

**Panasonic**  
ideas for life

GENERAL CATALOG

LIMIT SWITCHES



# Panasonic ideas on compact Limit Switches

## Installation and maintenance

- Easy wiring
- Installation work standardized
- Operating checks easy

## 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)

### IP64

Terminal mold model

#### ML mini Limit Switches



#### Magnelimit



### IP64

#### VL mini Limit Switches



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## IP67

### DL mini Limit Switches



## IP67

(die-cast model)

### HL Limit Switches



# Technical Information

## Standard glossary

- **Fixed rating values**

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

- **Operating object**

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

- **Detective object**

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

- **Reaction spring (movable spring)**

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

- **Contact**

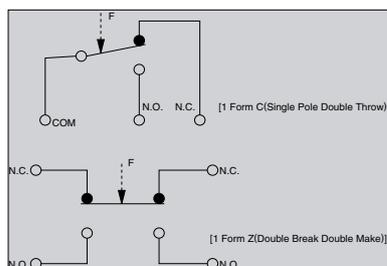
When the counter-spring revolves, power is switched on and off through the contact between metal parts.

- **Contact gap**

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

- **Contact arrangement**

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



- **Contact type**

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

- **Terminal mold**

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

## Construction

- **Actuator**

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

- **Headblock**

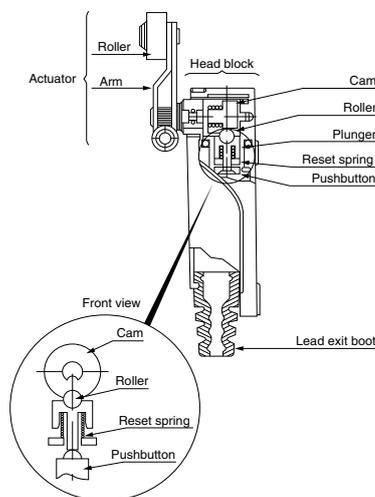
An independent part of the actuator mechanism of the Limit Switch.

- **Wiring vent (cord vent)**

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

- **Terminals**

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



VL limit switch

## Operating characteristics

- **Operating Force (O.F.)**

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

- **Release Force (R.F.)**

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

- **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.)**

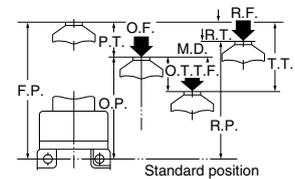
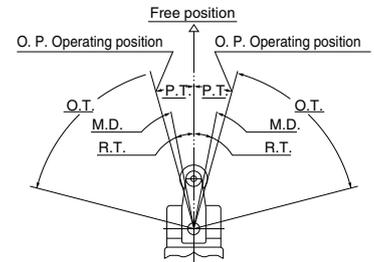
The position of the actuator when the traveling contact snaps to the fixed contact.

- **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.



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

## Glossary relating to the EN60947-5-1

- **EN60947-5-1**

EN standard same as IEC947-5-1

- **Utilization categories**

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

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

- **Rated operational voltage (Ue)**

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

- **Rated operational current (Ie)**

The maximum rated current for switch operation.

- **Rated insulation voltage (Ui)**

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

- **Rated impulse withstand voltage (Uimp)**

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

- **Rated enclosed thermal current (Ithe)**

The current value that enables current to flow without exceeding the specified maximum temperature in the recharging contact switch. If the pins are made of brass, the maximum temperature limit is 65°C 149°F.

- **Conditional short circuit current**

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

- **Short circuit protection device**

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

- **Switching overvoltage**

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

- **Pollution degree**

Expresses in levels the environment in which the switch is used. The four levels are shown below. Limit switches come under contamination level 3.

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

# Limit Switches Selector Chart

Classification		Compact size					
<b>Product name</b>		HL (AZH) Limit Switches (die-cast case)	HL (AZH) Limit Switches (die-cast case)	HL (AZH) Limit Switches (plastic case)	ML Mini Limit Switches (standard)		
<b>Appearance</b>							
<b>Head code</b>		AZH20 AZH22	AZH23	AZH10 AZH12	AZ7		
<b>Feature</b>		<ul style="list-style-type: none"> <li>High sealability that satisfies IEC IP67.</li> <li>Wiring is screw-terminal type.</li> <li>Low-level load type also available.</li> </ul>	<ul style="list-style-type: none"> <li>High sealability that satisfies IEC IP67.</li> <li>Less wiring, less installation connector type.</li> <li>LED lamp type also available.</li> </ul>	<ul style="list-style-type: none"> <li>Low-level load type available.</li> <li>Perfect for applications that prioritize economy.</li> </ul>	<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>		
<b>Protective construction</b>	Dust-proof type	IP60	○	○	○		
	Abrasion-proof type	IP64	○	○	—		
	Surge-proof type	IP65	○	○	—		
	Corrosion-proof type	IP67	○	○	—		
	Oil-resistant type	—	○	○	○		
<b>With lamps</b>	Neon	—	—	—	—		
	LED	—	○ (with LED lamps)	—	—		
<b>Ratings (load resistance)</b>		[Standard type] 5A125V AC 5A250V AC 5A8V DC 5A14V DC 5A30V DC 0.5A125V DC 0.25A250V DC	[Bifurcated type] LED lamps 0.1A125V AC 0.1A8V DC 0.1A14V DC 0.1A30V DC	[Bifurcated type] with LED lamps 0.1A24V AC	[Standard type] 5A125V AC 5A250V AC 5A8V DC 5A14V DC 5A30V DC 0.5A125V DC 0.25A250V DC	[Bifurcated type] 0.1A125V AC 0.1A8V DC 0.1A14V DC 0.1A30V DC	10A250V AC 10A125V AC 0.4A115V DC
<b>Life (Min.ope.)</b>	Mechanical	10 <sup>7</sup>	10 <sup>7</sup>	10 <sup>7</sup>	10 <sup>7</sup>		
	Electrical	5x10 <sup>5</sup>	5x10 <sup>5</sup>	5x10 <sup>5</sup>	2x10 <sup>5</sup>		
<b>Operating force (max.) (hinge lever type)</b>		2.45N {250gf} 3.92N {400gf} 11.8N {1,200gf} (Plunger type)	2.45N {250gf} 3.92N {400gf} 11.8N {1,200gf} (Plunger type)	2.45N {250gf} 3.92N {400gf}	1.47N {150gf}, 1.77N {180gf}, 1.96N {200gf}, 2.16N {220gf}, 2.35N {240gf}, 2.75N {280gf}, 5.88N {600gf} max.		
<b>Available actuators</b>		① ② ③ ⑪ ⑫ ⑬	① ② ③ ⑪ ⑫ ⑬	① ② ③ ⑨ ⑪ ⑫ ⑬	① ② ③ ⑨ ⑩ ⑪ ⑫		
<b>Terminals</b>		Screw terminal	Connector terminal	Screw terminal	Screw terminal		
<b>Wiring</b>		Cabtire code	Cabtire code	Cabtire code	Cabtire cable		
<b>Mounting pitch (Applicable screw)</b>		33mm 1.299inch (M4 screw)	33mm 1.299inch (M4 screw)	33mm 1.299inch (M4 screw)	25.4mm 1.000inch (M4 screw)		
<b>Available standards</b>		UL, CSA, TÜV, CE	UL, CSA, TÜV, CE	UL, CSA, TÜV, CE	UL, CSA, TÜV, CE		
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Note: Excludes Limit Switch replacement parts

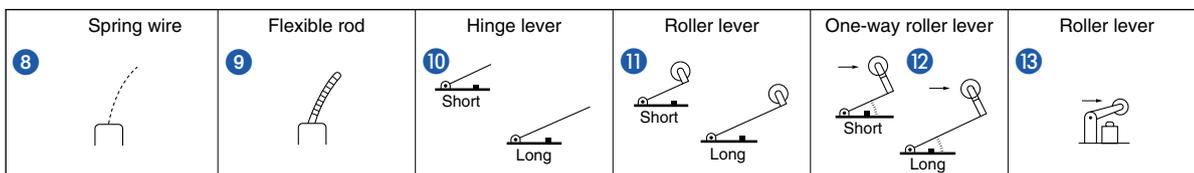
## Actuators

① Push plunger 	② Roller plunger 	③ Cross-roller plunger 	④ Roller arm 	⑤ Adjustable roller arm 	⑥ Adjustable rod 	⑦ Fork 
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Classification		Compact size vertical type		Door switch
<b>Product name</b>		DL mini Limit Switches	VL mini Limit Switches	Magnelimit
<b>Appearance</b>				
<b>Head code</b>		AZD1	AZ8	AZC1
<b>Feature</b>		<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. Dual-role switch in one unit.</li> <li>Construction possible with 100V AC power.</li> </ul>
<b>Protective construction</b>	Dust-proof type	○	○	—
	Abrasion-proof type	○	○	—
	Surge-proof type	○	—	—
	Corrosion-proof type	○	—	—
	Oil-resistant type	—	—	—
<b>With lamps</b>	Neon	—	○	—
	LED	—	○	—
<b>Ratings (load resistance)</b>		6A250V AC 6A380V AC 5A24V DC	[Standard type] 5A250V AC 5A125V AC 0.4A125V DC	[With lamp type] [Neon lamp type] 5A 240V AC 5A 125V AC [LED lamp type] 3A 24V DC
<b>Life (Min. ope.)</b>	<b>Mechanical</b>	10 <sup>7</sup>	10 <sup>7</sup>	10 <sup>5</sup>
	<b>Electrical</b>	1.5x10 <sup>5</sup>	3x10 <sup>5</sup>	3x10 <sup>4</sup>
<b>Operating force (max.) (hinge lever type)</b>		6.37N {650gf} 4.90N {500gf} 3.29N {400gf}	0.88N {90gf}, 5.88N {600gf}, 8.83N {900gf}, 9.16N {200gf}	3.43N {350gf}
<b>Available actuators</b>		① ② ④ ⑤ ⑥ ⑬	① ② ③ ④ ⑤ ⑥ ⑧ ⑨	①
<b>Terminals</b>		Screw terminal (Conduit connectors: PF: 1/2, PG: 13.5 types)	Screw terminal	Screw terminal
<b>Wiring</b>		Cabtire code	Cabtire cord Cabtire cable	Cabtire cord
<b>Mounting pitch (Applicable screw)</b>		22 × (47mm) .866 × 1.850inch	21 × 56mm .827 × 2.205inch (M4 screws)	52mm 2.047inch (M4)
<b>Available standards</b>		UL, CSA, TÜV, CE	UL, CSA, TÜV, CE	UL, CSA, CE
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Notes:

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



**Panasonic**  
ideas for life

**COMPACT SIZE  
LIMIT SWITCHES**

**HL (AZH)  
Limit Switches**



- **Wide selections of actuators, terminals and bodies to meet any application**
- **Excellent environmental resistance**  
Die-casting case—IEC IP67  
Plastic case—IEC IP64
- **Highly reliable operation**  
Bifurcated contact (Au clad) suitable for low-level circuit control
- **Connector type for easy installation**  
Easy on side installation with M4 screws
- **Compact design good for limited mounting space**  
17% less mounting space compared with ML (AZ7) Limit Switch
- **Conforms to UL/CSA TÜV standards**

**PRODUCT TYPE**

**1. Limit Switches**

Actuator	Type	Die-casting case				Plastic case	
		Screw terminal		Connector type		Screw terminal	
		Standard	Bifurcated	Bifurcated contact		Standard	Bifurcated
Without LED	With LED						
Push plunger		Common to panel mount push plunger				AZH1001	AZH1201
Roller plunger		Common to panel mount roller plunger				AZH1002	AZH1202
Cross roller plunger		Common to panel mount cross roller plunger				AZH1003	AZH1203
Panel mount push plunger		AZH2031	AZH2231	AZH2331	AZH233116	AZH1031	AZH1231
Panel mount roller plunger		AZH2032	AZH2232	AZH2332	AZH233216	AZH1032	AZH1232
Panel mount cross roller plunger		AZH2033	AZH2233	AZH2333	AZH233316	AZH1033	AZH1233
Sealed push plunger		AZH2011	AZH2211	AZH2311	AZH231116	AZH1011	AZH1211
Sealed roller plunger		AZH2012	AZH2212	AZH2312	AZH231216	AZH1012	AZH1212
Sealed cross roller plunger		AZH2013	AZH2213	AZH2313	AZH231316	AZH1013	AZH1213
Short roller lever		AZH2041	AZH2241	AZH2341	AZH234116	AZH1041	AZH1241
Roller lever		AZH2021	AZH2221	AZH2321	AZH232116	AZH1021	AZH1221
One-way short roller lever		AZH2044	AZH2244	AZH2344	AZH234416	AZH1044	AZH1244
One-way short lever		AZH2024	AZH2224	AZH2324	AZH232416	AZH1024	AZH1224
Flexible rod		—	—	—	—	AZH1066	AZH1266

**2. Accessories**

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

**FOREIGN STANDARDS**

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

# SPECIFICATIONS

## 1. Ratings

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

Notes: 1) Parameter of inductive load: AC power factor: Min. 0.4; DC time constant: Max. 7 ms.  
2) Lamp load generates 10 times of inrush current. 3) Motor load generates 6 times of inrush current.

## 2. Characteristics

	Standard type		Bifurcated type	
	Screw terminal		Screw terminal	Connector type
Contact arrangement	1 Form C		1 Form C (Bifurcated contact)	
Contact resistance	Initial: Max. 15 mΩ		Initial: Max. 100 mΩ	Initial: Max. 150 mΩ
Contact material	Silver alloy		Gold clad	
Insulation resistance	Initial: Min. 100MΩ (at 500 V DC)			
Initial breakdown voltage	1,000 Vrms for 1 min. between non-consecutive terminals 1,500 Vrms for 1 min. between dead metal parts and terminals 1,500 Vrms for 1 min. between ground and terminals			
Shock resistance	Free position	Max. 98 m/s <sup>2</sup> {10 G}		
	Full operating position	Max. 294 m/s <sup>2</sup> {30 G}		
Vibration resistance	10 to 55 Hz (Double amplitude for max. 1.5 mm)			
Mechanical life	10 <sup>7</sup> (at 120 cpm)			
Electrical life	5 × 10 <sup>5</sup> (at 20 cpm, 5 A 250 V AC resistive load)		5 × 10 <sup>5</sup> (at 20 cpm, 0.1 A 125 V AC resistive load)	
Ambient temperature	-10 to +80°C +14 to +176°F			
Ambient humidity	Max. 95% R.H.			
Max. switching frequency	Max. 120 cpm			

## 3. Operating characteristics

### • Die-cast case

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

### • Plastic case

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

# HL (AZH)

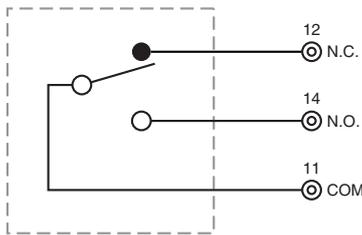
## 4. Performance data for EN60947-5-1

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

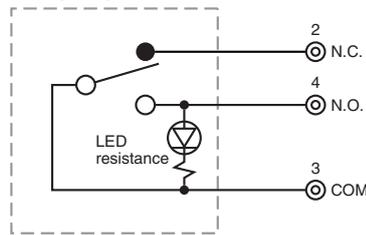
## OUTPUT CIRCUIT

Wiring diagram

1) Screw terminal type  
Internal circuit



2) LED wired type  
Lamp lighting circuit

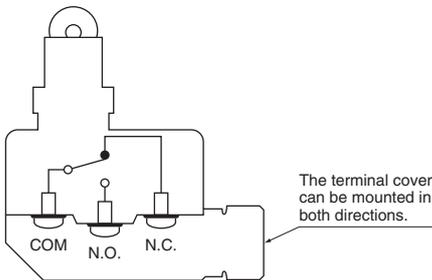


Note: Since LED is connected to N.O. side, the polarity of the load shall be + for N.O.

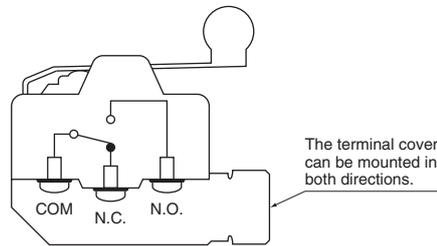
## CONTACTS

Screw terminal type

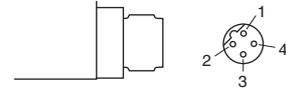
Plunger type



Lever type



Connector type



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

LED rating

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

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

Protective construction

IEC standard	Die-cast case	Plastic case
IP64	○	○
IP67	○	×

**DIMENSIONS**

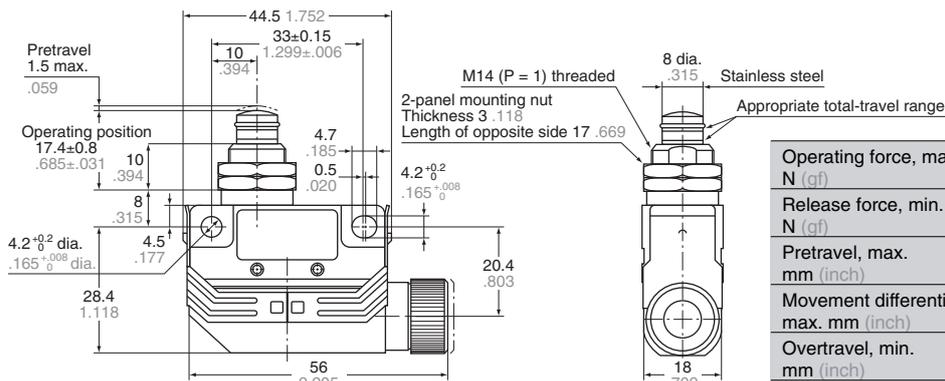
mm inch General tolerance: ±0.4 ±.016

**Die-cast case**

**1. Screw terminal  
Panel mount push plunger**



AZH2031  
AZH2231

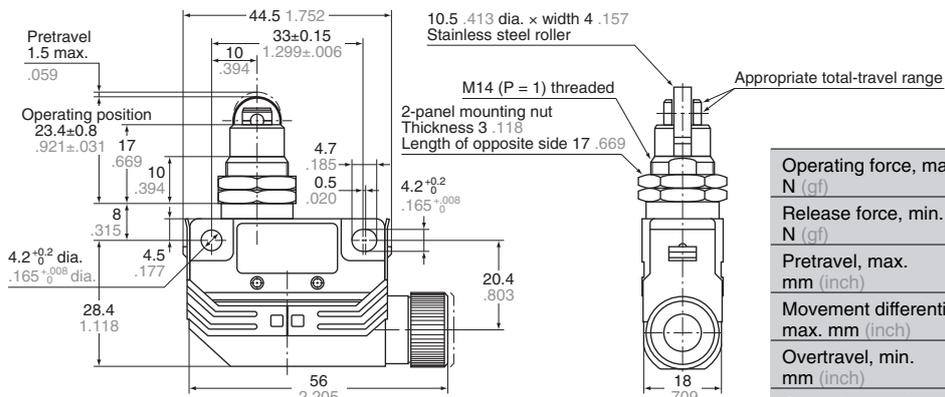


Operating force, max. N (gf)	11.8 (1200)
Release force, min. N (gf)	4.90 (500)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	17.4±0.8 (.685±.031)

**Panel mount roller plunger**



AZH2032  
AZH2232

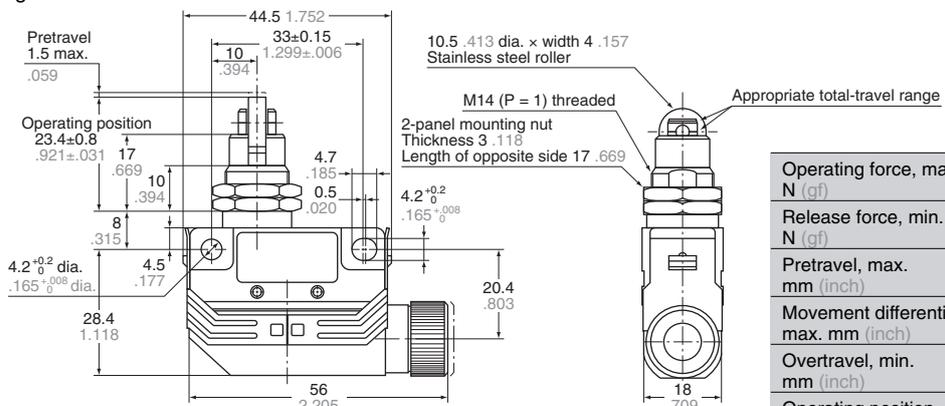


Operating force, max. N (gf)	11.8 (1200)
Release force, min. N (gf)	4.90 (500)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	23.4±0.8 (.909±.031)

**Panel mount cross roller plunger**



AZH2033  
AZH2233

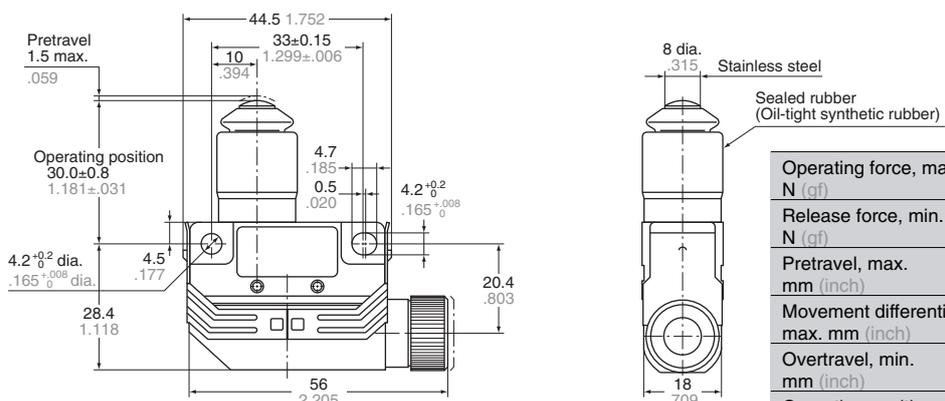


Operating force, max. N (gf)	11.8 (1200)
Release force, min. N (gf)	4.90 (500)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	23.4±0.8 (.909±.031)

**Sealed push plunger**



AZH2011  
AZH2211



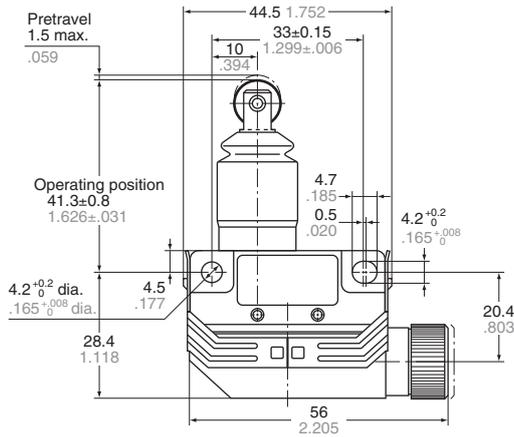
Operating force, max. N (gf)	11.8 (1200)
Release force, min. N (gf)	4.90 (500)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	30.0±0.8 (1.181±.031)

## HL (AZH)

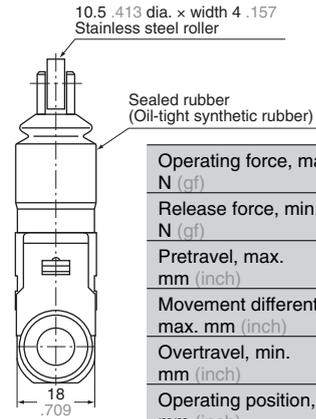
### Sealed roller plunger



AZH2012  
AZH2212



mm inch General tolerance: ±0.4 ±.016

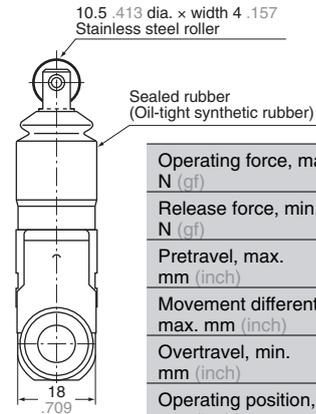
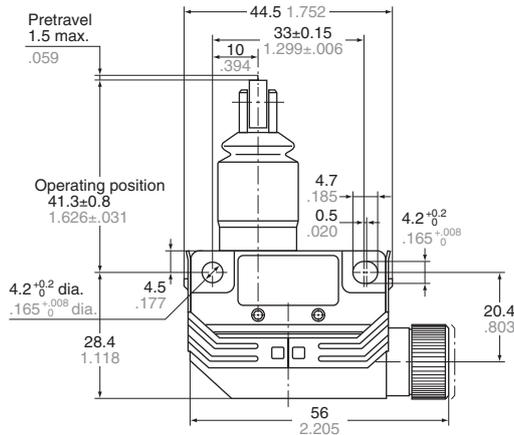


Operating force, max. N (gf)	11.8 (1200)
Release force, min. N (gf)	4.90 (500)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	41.3±0.8 (1.626±.031)

### Sealed cross roller plunger



AZH2013  
AZH2213

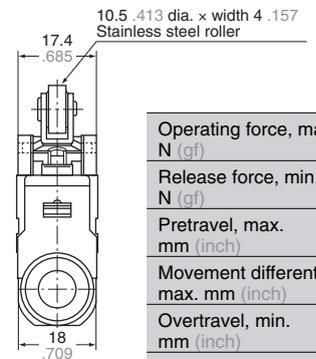
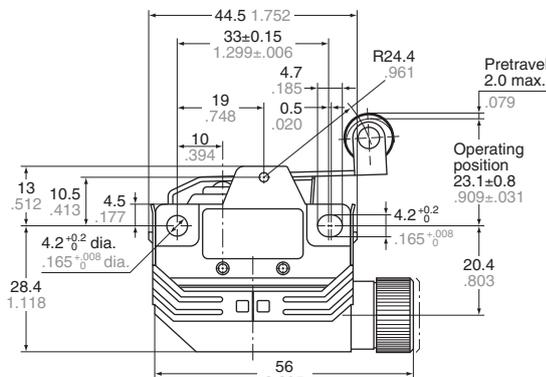


Operating force, max. N (gf)	11.8 (1200)
Release force, min. N (gf)	4.90 (500)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	41.3±0.8 (1.626±.031)

### Short roller lever



AZH2041  
AZH2241

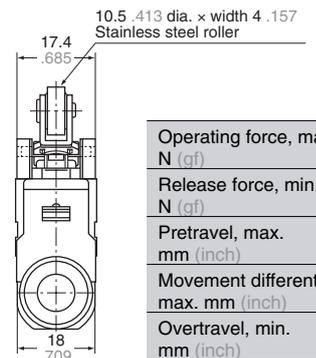
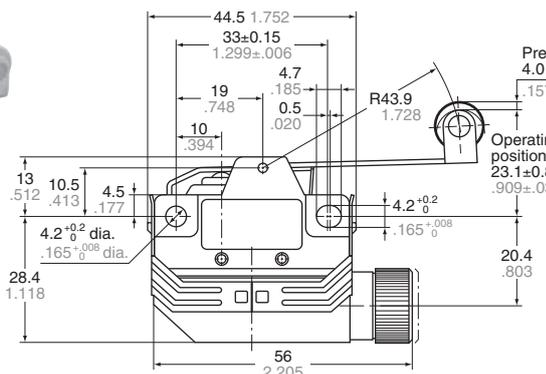


Operating force, max. N (gf)	3.92 (400)
Release force, min. N (gf)	0.78 (80)
Pretravel, max. mm (inch)	2.0 (.079)
Movement differential, max. mm (inch)	0.3 (.012)
Overtravel, min. mm (inch)	4.0 (.157)
Operating position, mm (inch)	23.1±0.8 (.909±.031)

### Roller lever



AZH2021  
AZH2221



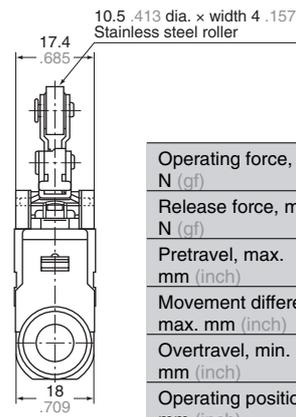
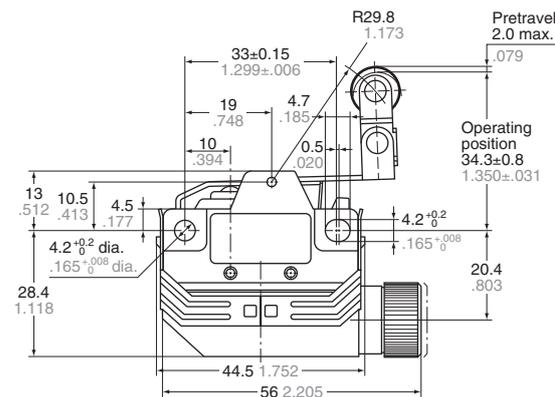
Operating force, max. N (gf)	2.45 (250)
Release force, min. N (gf)	0.39 (40)
Pretravel, max. mm (inch)	4.0 (.157)
Movement differential, max. mm (inch)	0.6 (.024)
Overtravel, min. mm (inch)	7.0 (.276)
Operating position, mm (inch)	23.1±0.8 (.909±.031)

One-way short roller lever

mm inch General tolerance: ±0.4 ±.016



AZH2044  
AZH2244

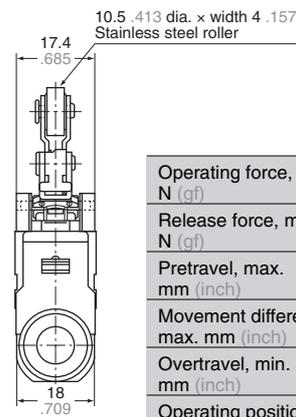
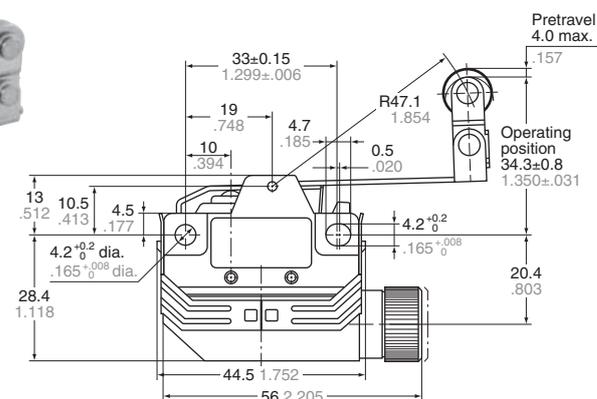


Operating force, max. N (gf)	3.92 (400)
Release force, min. N (gf)	0.78 (80)
Pretravel, max. mm (inch)	2.0 (.079)
Movement differential, max. mm (inch)	0.3 (.012)
Overtravel, min. mm (inch)	4.0 (.157)
Operating position, mm (inch)	34.3±0.8 (1.350±.031)

One-way roller lever



AZH2024  
AZH2224



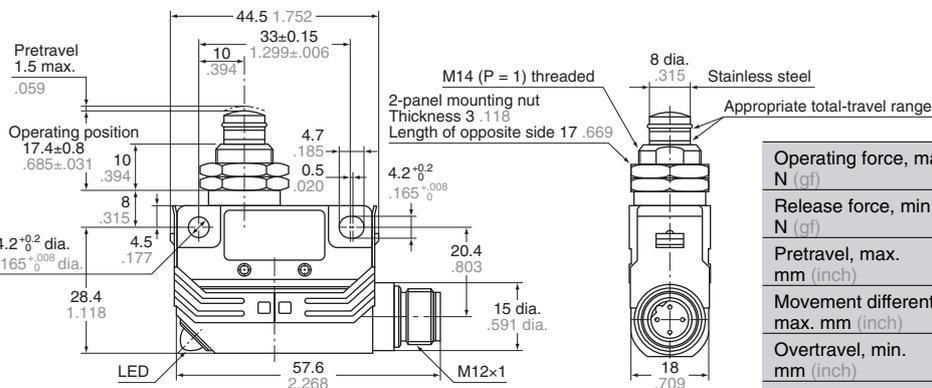
Operating force, max. N (gf)	2.45 (250)
Release force, min. N (gf)	0.39 (40)
Pretravel, max. mm (inch)	4.0 (.157)
Movement differential, max. mm (inch)	0.6 (.024)
Overtravel, min. mm (inch)	7.0 (.276)
Operating position, mm (inch)	34.3±0.8 (1.350±.031)

2. Connector type

Panel mount push plunger



AZH2331  
AZH233116

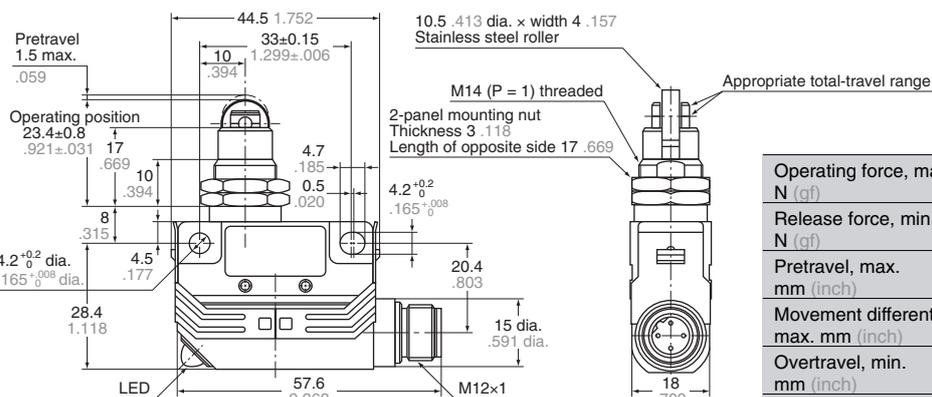


Operating force, max. N (gf)	11.8 (1200)
Release force, min. N (gf)	4.90 (500)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	17.4±0.8 (0.685±.031)

Panel mount roller plunger



AZH2332  
AZH233216



Operating force, max. N (gf)	11.8 (1200)
Release force, min. N (gf)	4.90 (500)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	23.4±0.8 (0.909±.031)

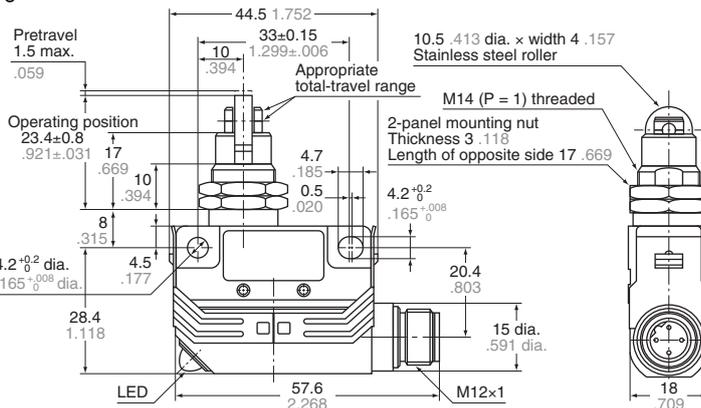
# HL (AZH)

## Panel mount cross roller plunger

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



AZH2333  
AZH233316

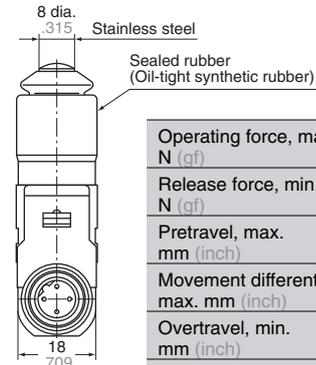
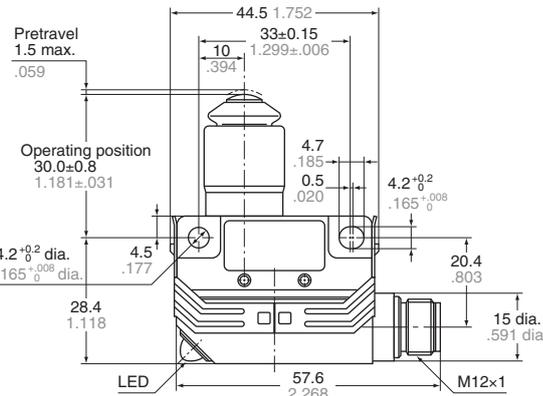


Operating force, max. N (gf)	11.8 (1200)
Release force, min. N (gf)	4.90 (500)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	23.4±0.8 (.921±.031)

## Sealed push plunger



AZH2311  
AZH231116

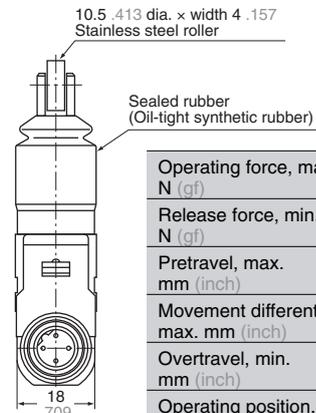
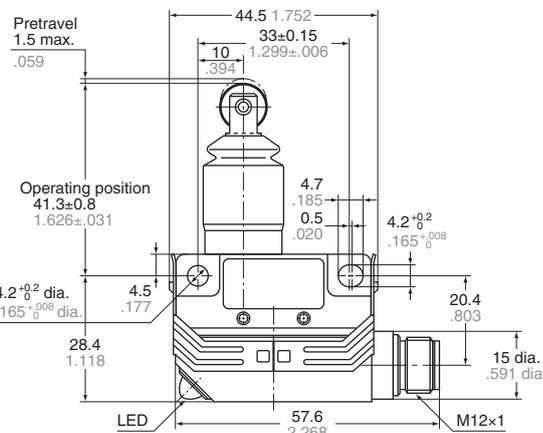


Operating force, max. N (gf)	11.8 (1200)
Release force, min. N (gf)	4.90 (500)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	30.0±0.8 (1.181±.031)

## Sealed roller plunger



AZH2312  
AZH231216

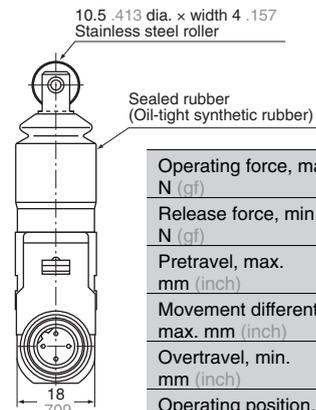
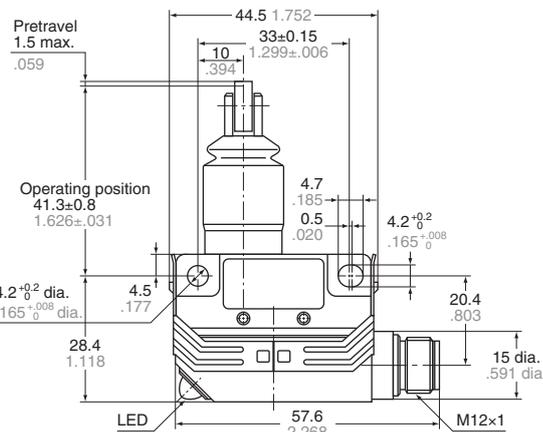


Operating force, max. N (gf)	11.8 (1200)
Release force, min. N (gf)	4.90 (500)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	41.3±0.8 (1.626±.031)

## Sealed cross roller plunger



AZH2313  
AZH231316



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

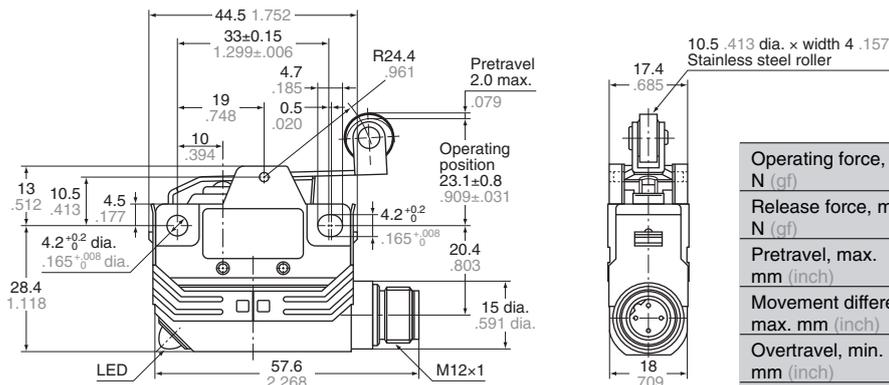
# HL (AZH)

## Short roller lever

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



AZH2341  
AZH234116

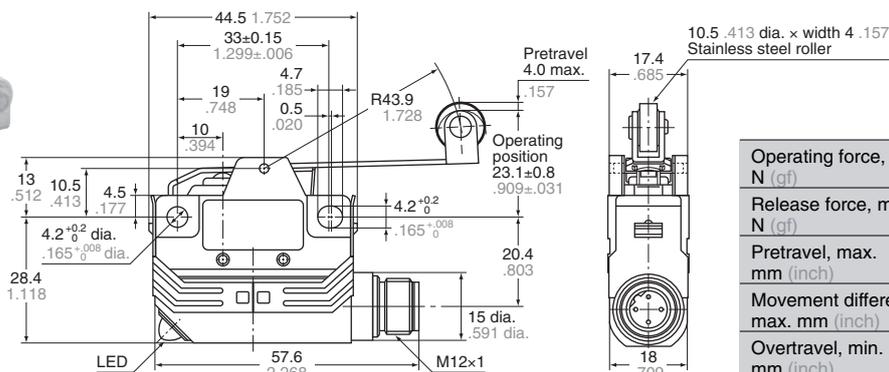


Operating force, max. N (gf)	3.92 (400)
Release force, min. N (gf)	0.78 (80)
Pretravel, max. mm (inch)	2.0 (.079)
Movement differential, max. mm (inch)	0.3 (.012)
Overtravel, min. mm (inch)	4.0 (.157)
Operating position, mm (inch)	23.1±0.8 (.909±.031)

## Roller lever



AZH2321  
AZH232116

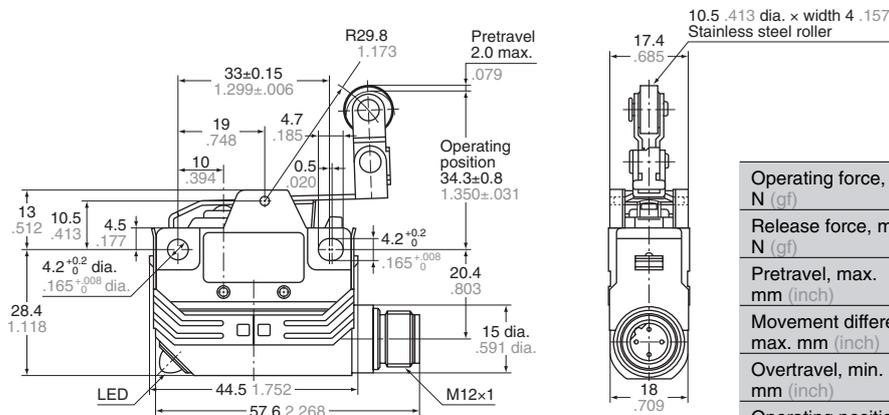


Operating force, max. N (gf)	2.45 (250)
Release force, min. N (gf)	0.39 (40)
Pretravel, max. mm (inch)	4.0 (.157)
Movement differential, max. mm (inch)	0.6 (.024)
Overtravel, min. mm (inch)	7.0 (.276)
Operating position, mm (inch)	23.1±0.8 (.909±.031)

## One-way short roller lever



AZH2344  
AZH234416

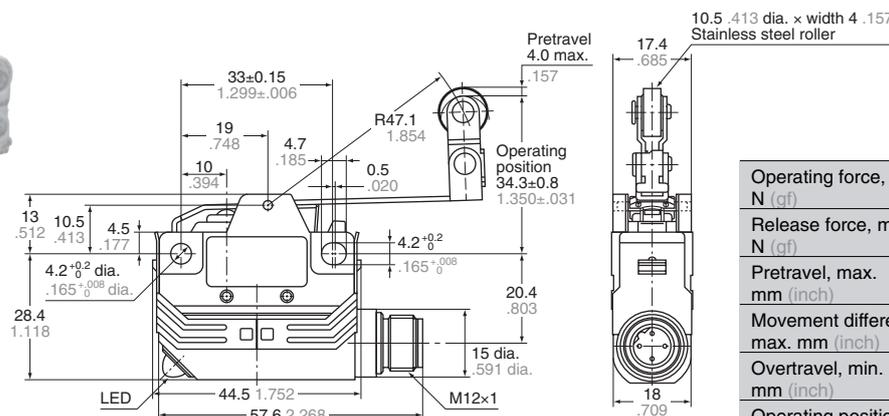


Operating force, max. N (gf)	3.92 (400)
Release force, min. N (gf)	0.78 (80)
Pretravel, max. mm (inch)	2.0 (.079)
Movement differential, max. mm (inch)	0.3 (.012)
Overtravel, min. mm (inch)	4.0 (.157)
Operating position, mm (inch)	34.3±0.8 (1.350±.031)

## One-way roller lever



AZH2324  
AZH232416



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

# HL (AZH)

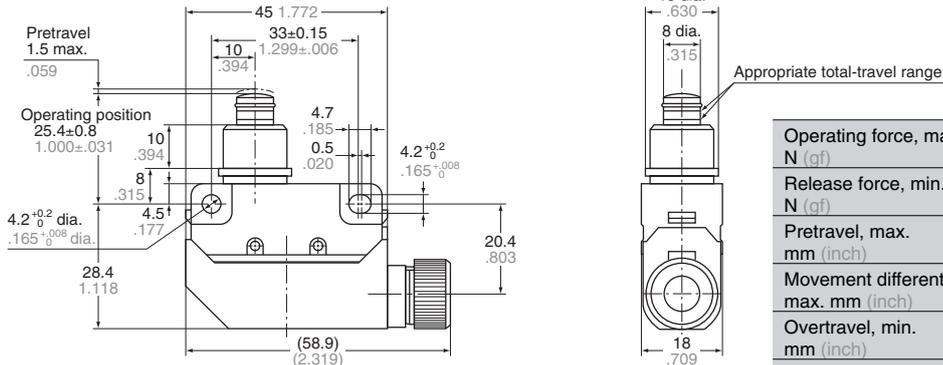
## Plastic case

mm inch General tolerance:  $\pm 0.4 \pm 0.16$

Push plunger



AZH1001  
AZH1201

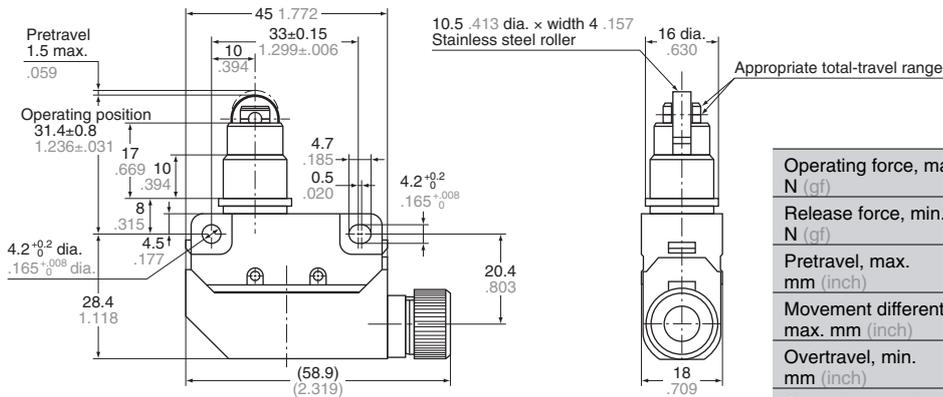


Operating force, max. N (gf)	5.88 (600)
Release force, min. N (gf)	0.98 (100)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	25.4 ± 0.8 (1.000 ± .031)

Roller plunger



AZH1002  
AZH1202

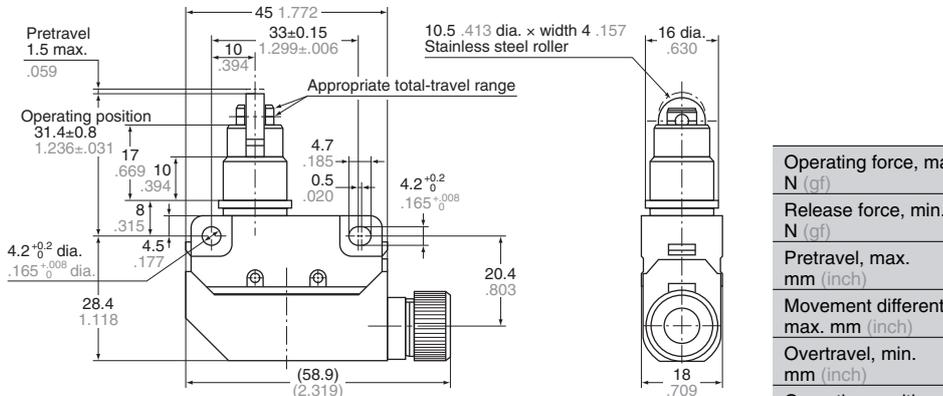


Operating force, max. N (gf)	5.88 (600)
Release force, min. N (gf)	0.98 (100)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	31.4 ± 0.8 (1.236 ± .031)

Cross roller plunger



AZH1003  
AZH1203

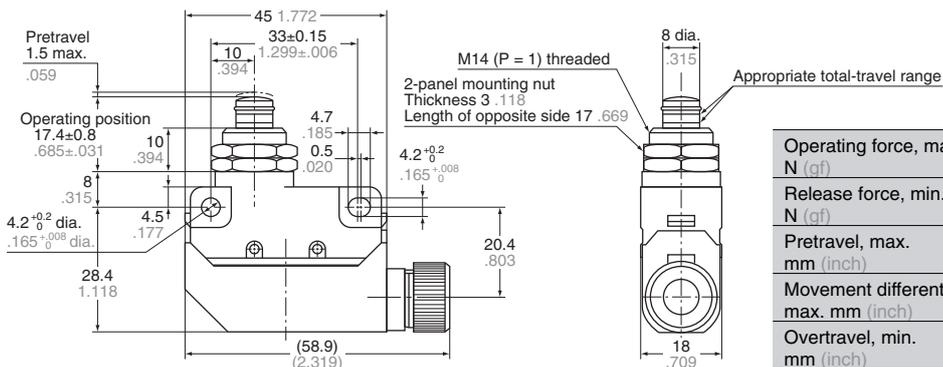


Operating force, max. N (gf)	5.88 (600)
Release force, min. N (gf)	0.98 (100)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	31.4 ± 0.8 (1.236 ± .031)

Panel mount push plunger



AZH1031  
AZH1231



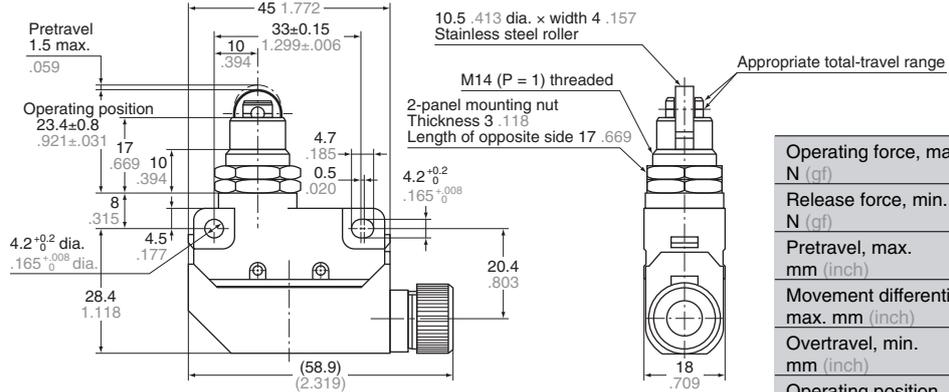
Operating force, max. N (gf)	5.88 (600)
Release force, min. N (gf)	0.98 (100)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	17.4 ± 0.8 (.685 ± .031)

Panel mount roller plunger

mm inch General tolerance: ±0.4 ±.016



AZH1032  
AZH1232

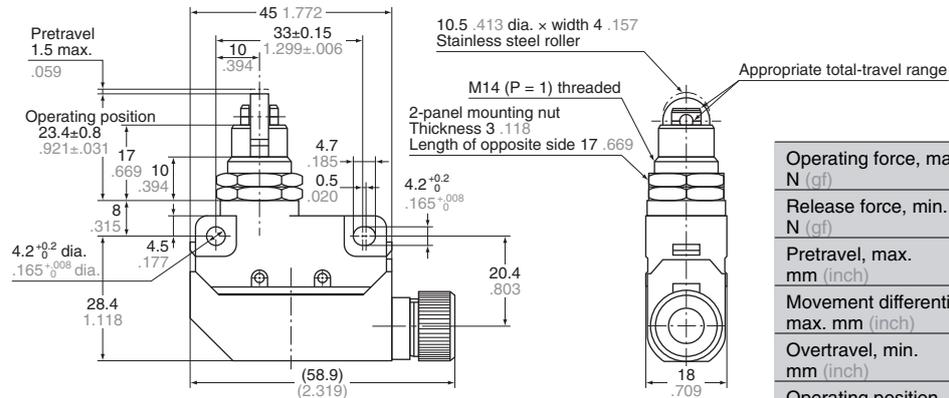


Operating force, max. N (gf)	5.88 (600)
Release force, min. N (gf)	0.98 (100)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	23.4±0.8 (.921±.031)

Panel mount cross roller plunger



AZH1033  
AZH1233

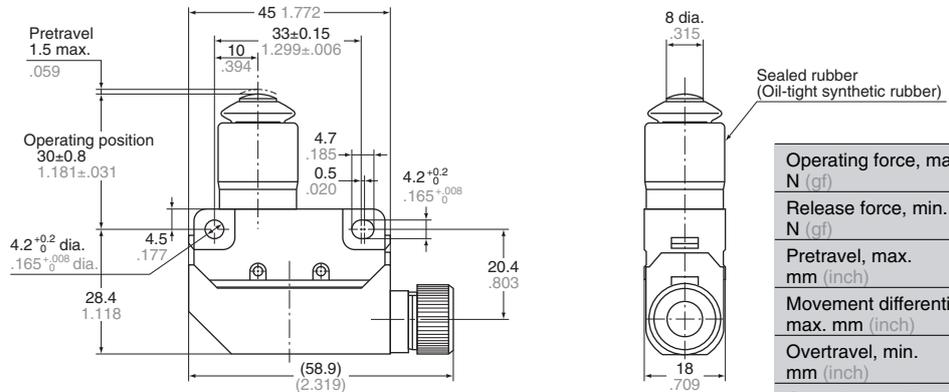


Operating force, max. N (gf)	5.88 (600)
Release force, min. N (gf)	0.98 (100)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	23.4±0.8 (.921±.031)

Sealed push plunger



AZH1011  
AZH1211

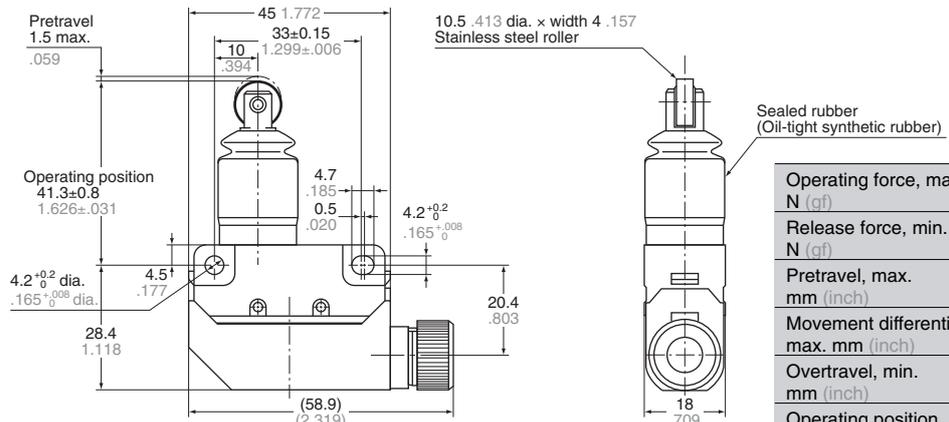


Operating force, max. N (gf)	5.88 (600)
Release force, min. N (gf)	0.98 (100)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	30.0±0.8 (1.181±.031)

Sealed roller plunger



AZH1012  
AZH1212



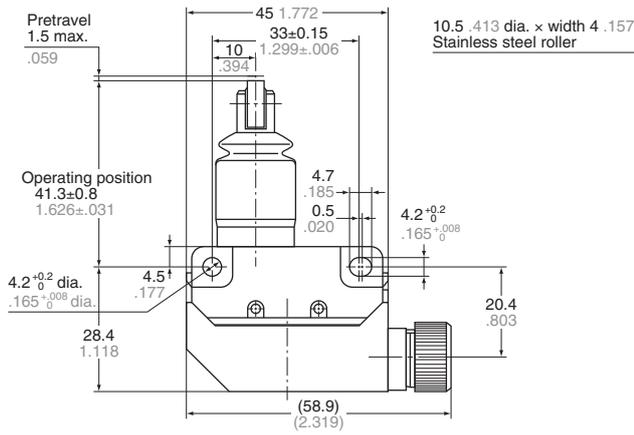
Operating force, max. N (gf)	5.88 (600)
Release force, min. N (gf)	0.98 (100)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	41.3±0.8 (1.626±.031)

## HL (AZH)

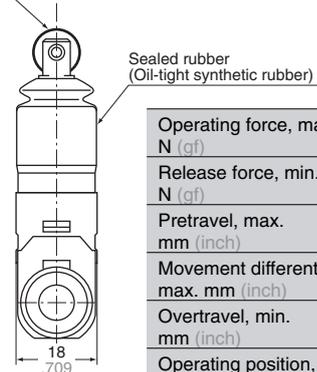
### Sealed cross roller plunger



AZH1013  
AZH1213



mm inch General tolerance: ±0.4 ±.016

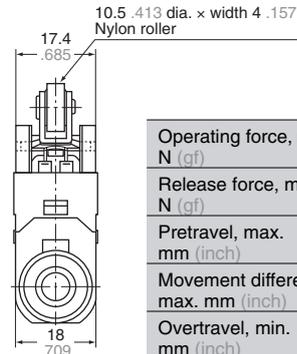
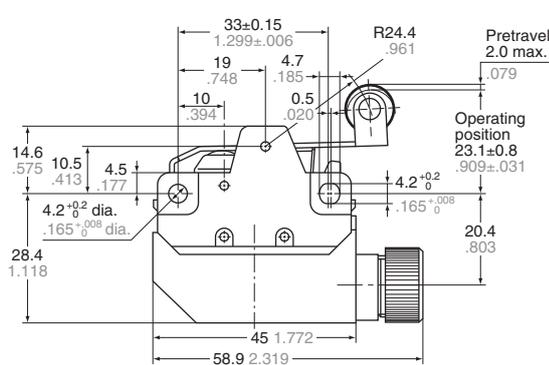


Operating force, max. N (gf)	5.88 (600)
Release force, min. N (gf)	0.98 (100)
Pretravel, max. mm (inch)	1.5 (.059)
Movement differential, max. mm (inch)	0.1 (.004)
Overtravel, min. mm (inch)	3.0 (.118)
Operating position, mm (inch)	41.3±0.8 (1.626±.031)

### Short roller lever



AZH1041  
AZH1241

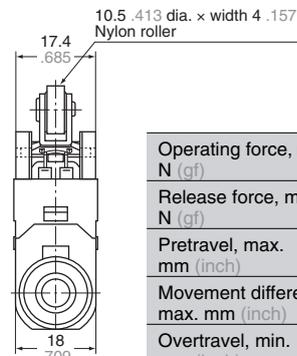
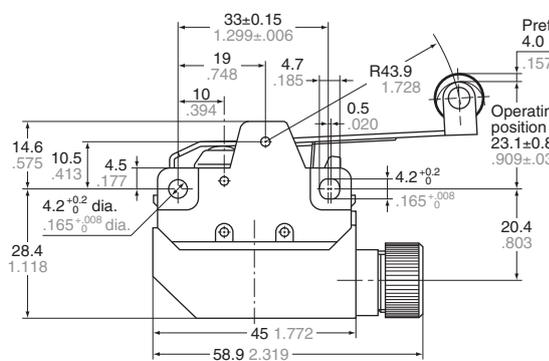


Operating force, max. N (gf)	3.92 (400)
Release force, min. N (gf)	0.78 (80)
Pretravel, max. mm (inch)	2.0 (.079)
Movement differential, max. mm (inch)	0.3 (.012)
Overtravel, min. mm (inch)	4.0 (.157)
Operating position, mm (inch)	23.1±0.8 (.909±.031)

### Roller lever



AZH1021  
AZH1221

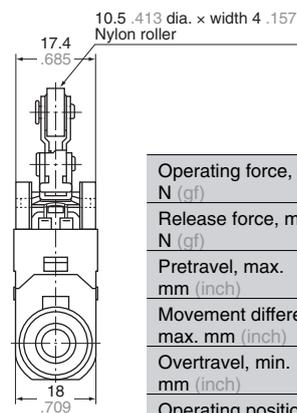
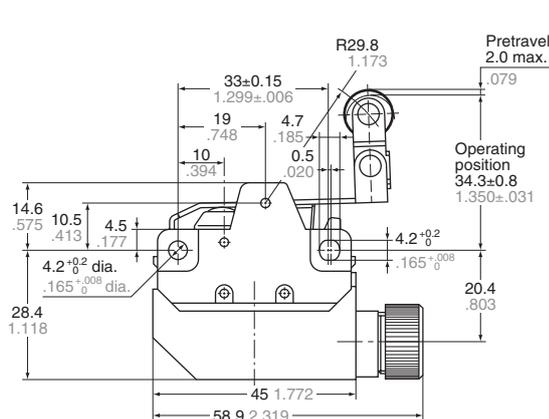


Operating force, max. N (gf)	2.45 (250)
Release force, min. N (gf)	0.39 (40)
Pretravel, max. mm (inch)	4.0 (.157)
Movement differential, max. mm (inch)	0.6 (.024)
Overtravel, min. mm (inch)	7.0 (.276)
Operating position, mm (inch)	23.1±0.8 (.909±.031)

### One-way short roller lever



AZH1044  
AZH1244



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

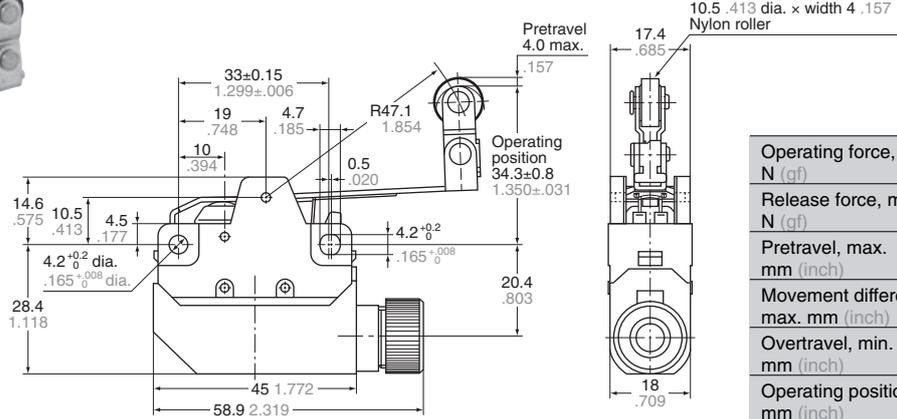
**HL (AZH)**

**One-way roller lever**

mm inch General tolerance: ±0.4 ±.016



AZH1024  
AZH1224

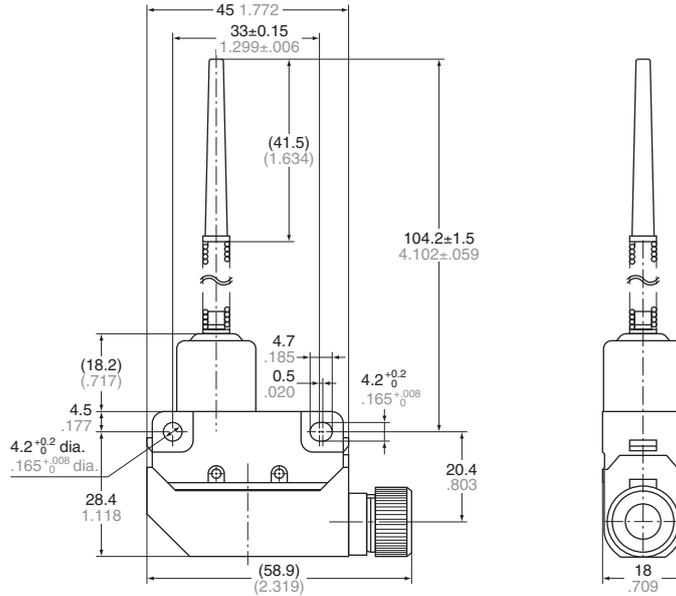


Operating force, max. N (gf)	2.45 (250)
Release force, min. N (gf)	0.39 (40)
Pretravel, max. mm (inch)	4.0 (.157)
Movement differential, max. mm (inch)	0.6 (.024)
Overtravel, min. mm (inch)	7.0 (.276)
Operating position, mm (inch)	34.3±0.8 (1.350±.031)

**Flexible rod**



AZH1066  
AZH1266

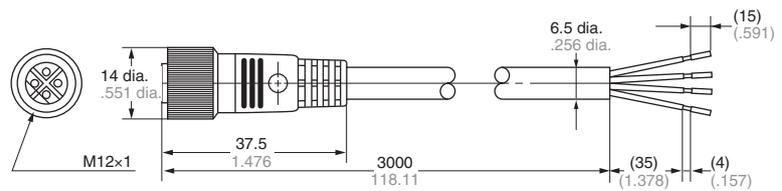


Operating force, max. N (gf)	0.88 (90)
Pretravel, min. mm (inch)	30.0 (1.181)
Overtravel, max. mm (inch)	20.0 (.787)

**Cable connected cord**  
Straight type



AZH28113

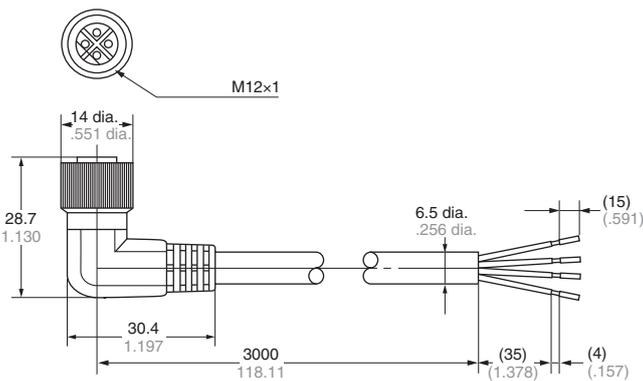


AC type

**Angle type**



AZH28133



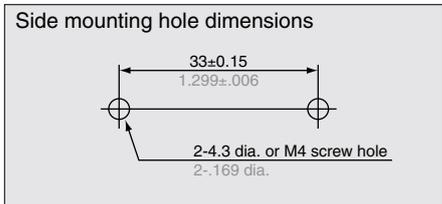
AC type

## HL (AZH)

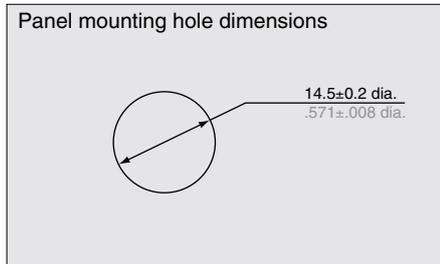
### MOUNTING METHOD

#### Die-cast case

1. Side mounting (all types)  
M4 screw is used for mounting on side.  
Mount it firmly with washer. Mounting torque is 1.37 to 1.57 N.m.  
Remove the hexagonal nut when plunger type is used in side mounting.

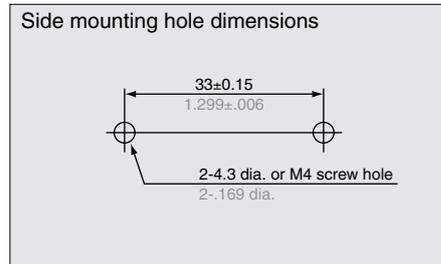


2. Panel mounting (Panel plunger type)  
When the panel mounting type is fixed on the panel, the torque of hexagonal nut is set under 7.84 N.m.



#### Plastic case

Side mounting (all types)  
M4 screw is used for mounting on side.  
Mount it firmly with washer. Mounting torque is 1.18 to 1.47 N.m.



### APPLICABLE WIRE

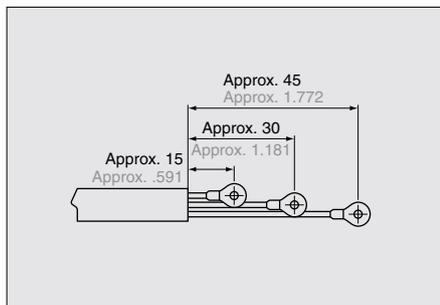
(For screw terminal)

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

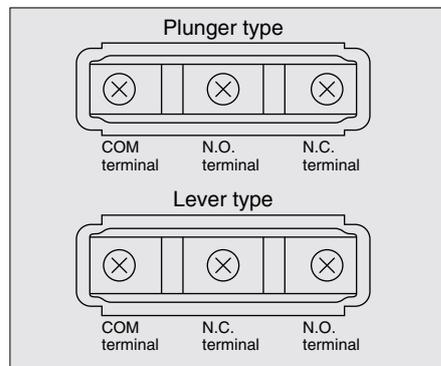
Electric wire name	Applicable wire		
	Wire strand	Conductor	Finished outside diameter
Vinyl cable cord (VCTF)	2-wire	0.75 mm <sup>2</sup> 1.25 mm <sup>2</sup> 2.0 mm <sup>2</sup>	6.6 mm dia. 7.4 mm dia. 8.0 mm dia.
	3-wire	0.75 mm <sup>2</sup> 1.25 mm <sup>2</sup>	7.0 mm dia. 7.8 mm dia.

### WIRING (For screw terminal)

M3 small binding screw is used as a terminal screw. When wiring, don't connect the lead wire to the terminal directly. Fasten the crimped terminals securely applying a tightening torque of 0.20 to 0.29 N.m.

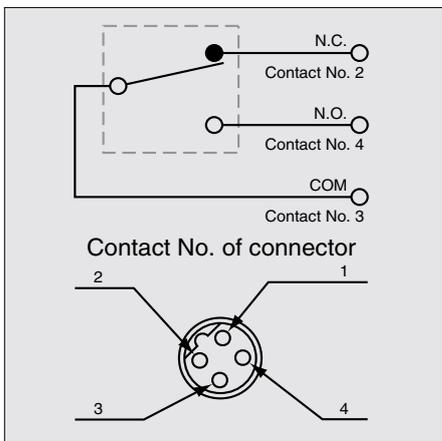


Take note the terminal arrangement is different between plunger type and lever type. The arrangement of N.C. and N.O. is reversed.



### CONNECTOR TYPE

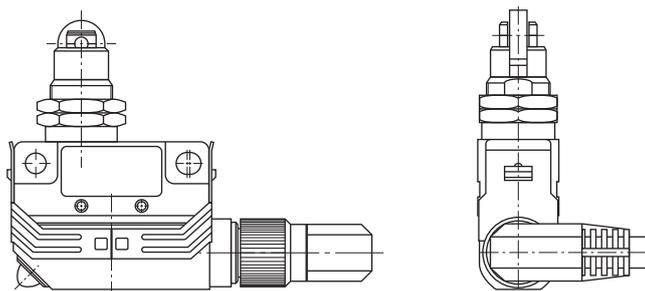
- 1) The cord outlet direction is interchangeable. Refer to "How to change the cord outlet direction".
- 2) Do not remove the connector over 50 times.
- 3) Wiring diagram as shown below.



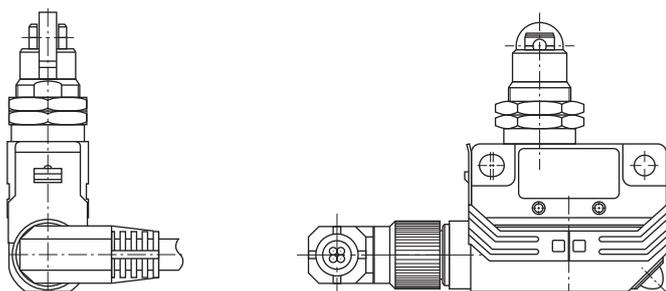
Note: Contact No. 1 is not in use.

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

Cord outlet direction (Right side)



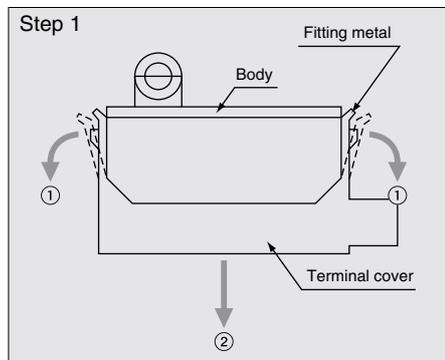
Cord outlet direction (Left side)



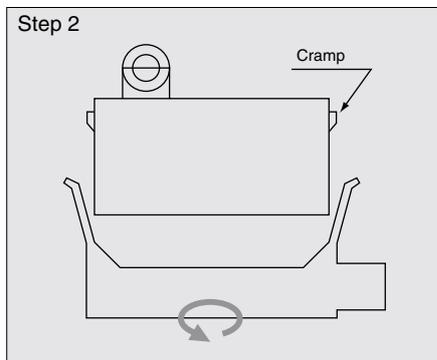
## HOW TO CHANGE THE CORD OUTLET DIRECTION FOR CONNECTOR TYPE

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

### Cord outlet direction (Right side)

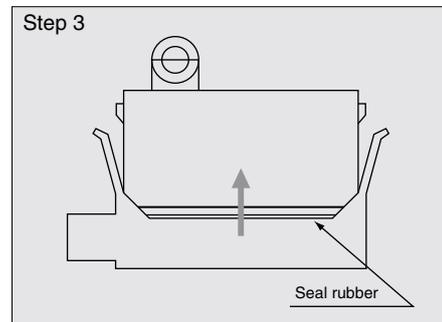


Push down the fitting metal while pulling it horizontal direction.



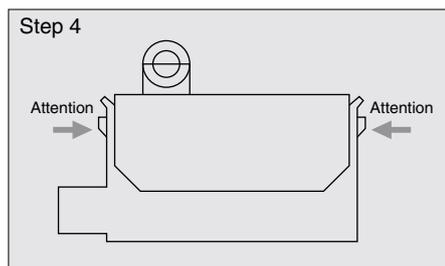
Turn the terminal cover at an angle of 180 degree. Follow the procedure 3.

- Do not pull the terminal cover.
- Do not rotate the terminal cover many times.
- Do not loosen the terminal screw.



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

### Cord outlet direction (Left side)

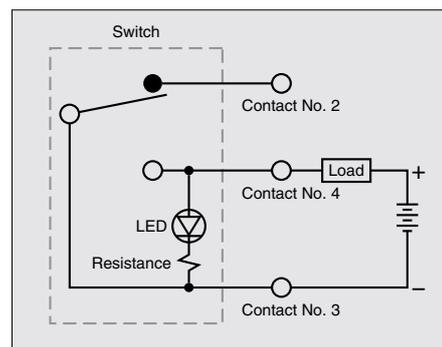


Confirm the fitting metal is on tightly. If it is loosen, it might be cause of the trouble.

## INDICATOR LIGHTING CIRCUIT (Connector type only)

- 1) See the circuit diagram.
- 2) Voltage across the terminal No. 3 and No. 4 shall not exceed 24 V DC, with the indicated polarity in the circuit diagram.
- 3) The LED is turned on when the switch is at a free position. The LED is turned off when the switch operates.
- 4) Applicable power source is 24 V DC. Use it with care on leakage current. The leakage current is approx. 1.5 mA at 24 V DC.

### Internal circuit



## CAUTIONS

### Die-cast case

- 1) Do not expose HL limit switch to hot water (over 60°C 140°F) and in a water vapor environment.
- 2) Avoid the place where organic solvents, strong acid, strong alkali liquid and vapor may attach to the products directly. Prevent using the HL limit switch in place where inflammable or corrosive gas will be generated.

### Plastic case

- 1) Do not use in water or oil. Do not place the switch where it is always exposed to water or dust splash.
- 2) Do not expose HL limit switch to hot water (over 60°C 140°F) and in a water vapor environment.
- 3) Avoid the place where organic solvents, strong acid, strong alkali liquid and vapor may attach to the products directly. Prevent using the HL limit switch in place

- 3) Do not change the operating position by bending the actuator.
- 4) If O.T. is too big, the life of limit switch will be shortened by switching friction. Use it with enough margin of O.T. 70% of O.T. standard value will be good.
- 5) Attach the terminal cover securely to the body with the metal stop latch to the projection of the body.

where inflammable or corrosive gas will be generated.

- 4) Do not change the operating position by bending the actuator.
- 5) 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.
- 6) Attach the terminal cover securely to the body to the extent you can identify the clicking or locking sound.

- 6) Confirmation test in the actual application is highly recommended.
- 7) Do not use the switch in a silicon atmosphere. Care should be taken where organic silicon rubber, adhesive, sealing material, oil, grease or lead wire generates silicon.

- 7) A confirmation test in the actual application is highly recommended.
- 8) 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.

**Panasonic**  
ideas for life

**COMPACT SIZE SIDE  
LIMIT SWITCHES**

**ML (AZ7)  
Limit Switches**



- **Long life**  
More than  $10^7$  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 $\phi$ $\approx$ 1)	Inductive load (cos $\phi$ $\approx$ 0.4)	Motor or lamp load	
				N.C. contact	N.O. contact
125V AC		10A	6A	3A	1.5A
250V AC		10A	4A	1.5A	1A
115V DC		0.4A	0.05A	-	-

**2.Characteristics**

Contact arrangement	1 Form C	
Initial contact resistance, max.	15mΩ* (By voltage drop 6 to 8V DC at rated current)	
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

**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
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.)

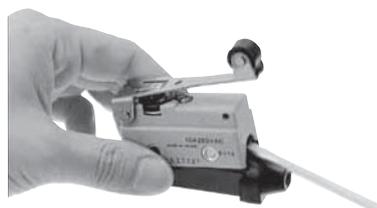
Note) For the operating characteristics, refer to the TECHNICAL INFORMATION.

**5. Protective characteristics**

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

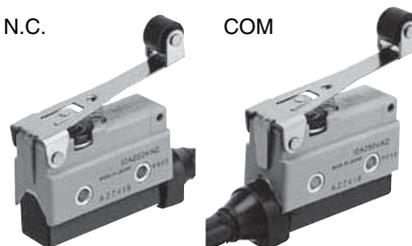
**CAUTIONS**

1. When the switch is to be used in places where oil or is abundant, bore a drain hole in the bottom of the terminal cover.
2. Avoid places where highly acid or alkaline fluids are used or high temperatures prevail.
- 3.Wiring



Standard

- (1) Remove the terminal cover with a ⊖ driver.
- (2) Insert the lead wire through the knock-out of the terminal cover.
- (3) Connect the lead wire to the terminal. When connecting the terminals with the fasten lug, those with the insulation sleeve are recommended.
- (4) The terminal cover can be mounted in both directions.



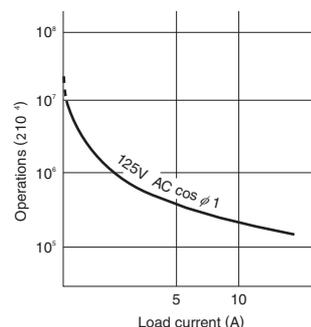
In this case, fasten the terminal cover in the opposite direction.

- For epoxy-sealed terminal types, there are two types by the cord outlet direction; N.C. side and COM side.

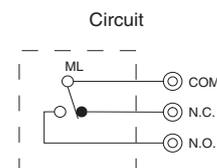
4. Flexible rod type
  - (1) Put the detective object to the tip of plastic part.
  - (2) Avoid pushing the tip of actuating spring in the direction of axis. In the places of oil or water splashes and much dust area, use the limit switch with keeping the actuating spring in the vertical direction.

**DATA**

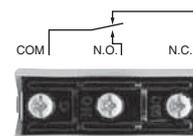
**1. Life curve**



**WIRING DIAGRAM**



Terminal

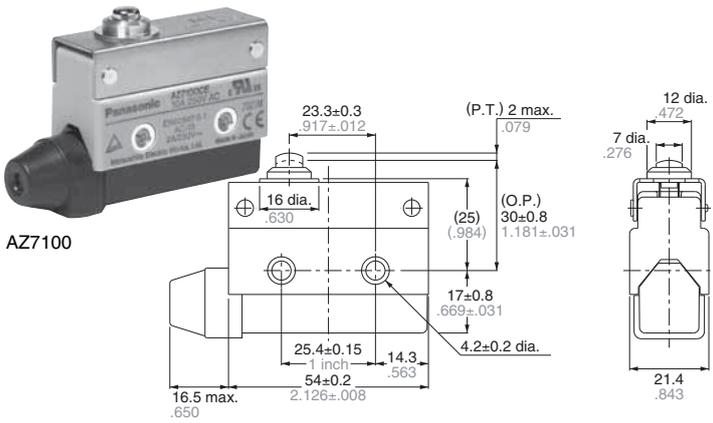


ML (AZ7)

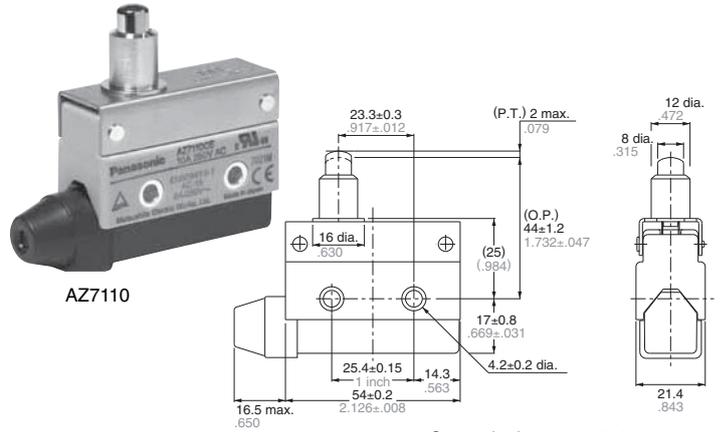
**DIMENSIONS**

mm inch

Short push plunger type

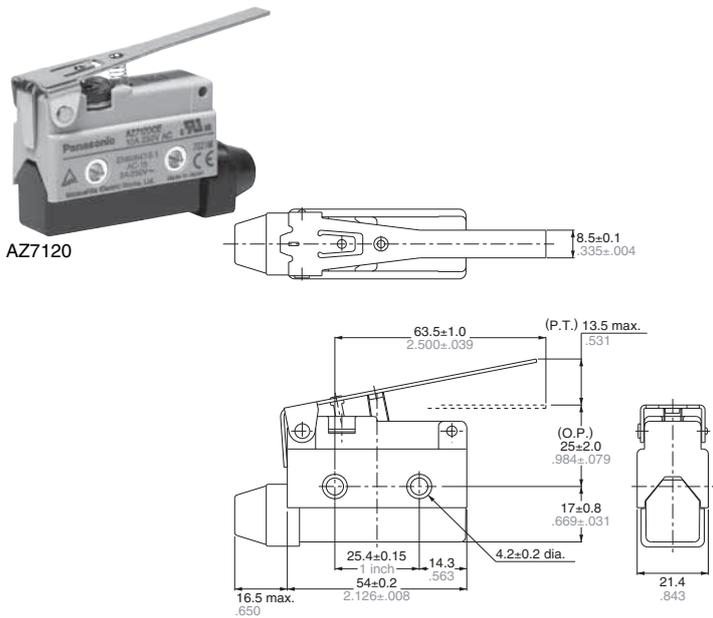


Push plunger type

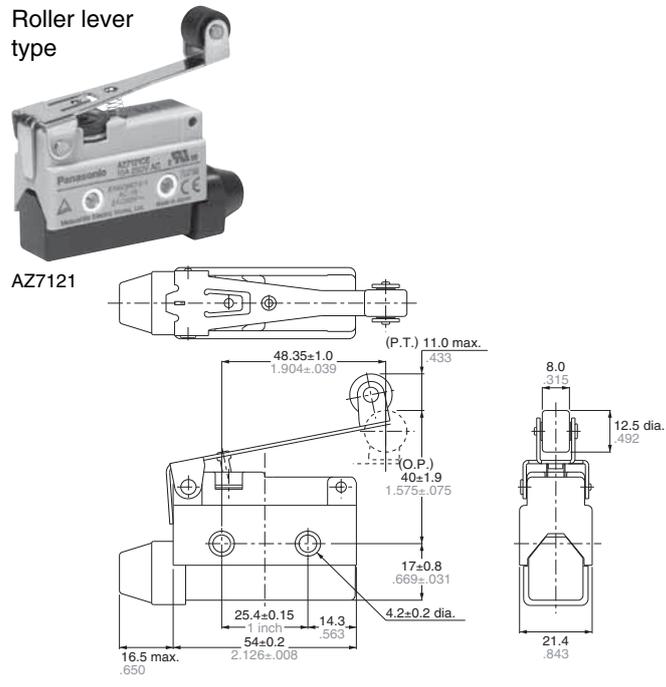


General tolerance: ±0.4 ±.016

Hinge lever type

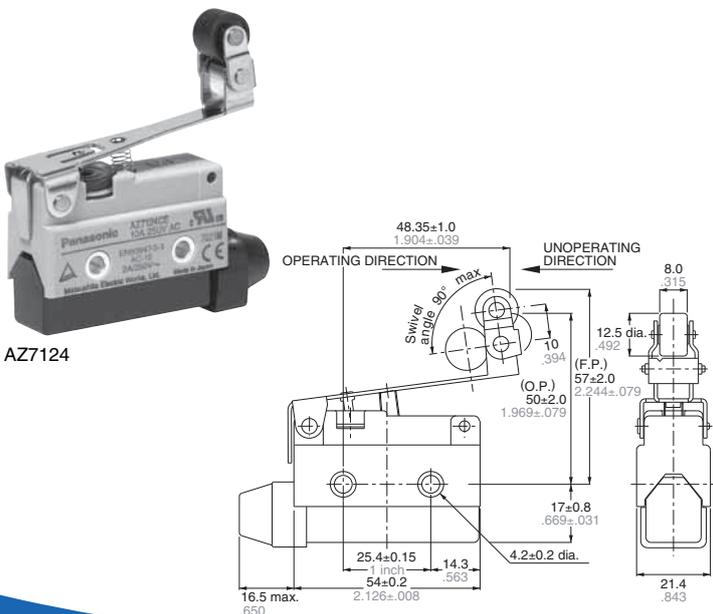


Roller lever type

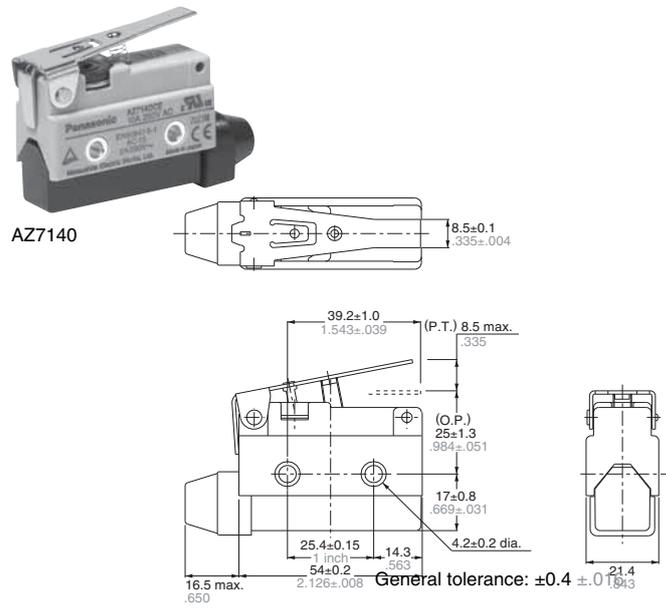


General tolerance: ±0.4 ±.016

One-way roller lever type



Hinge short lever type



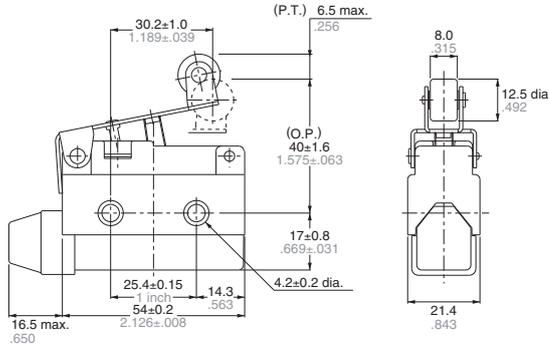
General tolerance: ±0.4 ±.016

ML (AZ7)

Short roller lever type

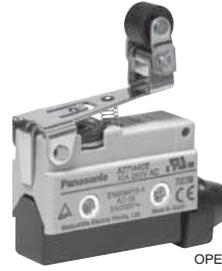


AZ7141

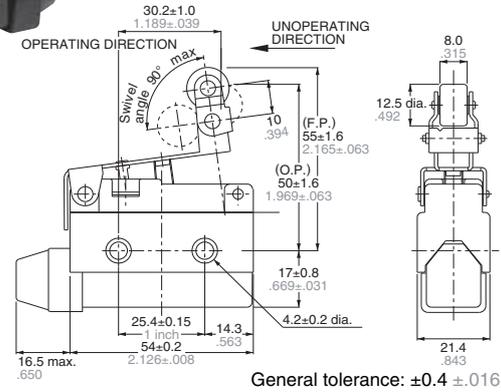


One-way short roller lever type

mm inch



AZ7144

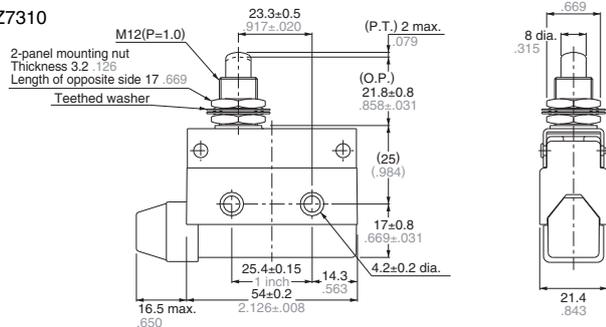


General tolerance: ±0.4 ±.016

Panel mount push plunger type



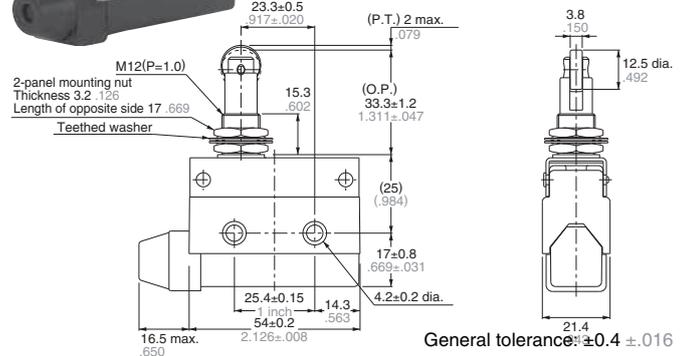
AZ7310



Panel mount roller plunger type



AZ7311

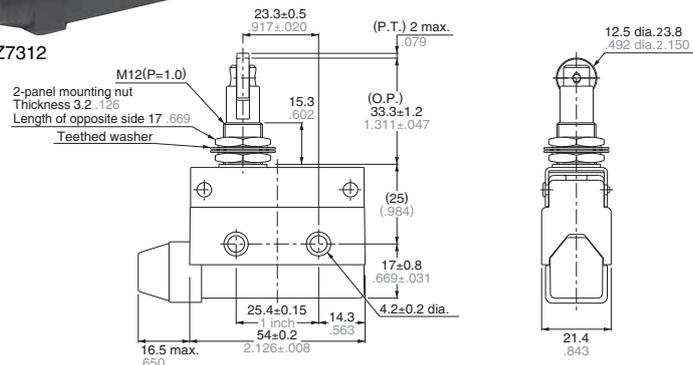


General tolerance: ±0.4 ±.016

Panel mount cross roller plunger type



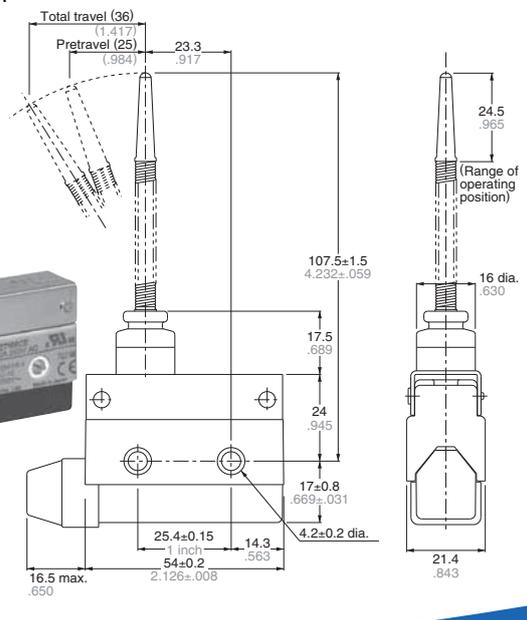
AZ7312



Flexible rod type



AZ7166



General tolerance: ±0.4 ±.016

**Panasonic**  
ideas for life

**COMPACT SIZE  
LIMIT SWITCHES**

**VL (AZ8)  
Limit Switches**



AZ8108CEJ AZ8107CEJ AZ8166CEJ AZ8169CEJ AZ8111CEJ AZ8112CEJ AZ8122CEJ AZ8104CEJ

- 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

VL (AZ8)

**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.		15m Ω (By voltage drop 6 to 8V DC at rated current)
Contact material		Gold clad over silver
Initial insulation resistance (At 500V DC)		Min. 100M Ω
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**

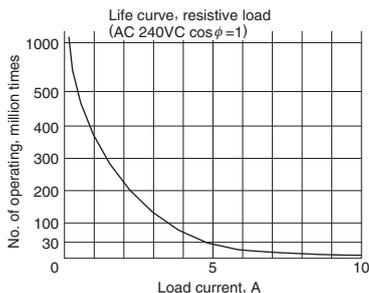
Characteristics	O.F. (N {gf}) max.	R.F. (N {gf}) min.	Pretravel (P.T.), max. mm inch	Movement Differential (M.D.), max. mm inch	Overtravel (O.T.), min. mm inch	Totaltravel (T.T.), min. mm inch
Actuator						
Push plunger	8.83 {900}	1.47 {150}	1.5 .059	0.7 .028	4 .028	5.5 .217
Roller plunger						
Cross 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}*	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.

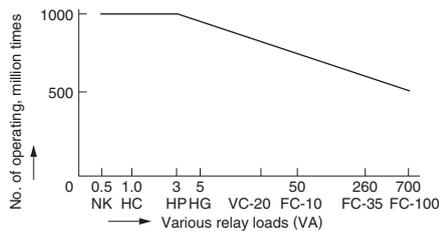
Notes 1. Keep the total travel values in the specified range. Otherwise the actuator force may rise to several times the operating force, resulting in a mechanical failure or much shorter service life.  
2. For the operating characteristics, refer to the TECHNICAL INFORMATION.

**DATA**

**1. Life curve**



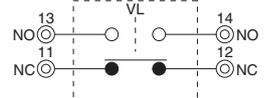
**2. Actual load life curve (relay coil load)**



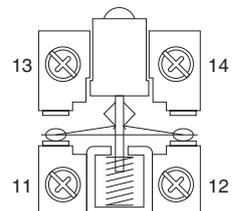
Note: The FC magnetic contactor series is 200V AC. The K is 2 Form C 24V DC type.

**WIRING DIAGRAM**

**Output circuit**



**Terminal**



**VL (AZ8)**

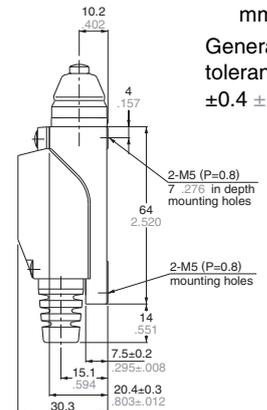
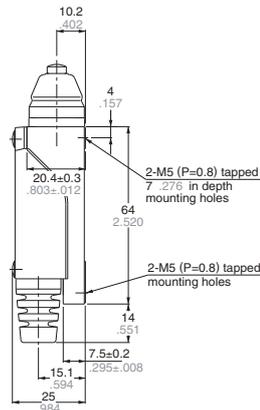
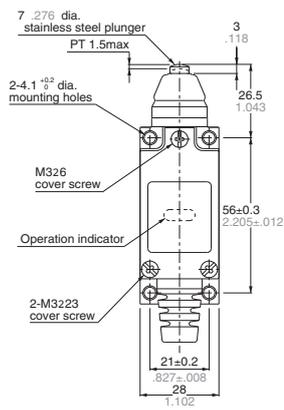
mm inch

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

**DIMENSIONS**

Push plunger type

Standard type  
AZ8111CEJ

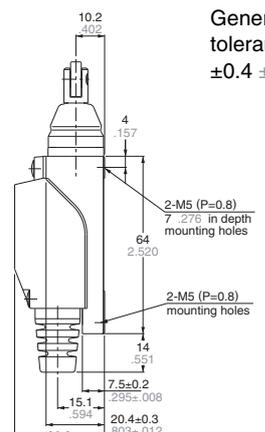
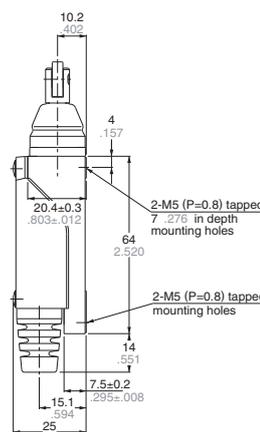
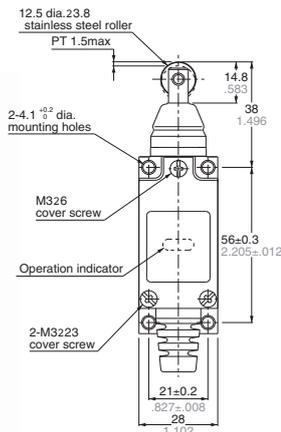


(Standard type)

(With Neon lamp)

Roller plunger type

Standard type  
AZ8112CEJ



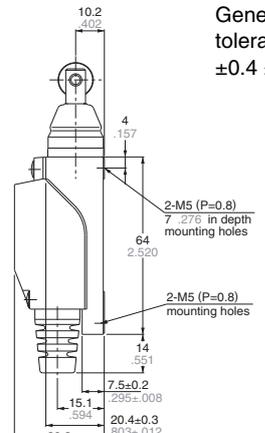
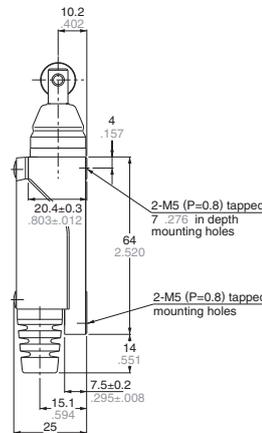
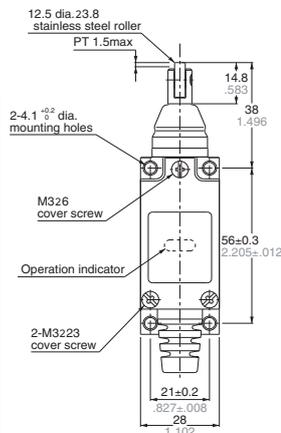
(Standard type)

(With Neon lamp)

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

Cross roller plunger type

Standard type  
AZ8122CEJ



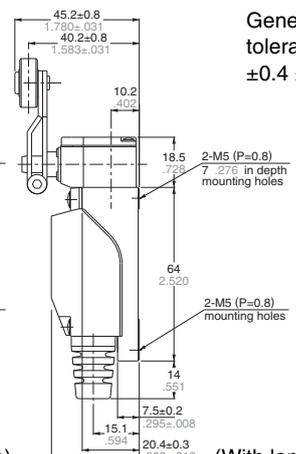
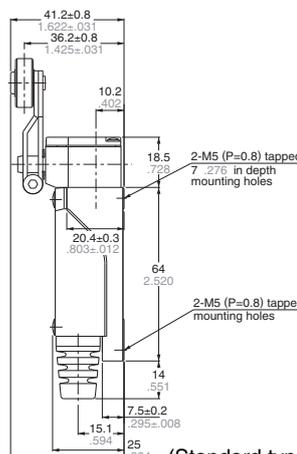
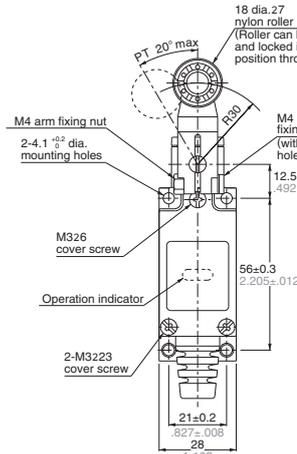
(Standard type)

(With Neon lamp)

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

Roller arm type

Standard type  
AZ8104CEJ



(Standard type)

(With lamp)

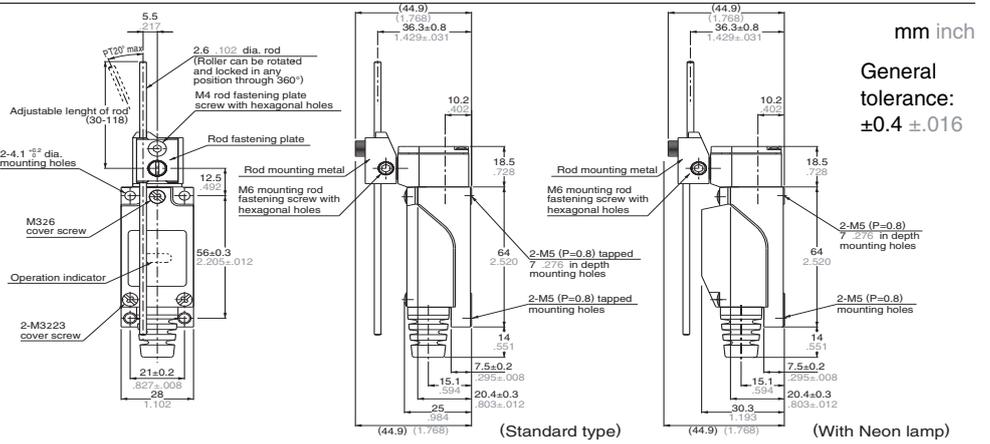
General tolerance:  $\pm 0.4 \pm .016$

## VL (AZ8)

Adjustable rod type

Standard type

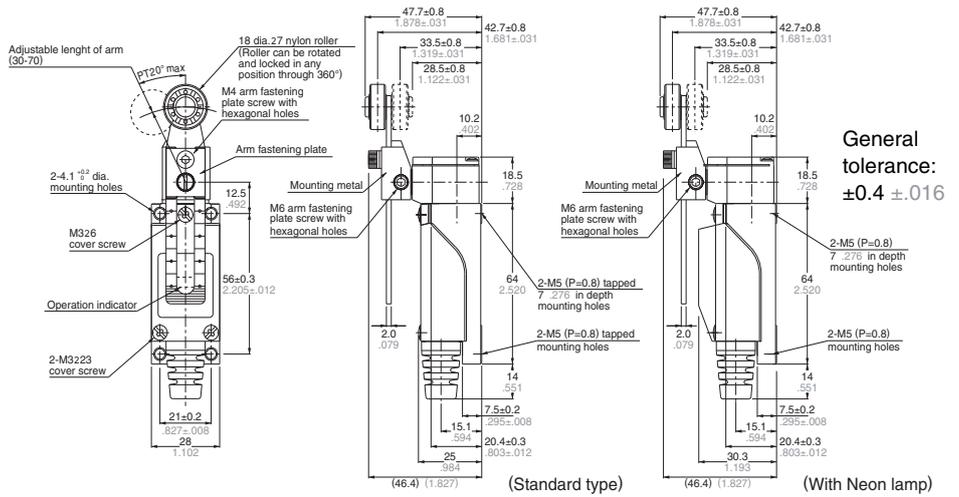
AZ8107CEJ



Adjustable roller arm type

Standard type

AZ8108CEJ

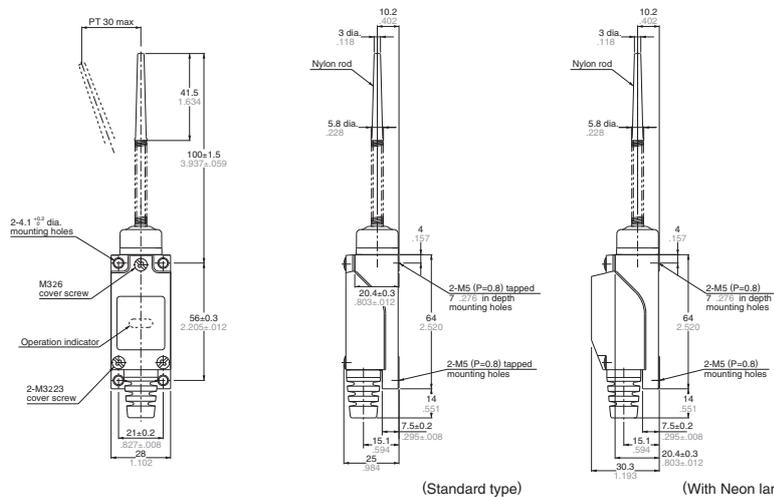


(Length of arm can be adjustable within 30 to 70mm  
1.181 to 2.756inch by 1mm .039inch pitch)

Flexible rod type

Standard type

AZ8166CEJ

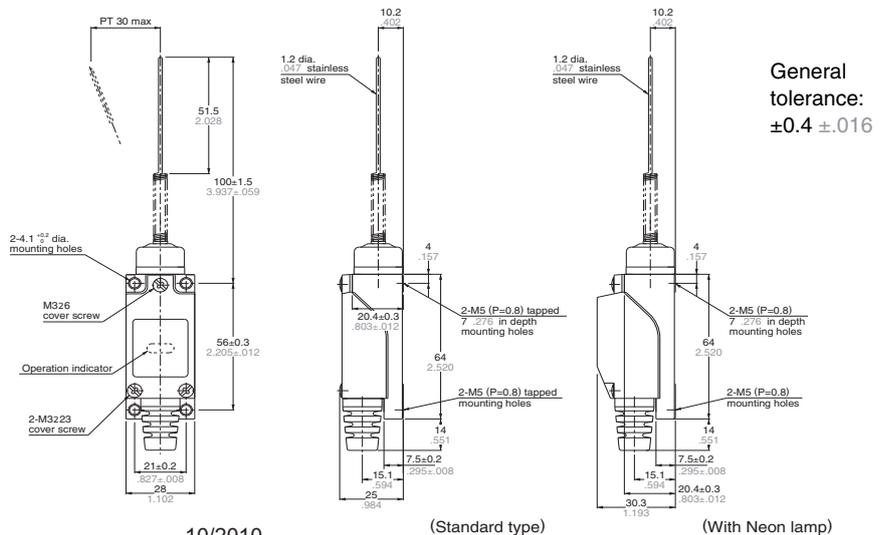


(Should be used with less than 50mm 1.969inch of T.T.)

Spring wire type

Standard type

AZ8169CEJ



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

**OPTION**

**VL Conduit Adaptor**



AZ8801

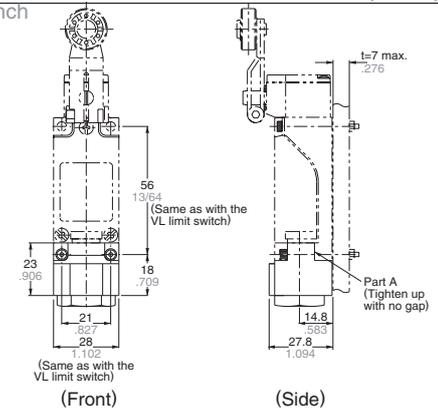
**Applicable wire**

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.)

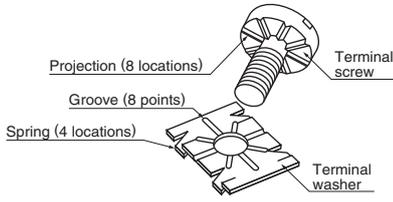
mm inch



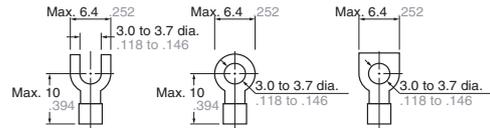
**WIRING**

mm inch

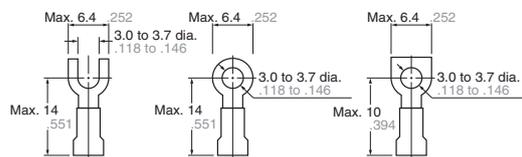
- Insulation distance more than 6.4mm .252inch for wiring and live parts
- Special assembly screws
- Grounding is available



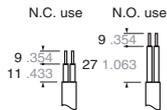
**Applicable fasten terminal**



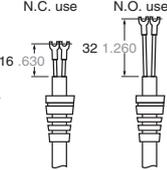
**With insulated grip**



**Cable treatment Ordinary terminal**



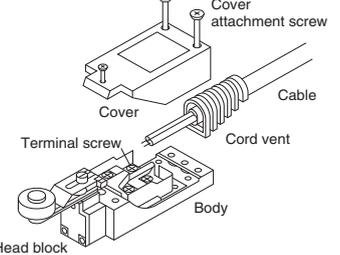
**Fasten terminal**



**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**

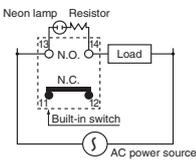
**1. Spring type**

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.)

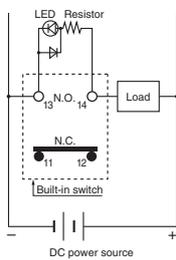
2) When connecting load to N.C. side: When connecting switch is at free position, the indicator turns off, and when the switch operates, the indicator is lit. (Use the lamp holder, changing it direction by 180°.)

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°.)

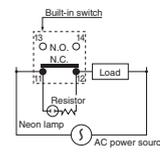
**(With neon lamp)**



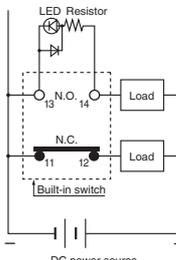
**(With LED)**



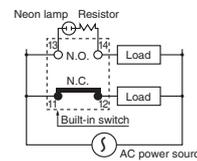
**(With neon lamp)**



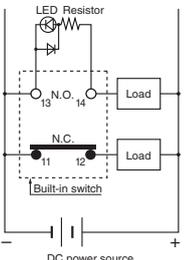
**(With LED)**



**(With neon lamp)**



**(With LED)**

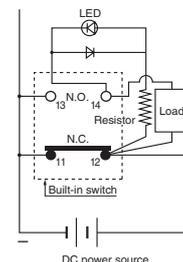


**2. Lead wire type (only for types with LED)**

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.)

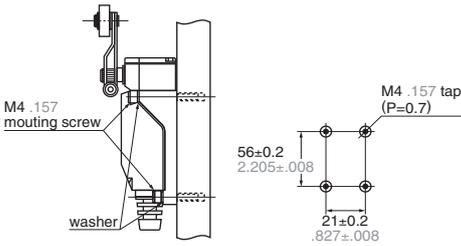
- More loads than for one circuit cannot be controlled.
- There is no leakage current.



## VL (AZ8)

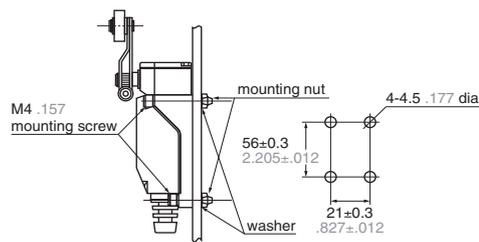
### MOUNTING DIMENSIONS

Surface mounting



Depth of screw holes > 15mm .591inch

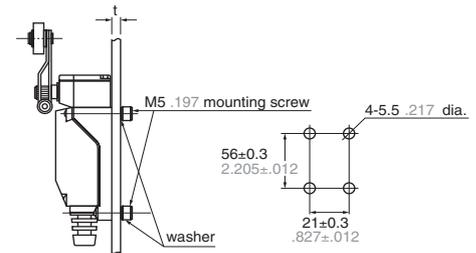
Through hole mounting



Thickness of panel < 5mm .197inch

Rear mounting

mm inch

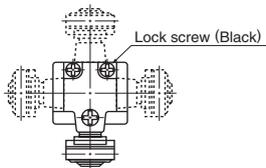


Length of bolt < panel thickness t+7mm .276inch

### 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.

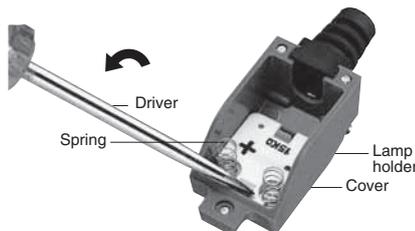
3) After changing the direction of the indicator holder, put the cover on it in such a way that the spring touches the top of the terminal screw.

(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.

**Panasonic**  
ideas for life

**COMPACT SIZE  
LIMIT SWITCHES**

**DL Mini (AZD1)  
Limit Switches**



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

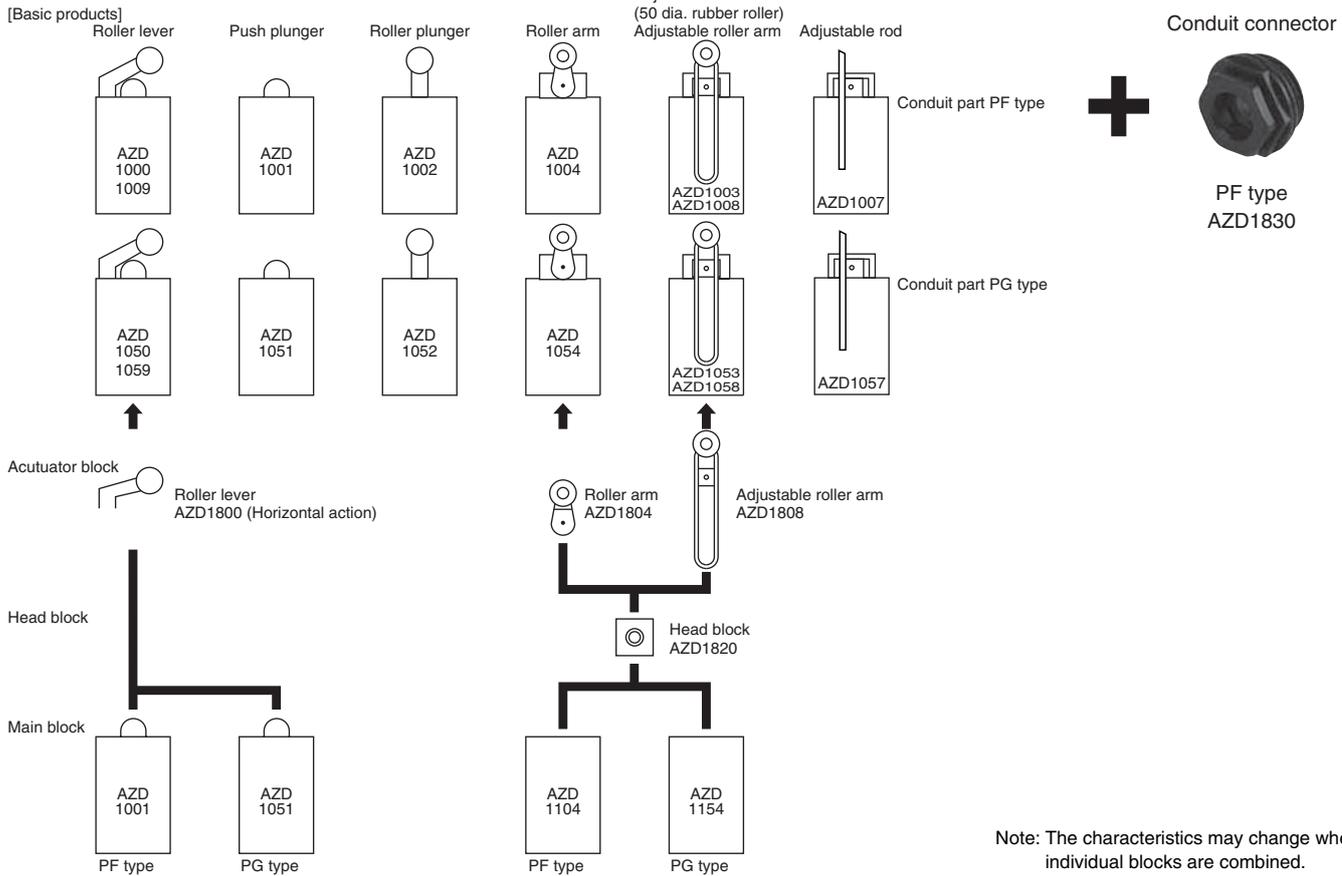
Product name		Part No.	
Type of actuators	Roller lever	AZD1800	
	Roller arm	AZD1804	
	Adjustable roller arm	AZD1808	
Head block		AZD1820	
Main block	For plunger	PF type	AZD1001
		PG type	AZD1051
	For arm type	PF type	AZD1104
		PG type	AZD1154

## FOREIGN STANDARDS

Standards	Applicable product	Part No.
UL	File No. : E122222 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	

# DL (AZD1)

## PRODUCT COMBINATION



## 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	Operating 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

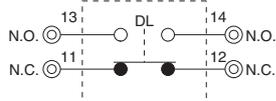
Note: The above values of adjustable roller arm shows the values when roller length is set at 26mm same as roller type.

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



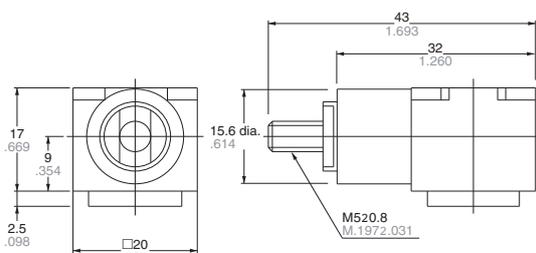
## DIMENSIONS

mm inch

Head block



AZD1820

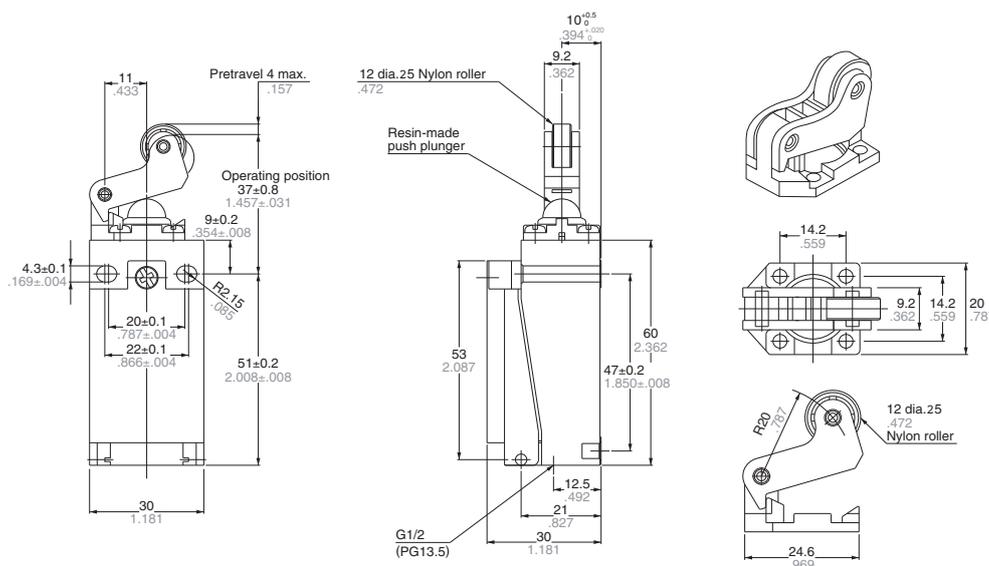


General tolerance:  $\pm 0.4 \pm .016$

Roller lever type



AZD1000  
AZD1050

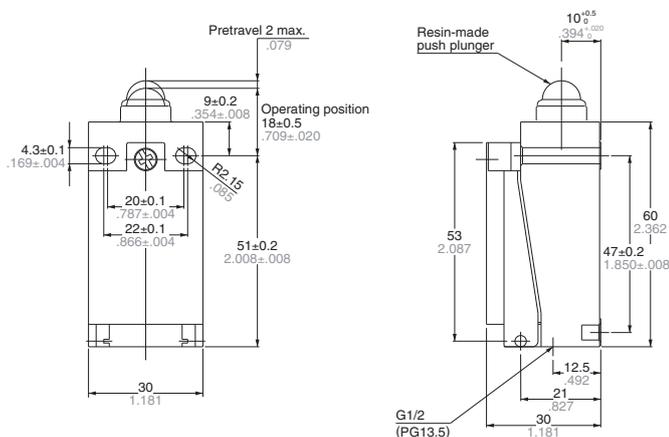


General tolerance:  $\pm 0.4 \pm .016$

Push plunger type



AZD1001  
AZD1051



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

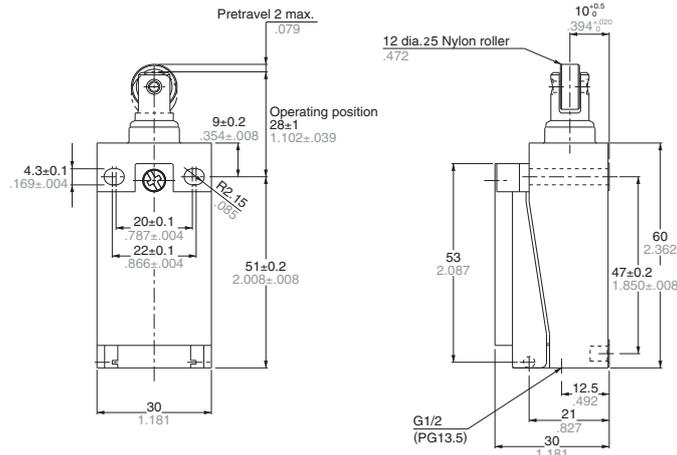
## DL (AZD1)

### Roller plunger type

mm inch



AZD1002  
AZD1052

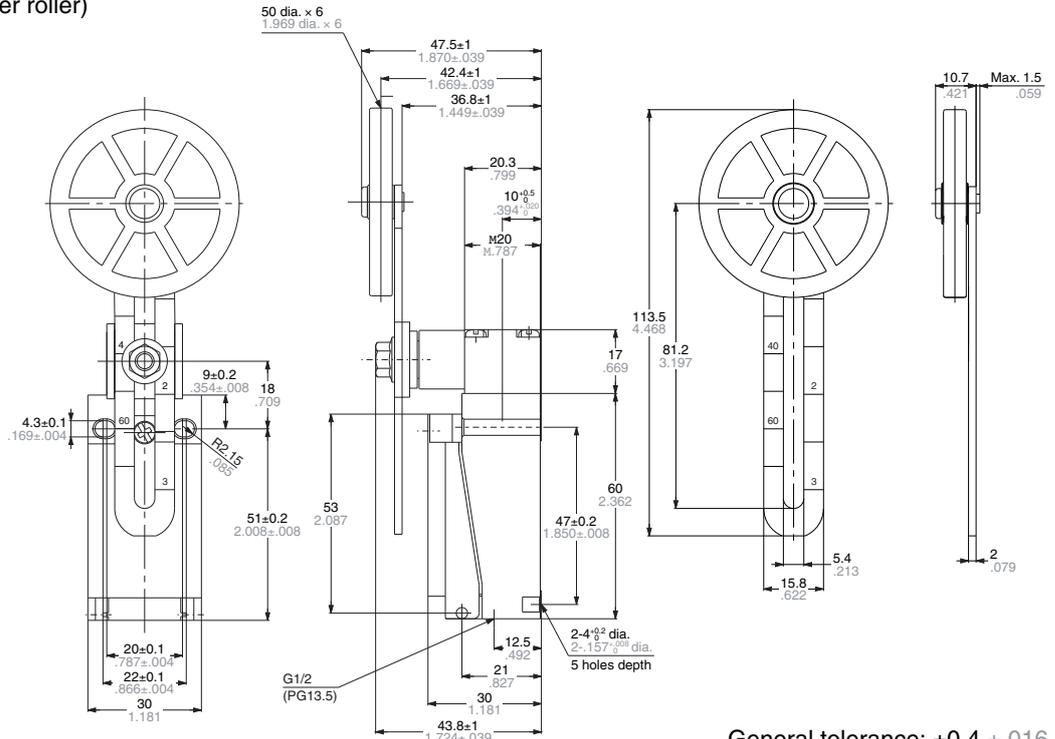


General tolerance: ±0.4 ±.016

### Adjustable roller arm (50 dia. rubber roller)



AZD1003  
AZD1053

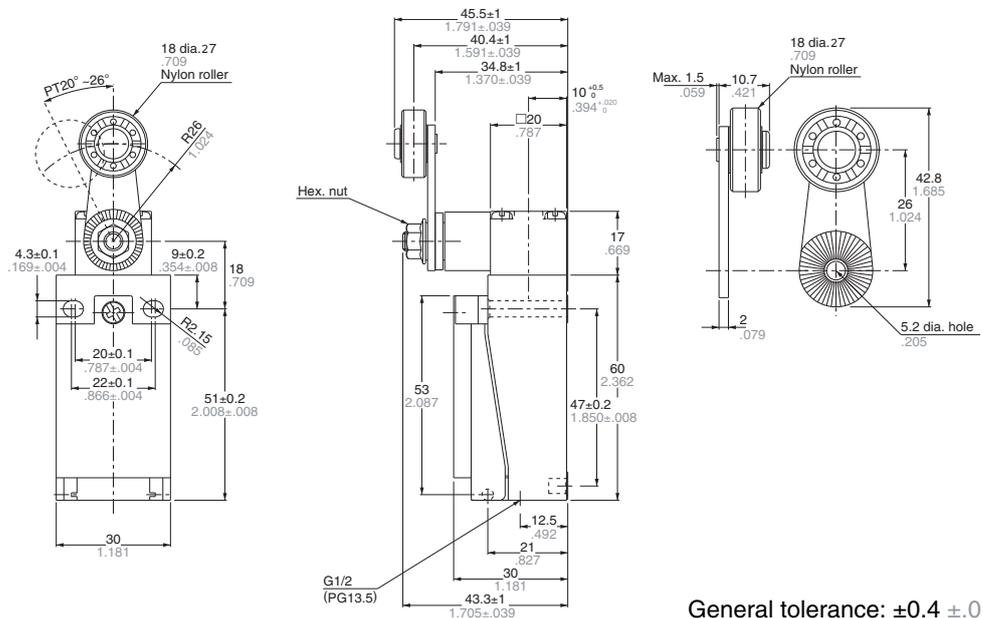


General tolerance: ±0.4 ±.016

### Roller arm type



AZD1004  
AZD1054



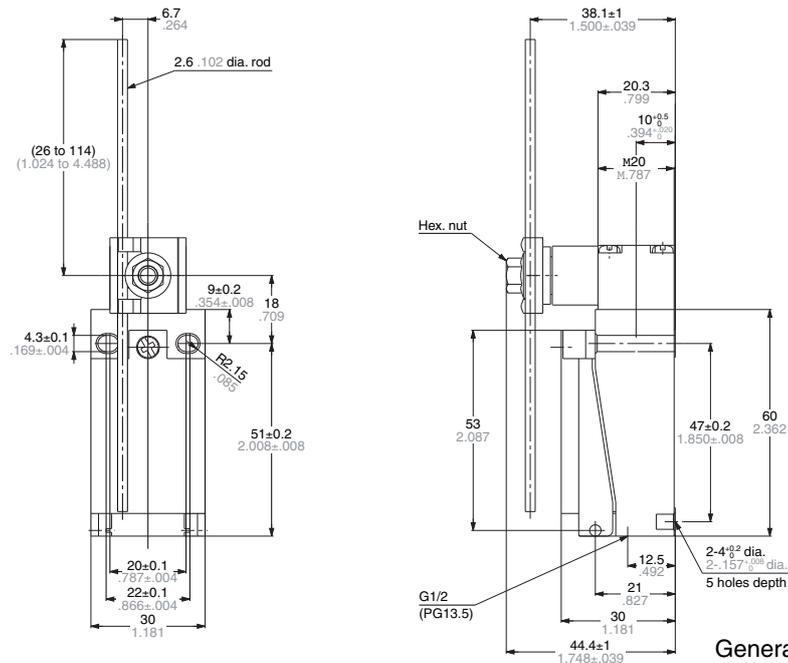
General tolerance: ±0.4 ±.016

Adjustable rod (2.6 dia.)

mm inch



AZD1007  
AZD1057

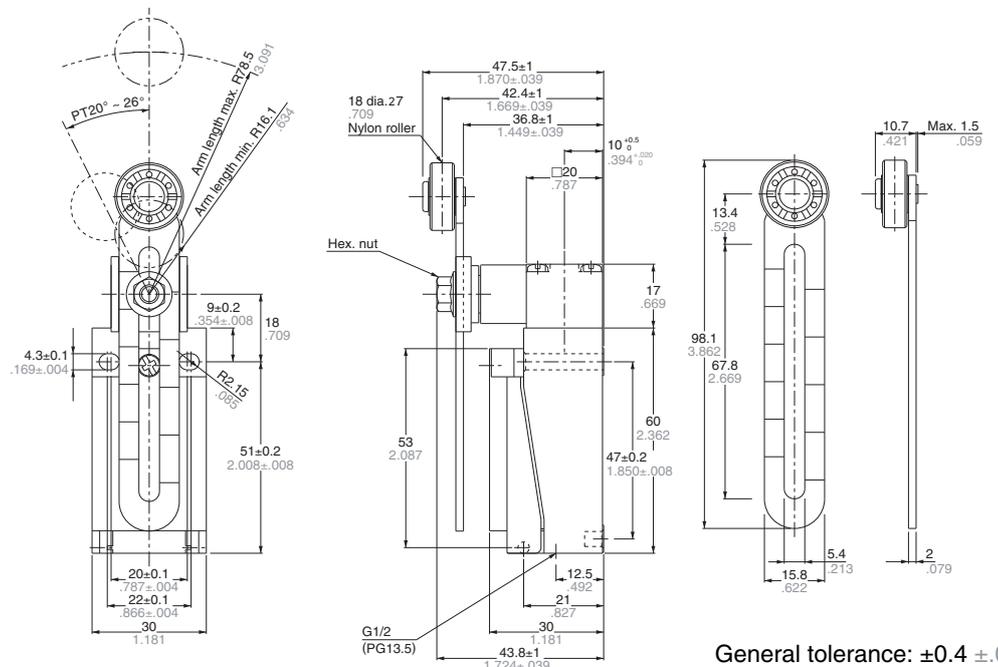


General tolerance: ±0.4 ±.016

Adjustable roller arm type



AZD1008  
AZD1058

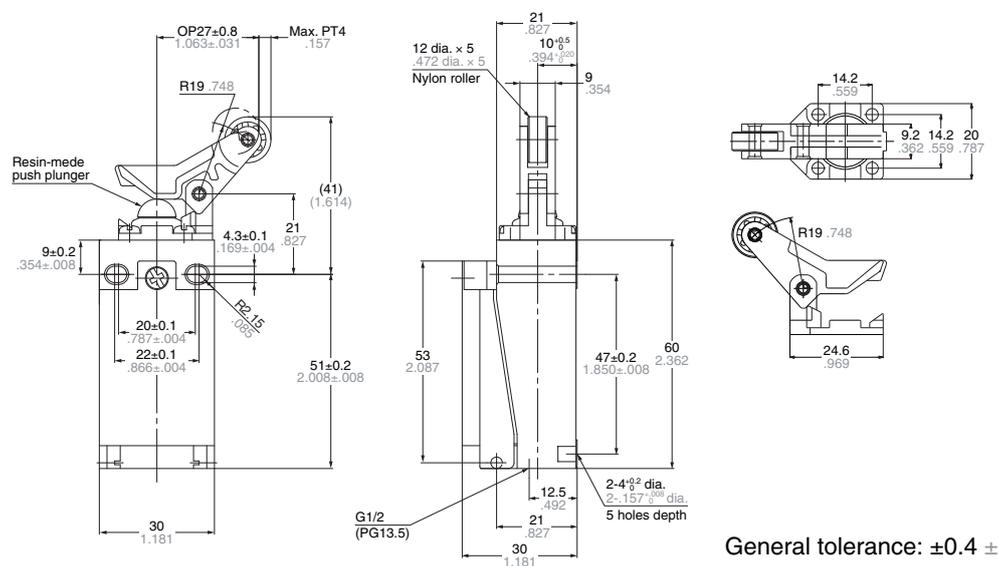


General tolerance: ±0.4 ±.016

Roller lever (vertical action)



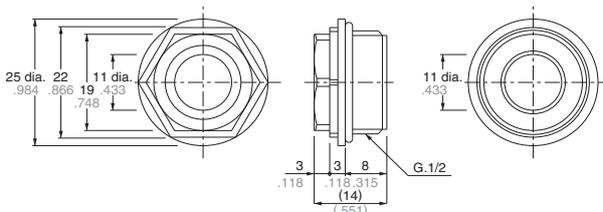
AZD1009  
AZD1059



General tolerance: ±0.4 ±.016

## DL (AZD1)

Conduit connector (PF type)



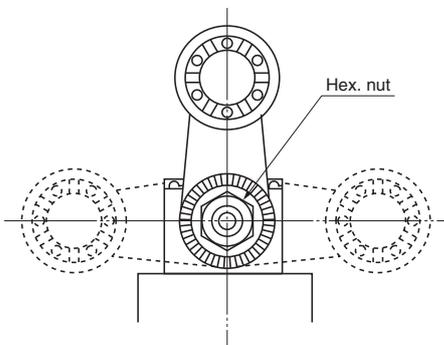
mm inch

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

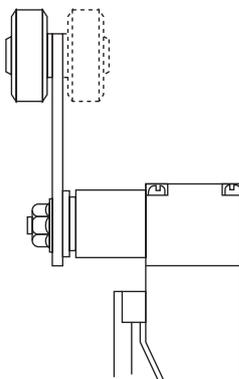
The roller arm of the arm types (AZD1003, AZD1004, AZD1008, AZD1053, AZD1054 and AZD1058) can be set in any position at 15° intervals. Loosen the arm fastening hex. nut, reposition the arm, and retighten the hex. nut. When doing so tighten the hex. nut with the arm secured to the unit. Tightening without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



### Roller Direction

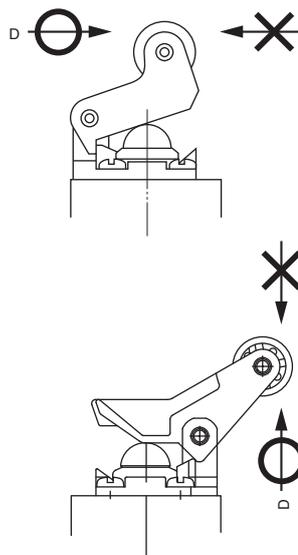
The roller of the arm types (AZD1004, AZD1008, AZD1054 and AZD1058) can be mounted on the front and rear (dotted line in the figure) sides of the switch, as shown below. (Positioned on the front side at delivery.)

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.



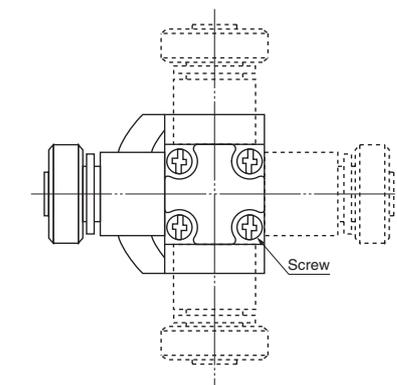
### Roller Lever Direction

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

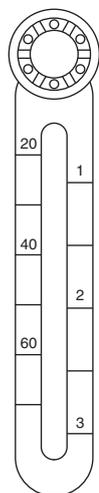
The head of the arm types (AZD1003, AZD1004, AZD1008, AZD1053, AZD1054 and AZD1058) can be set in any of four directions at 90° intervals, but not in any other intermediate directions. Loosen four screws on the upper side of the head, and set the head in a desired direction, and retighten them at a torque 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).



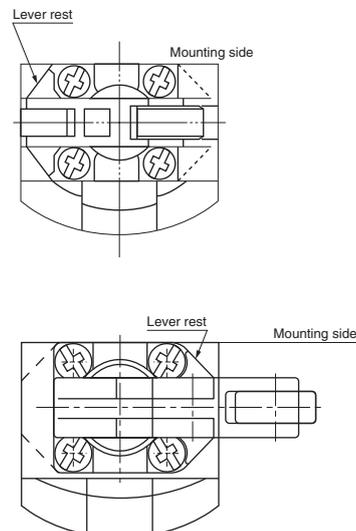
### Adjustable Arm Length

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

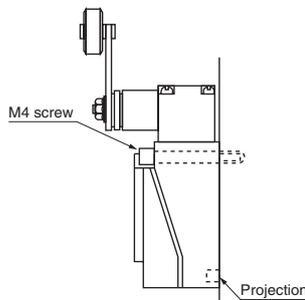
For the adjustable roller arm type, the cover will not open and close since it contacts the adjustable arm. Either extend the arm fully or remove the arm, then open or close the cover. Also, the same is true of the variable rod types (AZD1007 and AZD1057).

## Adjustable Rod Length

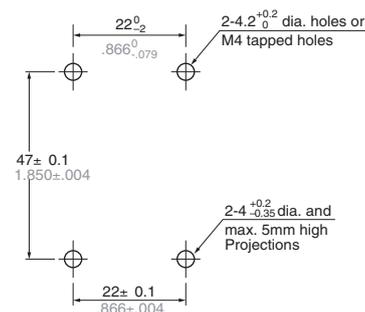
To adjust the length of the variable rod, slightly loosen the hex. nut that is securing the rod and then change the length. After making the change, tighten the hex. nut keeping within a tightening torque of 0.98 and 1.37 N•m. Over tightening might damage the rod presser plate.

## 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.

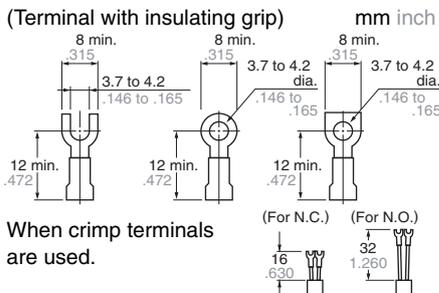


### • Mounting dimensions



## CAUTIONS

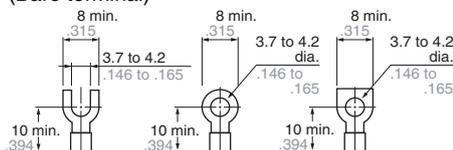
- 1) This model uses silver terminals. Therefore, if used at relatively low frequencies for long periods of time, or if used with very small loads, the oxidization that forms on the contact surfaces will not wear away and eventually cause improper contact. For such applications, use limit switches with 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

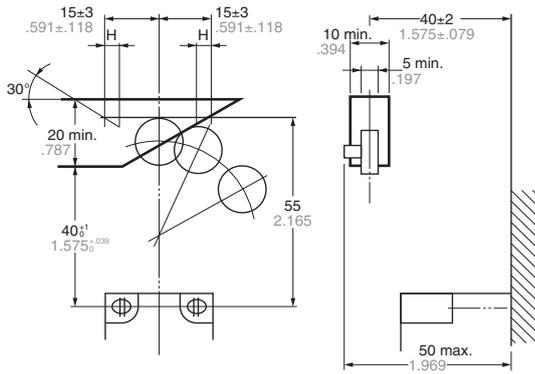
DL (AZD1)

**DESIGN OF OPERATING DOG**

mm inch

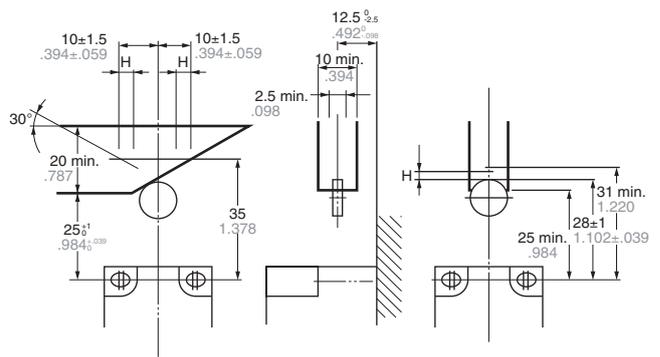
Roller arm type

(H: Hysterisis)



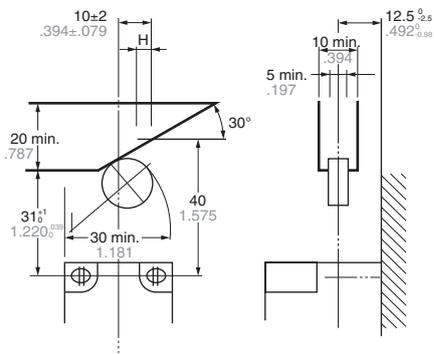
Roller plunger type

(H: Hysterisis)



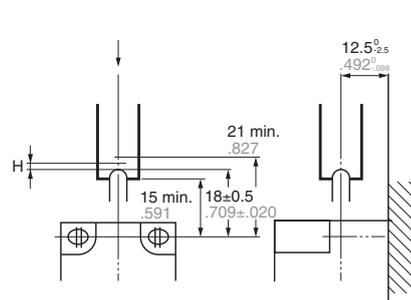
Roller lever type

(H: Hysterisis)



Push plunger type

(H: Hysterisis)



**Panasonic**  
ideas for life

**SAFEGUARDED BY MAGNET  
BUILT-IN DETECTOR SWITCH**

**Magnetlimit**



- 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	1a (ON when gate is closed)	Yellow	3kg type (29.4N {3kgf}) (Note: 1)	-	AZC11013Y
		Brown		-	AZC11013A
		Gray		-	AZC11013H
Magnetlimit 1 Form B	1b (ON when gate is open)	Yellow		-	AZC11113Y
		Brown		-	AZC11113A
		Gray		-	AZC11113H
Options	Metal plate	Metal plate (13mm × 60mm × 1.6mm .512inch × 2.362inch × .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
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.

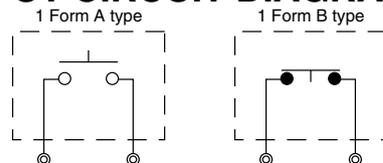
**2. Switch operating features**

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.

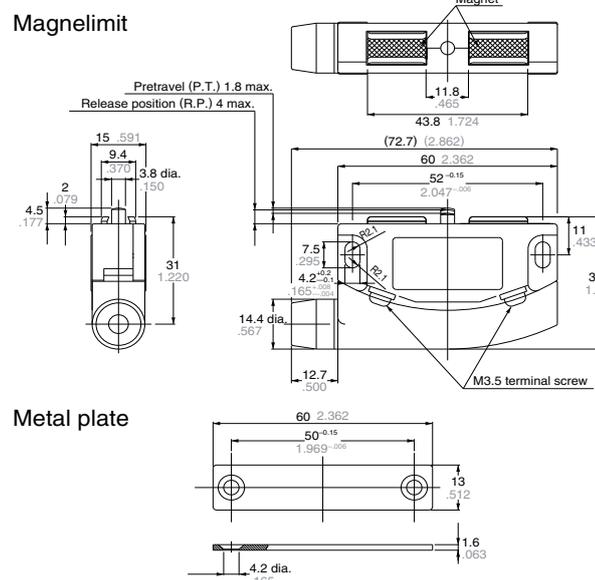
**3. Capabilities overview**

Electrical capabilities	Insulation resistance (initial)	Min. 100 $\triangleright$ (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.
Sustainability (when using the enclosed metal plate)		1kg (9.8N {1kgf}), 3kg (29.4N {3kgf}), 5kg (49N {5kgf})

**OUTPUT CIRCUIT DIAGRAM**



**DIMENSIONS** mm inch

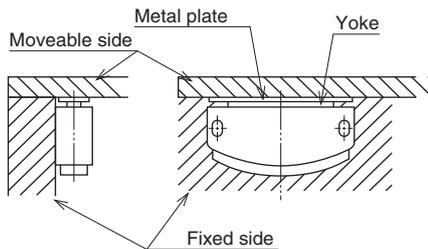


## Magnelimit

### METAL PLATE ATTACHMENT

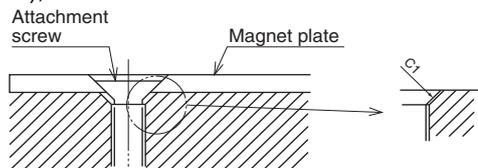
#### • Attaching the main unit

- 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.)
- When moveable parts such as the gate are closed, ensure that the yoke and metal plate are flush with each other.

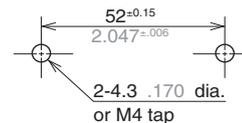


#### • Attaching the metal plate

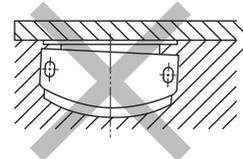
- Using an M3 dish screw, attach to the side opposite from the yoke. Pay particular attention that the head of the attached screw does not protrude further than the surface of the metal plate (if using wooden screws, a call of 2.7 is optimum.)
- If the adhesive side is magnetic (metal plate), the adhesion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



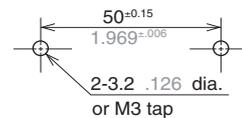
#### Unit attachment hole processing dimensions



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)

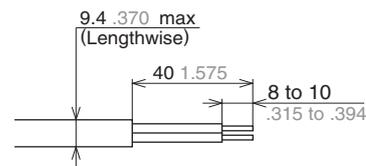
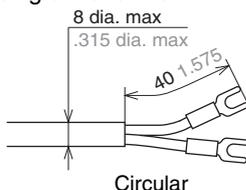
### SUITABLE WIRING

#### • 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

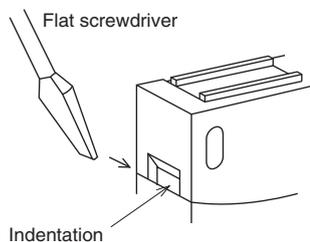
Refer to the diagram below for the wiring processing dimensions



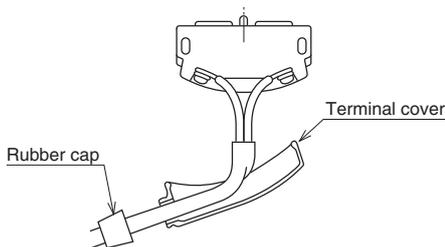
Flat (VVF 2 cores, conductor radius 1.6 .063 dia)

### WIRING

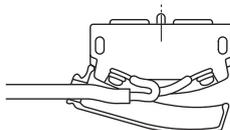
- Terminal uses a M3.5 angle washer attachment.
  - During wiring work, do not connect the lead wire directly to the terminal, but via a crimp contact. However, this excludes single wiring.
  - Wiring by solder should be avoided.
- Wiring method  
Insert a flat screwdriver into the indentation of the product side, and remove the terminal cover.



- 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).



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



### CAUTIONS FOR USE

- Because the magnelimit is not water-proof, avoid using in areas where it may be splashed with either water or oil. Also, avoid using in locations where dust may accumulate.
- Do not use in atmospheres where the unit may directly come into contact with any kind of organic solvent, strong acid or alkaline liquids, or combustible or corrosive gasses.
- Avoid using in silicon environments such as organic silicon-based rubber, solvents, sealants, oil, grease, or wiring.
- The moveable parts on the magnelimit such as the gates are equipped with a stopper, so avoid attachments that require them to bear the full load.
- In order to improve reliability under actual working conditions, check the quality under as close to actual working conditions as possible.
- This magnelimit has a built-in electro-magnet. 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.

# SAFETY STANDARDS OVERVIEW

## 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

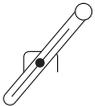
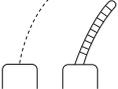
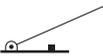
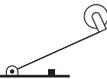
### Pilot Duty C300

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
HL Limit Switches	Die-cast case standard load model	E122222	5A 250V AC Pilot duty B300	LR55880	5A 250V AC Pilot duty B300	J9650514	DC-12 1A 30V-
	Die-cast case low level load model (includes connector type)		0.1A 30V DC		0.1A 30V DC		DC-12 0.1A 30V-
	Plastic case standard load model		5A 250V AC Pilot duty B300		5A 250VAC Pilot duty B300	J9650515	AC-15 2A 250V~ DC-12 1A 30V-
	Plastic case low level load model		0.1A 30V DC		0.1A 30V DC		DC-12 0.1A 30V-
ML Limit Switches	Standard model	E122222	10A 250V AC	LR55880	10A 250V AC	J9551204	AC-15 2A 250V~
	Terminal mold model	-	-	-	-	-	-
	With lamp	-	-	-	-	-	-
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~
	With neon lamp		-		-	-	-
DL Limit Switches		E122222	6A 380V AC Pilot duty A300	LR55880	6A 380V AC Pilot duty A300	J9551205	AC-15 2A 250V~
Magnetlimit		E122222	5A 250V AC Pilot duty B300	LR55880	5A 250V AC Pilot duty B300	-	-

# Actuator selection

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

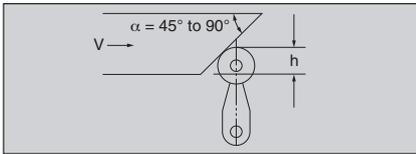
# CAUTIONS FOR USE

## Design of operating dog and operating speed

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

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

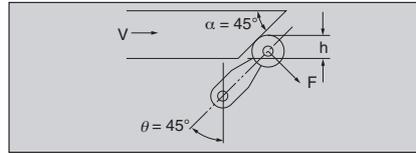
### 1. $V \leq 0.2m/s$



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

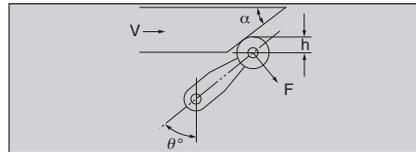
When  $V \leq 0.2m/s$ , set the arm to perpendicular and set the arm rise angle to between 45° and 90°. If the dog rise angle is reduced, the maximum tolerable speed is increased. As a rule,  $\alpha = 45^\circ$  is optimum.

### 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.

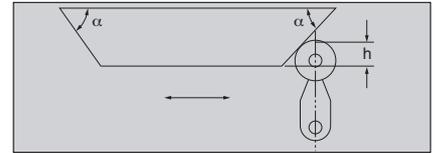
### 3. $0.5m/s < V \leq 2m/s$



$\alpha$	$V_{max}$ (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 ( $\theta = 90^\circ - \alpha$ )

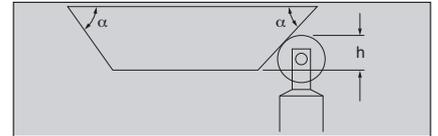
### 4. Overriding the dog ( $V \leq 0.2m/s$ )



$\alpha$	$V_{max}$ (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.

### 5. Roller plunger type



$\alpha$	$V_{max}$ (m/s)	$V_{max}$ (m/s)
20°	0.5	(0.5 to 0.7) T.T.
30°	0.25	(0.6 to 0.8) T.T.

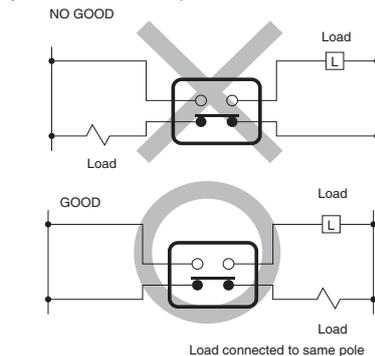
Even if overriding the dog, set the forwards and rearwards motion exactly the same, and avoid any settings that make the actuator accelerate rapidly from the dog.

## Protection circuit

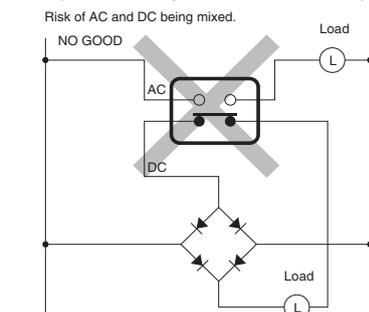
- 1) The ON/OFF circuit for the guidance load may suffer contact damage due to surges or inrushes when the power is turned either ON or OFF. Consequently, insertion of a protective circuit as per the following diagram is recommended, in order to protect the contacts.

Circuit	Caution for use
	(1) r must be a minimum of 10Ω; (2) When using AC power: Q 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. $r \approx R$ $C: 0.1 \mu F$
	(1) Dedicated DC use. (2) AC is impossible
	Can be used with both AC and DC as appropriate.

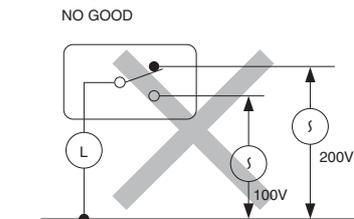
- 2) Do not connect either irregular poles or power sources to a switch contact. Power connection examples (irregular pole connection)



### 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

## Cautions for use

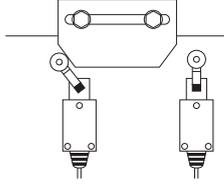
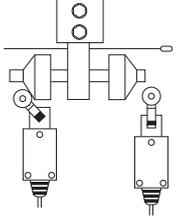
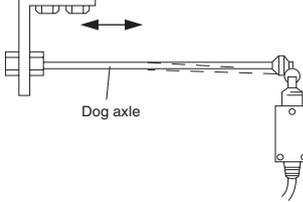
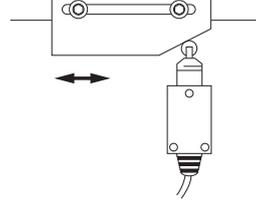
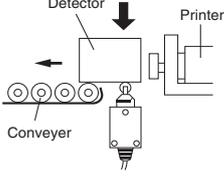
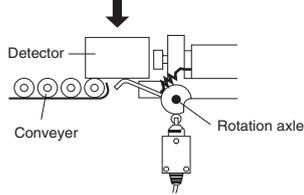
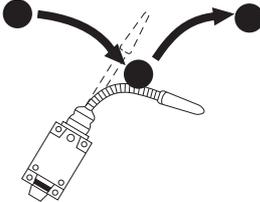
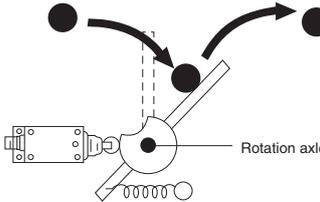
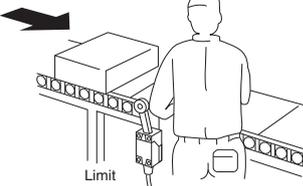
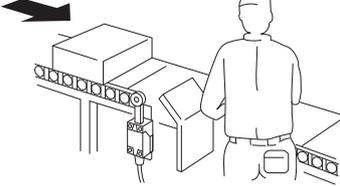
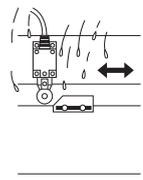
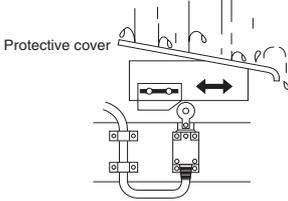
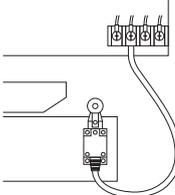
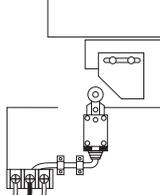
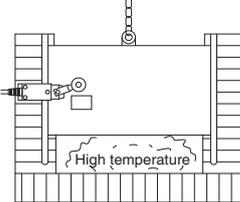
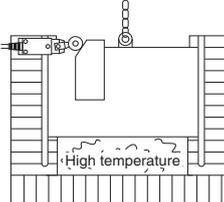
- 1) Do not attempt to physically alter any part of the switch itself, such as the actuator, or switch attachment vent, as this may cause alterations to both characteristics and performance, and damage the insulation.
- 2) Do not pour any lubricants such as oil or grease onto the moving parts of the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

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## Precautions relating to the installation environment

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

# IMPROVEMENT EXAMPLES

Poor design	Improved design	Explanation
		<ul style="list-style-type: none"> <li>■ Problem • Dog adjustment is difficult.</li> <li>■ Solution • Separate each one until the dog can be adjusted.</li> </ul>
		<ul style="list-style-type: none"> <li>■ Problem • The dog axis is too long, and slips out during operation.</li> <li>• For this reason, the limit switch operating position slips.</li> <li>■ Solution • Firmly fix the dog plate to the base.</li> </ul>
		<ul style="list-style-type: none"> <li>■ Problem • The detector sinks, applying force to the limit switch.</li> <li>• The limit switch O.T. cannot be set.</li> <li>■ Solution • Relieve the pressure using an additional actuator, and the O.T. can also be set.</li> </ul>
		<ul style="list-style-type: none"> <li>■ Problem • The area around the actuator coil is easily damaged.</li> <li>• Friction generated during operation.</li> <li>■ Solution • Relieve the friction by installing an additional actuator.</li> <li>• Change the type of limit switch.</li> </ul>
		<ul style="list-style-type: none"> <li>■ Problem • Workers keep bumping the actuator.</li> <li>■ Solution • Fit a protective cover to the side of the limit switch.</li> </ul>
		<ul style="list-style-type: none"> <li>■ Problem • 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> <li>■ Solution • 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>
		<ul style="list-style-type: none"> <li>■ Problem • The cord is not fixed, and gets pulled during work.</li> <li>• Dog adjustment is ineffective.</li> <li>■ Solution • Change the limit switch position, and fix the cord.</li> <li>• Attach an adjustment mechanism to the dog.</li> </ul>
		<ul style="list-style-type: none"> <li>■ Problem • The limit switch is near a high-temperature area.</li> <li>• Dog adjustment is ineffective, and the dog keeps bumping the lever.</li> <li>■ Solution • Move the limit switch further away.</li> <li>• Make dog adjustment possible, and change the shape of the unit.</li> </ul>

# IMPROVEMENT EXAMPLES

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> </ul> </li> <li>■ Solution                     <ul style="list-style-type: none"> <li>• The actuator is damaged.</li> <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 STANDARD?

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

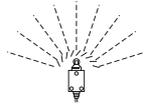
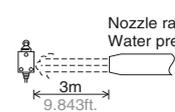
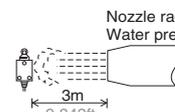
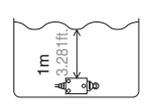
The main EC directives that are to do with machinery and electrical equipment are the machinery directive, the EMC directive, the low voltage directive, and the telecom directive. Although these directives have already been issued, the date of their enactment is different for each one. The machinery 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

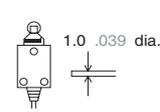
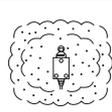
## Protective construction

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

Level	Protection level	Protection level and test methods
0	No particular protection	—
3	Protection against sprays to 60° from the vertical.	 <p>No damage incurred when sprayed with water continuously for 10 minutes at angles of up to 60° from the vertical.</p>
4	Protection against water splashed from all directions	 <p>No damage incurred when sprayed with water continuously for 10 minutes at angles of up to 180° from the perpendicular across a wide area.</p>
5	Protection against jets of water	 <p>Nozzle radius 6.3mm .248inch Water pressure 30kPa</p> <p>No damage incurred when sprayed with a jet of water for 3 minutes from all directions, as per the diagram on the left.</p>
6	Protection against strong jets of water	 <p>Nozzle radius 12.5mm .492inch Water pressure 100kPa</p> <p>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.</p>
7	Protection against the effects of immersion	 <p>Water does not invade the interior during immersion for 30 minutes at a depth of 1m 3.28ft..</p>

Level	Protection level	Protection level and test methods
4	Protection against solid objects exceeding 1mm .039inch in size.	 <p>1.0 .039 dia.</p> <p>A hard wire 1mm dia. .039 inch dia. across cannot penetrate the inside.</p>
5	Protection against dust. Limited ingress of dust permitted. (no harmful deposit)	 <p>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.</p>
6	Totally protected against ingress of dust	 <p>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.</p>

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

## Variety of products



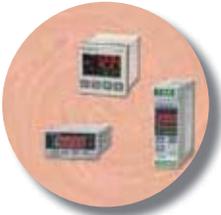
### Eco Power Meters

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.



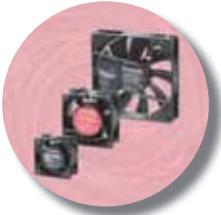
### Timers and Counters

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.



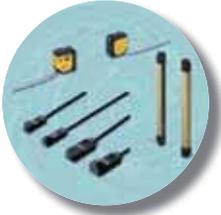
### Wireless Units

With the Panasonic KR20 Wireless Unit, process data transmission has hit the fast track, transmission security is tighter than ever, and cable clutter and installation marathons have become a thing of the past.



### 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

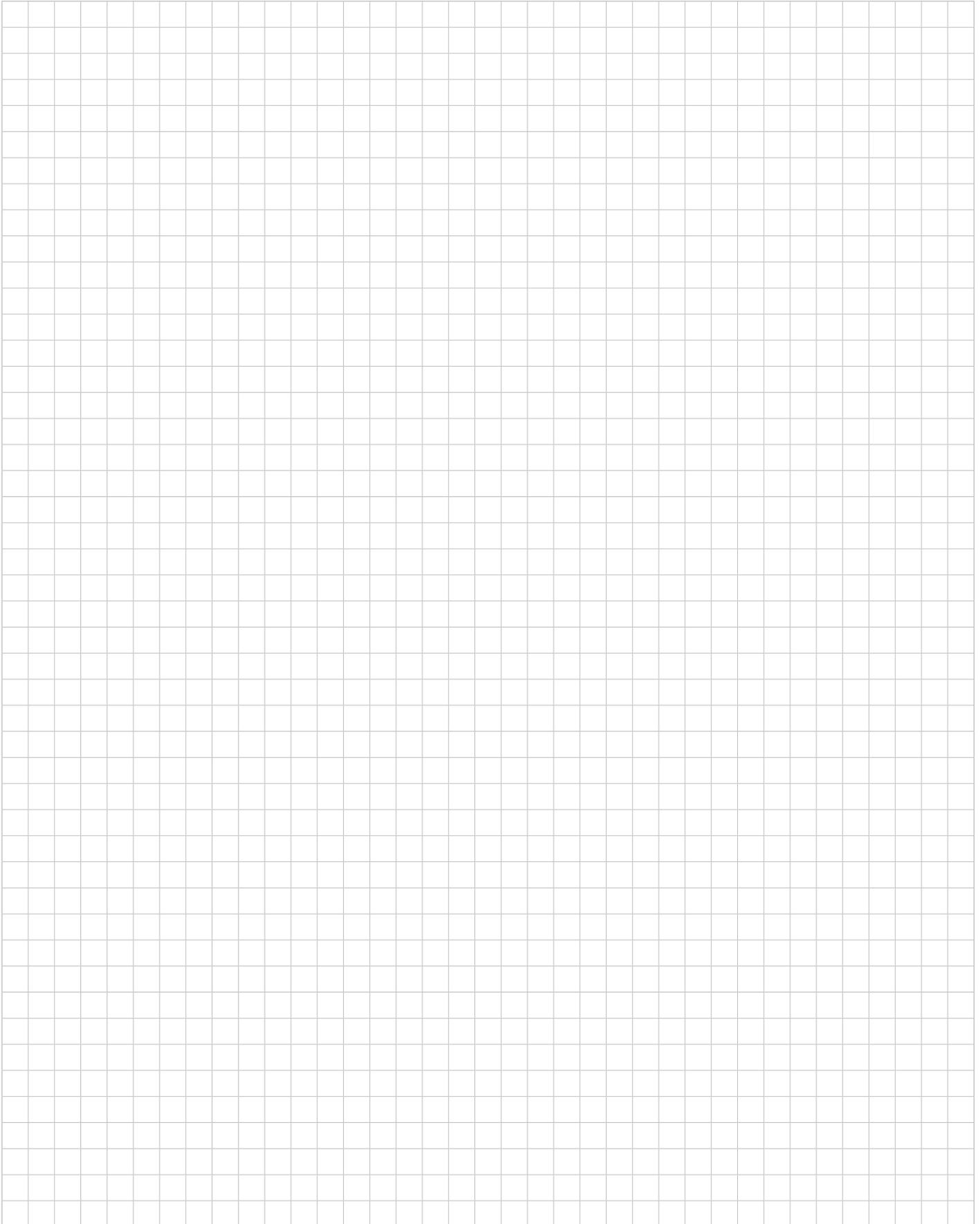
As a pioneering manufacturer of sensors, Panasonic/SUNX provide high performance sensors for a wide range of applications, facilitating factory automation in various types of production lines, such as those used for the manufacturing of semiconductors.



### Human Machine Interfaces

The new HMI's from Panasonic are universally suited for industrial applications as well as office environments. From the compact 3" to the large touch terminal with a 15" color display for upscale applications, Panasonic HMI's covers a broad spectrum.

# Notes



# Global Network

## 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>PEW Electronic 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 Czech s.r.o.</b>	Průmyslová 1, 34815 Planá, Tel. (+420-)374 799 990, Fax (+420-)374 799 999, <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>	Erdőalja út 91/a, 1037 Budapest, Tel. +36 (0) 20 9715688, <a href="http://www.panasonic-electric-works.hu">www.panasonic-electric-works.hu</a>
▶ <b>Ireland</b>	<b>Panasonic Electric Works UK Ltd.</b>	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 (0) 456752711, Fax +39 (0) 456700444, <a href="http://www.panasonic-electric-works.it">www.panasonic-electric-works.it</a>
▶ <b>Nordic Countries</b>	<b>Panasonic Electric Works Nordic AB</b>	Sjöängsvägen 10, 19272 Sollentuna, 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>Portugal</b>	<b>Panasonic Electric Works España S.A.</b>	ul. Woloska 9A,02-583 Warszawa, Tel. +48 (0) 22 338-11-33, Fax +48 (0) 22 338-12-00, <a href="http://www.panasonic-electric-works.pl">www.panasonic-electric-works.pl</a>
▶ <b>Spain</b>	<b>Panasonic Electric Works España S.A.</b>	Portuguese Branch Office, Avda Adelino Amaro da Costa 728 R/C J, 2750-277 Cascais, Tel. +351 214812520, Fax +351 214812529
▶ <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>PEW Corporation 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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### Asia Pacific/China/Japan

▶ <b>China</b>	<b>Panasonic Electric Works (China) Co., Ltd.</b>	Level 2, Tower W3, The Towers Oriental Plaza, No. 2, East Chang An Ave., Dong Cheng District, Beijing 100738, Tel. (010) 5925-5988, Fax (010) 5925-5973
▶ <b>Hong Kong</b>	<b>Panasonic Electric Works (Hong Kong) Co., Ltd.</b>	RM1205-9, 12/F, Tower 2, The Gateway, 25 Canton Road, Tsimshatsui, Kowloon, Hong Kong, Tel. (0852) 2956-3118, Fax (0852) 2956-0398
▶ <b>Japan</b>	<b>Panasonic Electric Works Co., Ltd.</b>	1048 Kadoma, Kadoma-shi, Osaka 571-8686, Japan, Tel. (06) 6908-1050, Fax (06) 6908-5781, <a href="http://panasonic-electric-works.net">http://panasonic-electric-works.net</a>
▶ <b>Singapore</b>	<b>Panasonic Electric Works Asia Pacific Pte. Ltd.</b>	101 Thomson Road, #25-03/05, United Square, Singapore 307591, Tel. (06255) 5473, Fax (06253) 5689