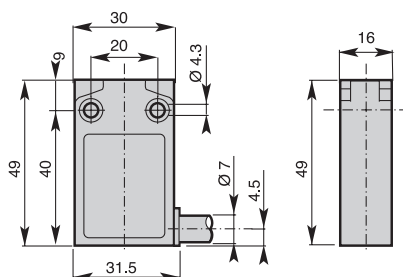


Z

X



Cross roller plunger  
MEM1G14\*  
G14: metall roller  
G15: nylon roller

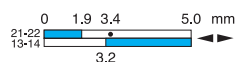
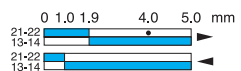
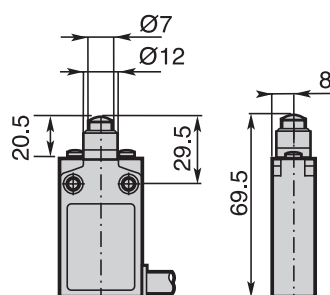
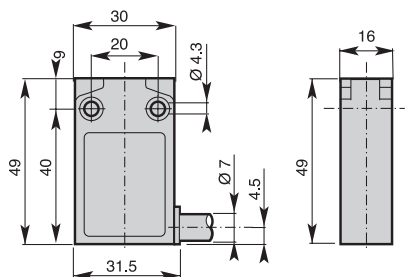


Z

X



Plain plunger with  
dust protection cap  
MEM1G16\*\*



Z

X

\* Snap action: Z or X  
\*\* Snap action: Z

**Product number**

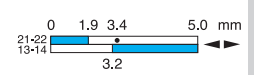
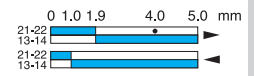
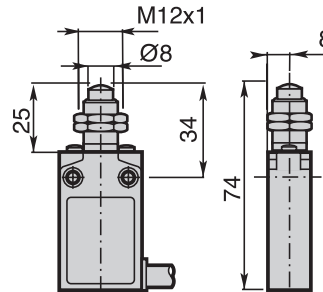
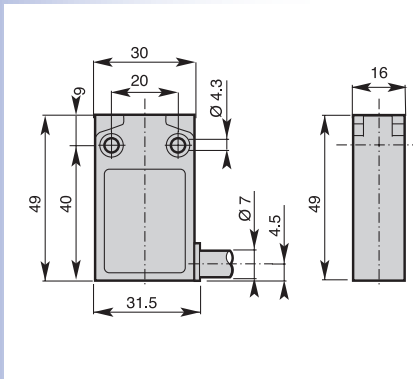
**Dimensions (basic)**

**Dimensions (head)**

**Operation diagram**



**Plain plunger with fixing nuts**  
MEM1G21\*\*

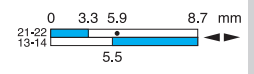
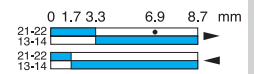
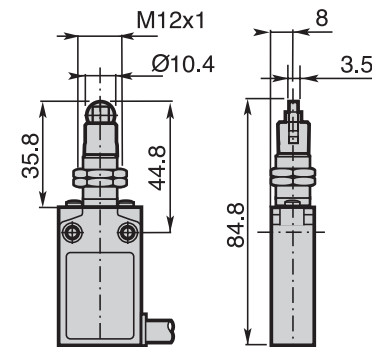
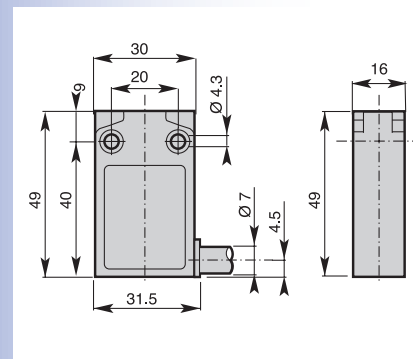


Z

X



**Roller plunger with fixing nuts**  
MEM1G22\*\*  
G22: metall roller  
G23: nylon roller

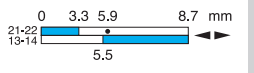
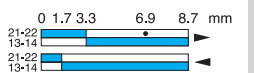
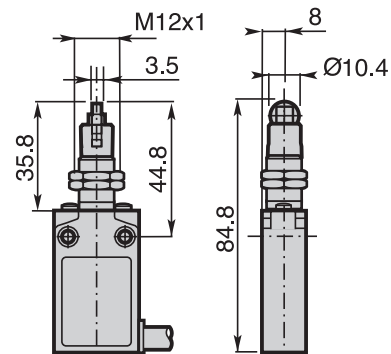
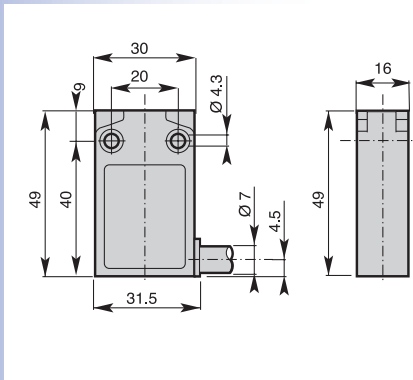


Z

X



**Cross roller plunger with fixing nuts**  
MEM1G24\*\*  
G24: metall roller  
G25: nylon roller

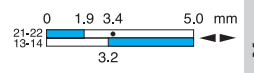
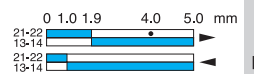
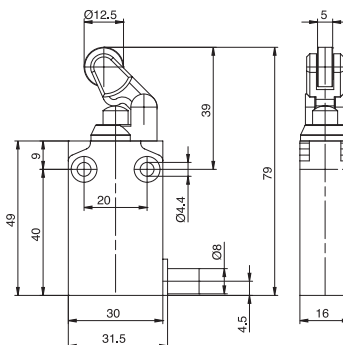
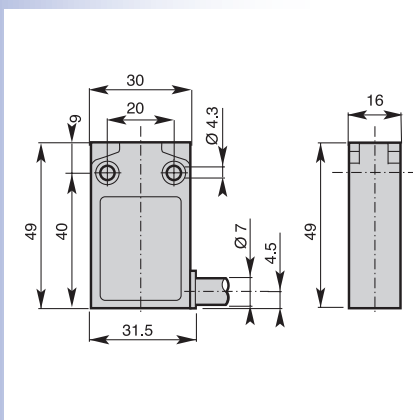


Z

X



**Plain plunger with fixing nuts**  
MEM1G31\*\*



Z

X

\* Snap action: Z or X  
\*\* Snap action: Z

Product number

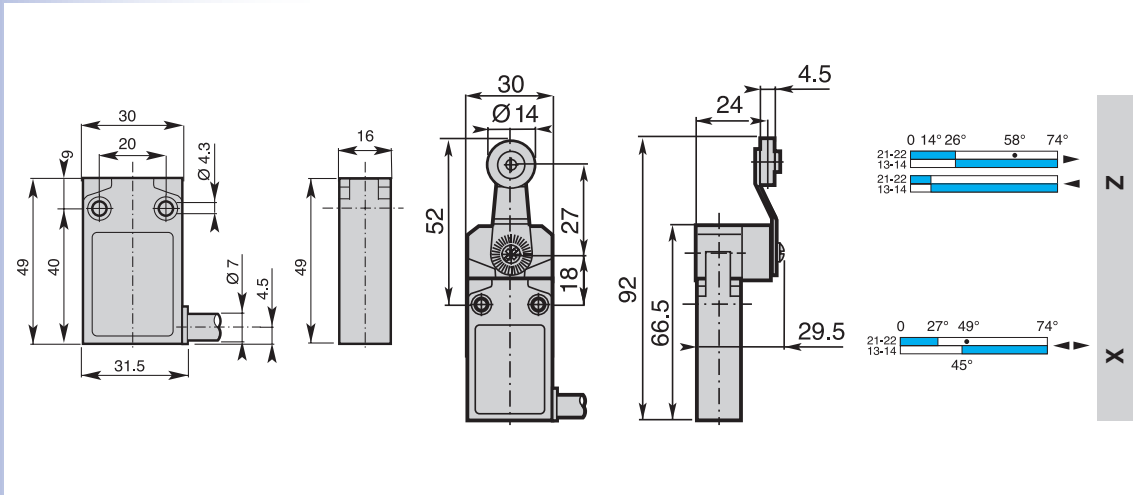
Dimensions (basic)

Dimensions (head)

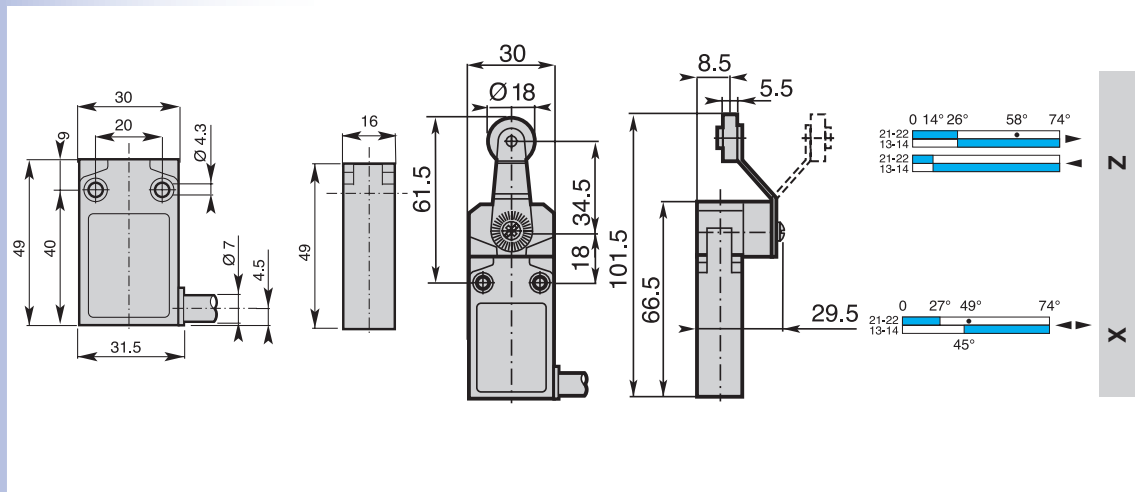
Operation diagram



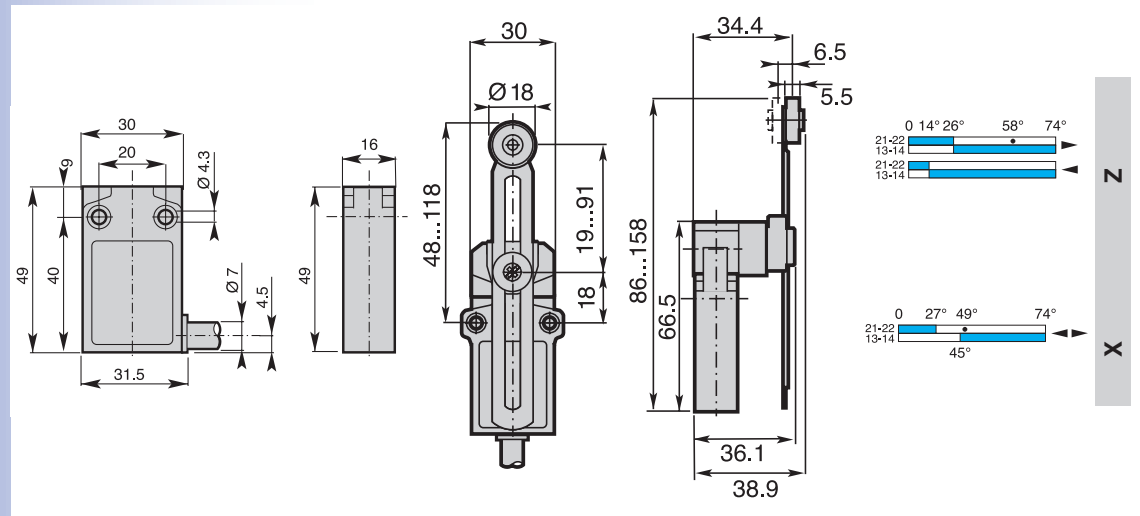
**Roller lever**  
MEM1G41\*  
G41: metal roller  
G42: nylon roller  
G43: ball bearing



**Roller lever**  
MEM1G45\*  
G45: nylon roller  
G46: metal roller



**Adjustable lever with roller**  
MEM1G51\*  
G51: nylon roller  
G53: metal roller



\* Snap action: Z or X  
\*\* Snap action: Z

**Product number**

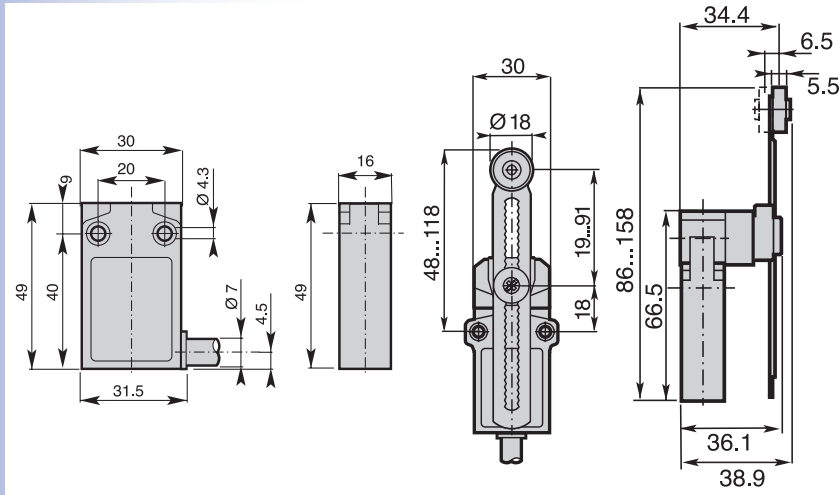
**Dimensions (basic)**

**Dimensions (head)**

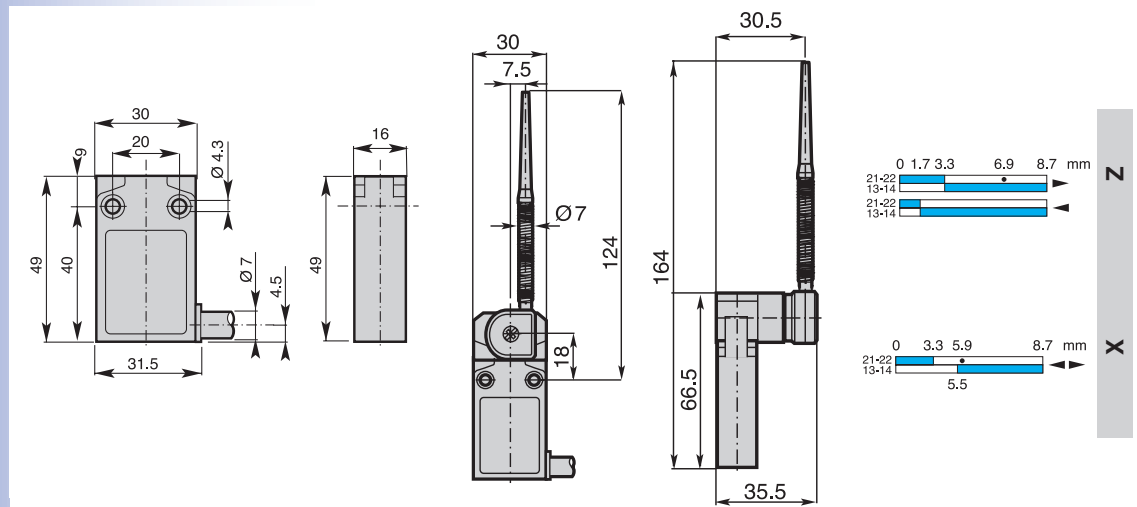
**Operation diagram**



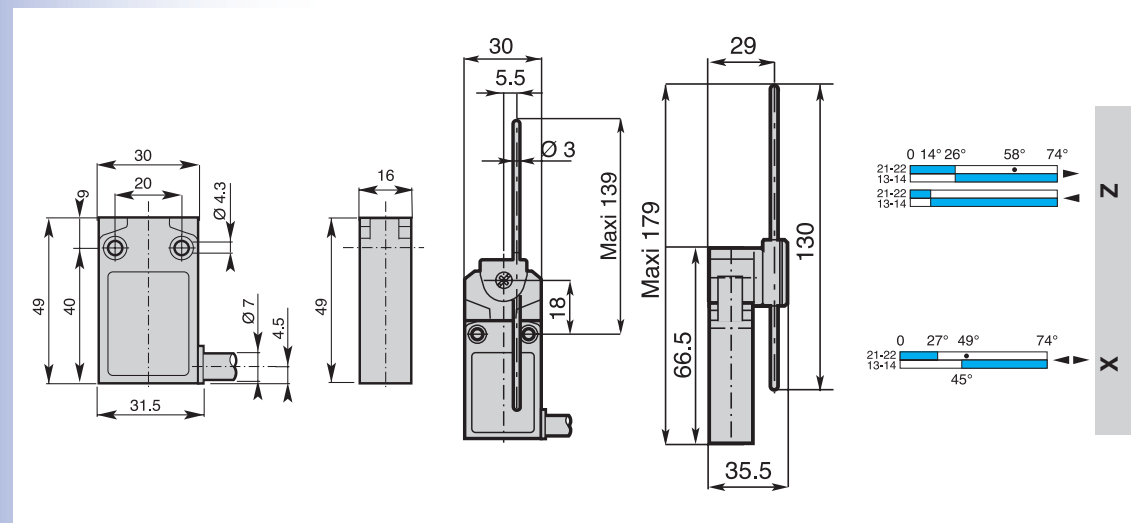
**Adjustable toothed lever (step 2mm) with nylon roller MEM1G5100\***



**Nylon actuator with stainless steel spring MEM1G61\***



**Adjustable rod lever MEM1G71\***  
 G71: stainless steel rod  
 G72: fiberglass rod  
 G75: square steel rod



\* Snap action: Z or X  
 \*\* Snap action: Z

## Product number

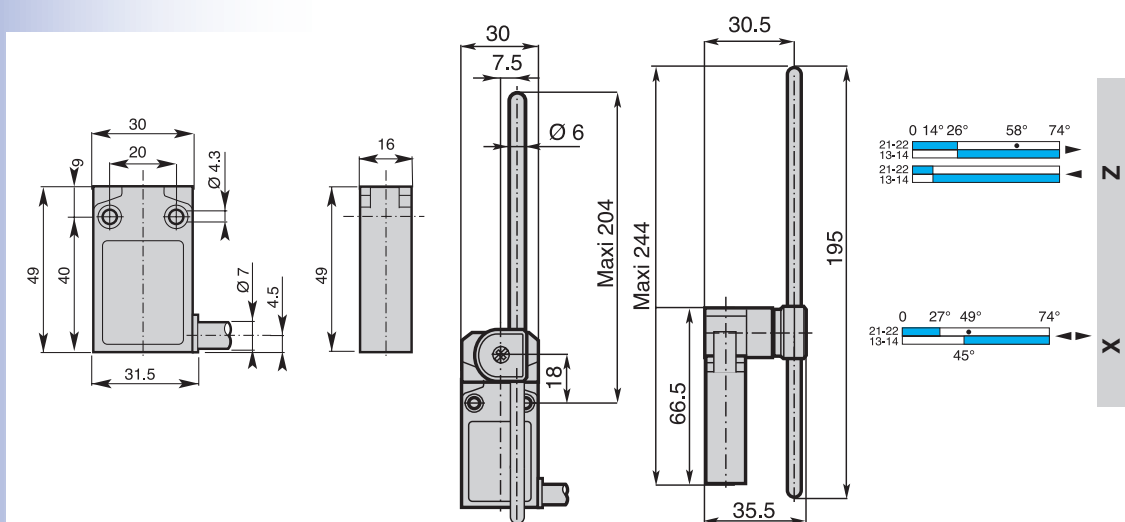
## Dimensions (basic)

## Dimensions (head)

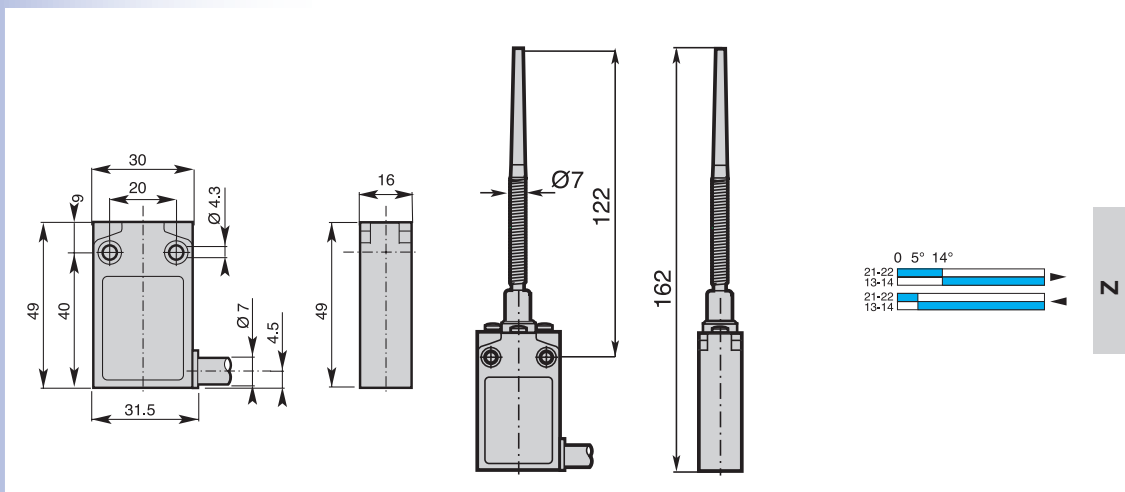
## Operation diagram



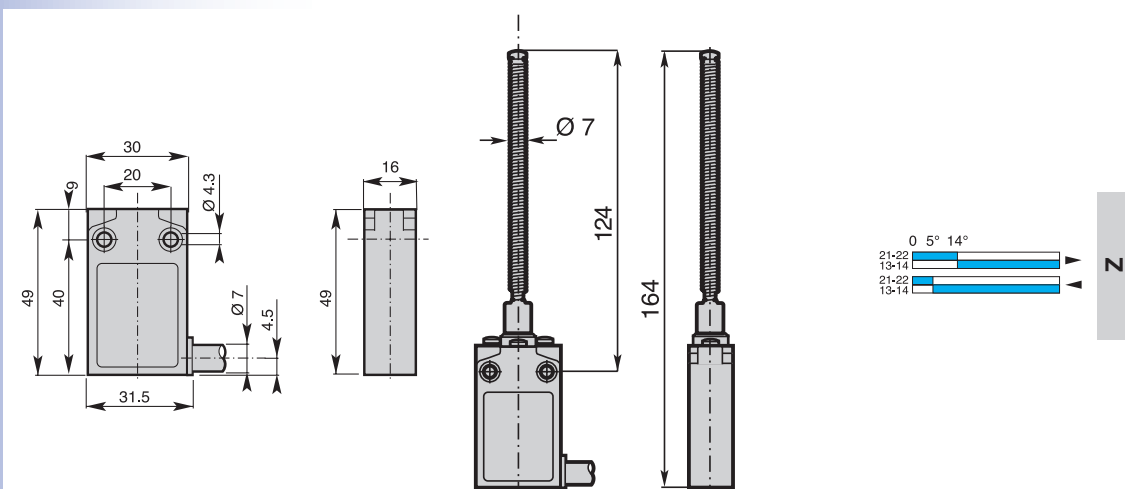
**Adjustable rod lever**  
MEM1G73\*  
G73: nylon rod  
G74: fiberglass rod



**Multidirectional nylon actuator with stainless steel spring**  
MEM1G92\*\*



**Multidirectional actuator with stainless steel spring**  
MEM1G93\*\*



\* Snap action: Z or X  
\*\* Snap action: Z

The MAC-I products listed in this catalogue are developed and manufactured according to the rules set out in IEC international publications and EN European standard.

## Specifications

- **International Specifications**  
The International Electrotechnical Commission, IEC, which is part of the International Standards Organization, ISO, publishes IEC publications which act as a basis for the world market.
- **European Specifications**  
The European Committee for Electrotechnical Standardisation (CENELEC), grouping 18 European countries, publishes EN standards for low voltage industrial apparatus.  
These European standards differ very little from IEC international standards and use a similar numbering system. The same is true of national standards. Contradicting national standards are withdrawn.
- **Harmonised European Specifications**  
The European Committees for Standardisation (CEN and CENELEC), grouping 18 European countries, publish EN standards relating to safety of machinery.
- **Specifications in Canada and the USA**  
These are equivalent, but differ markedly from IEC, UTE, VDE and BS specifications.  
UL Underwriters Laboratories (USA)  
CSA Canadian Standards Association (Canada)

Remark concerning the label issued by the UL (USA). Two levels of acceptance between devices must be distinguished.

“Recognized” Authorised to be included in equipment, if the equipment in question has been entirely mounted and wired by qualified personnel. They are not valid for use as “General purpose products” as their possibilities are limited.  
They bear the mark:

“Listed” Authorised to be included in equipment and for separate sale are “General purpose products” components in the USA. They bear the mark:

## European Directives

The guarantee of free movement of goods within the European Community assumes elimination of any regulatory differences between the member states. European Directives set up common rules that are included in the legislation of each state while contradictory regulations are cancelled.

There are three main directives:

- **Low Voltage Directive 2006/95/CE** concerning electrical equipment from 50 to 1000V a.c. and from 75 to 1500V d.c.  
This specifies that compliance with the requirements that is sets out is acquired once the equipment conforms to the standards harmonised at European level: EN 60947-1 and EN-60947-5-1 for limit switches.
- **Machines Directives - 2006/42/CE** defining main safety and health requirements concerning design and manufacture of the machines and other equipment including safety components in European Union countries.
- **Electromagnetic Compatibility Directive 2004/108/CE** concerning all electrical devices likely to create electromagnetic disturbances.

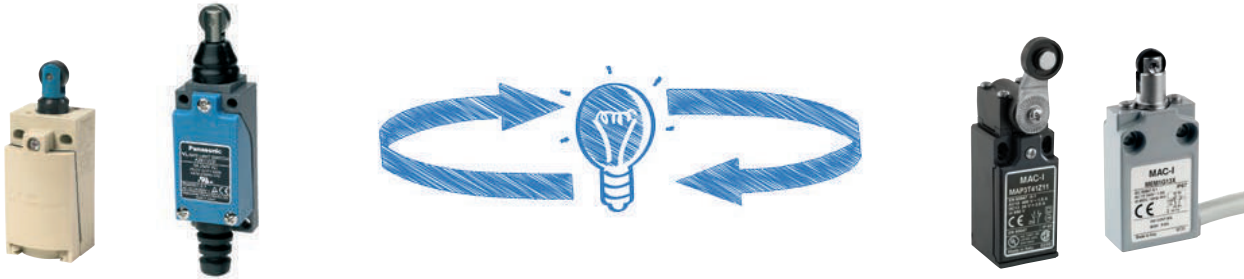
## Signification of CE marking:

- CE marking must not be confused with a quality label.
- CE marking placed on a product is proof of conformity with the European Devices concerning the product.
- CE marking is part of an administrative procedure and guarantees free movement of the product within the European Community.

## Standards

- **International Standards**
  - IEC 947-1 Low-voltage switchgear and controlgear - Part 1: General Rules (CEI EN 60947-1).
  - IEC 947-5-1 Low-voltage switchgear and controlgear - Part 5: Control circuit devices and switching elements - Section 1: Electromechanical control circuit devices (CEI EN 60947-5-1) - Chapter 3: Special requirements for control switches with positive opening operation.
  - IEC 204-1 Electrical equipment on industrial machines - Part 1: General requirements (CEI EN 60204-1).
  - IEC 204-2 Electrical equipment on industrial machines - Part 2: Item designation and examples of drawings, diagrams, tables and instructions.
  - IEC 529 Degrees of protection provided by enclosure (IPcode) (CEI EN 60529).
- **European Standards**
  - EN 50005 Low-voltage switchgear and controlgear for industrial use - Terminal marking and distinctive number: General rules (CEI 17-17).
  - EN 50013 Low-voltage switchgear and controlgear for industrial use - Terminal marking and distinctive number for particular control switches (CEI 17-17).
  - EN 50041 Low-voltage switchgear and controlgear for industrial use - Control switches - Position switches 42,5 x 80 - Dimensions and characteristics.
  - EN 50047 Low-voltage switchgear and controlgear for industrial use - Control switches - Position switches 30 x 55 - Dimensions and characteristics.
  - EN 60947-1 Low-voltage switchgear and controlgear for industrial use - Part 1: General rules (CEI EN 60947-1).
  - EN 60947-5-1 Low-voltage switchgear and controlgear for industrial use - Part 5: Control circuit devices and switching elements - Section 1: Electromechanical control circuit devices (CEI EN 60947-5-1) - Chapter 3: Special requirements for control switches with positive opening operation.
  - EN 60529 Degrees of protection provided by enclosures (IPcode).
  - EN 61058-1 Switches for appliances. Part. 1: general requirements.
- **American Standards**
  - UL 508 Standard for safety. Industrial control equipment.
  - CSA - C22.2 No. 14-95 Industrial control equipment. Industrial products.

## Panasonic ↔ MAC-I products

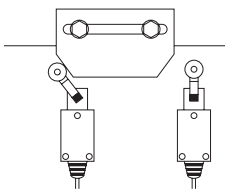
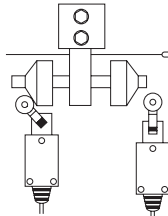
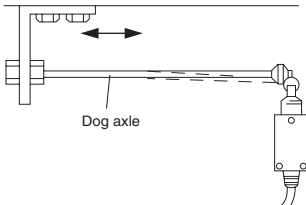
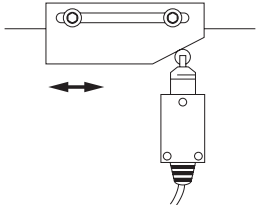
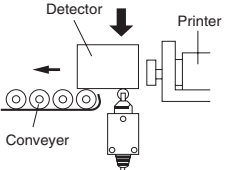
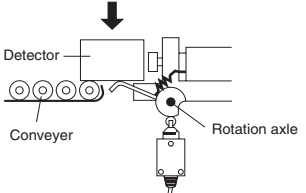
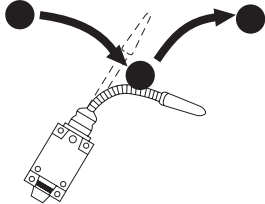
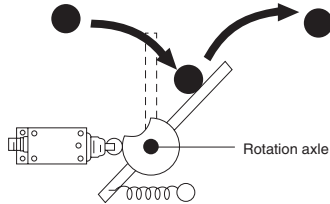
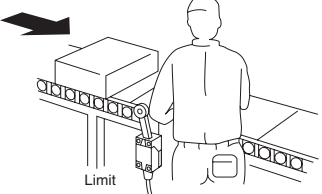
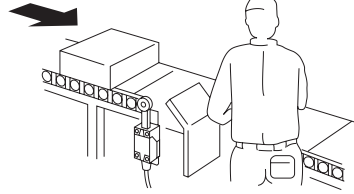
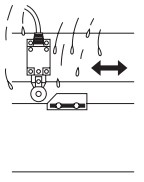
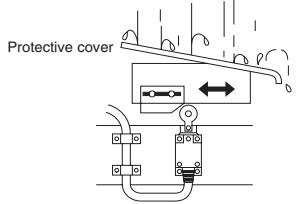
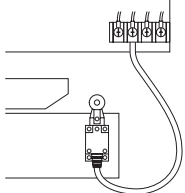
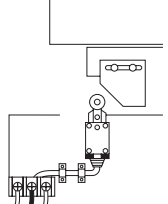


AZ8	Actuator	MAC-I equivalent
AZ8104CEJ	Roller arm	MAM1F41Z11
AZ8107CEJ	Adjustable rod	MAM1F71Z11
AZ8108CEJ	Adjustable roller arm	MAM1F51Z11
AZ8111CEJ	Push plunger	MAM1F11Z11
AZ8112CEJ	Roller plunger	MAM1F12Z11
AZ8122CEJ	Cross roller plunger	MAM1F12Z11
AZ8166CEJ	Flexible rod	MAM1T92Z11
AZ8169CEJ	Spring wire	MAM1T91Z11

AZ7	Actuator	MAC-I alternative
AZ7100CEJ	Short push plunger	MEP1G11Z
AZ7110CEJ	Push plunger	MEP1G16Z
AZ7120CEJ	Hinge lever	MEP1G31Z
AZ7121CEJ	Roller lever	MEP1G31Z
AZ7124CEJ	One-way roller lever	MEP1G31Z
AZ7140CEJ	Hinge short lever	MEP1G31Z
AZ7141CEJ	Short roller lever	MEP1G31Z
AZ7144CEJ	One-way short roller lever	MEP1G31Z
AZ7166CEJ	Flexible rod	MEP1G92Z
AZ7310CEJ	Panel mount push plunger	MEP1G21Z
AZ7311CEJ	Panel mount roller plunger	MEP1G22Z
AZ7312CEJ	Panel mount cross roller plunger	MEP1G24Z

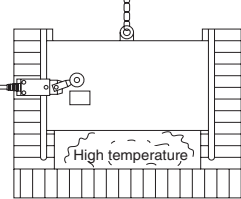
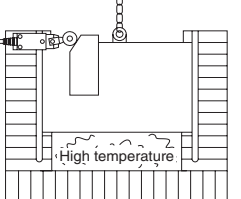
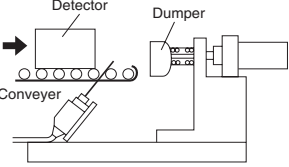
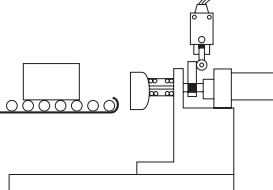
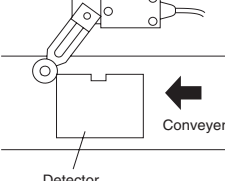
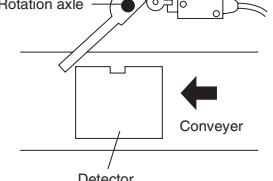
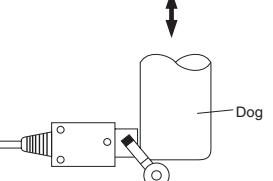
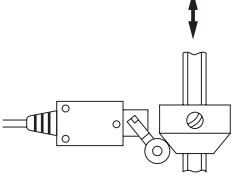
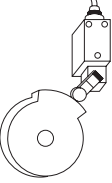
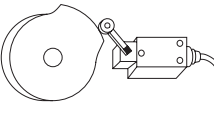
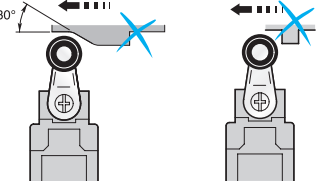


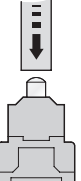
AZD1	Actuator	MAC-I equivalent
AZD1050CEJ	Roller lever	MAP1T30Z11
AZD1051CEJ	Push plunger	MAP1T10Z11
AZD1052CEJ	Roller plunger	MAP1T13Z11
AZD1053J	Adjustable roll lever	MAP1T52Z11
AZD1054CEJ	Roller arm	MAP1T41Z11
AZD1057J	Adjustable rod operator	MAP1T71Z11
AZD1058CEJ	Adjustable roller arm	MAP1T51Z11
AZD1059J	Roller lever, vertical operation	MAP1T36Z11

## Installation information

Incorrect	Correct	Explanation
		<ul style="list-style-type: none"> <li>■ Problem <ul style="list-style-type: none"> <li>• Dog adjustment is difficult.</li> </ul> </li> <li>■ Solution <ul style="list-style-type: none"> <li>• Separate each one until the dog can be adjusted.</li> </ul> </li> </ul>
 <p>Dog axle</p>		<ul style="list-style-type: none"> <li>■ Problem <ul style="list-style-type: none"> <li>• The dog axle is too long and slips out during operation.</li> </ul> </li> <li>• For this reason, the limit switch operating position slips.</li> <li>■ Solution <ul style="list-style-type: none"> <li>• Firmly fix the dog plate to the base.</li> </ul> </li> </ul>
 <p>Detector Printer Conveyer</p>	 <p>Detector Conveyer Rotation axle</p>	<ul style="list-style-type: none"> <li>■ Problem <ul style="list-style-type: none"> <li>• The detector sinks, applying force to the limit switch.</li> </ul> </li> <li>• The limit switch O.T. cannot be set.</li> <li>■ Solution <ul style="list-style-type: none"> <li>• Relieve the pressure using an additional actuator, and the O.T. can also be set.</li> </ul> </li> </ul>
	 <p>Rotation axle</p>	<ul style="list-style-type: none"> <li>■ Problem <ul style="list-style-type: none"> <li>• The area around the actuator coil is easily damaged.</li> <li>• Friction is generated during operation.</li> </ul> </li> <li>■ Solution <ul style="list-style-type: none"> <li>• Relieve the friction by installing an additional actuator.</li> <li>• Change the type of limit switch.</li> </ul> </li> </ul>
 <p>Limit</p>		<ul style="list-style-type: none"> <li>■ Problem <ul style="list-style-type: none"> <li>• Workers keep bumping the actuator.</li> </ul> </li> <li>■ Solution <ul style="list-style-type: none"> <li>• Fit a protective cover to the side of the limit switch.</li> </ul> </li> </ul>
	 <p>Protective cover</p>	<ul style="list-style-type: none"> <li>■ Problem <ul style="list-style-type: none"> <li>• Because the cord vent for the limit switch faces upwards, water droplets and so forth can easily penetrate the interior.</li> <li>• The cord is constantly moving and thus easily damaged.</li> </ul> </li> <li>■ Solution <ul style="list-style-type: none"> <li>• Fix the limit switch position on the stationary board.</li> <li>• Fit a protective cover so that water and oil cannot come into direct contact with the limit switch.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>■ Problem <ul style="list-style-type: none"> <li>• The cord is not fixed, and gets pulled during work.</li> </ul> </li> <li>• Dog adjustment is ineffective.</li> <li>■ Solution <ul style="list-style-type: none"> <li>• Change the limit switch position, and fix the cord.</li> <li>• Attach an adjustment mechanism to the dog.</li> </ul> </li> </ul>



## Installation information

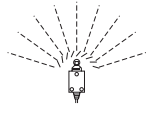
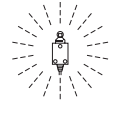
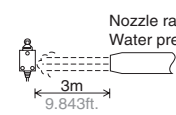
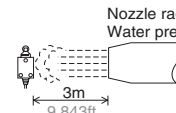
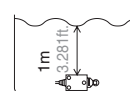
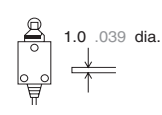

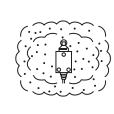
Incorrect	Correct	Explanation
		<ul style="list-style-type: none"> <li>■ <b>Problem</b> <ul style="list-style-type: none"> <li>• The limit switch is near a high-temperature area.</li> <li>• Dog adjustment is ineffective, and the dog keeps bumping the lever.</li> </ul> </li> <li>■ <b>Solution</b> <ul style="list-style-type: none"> <li>• Move the limit switch further away.</li> <li>• Make dog adjustment possible, and change the shape of the unit.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>■ <b>Problem</b> <ul style="list-style-type: none"> <li>• The detector is scratched.</li> <li>• Limit attachment adjustments are difficult</li> <li>• The actuator is damaged.</li> <li>• Specimen transfer is impeded.</li> </ul> </li> <li>■ <b>Solution</b> <ul style="list-style-type: none"> <li>• Fix the limit position to behind the dumper to solve the above problems.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>■ <b>Problem</b> <ul style="list-style-type: none"> <li>• The transfer path of the detector is not fixed and it keeps bumping the actuator.</li> <li>• The operating position is unstable.</li> <li>• The actuator is damaged.</li> </ul> </li> <li>■ <b>Solution</b> <ul style="list-style-type: none"> <li>• Stabilize the operating position by fitting an additional actuator.</li> <li>• Make limit switch adjustment possible.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>■ <b>Problem</b> <ul style="list-style-type: none"> <li>• Stroke adjustment ineffective.</li> <li>• Release the limit switch position and ensure that the dog does not bump the lever.</li> </ul> </li> <li>■ <b>Solution</b> <ul style="list-style-type: none"> <li>• Make dog adjustment possible.</li> <li>• Change the limit switch position and ensure that the dog does not bump the lever.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>■ <b>Problem</b> <ul style="list-style-type: none"> <li>• The rubber shape is unsuitable (especially during release and strike release).</li> <li>• Direction of limit switch attachment is unsuitable.</li> </ul> </li> <li>■ <b>Solution</b> <ul style="list-style-type: none"> <li>• Render the rubber shape smooth.</li> <li>• Change the limit switch position.</li> </ul> </li> </ul>
		
		

## Protective construction

Expresses the degree of protection that guards the level of functionality of the switch against ingress of solid objects, water, and oil. The standards are IEC 529 (IEC: International Electrotechnical Commission) standards. IEC standards determine the level of protection against both water and solid objects but not against oil.

## Protection against both water and solid objects

IP

		Protection level	Level	Protection level and test methods
Protection against water	0	No particular protection	—	—
	3	Protection against sprays to 60° from the vertical		No damage incurred when sprayed with water continuously for 10 minutes at angles of up to 60° from the vertical.
	4	Protection against water splashed from all directions		No damage incurred when sprayed with water continuously for 10 minutes at angles of up to 180° from the perpendicular across a wide area.
	5	Protection against jets of water		No damage incurred when sprayed with a jet of water for 3 minutes from all directions, as per the diagram on the left.
	6	Protection against strong jets of water		Water does not invade the interior when sprayed with a jet of water for 3 minutes from all directions, as per the diagram on the left.
	7	Protection against the effects of immersion		Water does not invade the interior during immersion for 30 minutes at a depth of 1m.
	Protection against solid foreign matter	4	Protection against solid objects exceeding 1mm in size	
5		Protection against dust. Limited ingress of dust permitted. (no harmful deposit)		The unit is left for 8 hours in an atmosphere in which 2kg of talcum powder per 1m <sup>3</sup> is floating. No damage incurred from talcum powder penetrating the inside.
6		Totally protected against ingress of dust		The unit is left for 8 hours in an atmosphere in which 2kg of talcum powder per 1m <sup>3</sup> is floating. The talcum powder does not penetrate the inside.

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

# Notes

A large rectangular grid of small squares, intended for writing notes. The grid consists of 30 columns and 35 rows.

# Further Panasonic products



## Eco-POWER METERS

Panasonic Eco components help you to save energy and protect the environment, maintain and manage your energy-saving and environmental measures. Guards against wasted electricity.



## Timers and Counters

Panasonic's precision timers, counters, preset type counters and time switches are flexible, reliable and affordable. Moreover, you can be sure that the wide product range will always include the right device for your application.



## Temperature Controllers

Control any temperature simply, accurately and economically with our temperature controllers. Five different models, a universal input (for thermocouples, resistance temperature detectors, voltage, current), a variety of outputs (relays, solid-state relays, current, alarm) and ease of use mark the KT Series.



## Fans

For years Panasonic fan motors have been characterized by high performance, a long lifetime and quiet operation. Because of their high performance and availability in all standard sizes and all voltages, our motor fans can be implemented in a wide range of applications.



## UV Curing Systems

Panasonic's award winning UV curing system, Aicure UJ30/35, is an LED technology based curing system that quickly hardens UV-sensitive resin such as adhesives, ink, and coatings. It is especially suited for precise and high-intensity curing of punctiform or small areas.



## Sensors

As a pioneering manufacturer of sensors, Panasonic provide high performance sensors for a wide range of applications, facilitating factory automation in various types of production lines, such as those used for the manufacturing of semiconductors.

## North America

## Europe

## Asia Pacific

## China

## Japan

## Panasonic Electric Works

Please contact our Global Sales Companies in:

Europe		
▶ <b>Headquarters</b>	<b>Panasonic Electric Works Europe AG</b>	Rudolf-Diesel-Ring 2, 83607 Holzkirchen, Tel. +49 (0) 8024 648-0, Fax +49 (0) 8024 648-111, <a href="http://www.panasonic-electric-works.com">www.panasonic-electric-works.com</a>
▶ <b>Austria</b>	<b>Panasonic Electric Works Austria GmbH</b>	Josef Madersperger Str. 2, 2362 Biedermannsdorf, Tel. +43 (0) 2236-26846, Fax +43 (0) 2236-46133 <a href="http://www.panasonic-electric-works.at">www.panasonic-electric-works.at</a>
	<b>Panasonic Industrial Devices Materials Europe GmbH</b>	Ennshafenstraße 30, 4470 Enns, Tel. +43 (0) 7223 883, Fax +43 (0) 7223 88333, <a href="http://www.panasonic-electronic-materials.com">www.panasonic-electronic-materials.com</a>
▶ <b>Benelux</b>	<b>Panasonic Electric Works Sales Western Europe B.V.</b>	De Rijn 4, (Postbus 211), 5684 PJ Best, (5680 AE Best), Netherlands, Tel. +31 (0) 499 372727, Fax +31 (0) 499 372185, <a href="http://www.panasonic-electric-works.nl">www.panasonic-electric-works.nl</a>
▶ <b>Czech Republic</b>	<b>Panasonic Electric Works Europe AG</b>	Administrative centre PLATINIUM, Veverí 3163/111, 616 00 Brno, Tel. +420 541 217 001, Fax +420 541 217 101, <a href="http://www.panasonic-electric-works.cz">www.panasonic-electric-works.cz</a>
▶ <b>France</b>	<b>Panasonic Electric Works Sales Western Europe B.V.</b>	Succursale française, 10, rue des petits ruisseaux, 91370 Verrières Le Buisson, Tél. +33 (0) 1 6013 5757, Fax +33 (0) 1 6013 5758, <a href="http://www.panasonic-electric-works.fr">www.panasonic-electric-works.fr</a>
▶ <b>Germany</b>	<b>Panasonic Electric Works Europe AG</b>	Rudolf-Diesel-Ring 2, 83607 Holzkirchen, Tel. +49 (0) 8024 648-0, Fax +49 (0) 8024 648-111, <a href="http://www.panasonic-electric-works.de">www.panasonic-electric-works.de</a>
▶ <b>Hungary</b>	<b>Panasonic Electric Works Europe AG</b>	Magyarországi Közvetlen Kereskedelmi Képviselet, 1117 Budapest, Neumann János u. 1., Tel. +36 1 999 89 26 <a href="http://www.panasonic-electric-works.hu">www.panasonic-electric-works.hu</a>
▶ <b>Ireland</b>	<b>Panasonic Electric Works UK Ltd.</b>	Irish Branch Office, Dublin, Tel. +353 (0) 14600969, Fax +353 (0) 14601131, <a href="http://www.panasonic-electric-works.co.uk">www.panasonic-electric-works.co.uk</a>
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▶ <b>Nordic Countries</b>	<b>Panasonic Electric Works Europe AG</b> <b>Panasonic Eco Solutions Nordic AB</b>	Filial Nordic, Knarrarnäsgatan 15, 164 40 Kista, Sweden, Tel. +46 859476680, Fax +46 859476690, <a href="http://www.panasonic-electric-works.se">www.panasonic-electric-works.se</a>
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▶ <b>Spain</b>	<b>Panasonic Electric Works España S.A.</b>	ul. Wotoska 9A, 02-583 Warszawa, Tel. +48 22 338-11-33, Fax +48 22 338-12-00, <a href="http://www.panasonic-electric-works.pl">www.panasonic-electric-works.pl</a>
▶ <b>Switzerland</b>	<b>Panasonic Electric Works Schweiz AG</b>	Barajas Park, San Severo 20, 28042 Madrid, Tel. +34 913293875, Fax +34 913292976, <a href="http://www.panasonic-electric-works.es">www.panasonic-electric-works.es</a>
▶ <b>United Kingdom</b>	<b>Panasonic Electric Works UK Ltd.</b>	Grundstrasse 8, 6343 Rotkreuz, Tel. +41 (0) 41 7997050, Fax +41 (0) 41 7997055, <a href="http://www.panasonic-electric-works.ch">www.panasonic-electric-works.ch</a>
		Sunrise Parkway, Linford Wood, Milton Keynes, MK14 6 LF, Tel. +44 (0) 1908 231555, Fax +44 (0) 1908 231599, <a href="http://www.panasonic-electric-works.co.uk">www.panasonic-electric-works.co.uk</a>

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## Asia Pacific/China/Japan

▶ <b>China</b>	<b>Panasonic Electric Works Sales (China) Co. Ltd.</b>	Level 2, Tower W3, The Towers Oriental Plaza, No. 2, East Chang An Ave., Dong Cheng District, Beijing 100738, Tel. +86-10-5925-5988, Fax +86-10-5925-5973
▶ <b>Hong Kong</b>	<b>Panasonic Industrial Devices Automation Controls Sales (Hong Kong) Co., Ltd.</b>	RM1205-9, 12/F, Tower 2, The Gateway, 25 Canton Road, Tsimshatsui, Kowloon, Hong Kong, Tel. +852-2956-3118, Fax +852-2956-0398
▶ <b>Japan</b>	<b>Panasonic Corporation</b>	1048 Kadoma, Kadoma-shi, Osaka 571-8686, Japan, Tel. +81-6-6908-1050, Fax +81-6-6908-5781, <a href="http://www.panasonic.net">www.panasonic.net</a>
▶ <b>Singapore</b>	<b>Panasonic Industrial Devices Automation Controls Sales Asia Pacific</b>	300 Beach Road, #16-01 The Concourse, Singapore 199555, Tel. +65-6390-3811, Fax +65-6390-3810

# Panasonic

## SAFETY COMPONENTS

MAC-I LIMIT SWITCHES





## Features

The MAC-I limit switches are developed and manufactured according to the rules set out in IEC international publications and EN European standards.

Easy to use, electromechanical limit switches offer specific qualities:

- Visible operation
- Able to switch strong currents (10A conventional thermal current)
- Precise operating points (consistency)
- Immune to electromagnetic disturbances
- Electrically separated contacts
- N.C. contacts with positive opening operation



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## European Standards

- EN 50005 Low-voltage switchgear and controlgear for industrial use - Terminal marking and distinctive number: General rules (CEI 17-17).
- EN 50013 Low-voltage switchgear and controlgear for industrial use - Terminal marking and distinctive number for particular control switches (CEI 17-17).
- EN 50041 Low-voltage switchgear and controlgear for industrial use - Control switches - Position switches 42,5 x 80 - Dimensions and characteristics.
- EN 50047 Low-voltage switchgear and controlgear for industrial use - Control switches - Position switches 30 x 55 - Dimensions and characteristics.
- EN 60947-1 Low-voltage switchgear and controlgear for industrial use - Part 1: General rules (CEI EN 60947-1).
- EN 60947-5-1 Low-voltage switchgear and controlgear for industrial use - Part 5: Control circuit devices and switching elements - Section 1: Electromechanical control circuit devices (CEI EN 60947-5-1) - Chapter 3: Special requirements for control switches with positive opening operation.
- EN 60529 Degrees of protection provided by enclosures (IP code).
- EN 61058-1 Switches for appliances. Part 1: General requirements.



# MA150 series

## Electrical connection

Replace the symbol "•" with the required thread:

0: for PG 13.5 cable gland

On request:

2: for 1/2" NPT cable gland

(with adapter in MA150 and MA160 series)

3: for PG11 cable gland

4: for M16 x 1.5 cable gland

5: for M20 x 1.5 cable gland



MA150  
90° adjustable  
head

MA150T  
Fully turnable  
head

## Available contact blocks

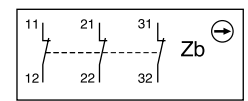
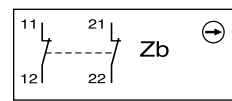
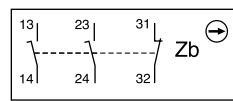
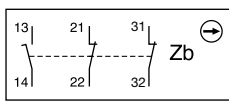
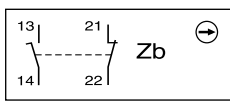
**X11:** Slow action break before  
make 1NO + 1NC

**X12P:** Slow action break before  
make 1NO + 2NC

**X21P:** Slow action break before  
make 2NO + 1NC

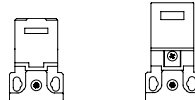
**W02:** Simultaneous slow action  
2NC

**W03P:** Simultaneous slow action  
3NC



### MA150 series

30mm polymeric casing.  
1 cable inlet. IP65



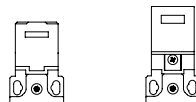
Contact blocks

	↻	↻
X11 (1NO+1NC)	MA15•T•X11	MA15•FT•X11
X12P (1NO+2NC)	MA15•T•X12P	MA15•FT•X12P
X21P (2NO+1NC)	MA15•T•X21P	MA15•FT•X21P
W02 (2NC)	MA15•T•W02	MA15•FT•W02
W03P (3NC)	MA15•T•W03P	MA15•FT•W03P



### MA150M series

30mm metal casing.  
1 cable inlet. IP66



Contact blocks

	↻	↻
X11 (1NO+1NC)	MA15•MT•X11	MA15•MFT•X11
X12P (1NO+2NC)	MA15•MT•X12P	MA15•MFT•X12P
X21P (2NO+1NC)	MA15•MT•X21P	MA15•MFT•X21P
W02 (2NC)	MA15•MT•W02	MA15•MFT•W02
W03P (3NC)	MA15•MT•W03P	MA15•MFT•W03P

## Ordering code MA150 (T) series :

**M A 1 5 0 M F T 8 3 X 1 1**

Electrical connection  
see top of page

Metal casing

Fully turnable head

Operating keys  
T83, T84, T85  
T86, T87, T88, T90  
(see page 10)

### Contact blocks

- X11: Slow action break before make 1NO + 1NC
- X12P: Slow action break before make 1NO + 2NC
- X21P: Slow action break before make 2NO + 1NC
- W02: Simultaneous slow action 2NC
- W03P: Simultaneous slow action 3NC

## Electrical connection

Replace the symbol "•" with the required thread:

0: for PG 13.5 cable gland

On request:

2: for 1/2" NPT cable gland

(with adapter in MA150 and MA160 series)

3: for PG11 cable gland

4: for M16 x 1.5 cable gland

5: for M20 x 1.5 cable gland



MA160  
90° adjustable  
head

MA160T  
Fully turnable  
head

## Available contact blocks

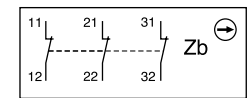
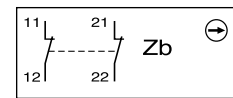
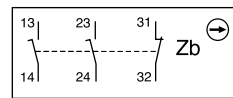
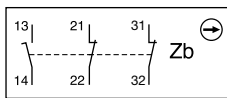
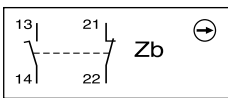
**X11:** Slow action break before  
make 1NO + 1NC

**X12P:** Slow action break before  
make 1NO + 2NC

**X21P:** Slow action break before  
make 2NO + 1NC

**W02:** Simultaneous slow action  
2NC

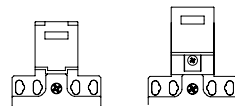
**W03P:** Simultaneous slow action  
3NC



## MA160 series

50mm polymeric casing.

2 cable inlets. IP65



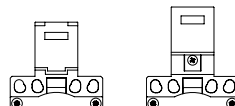
Contact blocks

	↻	↻
X11 (1NO+1NC)	MA16•T↔X11	MA16•FT↔X11
X12P (1NO+2NC)	MA16•T↔X12P	MA16•FT↔X12P
X21P (2NO+1NC)	MA16•T↔X21P	MA16•FT↔X21P
W02 (2NC)	MA16•T↔W02	MA16•FT↔W02
W03P (3NC)	MA16•T↔W03P	MA16•FT↔W03P

## MA160M series

50mm metal casing.

3 cable inlets. IP66



Contact blocks

	↻	↻
X11 (1NO+1NC)	MA16•MT↔X11	MA16•MFT↔X11
X12P (1NO+2NC)	MA16•MT↔X12P	MA16•MFT↔X12P
X21P (2NO+1NC)	MA16•MT↔X21P	MA16•MFT↔X21P
W02 (2NC)	MA16•MT↔W02	MA16•MFT↔W02
W03P (3NC)	MA16•MT↔W03P	MA16•MFT↔W03P

## Ordering code MA160 (T) series :

**M A 1 6 0 M F T 8 3 X 1 1**

Electrical connection  
see top of page

Metal casing

Fully turnable head

Operating keys

T83, T84, T85

T86, T87, T88, T90

(see page 10)

Contact blocks

X11: Slow action break before

make 1NO + 1NC

X12P: Slow action break before

make 1NO + 2NC

X21P: Slow action break before

make 2NO + 1NC

W02: Simultaneous slow action

2NC

W03P: Simultaneous slow action

3NC

# SLC & SLZ series 30mm

## Electrical connection

Replace the symbol "•" with the required thread:

1: for PG 13.5 cable gland

On request:

2: for 1/2" NPT cable gland

(with adapter in MA150 and MA160 series)

3: for PG11 cable gland

4: for M16 x 1.5 cable gland

5: for M20 x 1.5 cable gland



C71  
Zinc plated steel shaft  
C72  
Stainless steel shaft



Z61  
Zinc plated steel lever



C71  
Zinc plated steel shaft  
C72  
Stainless steel shaft



Z61  
Zinc plated steel lever

## Available contact blocks

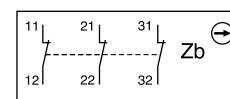
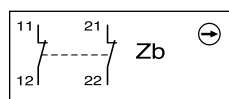
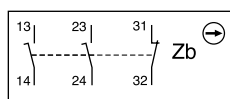
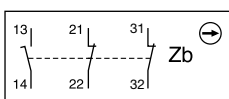
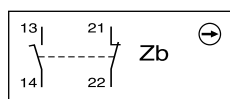
**X11:** Slow action break before make 1NO + 1NC

**X12P:** Slow action break before make 1NO + 2NC

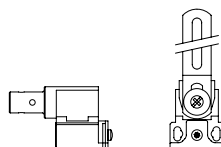
**X21P:** Slow action break before make 2NO + 1NC

**W02:** Simultaneous slow action 2NC

**W03P:** Simultaneous slow action 3NC



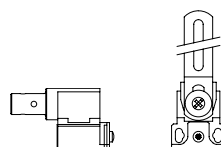
SLC & SLZ series  
30mm polymeric casing.  
1 cable inlet. IP65



Contact blocks	↻	↻
X11 (1NO+1NC)	SL•C7•X11	SL•Z61X11
X12P (1NO+2NC)	SL•C7•X12P	SL•Z61X12P
X21P (2NO+1NC)	SL•C7•X21P	SL•Z61X21P
W02 (2NC)	SL•C7•W02	SL•Z61W02
W03P (3NC)	SL•C7•W03P	SL•Z61W03P



SLC & SLZ series  
30mm metal casing.  
1 cable inlet. IP66



Contact blocks	↻	↻
X11 (1NO+1NC)	SL•MC7•X11	SL•MZ61X11
X12P (1NO+2NC)	SL•MC7•X12P	SL•MZ61X12P
X21P (2NO+1NC)	SL•MC7•X21P	SL•MZ61X21P
W02 (2NC)	SL•MC7•W02	SL•MZ61W02
W03P (3NC)	SL•MC7•W03P	SL•MZ61W03P

## Ordering code SLC / SLZ (M) series :

**S L 1 M C 7 1 X 1 1**

Electrical connection  
see top of page

Metal casing

Shaft SLC type  
C71, C72

Lever SLZ type  
Z61

## Contact blocks

- X11: Slow action break before make 1NO + 1NC
- X12P: Slow action break before make 1NO + 2NC
- X21P: Slow action break before make 2NO + 1NC
- W02: Simultaneous slow action 2NC
- W03P: Simultaneous slow action 3NC

## Electrical connection

Replace the symbol "•" with the required thread:

1: for PG 13.5 cable gland

On request:

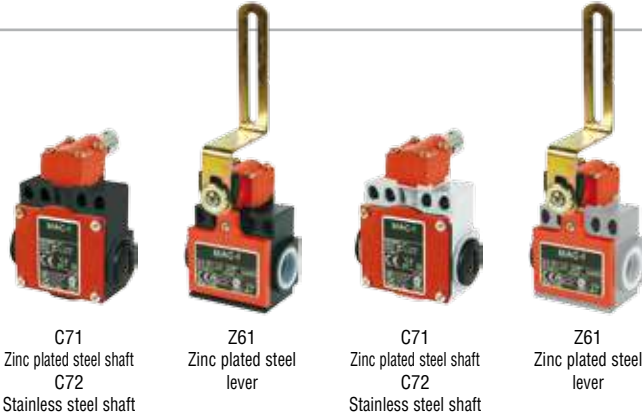
2: for 1/2" NPT cable gland

(with adapter in MA150 and MA160 series)

3: for PG11 cable gland

4: for M16 x 1.5 cable gland

5: for M20 x 1.5 cable gland



C71  
Zinc plated steel shaft  
C72  
Stainless steel shaft

Z61  
Zinc plated steel lever

C71  
Zinc plated steel shaft  
C72  
Stainless steel shaft

Z61  
Zinc plated steel lever

## Available contact blocks

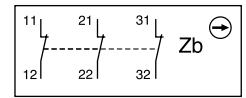
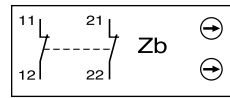
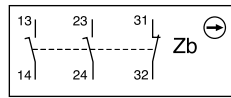
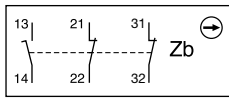
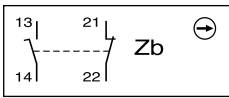
**X11:** Slow action break before make 1NO + 1NC

**X12P:** Slow action break before make 1NO + 2NC

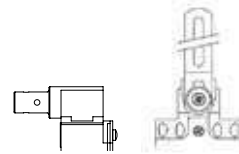
**X21P:** Slow action break before make 2NO + 1NC

**W02:** Simultaneous slow action 2NC

**W03P:** Simultaneous slow action 3NC

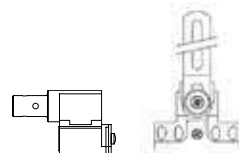


SLC & SLZ series  
50mm polymeric casing.  
2 cable inlet. IP65



Contact blocks	↻	↻
X11(1NO+1NC)	SL•5C7•X11	SL•5Z61X11
X12P(1NO+2NC)	SL•5C7•X12P	SL•5Z61X12P
X21P(2NO+1NC)	SL•5C7•X21P	SL•5Z61X21P
W02 (2NC)	SL•5C7•W02	SL•5Z61W02
W03P (3NC)	SL•5C7•W03P	SL•5Z61W03P

SLC & SLZ series  
50mm metal casing.  
3 cable inlet. IP66



Contact blocks	↻	↻
X11(1NO+1NC)	SL•M5C7•X11	SL•M5Z61X11
X12P(1NO+2NC)	SL•M5C7•X12P	SL•M5Z61X12P
X21P(2NO+1NC)	SL•M5C7•X21P	SL•M5Z61X21P
W02 (2NC)	SL•M5C7•W02	SL•M5Z61W02
W03P (3NC)	SL•M5C7•W03P	SL•M5Z61W03P

## Ordering code SLC / SLZ (M) series :

**S L 1 5 M C 7 1 X 1 1**

Electrical connection  
see top of page

50mm

Metal casing

Shaft SLC type  
**C71, C72**

Lever SLZ type  
**Z61**

## Contact blocks

- X11: Slow action break before make 1NO + 1NC
- X12P: Slow action break before make 1NO + 2NC
- X21P: Slow action break before make 2NO + 1NC
- W02: Simultaneous slow action 2NC
- W03P: Simultaneous slow action 3NC

# SLF series

## Electrical connection

Replace the symbol "•" with the required thread:

1: for PG 13.5 cable gland

On request

2: for 1/2" NPT cable gland

(with adapter in MA150 and MA160 series)

3: for PG11 cable gland

4: for M16 x 1.5 cable gland

5: for M20 x 1.5 cable gland



F96  
Pull wire  
without  
reset for  
simple stop

F98  
Pull wire with  
reset for  
emergency stop

## Available contact blocks

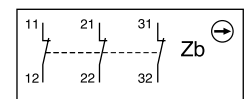
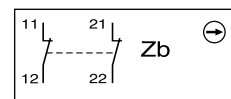
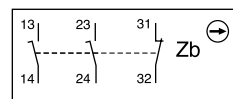
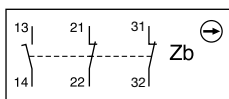
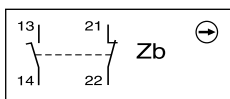
**X11:** Slow action break before  
make 1NO + 1NC

**X12P:** Slow action break before  
make 1NO + 2NC

**X21P:** Slow action break before  
make 2NO + 1NC

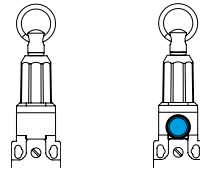
**W02:** Simultaneous slow action  
2NC

**W03P:** Simultaneous slow action  
3NC



## SLF series

**30mm metal casing**  
1 cable inlet. IP66



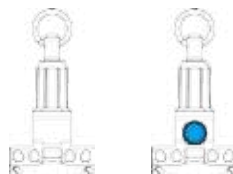
### Contact blocks

	↻	↻
X11(1NO+1NC)	SL•F96X11	SL•F98X11
X12P (1NO+2NC)	SL•F96X12P	SL•F98X12P
X21P (2NO+1NC)	SL•F96X21P	SL•F98X21P
W02 (2NC)	SL•F96W02	SL•F98W02
W03P (3NC)	SL•F96W03P	SL•F98W03P



## SLF series

**50mm metal casing.**  
3 cable inlet. IP66



### Contact blocks

	↻	↻
X11(1NO+1NC)	SL•5F96X11	SL•5F98X11
X12P (1NO+2NC)	SL•5F96X12P	SL•5F98X12P
X21P (2NO+1NC)	SL•5F96X21P	SL•5F98X21P
W02 (2NC)	SL•5F96W02	SL•5F98W02
W03P (3NC)	SL•5F96W03P	SL•5F98W03P

## Ordering code SLF (M) series :

**SL 1 5 F96 X11**

Electrical connection  
see top of page

50mm Metal casing

F96 = pull wire w.o. reset  
F98 = pull wire with reset

## Contact blocks

X11: Slow action break before  
make 1NO + 1NC

X12P: Slow action break before  
make 1NO + 2NC

X21P: Slow action break before  
make 2NO + 1NC

W02: Simultaneous slow action 2NC

W03P: Simultaneous slow action 3NC

### Electrical connection

Replace the symbol "•" with the required thread:

**1:** for PG 13.5 cable gland

On request:

**2:** for 1/2" NPT cable gland

(with adapter in MA150 and MA160 series)

**5:** for M20 x 1.5 cable gland



**F97**  
Pull wire without reset for simple stop

**F99**  
Pull wire with reset for emergency stop

### Available contact blocks

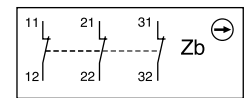
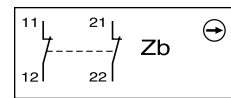
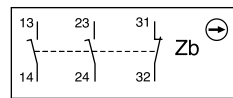
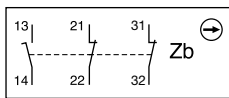
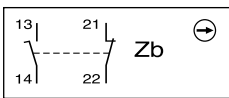
**X11:** Slow action break before make 1NO + 1NC

**X12:** Slow action break before make 1NO + 2NC

**X21:** Slow action break before make 2NO + 1NC

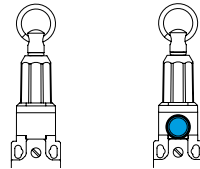
**W02:** Simultaneous slow action 2NC

**W03:** Simultaneous slow action 3NC



### SLF series

**40mm** aluminium casing.  
1 cable inlet. IP66

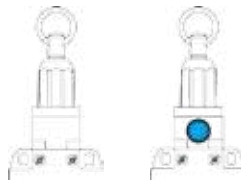


Contact blocks	⊖	⊕
X11 (1NO+1NC)	SL•F97X11	SL•F99X11
X12 (1NO+2NC)	SL•F97X12	SL•F99X12
X21 (2NO+1NC)	SL•F97X21	SL•F99X21
W02 (2NC)	SL•F97W02	SL•F99W02
W03 (3NC)	SL•F97W03	SL•F99W03



### SLF series

**60mm** aluminium casing.  
3 cable inlet. IP66



Contact blocks	⊖	⊕
X11(1NO+1NC)	SL•6F97X11	SL•6F99X11
X12 (1NO+2NC)	SL•6F97X12	SL•6F99X12
X21 (2NO+1NC)	SL•6F97X21	SL•6F99X21
W02 (2NC)	SL•6F97W02	SL•6F99W02
W03 (3NC)	SL•6F97W03	SL•6F99W03

### Ordering code SLF (A) series :

**SL 1 6 F97 X11**

Electrical connection  
see top of page

60mm aluminium casing

F97 = pull wire w.o. reset  
F99 = pull wire with reset

### Contact blocks

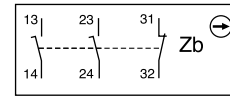
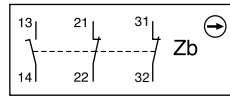
- X11: Slow action break before make 1NO + 1NC
- X12: Slow action break before make 1NO + 2NC
- X21: Slow action break before make 2NO + 1NC
- W02: Simultaneous slow action 2NC
- W03: Simultaneous slow action 3NC

# MAP/MAM/MDP/MDM series

## Available contact blocks

**X12P:** Slow action break before make 1NO + 2NC

**X21P:** Slow action break before make 2NO + 1NC



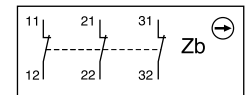
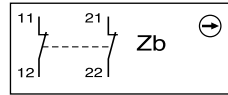
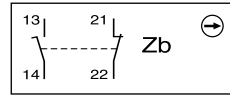
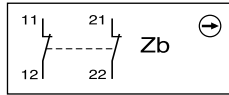
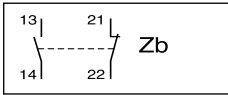
**Z11:** Snap action 1NO + 1NC

**Z02:** Snap action 2NC

**X11:** Slow action break before make 1NO + 1NC

**W02:** Simultaneous slow action 2NC

**W03P:** Simultaneous slow action 3NC



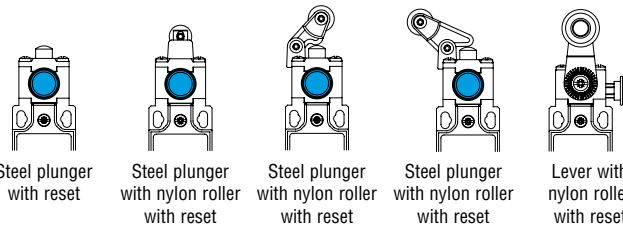
## MAP-R series

## 30mm polymeric limit switches - IP65 - 1 cable inlet



### Cable inlets

MAP1: PG 13.5
MAP2: 1/2" NPT (with adapter)
MAP3: PG 11
MAP4: M 16 x 1.5
MAP5: M 20 x 1.5



Contact blocks	R11	R13	R31	R32	R41
X11 Non overlapping Slow action contacts (1NO + 1NC)	MAP•R11X11	MAP•R13X11	MAP•R31X11	MAP•R32X11	MAP•R41X11
X12P Non overlapping Slow action contacts (1NO + 2NC)	MAP•R11X12P	MAP•R13X12P	MAP•R31X12P	MAP•R32X12P	MAP•R41X12P
X21P Non overlapping Slow action contacts (2NO + 1NC)	MAP•R11X21P	MAP•R13X21P	MAP•R31X21P	MAP•R32X21P	MAP•R41X21P
Z11 Snap action contacts (1NO + 1NC)	MAP•R11Z11	MAP•R13Z11	MAP•R31Z11	MAP•R32Z11	MAP•R41Z11
Z02 Snap action contacts (2NC)	MAP•R11Z02	MAP•R13Z02	MAP•R31Z02	MAP•R32Z02	MAP•R41Z02
W02 Slow action contacts (2NC)	MAP•R11W02	MAP•R13W02	MAP•R31W02	MAP•R32W02	MAP•R41W02
W03P Slow action contacts (3NC)	MAP•R11W03P	MAP•R13W03P	MAP•R31W03P	MAP•R32W03P	MAP•R41W03P

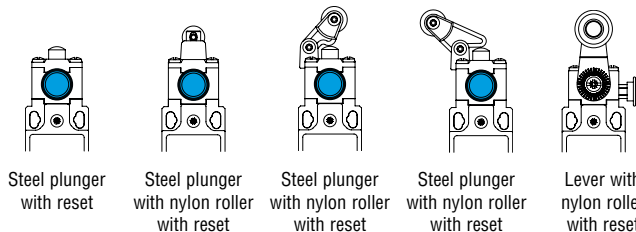
## MAM-R series

## 30mm metal limit switches - with polymeric working heads - IP66 - 1 cable inlet



### Cable inlets

MAM1: PG13.5
MAM2: 1/2" NPT
MAM3: PG11
MAM4: M16 x 1.5
MAM5: M20 x 1.5



Contact blocks	R11	R13	R31	R32	R41
X11 Non overlapping Slow action contacts (1NO + 1NC)	MAM•R11X11	MAM•R13X11	MAM•R31X11	MAM•R32X11	MAM•R41X11
X12P Non overlapping Slow action contacts (1NO + 2NC)	MAM•R11X12P	MAM•R13X12P	MAM•R31X12P	MAM•R32X12P	MAM•R41X12P
X21P Non overlapping Slow action contacts (2NO + 1NC)	MAM•R11X21P	MAM•R13X21P	MAM•R31X21P	MAM•R32X21P	MAM•R41X21P
Z11 Snap action contacts (1NO + 1NC)	MAM•R11Z11	MAM•R13Z11	MAM•R31Z11	MAM•R32Z11	MAM•R41Z11
Z02 Snap action contacts (2NC)	MAM•R11Z02	MAM•R13Z02	MAM•R31Z02	MAM•R32Z02	MAM•R41Z02
W02 Slow action contacts (2NC)	MAM•R11W02	MAM•R13W02	MAM•R31W02	MAM•R32W02	MAM•R41W02
W03P Slow action contacts (3NC)	MAM•R11W03P	MAM•R13W03P	MAM•R31W03P	MAM•R32W03P	MAM•R41W03P

Other versions available on request

## Ordering code MAP/MAM series :

**M** **AP1** **R11** **Z11**

### Cable inlets

MAP1, MAP2, MAP3, MAP4, MAP5  
MAM1, MAM2, MAM3, MAM4, MAM5  
See product description.

### Head types

R11, R13, R31, R32, R41

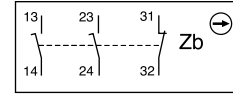
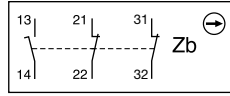
### Contact blocks

Z11: Snap action 1NO+1NC  
Z02: Snap action 2NC  
X11: Slow action break before make 1NO+1NC  
X12P: Slow action break before make 1NO+2NC  
X21P: Slow action break before make 2NO+1NC  
W02: Simultaneous slow action 2NC  
W03P: Simultaneous slow action 3NC

Available contact blocks

X12P: Slow action break before make 1NO + 2NC

X21P: Slow action break before make 2NO + 1NC



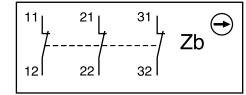
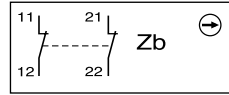
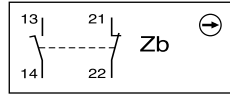
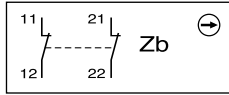
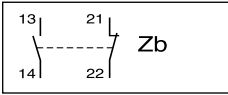
Z11: Snap action 1NO + 1NC

Z02: Snap action 2NC

X11: Slow action break before make 1NO + 1NC

W02: Simultaneous slow action 2NC

W03P: Simultaneous slow action 3NC



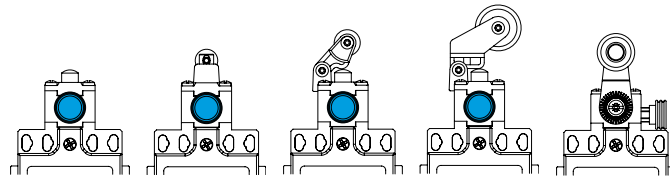
MDP-R series

50mm polymeric limit switches - IP65 - 2 cable inlets



Cable inlets

- MDP1: PG 13.5
- MDP2: 1/2" NPT (with adapter)
- MDP3: PG 11
- MDP4: M 16 x 1.5
- MDP5: M 20 x 1.5



Steel plunger with reset    Steel plunger with nylon roller with reset    Steel plunger with nylon roller with reset    Steel plunger with nylon roller with reset    Lever with nylon roller with reset

Contact blocks	R11	R13	R31	R38	R41
X11 Non overlapping Slow action contacts (1NO + 1NC)	MDP•R11X11	MDP•R13X11	MDP•R31X11	MDP•R38X11	MDP•R41X11
X12P Non overlapping Slow action contacts (1NO + 1NC)	MDP•R11X12P	MDP•R13X12P	MDP•R31X12P	MDP•R38X12P	MDP•R41X12P
X21P Non overlapping Slow action contacts (2NO + 1NC)	MDP•R11X21P	MDP•R13X21P	MDP•R31X21P	MDP•R38X21P	MDP•R41X21P
Z11 Snap action contacts (1NO + 1NC)	MDP•R11Z11	MDP•R13Z11	MDP•R31Z11	MDP•R38Z11	MDP•R41Z11
Z02 Snap action contacts (2NC)	MDP•R11Z02	MDP•R13Z02	MDP•R31Z02	MDP•R38Z02	MDP•R41Z02
W02 Slow action contacts (2NC)	MDP•R11W02	MDP•R13W02	MDP•R31W02	MDP•R38W02	MDP•R41W02
W03P Slow action contacts (3NC)	MDP•R11W03P	MDP•R13W03P	MDP•R31W03P	MDP•R38W03P	MDP•R41W03P

Other versions available on request

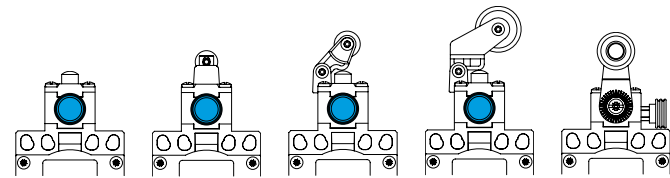
MDM-R series

50mm metal limit switches - with polymeric working heads - IP66 - 3 cable inlets



Cable inlets

- MDM1: PG 13.5
- MDM2: 1/2" NPT
- MDM3: PG 11
- MDM4: M 16 x 1.5
- MDM5: M 20 x 1.5



Steel plunger with reset    Steel plunger with nylon roller with reset    Steel plunger with nylon roller with reset    Steel plunger with nylon roller with reset    Lever with nylon roller with reset

Contact blocks	R11	R13	R31	R38	R41
X11 Non overlapping Slow action contacts (1NO + 1NC)	MDM•R11X11	MDM•R13X11	MDM•R31X11	MDM•R38X11	MDM•R41X11
X12P Non overlapping Slow action contacts (1NO + 1NC)	MDM•R11X12P	MDM•R13X12P	MDM•R31X12P	MDM•R38X12P	MDM•R41X12P
X21P Non overlapping Slow action contacts (2NO + 1NC)	MDM•R11X21P	MDM•R13X21P	MDM•R31X21P	MDM•R38X21P	MDM•R41X21P
Z11 Snap action contacts (1NO + 1NC)	MDM•R11Z11	MDM•R13Z11	MDM•R31Z11	MDM•R38Z11	MDM•R41Z11
Z02 Snap action contacts (2NC)	MDM•R11Z02	MDM•R13Z02	MDM•R31Z02	MDM•R38Z02	MDM•R41Z02
W02 Slow action contacts (2NC)	MDM•R11W02	MDM•R13W02	MDM•R31W02	MDM•R38W02	MDM•R41W02
W03P Slow action contacts (3NC)	MDM•R11W03P	MDM•R13W03P	MDM•R31W03P	MDM•R38W03P	MDM•R41W03P

Other versions available on request

Ordering code MDP/MDM series :

**M DP1 R11 Z11**

Cable inlets

MDP1, MDP2, MDP3, MDP4, MDP5  
MDM1, MDM2, MDM3, MDM4, MDM5  
See product description.

Head types

R11, R13, R31, R38, R41

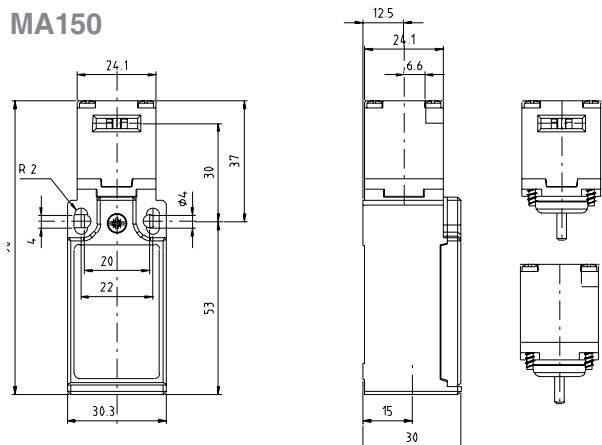
Contact blocks

- Z11: Snap action 1NO+1NC
- Z02: Snap action 2NC
- X11: Slow action break before make 1NO+1NC
- X12P: Slow action break before make 1NO+2NC
- X21P: Slow action break before make 2NO+1NC
- W02: Simultaneous slow action 2NC
- W03P: Simultaneous slow action 3NC

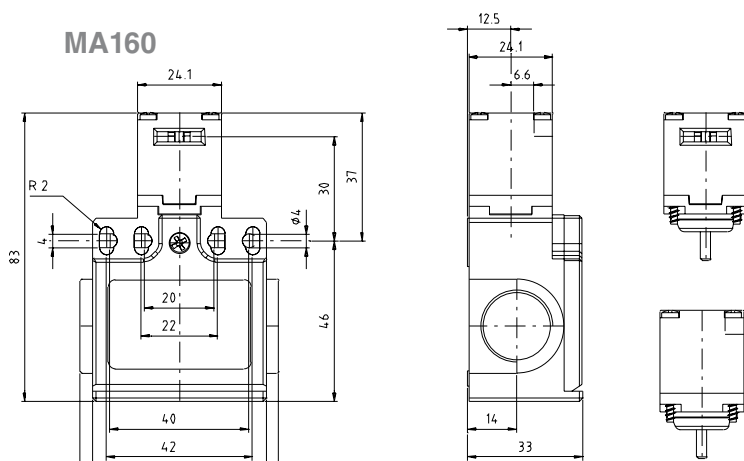


# Dimensions

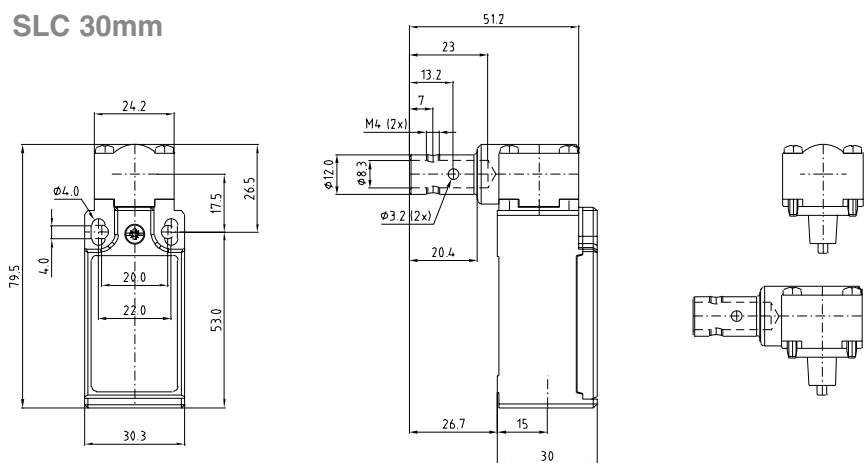
**MA150**



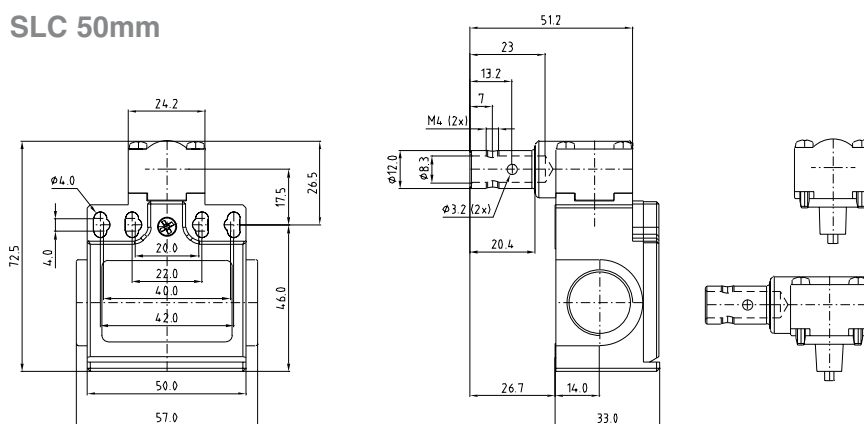
**MA160**



**SLC 30mm**

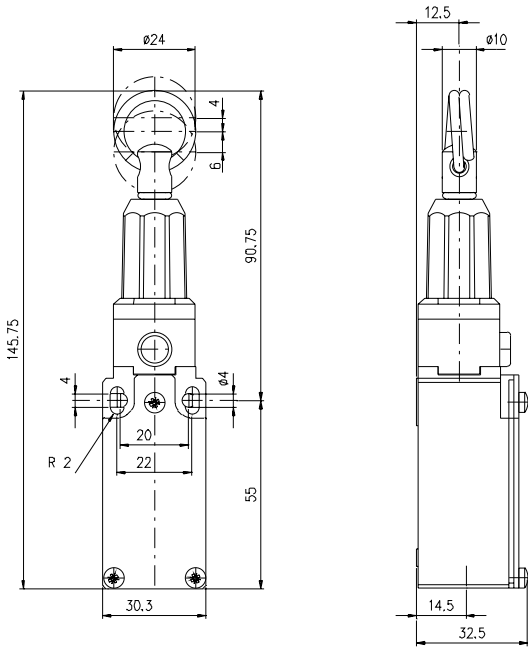


**SLC 50mm**

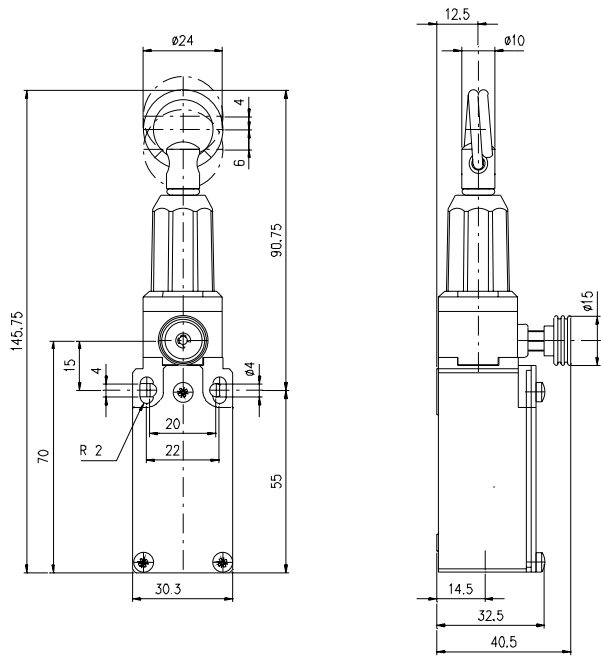


All measurements in mm

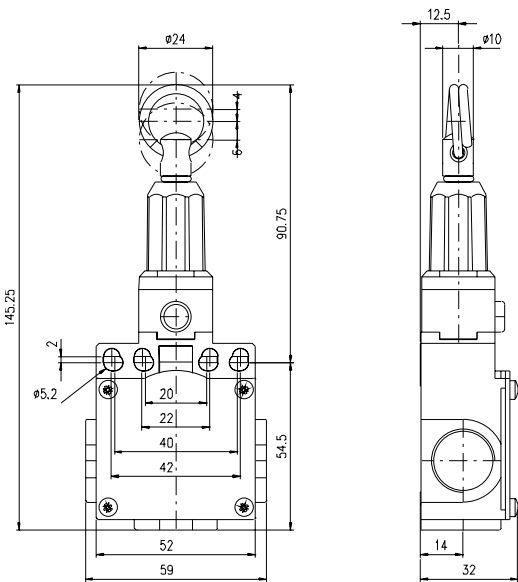
SLF 30mm without reset



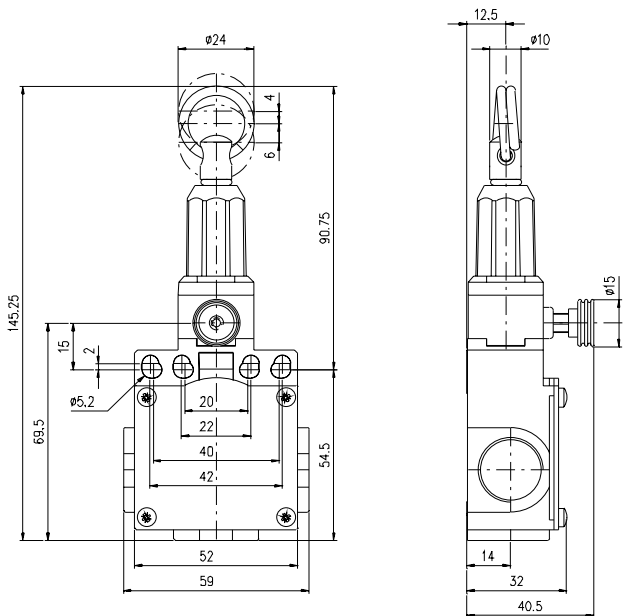
SLF 30mm with reset



SLF 50mm without reset



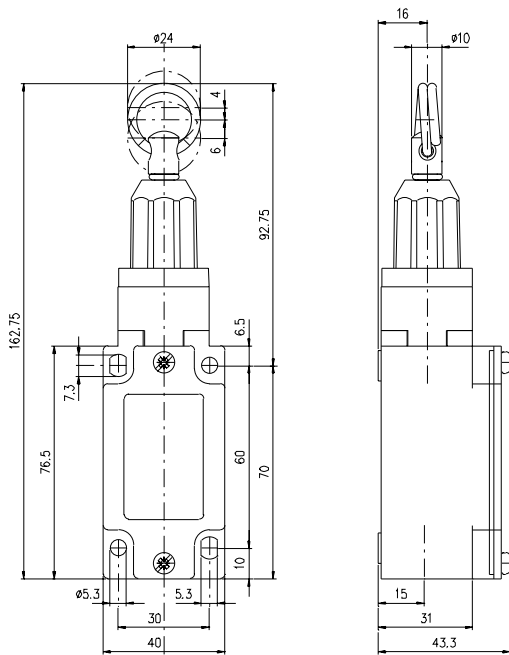
SLF 50mm with reset



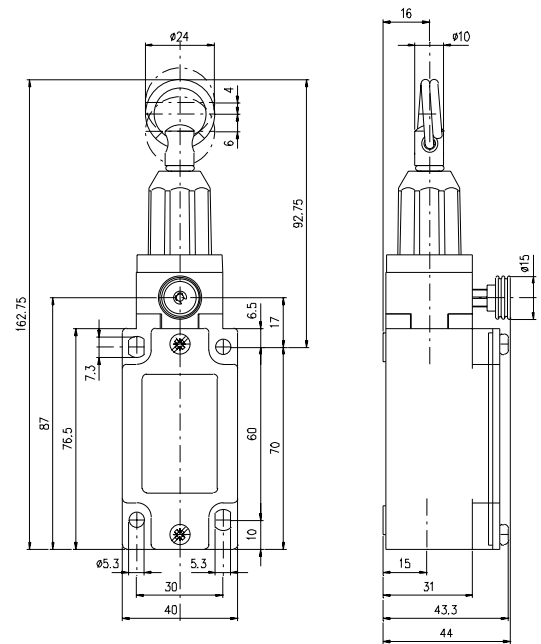
All measurements in mm

# Dimensions

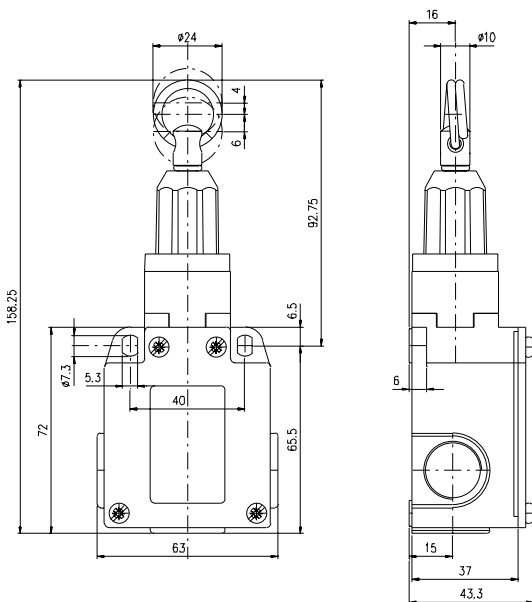
SLF 40mm



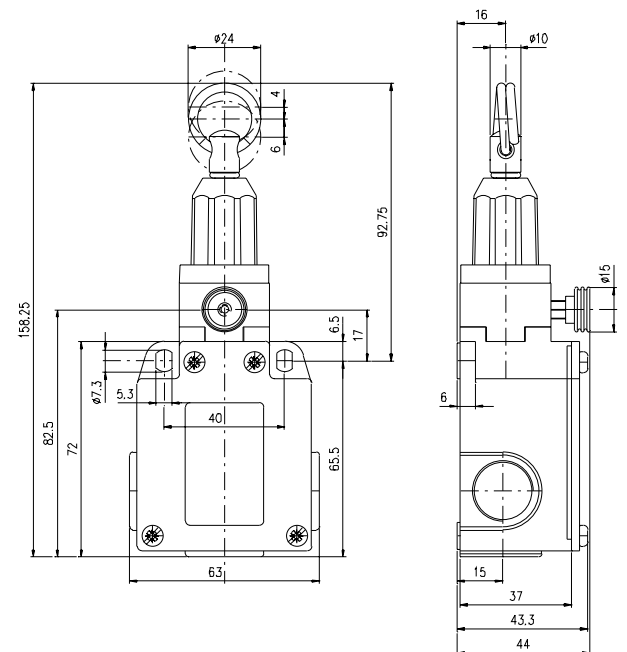
SLF 40mm with reset button



SLF 60mm

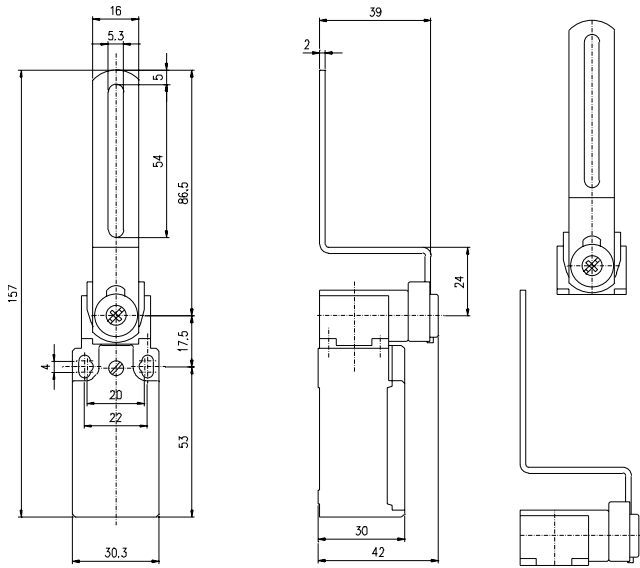


SLF 60mm with reset button

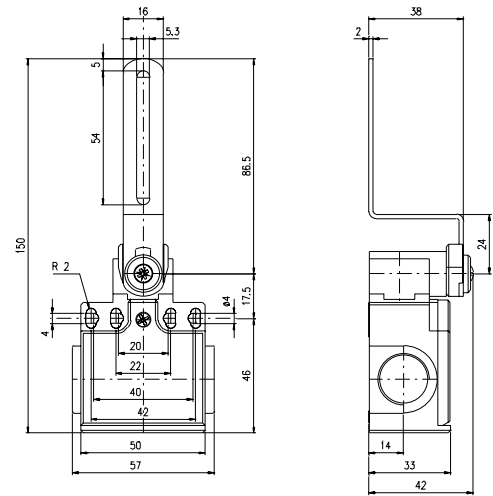


All measurements in mm

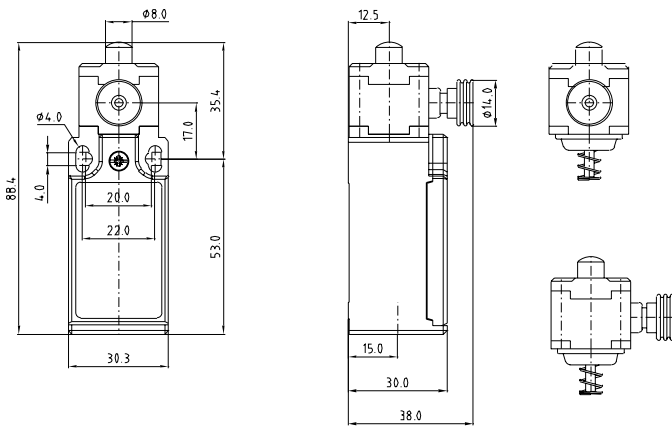
### SLZ 30mm



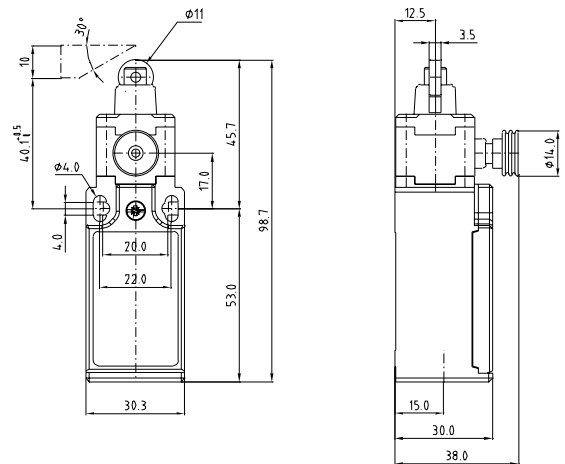
### SLZ 50mm



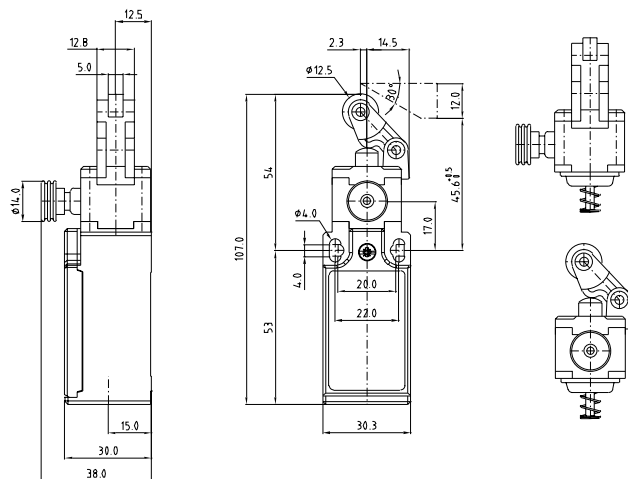
### MAPR11



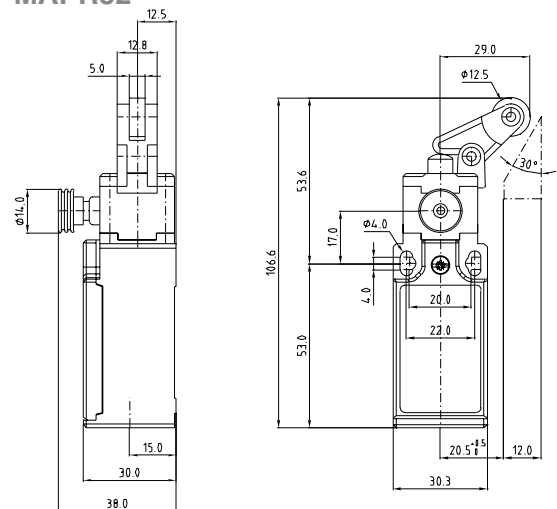
### MAPR13



### MAPR31

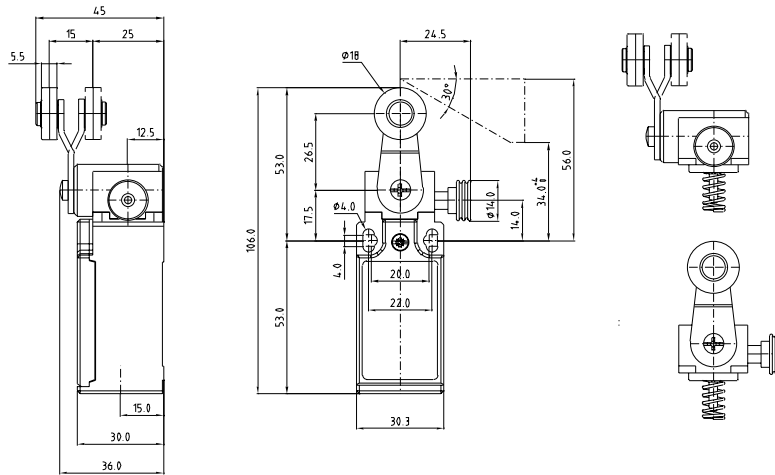


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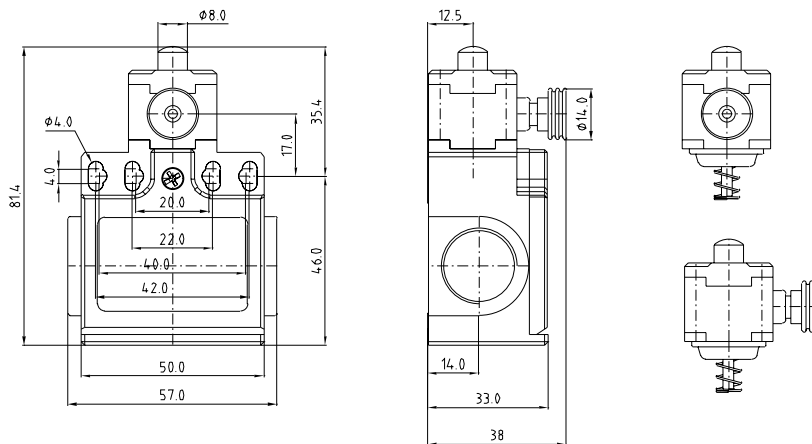


All measurements in mm

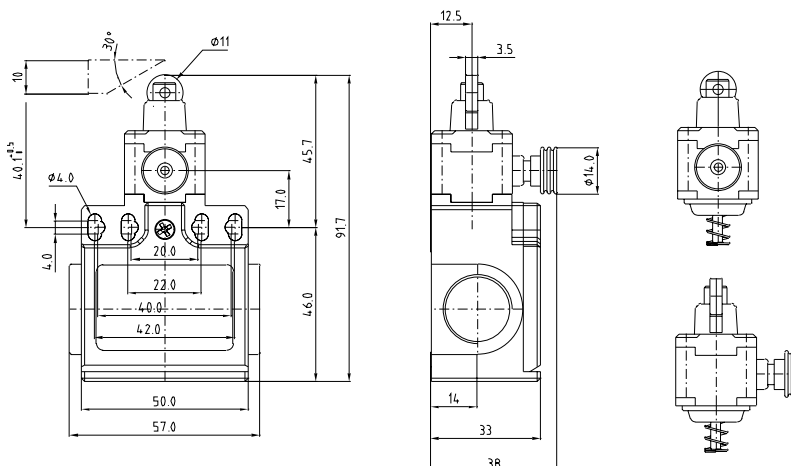
## MAPR41



## MDPR11

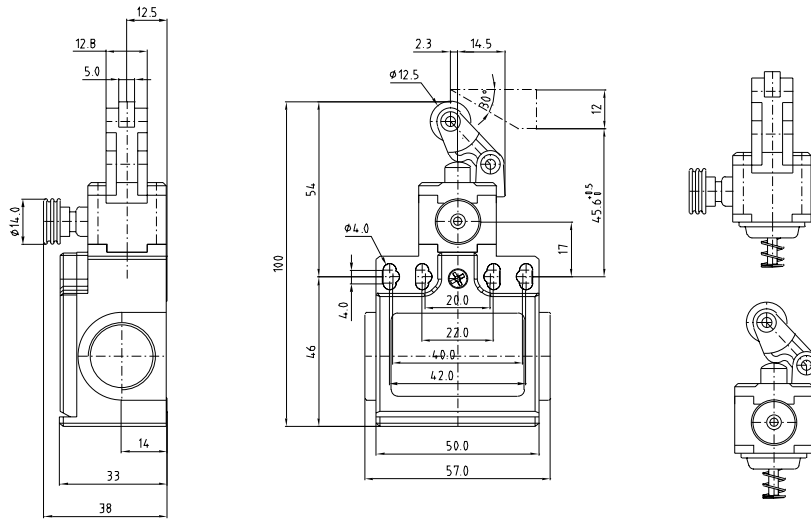


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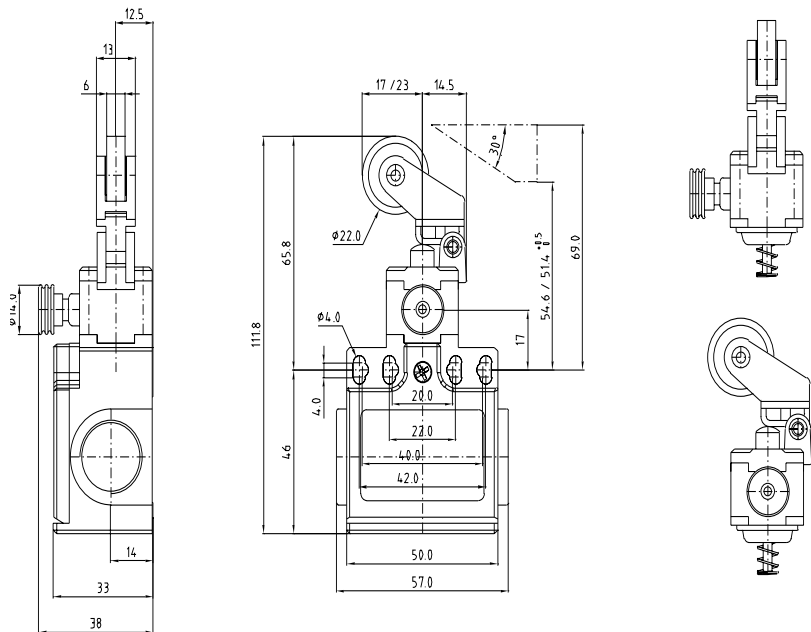


All measurements in mm

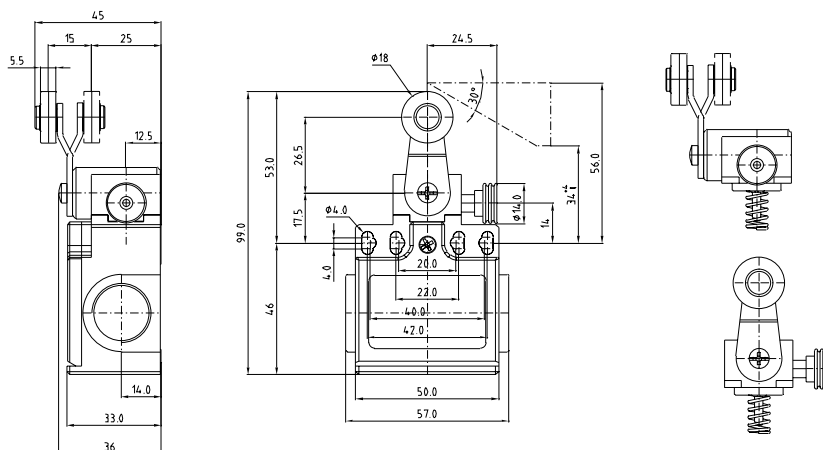
### MDPR31



### MDPR38









### MDPR41










All measurements in mm

## Specifications

						
<b>Type</b>	<b>MAC-I</b> <b>MA 150/160</b>	<b>MAC-I</b> <b>SLC</b>	<b>MAC-I</b> <b>SLF</b>	<b>MAC-I</b> <b>SLZ</b>	<b>MAC-I</b> <b>MA-R</b>	<b>MAC-I</b> <b>MD-R</b>
	limit switches with operating keys	limit switches with shaft lever	limit switches with pull wire	limit switches with steel lever	limit switches with pull button reset	limit switches with pull button reset
Casing	Polymeric		Metal	Polymeric/metal		
Standards	IEC 947-5-1, EN 60947-5-1, UL 508, CSA C22-2 No 14					
Operating temperature range	-25°C to +70°C					
Protection against electrical shock (IEC 536)	class II			class I		
Protection degree	IP65			IP66		
Rated insulation voltage (acc. to IEC 529)	Ui= 690V (MA150M/160M;SLC-M;SLZ-M;SLF-M series Ui=400V,)					
Rated impuled withstand voltage (acc. to IEC 947-1)	Uimp= 4kV					
Short-circuit protection	10A type gG(gl)					
Rated operational current (acc. to IEC 947-5-1)	AC-15: 24V-10A; 230V-3,1A; 380V-1, 9A DC-13: 24V-2,8A; 250V-0,27A					

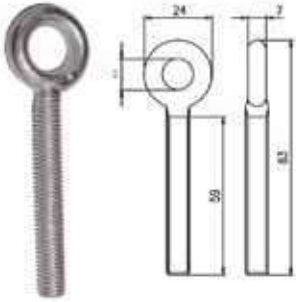
## Specifications

<b>Operating keys for MA150/160</b>							
<b>Description</b>	<b>Bent key</b>	<b>Flat key</b>	<b>Bent key</b>	<b>Flat Key</b>	<b>Shock absorbing bent key</b>	<b>Shock absorbing flat key</b>	<b>Adjustable joint key</b>
Centre distance fixing holes	22mm	22mm	13mm	13mm	15mm	15mm	40mm
Order code	T83	T84	T85	T86	T87	T88	T90

You can find further information on our homepage: [www.panasonic-electric-works.com](http://www.panasonic-electric-works.com)

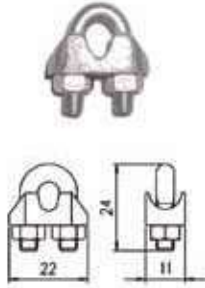
# Accessories

OCC 08



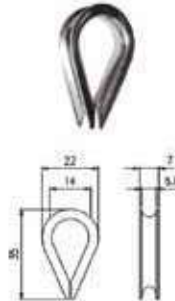
Stay bolt

MOR 05



Rope clamp

RED 05



Rope eye

FUN 05

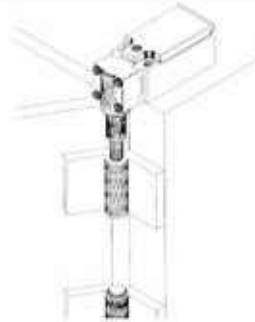


Code:	Meters
FUN05M010	10
FUN05M015	15
FUN05M020	20
FUN05M025	25
FUN05M102	102

Rope Ø 5mm



Key safety switch



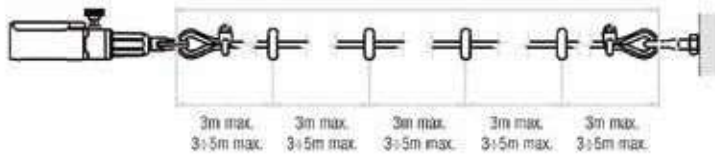
Shaft safety switch



Z lever safety switch

SLF series 30mm,50mm metal casing → 6m max.  
 SLF series 40mm, 60mm aluminium casing → 16m max.

SLF series 30mm,50mm metal casing → 15m max.  
 SLF series 40mm, 60mm aluminium casing → 25m max.



# Notes





North America

Europe

Asia Pacific

China

Japan

## Panasonic Electric Works

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▶ <b>Hungary</b>	<b>Panasonic Electric Works Europe AG</b>	Magyarországi Közvetlen Kereskedelmi Képviselet, 1117 Budapest, Neumann János u. 1., Tel. +36 1 999 89 26 <a href="http://www.panasonic-electric-works.hu">www.panasonic-electric-works.hu</a>
▶ <b>Ireland</b>	<b>Panasonic Electric Works UK Ltd.</b>	Irish Branch Office, Dublin, Tel. +353 (0) 14600969, Fax +353 (0) 14601131, <a href="http://www.panasonic-electric-works.co.uk">www.panasonic-electric-works.co.uk</a>
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▶ <b>Nordic Countries</b>	<b>Panasonic Electric Works Europe AG</b> <b>Panasonic Eco Solutions Nordic AB</b>	Filial Nordic, Knarrarnäsgatan 15, 164 40 Kista, Sweden, Tel. +46 859476680, Fax +46 859476690, <a href="http://www.panasonic-electric-works.se">www.panasonic-electric-works.se</a>
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		Sunrise Parkway, Linford Wood, Milton Keynes, MK14 6 LF, Tel. +44 (0) 1908 231555, Fax +44 (0) 1908 231599, <a href="http://www.panasonic-electric-works.co.uk">www.panasonic-electric-works.co.uk</a>

### North & South America








▶ <b>USA</b>	<b>Panasonic Industrial Devices Sales Company of America</b>	629 Central Avenue, New Providence, N.J. 07974, Tel. 1-908-464-3550, Fax 1-908-464-8513, <a href="http://www.pewa.panasonic.com">www.pewa.panasonic.com</a>
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▶ <b>Hong Kong</b>	<b>Panasonic Industrial Devices Automation Controls Sales (Hong Kong) Co., Ltd.</b>	RM1205-9, 12/F, Tower 2, The Gateway, 25 Canton Road, Tsimshatsui, Kowloon, Hong Kong, Tel. +852-2956-3118, Fax +852-2956-0398
▶ <b>Japan</b>	<b>Panasonic Corporation</b>	1048 Kadoma, Kadoma-shi, Osaka 571-8686, Japan, Tel. +81-6-6908-1050, Fax +81-6-6908-5781, <a href="http://www.panasonic.net">www.panasonic.net</a>
▶ <b>Singapore</b>	<b>Panasonic Industrial Devices Automation Controls Sales Asia Pacific</b>	300 Beach Road, #16-01 The Concourse, Singapore 199555, Tel. +65-6390-3811, Fax +65-6390-3810

# Fan Motor Selector Chart

## AC FAN MOTOR

	ASEN6051* 60 sq.x30t				ASEN8021* 80 sq.x25t				ASEN804*** 80 sq.x38t			
Type												
Rated voltage	100 V		115 V		100 V		115 V		100 V	115 V	200 V	230 V
Frequency	50/60 Hz				50/60 Hz				50/60 Hz			
Input power (W) <sup>+10</sup> / <sub>-20%</sub>	6/5		4.5/4		6/5		6/5		9/7		10/8	
Rated current, max. (mA)	80/70		70/60		90/80		80/70		170/120	140/110	80/65	70/55
Locked current (mA)	85/75		70/60		95/85		85/75		180/160	160/140	90/80	80/70
Rotation speed, min. (r/min)	2,000/2,600				2,400/2,750				2,700/3,200			
Max. air flow, min. (m³/min)	0.2/0.26				0.74/0.85				0.75/0.9			
Max. static pressure, min. (Pa)	13.7/22.6				37.5/43				44.2/62.8			
Noise, average (dB(A))	28/29				28/33				33/38			
Operating voltage range (V)	Rated voltage ±10%				Rated voltage ±10%				Rated voltage ±10%			
Weight (kg)	0.14				0.22				0.3			
Page	14				15				16			
	ASEN902*** 92 sq.x25t								ASEN102*** 120 sq.x25t			
Type												
Rated voltage	100 V	115 V	200 V	230 V	100 V	115 V	200 V	230 V	100 V	115 V	200 V	230 V
Frequency	50/60 Hz								50/60 Hz			
Input power (W) <sup>+10</sup> / <sub>-20%</sub>	13/10								14/11			
Rated current, max. (mA)	190/150	170/130	100/80	90/70	220/180	190/160	110/90	100/90	220/180	190/160	120/100	110/100
Locked current (mA)	200/170	180/160	110/100	100/80	220/200	200/180	120/100	110/100	220/200	200/180	120/100	110/100
Rotation speed, min. (r/min)	2,600/3,100								2,300/2,700			
Max. air flow, min. (m³/min)	0.80/0.98								1.8/2.0			
Max. static pressure, min. (Pa)	43.1/60.8								41.2/41.2			
Noise, average (dB(A))	34/39								34/38			
Operating voltage range (V)	Rated voltage ±10%								Rated voltage ±10%			
Weight (kg)	0.3								0.36			
Page	17								18			
	ASEN104*** 120 sq.x38t								ASEN5075* 150x172x38t			
Type												
Rated voltage	100 V	115 V	200 V	230 V	100 V	115 V	200 V	230 V	100 V	115 V	200 V	230 V
Frequency	50/60 Hz								50/60 Hz			
Input power (W) <sup>+10</sup> / <sub>-20%</sub>	15/14	15.5/14.5	15/13	15/14	37/33	35/32	34/33	35/35	37/33	380/360	340/320	35/35
Rated current, max. (mA)	270/230	250/210	140/120	120/100	470/400	380/360	230/210	190/180	470/400	380/360	340/320	280/310
Locked current (mA)	370/300	320/270	190/170	160/140	750/700	550/530	340/320	280/310	750/700	550/530	340/320	280/310
Rotation speed, min. (r/min)	2,600/2,900								2,700/3,200			
Max. air flow, min. (m³/min)	2.5/2.9								5.0/6.0			
Max. static pressure, min. (Pa)	64.7/76.4								157/215.8			
Noise, average (dB(A))	37/41								52/56			
Operating voltage range (V)	Rated voltage ±10%								Rated voltage ±10%			
Weight (kg)	0.55								0.8			
Page	19								20			

**AC FAN MOTOR**

Size	Specifications	Rotation speed	Voltage	Part number
60 sq.×30	Lead wire type	Standard speed	100V AC	ASEN60511
			115V AC	ASEN60512
80 sq.×25	Lead wire type	Standard speed	100V AC	ASEN80211
			115V AC	ASEN80212
80 sq.×38	Lead wire type	Standard speed	100V AC	ASEN80411
			115V AC	ASEN80412
			200V AC	ASEN80414
			230V AC	ASEN80416
	2-terminal type	Standard speed	100V AC	ASEN804519
			115V AC	ASEN804529
			200V AC	ASEN804549
			230V AC	ASEN804569
92 sq.×25	Lead wire type	Standard speed	100V AC	ASEN90211
			115V AC	ASEN90212
			200V AC	ASEN90214
			230V AC	ASEN90216
	2-terminal type	Standard speed	100V AC	ASEN902519
			115V AC	ASEN902529
			200V AC	ASEN902549
			230V AC	ASEN902569
120 sq.×25	Lead wire type	Standard speed	100V AC	ASEN10211
			115V AC	ASEN10212
			200V AC	ASEN10214
			230V AC	ASEN10216
	2-terminal type	Standard speed	100V AC	ASEN102519
			115V AC	ASEN102529
			200V AC	ASEN102549
			230V AC	ASEN102569
120 sq.×38	Lead wire type	Standard speed	100V AC	ASEN10411
			115V AC	ASEN10412
			200V AC	ASEN10414
			230V AC	ASEN10416
	2-terminal type	Standard speed	100V AC	ASEN104519
			115V AC	ASEN104529
			200V AC	ASEN104549
			230V AC	ASEN104569
150×172×38	2-terminal type	Standard speed	100V AC	ASEN50751
			115V AC	ASEN50752
			200V AC	ASEN50754
			230V AC	ASEN50756

Notes: 1. Although “standard speed” is used as the standard fan rotation speed, middle speed and low speed types can be special ordered.  
 2. 220 V AC and 240 V AC types can be special ordered.

**ACCESSORIES**

**1. Plug Cord for AC Fan Motor**

Product name	Specifications	Part number
Plug code for 2-terminal type	For inside of appliance, L = 1,000 mm	ASE51100
	Compliant with Electrical Appliance and Material Safety Law, L = 1,000 mm	ASE51107
	UL Standard, L = 1,000 mm	ASE51109

**2. Fan Guard for DC and AC Fan Motor**

Product name	Specifications	Part number
40 sq.	Recognized by UL/CSA	ASFN48001
60 sq.	Recognized by UL/CSA	ASFN68001
80 sq.	Recognized by UL/CSA	ASFN88001
92 sq.	Recognized by UL/CSA	ASFN98001
80 sq.	Compliant with Electrical Appliance and Material Safety Law	ASEN88001
92 sq.	Compliant with Electrical Appliance and Material Safety Law	ASEN98001
120 sq.	Compliant with Electrical Appliance and Material Safety Law	ASEN18001
150×172	Recognized by UL/CSA	ASEN58001

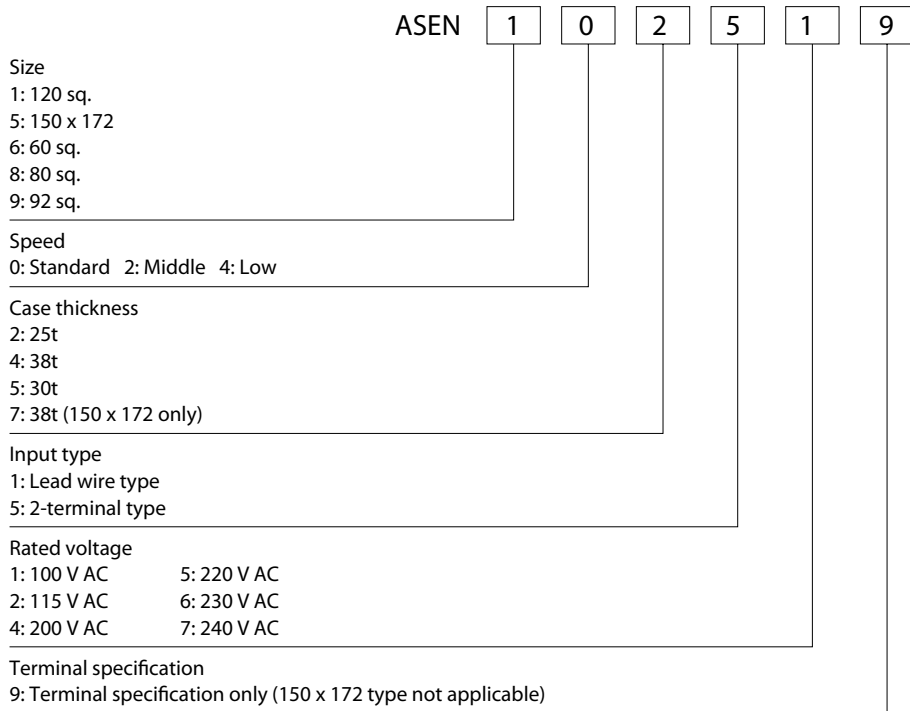
**3. Filter for DC and AC Fan Motor**

Product name	Part number
60 sq.	ASEN68002
80 sq.	ASEN88002
92 sq.	ASEN98002
120 sq.	ASEN18002

# Ordering Information

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## AC Type



• For the AC type, a middle speed type, low speed type, and 220 V and 240V types can be special ordered.

\*Depending on the combination, not all specifications can be met. For details, please consult us.

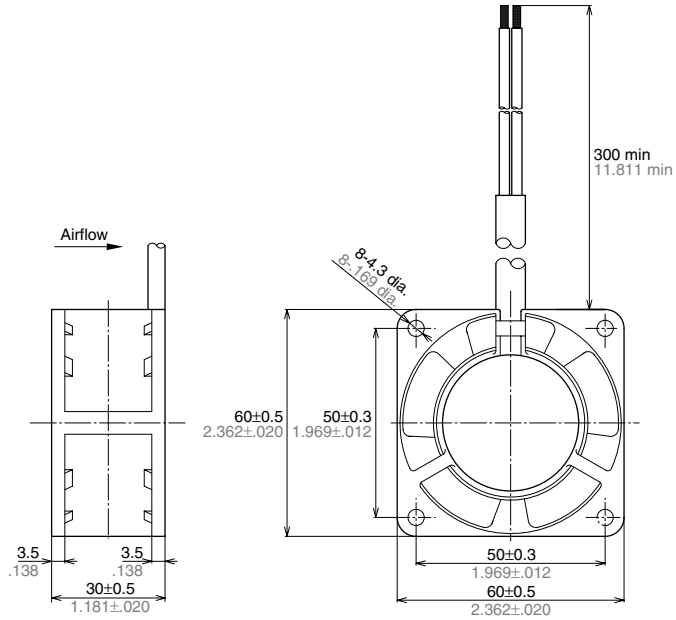
**Panasonic**  
ideas for life

**AC Fan Motor**

**60 sq.×30t  
(ASEN6)**

**NEW**

**DIMENSIONS (mm inch)**



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

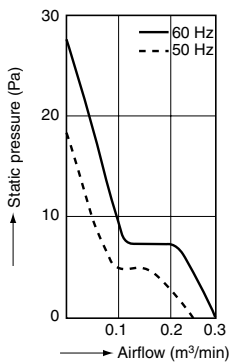
**RATING**

**Lead wire type, Standard speed**

Part number	Rated voltage (V)	Frequency (Hz)	Input power, <sup>+10</sup> / <sub>-20</sub> % (W)	Rated current, max. (mA)	Locked current, max. (mA)	*Rotation speed (r/min)	*Max. air flow (m <sup>3</sup> /min)	*Max. static pressure (Pa)	Noise (dB(A))	Operating voltage range (V) (%)	Weight (kg)
ASEN60511	100	50/60	6/5	80/70	85/75	2000/2600	0.2/0.26	13.7/22.6	28/29 (29/30)	±10	0.14
ASEN60512	115		4.5/4	70/60	70/60						

Notes: 1. Asterisks in the table above indicate minimum values.  
2. Values above without designations are averages.  
3. Noise level was measured at a distance of 1 m from side of fan. Values in brackets were measured at a distance of 1 m from front of fan.

**DATA (Airflow - Static pressure Characteristic Curve)**



**MATERIALS USED**

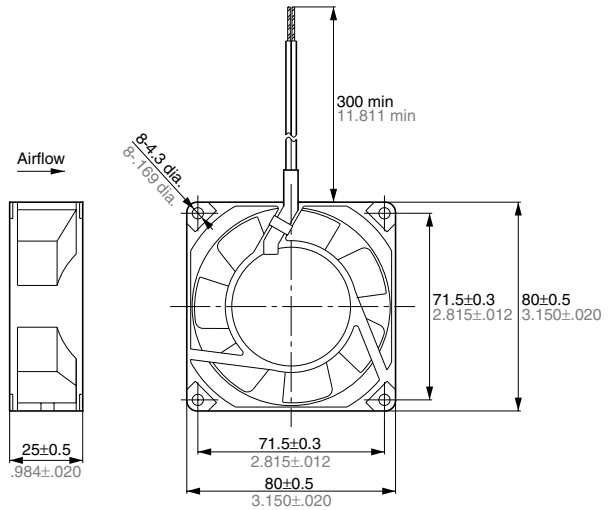
Frame: aluminum alloy die-casting      Label: 100 V class...black base  
 Propeller: plastic  
 Bearings: ball bearings  
 Lead wires: UL3266 and AWG22

**SPECIFICATIONS**

Ambient temperature	-10°C to +60°C +14°F to +140°F	
Ambient humidity	15 to 85%RH	
Storage temperature	-20°C to +70°C -4°F to +158°F	
Breakdown voltage	1,500 V AC for 1 min. (between charging section and frame)	
Insulation resistance	Min. 100MΩ (at 500 V DC megger)(between charging section and frame)	
Insulation class	UL:A class, CSA:B class	
Vibration resistance	Frequency	10 to 55Hz
	Double amplitude width	0.75mm
	Applied direction	X, Y and Z directions
	Applied time	10 min. in each direction
Protection	Impedance protected	
Mean life	MTTF: 50,000 hrs. (Time it takes until rotation frequency drops 30% of initial value when run continuously under 25°C 77°F and room humidity at the nominal voltage.)	

**NEW**

**DIMENSIONS** (mm inch)



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

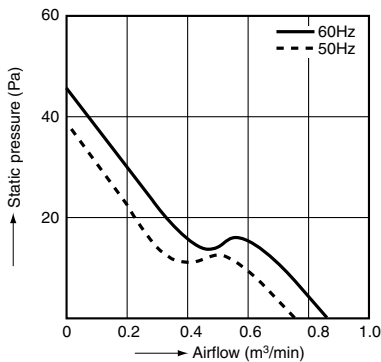
**RATING**

Lead wire type, Standard speed

Part number	Rated voltage (V)	Frequency (Hz)	Input power, <sup>+10</sup> / <sub>-20</sub> % (W)	Rated current, max. (mA)	Locked current, max. (mA)	*Rotation speed (r/min)	*Max. air flow (m <sup>3</sup> /min)	*Max. static pressure (Pa)	Noise (dB(A))	Operating voltage range (V) (%)	Weight (kg)
ASEN80211	100	50/60	6/5	90/80	95/85	2400/2750	0.74/0.85	37.5/43	28/33 (29/34)	±10	0.22
ASEN80212	115			80/70	85/75						

Notes: 1. Asterisks in the table above indicate minimum values.  
2. Values above without designations are averages.  
3. Noise level was measured at a distance of 1 m from side of fan. Values in brackets were measured at a distance of 1 m from front of fan.

**DATA** (Airflow - Static pressure Characteristic Curve)



**MATERIALS USED**

Frame: aluminum alloy die-casting  
Propeller: plastic  
Bearings: ball bearings  
Lead wires: UL3266 and AWG22

Label: 100 V class...black base

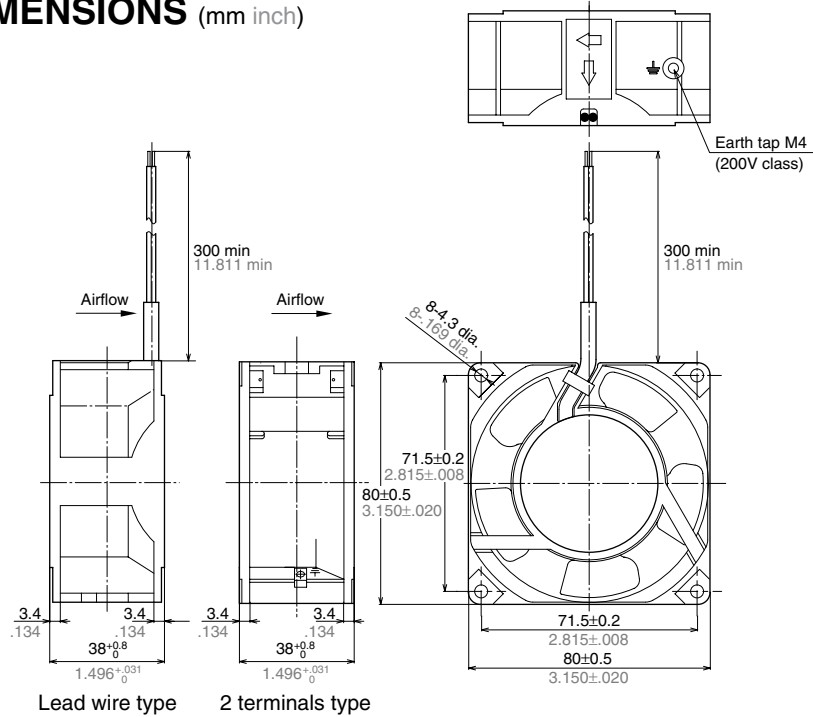
**SPECIFICATIONS**

Ambient temperature	-10°C to +60°C +14°F to +140°F	
Ambient humidity	15 to 85%RH	
Storage temperature	-20°C to +70°C -4°F to +158°F	
Breakdown voltage	1,500 V AC for 1 min. (between charging section and frame)	
Insulation resistance	Min. 100MΩ (at 500 V DC megger)(between charging section and frame)	
Insulation class	UL:A class, CSA:B class	
Vibration resistance	Frequency	10 to 55Hz
	Double amplitude width	0.75mm
	Applied direction	X, Y and Z directions
	Applied time	10 min. in each direction
Protection	Impedance protected	
Mean life	MTTF: 50,000 hrs. (Time it takes until rotation frequency drops 30% of initial value when run continuously under 25°C 77°F and room humidity at the nominal voltage.)	

**NEW**



**DIMENSIONS (mm inch)**



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

**RATING**

**1. Lead wire type, Standard speed**

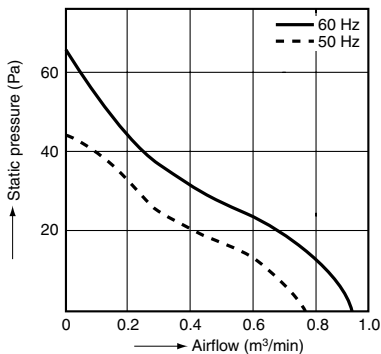
Part number	Rated voltage (V)	Frequency (Hz)	Input power, $\pm 10\%$ (W)	Rated current, max. (mA)	Locked current, max. (mA)	*Rotation speed (r/min)	*Max. air flow (m <sup>3</sup> /min)	*Max. static pressure (Pa)	Noise (dB(A))	Operating voltage range (V) (%)	Weight (kg)
ASEN80411	100	50/60	9/7	170/120	180/160	2700/3200	0.75/0.9	44.2/62.8	33/38 (36/42)	±10	0.3
ASEN80412	115			140/110	160/140						
ASEN80414	200			80/65	90/80						
ASEN80416	230			10/8	70/55						

**2. 2 terminals type, Standard speed**

Part number	Rated voltage (V)	Frequency (Hz)	Input power, $\pm 10\%$ (W)	Rated current, max. (mA)	Locked current, max. (mA)	*Rotation speed (r/min)	*Max. air flow (m <sup>3</sup> /min)	*Max. static pressure (Pa)	Noise (dB(A))	Operating voltage range (V) (%)	Weight (kg)
ASEN804519	100	50/60	9/7	170/120	180/160	2700/3200	0.75/0.9	44.2/62.8	33/38 (36/42)	±10	0.3
ASEN804529	115			140/110	160/140						
ASEN804549	200			80/65	90/80						
ASEN804569	230			10/8	70/55						

Notes: 1. Asterisks in the table above indicate minimum values.  
2. Values above without designations are averages.  
3. Noise level was measured at a distance of 1 m from side of fan. Values in brackets were measured at a distance of 1 m from front of fan.

**DATA (Airflow - Static pressure Characteristic Curve)**



**MATERIALS USED**

Frame: aluminum alloy die-casting  
Propeller: plastic  
Bearings: ball bearings  
Lead wires: UL3266 and AWG22

Terminal: Equivalent to Faston #110  
Label: 100 V class...black base  
200 V class...red base

**SPECIFICATIONS**

Ambient temperature	-10°C to +60°C +14°F to +140°F	
Ambient humidity	15 to 85%RH	
Storage temperature	-20°C to +70°C -4°F to +158°F	
Breakdown voltage	1,500 V AC for 1 min. (between charging section and frame)	
Insulation resistance	Min. 100MΩ (at 500 V DC megger)(between charging section and frame)	
Insulation class	UL:A class, CSA:B class	
Vibration resistance	Frequency	10 to 55Hz
	Double amplitude width	0.75mm
	Applied direction	X, Y and Z directions
	Applied time	10 min. in each direction
Protection	Impedance protected	
Mean life	MTTF: 50,000 hrs. (Time it takes until rotation frequency drops 30% of initial value when run continuously under 25°C 77°F and room humidity at the nominal voltage.)	

**Panasonic**  
ideas for life

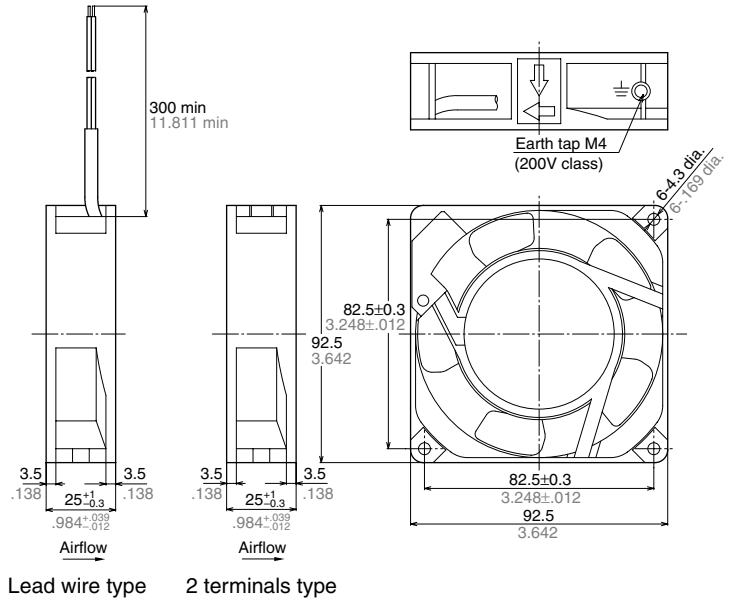
**AC Fan Motor**

**92 sq.×25t  
(ASEN9)**

**NEW**



**DIMENSIONS (mm inch)**



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

**RATING**

**1. Lead wire type, Standard speed**

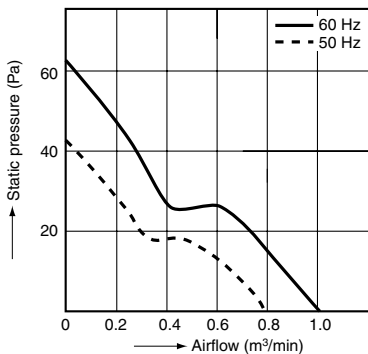
Part number	Rated voltage (V)	Frequency (Hz)	Input power, $\pm 10\%$ (W)	Rated current, max. (mA)	Locked current, max. (mA)	*Rotation speed (r/min)	*Max. air flow (m <sup>3</sup> /min)	*Max. static pressure (Pa)	Noise (dB(A))	Operating voltage range (V) (%)	Weight (kg)
ASEN90211	100	50/60	13/10	190/150	200/170	2600/3100	0.80/0.98	43.1/60.8	34/39 (39/44)	±10	0.3
ASEN90212	115			170/130	180/160						
ASEN90214	200			100/80	110/100						
ASEN90216	230			90/70	100/80						

**2. 2 terminals type, Standard speed**

Part number	Rated voltage (V)	Frequency (Hz)	Input power, $\pm 10\%$ (W)	Rated current, max. (mA)	Locked current, max. (mA)	*Rotation speed (r/min)	*Max. air flow (m <sup>3</sup> /min)	*Max. static pressure (Pa)	Noise (dB(A))	Operating voltage range (V) (%)	Weight (kg)
ASEN902519	100	50/60	13/10	190/150	200/170	2600/3100	0.80/0.98	43.1/60.8	34/39 (39/44)	±10	0.3
ASEN902529	115			170/130	180/160						
ASEN902549	200			100/80	110/100						
ASEN902569	230			90/70	100/80						

Notes: 1. Asterisks in the table above indicate minimum values.  
2. Values above without designations are averages.  
3. Noise level was measured at a distance of 1 m from side of fan. Values in brackets were measured at a distance of 1 m from front of fan.

**DATA (Airflow - Static pressure Characteristic Curve)**



**MATERIALS USED**

Frame: aluminum alloy die-casting  
Propeller: plastic  
Bearings: ball bearings  
Lead wires: UL3266 and AWG22

Terminal: Equivalent to Faston #110  
Label: 100 V class...black base  
200 V class...red base

**SPECIFICATIONS**

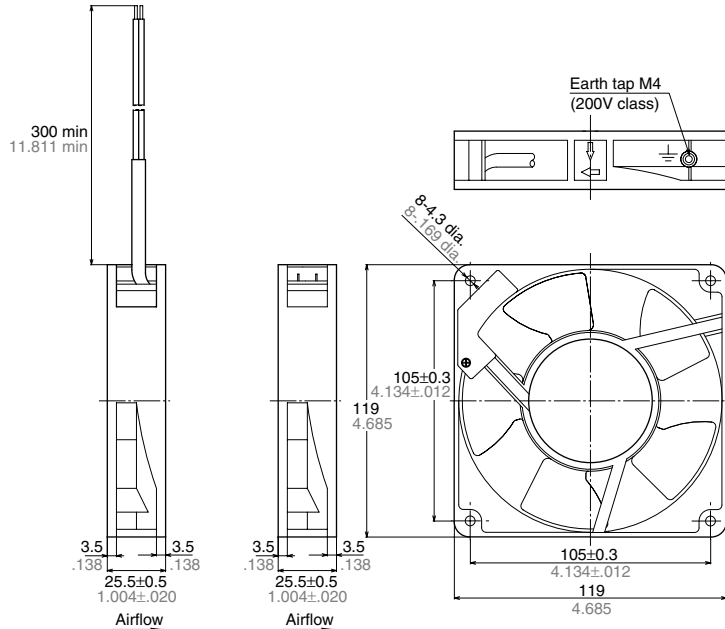
Ambient temperature	-10°C to +60°C +14°F to +140°F	
Ambient humidity	15 to 85%RH	
Storage temperature	-20°C to +70°C -4°F to +158°F	
Breakdown voltage	1,500 V AC for 1 min. (between charging section and frame)	
Insulation resistance	Min. 100MΩ (at 500 V DC megger)(between charging section and frame)	
Insulation class	UL:A class, CSA:B class	
Vibration resistance	Frequency	10 to 55Hz
	Double amplitude width	0.75mm
	Applied direction	X, Y and Z directions
	Applied time	10 min. in each direction
Protection	Impedance protected	
Mean life	MTTF: 50,000 hrs. (Time it takes until rotation frequency drops 30% of initial value when run continuously under 25°C 77°F and room humidity at the nominal voltage.)	



**NEW**



**DIMENSIONS (mm inch)**



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

**RATING**

**1. Lead wire type, Standard speed**

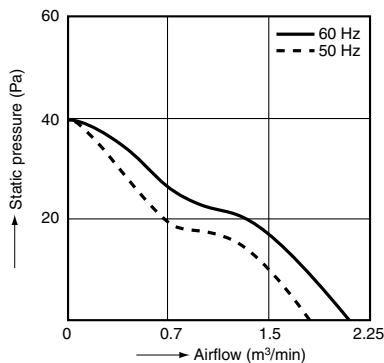
Part number	Rated voltage (V)	Frequency (Hz)	Input power, $\pm 10\%$ (W)	Rated current, max. (mA)	Locked current, max. (mA)	*Rotation speed (r/min)	*Max. air flow (m <sup>3</sup> /min)	*Max. static pressure (Pa)	Noise (dB(A))	Operating voltage range (V) (%)	Weight (kg)
ASEN10211	100	50/60	14/11	220/180	220/200	2300/2700	1.8/2.0	41.2/41.2	34/38 (42/46)	±10	0.36
ASEN10212	115			190/160	200/180						
ASEN10214	200			110/90	120/100						
ASEN10216	230			100/90	110/100						

**2. 2 terminals type, Standard speed**

Part number	Rated voltage (V)	Frequency (Hz)	Input power, $\pm 10\%$ (W)	Rated current, max. (mA)	Locked current, max. (mA)	*Rotation speed (r/min)	*Max. air flow (m <sup>3</sup> /min)	*Max. static pressure (Pa)	Noise (dB(A))	Operating voltage range (V) (%)	Weight (kg)
ASEN102519	100	50/60	14/11	220/180	220/200	2300/2700	1.8/2.0	41.2/41.2	34/38 (42/46)	±10	0.36
ASEN102529	115			190/160	200/180						
ASEN102549	200			110/90	120/100						
ASEN102569	230			100/90	110/100						

Notes: 1. Asterisks in the table above indicate minimum values.  
2. Values above without designations are averages.  
3. Noise level was measured at a distance of 1 m from side of fan. Values in brackets were measured at a distance of 1 m from front of fan.

**DATA (Airflow - Static pressure Characteristic Curve)**



**MATERIALS USED**

Frame: aluminum alloy die-casting  
Propeller: plastic  
Bearings: ball bearings  
Lead wires: UL3266 and AWG22

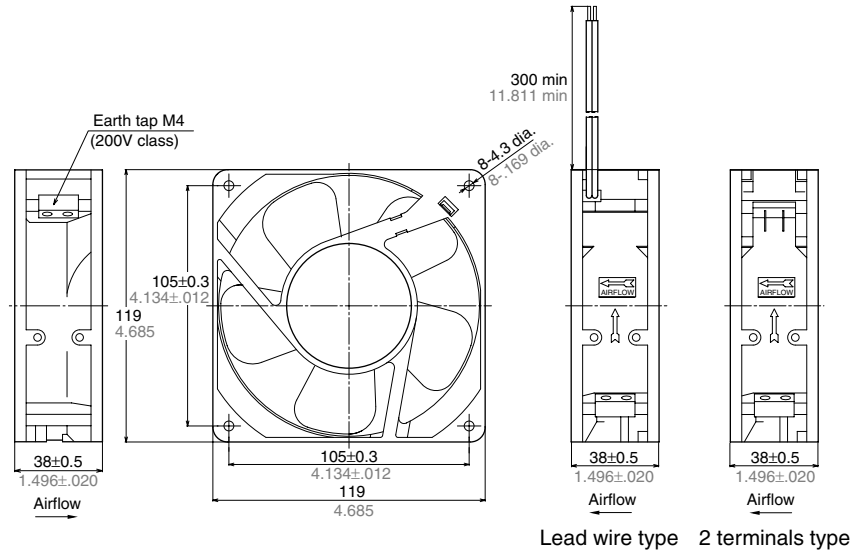
Terminal: Equivalent to Faston #110  
Label: 100 V class...black base  
200 V class...red base

**SPECIFICATIONS**

Ambient temperature	-10°C to +60°C +14°F to +140°F	
Ambient humidity	15 to 85%RH	
Storage temperature	-20°C to +70°C -4°F to +158°F	
Breakdown voltage	1,500 V AC for 1 min. (between charging section and frame)	
Insulation resistance	Min. 100MΩ (at 500 V DC megger)(between charging section and frame)	
Insulation class	UL:A class, CSA:B class	
Vibration resistance	Frequency	10 to 55Hz
	Double amplitude width	0.75mm
	Applied direction	X, Y and Z directions
	Applied time	10 min. in each direction
Protection	Impedance protected	
Mean life	MTTF: 50,000 hrs. (Time it takes until rotation frequency drops 30% of initial value when run continuously under 25°C 77°F and room humidity at the nominal voltage.)	

**NEW**

**DIMENSIONS** (mm inch)



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

**RATING**

**1. Lead wire type, Standard speed**

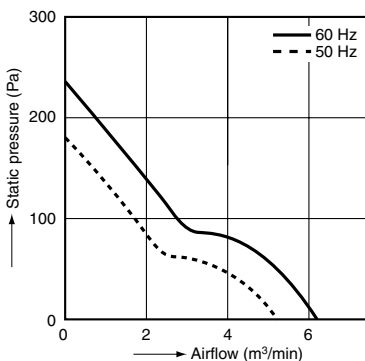
Part number	Rated voltage (V)	Frequency (Hz)	Input power, $\pm 10\%$ (W)	Rated current, max. (mA)	Locked current, max. (mA)	*Rotation speed (r/min)	*Max. air flow (m <sup>3</sup> /min)	*Max. static pressure (Pa)	Noise (dB(A))	Operating voltage range (V) (%)	Weight (kg)
ASEN10411	100	50/60	15/14	270/230	370/300	2600/2900	2.5/2.9	64.7/76.4	37/41 (44/48)	±10	0.55
ASEN10412	115		15.5/14.5	250/210	320/270						
ASEN10414	200		15/13	140/120	190/170						
ASEN10416	230		15/14	120/100	160/140						

**2. 2 terminals type, Standard speed**

Part number	Rated voltage (V)	Frequency (Hz)	Input power, $\pm 10\%$ (W)	Rated current, max. (mA)	Locked current, max. (mA)	*Rotation speed (r/min)	*Max. air flow (m <sup>3</sup> /min)	*Max. static pressure (Pa)	Noise (dB(A))	Operating voltage range (V) (%)	Weight (kg)
ASEN104519	100	50/60	15/14	270/230	370/300	2600/2900	2.5/2.9	64.7/76.4	37/41 (44/48)	±10	0.55
ASEN104529	115		15.5/14.5	250/210	320/270						
ASEN104549	200		15/13	140/120	190/170						
ASEN104569	230		15/14	120/100	160/140						

Notes: 1. Asterisks in the table above indicate minimum values.  
2. Values above without designations are averages.  
3. Noise level was measured at a distance of 1 m from side of fan. Values in brackets were measured at a distance of 1 m from front of fan.

**DATA** (Airflow - Static pressure Characteristic Curve)



**MATERIALS USED**

Frame: aluminum alloy die-casting  
Propeller: plastic  
Bearings: ball bearings  
Lead wires: UL3266 and AWG22

Terminal: Equivalent to Faston #110  
Label: 100 V class...black base  
200 V class...red base

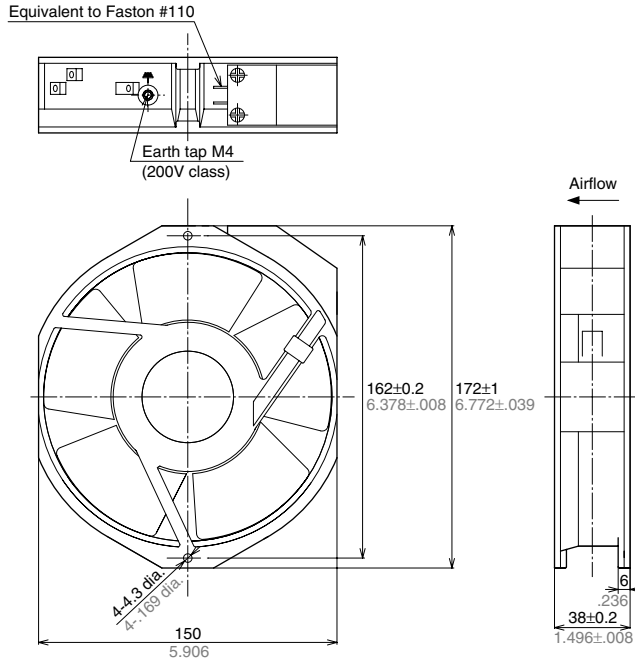
**SPECIFICATIONS**

Ambient temperature	-10°C to +60°C +14°F to +140°F	
Ambient humidity	15 to 85%RH	
Storage temperature	-20°C to +70°C -4°F to +158°F	
Breakdown voltage	1,500 V AC for 1 min. (between charging section and frame)	
Insulation resistance	Min. 100MΩ (at 500 V DC megger)(between charging section and frame)	
Insulation class	UL:A class, CSA:B class	
Vibration resistance	Frequency	10 to 55Hz
	Double amplitude width	0.75mm
	Applied direction	X, Y and Z directions
	Applied time	10 min. in each direction
Protection	Impedance protected	
Mean life	MTTF: 50,000 hrs. (Time it takes until rotation frequency drops 30% of initial value when run continuously under 25°C 77°F and room humidity at the nominal voltage.)	

**NEW**



**DIMENSIONS (mm inch)**



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

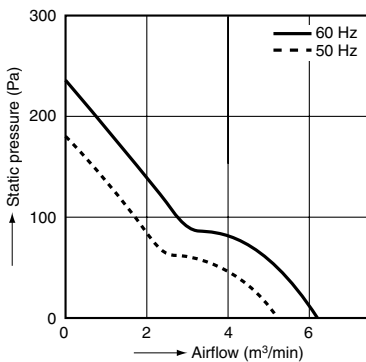
**RATING**

**2 terminals type, Standard speed**

Part number	Rated voltage (V)	Frequency (Hz)	Input power, <sup>+10%</sup> / <sub>-20%</sub> (W)	Rated current, max. (mA)	Locked current, max. (mA)	*Rotation speed (r/min)	*Max. air flow (m <sup>3</sup> /min)	*Max. static pressure (Pa)	Noise (dB(A))	Operating voltage range (V) (%)	Weight (kg)
ASEN50751	100	50/60	37/33	470/440	750/700	2700/3200	5.0/6.0	157/215.8	52/56 (57/61)	±10	0.8
ASEN50752	115		35/32	380/360	550/530						
ASEN50754	200		34/33	230/210	340/320						
ASEN50756	230		35/35	190/180	280/310						

Notes: 1. Asterisks in the table above indicate minimum values.  
2. Values above without designations are averages.  
3. Noise level was measured at a distance of 1 m from side of fan. Values in brackets were measured at a distance of 1 m from front of fan.

**DATA (Airflow - Static pressure Characteristic Curve)**



**MATERIALS USED**

Frame: aluminum alloy die-casting  
Propeller: plastic  
Bearings: ball bearings  
Terminal: Equivalent to Faston #110

Label: 100 V class...black base  
200 V class...red base

**SPECIFICATIONS**

Ambient temperature	-10°C to +60°C +14°F to +140°F	
Ambient humidity	15 to 85%RH	
Storage temperature	-20°C to +70°C -4°F to +158°F	
Breakdown voltage	1,500 V AC for 1 min. (between charging section and frame)	
Insulation resistance	Min. 100MΩ(at 500 V DC megger)(between charging section and frame)	
Insulation class	UL:A class, CSA:B class	
Vibration resistance	Frequency	10 to 55Hz
	Double amplitude width	0.75mm
	Applied direction	X, Y and Z directions
	Applied time	10 min. in each direction
Protection	Impedance protected	
Mean life	MTTF: 50,000 hrs. (Time it takes until rotation frequency drops 30% of initial value when run continuously under 25°C 77°F and room humidity at the nominal voltage.)	

# Accessories

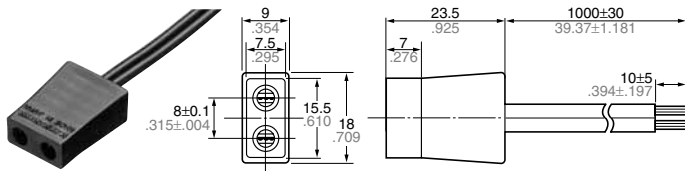
## DIMENSIONS (mm inch)

### 1. Plug cord for AC Fan Motor 2 terminals type

ASE51100

For inside of appliance

Flat type 2-core cord (20/0.18)



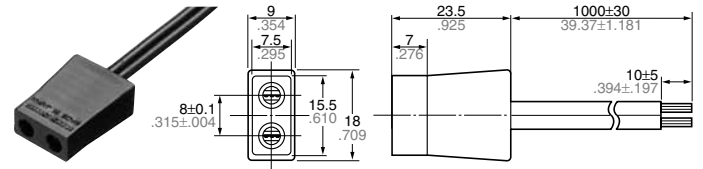
ASE51109

UL Standard: File No. E106219

Thermoplastic, flat type 2-core cord

UL SPT-1 AWG18 (41/0.16)

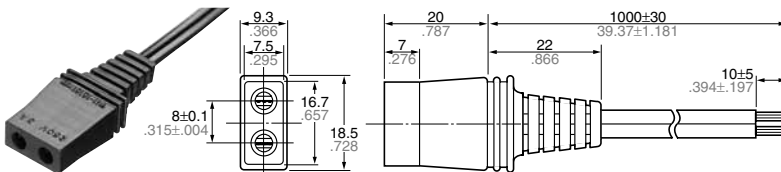
CSA POT-64 AWG18 (41/0.16)



ASE51107

Compliant with Electrical Appliance and Material Safety Law

Flat type 2-core cord (30/0.18)

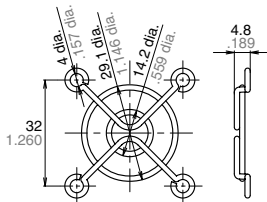


### 2. Fan guard (You can use this with both DC and AC types.)

ASFN48001

Recognized for 40 sq. by UL/CSA

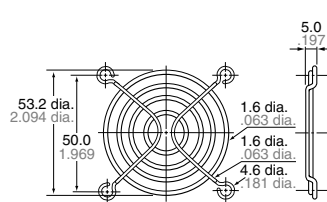
Material used: Steel, 1.6 dia.



ASFN68001

Recognized for 60 sq. by UL/CSA

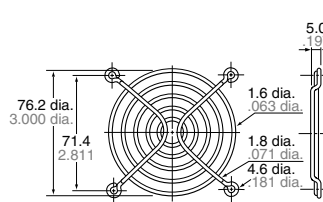
Material used: Steel, 1.6 dia.



ASFN88001

Recognized for 80 sq. by UL/CSA

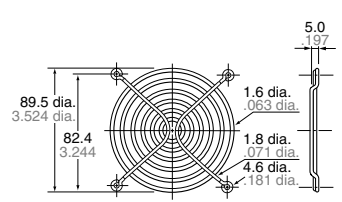
Material used: Steel, 1.6 dia.



ASFN98001

Recognized for 92 sq. by UL/CSA

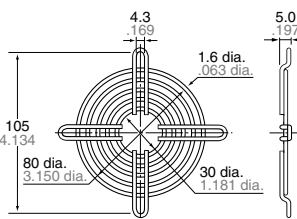
Material used: Steel, 1.6 dia.



ASEN88001

For 80 sq. by Electrical Appliance and Material Safety Law

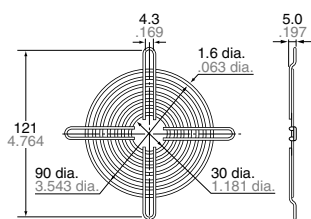
Material used: Steel, 1.6 dia.



ASEN98001

For 92 sq. by Electrical Appliance and Material Safety Law

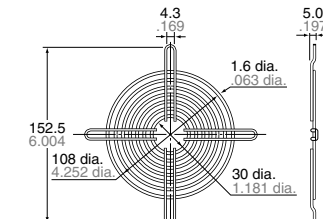
Material used: Steel, 1.6 dia.



ASEN18001

For 120 sq. by Electrical Appliance and Material Safety Law

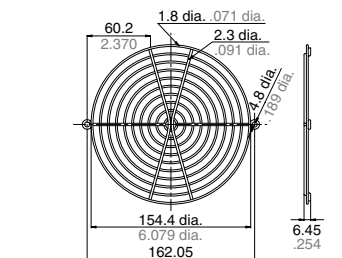
Material used: Steel, 1.6 dia.



ASEN58001

Recognized for 150x172 by UL/CSA

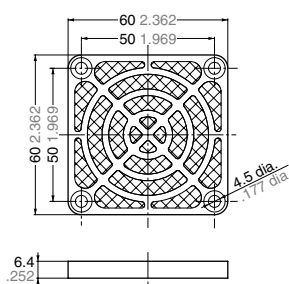
Material used: Steel, 2.3 dia.



### 3. Fan motor filter (You can use this with both DC and AC types.)

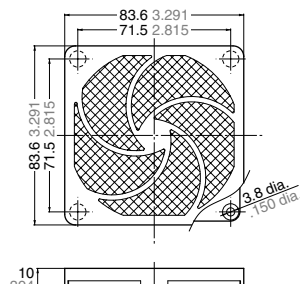
ASEN68002

For 60 sq.



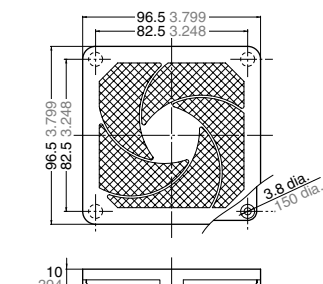
ASEN88002

For 80 sq.



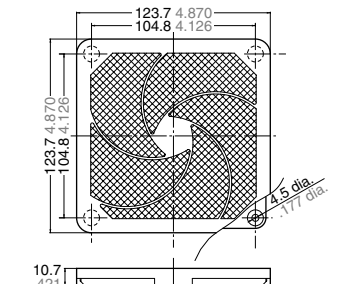
ASEN98002

For 92 sq.



ASEN18002

For 120 sq.

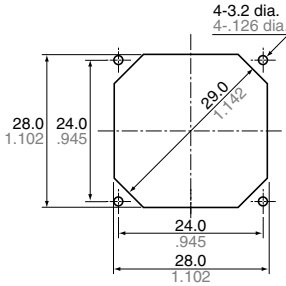


# Mounting Hole Dimensions

## For DC Fan Motor

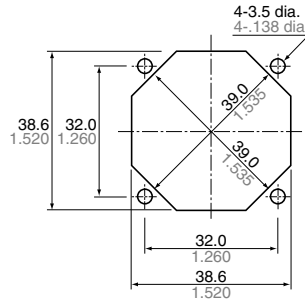
### 1. 30 sq. Series

Discharge side/Suction side



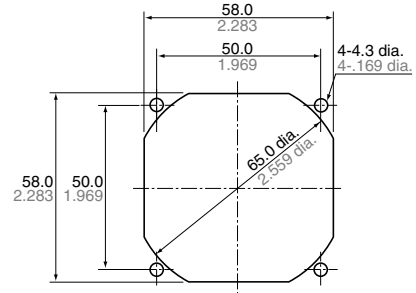
### 2. 40 sq. Series

Discharge side/Suction side



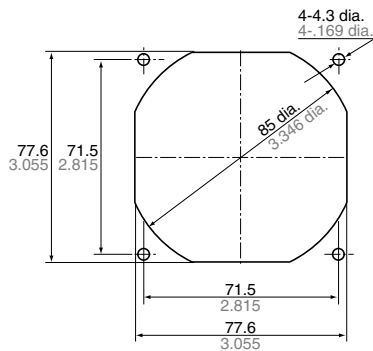
### 3. 60 sq. Series

Discharge side/Suction side



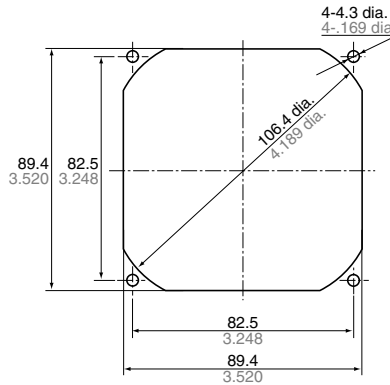
### 4. 80 sq. Series

Discharge side/Suction side



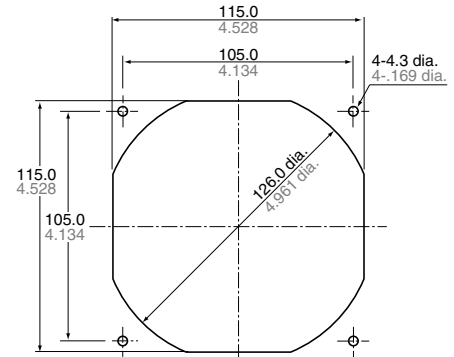
### 5. 92 sq. Series

Discharge side/Suction side



### 6. 120 sq. Series

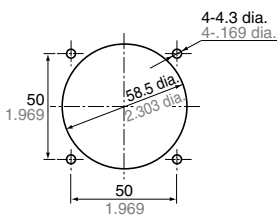
Discharge side/Suction side



## For AC Fan Motor

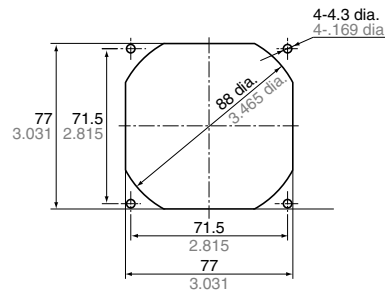
### 1. 60 sq. Series

Discharge side/Suction side



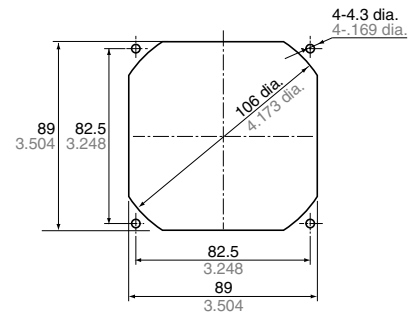
### 2. 80 sq. Series

Discharge side/Suction side



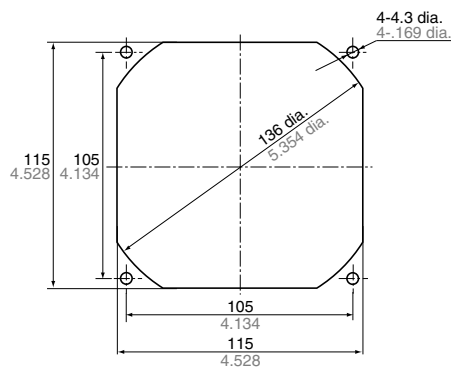
### 3. 92 sq. Series

Discharge side/Suction side



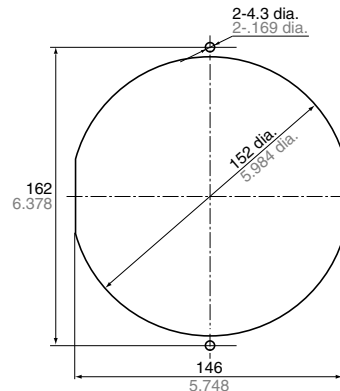
### 4. 120 sq. Series

Discharge side/Suction side



### 5. 150x172 Series

Discharge side/Suction side



# Functions of DC Fan Sensor

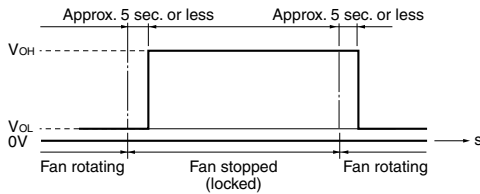
## DC FAN SENSOR

If the fan stops as a result of forced external restraint, a signal will be generated to indicate that there is a problem. This signal can be used to control an external warning circuit in order to help prevent the device from overheating.

Although there are various detection methods for this sensor, we employ the method that uses a logic circuit.

### 1. Lock sensor specifications

Output waveform



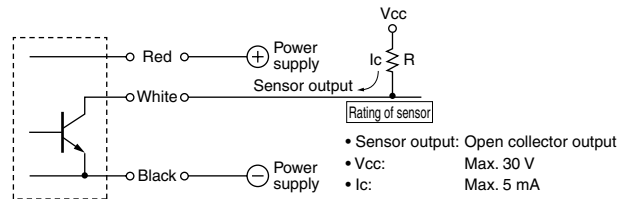
\* Output may be high for approximately 0.5 seconds when power is turned on.

\* The continually high output waveform type when fan is stopped (locked) is standard.

A high/low output waveform type and output waveform type that corresponds to the rotation frequency during fan rotation are available by special order.

Please inquire for details.

### 2. Sensor output circuit



Notes: 1. Set the resistance value (R) so that the sensor circuit current ( $I_c$ ) does not exceed 5 mA.

2. When using at TTL level, the sensor circuit current ( $I_c$ ) should be approximately 2 mA.

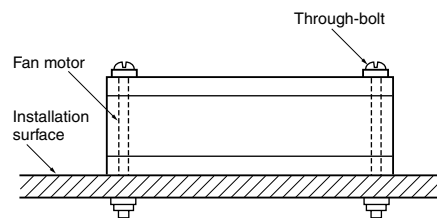
\* Exceeding the values above may lead to IC damage.

# Cautions For Use

## DC FAN MOTOR

1. Do not reverse-connect the power supply. Although nothing adverse will occur if the rated voltage is connected in reverse for a short time period, the fan will not operate.
2. If the power is to be pulsed on and off in order to start and stop the fan quickly, be sure to install a switch on the + side of the power supply. Not doing so may damage the circuit.

3. The DC fan motor installation bracket has a rib. As shown in the figure, use the through-bolts when installing.
4. Use a tightening torque of no more than 0.6 Nm.

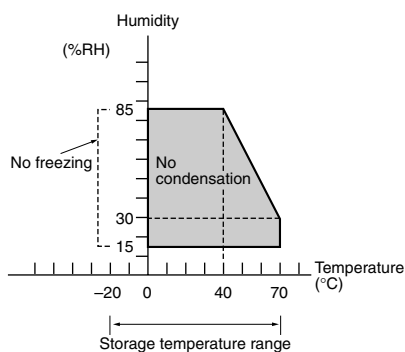


## DC FAN MOTOR and AC FAN MOTOR

1. Since our fan motor employs precision ball bearings, due care should be taken not to apply any shock in handling.
2. Due to the bearing mechanism, the noise level will increase in proportion to the length of time the fan is used. Avoid use where the temperature is high or where there is a lot of dirt.
3. Do not allow substances such as oil and grease to get onto the plastic part of the fan body. Some oils and greases decompose and become altered at high temperatures. These can have an adverse effect if they contact the fan. Therefore, be very careful when handling these substances.
4. Do not apply unnecessary force to the internal parts when handling the product. Also, do not use a fan that has been dropped.
5. Fan life is based on usage at room temperature and a humidity of 15 to 45% RH. Please verify life under actual conditions, since life will depend on the frequency and duration of use, as well as the atmosphere in which it is used.

### 6. Transport and storage conditions

The allowable specifications for environments suitable for transportation and storage are given below.



- No freezing between  $-20^{\circ}\text{C}$  to  $0^{\circ}\text{C}$   
 $-4^{\circ}\text{F}$  to  $+32^{\circ}\text{F}$
- No condensation in the range above between  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$   
 $+32^{\circ}\text{F}$  to  $+158^{\circ}\text{F}$

### 1) Condensation

If the temperature is high and there is a lot of humidity, condensation will occur when the temperature suddenly changes. This should be avoided because it can cause degradation of the fan insulation.

### 2) Freezing

At temperatures below  $0^{\circ}\text{C}$   $+32^{\circ}\text{F}$  moisture such as that caused by condensation will freeze and lead to problems such as lockage of the moving parts and operation lags. Be careful to prevent this from happening.

### 3) Low-temperature, low-humidity environments

Do not leave the fan for a long period in an environment of low temperature and low humidity. Doing so may cause the plastic to become brittle.

4) When storing, avoid places of high temperature and high humidity or where corrosive gas is present.

5) Do not store the fan any longer than six months.

# Technical Information

## MEASUREMENT of AIRFLOW and STATIC PRESSURE

It is very difficult to measure airflow and static pressure, and there are cases where measured values vary depending on measuring devices. There are two kinds of measuring methods; double chamber method provided by JIS and AMCA (Air Moving and Conditioning Association) and wind tunnel method. Our company adopted the double chamber method, and therefore we will explain it hereinafter.

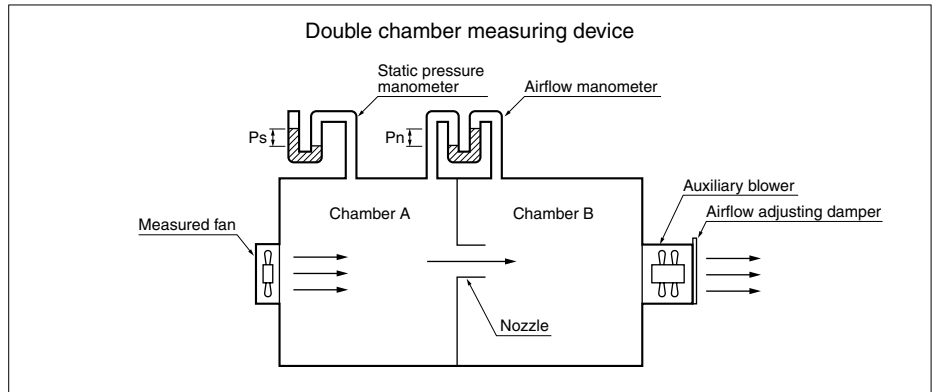
The auxiliary blower (fan) adjusts an inner pressure by sucking out air. At this moment, as airflow and static pressure are varied by opening or closing the damper, each value is read on the manometer.

### Maximum airflow:

The damper opens, and the auxiliary blower sucks out air so that static pressure becomes zero. At this moment, the pressure differential (airflow differential pressure: Pn) in chambers A and B becomes maximum. The airflow whose Pn is measured and which is determined by using the equation shown at right is called the maximum airflow.

### Maximum static pressure:

When the damper is completely closed, the pressure in chamber A becomes maximum. At this moment, the pressure differential (static pressure: Ps) in chambers A against atmospheric pressure is called the maximum static pressure.



### 1. Equation

Airflow Q =

$$60 \times C \times \left(\frac{D}{2}\right)^2 \times \pi \times \sqrt{\frac{2g}{7}} \times (P_n \times 9.81) \quad (\text{m}^3/\text{min})$$

In the above equation,

C: Flow coefficient of nozzle

D: Nozzle diameter (m)

γ: Air density =

$$\left[1.293 \times \frac{273}{273+t} \times P \times 133.32\right] (\text{kg}/\text{m}^3)$$

t: Temperature(°C)

P: Atmospheric pressure(Pa)

g: 9.8(m/s<sup>2</sup>)

Pn: Airflow differential pressure (Pa)

Ps: Static pressure (Pa)

### 2. Unit conversion table

#### 1) Airflow

m <sup>3</sup> /min.	l/s	CFM (ft <sup>3</sup> /min.)
1	16.678	35.334
0.06	1	2.1186
0.0283	0.472	1

#### 2) Static pressure

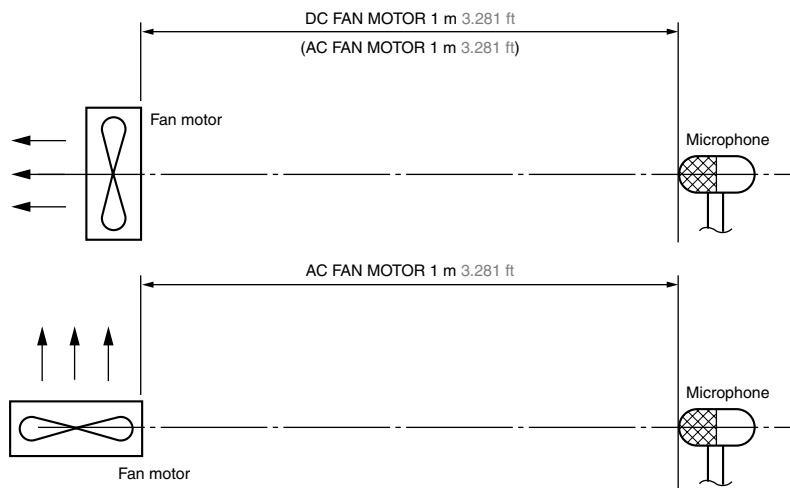
Pa	mmH <sub>2</sub> O (mmAq)
1	0.10197
9.80665	1

## NOISE MEASUREMENT

Operation noise is measured by hanging the fan in midair. For the DC fan, noise is measured in dB(A) 1 m from the front of the air-intake side. For the AC fan, noise is measured in dB(A) 1 m from the front of the air-intake side and the side of the fan.

The background noise complies with the section in JIS B8346 that states that it should be at least 10 dB lower than the target noise reading.

Our measurements were made in an anechoic chamber with a background noise of approximately 15 dB.



## COUNTERMEASURES AGAINST NOISE

Our fan motors are designed placing great importance on low noise. However, take into consideration the following points because noise is influenced depending on the mechanism design used.

- 1) Leave a space between the rear side of the fan suction opening and the cooled object.
- 2) When using two or more fan motors, leave a space between the fans.
- 3) According to the mounting hole dimensions (page 22), design so that the mounting face and blades are not crossed.
- 4) Grease in the bearings will deteriorate and noise will gradually increase as the fan is used. The replacement period will differ depending on the conditions of use and allowable sound level. We recommend periodic replacement.

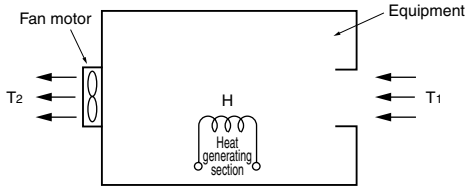


# Technical Information

## METHOD OF SELECTING FAN MOTOR

When selecting a fan motor, for normal use the following method is used.

- 1) Determine the amount of heat generated inside the equipment.
- 2) Decide the permissible temperature rise inside the equipment.



- 3) Calculate the volume of air necessary from Equation (1).

Equation (1)

$$Q = \frac{50 \times H}{T_2 - T_1} = \frac{50 \times H}{\Delta T} \text{ (m}^3/\text{min)}$$

where

- Q: Air volume (m<sup>3</sup>/min.)
- H: Heat generated (kW)
- T<sub>1</sub>: Inlet air temperature(°C)
- T<sub>2</sub>: Exhaust air temperature(°C)
- ΔT: Temperature rise(°C)

4) Determine the system impedance of the equipment by means of Equation (2). For the flow of air to the equipment, there is a loss of pressure due to the resistance to the flow of air from the components inside the equipment. This loss varies in accordance with the flow of air. This is referred to as the system impedance.  $\Delta P = KQ^n$ .....Equation (2)

where

- ΔP: Pressure drop(Pa{mmH<sub>2</sub>O})
- K: Constant determined for each equipment
- Q: Air volume (m<sup>3</sup>/min.)
- n: Coefficient determined by air flow

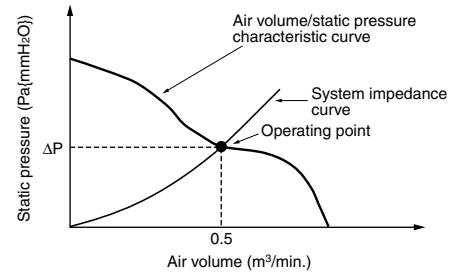
In this equation, it is generally considered that n = 2.

Also, it is difficult to calculate the value of K, since there is no good method other than an actual test measurement with the equipment.

Example:

When the heat generated is 100 W with ΔT = 10°C 50°F, the following is the result.

$$Q = \frac{50 \times 0.1}{10} = 0.5 \text{ (m}^3/\text{min)}$$



The intersection of the air volume/static pressure characteristic curve with the system impedance curve is called the operating point. This shows the condition with the fan motor operating.

In actuality, the system impedance is approximately assumed, a fan motor is decided from the catalogue, the temperature difference “ΔT” and air volume “Q” are measured, and from this data the fan is judged as suitable or not as the ordinary method. If the temperature difference “ΔT” is high indicating the air volume “Q” is not satisfactory, because the system impedance is higher than the assumed value, a change should be made to a fan motor with a greater air volume.

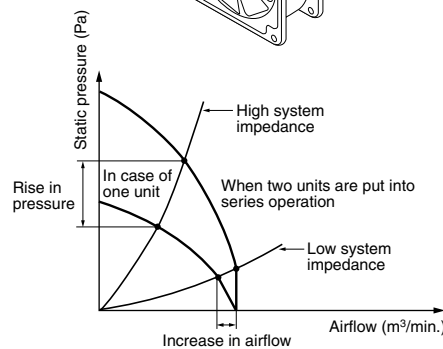
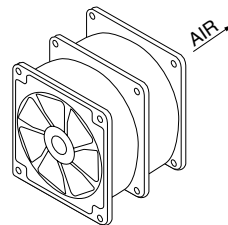
## FAN MOTOR SERIES/PARALLEL OPERATION

When one fan motor does not satisfy a sufficient cooling capacity;

Series operation: Higher pressure characteristic obtained. (Nearly double)

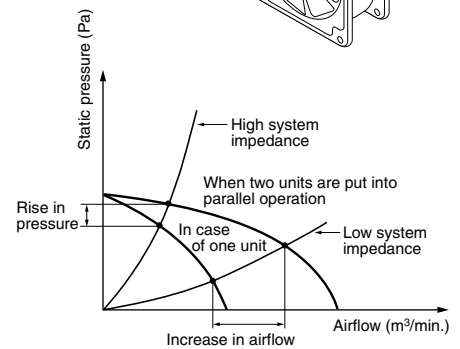
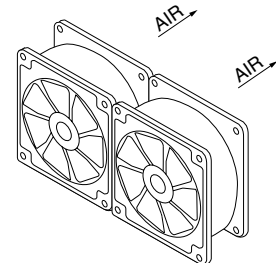
Parallel operation: Larger airflow characteristic obtained. (Nearly double)

### 1. In case of series operation



- In case of high system impedance, static pressure rises.
- In case of low system impedance, airflow slightly increases.



### 2. In case of parallel operation








- In case of low system impedance, airflow increases.
- In case of high system impedance, pressure slightly rises.

# Fan Motor Selector Chart

## DC FAN MOTOR

Type	ASFN3*7** 30 sq.×10t						ASFN4*7** 40 sq.×10t					
	<b>NEW</b> 						<b>NEW</b> 					
Item	Standard speed		Middle speed		Low speed		Standard speed		Middle speed		Low speed	
Rated operating voltage	5 V DC	12 V DC	5 V DC	12 V DC	5 V DC	12 V DC	5 V DC	12 V DC	5 V DC	12 V DC	5 V DC	12 V DC
Rated operating current, max. (mA)	240	120	200	100	130	90	210	100	160	100	100	90
Rated power consumption, max. (W)	1.20	1.44	1.00	1.20	0.65	1.08	1.05	1.20	0.80	1.20	0.50	1.08
Rotation speed, average (r/min)	10,500		9,000		7,500		6,500		5,500		4,500	
Max. static pressure, average (Pa)	54.0		37.0		29.0		46.0		34.0		24.0	
Max. air flow, average (m <sup>3</sup> /min)	0.110		0.091		0.078		0.17		0.15		0.12	
Noise, average (dB(A))	27		23		21		29		25		22	
Weight (g)	8.5						15.0					
Operating voltage range	For rated 5 V: 4.5 to 5.5 V DC, for rated 12 V: 6 to 13.8 V DC						For rated 5 V: 4.5 to 5.5 V DC, for rated 12 V: 10.2 to 13.8 V DC					
Page	7						8					

Type	ASFN6*3** 60 sq.×25t						ASFN8*3** 80 sq.×25t					
	<b>NEW</b> 						<b>NEW</b> 					
Item	Standard speed		Middle speed		Low speed		Standard speed		Middle speed		Low speed	
Rated operating voltage	12 V DC	24 V DC	12 V DC	24 V DC	12 V DC	24 V DC	12 V DC	24 V DC	12 V DC	24 V DC	12 V DC	24 V DC
Rated operating current, max. (mA)	160	100	100	60	70	50	330	180	170	90	100	60
Rated power consumption, max. (W)	1.92	2.40	1.20	1.44	0.84	1.20	3.96	4.32	2.04	2.16	1.20	1.44
Rotation speed, average (r/min)	4,050		3,000		2,550		2,950		2,400		1,900	
Max. static pressure, average (Pa)	41.7		23.4		17.2		36.6		24.3		14.2	
Max. air flow, average (m <sup>3</sup> /min)	0.61		0.44		0.37		1.09		0.88		0.68	
Noise, average (dB(A))	30.5		22.5		19.0		32.5		27.0		22.0	
Weight (g)	65						80					
Operating voltage range	For rated 12 V: 6 to 13.8 V DC, for rated 24 V: 15 to 27.6 V DC						For rated 12 V: 6 to 13.8 V DC, for rated 24 V: 10 to 27.6 V DC					
Page	9						10					

Type	ASFN9*3** 92 sq.×25t						ASFN1*3** 120 sq.×25t						ASFN1*B** 120 sq.×38t					
	<b>NEW</b> 						<b>NEW</b> 						<b>NEW</b> 					
Item	Standard speed		Middle speed		Low speed		Standard speed		Middle speed		Low speed		Standard speed		Middle speed		Low speed	
Rated operating voltage	12 V DC	24 V DC	12 V DC	24 V DC	12 V DC	24 V DC	12 V DC	24 V DC	12 V DC	24 V DC	12 V DC	24 V DC	12 V DC	24 V DC	12 V DC	24 V DC	12 V DC	24 V DC
Rated operating current, max. (mA)	250	130	180	90	120	80	520	290	250	130	160	100	720	400	520	280	350	200
Rated power consumption, max. (W)	3.00	3.12	2.16	2.16	1.44	1.92	6.24	6.96	3.00	3.12	1.92	2.40	8.64	9.60	6.24	6.72	4.20	4.80
Rotation speed, average (r/min)	2,350		2,000		1,700		2,500		1,900		1,600		2,950		2,650		2,300	
Max. static pressure, average (Pa)	27.6		20.0		14.4		40.9		24.8		17.9		68.1		55.9		44.1	
Max. air flow, average (m <sup>3</sup> /min)	1.38		1.17		0.98		2.85		2.15		1.80		3.07		2.75		2.37	
Noise, average (dB(A))	32.0		27.0		22.0		38.5		31.0		27.0		42.5		41.0		37.0	
Weight (g)	85						180						260					
Operating voltage range	For rated 12 V: 6 to 13.8 V DC, for rated 24 V: 10 to 27.6 V DC						For rated 12 V: 6 to 13.8 V DC, for rated 24 V: 10 to 27.6 V DC						For rated 12 V: 6 to 13.8 V DC, for rated 24 V: 10 to 27.6 V DC					
Page	11						12						13					

# Product Types

## DC FAN MOTOR

Size	Specifications	Rotation speed	Voltage	Part number
30 sq.×10	Ball bearing type	Standard Standard speed	5V DC	ASFN30770
		Middle speed		ASFN32770
		Low speed		ASFN34770
	Ball bearing type	Standard speed	12V DC	ASFN30771
		Middle speed		ASFN32771
		Low speed		ASFN34771
40 sq.×10	Ball bearing type	Standard speed	5V DC	ASFN40770
		Middle speed		ASFN42770
		Low speed		ASFN44770
	Ball bearing type	Standard speed	12V DC	ASFN40771
		Middle speed		ASFN42771
		Low speed		ASFN44771
60 sq.×25	Ball bearing type	Standard speed	12V DC	ASFN60371
		Middle speed		ASFN62371
		Low speed		ASFN64371
	Ball bearing type	Standard speed	24V DC	ASFN60372
		Middle speed		ASFN62372
		Low speed		ASFN64372
80 sq.×25	Ball bearing type	Standard speed	12V DC	ASFN80371
		Middle speed		ASFN82371
		Low speed		ASFN84371
	Ball bearing type	Standard speed	24V DC	ASFN80372
		Middle speed		ASFN82372
		Low speed		ASFN84372
92 sq.×25	Ball bearing type	Standard speed	12V DC	ASFN90371
		Middle speed		ASFN92371
		Low speed		ASFN94371
	Ball bearing type	Standard speed	24V DC	ASFN90372
		Middle speed		ASFN92372
		Low speed		ASFN94372
120 sq.×25	Ball bearing type	Standard speed	12V DC	ASFN10371
		Middle speed		ASFN12371
		Low speed		ASFN14371
	Ball bearing type	Standard speed	24V DC	ASFN10372
		Middle speed		ASFN12372
		Low speed		ASFN14372
120 sq.×38	Ball bearing type	Standard speed	12V DC	ASFN10B71
		Middle speed		ASFN12B71
		Low speed		ASFN14B71
	Ball bearing type	Standard speed	24V DC	ASFN10B72
		Middle speed		ASFN12B72
		Low speed		ASFN14B72

- Notes: 1. Frames with ribs are standard (except 120 sq.×38). Casings without ribs can be special ordered.  
 2. A super speed type (except ASFN3 and ASFN4 Series), 48 V DC type (only ASFN1\*B\*\* Series), and type with sensor can be special ordered.  
 (For details, please refer the description of the DC fan sensor function on page 14.)

# ACCESSORIES

## 1. Plug Cord for AC Fan Motor

Product name	Specifications	Part number
Plug code for 2-terminal type	For inside of appliance, L = 1,000 mm	ASE51100
	Compliant with Electrical Appliance and Material Safety Law, L = 1,000 mm	ASE51107
	UL Standard, L = 1,000 mm	ASE51109

## 2. Fan Guard for DC and AC Fan Motor

Product name	Specifications	Part number
40 sq.	Recognized by UL/CSA	ASFN48001
60 sq.	Recognized by UL/CSA	ASFN68001
80 sq.	Recognized by UL/CSA	ASFN88001
92 sq.	Recognized by UL/CSA	ASFN98001
80 sq.	Compliant with Electrical Appliance and Material Safety Law	ASEN88001
92 sq.	Compliant with Electrical Appliance and Material Safety Law	ASEN98001
120 sq.	Compliant with Electrical Appliance and Material Safety Law	ASEN18001
150×172	Recognized by UL/CSA	ASEN58001

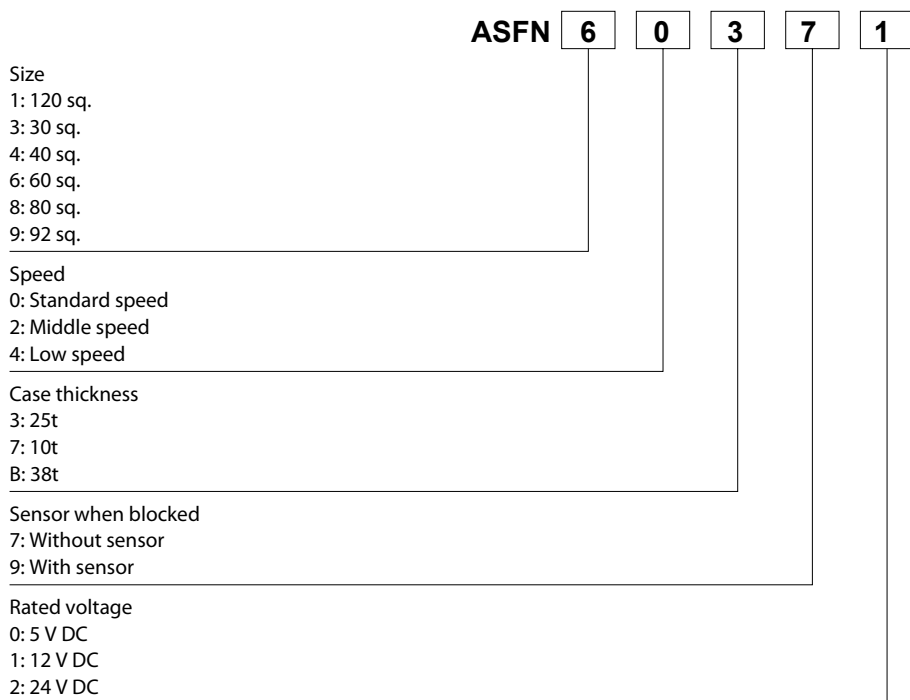
## 3. Filter for DC and AC Fan Motor

Product name	Part number
60 sq.	ASEN68002
80 sq.	ASEN88002
92 sq.	ASEN98002
120 sq.	ASEN18002

# Ordering Information

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## DCType

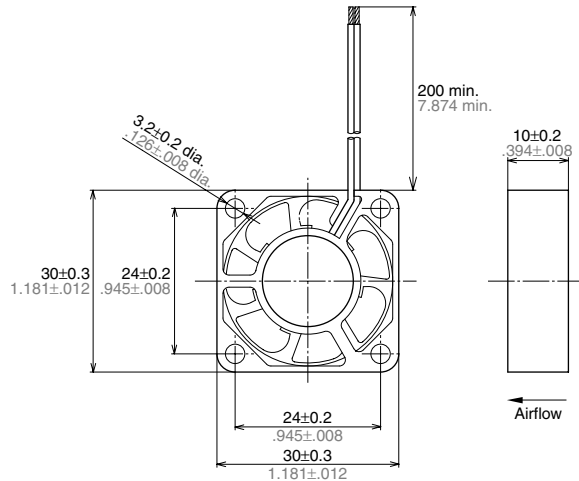


• For the DC type, a super speed type (except ASFN3 and ASFN4 Series), 48 V DC type (only ASFN1 \*B\*\* Series), and type with sensor can be special ordered.

\*Depending on the combination, not all specifications can be met. For details, please consult us.

**NEW**

**DIMENSIONS** (mm inch)



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

**RATING**

**1. Standard speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN30770	5	1.20/0.90	240/180	10,500	0.110	54.0	27	8.5
ASFN30771	12	1.44/0.96	120/80					

**2. Middle speed**

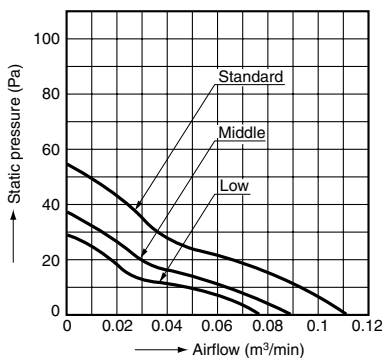
Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN32770	5	1.00/0.70	200/140	9,000	0.091	37.0	23	8.5
ASFN32771	12	1.20/0.84	100/70					

**3. Low speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN34770	5	0.65/0.50	130/100	7,500	0.078	29.0	21	8.5
ASFN34771	12	1.08/0.72	90/60					

Notes: 1. Values above without designations are averages.  
2. Noise levels are based on measurements taken at a distance of 1 m from the front of the fan.

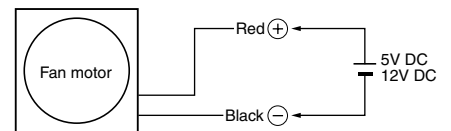
**DATA** (Airflow - Static pressure Characteristic Curve)



**MATERIALS USED**

Frame: plastic  
Propeller: plastic  
Bearings: ball bearings  
Lead wires: UL1061 and AWG26

**WIRING DIAGRAM**



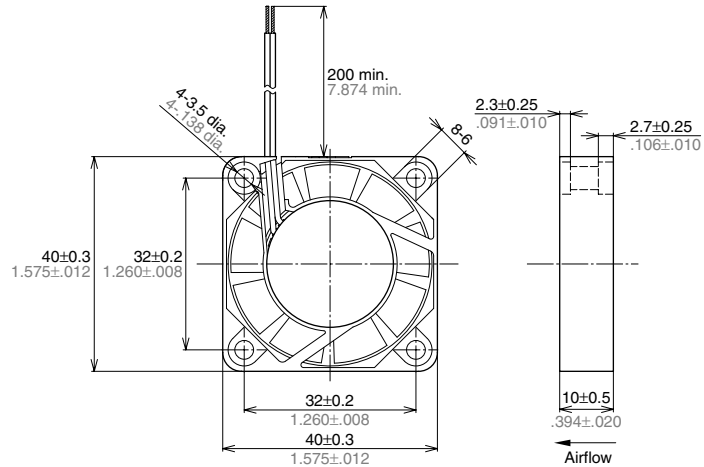
**SPECIFICATIONS**

Ambient temperature	-10°C to +60°C +14°F to +140°F
Ambient humidity	15 to 85% RH
Temperature rise	Coil surface: Max. 50 °C 122°F (Nominal voltage, by resistive method) External surface: Max. 20°C 68°F (Nominal voltage, by thermocouple method)
Breakdown voltage	500 V AC for 1 min. (between lead wire and external housing)
Insulation resistance	Min. 10MΩ (at 500 V DC)
Vibration resistance	Frequency
	Double amplitude width
	Applied direction
	Applied time
Lead wire tensile strength	9.8 N, single wires did not break at 15 seconds
Fan blockage	No coil burnout even after blockage of 72 hrs. at nominal voltage.
Reverse polarity power connection	No damage even after reverse polarity connection for short time at nominal voltage.
Expected life	90% survival rate at 50,000 hrs. (When rotation frequency drops 30% of initial value when run at nominal voltage under 25°C 77°F, room humidity.)

**NEW**



**DIMENSIONS** (mm inch)



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

**RATING**

**1. Standard speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN40770	5	1.05/0.775	210/155	6,500	0.17	46.0	29	15.0
ASFN40771	12	1.20/0.876	100/73					

**2. Middle speed**

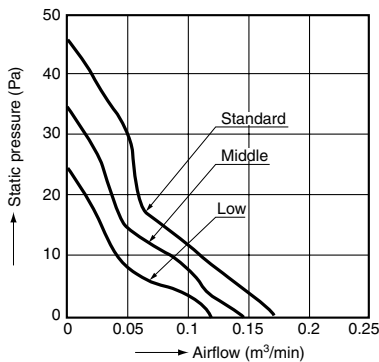
Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN42770	5	0.80/0.60	160/120	5,500	0.15	34.0	25	15.0
ASFN42771	12	1.20/0.876	100/73					

**3. Low speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN44770	5	0.50/0.375	100/75	4,500	0.12	24.0	22	15.0
ASFN44771	12	1.08/0.744	90/62					

Notes: 1. Values above without designations are averages.  
2. Noise levels are based on measurements taken at a distance of 1 m from the front of the fan.

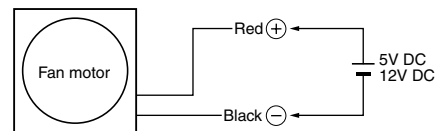
**DATA** (Airflow - Static pressure Characteristic Curve)



**MATERIALS USED**

Frame: plastic  
Propeller: plastic  
Bearings: ball bearings  
Lead wires: UL1061 and AWG26

**WIRING DIAGRAM**

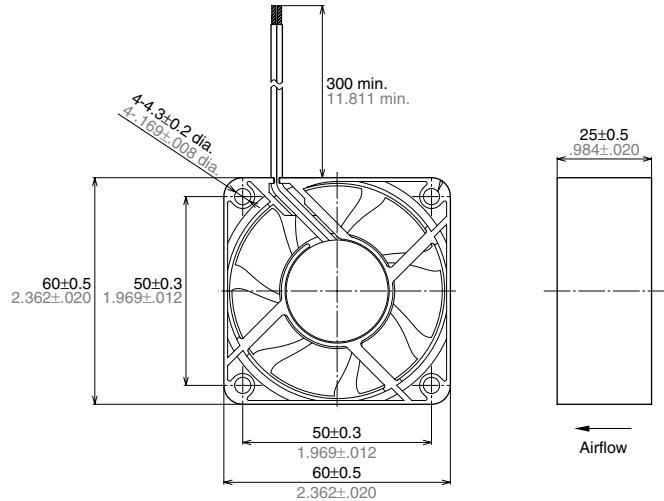


**SPECIFICATIONS**

Ambient temperature	-10°C to +60°C +14°F to +140°F	
Ambient humidity	15 to 85% RH	
Temperature rise	Coil surface: Max. 50 °C 122°F (Nominal voltage, by resistive method) External surface: Max. 20°C 68°F (Nominal voltage, by thermocouple method)	
Breakdown voltage	500 V AC for 1 min. (between lead wire and external housing)	
Insulation resistance	Min. 10 MΩ (at 500 V DC)	
Vibration resistance	Frequency	10 to 55Hz
	Double amplitude width	0.75mm
	Applied direction	X, Y and Z directions
	Applied time	10 min. in each direction
Lead wire tensile strength	9.8 N, single wires did not break at 15 seconds	
Fan blockage	No coil burnout even after blockage of 72 hrs. at nominal voltage.	
Reverse polarity power connection	No damage even after reverse polarity connection for short time at nominal voltage.	
Expected life	90% survival rate at 60,000 hrs. (When rotation frequency drops 30% of initial value when run at nominal voltage under 25°C 77°F, room humidity.)	

**NEW**

**DIMENSIONS (mm inch)**



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

**RATING**

**1. Standard speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN60371	12	1.92/1.56	160/120	4,050	0.61	41.7	30.5	65
ASFN60372	24	2.40/1.92	100/80					

**2. Middle speed**

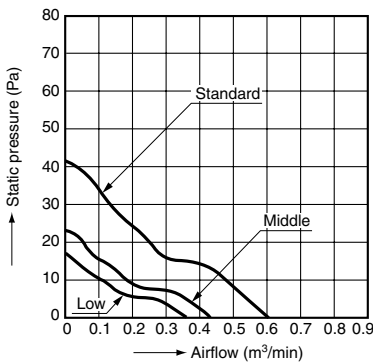
Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN62371	12	1.20/0.96	100/80	3,000	0.44	23.4	22.5	65
ASFN62372	24	1.44/1.20	60/50					

**3. Low speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN64371	12	0.84/0.6	70/50	2,550	0.37	17.2	19.0	65
ASFN64372	24	1.20/0.96	50/40					

Notes: 1. Values above without designations are averages.  
2. Noise levels are based on measurements taken at a distance of 1 m from the front of the fan.

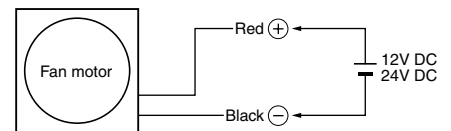
**DATA (Airflow - Static pressure Characteristic Curve)**



**MATERIALS USED**

Frame: plastic  
Propeller: plastic  
Bearings: ball bearings  
Lead wires: UL1007 and AWG24

**WIRING DIAGRAM**



**SPECIFICATIONS**

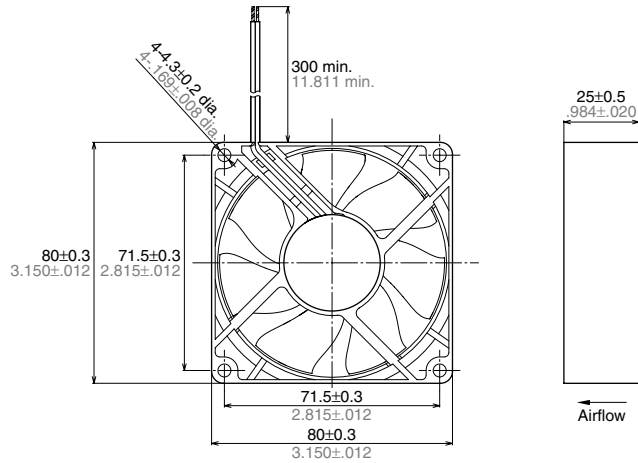
Ambient temperature	-10°C to +60°C +14°F to +140°F	
Ambient humidity	15 to 85% RH	
Temperature rise	Coil surface: Max. 50 °C 122°F (Nominal voltage, by resistive method) External surface: Max. 20°C 68°F (Nominal voltage, by thermocouple method)	
Breakdown voltage	500 V AC for 1 min. (between lead wire and external housing)	
Insulation resistance	Min. 10 MΩ (at 500 V DC)	
Vibration resistance	Frequency	10 to 55Hz
	Double amplitude width	0.75mm
	Applied direction	X, Y and Z directions
	Applied time	10 min. in each direction
Lead wire tensile strength	9.8 N, single wires did not break at 15 seconds	
Fan blockage	No coil burnout even after blockage of 72 hrs. at nominal voltage.	
Reverse polarity power connection	No damage even after reverse polarity connection for short time at nominal voltage.	
Expected life	90% survival rate at 60,000 hrs. (When rotation frequency drops 30% of initial value when run at nominal voltage under 25°C 77°F, room humidity.)	



**NEW**



**DIMENSIONS (mm inch)**



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

**RATING**

**1. Standard speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN80371	12	3.96/3.00	330/250	2,950	1.09	36.6	32.5	80
ASFN80372	24	4.32/3.36	180/140					

**2. Middle speed**

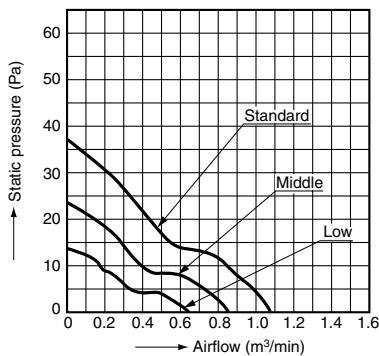
Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN82371	12	2.04/1.56	170/130	2,400	0.88	24.3	27.0	80
ASFN82372	24	2.16/1.68	90/70					

**3. Low speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN84371	12	1.20/0.84	100/70	1,900	0.68	14.2	22	80
ASFN84372	24	1.44/0.96	60/40					

Notes: 1. Values above without designations are averages.  
2. Noise levels are based on measurements taken at a distance of 1 m from the front of the fan.

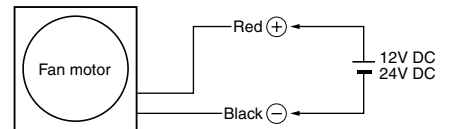
**DATA (Airflow - Static pressure Characteristic Curve)**



**MATERIALS USED**

Frame: plastic  
Propeller: plastic  
Bearings: ball bearings  
Lead wires: UL1007 and AWG24

**WIRING DIAGRAM**



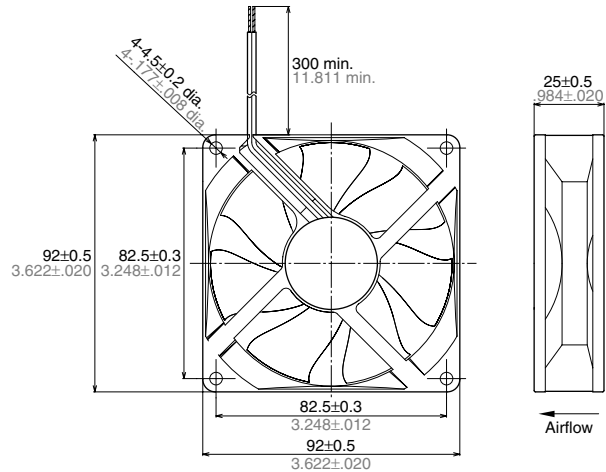
**SPECIFICATIONS**

Ambient temperature	-10°C to +60°C +14°F to +140°F	
Ambient humidity	15 to 85% RH	
Temperature rise	Coil surface: Max. 50 °C 122°F (Nominal voltage, by resistive method) External surface: Max. 20°C 68°F (Nominal voltage, by thermocouple method)	
Breakdown voltage	500 V AC for 1 min. (between lead wire and external housing)	
Insulation resistance	Min. 10 MΩ (at 500 V DC)	
Vibration resistance	Frequency	10 to 55Hz
	Double amplitude width	0.75mm
	Applied direction	X, Y and Z directions
	Applied time	10 min. in each direction
Lead wire tensile strength	9.8 N, single wires did not break at 15 seconds	
Fan blockage	No coil burnout even after blockage of 72 hrs. at nominal voltage.	
Reverse polarity power connection	No damage even after reverse polarity connection for short time at nominal voltage.	
Expected life	90% survival rate at 60,000 hrs. (When rotation frequency drops 30% of initial value when run at nominal voltage under 25°C 77°F, room humidity.)	

**NEW**



**DIMENSIONS (mm inch)**



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

**RATING**

**1. Standard speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN90371	12	3.00/2.40	250/200	2,350	1.38	27.6	32.0	85
ASFN90372	24	3.12/2.40	130/100					

**2. Middle speed**

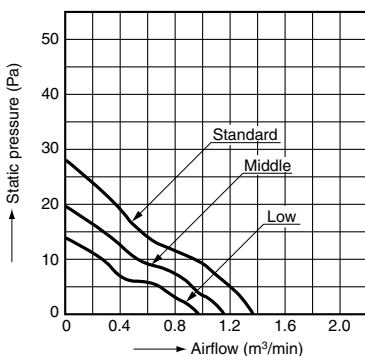
Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN92371	12	2.16/1.68	180/140	2,000	1.17	20.0	27.0	85
ASFN92372	24	2.16/1.68	90/70					

**3. Low speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN94371	12	1.44/1.08	120/90	1,700	0.98	14.4	22.0	85
ASFN94372	24	1.92/1.20	80/50					

Notes: 1. Values above without designations are averages.  
2. Noise levels are based on measurements taken at a distance of 1 m from the front of the fan.

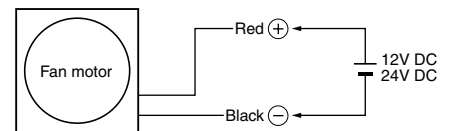
**DATA (Airflow - Static pressure Characteristic Curve)**



**MATERIALS USED**

Frame: plastic  
Propeller: plastic  
Bearings: ball bearings  
Lead wires: UL1007 and AWG24

**WIRING DIAGRAM**



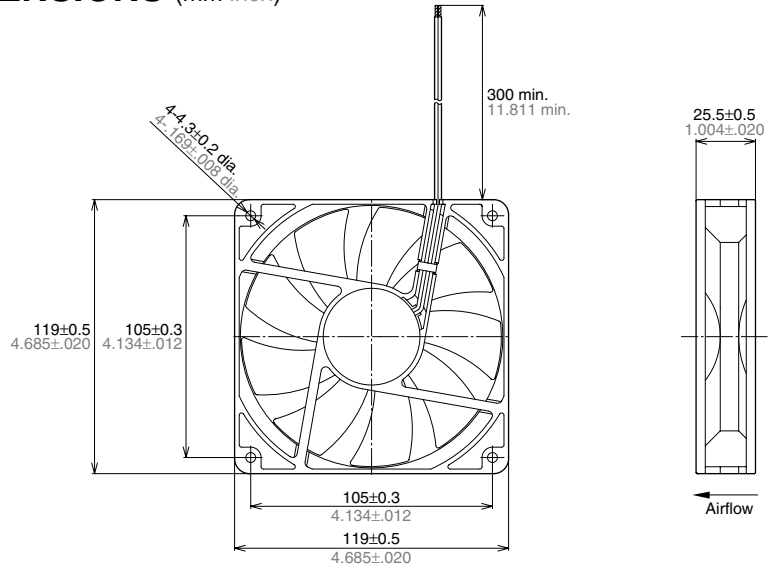
**SPECIFICATIONS**

Ambient temperature	-10°C to +60°C +14°F to +140°F
Ambient humidity	15 to 85% RH
Temperature rise	Coil surface: Max. 50 °C 122°F (Nominal voltage, by resistive method) External surface: Max. 20°C 68°F (Nominal voltage, by thermocouple method)
Breakdown voltage	500 V AC for 1 min. (between lead wire and external housing)
Insulation resistance	Min. 10 MΩ (at 500 V DC)
Vibration resistance	Frequency
	Double amplitude width
	Applied direction
	Applied time
Lead wire tensile strength	9.8 N, single wires did not break at 15 seconds
Fan blockage	No coil burnout even after blockage of 72 hrs. at nominal voltage.
Reverse polarity power connection	No damage even after reverse polarity connection for short time at nominal voltage.
Expected life	90% survival rate at 60,000 hrs. (When rotation frequency drops 30% of initial value when run at nominal voltage under 25°C 77°F, room humidity.)

**NEW**



**DIMENSIONS (mm inch)**



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

**RATING**

**1. Standard speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN10371	12	6.24/4.80	520/400	2,500	2.85	40.9	38.5	180
ASFN10372	24	6.96/5.28	290/220					

**2. Middle speed**

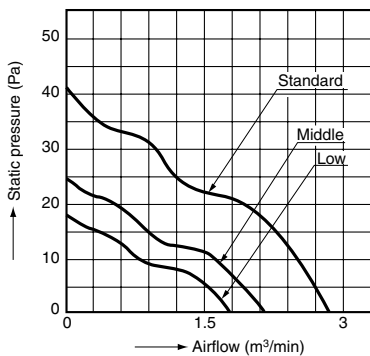
Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN12371	12	3.00/2.28	250/190	1,900	2.15	24.8	31.0	180
ASFN12372	24	3.12/2.40	130/100					

**3. Low speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN14371	12	1.92/1.44	160/120	1,600	1.80	17.9	27.0	180
ASFN14372	24	2.40/1.92	100/80					

Notes: 1. Values above without designations are averages.  
2. Noise levels are based on measurements taken at a distance of 1 m from the front of the fan.

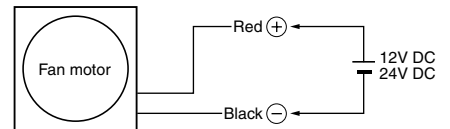
**DATA (Airflow - Static pressure Characteristic Curve)**



**MATERIALS USED**

Frame: plastic  
Propeller: plastic  
Bearings: ball bearings  
Lead wires: UL1007 and AWG24

**WIRING DIAGRAM**



**SPECIFICATIONS**

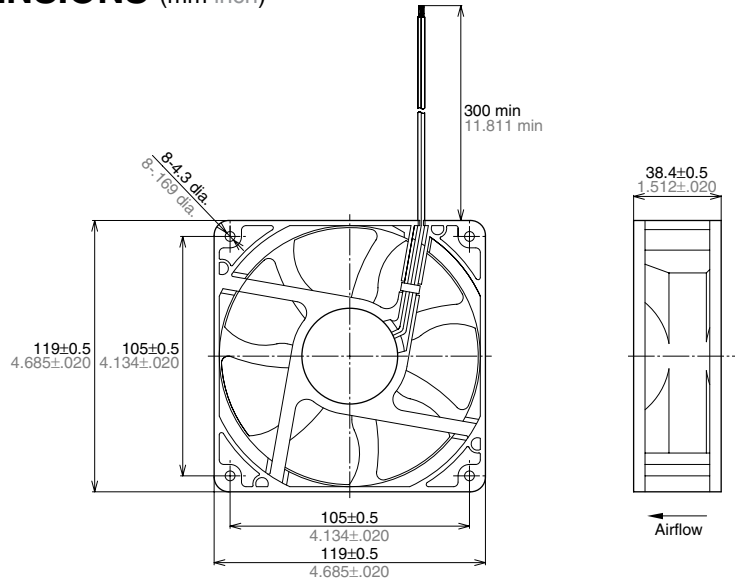
Ambient temperature	-10°C to +60°C +14°F to +140°F	
Ambient humidity	15 to 85% RH	
Temperature rise	Coil surface: Max. 50 °C 122°F (Nominal voltage, by resistive method) External surface: Max. 20°C 68°F (Nominal voltage, by thermocouple method)	
Breakdown voltage	500 V AC for 1 min. (between lead wire and external housing)	
Insulation resistance	Min. 10 MΩ (at 500 V DC)	
Vibration resistance	Frequency	10 to 55Hz
	Double amplitude width	0.75mm
	Applied direction	X, Y and Z directions
	Applied time	10 min. in each direction
Lead wire tensile strength	9.8 N, single wires did not break at 15 seconds	
Fan blockage	No coil burnout even after blockage of 72 hrs. at nominal voltage.	
Reverse polarity power connection	No damage even after reverse polarity connection for short time at nominal voltage.	
Expected life	90% survival rate at 100,000 hrs. (When rotation frequency drops 30% of initial value when run at nominal voltage under 25°C 77°F, room humidity.)	

**NEW**



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

**DIMENSIONS (mm inch)**



**RATING**

**1. Standard speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN10B71	12	8.64/6.60	720/550	2,950	3.07	68.1	42.5	260
ASFN10B72	24	9.60/7.44	400/310					

**2. Middle speed**

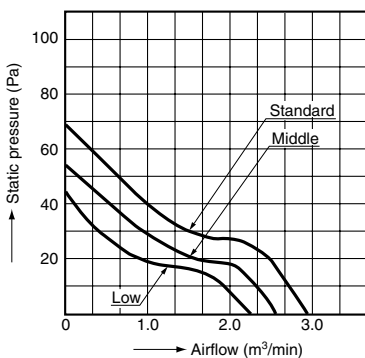
Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN12B71	12	6.24/4.80	520/400	2,650	2.75	55.9	41.0	260
ASFN12B72	24	6.72/5.04	280/210					

**3. Low speed**

Part number	Rated voltage (V)	Input power (W) Max./Av.	Rated current (mA) Max./Av.	Rotation speed (r/min)	Max. air flow (m <sup>3</sup> /min)	Max. static pressure (Pa)	Noise (dB(A))	Weight (g)
ASFN14B71	12	4.20/3.24	350/270	2,300	2.37	44.1	37.0	260
ASFN14B72	24	4.80/3.60	200/150					

Notes: 1. Values above without designations are averages.  
2. Noise levels are based on measurements taken at a distance of 1 m from the front of the fan.

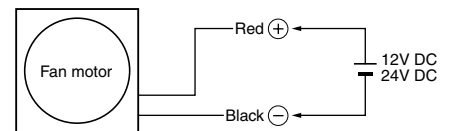
**DATA (Airflow - Static pressure Characteristic Curve)**



**MATERIALS USED**

Frame: plastic  
Propeller: plastic  
Bearings: ball bearings  
Lead wires: UL1007 and AWG24

**WIRING DIAGRAM**



**SPECIFICATIONS**

Ambient temperature	-10°C to +60°C +14°F to +140°F	
Ambient humidity	15 to 85% RH	
Temperature rise	Coil surface: Max. 50 °C 122°F (Nominal voltage, by resistive method) External surface: Max. 20°C 68°F (Nominal voltage, by thermocouple method)	
Breakdown voltage	500 V AC for 1 min. (between lead wire and external housing)	
Insulation resistance	Min. 10 MΩ (at 500 V DC)	
Vibration resistance	Frequency	10 to 55Hz
	Double amplitude width	0.75mm
	Applied direction	X, Y and Z directions
	Applied time	10 min. in each direction
Lead wire tensile strength	9.8 N, single wires did not break at 15 seconds	
Fan blockage	No coil burnout even after blockage of 72 hrs. at nominal voltage.	
Reverse polarity power connection	No damage even after reverse polarity connection for short time at nominal voltage.	
Expected life	90% survival rate at 50,000 hrs. (When rotation frequency drops 30% of initial value when run at nominal voltage under 25°C 77°F, room humidity.)	

# Accessories

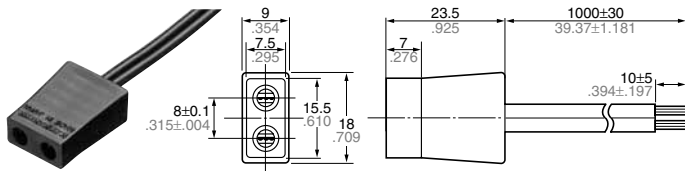
## DIMENSIONS (mm inch)

### 1. Plug cord for AC Fan Motor 2 terminals type

ASE51100

For inside of appliance

Flat type 2-core cord (20/0.18)



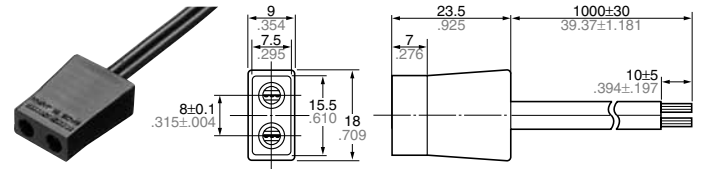
ASE51109

UL Standard: File No. E106219

Thermoplastic, flat type 2-core cord

UL SPT-1 AWG18 (41/0.16)

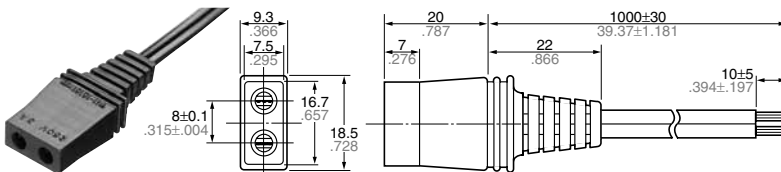
CSA POT-64 AWG18 (41/0.16)



ASE51107

Compliant with Electrical Appliance and Material Safety Law

Flat type 2-core cord (30/0.18)

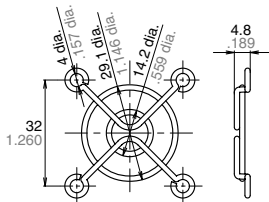


### 2. Fan guard (You can use this with both DC and AC types.)

ASFN48001

Recognized for 40 sq. by UL/CSA

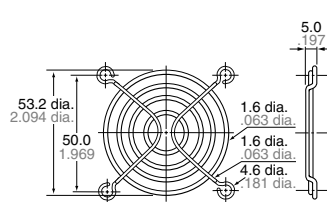
Material used: Steel, 1.6 dia.



ASFN68001

Recognized for 60 sq. by UL/CSA

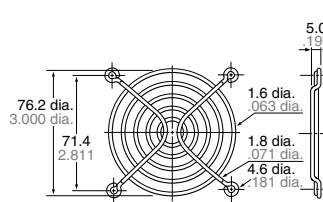
Material used: Steel, 1.6 dia.



ASFN88001

Recognized for 80 sq. by UL/CSA

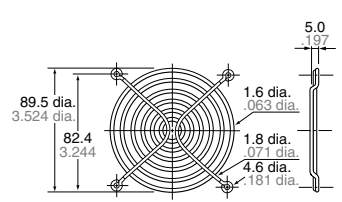
Material used: Steel, 1.6 dia.



ASFN98001

Recognized for 92 sq. by UL/CSA

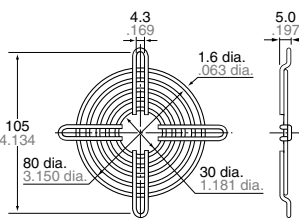
Material used: Steel, 1.6 dia.



ASEN88001

For 80 sq. by Electrical Appliance and Material Safety Law

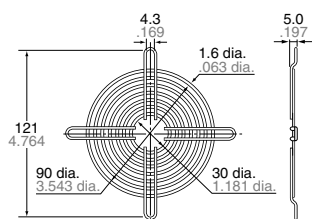
Material used: Steel, 1.6 dia.



ASEN98001

For 92 sq. by Electrical Appliance and Material Safety Law

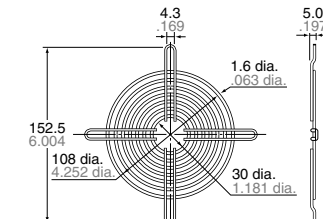
Material used: Steel, 1.6 dia.



ASEN18001

For 120 sq. by Electrical Appliance and Material Safety Law

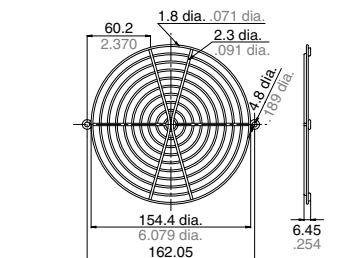
Material used: Steel, 1.6 dia.



ASEN58001

Recognized for 150x172 by UL/CSA

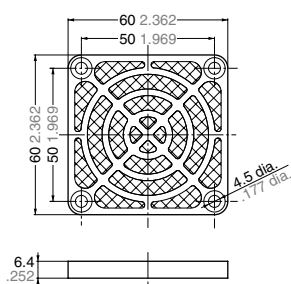
Material used: Steel, 2.3 dia.



### 3. Fan motor filter (You can use this with both DC and AC types.)

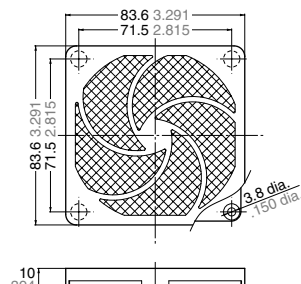
ASEN68002

For 60 sq.



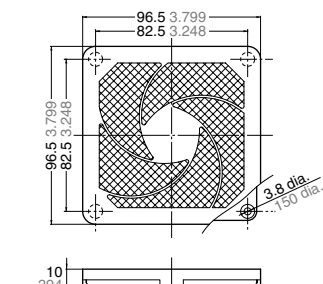
ASEN88002

For 80 sq.



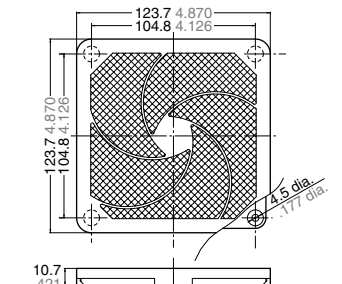
ASEN98002

For 92 sq.



ASEN18002

For 120 sq.

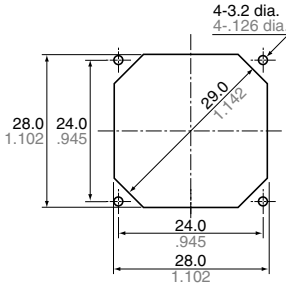


# Mounting Hole Dimensions

## For DC Fan Motor

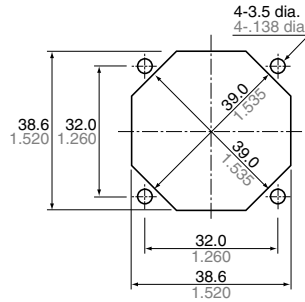
### 1. 30 sq. Series

Discharge side/Suction side



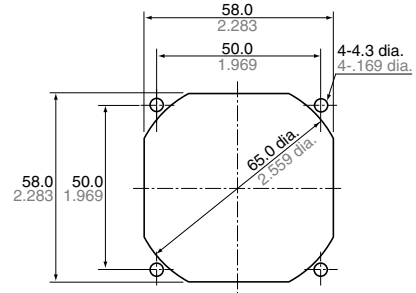
### 2. 40 sq. Series

Discharge side/Suction side



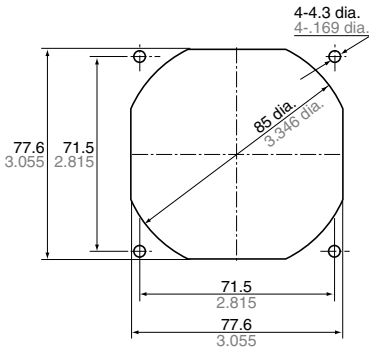
### 3. 60 sq. Series

Discharge side/Suction side



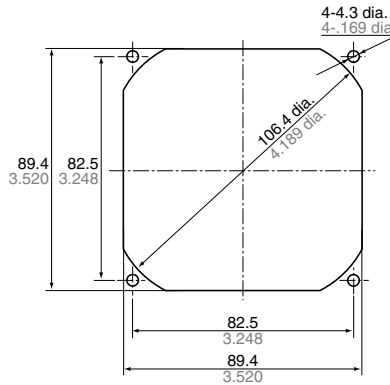
### 4. 80 sq. Series

Discharge side/Suction side



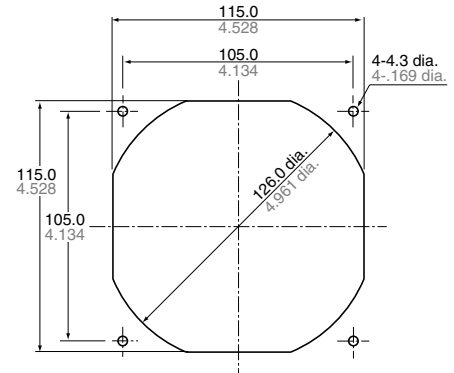
### 5. 92 sq. Series

Discharge side/Suction side



### 6. 120 sq. Series

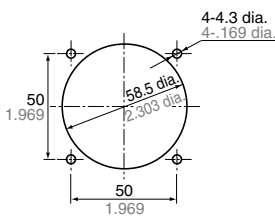
Discharge side/Suction side



## For AC Fan Motor

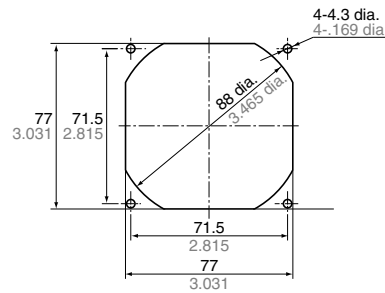
### 1. 60 sq. Series

Discharge side/Suction side



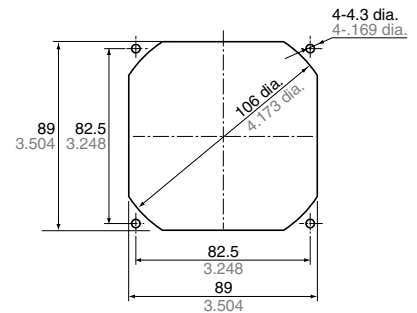
### 2. 80 sq. Series

Discharge side/Suction side



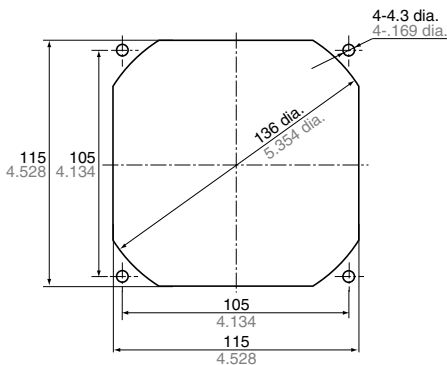
### 3. 92 sq. Series

Discharge side/Suction side



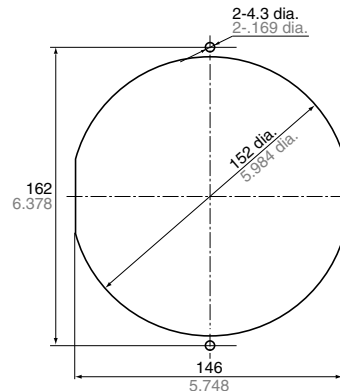
### 4. 120 sq. Series

Discharge side/Suction side



### 5. 150x172 Series

Discharge side/Suction side



# Functions of DC Fan Sensor

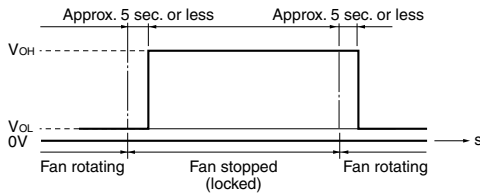
## DC FAN SENSOR

If the fan stops as a result of forced external restraint, a signal will be generated to indicate that there is a problem. This signal can be used to control an external warning circuit in order to help prevent the device from overheating.

Although there are various detection methods for this sensor, we employ the method that uses a logic circuit.

### 1. Lock sensor specifications

Output waveform



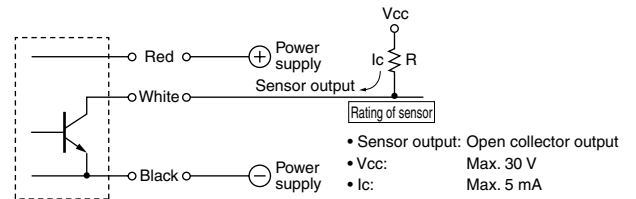
\* Output may be high for approximately 0.5 seconds when power is turned on.

\* The continually high output waveform type when fan is stopped (locked) is standard.

A high/low output waveform type and output waveform type that corresponds to the rotation frequency during fan rotation are available by special order.

Please inquire for details.

### 2. Sensor output circuit



- Sensor output: Open collector output
- Vcc: Max. 30 V
- I<sub>c</sub>: Max. 5 mA

Notes: 1. Set the resistance value (R) so that the sensor circuit current (I<sub>c</sub>) does not exceed 5 mA.

2. When using at TTL level, the sensor circuit current (I<sub>c</sub>) should be approximately 2 mA.

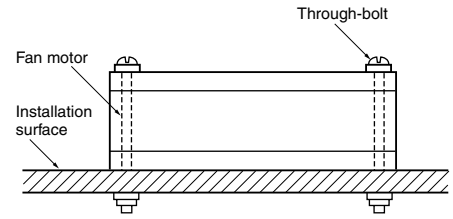
\* Exceeding the values above may lead to IC damage.

# Cautions For Use

## DC FAN MOTOR

1. Do not reverse-connect the power supply. Although nothing adverse will occur if the rated voltage is connected in reverse for a short time period, the fan will not operate.
2. If the power is to be pulsed on and off in order to start and stop the fan quickly, be sure to install a switch on the + side of the power supply. Not doing so may damage the circuit.

3. The DC fan motor installation bracket has a rib. As shown in the figure, use the through-bolts when installing.
4. Use a tightening torque of no more than 0.6 Nm.

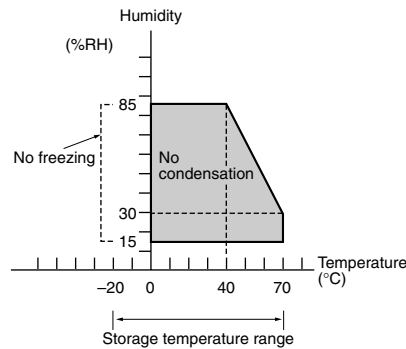


## DC FAN MOTOR and AC FAN MOTOR

1. Since our fan motor employs precision ball bearings, due care should be taken not to apply any shock in handling.
2. Due to the bearing mechanism, the noise level will increase in proportion to the length of time the fan is used. Avoid use where the temperature is high or where there is a lot of dirt.
3. Do not allow substances such as oil and grease to get onto the plastic part of the fan body. Some oils and greases decompose and become altered at high temperatures. These can have an adverse effect if they contact the fan. Therefore, be very careful when handling these substances.
4. Do not apply unnecessary force to the internal parts when handling the product. Also, do not use a fan that has been dropped.
5. Fan life is based on usage at room temperature and a humidity of 15 to 45% RH. Please verify life under actual conditions, since life will depend on the frequency and duration of use, as well as the atmosphere in which it is used.

### 6. Transport and storage conditions

The allowable specifications for environments suitable for transportation and storage are given below.



- No freezing between  $-20^{\circ}\text{C}$  to  $0^{\circ}\text{C}$   
 $-4^{\circ}\text{F}$  to  $+32^{\circ}\text{F}$
- No condensation in the range above between  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$   
 $+32^{\circ}\text{F}$  to  $+158^{\circ}\text{F}$

### 1) Condensation

If the temperature is high and there is a lot of humidity, condensation will occur when the temperature suddenly changes. This should be avoided because it can cause degradation of the fan insulation.

### 2) Freezing

At temperatures below  $0^{\circ}\text{C}$   $+32^{\circ}\text{F}$  moisture such as that caused by condensation will freeze and lead to problems such as lockage of the moving parts and operation lags. Be careful to prevent this from happening.

### 3) Low-temperature, low-humidity environments

Do not leave the fan for a long period in an environment of low temperature and low humidity. Doing so may cause the plastic to become brittle.

4) When storing, avoid places of high temperature and high humidity or where corrosive gas is present.

5) Do not store the fan any longer than six months.



# Technical Information

## MEASUREMENT of AIRFLOW and STATIC PRESSURE

It is very difficult to measure airflow and static pressure, and there are cases where measured values vary depending on measuring devices. There are two kinds of measuring methods; double chamber method provided by JIS and AMCA (Air Moving and Conditioning Association) and wind tunnel method. Our company adopted the double chamber method, and therefore we will explain it hereinafter.

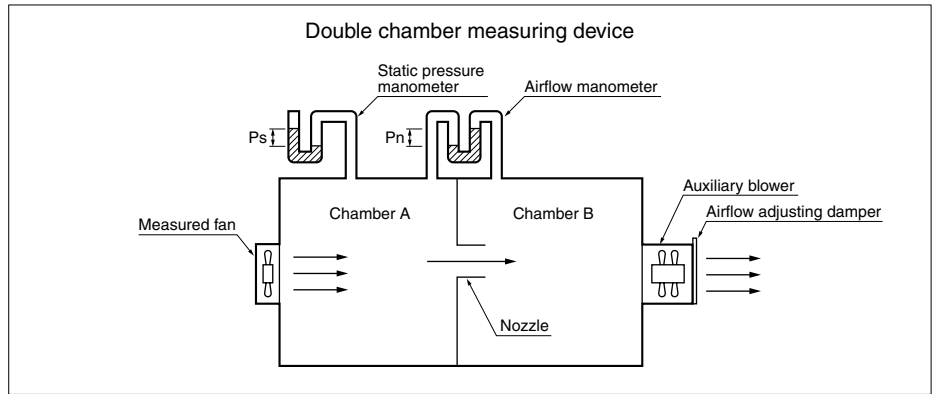
The auxiliary blower (fan) adjusts an inner pressure by sucking out air. At this moment, as airflow and static pressure are varied by opening or closing the damper, each value is read on the manometer.

### Maximum airflow:

The damper opens, and the auxiliary blower sucks out air so that static pressure becomes zero. At this moment, the pressure differential (airflow differential pressure: Pn) in chambers A and B becomes maximum. The airflow whose Pn is measured and which is determined by using the equation shown at right is called the maximum airflow.

### Maximum static pressure:

When the damper is completely closed, the pressure in chamber A becomes maximum. At this moment, the pressure differential (static pressure: Ps) in chambers A against atmospheric pressure is called the maximum static pressure.



### 1. Equation

Airflow Q =

$$60 \times C \times \left(\frac{D}{2}\right)^2 \times \pi \times \sqrt{\frac{2g}{7}} \times (P_n \times 9.81) \quad (\text{m}^3/\text{min})$$

In the above equation,

C: Flow coefficient of nozzle

D: Nozzle diameter (m)

γ: Air density =

$$\left[1.293 \times \frac{273}{273+t} \times P \times 133.32\right] (\text{kg}/\text{m}^3)$$

t: Temperature(°C)

P: Atmospheric pressure(Pa)

g: 9.8(m/s<sup>2</sup>)

Pn: Airflow differential pressure (Pa)

Ps: Static pressure (Pa)

### 2. Unit conversion table

#### 1) Airflow

m <sup>3</sup> /min.	l/s	CFM (ft <sup>3</sup> /min.)
1	16.678	35.334
0.06	1	2.1186
0.0283	0.472	1

#### 2) Static pressure

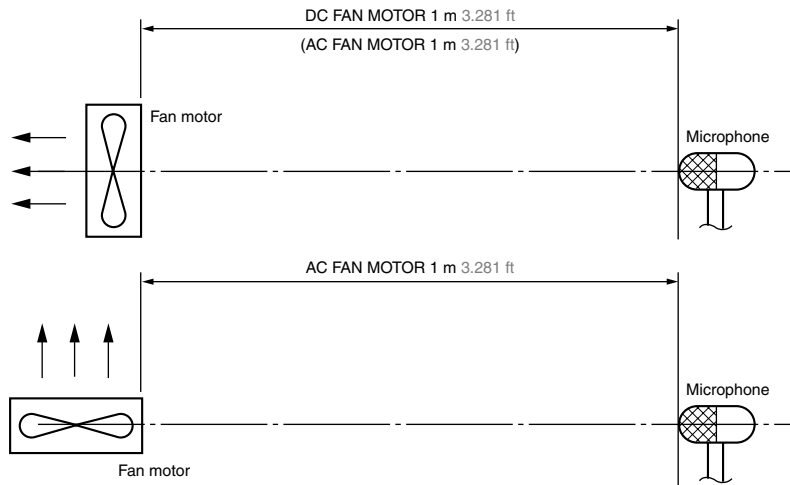
Pa	mmH <sub>2</sub> O (mmAq)
1	0.10197
9.80665	1

## NOISE MEASUREMENT

Operation noise is measured by hanging the fan in midair. For the DC fan, noise is measured in dB(A) 1 m from the front of the air-intake side. For the AC fan, noise is measured in dB(A) 1 m from the front of the air-intake side and the side of the fan.

The background noise complies with the section in JIS B8346 that states that it should be at least 10 dB lower than the target noise reading.

Our measurements were made in an anechoic chamber with a background noise of approximately 15 dB.



## COUNTERMEASURES AGAINST NOISE

Our fan motors are designed placing great importance on low noise. However, take into consideration the following points because noise is influenced depending on the mechanism design used.

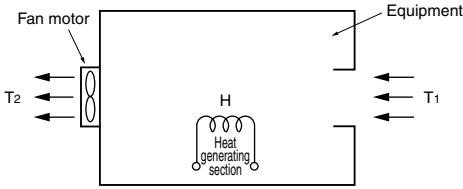
- 1) Leave a space between the rear side of the fan suction opening and the cooled object.
- 2) When using two or more fan motors, leave a space between the fans.
- 3) According to the mounting hole dimensions (page 22), design so that the mounting face and blades are not crossed.
- 4) Grease in the bearings will deteriorate and noise will gradually increase as the fan is used. The replacement period will differ depending on the conditions of use and allowable sound level. We recommend periodic replacement.

# Technical Information

## METHOD OF SELECTING FAN MOTOR

When selecting a fan motor, for normal use the following method is used.

- 1) Determine the amount of heat generated inside the equipment.
- 2) Decide the permissible temperature rise inside the equipment.



- 3) Calculate the volume of air necessary from Equation (1).

Equation (1)

$$Q = \frac{50 \times H}{T_2 - T_1} = \frac{50 \times H}{\Delta T} \text{ (m}^3/\text{min)}$$

where

- Q: Air volume (m<sup>3</sup>/min.)
- H: Heat generated (kW)
- T<sub>1</sub>: Inlet air temperature(°C)
- T<sub>2</sub>: Exhaust air temperature(°C)
- ΔT: Temperature rise(°C)

4) Determine the system impedance of the equipment by means of Equation (2). For the flow of air to the equipment, there is a loss of pressure due to the resistance to the flow of air from the components inside the equipment. This loss varies in accordance with the flow of air. This is referred to as the system impedance.

$$\Delta P = KQ^n \dots \dots \dots \text{Equation (2)}$$

where

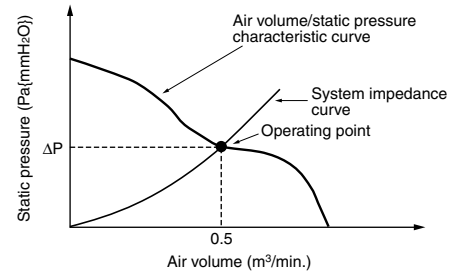
- ΔP: Pressure drop(Pa{mmH<sub>2</sub>O})
  - K: Constant determined for each equipment
  - Q: Air volume (m<sup>3</sup>/min.)
  - n: Coefficient determined by air flow
- In this equation, it is generally considered that n = 2.

Also, it is difficult to calculate the value of K, since there is no good method other than an actual test measurement with the equipment.

Example:

When the heat generated is 100 W with ΔT = 10°C 50°F, the following is the result.

$$Q = \frac{50 \times 0.1}{10} = 0.5 \text{ (m}^3/\text{min)}$$



The intersection of the air volume/static pressure characteristic curve with the system impedance curve is called the operating point. This shows the condition with the fan motor operating.

In actuality, the system impedance is approximately assumed, a fan motor is decided from the catalogue, the temperature difference “ΔT” and air volume “Q” are measured, and from this data the fan is judged as suitable or not as the ordinary method. If the temperature difference “ΔT” is high indicating the air volume “Q” is not satisfactory, because the system impedance is higher than the assumed value, a change should be made to a fan motor with a greater air volume.

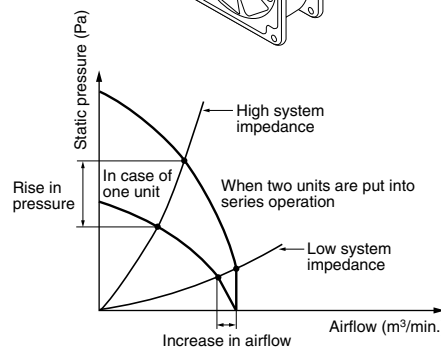
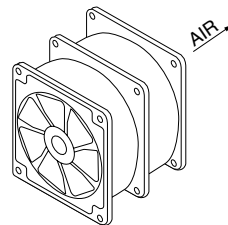
## FAN MOTOR SERIES/PARALLEL OPERATION

When one fan motor does not satisfy a sufficient cooling capacity;

Series operation: Higher pressure characteristic obtained. (Nearly double)

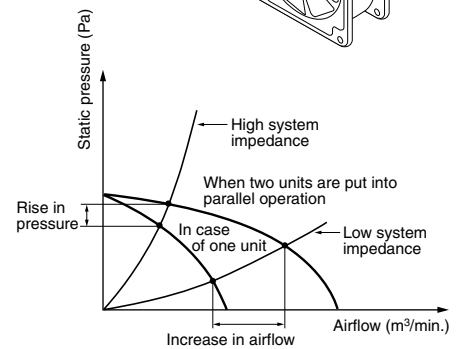
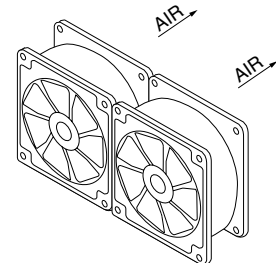
Parallel operation: Larger airflow characteristic obtained. (Nearly double)

### 1. In case of series operation

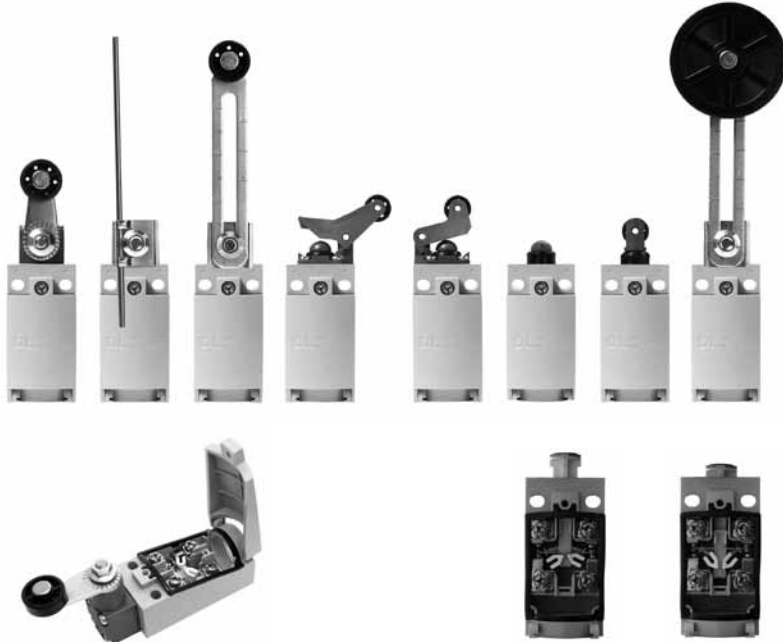


- In case of high system impedance, static pressure rises.
- In case of low system impedance, airflow slightly increases.

### 2. In case of parallel operation



- In case of low system impedance, airflow increases.
- In case of high system impedance, pressure slightly rises.



Hinged cover

Forced contact opening mechanism

- **Forced contact opening mechanism**  
When the limit switch is ON, the contact is forced open by the N.C. contact through the cam movement.
- **Conforms to EN standard (EN50047)**
- **Uses a unit system**  
Any combination of actuator, head block, and unit block is possible. The units are also sold separately, making maintenance easy.
- **Hinged cover for easy wiring**
- **Protective construction (IP67)**
- **Wide operating temperature range**  
(-30°C to +80°C -22°F to +176°F)
- **Conforms to UL/CSA, CE, TÜV standards**

## PRODUCT TYPE

### 1. Basic products

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

Notes: 1. Type of conduit size: PF type (G1/2), PG type (PG13.5)

2. PG is a size standard used in Europe.

3. The roller arm and adjustable roller arm are available with metal rollers on a custommade basis. Please inquire.

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

### 3. Conduit connector

Product name	Part No.
PF type conduit connector	AZD1830

Note: The conduit connector is for cables.

Rubber seals with an inside diameter of 9 and 11 are attached.

### 2. Blocks

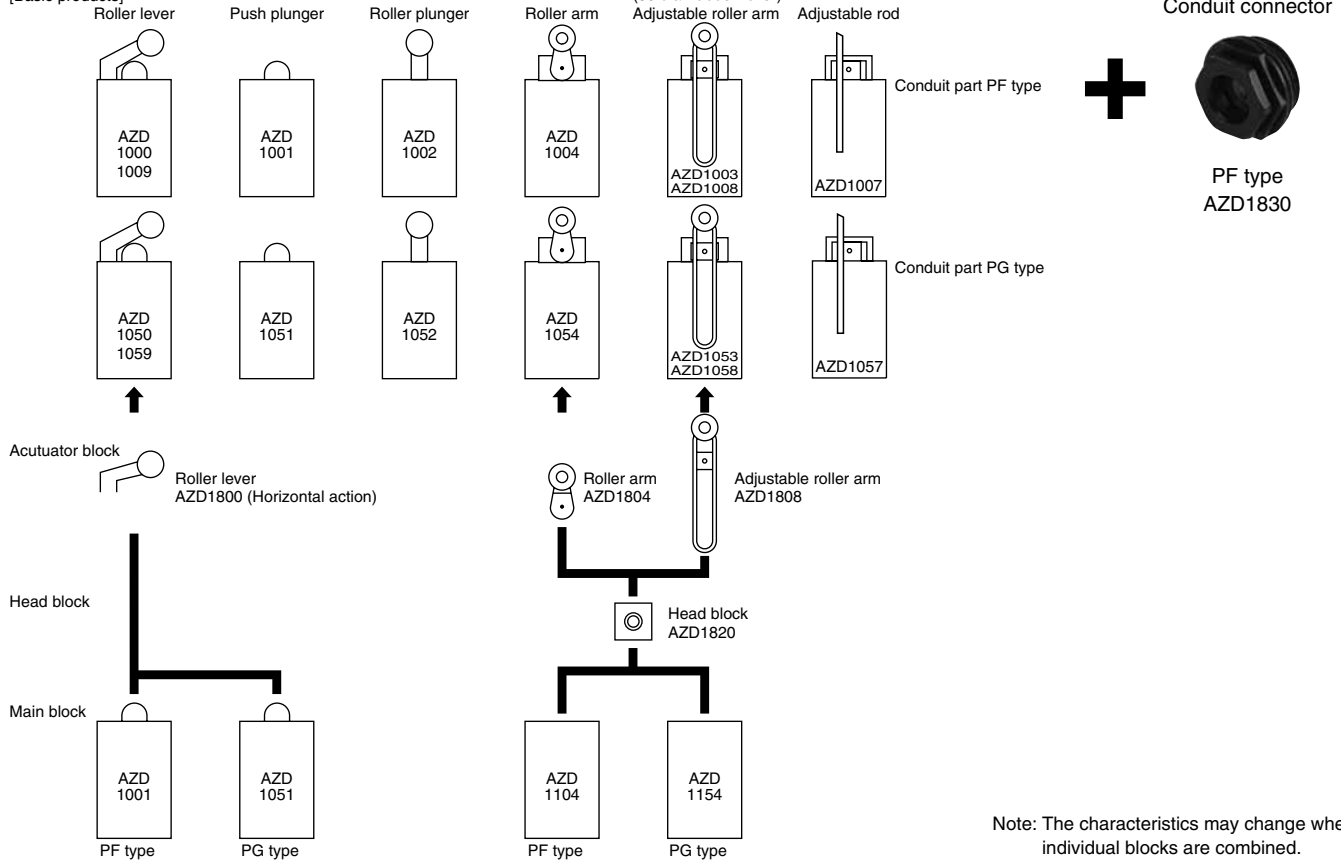
Product name		Part No.	
Type of actuators	Roller lever	AZD1800	
	Roller arm	AZD1804	
	Adjustable roller arm	AZD1808	
Head block		AZD1820	
Main block	For plunger	PF type	AZD1001
		PG type	AZD1051
	For arm type	PF type	AZD1104
		PG type	AZD1154

## FOREIGN STANDARDS

Standards	Applicable product	Part No.
UL	File No. : E122222	Order by standard part No.
	Ratings : 6A 380V AC Pilot duty A300	
	Product type : All models	
CSA	File No. : LR55880	Order by standard part No.
	Ratings : 6A 380V AC Pilot duty A300	
	Product type : All models	
TÜV	File No. : J9551205	Order by standard part No.
	Ratings : AC-15 2A/250V~ Pilot duty A300	
	Product type : All models	

## PRODUCT COMBINATION

[Basic products]



## SPECIFICATIONS

### 1. Rating

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

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

### 3. EN60947-5-1 performance

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

Note) \* The ratings, performance and operating characteristics are based on the basic model.

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

### 5. Protective characteristics

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

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

The switches are compatible with DIN EN50047.

### 2. Characteristics

Contact arrangement	1a1b	
Initial contact resistance, max.	25m $\Omega$ (By voltage drop of 5 to 6 V DC 1A)	
Contact material	Silver alloy	
Initial insulation resistance (At 500V DC)	Min. 100M $\Omega$	
Initial breakdown voltage	1,000Vrms for 1 min between non-consecutive terminals 2,500Vrms for 1 min between dead metal parts and each terminal 2,500Vrms for 1 min between ground and each terminal	
Shock resistance	Functional	Max. 294 m/s <sup>2</sup> (equivalent 30G) (Note 1)
	Destructive	Max. 980 m/s <sup>2</sup> (equivalent 100G)
Vibration resistance	10 to 55Hz, double amplitude of 1.5mm	
Expected life (min. operations)	Mechanical	10 <sup>7</sup> (at 120 cpm)
	Electrical	1.5 $\times$ 10 <sup>5</sup> (at 20 cpm, 6A 380V AC resistive load)
Ambient temperature	-30 to +80°C -22°F to +176°F (but not in a frozen environment)	
Ambient humidity	Max. 95%R.H. (without dew at 40°C 104°F)	
Max. operating speed	120 cpm	

Note: The ratings, performance and operating characteristics are based on the basic model.

Note 1: This value applies when the arm length of the adjustable roller arm (50 dia. rubber roller) is 70 mm or less.

### 4. Operating characteristics

Characteristics	O.F. (N {gf}) max.	R.F. (N {gf}) min.	Pretravel (P.T.), max. mm inch	Movement Differential (M.D.), max. mm inch	Overtravel (O.T.), min. mm inch	Operating Position (O.P.), mm inch
Actuator						
Push plunger	6.37 {650}	1.47 {150}	2.079	1.2 .047	4.157	18 $\pm$ 0.5 .708 $\pm$ .020
Roller plunger	6.37 {650}	1.47 {150}	2.079	1.2 .047	4.157	28 $\pm$ 1 1.102 $\pm$ .03
Roller arm	4.90 {500}	0.49 {50}	20° to 26°	14°	30°	—
Roller lever	3.92 {400}	0.78 {80}	4.157	1.6 .063	5.197	—
Adjustable roller arm	4.90 {500}	0.49 {50}	20° to 26°	14°	30°	—
Adjustable roller arm (50 dia. rubber roller)	4.17 {425}	0.42 {43}	20° to 26°	14°	30°	—
Adjustable rod (2.6 dia.)	4.90 {500}	0.49 {50}	20° to 26°	14°	30°	—
Roller lever (vertical action)	4.41 {450}	0.88 {90}	4.157	1.7 .067	5.197	27 $\pm$ 0.8 1.063 $\pm$ .031

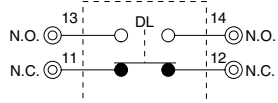
Note: The above values of adjustable roller arm shows the values when roller length is set at 26mm same as roller type.

The value of adjustable roller arm (50 dia. rubber roller) type shows the value when roller length is set at 32 mm.

The value of adjustable rod (2.6 dia.) type shows the value when length of rod is set at 26 mm same as the roller arm type.

# WIRING DIAGRAM

Internal circuit



Terminals



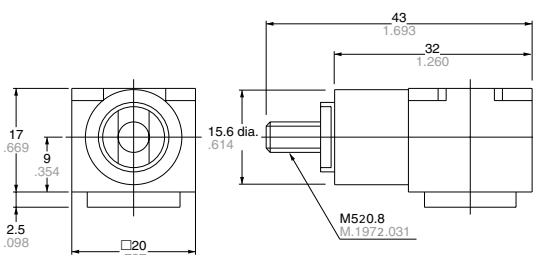
# DIMENSIONS

mm inch

Head block



AZD1820

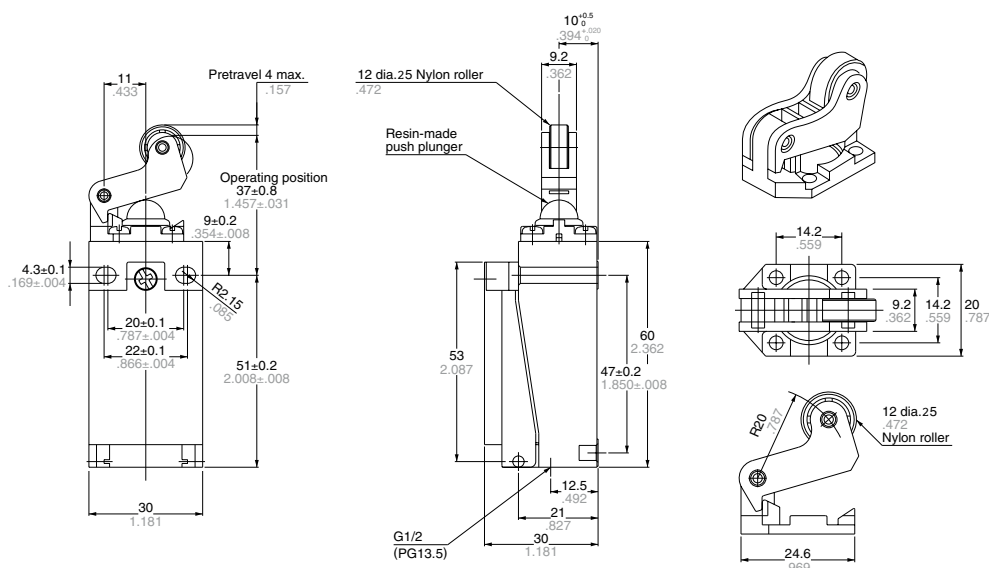


General tolerance:  $\pm 0.4 \pm .016$

Roller lever type



AZD1000  
AZD1050

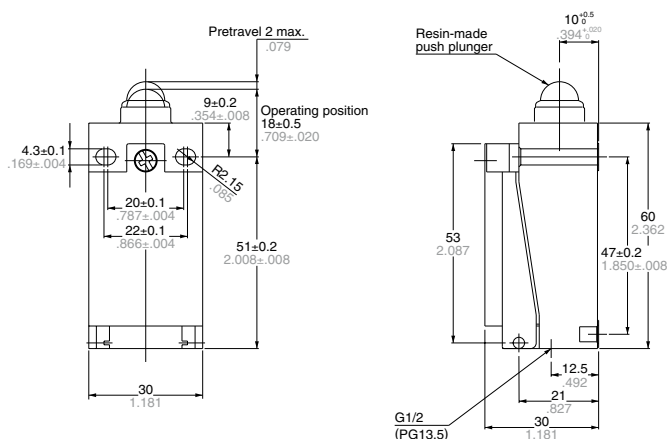


General tolerance:  $\pm 0.4 \pm .016$

Push plunger type



AZD1001  
AZD1051



General tolerance:  $\pm 0.4 \pm .016$

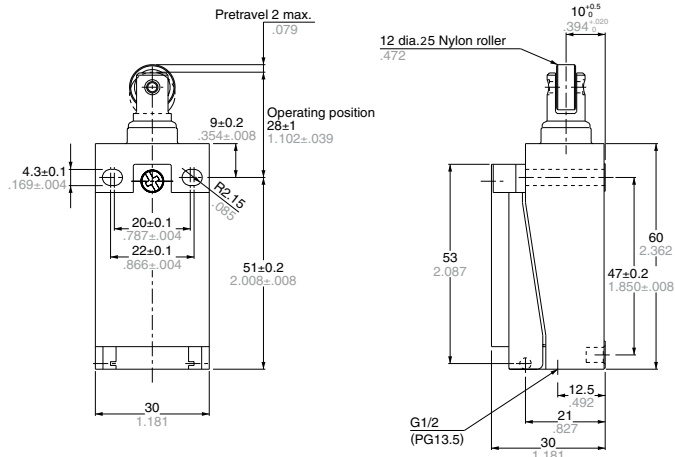
DL (AZD1)

Roller plunger type

mm inch



AZD1002  
AZD1052

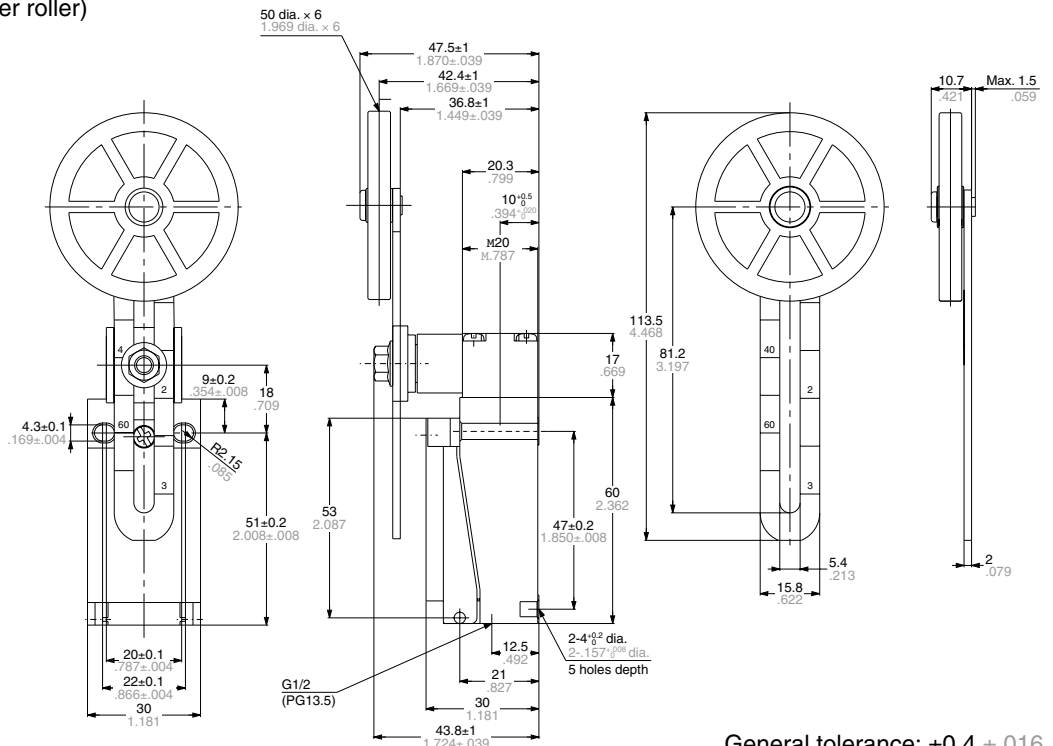


General tolerance: ±0.4 ±.016

Adjustable roller arm (50 dia. rubber roller)



AZD1003  
AZD1053

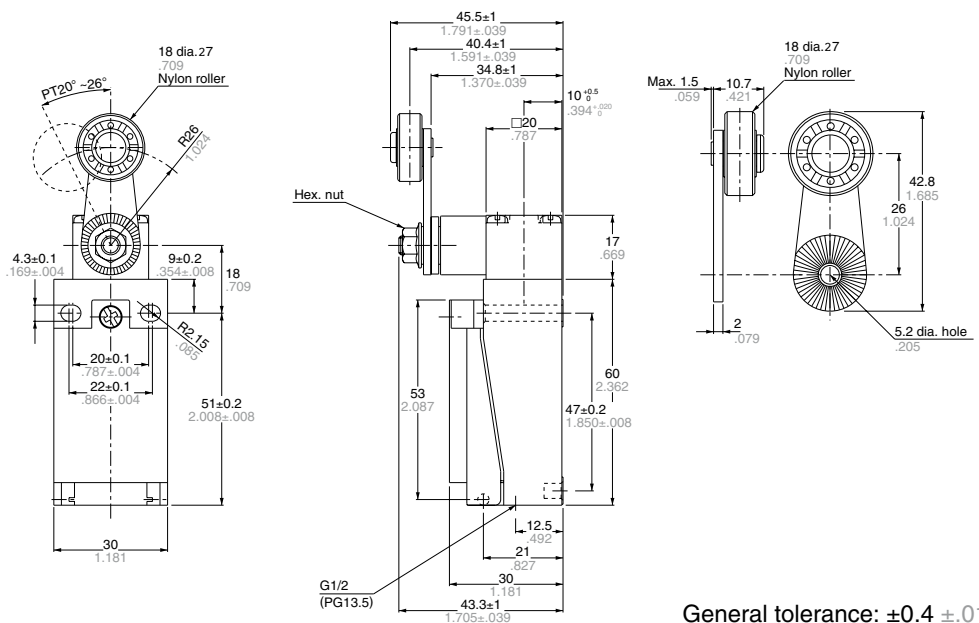


General tolerance: ±0.4 ±.016

Roller arm type



AZD1004  
AZD1054

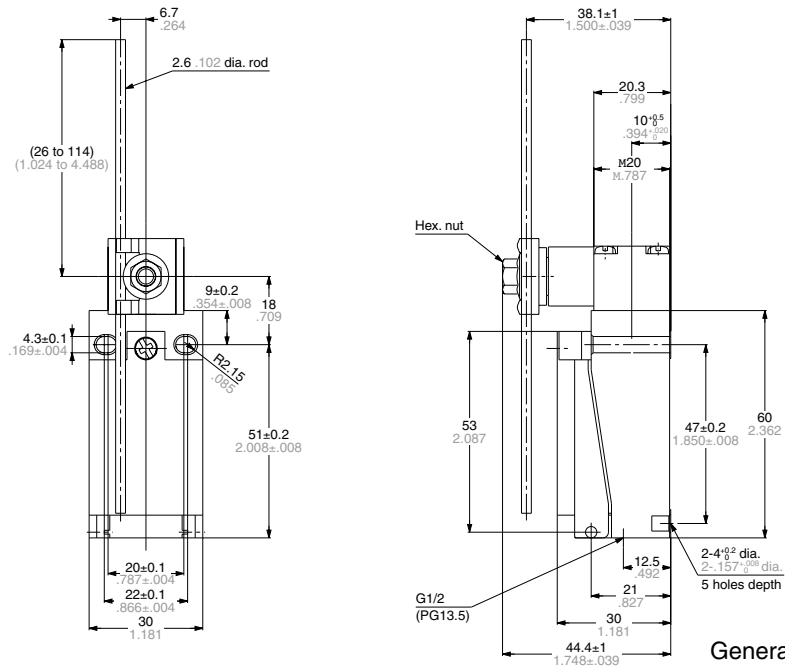


General tolerance: ±0.4 ±.016

Adjustable rod (2.6 dia.)



AZD1007  
AZD1057

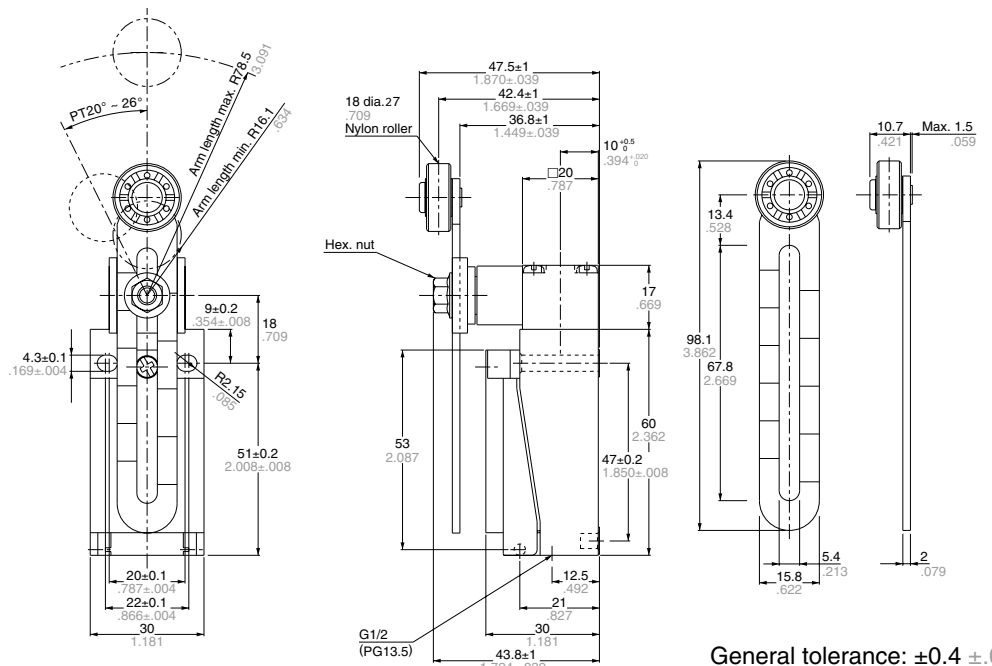


General tolerance: ±0.4 ±.016

Adjustable roller arm type



AZD1008  
AZD1058

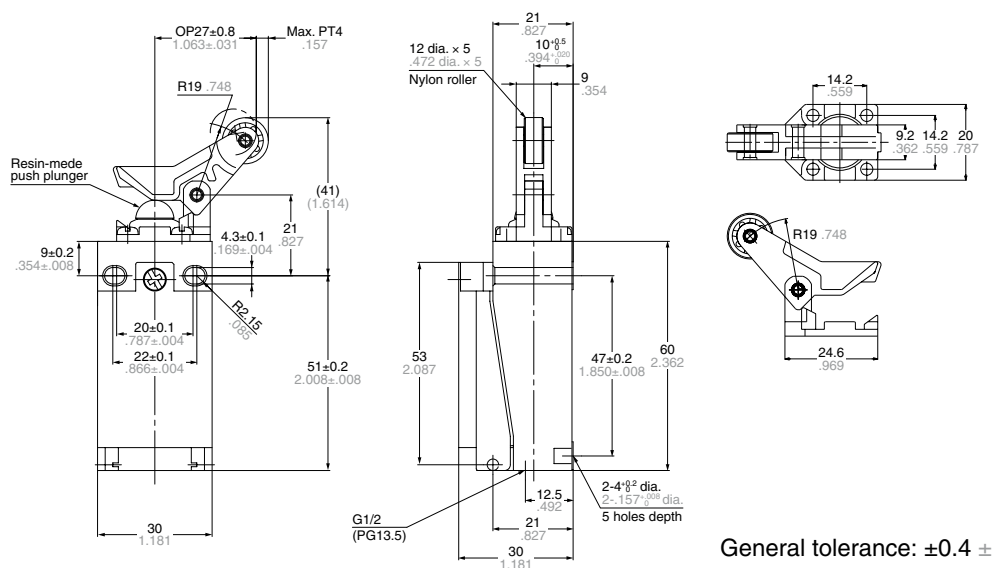


General tolerance: ±0.4 ±.016

Roller lever (vertical action)



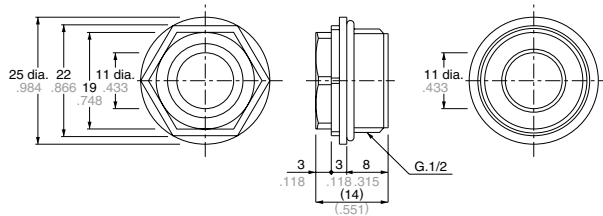
AZD1009  
AZD1059



General tolerance: ±0.4 ±.016

# DL (AZD1)

Conduit connector (PF type)



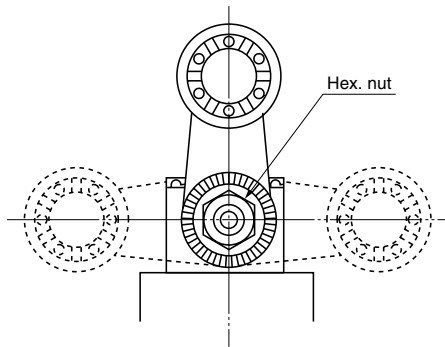
mm inch

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

General tolerance:  $\pm 0.5 \pm .020$

## Arm Setting Position

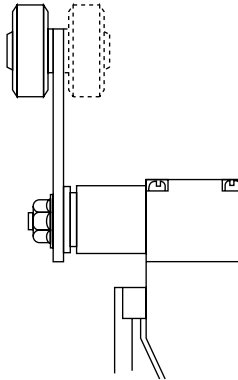
The roller arm of the arm types (AZD1003, AZD1004, AZD1008, AZD1053, AZD1054 and AZD1058) can be set in any position at 15° intervals. Loosen the arm fastening hex. nut, reposition the arm, and retighten the hex. nut. When doing so tighten the hex. nut with the arm secured to the unit. Tightening without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



## Roller Direction

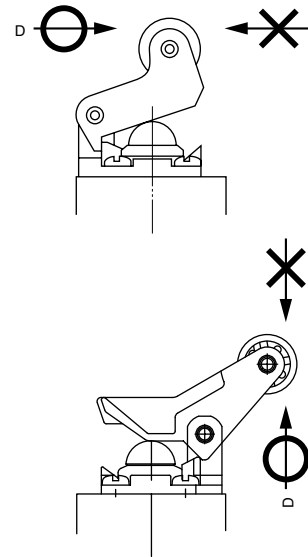
The roller of the arm types (AZD1004, AZD1008, AZD1054 and AZD1058) can be mounted on the front and rear (dotted line in the figure) sides of the switch, as shown below. (Positioned on the front side at delivery.)

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



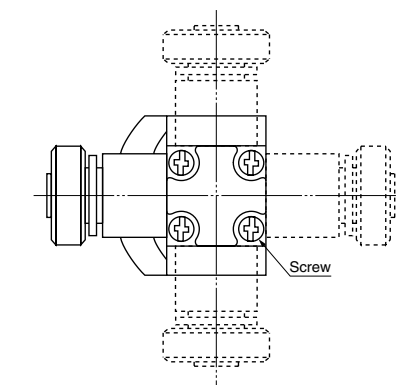
## Roller Lever Direction

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



## Head Direction

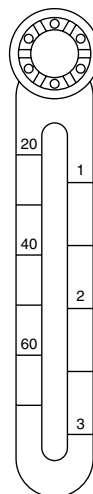
The head of the arm types (AZD1003, AZD1004, AZD1008, AZD1053, AZD1054 and AZD1058) can be set in any of four directions at 90° intervals, but not in any other intermediate directions. Loosen four screws on the upper side of the head, and set the head in a desired direction, and retighten them at a torque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



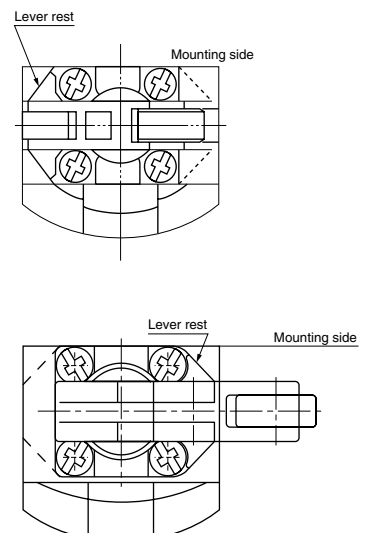
## Adjustable Arm Length

To adjust the length of the adjustable arm of AZD1008 and AZD1058, slightly loosen the arm fastening hex. nut, and adjust the length.

The adjustable arm is graduated in two kinds of length units. Use these indications as the reference during adjustment.



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





## Open and close the cover

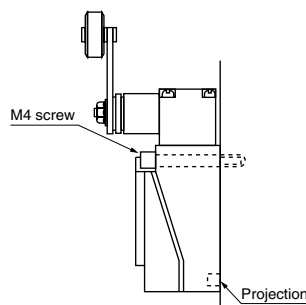
For the adjustable roller arm type, the cover will not open and close since it contacts the adjustable arm. Either extend the arm fully or remove the arm, then open or close the cover. Also, the same is true of the variable rod types (AZD1007 and AZD1057).

## Adjustable Rod Length

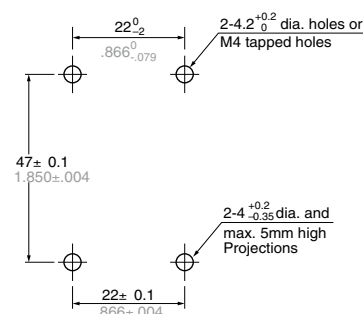
To adjust the length of the variable rod, slightly loosen the hex. nut that is securing the rod and then change the length. After making the change, tighten the hex. nut keeping within a tightening torque of 0.98 and 1.37 N•m. Over tightening might damage the rod presser plate.

## Mounting

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

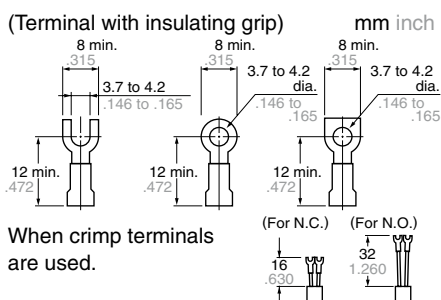


### • Mounting dimensions



## CAUTIONS

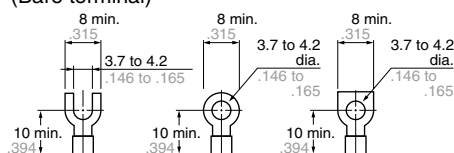
- 1) This model uses silver terminals. Therefore, if used at relatively low frequencies for long periods of time, or if used with very small loads, the oxidization that forms on the contact surfaces will not wear away and eventually cause improper contact. For such applications, use limit switches with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



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

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

Adaptable crimp terminal (Bare terminal) mm inch



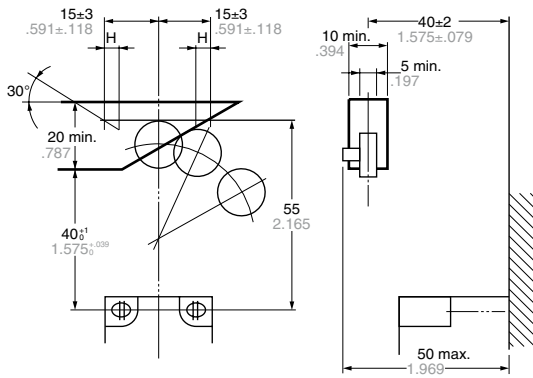
	Actuator movement	Required force (Min.)
Push plunger Roller plunger	Approx. 3.5mm .138 inch	Approx. 29.4 N
Roller arm Adjustable rod Adjustable roller arm (50 dia. rubber roller)	Approx. 45°	9.8 N 6.4 N
Roller lever type	Approx. 7 mm .276 inch	19.6 N

**DESIGN OF OPERATING DOG**

mm inch

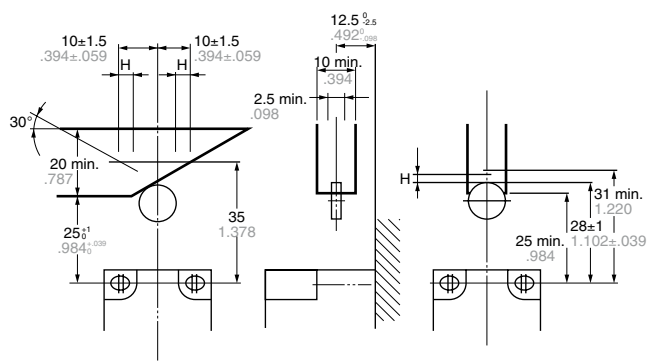
Roller arm type

(H: Hysteresis)



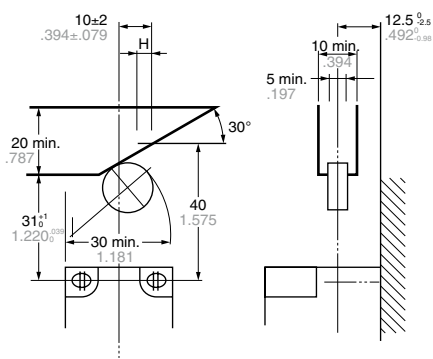
Roller plunger type

(H: Hysteresis)



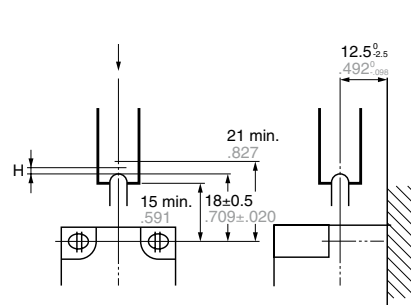
Roller lever type

(H: Hysteresis)



Push plunger type

(H: Hysteresis)





- Compact design
- Au-clad contacts that can even use low level circuit and little chattering and bouncing
- Easy wiring with full-open terminals
- Mounting are possible to both front and back
- Type with a lamp is available
- Dust-proof, waterproof, oil resistant construction (IP64)
- Zinc coated\* type available (bolts and nuts)

\*roller arm type

## PRODUCT TYPE

### 1. Standard type

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

Note) When ordering an overseas-specified product, refer to the Overseas Standards given below.

## FOREIGN STANDARDS

Standard	Applicable product	Part No.
UL	File No. : E122222 Ratings : 5A 250V AC Pilot duty B300	Order by standard part No. However, add "9" to the end of the part No. for the model with neon lamp.
	Product type : Standard model, with neon lamp	
CSA	File No. : LR55880 Ratings : 5A 250V AC Pilot duty B300	
	Product type : Standard model, with neon lamp	
TÜV	File No. : J9551203 Ratings : AC-15 2A/250V~ Product type : Standard model only	Order by standard part No.

## 2. With neon lamp

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

Note) When ordering an overseas-specified product, refer to the Overseas Standards given below.

## 3. With LED

Lamp connection	Actuator	Lamp rating	
		12V DC	24 to 48V DC
		Part No.	
Spring type	Push plunger	AZ8111161	AZ811116
	Roller plunger	AZ8112161	AZ811216
	Cross roller plunger	AZ8122161	AZ812216
	Roller arm	AZ8104161	AZ810416
	Adjustable roller arm	AZ8108161	AZ810816
	Adjustable rod	AZ8107161	AZ810716
	Flexible rod	AZ8166161	AZ816616
	Spring wire	AZ8169161	AZ816916
	Remote wire control plunger	AZ8181161	AZ818116
Lead wire type	Push plunger	AZ8111661	AZ811166
	Roller plunger	AZ8122661	AZ811266
	Cross roller plunger	AZ8122661	AZ812266
	Roller arm	AZ8104661	AZ810466
	Adjustable roller arm	AZ8108661	AZ810866
	Adjustable rod	AZ8107661	AZ810766
	Flexible rod	AZ8166661	AZ816666
	Spring wire	AZ8169661	AZ816966

Notes 1. LED rating 6V DC type is available. When ordering, add suffix 162(spring type) or 662(lead wire type) to the standard part No.  
2. The DC24-48V rated lamp is recommended for PC input use.

## 4. Option

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

## 5. Protective construction

Protective construction	VL mini limit SW	VL mini limit SW (with indicator)
IEC		
IP60	○	○
IP64	○	○

## 6. Lamp rating

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

# SPECIFICATIONS

## 1. Rating

1) Standard type

Rated control voltage	Load	Resistive load (cos φ ≈ 1)	Inductive load (cos φ ≈ 0.4)
125V AC		5A	3A
250V AC		5A	2A
125V DC		0.4A	0.1A

2) Type with indicator

Types	Rated control voltage	Resistive load (cos φ ≈ 1)	Inductive load (cos φ ≈ 0.4)
With neon lamp	125V AC	5A	3A
	240V AC	5A	2A
With LED	24V DC	3A	–

## 2. Characteristics

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

## 3. EN60947-5-1 performance

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

## 4. Operating characteristics

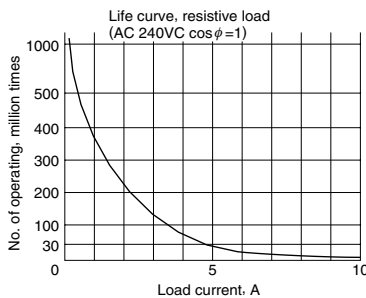
Characteristics	O.F. (N {gf}) max.	R.F. (N {gf}) min.	Pretravel (P.T.), max. mm inch	Movement Differential (M.D.), max. mm inch	Overtravel (O.T.), min. mm inch	Totaltravel (T.T.), min. mm inch
Actuator						
Push plunger	8.83 {900}	1.47 {150}	1.5 .059	0.7 .028	4 .028	5.5 .217
Roller plunger						
Cross roller plunger						
Roller arm	5.88 {600}	0.49 {50}	20°	10°	75°	95°
Adjustable roller arm	7.84 {800}~3.35 {342}	0.49 {50}~0.21 {21}	20°	10°	75°	95°
Adjustable rod	7.84 {800}~1.99 {203}	0.49 {50}~0.12 {12}	20°	10°	75°	95°
Flexible spring wire	0.88 {90}	–	30 (1.181)	–	20 (.787)	50 (1.969)
Remote wire control plunger	19.61 {2,000}~24.52 {2,500}* 19.61 {2,000}~24.52 {2,500}* 1.96 {200}~1.96 {200}* 1.5 .059 4 .157* 0.7 .028 2.0 .079* 4.5 .177 2.0 .079* 6 .236 6 .236*	1.96 {200}~1.96 {200}* 1.96 {200}~1.96 {200}* 1.5 .059 4 .157* 0.7 .028 2.0 .079* 4.5 .177 2.0 .079* 6 .236 6 .236*	1.5 .059 4 .157* 0.7 .028 2.0 .079* 4.5 .177 2.0 .079* 6 .236 6 .236*	0.7 .028 2.0 .079* 4.5 .177 2.0 .079* 6 .236 6 .236*	4.5 .177 2.0 .079* 6 .236 6 .236*	6 .236 6 .236* 6 .236 6 .236* 6 .236 6 .236* 6 .236 6 .236*

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

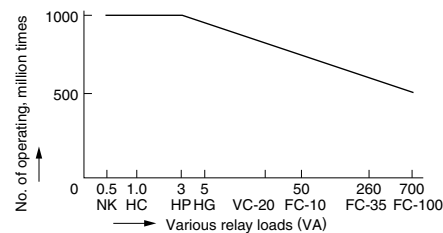
Notes 1. Keep the total travel values in the specified range. Otherwise the actuator force may rise to several times the operating force, resulting in a mechanical failure or much shorter service life.  
2. For the operating characteristics, refer to the TECHNICAL INFORMATION.

## DATA

### 1. Life curve



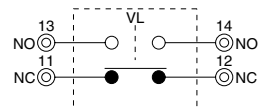
### 2. Actual load life curve (relay coil load)



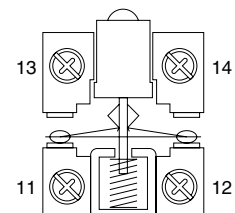
Note: The FC magnetic contactor series is 200V AC. The K is 2 Form C 24V DC type.

## WIRING DIAGRAM

### Output circuit



### Terminal

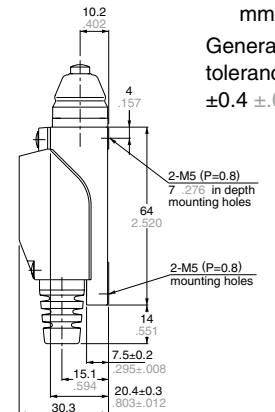
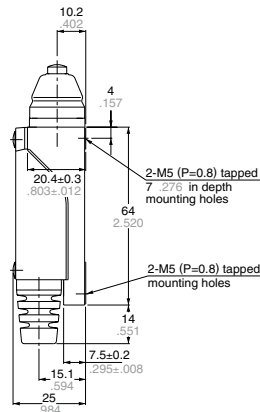
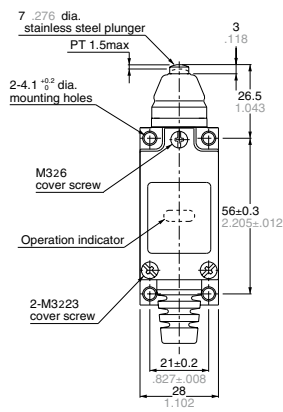


General tolerance: ±0.4 ±.016

**DIMENSIONS**

Push plunger type

Standard type  
AZ8111CEJ

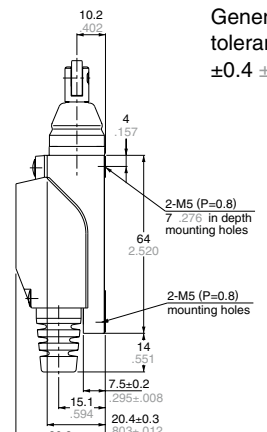
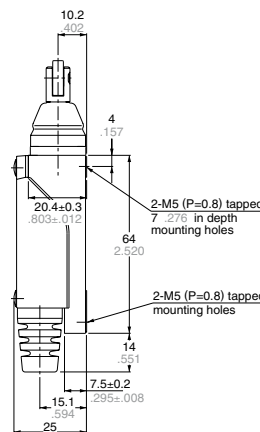
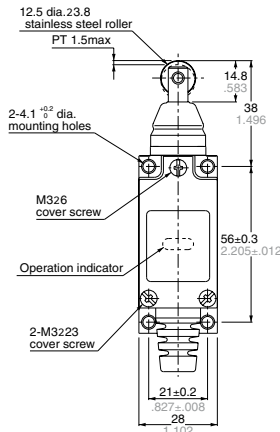


(Standard type)

(With Neon lamp)

Roller plunger type

Standard type  
AZ8112CEJ



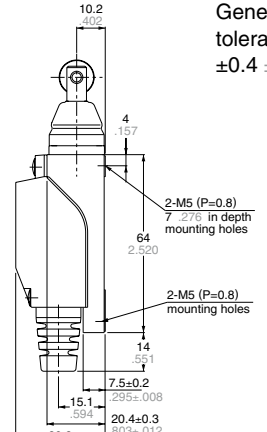
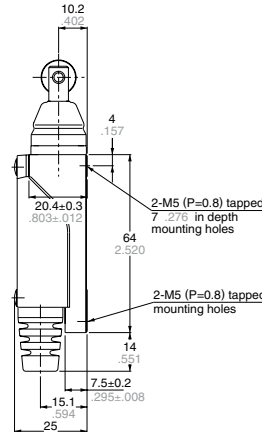
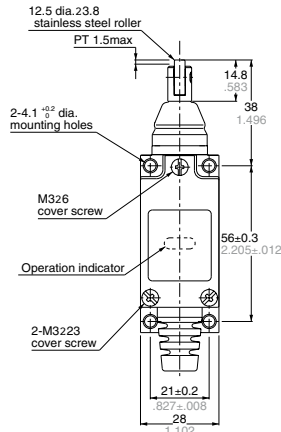
(Standard type)

(With Neon lamp)

General tolerance: ±0.4 ±.016

Cross roller plunger type

Standard type  
AZ8122CEJ



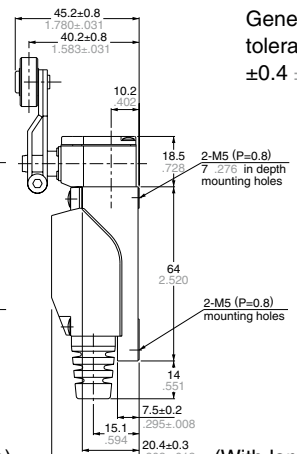
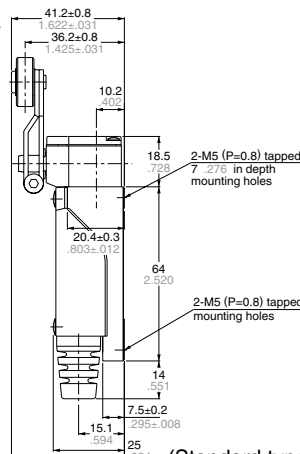
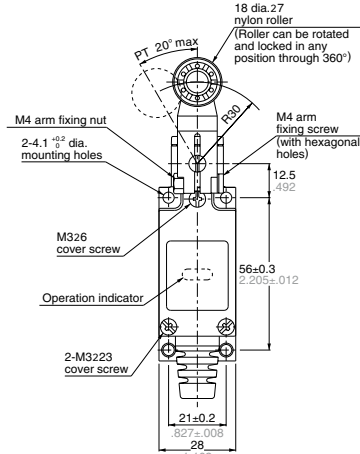
(Standard type)

(With Neon lamp)

General tolerance: ±0.4 ±.016

Roller arm type

Standard type  
AZ8104CEJ



(Standard type)

(With lamp)

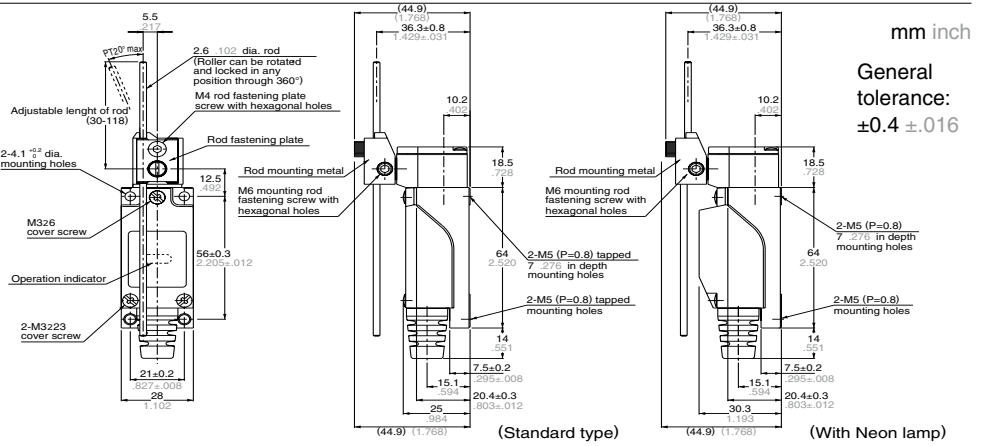
General tolerance: ±0.4 ±.016

# VL (AZ8)

## Adjustable rod type

Standard type

AZ8107CEJ



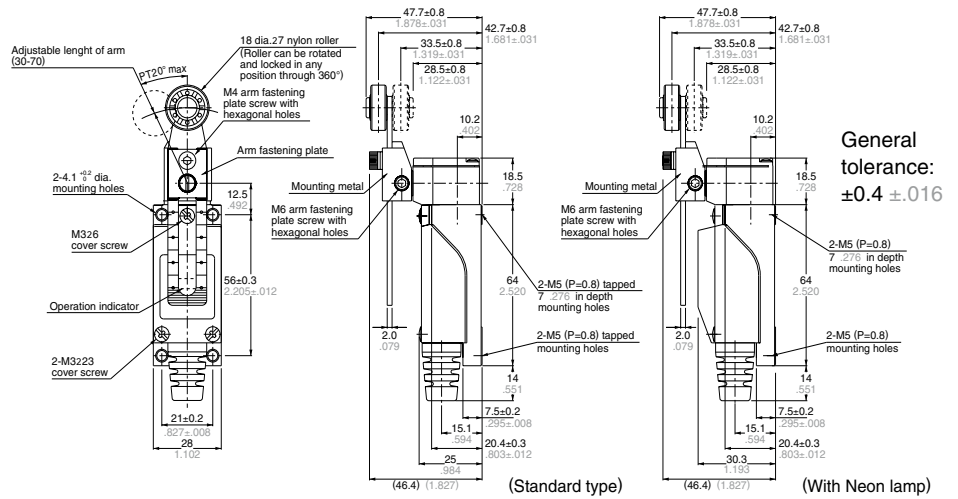
mm inch

General tolerance: ±0.4 ±.016

## Adjustable roller arm type

Standard type

AZ8108CEJ



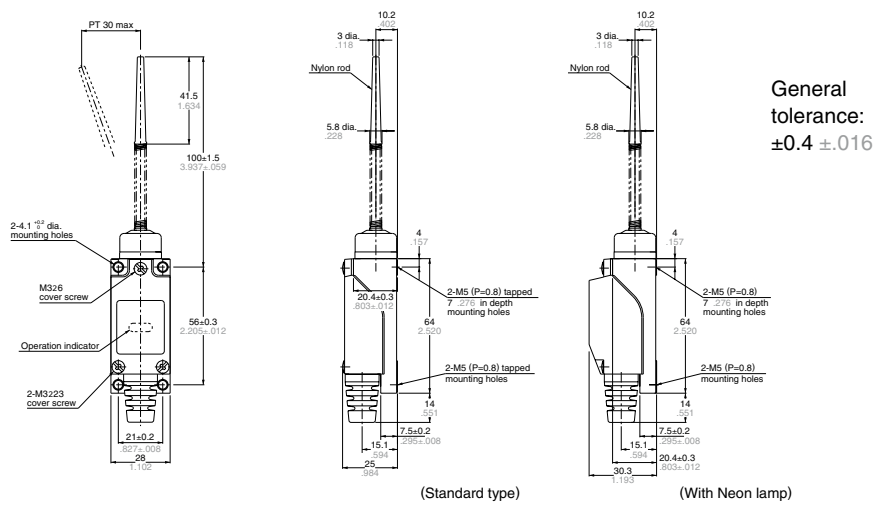
General tolerance: ±0.4 ±.016

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

## Flexible rod type

Standard type

AZ8166CEJ



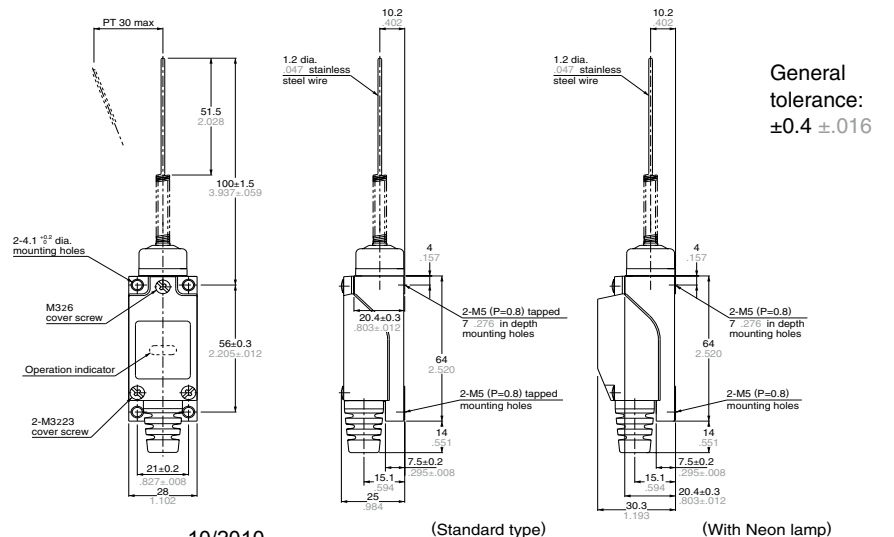
General tolerance: ±0.4 ±.016

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

## Spring wire type

Standard type

AZ8169CEJ



General tolerance: ±0.4 ±.016

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

**OPTION**

**VL Conduit Adaptor**



AZ8801

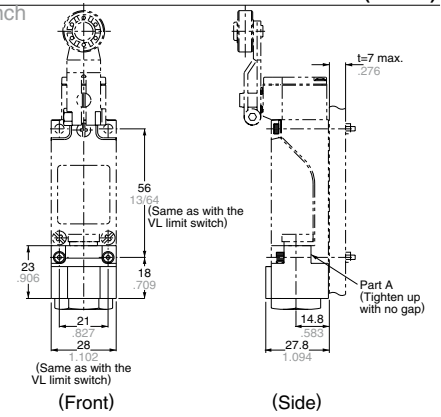
**Applicable wire**

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



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

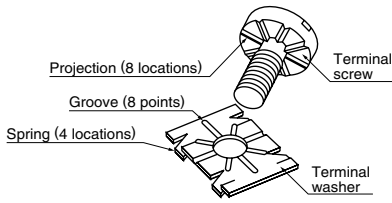
mm inch



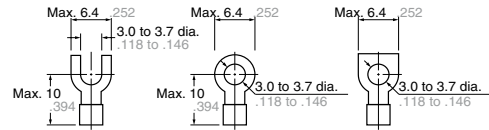
**WIRING**

mm inch

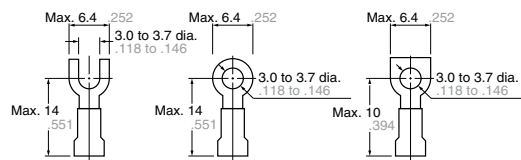
- Insulation distance more than 6.4mm .252inch for wiring and live parts
- Special assembly screws
- Grounding is available



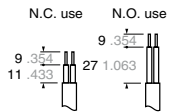
**Applicable fasten terminal**



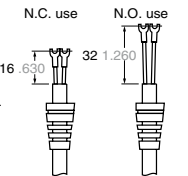
**With insulated grip**



**Cable treatment Ordinary terminal**



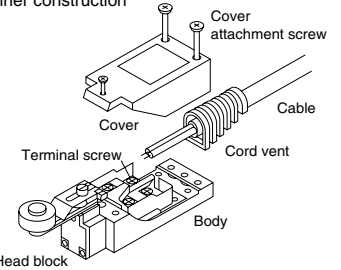
**Fasten terminal**



**Applicable wire**

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

**Inner construction**



**INDICATOR LIGHTING CIRCUIT**

**1. Spring type**

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

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

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

(With neon lamp)

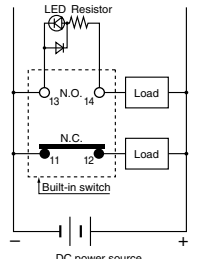
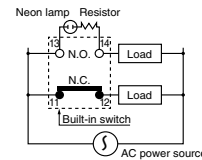
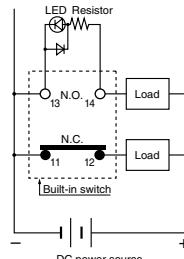
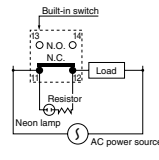
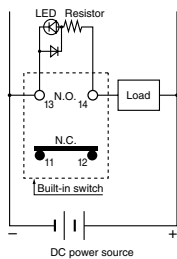
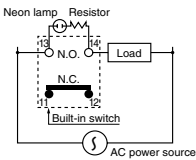
(With LED)

(With neon lamp)

(With LED)

(With neon lamp)

(With LED)

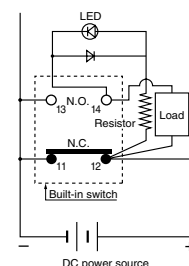


**2. Lead wire type (only for types with LED)**

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

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

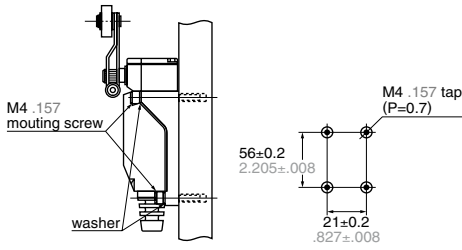
- More loads than for one circuit cannot be controlled.
- There is no leakage current.





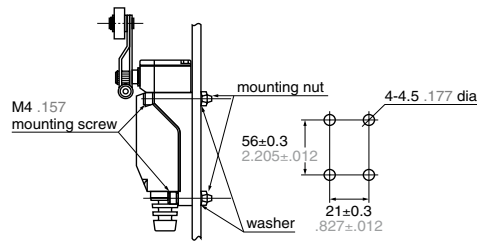
## MOUNTING DIMENSIONS

Surface mounting



Depth of screw holes > 15mm .591inch

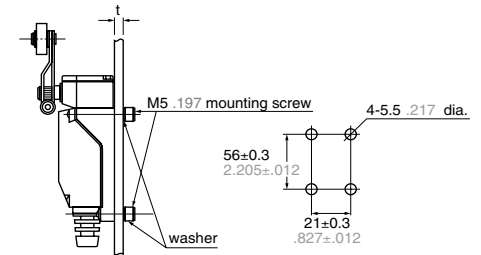
Through hole mounting



Thickness of panel < 5mm .197inch

Rear mounting

mm inch

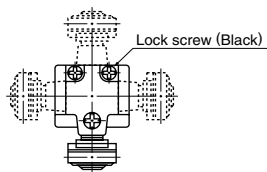


Length of bolt < panel thickness t+7mm .276inch

## HEAD DIRECTION CHANGE

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

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



## CAUTIONS

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

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

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

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

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

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

### 5. Mounting

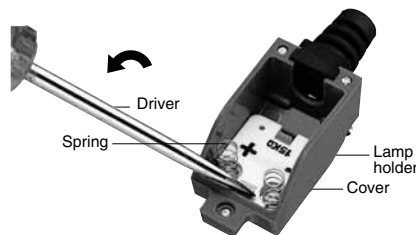
Three cover screws should be fasten uniformly. The rubber for opening cord should be corrected as normal condition after connecting the wire.

### 6. How to change the indicator holder.

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

### 7. Matters to be attended to in using spring type VL Limit Switch with indicator.

- 1) When loads are connected to both N.O. and N.C. only the indicator at non-operation time can be used.
- 2) Take special care not to damage or deform the contact spring during change of indicator holder direction or during connection work.



3) In the case of VL Limit Switch with Neon lamp, if the indicator is connected in series in a 100V circuit, the indicator ceases to be lighted.

However, for a 200V circuit, up to 2 lamps can be connected in series.

### 8. Matters to be attended to in using lead wire type VL with lamp.

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

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