

Anatomy of a Limit Switch

NEMA Versus IEC Limit Switches

The primary difference between NEMA and IEC is the robustness of the switch AND its cost. In many extreme applications, such as heavy machinery, foundries, or even mining, the performance of a NEMA limit switch is an absolute must. However, a NEMA limit switch is typically over twice the price of an IEC limit switch, and in many applications, such as material handling, or ASRS (automated storage and retrieval systems), an IEC limit switch will perform very well and will save you money. So remember, take a close look at your application needs and choose the

most cost effective limit switch for your needs.

How long does a limit switch last?

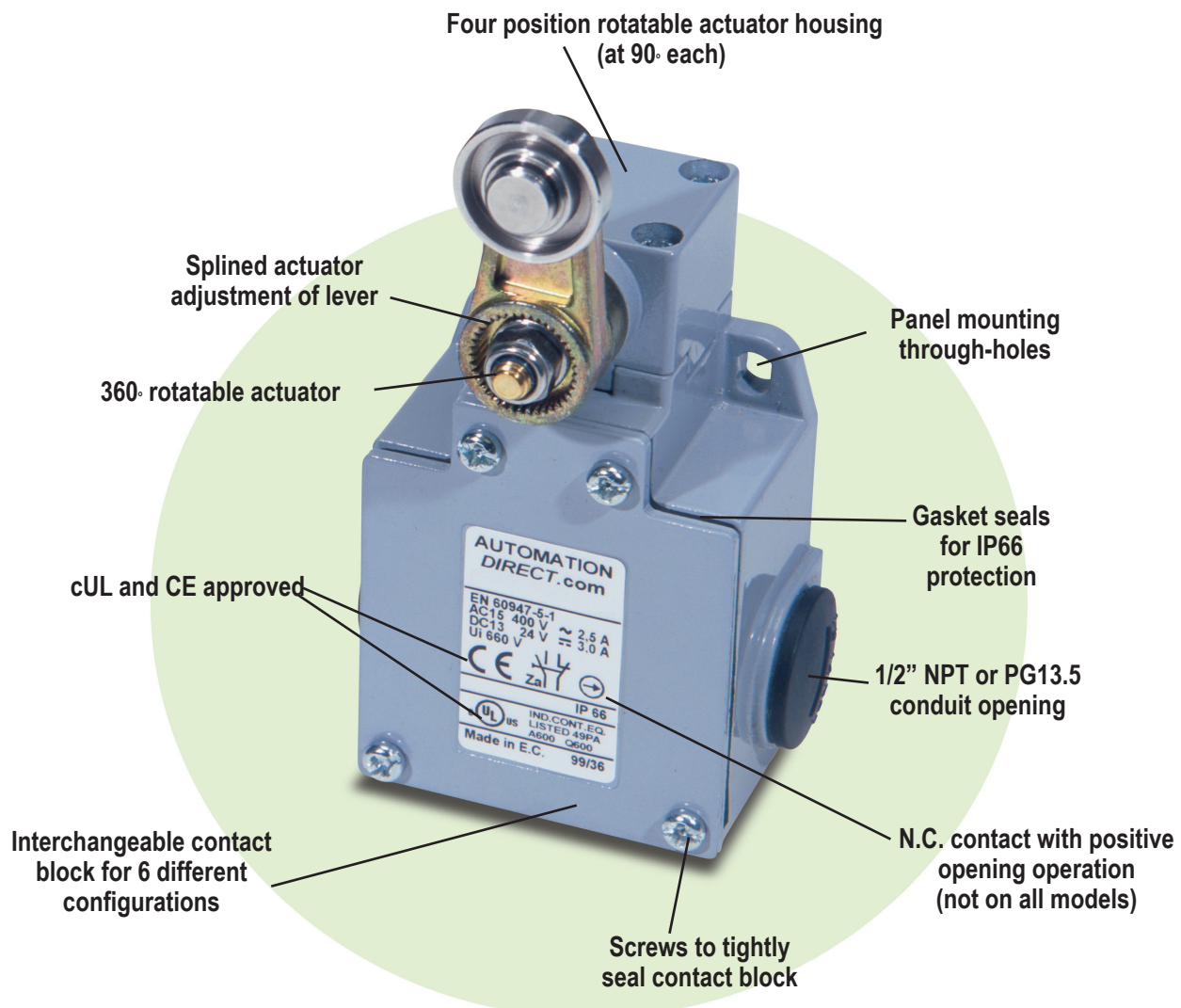
Limit switches are involved in physical contact applications that cause wear and tear on the switch. We recognize this concern and supply only the highest quality, longest lasting limit switches.

In addition, don't be fooled by specifications on the mechanical life of a limit switch. Typically, the electrical life of the contact block is the limiting factor in the overall life of a limit switch. Because of

this, we offer replacement contact blocks for as little as \$4.25. You shouldn't have to pay a lot to maintain your system.

(Note: The compact series and the Eaton NEMA limit switches have non-replaceable contacts blocks)

In evaluating the specification, you will find that the AutomationDirect limit switch has an astounding mechanical life of 30 million operations, while the electrical life is an incredible 5 million operations. Compare this to some competitors' specifications and you'll see the AutomationDirect advantage.



IEC model shown. Features of the other limit switch series may vary.

Limit Switches Selection Guide



| Series | F25 Series | ABM Series | ABP Series |
|-------------------------------|---|---|---|
| Description | Eaton NEMA Limit Switches | Heavy duty IEC | Double-insulated, non-metallic IEC |
| Material | Die-Cast Zinc Alloy | Aluminum | PBT (plastic) |
| Degree of Protection (IEC529) | IEC IP67 | IEC IP66 | IEC IP65 |
| Maximum Switching Frequency | 8000 operations per hour | Contact blocks: all two cycles per second | Contact blocks: all two cycles per second |
| Mechanical Service Life | Side rotary: 13 million operations minimum Side and Top Push: 10 million operations minimum Wobble: 10 million operations minimum | 25 million cycles | 25 million cycles |
| Contact Configuration | SPDT, DPDT snap acting | One snap action set of N.O. / N.C. contacts. (Optional contact blocks with other configurations are available) | One snap action set of N.O. / N.C. contacts. (Optional contact blocks with other configurations are available) |
| Conduit Opening | 1/2 in NPT | One and three cable holes, PG 13.5 or 1/2 NPT | One cable hole, PG 13.5 or 1/2 NPT |
| Connection | AWG #12 through #18 AWG wire | 2x2.5 mm ² (AWG14) to 2x0.5 mm ² (AWG 18) | 2x2.5 mm ² (AWG14) to 2x0.5 mm ² (AWG 18) |
| Agency Approvals | F25Axx versions are CE-approved; All versions cULus. | CE markings for applicable CE Directives UL certified (UL508), File E191072. RoHS | CE markings for applicable CE Directives UL certified (UL508), File E191072. RoHS |



| Series | AAP Series | AEM Series | Precision Series |
|-------------------------------|---|--|---|
| Description | Double-insulated, non-metallic mini-DIN IEC | Compact 25mm mount | Precision touch |
| Material | PBT (plastic) | Zinc Alloy | Stainless Steel |
| Degree of Protection (IEC529) | IEC IP65 | IEC IP67 | IEC IP40 to IP67, depending on model |
| Maximum Switching Frequency | Contact blocks: all two cycles per second | Contact blocks: all one cycle per second | N/A |
| Mechanical Service Life | 25 million cycles | 5 million or 10 million cycles, depending on model | 1 million to 10 million cycles, depending on model |
| Contact Configuration | One snap-action set of N.O. / N.C. contacts. (Optional contact blocks with other configurations are available) | One snap-action set of N.O. / N.C. contacts. One slow-action set of N.O. / N.C. contacts. | One set of N.O. or N.C. contacts. |
| Conduit Opening | One cable hole, PG 11 or 1/2 NPT | N/A | N/A |
| Connection | 2x2.5 mm ² (AWG14) to 2x0.5 mm ² (AWG 18) | 3 meter cable Center or Right Exit; M12 Quick-disconnect 5-Pin Center or Right Exit | 2 meter cable, 3 meter cable, or 0.5 m core wire, depending on model. |
| Agency Approvals | CE markings for applicable CE Directives UL certified (UL508), File E191072. RoHS | CE markings for applicable CE Directives (UL certified (UL508), File E191072. RoHS | N/A |

Eaton NEMA Limit Switches

NEMA Limit Switches F25 Series

- 9 side rotary heads available
- 990-degree adjustable head. Levers are adjustable to any angle on the operating shaft.
- Die-cast zinc housing for industrial applications
- Fully assembled out of box
- SPDT and DPDT snap action configurations available
- 1/2 inch NPT conduit opening
- Contact patterns similar to those of leading competitors

| NEMA Limit Switches F25 Series | | | | | | | | |
|--------------------------------|----------|---------------------|---|----------------------|----------------------------|--------------|---------------------------|-------|
| Part Number | Price | Drawing Link | Actuator Type | Snap Action Contacts | Travel to Operate Contacts | Total Travel | Force to Operate Contacts | Photo |
| Side Rotary | | | | | | | | |
| F25ASRL200 | \$155.00 | PDF | 1.5 inch stainless steel lever with Nylatron roller | (1) N.O./(1) N.C. | 5° | 90° | 3 lb•in [0.34 N•m] | A |
| F25BSRL200 | \$191.00 | PDF | | (2) N.O./(2) N.C. | | | | B |
| F25ASRL355 | \$155.00 | PDF | 1.5 inch stainless steel lever with metal roller | (1) N.O./(1) N.C. | | | | C |
| F25BSRL355 | \$191.00 | PDF | | (2) N.O./(2) N.C. | | | | D |
| F25ASRL549 | \$170.00 | PDF | 2 inch stainless steel lever with metal roller | (1) N.O./(1) N.C. | | | | E |
| F25BSRL549 | \$206.00 | PDF | | (2) N.O./(2) N.C. | | | | F |
| F25ASRL551 | \$171.00 | PDF | 3 inch stainless steel lever with metal roller | (1) N.O./(1) N.C. | | | | G |
| F25BSRL551 | \$207.00 | PDF | | (2) N.O./(2) N.C. | | | | H |
| F25ASRL548 | \$171.00 | PDF | 3 inch stainless steel lever with Nylatron roller | (1) N.O./(1) N.C. | | | | I |
| F25BSRL548 | \$207.00 | PDF | | (2) N.O./(2) N.C. | | | | |
| F25ASRL539 | \$177.00 | PDF | Adjustable stainless steel lever with ball bearing roller | (1) N.O./(1) N.C. | | | | |
| F25BSRL539 | \$212.00 | PDF | | (2) N.O./(2) N.C. | | | | |
| F25ASRL201 | \$170.00 | PDF | Side rotary adjustable stainless steel lever with Nylatron roller | (1) N.O./(1) N.C. | | | | |
| F25BSRL201 | \$206.00 | PDF | | (2) N.O./(2) N.C. | | | | |
| F25ASRL421 | \$170.00 | PDF | Adjustable spring stainless steel rod | (1) N.O./(1) N.C. | | | | |
| F25BSRL421 | \$206.00 | PDF | | (2) N.O./(2) N.C. | | | | |
| F25ASRL142 | \$170.00 | PDF | 6 inch Nylatron loop | (1) N.O./(1) N.C. | | | | |
| F25BSRL142 | \$206.00 | PDF | | (2) N.O./(2) N.C. | | | | |



A



B



C



D



E



F



G



H



I

Eaton NEMA Limit Switches

NEMA Limit Switches F25 Series

- 12 push and 6 wobble heads available
- 90-degree adjustable head
- Die-cast zinc housing for industrial applications
- Fully assembled out of box
- SPDT and DPDT snap action configurations available
- 1/2 in NPT conduit opening
- Contact patterns similar to those of leading competitors

| NEMA Limit Switches F25 Series | | | | | | | | |
|--------------------------------|----------|---------------------|--------------------------------------|----------------------|----------------------------|------------------------|---------------------------|-------|
| Part Number | Price | Drawing Link | Actuator Type | Snap Action Contacts | Travel to Operate Contacts | Total Travel | Force to Operate Contacts | Photo |
| Side Push | | | | | | | | |
| F25ASP1 | \$161.00 | PDF | Side metal plunger | (1) N.O./ (1) N.C. | 0.065 in [1.651 mm] | 0.290 in [7.366 mm] | 4lb [1.81 kg] | A |
| F25BSP1 | \$204.00 | PDF | | (2) N.O./ (2) N.C. | | | | |
| F25ASP2 | \$183.00 | PDF | Side metal plunger adjustable | (1) N.O./ (1) N.C. | | | | B |
| F25BSP2 | \$224.00 | PDF | | (2) N.O./ (2) N.C. | | | | |
| F25ASP3 | \$183.00 | PDF | Side metal plunger with metal roller | (1) N.O./ (1) N.C. | | | | C |
| F25BSP3 | \$219.00 | PDF | | (2) N.O./ (2) N.C. | | | | |
| Top Push | | | | | | | | |
| F25ATP1 | \$146.00 | PDF | Metal plunger | (1) N.O./ (1) N.C. | 0.040 in [1.00 mm] | 0.280 in [7.366 mm] | 4lb [1.81 kg] | D |
| F25BTP1 | \$192.00 | PDF | | (2) N.O./ (2) N.C. | | | | |
| F25ATP2 | \$183.00 | PDF | Metal plunger adjustable | (1) N.O./ (1) N.C. | | | | E |
| F25BTP2 | \$224.00 | PDF | | (2) N.O./ (2) N.C. | | | | |
| F25ATP3 | \$161.00 | PDF | Metal plunger with metal roller | (1) N.O./ (1) N.C. | | | | F |
| F25BTP3 | \$204.00 | PDF | | (2) N.O./ (2) N.C. | | | | |
| Wobble Head | | | | | | | | |
| F25AW2 | \$143.00 | PDF | 360 degree nylon rod | (1) N.O./ (1) N.C. | 10° | 15° | 2 lb•in [1.23 N•m] | G |
| F25BW2 | \$209.00 | PDF | | (2) N.O./ (2) N.C. | | | | |
| F25AW3 | \$143.00 | PDF | 360 degree stainless steel rod | (1) N.O./ (1) N.C. | | | | H |
| F25BW3 | \$209.00 | PDF | | (2) N.O./ (2) N.C. | | | | |
| F25AW4 | \$146.00 | PDF | 360 degree stainless steel spring | (1) N.O./ (1) N.C. | | | | I |
| F25BW4 | \$209.00 | PDF | | (2) N.O./ (2) N.C.. | | | | |



Eaton NEMA Limit Switches

Specifications



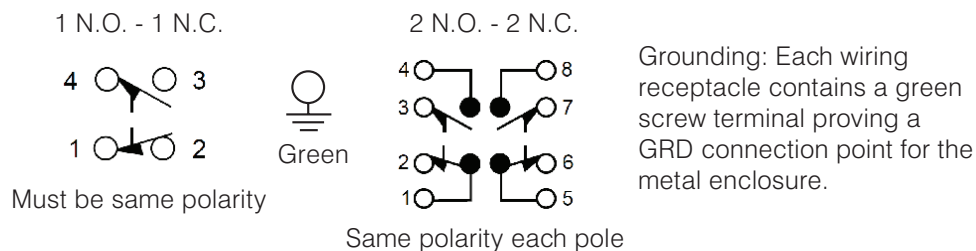
| NEMA Limit Switches Specifications F25 Series | | |
|---|----|--|
| Environmental | | |
| Degree of Protection | | NEMA 3, 3S, 4, 4X, 6, 6P, 13 IP67 |
| Temperature Range | | Side Rotary 10°F [-12°C] to 200°F [94°C] Side Push 14°F [-10°C] to 200°F [94°C] Wobble 14°F [-10°C] to 250°F [121°C] |
| Mechanical Ratings | | |
| Repeat Accuracy | | Side Operated: Within 0.0012 in. [0.0305 mm] Side Push: Within 0.003 in. [0.076 mm] Top Push: Within 0.002 in. [0.051 mm] |
| Mechanical Life | | Side Rotary: 13 million operations minimum Side and Top Push: 10 million operations minimum Wobble: 10 million operations minimum |
| Conduit Entrance | | 1/2 in NPT |
| Enclosure Material | | Die-cast zinc alloy |
| Contact Blocks Rating | | |
| Contact Rating | | NEMA A600 R300 |
| Electrical Ratings | AC | Make: 60A at 120VAC; 30A at 240VAC; 15A at 480VAC; 12A at 600VAC Break: 6A at 120VAC; 3A at 240VAC; 1.5 A at 480VAC; 1.2 A at 600VAC Continuous: 10A at 480VAC |
| | DC | Make: 0.25 A at 120VDC; 0.125 A at 240VDC |
| Maximum Switching Frequency | | 8000 operations per hour |
| Electrical Life | | Single Pole: 1,000,000 operations typical at full load Double Pole: 100,000 operations typical at full load |
| Wiring Connections | | AWG #12 through #18 AWG Wire |
| Torque Requirements | | Switch Body Screws 25 - 30 in-lb [2.8 - 3.4 N•m] Operating Head Screws 14 - 18 in-lb [1.6 - 2.0 N•m] |
| Agency Approvals * | | cULus 170645 all versions F25Ax versions have CE, All units are Reach compliant |

*To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.

Connection Diagram

Connection diagram - SPDT, DPDT

The following connection diagram appears on the switch body nameplate.





SCHMERSAL IEC Limit Switches

Metal Body Limit Switches 235 Series

Features

- 16 models available
- 90-degree adjustable head, levers are adjustable to any angle on the operating shaft
- Die-Cast Zinc enclosure
- Fully assembled out of box
- Snap action with constant contact pressure up to switching point
- M20 x 1.5 to 1/2" NPT conduit adapter
- Contact patterns similar to those of leading competitors

| Metal Body Limit Switches 235 Series | | | | | | | | |
|--------------------------------------|---------|--|----------------------|----------------------------|-----------------|-----------------------|-----------------------|---------------------|
| Part Number | Price | Actuator Type | Snap Action Contacts | Travel to Operate Contacts | Total Travel | Actuating Force (min) | Switch Travel Diagram | Drawing Link * |
| ZS-235-02Z | \$29.50 | Metal plunger | (2) N.C. | 0.07in [1.8mm] | 0.24in [6mm] | 79.66 lb-in [9 N•m] | Diagram 1 | PDF |
| ZS-235-11Z | \$29.50 | | (1) N.O./(1) N.C. | 0.1in [2.5mm] | | | Diagram 2 | PDF |
| ZR-235-02Z | \$31.50 | Metal plunger with plastic roller | (2) N.C. | 0.07in [1.8mm] | | | Diagram 1 | PDF |
| ZR-235-11Z | \$31.50 | | (1) N.O./(1) N.C. | 0.1in [2.5mm] | | | Diagram 2 | PDF |
| Z4S-235-02Z | \$36.50 | Metal plunger with fixing nuts | (2) N.C. | 0.07in [1.8mm] | | | Diagram 1 | PDF |
| Z4S-235-11Z | \$36.50 | | (1) N.O./(1) N.C. | 0.1in [2.5mm] | | | Diagram 2 | PDF |
| Z4R-235-02Z | \$39.50 | Metal plunger with plastic roller with fixing nuts | (2) N.C. | 0.07in [1.8mm] | | | Diagram 1 | PDF |
| Z4R-235-11Z | \$39.50 | | (1) N.O./(1) N.C. | 0.1in [2.5mm] | | | Diagram 2 | PDF |
| ZV12H-235-02Z | \$45.00 | Side rotary lever with plastic roller | (2) N.C. | 22° | 70° | 1.33 lb-in [0.15 N•m] | Diagram 3 | PDF |
| ZV12H-235-11Z | \$45.00 | | (1) N.O./(1) N.C. | | | | Diagram 3 | PDF |
| ZK-235-02Z | \$32.50 | One-way horizontal lever with plastic roller | (2) N.C. | 0.1in [2.5mm] | 0.37in [9.3 mm] | 79.66 lb-in [9 N•m] | Diagram 5 | PDF |
| ZK-235-11Z | \$32.50 | | (1) N.O./(1) N.C. | 0.14in [3.6mm] | | | Diagram 6 | PDF |
| ZV7H-235-02Z | \$48.50 | Side rotary adjustable lever with plastic roller | (2) N.C. | 22° | 70° | 1.33 lb-in [0.15 N•m] | Diagram 7 | PDF |
| ZV7H-235-11Z | \$48.50 | | (1) N.O./(1) N.C. | 30° | | | Diagram 8 | PDF |
| ZV10H-235-02Z | \$47.00 | Side rotary adjustable 6mm plastic rod | (2) N.C. | 22° | 70° | | Diagram 7 | PDF |
| ZV10H-235-11Z | \$47.00 | | (1) N.O./(1) N.C. | 30° | | | Diagram 8 | PDF |

* Weights are included on the drawing



[ZS-236-02Z](#)



[ZR-235-02Z](#)



[Z4S-235-02Z](#)



[Z4R-235-02Z](#)



[ZV12H-235-02Z](#)



[ZK-235-02Z](#)



[ZV7H-235-02Z](#)



[ZV10H-235-02Z](#)



SCHMERSAL IEC Limit Switches

Plastic Body Limit Switches 236 Series

Features

- 16 models available
- 90-degree adjustable head, levers are adjustable to any angle on the operating shaft
- Double-insulated thermoplastic enclosure
- Fully assembled out of box
- Snap action with constant contact pressure up to switching point
- M20 x 1.5 to 1/2" NPT conduit adapter
- Contact patterns similar to those of leading competitors

| Thermoplastic Body Limit Switches 236 Series | | | | | | | | |
|--|---------|--|----------------------|----------------------------|----------------|-----------------------|-----------------------|----------------------------|
| Part Number | Price | Actuator Type | Snap Action Contacts | Travel to Operate Contacts | Total Travel | Actuating Force (min) | Switch Travel Diagram | Drawing Link * |
| <u>ZS-236-02Z</u> | \$15.50 | Plastic plunger | (2) N.C. | 0.07in [1.8mm] | 0.24in [6mm] | 79.66 lb-in [9 N•m] | Diagram 1 | <u>PDF</u> |
| <u>ZS-236-11Z</u> | \$15.50 | | (1) N.O./(1) N.C. | 0.1in [2.5mm] | | | Diagram 2 | <u>PDF</u> |
| <u>ZR-236-02Z</u> | \$17.50 | Metal plunger with plastic roller | (2) N.C. | 0.07in [1.8mm] | | | Diagram 1 | <u>PDF</u> |
| <u>ZR-236-11Z</u> | \$17.50 | | (1) N.O./(1) N.C. | 0.1in [2.5mm] | | | Diagram 2 | <u>PDF</u> |
| <u>Z4S-236-02Z</u> | \$28.50 | Metal plunger with fixing nuts | (2) N.C. | 0.07 in [1.8 mm] | | | Diagram 1 | <u>PDF</u> |
| <u>Z4S-236-11Z</u> | \$28.50 | | (1) N.O./(1) N.C. | 0.1in [2.5mm] | | | Diagram 2 | <u>PDF</u> |
| <u>Z4R-236-02Z</u> | \$31.50 | Metal plunger with plastic roller with fixing nuts | (2) N.C. | 0.07in [1.8mm] | | | Diagram 1 | <u>PDF</u> |
| <u>Z4R-236-11Z</u> | \$31.50 | | (1) N.O./(1) N.C. | 0.1in [2.5mm] | | | Diagram 2 | <u>PDF</u> |
| <u>ZV12H-236-02Z</u> | \$29.50 | Side rotary lever with plastic roller | (2) N.C. | 22° | 70° | 1.33 lb-in [0.15 N•m] | Diagram 3 | <u>PDF</u> |
| <u>ZV12H-236-11Z</u> | \$29.50 | | (1) N.O./(1) N.C. | | | | Diagram 3 | <u>PDF</u> |
| <u>ZK-236-02Z</u> | \$21.00 | One-way horizontal lever with plastic roller | (2) N.C. | 0.1in [2.5mm] | 0.37in [9.3mm] | 79.66 lb-in [9 N•m] | Diagram 5 | <u>PDF</u> |
| <u>ZK-236-11Z</u> | \$21.00 | | (1) N.O./(1) N.C. | 0.14in [3.6mm] | | | Diagram 6 | <u>PDF</u> |
| <u>ZV7H-236-02Z-2138</u> | \$32.50 | Side rotary adjustable lever with plastic roller | (2) N.C. | 22° | 70° | 1.33 lb-in [0.15 N•m] | Diagram 3 | <u>PDF</u> |
| <u>ZV7H-236-11Z-2138</u> | \$32.50 | | (1) N.O./(1) N.C. | 30° | | | Diagram 4 | <u>PDF</u> |
| <u>ZV10H-236-02Z</u> | \$31.50 | Side rotary adjustable 6mm plastic rod | (2) N.C. | 22° | 70° | | Diagram 7 | <u>PDF</u> |
| <u>ZV10H-236-11Z</u> | \$31.50 | | (1) N.O./(1) N.C. | 30° | | | Diagram 8 | <u>PDF</u> |

* Weights are included on the drawing



[ZS-236-02Z](#)



[ZR-236-02Z](#)



[Z4S-236-02Z](#)



[Z4R-236-02Z](#)



[ZV12H-236-02Z](#)



[ZK-236-02Z](#)



[ZV7H-236-02Z-2138](#)

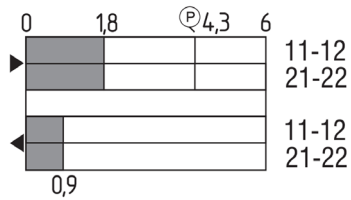
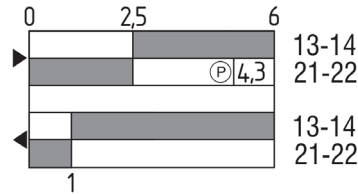
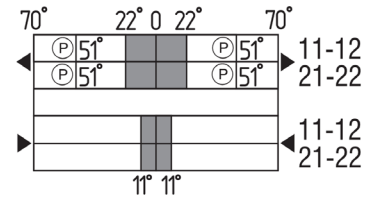
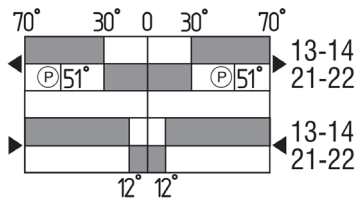
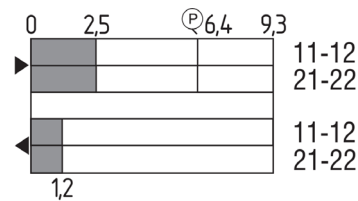
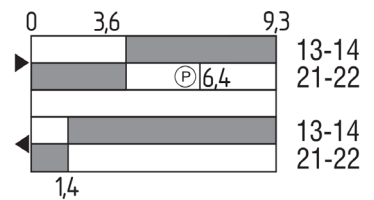
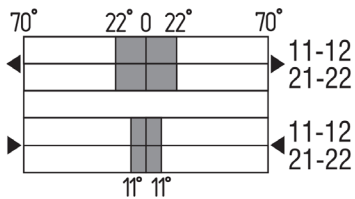
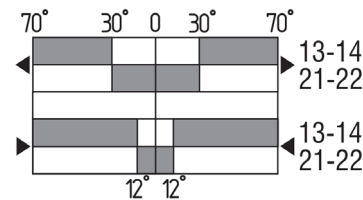


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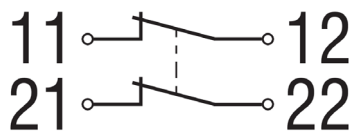
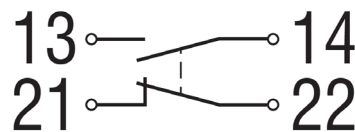

SCHMERSAL

235/236 Series Travel Diagrams

Switch Travel Diagrams


Diagram 1

Diagram 2

Diagram 3

Diagram 4

Diagram 5

Diagram 6

Diagram 7

Diagram 8

Contact Travel Diagrams


Diagram 1

Diagram 2



SCHMERSAL 235/236 Series Specifications

| 235/236 Series Specifications | | |
|---|---|---|
| Series | 235 | 236 |
| Environmental | | |
| Degree of Protection | IP67 | |
| Temperature Range | -30 to 80°C [-22 to 176°F] | |
| Mechanical Ratings | | |
| Body Footprint (Without Actuator Head) | 30 x 30 x 63.5mm | 30 x 30 x 58.5mm |
| Mechanical Life | 20 Million Operations | |
| Conduit Entrance | M20 x 1.5, each unit comes with a 1/2 in NPT adapter | |
| Enclosure Material | Die-cast zinc alloy | Plastic, Glass-fiber reinforced thermoplastic, self-extinguishing |
| Contact Blocks Rating | | |
| Rated Impulse Withstand Voltage | 6 kV | |
| Electrical Ratings | AC | AC-15 - 4A @ 230VAC Continuous: 10A @ 230VAC Required rated short-circuit current to EN60947-5-1 : 1,000A |
| | DC | DC-13 - 1A @ 24VDC |
| Maximum Switching Frequency | 5,000 operations per hour, Switchover time: Max 5.5 ms, Bounce Duration: Max 3ms | |
| Contact Type | Change-over contact with double break, type 1 N.C. or 2 N.C. contacts, with galvanically separated contact bridges: snap-action, N.C. contacts with positive break | |
| Wiring Connections | AWG #14 through AWG #18 Wire | |
| Torque Requirements | Wiring Terminals: 7.1 in-lb [0.8 N•m] | |
| Safety Data | | |
| General | 02Z Series - Safety Function, Yes; Number of Safety Contacts: 2 11Z Series - Safety Function, Yes; Number of Safety Contacts 1, Number of Aux Contacts 1 | |
| Safety Appraisal | Standards: ISO 13849-1, Mission Time 20 Year(s) Safety Outputs: B10d Normally-closed contact (N.C.), 20,000,000 Operations | |
| Agency Approvals* | cULus E57648 all versions. All units are CE and Reach Compliant Standards: IEC 60947-5-1 : 2010, ISO 13849-1, BG-GS-ET-15, ISO 13849-1 | |

*To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.



SCHMERSAL IEC Limit Switches

Metal Body Limit Switches 335 Series

Features

- 9 Models available
- 90-degree adjustable head. Levers are adjustable to any angle on the operating shaft
- Aluminum enclosure
- Fully assembled out of box
- Snap-action with constant contact pressure up to switching point
- M20 x 1.5 to 1/2" NPT conduit adapter
- Contact patterns similar to those of leading competitors

| Metal Body Limit Switches 335 Series | | | | | | | | |
|---------------------------------------|---------|--|----------------------|----------------------------|-------------------|--------------------------|-----------------------|----------------------------|
| Part Number | Price | Actuator Type | Snap Action Contacts | Travel to Operate Contacts | Total Travel | Actuating Force (min) | Switch Travel Diagram | Drawing Link * |
| <u>ZS-335-11Z</u> | \$55.00 | Metal plunger | (1) N.O./ (1) N.C. | 0.8in [2.0mm] | 0.24in [6mm] | 106.2 lb-in [12 N•m] | Diagram 1 | <u>PDF</u> |
| <u>ZR-335-11Z</u> | \$57.00 | Metal plunger with plastic roller | (1) N.O./ (1) N.C. | | | | | <u>PDF</u> |
| <u>Z4VH-335-02Z</u> | \$76.00 | Side rotary lever with plastic roller | (2) N.C. | 19° | 80° | 2.3 lb-in [0.26 N•m] | Diagram 2 | <u>PDF</u> |
| <u>Z4VH-335-11Z</u> | \$76.00 | | (1) N.O./ (1) N.C. | 24° | | | Diagram 3 | <u>PDF</u> |
| <u>Z1K-335-11Z</u> | \$70.00 | One-way horizontal lever with plastic roller | (1) N.O./ (1) N.C. | 0.82in [2.1mm] | 0.25in [6.3mm] | 106.2 lb-in [12 N•m] | Diagram 4 | <u>PDF</u> |
| <u>Z4V7H-335-02Z</u> | \$76.00 | Side rotary adjustable lever with plastic roller | (2) N.C. | 19° | 80° | 1.33 lb-in [0.15 N•m] | Diagram 5 | <u>PDF</u> |
| <u>Z4V7H-335-11Z</u> | \$76.00 | | (1) N.O./ (1) N.C. | 24° | | | Diagram 6 | <u>PDF</u> |
| <u>Z4V10H-335-02Z</u> | \$76.00 | Side rotary adjustable 6mm plastic rod | (2) N.C. | 19° | | | Diagram 5 | <u>PDF</u> |
| <u>Z4V10H-335-11Z</u> | \$76.00 | | (1) N.O./ (1) N.C. | 24° | | | Diagram 6 | <u>PDF</u> |

* Weights are included on the drawing



[ZS-335-11Z](#)



[ZR-335-11Z](#)



[Z4VH-335-02Z](#)



[Z1K-335-11Z](#)



[Z4V7H-335-02Z](#)



[Z4V10H-335-02Z](#)



SCHMERSAL IEC Limit Switches

Plastic Body Limit Switches 336 Series

Features

- 9 models available
- 90-degree adjustable head, levers are adjustable to any angle on the operating shaft
- Double-insulated thermoplastic enclosure
- Fully assembled out of box
- Snap action with constant contact pressure up to switching point
- M20 x 1.5 to 1/2" NPT conduit adapter
- Contact patterns similar to those of leading competitors

| Plastic Body Limit Switches 336 Series | | | | | | | | |
|--|---------|--|----------------------|----------------------------|----------------|-----------------------|-----------------------|----------------------------|
| Part Number | Price | Actuator Type | Snap Action Contacts | Travel to Operate Contacts | Total Travel | Actuating Force (min) | Switch Travel Diagram | Drawing Link * |
| <u>ZS-336-11Z</u> | \$23.00 | Metal plunger | (1) N.O./ (1) N.C. | 0.08in [2.0mm] | 0.24in [6mm] | 106.2 lb-in [12 N•m] | Diagram 1 | <u>PDF</u> |
| <u>ZR-336-11Z</u> | \$29.50 | Metal plunger with plastic roller | (1) N.O./ (1) N.C. | | | | | <u>PDF</u> |
| <u>Z4VH-336-02Z</u> | \$38.50 | Side rotary lever with plastic roller | (2) N.C. | 19° | 80° | 2.3 lb-in [0.26 N•m] | Diagram 2 | <u>PDF</u> |
| <u>Z4VH-336-11Z</u> | \$38.50 | | (1) N.O./ (1) N.C. | 24° | | | Diagram 3 | <u>PDF</u> |
| <u>Z1K-336-11Z</u> | \$44.00 | One-way horizontal lever with plastic roller | (1) N.O./ (1) N.C. | 0.82in [2.1mm] | 0.25in [6.3mm] | 106.2 lb-in [12 N•m] | Diagram 4 | <u>PDF</u> |
| <u>Z4V7H-336-02Z</u> | \$38.50 | Side rotary adjustable lever with plastic roller | (2) N.C. | 19° | 80° | 1.33 lb-in [0.15 N•m] | Diagram 5 | <u>PDF</u> |
| <u>Z4V7H-336-11Z</u> | \$38.50 | | (1) N.O./ (1) N.C. | 24° | | | Diagram 6 | <u>PDF</u> |
| <u>Z4V10H-336-02Z</u> | \$36.50 | Side rotary adjustable 6mm plastic rod | (2) N.C. | 19° | | | Diagram 5 | <u>PDF</u> |
| <u>Z4V10H-336-11Z</u> | \$36.50 | | (1) N.O./ (1) N.C. | 24° | | | Diagram 6 | <u>PDF</u> |

* Weights are included on the drawing



[ZS-336-11Z](#)



[ZR-336-11Z](#)



[Z4VH-336-02Z](#)



[Z1K-336-11Z](#)



[Z4V7H-336-02Z](#)



[Z4V10H-336-02Z](#)



SCHMERSAL 335/336 Series Travel Diagrams

Switch Travel Diagrams

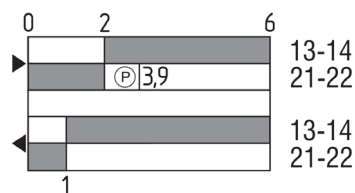


Diagram 1

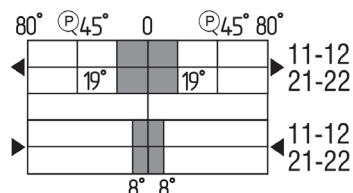


Diagram 2

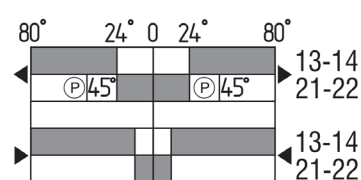


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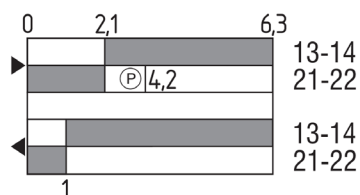


Diagram 4

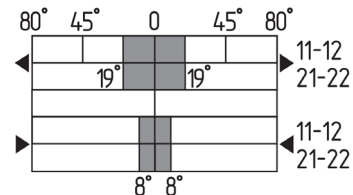


Diagram 5

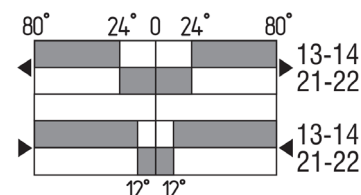


Diagram 6

Contact Travel Diagrams

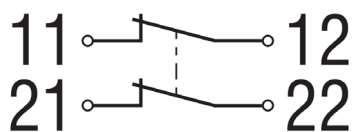


Diagram 1

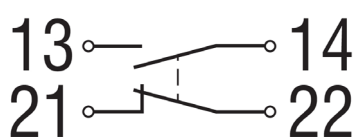


Diagram 2



SCHMERSAL 335/336 Series Specifications

| 335/336 Series Specifications | | |
|---|--|---|
| Series | 335 | 336 |
| Environmental | | |
| Degree of Protection | IP67 | |
| Temperature Range | -30 to 80°C [-22 to 176°F] | |
| Mechanical Ratings | | |
| Body Footprint (Without Actuator Head) | 40.5 x 38 x 66.5mm | |
| Mechanical Life | 30 Million Operations | |
| Conduit Entrance | M20 x 1.5, each unit comes with a 1/2 in NPT adapter | |
| Enclosure Material | Aluminum | Plastic, Glass-fiber reinforced thermoplastic, self-extinguishing |
| Contact Blocks Rating | | |
| Rated Impulse Withstand Voltage | 6 kV | |
| Electrical Ratings | AC | AC-15 - 4A @ 230VAC Continuous: 10A @ 230VAC Required rated short-circuit current to EN60947-5-1 : 1,000A |
| | DC | DC-13 - 4A @ 24VDC |
| Maximum Switching Frequency | 5,000 operations per hour, Switchover time: Max 2ms, Bounce Duration, in accordance with actuating speed | |
| Contact Type | Change-over contact with double break, type 1 N.C. or 2 N.C. contacts, with galvanically separated contact bridges: snap-action, N.C. contacts with positive break | |
| Wiring Connections | AWG #14 through AWG #18 Wire | |
| Torque Requirements | Wiring Terminals: 7.1 in-lb [0.8 N•m] | |
| Safety Data | | |
| General | 02Z Series - Safety Function, Yes: Number of Safety Contacts: 2 11Z Series - Safety Function, Yes, Number of Safety Contacts 1, Number of Aux Contacts 1 | |
| Safety Appraisal | Standards: ISO 13849-1, Mission Time 20 Year(s) Safety Outputs: B10d Normally-closed contact (N.C.), 20,000,000 Operations | |
| Agency Approvals* | cULus E57648 all versions. All units are CE and Reach Compliant Standards: IEC 60947-5-1 : 2010, ISO 13849-1, BG-GS-ET-15 | |

*To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.



SCHMERSAL Compact Limit Switches

Compact Limit Switches PS116 Series

Features

- Metal top with thermoplastic body
- (1) N.O./ (1) N.C. contact on all units
- 45-degree adjustable head
- Lever angle models adjustable 15° steps
- IP66, IP67



PS116Z11-STRR200

| Compact Limit Switches PS116 Series | | | | | | | | |
|-------------------------------------|---------|--------------------------|-------------------------------|--|-----------------------------|--------------------------|---|---|
| Part Number | Price | Drawing Link and Weights | Action | Actuator Type | Min. Actuating Speed mm/min | Max. Actuating Speed m/s | Switch Travel / Contact Diagram | Connection Type |
| PS116Z11-L200S200 | \$37.00 | PDF | Snap | Plastic plunger | 10 | 0.5 | 2 / 2 | 6.5ft/2m pigtail,bottom exit |
| PS116Z11-LR200S200 | \$37.00 | PDF | | | | | 2 / 2 | 6.5ft/2m pigtail, right exit |
| PS116Z11-ST5200 | \$37.00 | PDF | | | | | 2 / 2 | (1) 4-pin M12 quick-disconnect, bottom exit |
| PS116Z11-STRS200 | \$37.00 | PDF | | | | | 2 / 2 | (1) 4-pin M12 quick-disconnect, right exit |
| PS116T11-L200S200 | \$37.00 | PDF | Slow action break before make | | 60 | | 4 / 1 | 6.5ft/2m pigtail, bottom exit |
| PS116T11-STRS200 | \$37.00 | PDF | | | | | 4 / 1 | (1) 4-pin M12 quick-disconnect, right exit |
| PS116Z11-LR200R200 | \$43.00 | PDF | Snap | Plunger with plastic roller | 10 | | 2 / 2 | 6.5ft/2m pigtail, right exit |
| PS116Z11-L200R200 | \$43.00 | PDF | | | | | 2 / 2 | 6.5ft/2m pigtail,bottom exit |
| PS116Z11-STR200 | \$43.00 | PDF | | | | | 2 / 2 | (1) 4-pin M12 quick-disconnect, bottom exit |
| PS116Z11-STRR200 | \$43.00 | PDF | | | | | 2 / 2 | (1) 4-pin M12 quick-disconnect, right exit |
| PS116T11-L200R200 | \$43.00 | PDF | Slow action break before make | | 60 | | 4 / 1 | 6.5ft/2m pigtail, bottom exit |
| PS116T11-STRR200 | \$43.00 | PDF | | | | | 4 / 1 | (1) 4-pin M12 quick-disconnect, right exit |
| PS116Z11-L200H200 | \$45.00 | PDF | Snap | Side rotary lever with plastic roller | 10 | 1 | 1 / 2 | 6.5ft/2m pigtail, bottom exit |
| PS116Z11-LR200H200 | \$45.00 | PDF | | | | | 1 / 2 | 6.5ft/2m pigtail, right exit |
| PS116Z11-STH200 | \$45.00 | PDF | | | | | 1 / 2 | (1) 4-pin M12 quick-disconnect, bottom exit |
| PS116Z11-STRH200 | \$45.00 | PDF | | | | | 1 / 2 | (1) 4-pin M12 quick-disconnect, right exit |
| PS116T11-L200H200 | \$45.00 | PDF | Slow action break before make | | 60 | | 3 / 1 | 6.5ft/2m pigtail, bottom exit |
| PS116T11-STRH200 | \$45.00 | PDF | | | | | 3 / 1 | (1) 4-pin M12 quick-disconnect, right exit |
| PS116Z11-L200N200 | \$49.00 | PDF | Snap | Side rotary adjustable lever with plastic roller | 10 | | 1 / 2 | 6.5ft/2m pigtail, bottom exit |
| PS116Z11-LR200N200 | \$49.00 | PDF | | | | | 1 / 2 | 6.5ft/2m pigtail, right exit |
| PS116Z11-STN200 | \$49.00 | PDF | | | | | 1 / 2 | (1) 4-pin M12 quick-disconnect, bottom exit |
| PS116Z11-STRN200 | \$49.00 | PDF | | | | | 1 / 2 | (1) 4-pin M12 quick-disconnect, right exit |
| PS116T11-L200N200 | \$49.00 | PDF | Slow action break before make | | 60 | | 3 / 2 | 6.5ft/2m pigtail, bottom exit |
| PS116T11-STRN200 | \$49.00 | PDF | | | | | 3 / - | (1) 4-pin M12 quick-disconnect, right exit |
| PS116Z11-L200J200 | \$49.00 | PDF | Snap | Side rotary adjustable plastic rod | 10 | 5 / 2 | 6.5ft/2m pigtail, bottom exit | |
| PS116Z11-LR200J200 | \$49.00 | PDF | | | | | 6.5ft/2m pigtail, right exit | |
| PS116Z11-STJ200 | \$49.00 | PDF | | | | | (1) 4-pin M12 quick-disconnect, bottom exit | |



SCHMERSAL Compact Limit Switches PS116 Series

**PS116Z11-LR200S200****PS116Z11-STH200****PS116Z11-STRN200****PS116Z11-STJ200**

Compact Limit Switches Specifications PS116 Series

Technical Data

| | |
|-----------------------------|----------------------------|
| Standards | IEC 60947-5-1 |
| Degree of Protection | IP66, IP67 |
| Protection Rating | II |
| Degree of Pollution | 3 |
| Temperature Range | -30 to 80°C [-22 to 176°F] |

Mechanical Ratings

| | |
|----------------------------------|--|
| Min. Actuating Force | 10N |
| Min. Positive Break Force | 40N |
| Mechanical Life | 10,000,000 operations minimum |
| Enclosure Material | Plastic, glass fiber reinforced thermoplastic, zinc die-cast, chromate |

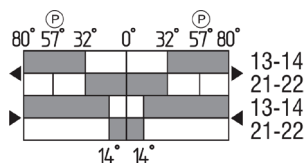
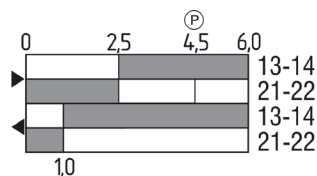
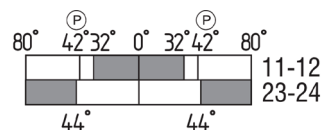
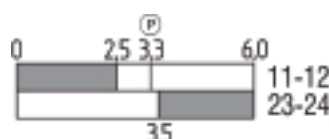
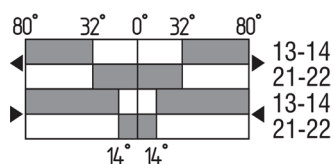
Electrical Data

| | | |
|--|---|-----------------------------|
| Rated Operating Current/Voltage Ie/Ue | Connecting Cable, 4 core: | 3A / 240VAC, 1.5 A 24VDC |
| | Connector Plug M12 4-pole | 1.5 A / 240VAC, 1.5 A 24VDC |
| Rated Impulse Withstand Voltage Uimp | Connecting Cable, 4 core: | 4kV |
| | Connector Plug M12 4-pole | 2.5 kV |
| Rated Insulation Voltage Ui | Connecting Cable, 4 core: | 300V |
| | Connector Plug M12 4-pole | 300V |
| Thermal Test Current Ithe | Connecting Cable, 4 core: | 5A |
| | Connector Plug M12 4-pole | 2.5 A |
| Maximum Fuse Rating | 6 AgG D-fuse | |
| Required Short-Circuit Current (EN 60947-5-1) | 400A | |
| B10D to ISO 13849-1 | N.C. Contact | 20,000,000 |
| | N.O. Contact (at 10% ohmic contact load) | 1,000,000 |
| Agency Approvals * | UL File E57648, CE | |

*To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.

SCHMERSAL Compact Limit Switches PS116 Series

Switch Travel Diagrams

**DIAGRAM 1****DIAGRAM 2****DIAGRAM 3****DIAGRAM 4****DIAGRAM 5**

Contact Travel Diagrams

Slow Action

(3) BN 11 — 12 PK (4)
(1) YE 23 — 24 WH (2)

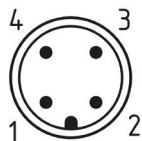
DIAGRAM 1

Snap Action

(3) BN 13 — 14 PK (4)
(1) YE 21 — 22 WH (2)

DIAGRAM 2

M12 Connector



SCHMERSAL Heavy Duty Limit Switches

Cast Iron Limit Switches 250 Series

Overview

The Schmersal heavy duty cast iron limit switches offer a variety of actuator options, including side rotary levers with metal or plastic rollers, metal belt alignment rollers, or high-temperature models with metal rollers. They are IP65, IP66, and IP67 rated and have up to 2 conduit entries.

Belt alignment switches are actuated when the conveyor belt becomes misaligned. Depending on the plant arrangements, this signal can be used to switch the equipment off or to provide automatic correction of the belt alignment. The actuator arm contains a heavy duty roller and can be actuated to either side. Material handling applications often need special purpose switches for belt alignment. Many feature the heavy duty limit switch housings with uniquely designed actuators for these purposes.

Features

- Cast iron enclosure
- (2) M25 x 1.5 cable entry connection
- Available in snap action and slow action contacts
- IP65 IP66 IP67 protection rating
- High temperature models available -40 to 200°C [-40 to 392°F]



MD250-11Z



TD250-02/02Z-RMS



M.250-22Z-1224



TD250-10/10Z-T

Cast Iron Limit Switches 250 Series

| Part Number | Price | Actuator Type | Snap Action Contacts | Slow Action Contacts | Travel Diagram | Total Travel | Actuating Force (min) | Weight (lbs) | Drawing Link |
|---|----------|--|----------------------|---|----------------|--------------|-----------------------|--------------|----------------------------|
| <u>MD250-11Z</u> | \$513.00 | Side rotary lever with plastic roller | (1) N.O./ (1) N.C. | — | 1 | 90° | 40N | 8.5 | <u>PDF</u> |
| <u>MD250-22Z</u> | \$608.00 | | (2) N.O./ (2) N.C. | — | 2 | | | 8.75 | <u>PDF</u> |
| <u>TD250-02/02Z</u> | \$579.00 | | — | (2) N.C. left and (2) N.C. right | 3 | | | 9.66 | <u>PDF</u> |
| <u>TD250-11/11Z</u> | \$579.00 | | — | (1) N.O./ (1) N.C. left and (1) N.O./ (1) N.C. right | 4 | | | 9.17 | <u>PDF</u> |
| <u>TD250-02Z</u> | \$490.00 | | — | (2) N.C. | 5 | | | 9.66 | <u>PDF</u> |
| <u>TD250-02/02Z-RMS</u> | \$579.00 | Side rotary lever with metal roller | — | (2) N.C. left and (2) N.C. right | 3 | | | 10.19 | <u>PDF</u> |
| Belt Alignment Models | | | | | | | | | |
| <u>M.250-11Z-1224</u> | \$747.00 | Side rotary lever with metal belt roller | (1) N.O./ (1) N.C. | — | 1 | 90° | 40N | 9.74 | <u>PDF</u> |
| <u>M.250-22Z-1224</u> | \$841.00 | | (2) N.O./ (2) N.C. | — | 2 | | | 9.71 | <u>PDF</u> |
| <u>T.250-02Z-H-966</u> | \$708.00 | | — | (2) N.C. | 5 | | | 8.37 | <u>PDF</u> |
| High Temperature Models | | | | | | | | | |
| <u>TD250-10/10Z-T</u> | \$581.00 | Side rotary lever with metal roller | — | (1) N.O. left and (1) N.O. right | 6 | 90° | 40N | 9.62 | <u>PDF</u> |
| <u>MD250-11Z-T</u> | \$580.00 | | (1) N.O./ (1) N.C.. | — | 1 | | | 8.64 | <u>PDF</u> |

SCHMERSAL Heavy Duty Limit Switches

Cast Iron Limit Switches 250 Series Specifications

| Series | Snap Action | | Slow Action |
|---------------------------------|--|---|--|
| Impact Energy (maximum) | 7 J | | |
| Actuating Speed (maximum) | 3 m/s | | |
| Enclosure Material | Cast iron (galvanized and painted) | | |
| Contact Material | Gold-plated silver | | |
| Thermal Current | 16A | | |
| Short Circuit Current | 1,000A | | |
| Bounce Duration (maximum) | 5ms | | |
| Switching Frequency (maximum) | 3,000/h | | |
| Switchover Time (maximum) | 35ms | | |
| Rated Impulse Withstand Voltage | 4kV | | 6kV |
| Electrical Data - Contacts | Voltage AC-15 | 400 VAC (M.250-11Z-1224 and MD250-11Z 230 VAC) | |
| | Current AC-15 | 4A (M.250-11Z-1224 and MD250-11Z 2.5 A) | |
| Contact Type | Snap action: change-over contact, up to 250 V, with 2 galvanic separated contact bridges | | Slow action: change-over contact, up to 250 V, with 2 galvanic separated contact bridges, positive break NC contacts A |
| Conduit Entrance | (2) M25 x 1.5 cable entry | | |
| Connection | Screw terminals M 3.5 2.5 mm ² (including conductor ferrules) | | |
| Torque Requirements | 1N•m | | |
| Mechanical Life | 5 million operations | | 10 million operations |
| Degree of Protection | IP65 IP66 IP67 | | |
| Temperature Range | -30 to 90°C [-22 to 194°F] TD250-10/10Z-T , and MD250-11Z-T -40 to 200°C [-40 to 392°F] | | |
| Agency Approvals* | cULus E57648, CE | | |

*To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.

Travel Diagrams

Diagram 1
Snap Action
1 N.O. / 1 N.C.

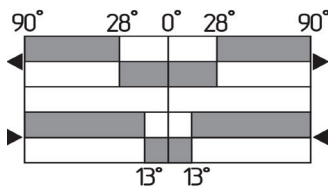


Diagram 2
Snap Action
2 N.O. / 2 N.C.

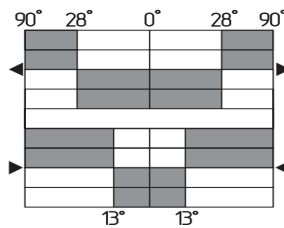


Diagram 3
Slow Action
2 N.C. Left, 2 N.C. Right

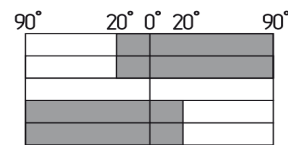


Diagram 4
Slow Action
1 N.O. / 1 N.C. Left
1 N.O. / 1 N.C. Right

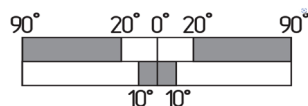


Diagram 5
Slow Action
2 N.C.

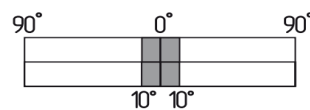
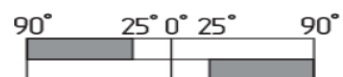


Diagram 6
Slow Action
1 N.O. Left / 1 N.O. Right

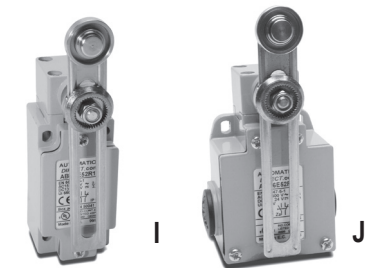
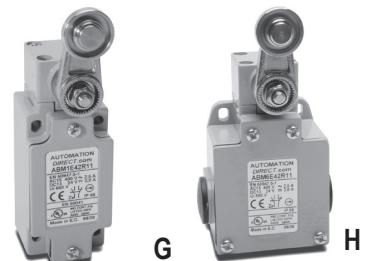
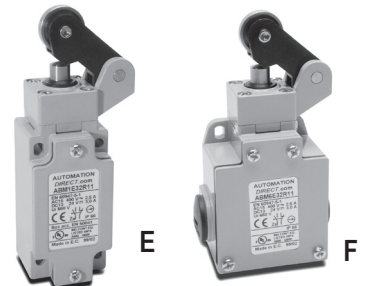
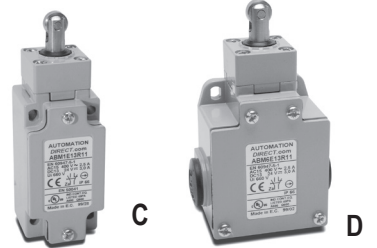
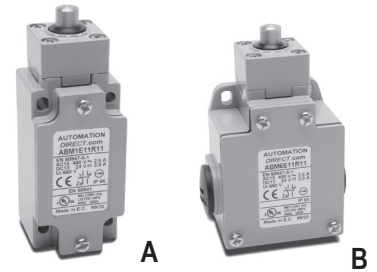


IEC Limit Switches

Heavy-duty IEC Limit Switches ABM Series

- Featuring a die-cast aluminum body for heavy-duty industrial applications
- Single and multiple conduit openings to save wiring time and money when interconnecting several limit switches
- Conduit openings in 1/2" NPT or PG13.5
- Splined actuator shaft allows very fine adjustment of switch to fit all applications
- Choose from eight different actuators including roller levers and plungers

| Heavy-duty IEC Limit Switches ABM Series | | | | | | | | | |
|--|---------|---------------------|---|-------------------------|-----------------|----------------------------|---------------------------------------|---|-------|
| Part Number | Price | Drawing Link | Actuator Type | Number of Conduit Holes | Conduit Threads | Max. Actuation Speed (m/s) | Min. Actuation Force (N) Torque (N•m) | Min. Positive Opening Force (N) /torque (N•m) | Photo |
| ABM1E11Z11 | \$21.00 | PDF | Stainless steel plunger | 1 | PG13.5 | 0.5 | 30N | 45N | A |
| ABM2E11Z11 | \$48.00 | PDF | | 1 | 1/2" NPT | 0.5 | 30N | 45N | A |
| ABM5E11Z11 | \$46.00 | PDF | | 3 | PG13.5 | 0.5 | 30N | 45N | B |
| ABM6E11Z11 | \$48.00 | PDF | | 3 | NPT | 0.5 | 30N | 45N | B |
| ABM2E13Z11 | \$48.00 | PDF | Stainless steel plunger with roller | 1 | 1/2" NPT | 0.5 | 22N | 40N | C |
| ABM6E13Z11 | \$48.00 | PDF | | 3 | 1/2" NPT | 0.5 | 22N | 40N | D |
| ABM1E32Z11 | \$46.00 | PDF | One-way lever with stainless steel roller | 1 | PG13.5 | 1.5 | 12N | 40N | E |
| ABM2E32Z11 | \$48.00 | PDF | | 1 | 1/2" NPT | 1.5 | 12N | 40N | E |
| ABM5E32Z11 | \$46.00 | PDF | | 3 | PG13.5 | 1.5 | 12N | 40N | F |
| ABM6E32Z11 | \$48.00 | PDF | | 3 | 1/2" NPT | 1.5 | 12N | 40N | F |
| ABM1E42Z11 | \$48.00 | PDF | Rotary lever with stain. steel roller (See accessories for opt. roller and actuator levers) | 1 | PG13.5 | 1.5 | 0.15 N•m | 0.30 N•m | G |
| ABM2E42Z11 | \$48.00 | PDF | | 1 | 1/2" NPT | 1.5 | 0.15 N•m | 0.30 N•m | G |
| ABM5E42Z11 | \$48.00 | PDF | | 3 | PG13.5 | 1.5 | 0.15 N•m | 0.30 N•m | H |
| ABM6E42Z11 | \$48.00 | PDF | | 3 | 1/2" NPT | 1.5 | 0.15 N•m | 0.30 N•m | H |
| ABM1E52Z11 | \$48.00 | PDF | Adj. rotary lever w/ stainless steel roller (See accessories for opt. roller and actuator levers) | 1 | PG13.5 | 1.5 | 0.15 N•m | 0.30 N•m | I |
| ABM2E52Z11 | \$48.00 | PDF | | 1 | 1/2" NPT | 1.5 | 0.15 N•m | 0.30 N•m | I |
| ABM5E52Z11 | \$46.00 | PDF | | 3 | PG13.5 | 1.5 | 0.15 N•m | 0.30 N•m | J |
| ABM6E52Z11 | \$48.00 | PDF | | 3 | NPT | 1.5 | 0.15 N•m | 0.30 N•m | J |
| ABM1E71Z11 | \$48.00 | PDF | Adjustable rotary lever w/ stainless steel rod | 1 | PG13.5 | 1.5 | 0.15 N•m | 0.30 N•m | K |
| ABM2E71Z11 | \$48.00 | PDF | | 1 | 1/2" NPT | 1.5 | 0.15 N•m | 0.30 N•m | K |
| ABM5E71Z11 | \$27.00 | PDF | | 3 | PG13.5 | 1.5 | 0.15 N•m | 0.30 N•m | L |
| ABM6E71Z11 | \$48.00 | PDF | | 3 | 1/2" NPT | 1.5 | 0.15 N•m | 0.30 N•m | L |
| ABM1E92Z11 | \$23.50 | PDF | Wobble lever w/ polyamide tip stainless steel spring | 1 | PG13.5 | 1.0 | 0.18 N•m | - | M |
| ABM2E92Z11 | \$48.00 | PDF | | 1 | 1/2" NPT | 1.0 | 0.18 N•m | - | M |
| ABM6E92Z11 | \$46.00 | PDF | | 3 | 1/2" NPT | 1.0 | 0.18 N•m | - | N |
| ABM1E93Z11 | \$48.00 | PDF | Wobble lever w/ stainless steel spring | 1 | PG13.5 | 1.0 | 0.18 N•m | - | O |
| ABM2E93Z11 | \$48.00 | PDF | | 1 | 1/2" NPT | 1.0 | 0.18 N•m | - | O |
| ABM6E93Z11 | \$48.00 | PDF | | 3 | 1/2" NPT | 1.0 | 0.18 N•m | - | P |

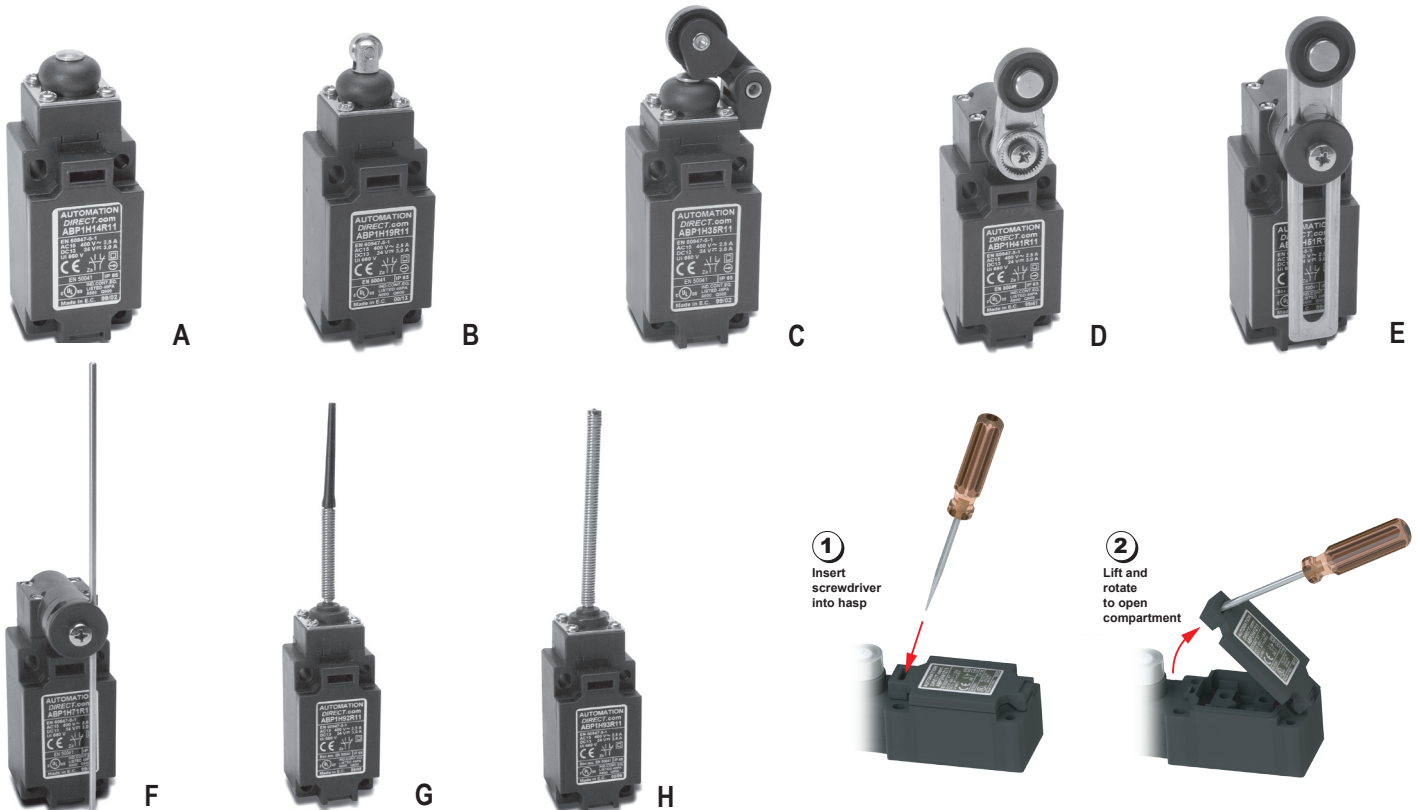


IEC Limit Switches

Double Insulated Limit Switches ABP Series

- Featuring an electrically isolated PBT body for corrosive environments
- Single conduit openings in 1/2" NPT or PG13.5
- Conduit openings splined actuator shaft allows very fine adjustment of switch to fit all applications
- Choose from eight different actuators including roller levers, plungers, and wobble sticks

| Double Insulated Limit Switches ABP Series | | | | | | | | | |
|--|---------|---------------------|--|-------------------------|-----------------|----------------------------|--|---|-------|
| Part Number | Price | Drawing Link | Actuator Type | Number of Conduit Holes | Conduit Threads | Max. Actuation Speed (m/s) | Min. Actuation Force (N) Torque (N•m) | Min. Positive Opening Force (N) Torque (N•m) | Photo |
| ABP1H14Z11 | \$31.50 | PDF | Galvanized steel plunger | 1 | PG13.5 | 0.5 | 14N | 40N | A |
| ABP2H14Z11 | \$32.00 | PDF | | | 1/2" NPT | 0.5 | 14N | 40N | A |
| ABP1H19Z11 | \$31.50 | PDF | Galvanized steel plunger with roller | | PG13.5 | 0.5 | 14N | 40N | B |
| ABP2H19Z11 | \$32.00 | PDF | | | 1/2" NPT | 0.5 | 14N | 40N | B |
| ABP1H35Z11 | \$32.00 | PDF | One-way lever with polyamide roller | | PG13.5 | 1.0 | 8N | 30N | C |
| ABP2H35Z11 | \$32.00 | PDF | | | 1/2" NPT | 1.0 | 8N | 30N | C |
| ABP1H41Z11 | \$31.50 | PDF | Side rotary lever with polyamide roller | | PG13.5 | 1.5 | 0.15 N•m | 0.30 N•m | D |
| ABP2H41Z11 | \$32.00 | PDF | | | 1/2" NPT | 1.5 | 0.15 N•m | 0.30 N•m | D |
| ABP1H51Z11 | \$32.00 | PDF | Side rotary adjustable lever with polyamide roller | | PG13.5 | 1.5 | 0.15 N•m | 0.30 N•m | E |
| ABP2H51Z11 | \$32.00 | PDF | | | 1/2" NPT | 1.5 | 0.15 N•m | 0.30 N•m | E |
| ABP1H71Z11 | \$32.00 | PDF | Side rotary with stainless steel rod | | PG13.5 | 1.5 | 0.15 N•m | 0.30 N•m | F |
| ABP2H71Z11 | \$32.00 | PDF | | | 1/2" NPT | 1.5 | 0.15 N•m | 0.30 N•m | F |
| ABP1H92Z11 | \$32.00 | PDF | Wobble lever w/ polyamide tip stainless steel spring | | PG13.5 | 1.0 | 0.18 N•m | - | G |
| ABP2H92Z11 | \$32.00 | PDF | | | 1/2" NPT | 1.0 | 0.18 N•m | - | G |
| ABP1H93Z11 | \$32.00 | PDF | Wobble lever w/ stainless steel spring | | PG13.5 | 1.0 | 0.18 N•m | - | H |
| ABP2H93Z11 | \$32.00 | PDF | | | 1/2" NPT | 1.0 | 0.18 N•m | - | H |



IEC Limit Switches Accessories

Replacement Contact Blocks

Easily-installed replacement contact blocks fit both heavy-duty IEC and double-insulated limit switches, including mini-DIN models.

Note: Limit switches come standard with snap-action contacts ([AGZ11-SWITCH](#).) To replace contact block, remove limit switch cover. Carefully remove old contact block and install replacement. Contact blocks are supplied with an adapter to fit into larger ABM and ABP switches. Remove this adapter when installing contacts in mini-DIN AAP models.



| Replacement Contact Blocks | | | |
|------------------------------|--------|---|----------------------|
| Part Number | Price | Contact Type | Action |
| AGZ11-SWITCH | \$6.25 | Snap action (1) N.O. and (1) N.C. | 3ms change-over time |
| AGZ02-SWITCH | \$6.00 | Snap action (2) N.C. | 3ms change-over time |
| AGX11-SWITCH | \$6.00 | Slow action (1) N.O. and (1) N.C. | Break before make |
| AGY11-SWITCH | \$6.00 | Slow action overlay (1) N.O. and (1) N.C. | Make before break |
| AGW02-SWITCH | \$6.50 | Slow action delay (2) N.C. | Simultaneous |
| AGW20-SWITCH | \$4.50 | Slow action overlay (2) N.O. | Simultaneous |

Additional Lever Arms, Spare Parts and Accessories for ABM Series

| Additional Lever Arms/Spare Parts and Accessories | | | |
|---|--------|---------------------|--|
| Part Number | Price | Drawing Link | Actuator Type |
| AGE42-LEVER | \$6.00 | PDF | Lever with stainless steel roller for E42 models (replacement lever) |
| AGE44-LEVER | \$6.00 | N/A | Lever with 50mm diameter rubber roller (fits E42 models) |
| AGE52-LEVER | \$7.25 | PDF | Lever with stainless steel roller for E52 models (replacement lever) |
| AGE54-LEVER | \$7.25 | PDF | Lever with 50mm diameter rubber roller (fits E52 models) |

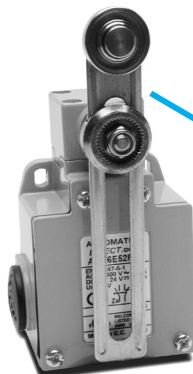
Note: See the Bar Charts page of this section for more information.



Replacement actuator levers for heavy-duty IEC models

Easily-replaceable actuators for E42 and E52 model limit switches.

Note: These models have an E42 or E52 in the part number, for example, [ABM1E42Z11](#).



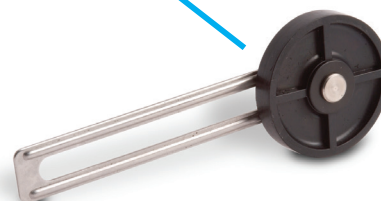
AGE52-LEVER

(Replacement lever shown installed on [ABM5E52Z11](#) limit switch)

AGE44-LEVER



AGE54-LEVER



Achieve™ IEC Limit Switches

Plastic 50mm IEC Limit Switches ADP Series

- 90-degree adjustable, head, levers are adjustable 10° on the operating shaft
- Snap action contacts (1) N.O./ (1) N.C. on each unit
- Reinforced thermoplastic housing
- Wide offering of head actuators
- IP65

Plastic 50mm IEC Limit Switches ADP Series Selection Chart

| Part Number | Price | Actuator Type | Max. Actuation Speed | Min. Actuation Force | Min. Positive Opening Force | Travel to Operate Contacts | Total Travel | Travel Diagram | Connection Type | Drawing Link * |
|------------------------------|---------|--|----------------------|----------------------|-----------------------------|----------------------------|---------------------|----------------|---|---------------------|
| ADP2T13Z11 | \$17.00 | Metal plunger with metal roller | 0.3 ms | 12N | 30N | 4.7 mm [0.18 in] | 9.6 mm [0.37 in] | 1 | (2) PG11 cable entries with (1) 1/2in NPT adapter | PDF |
| ADP2T14Z11 | \$18.00 | Metal plunger with metal roller and dust cap | 0.5 ms | 15N | 30N | 2.5 mm [0.09 in] | 5.6 mm [0.22 in] | 2 | | PDF |
| ADP2T35Z11 | \$20.00 | One-way horizontal lever with metal roller and dust cap | 1ms | 7N | 24N | 9mm [0.35 in] | 21mm [0.82 in] | 3 | | PDF |
| ADP2T41Z11 | \$18.00 | Side rotary lever with 18mm nylon roller | 1.5 ms | 0.1 N•m | 0.32 N•m | 31° | 74° | 4 | | PDF |
| ADP2T45Z11 | \$19.00 | Side rotary lever inward with 18mm nylon roller | | | | | | | | PDF |
| ADP2T51Z11 | \$19.00 | Side rotary adjustable lever with 18mm nylon roller | | | | | | | | PDF |
| ADP2T5100Z11 | \$19.00 | Side rotary 2mm step adjustable lever with 18mm nylon roller | | | | | | | | PDF |
| ADP2T71Z11 | \$20.00 | Side rotary adjustable 3mm stainless steel rod | | | | | | | | PDF |

* Weights are included on the drawing.



[ADP2T13Z11](#)



[ADP2T14Z11](#)



[ADP2T35Z11](#)



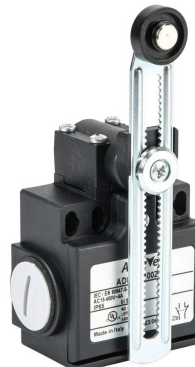
[ADP2T41Z11](#)



[ADP2T45Z11](#)



[ADP2T51Z11](#)



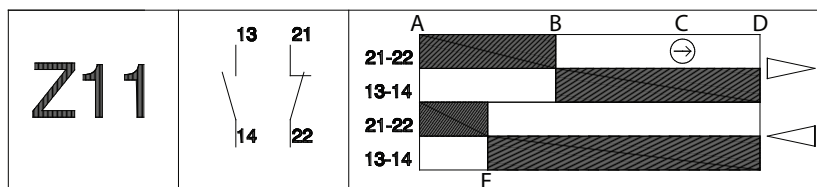
[ADP2T5100Z11](#)



[ADP2T71Z11](#)

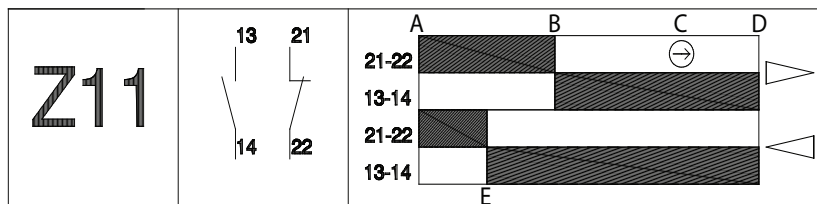
Travel Diagrams

Diagram 1



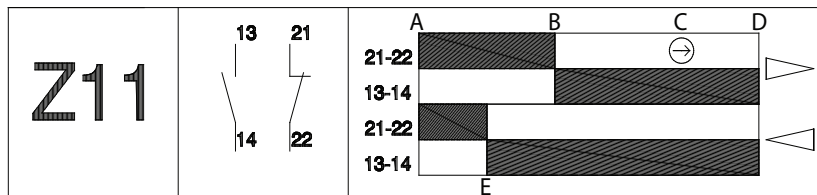
| TAG | mm |
|-----|-----|
| A | 0 |
| B | 4.7 |
| C | 7.6 |
| D | 9.6 |
| E | 2.5 |

Diagram 2



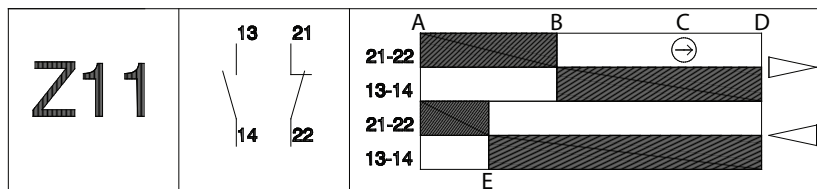
| TAG | mm |
|-----|-----|
| A | 0 |
| B | 2.5 |
| C | 4.1 |
| D | 5.6 |
| E | 1.3 |

Diagram 3



| TAG | mm |
|-----|------|
| A | 0 |
| B | 9 |
| C | 14.5 |
| D | 21 |
| E | 4.9 |

Diagram 4



| TAG | degree |
|-----|--------|
| A | 0 |
| B | 31 |
| C | 47 |
| D | 74 |
| E | 17 |

Achieve™ IEC Limit Switches

Metal 50mm IEC Limit Switches ADM Series

- 90-degree adjustable head, levers are adjustable 10° on the operating shaft
- Snap-action contacts (1) N.O./ (1) N.C. on each unit
- Metal enclosure
- Wide offering of head actuators
- IP66; part number [ADM2T93Z11](#) is IP65

Metal 50mm IEC Limit Switches ADM Series Selection Chart

| Part Number | Price | Actuator Type | Max. Actuation Speed | Min. Actuation Force | Min. Positive Opening Force | Travel to Operate Contacts | Total Travel | Travel Diagram | Connection Type | Drawing Link * |
|-------------------------------|---------|---|----------------------|----------------------|-----------------------------|----------------------------|------------------|----------------|-----------------------|---------------------|
| ADM2F11Z11 | \$17.00 | Metal plunger | 0.5 ms | 15N | 30N | 2.5 mm [0.09 in] | 5.6 mm [0.22 in] | 2 | (3) 1/2in NPT entries | PDF |
| ADM2F12Z11 | \$19.00 | Metal plunger with metal roller | 0.3 ms | 12N | 30N | 4.7 mm [0.18 in] | 9.6 mm [0.37 in] | 1 | | PDF |
| ADM2T35Z11 | \$21.00 | One-way horizontal lever with metal roller and dust cap | 1ms | 7N | 24N | 9mm [0.35 in] | 21mm [0.82 in] | 3 | | PDF |
| ADM2F43Z11 | \$22.00 | Side rotary lever with 18mm metal roller | 1.5 ms | 0.1 N•m | 0.32 N•m | 31° | 74° | 4 | | PDF |
| ADM2F46Z11 | \$23.00 | Side rotary lever inward with 18mm metal roller | | | | | | | | PDF |
| ADM2F53Z11 | \$23.00 | Side rotary adjustable metal lever with 18mm metal roller | | | | | | | | PDF |
| ADM2F71Z11 | \$23.00 | Side rotary adjustable 3mm stainless steel rod | | | | | | | | PDF |
| ADM2T93Z11 | \$20.00 | 360 degree stainless steel spring | 1ms | 0.12 N•m | N/A | 23° | 23° | 5 | | PDF |
| ADM2T9805Z11A | \$28.00 | Pull action with ring | 0.5 ms | 30N | | 2.0 mm [0.07 in] | 5.6 mm [0.22 in] | 6 | | PDF |

* Weights are included on the drawing.



[ADM2F11Z11](#)



[ADM2F12Z11](#)



[ADM2T35Z11](#)



[ADM2F43Z11](#)



[ADM2F46Z11](#)



[ADM2F53Z11](#)



[ADM2F71Z11](#)



[ADM2T93Z11](#)



[ADM2T9805Z11A](#)

Travel Diagrams

Diagram 1

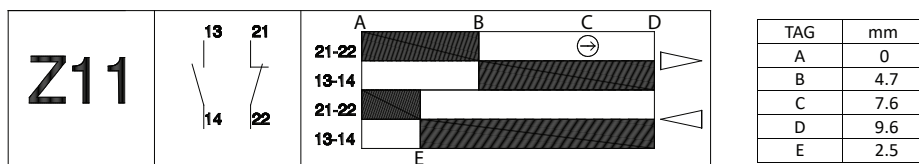


Diagram 2

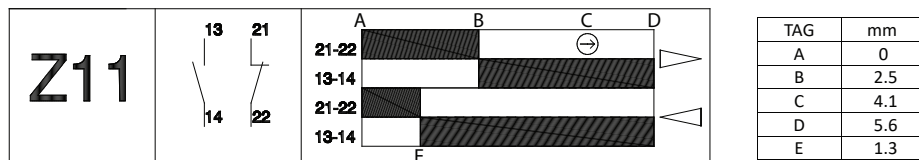


Diagram 3

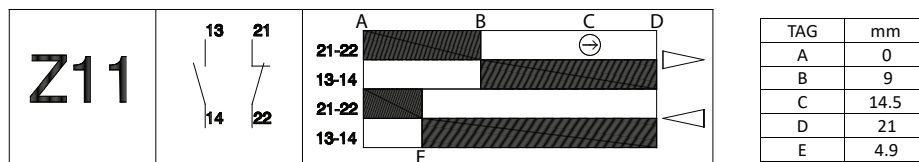


Diagram 4

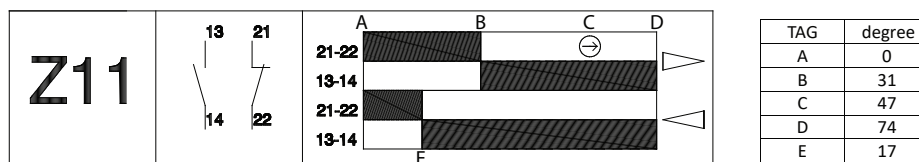


Diagram 5

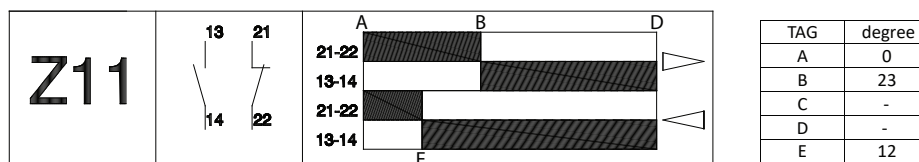
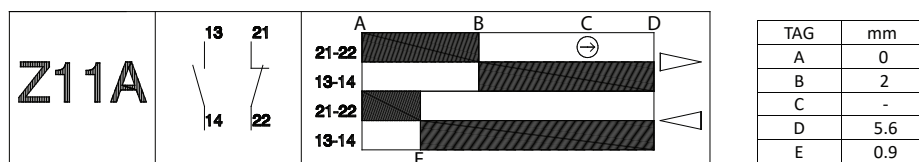


Diagram 6





IEC Limit Switches Specifications

| IEC Limit Switches Specifications | | | |
|---|-----------------------|---|--|
| Series | | AAM, AAP, ABM, ABP | ADM, ADP |
| Environmental | | | |
| Degree of Protection | | Plastic models: IP65 according to IEC 529 Metal models: IP66 according to IEC 144-CEI70-1; part number ADM2T93Z11 is IP65 | |
| Temperature Range ¹ | Plastic Models | Storage: -30 to 80°C [-22 to 176°F] Operating: -25 to 70°C [-13 to 158°F]; | |
| | Metal Models | Storage: -30 to 80°C [-22 to 176°F] Operating: -10 to 70°C [14 to 158°F]; part number ADM2T9805Z11A -40 to 70°C [-40 to 158°F] | |
| Rated Impulse Withstand Voltage | | 6 kV (degree of pollution 3) | 6 kV (degree of pollution 3) |
| Mechanical Ratings | | | |
| Working Positions ² | | All actuators can be rotated in 90° increments | |
| Mechanical Life | | Straight line working heads: 30 million operations, side rotary heads: 25 million operations, multi directional heads: 10 million operations | 25 million operations |
| Enclosure Material | | Plastic models AAP and ABP: fiberglass-reinforced plastic-V0 class (UL94); Metal models AAM and ABM: die cast aluminum | ADP models: Reinforced thermoplastic ADM models: Zinc Alloy |
| Contact Blocks Rating | | | |
| Positive Opening ³ | | All models except 98, 92, 93 operating heads | |
| Electrical Ratings | AC15 | Make: 60A@120VAC; 30A @ 240VAC; 18A @ 400VAC Break: 10A @ 24VAC; 6.5 A @130VAC; 3.1 A @ 230VAC; 1.8 A @ 400VAC | 10A @ 24VAC, 6A @ 120VAC, 4A @ 400VAC |
| | DC13 | 2.8 A @ 24VDC; 0.5 A @ 110VDC | 6A @ 24VDC, 0.55 A @125VDC, 0.4A @ 250VDC |
| Maximum Switching Frequency | | Contact blocks: all two cycles per second | 3600 (Cycles/hour) |
| Repeat Accuracy | | 0.01 mm on the operating points at 1 million operations | |
| Short-Circuit Protection | | Cartridge fuses gl 10A-500V 10.3x38 1 100KA | 10A @ < 500VAC (fuse type gG (gl)) |
| Contact Resistance | | 25 mΩ | |
| Recommended Min. Operating Speed | | With snap-action contacts: 20mm per minute ⁴ With slow-action contacts: 500mm per minute ⁵ | 20mm per minute |
| Rated Insulation Voltage | | 690V | 500V |
| Terminals Marking | | According to CENELEC EN 50013 | According to IEC 60947-5-1 |
| Wiring Connections | | 2 x 2.5mm ² (AWG14) to 2 x 0.5mm ² (AWG18) | 18-14 AWG [0.75 to 2.5 mm ²] |
| Wiring Terminal Type | | Captive screw with self-lifting pressure plate | M3.5 screw with cable clamp (+, -) pozidriv 2 |
| Electrical Protection | | Double insulation (plastic models only) | ADM models Class I, ADP models Class II - double insulation |
| Contact Blocks Performance | | | |
| Operation Frequency | | 3600 ops/h | |
| Electrical Durability (according to IEC 947-5-1) | | Utilization categories AC-15 and DC-13; load factor of 0.5. | |
| Tools Needed | | Phillips screwdriver, #1 #2 / Hex wrench, 10mm | Pozidriv 2 screwdriver |
| Approvals | | UL E191072, CE | |

¹ Minimum temperatures assume that the atmosphere is free of moisture, which could cause moving parts to freeze up.

² Some types of actuators, such as a long, heavy spring with the adjustable actuator fully extended, may not work properly if installed in a horizontal position.

³ Positive opening in a snap-action contact block is performed by a rigid mechanism that forces the N.C. contact to open in case the snap-action mechanism fails.

This would provide protection if, for example, the contacts became "welded" together by excessive current rush. Generally, positive opening is not considered to work properly on switches with actuators that are not a solid design (such as a spring or rubber roller), despite the fact that the contact block itself has positive opening. In order to be considered as having positive opening, a switch must not have flexible components between actuator actioning points and the electrical contact.

⁴ This is the speed at which snap-action contact blocks are tested. There is no minimum operating speed for snap-action contacts because the speed has no influence on the switch action. When using spring actuators, the changeover time may vary from 1ms to 3ms from maximum to minimum operating speed.

⁵ Slow-action contacts must not be operated at very low speeds because of the tendency to maintain the arc if contacts are not rapidly separated.

IEC Limit Switches Bar Charts

Limit switch types

Snap action contact: A contact element in which the contact motion is independent of the speed of the actuator. This feature ensures reliable electrical performance even in applications involving very slow moving actuators.

Slow make/slow break contacts: A contact element in which the contact motion is dependent on the actuator speed.

Terminal identification (IEC)

Each terminal is marked with two digits. The first digit indicates the pole (circuit). The second digit indicates the type of contact.

_1-_2 is N.C., _3-_4 is N.O.
so 11-12, 21-22 are N.C., while 13-14, 23-24 are N.O.



Make-before-break (overlapping) SPDT: the N.O. contact closes before the N.C. contact opens. (See ex: Y11)



Break-before-make (offset) SPDT: the N.C. contact opens before the N.O. contact closes. (See ex: X11)

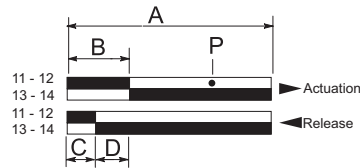
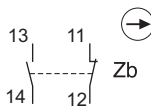


Simultaneous make and break SPDT: the N.C. contact opens at the same time as the N.O. contact closes. (See ex: Z11)

Contacts Configuration

Z11 Snap Action Contacts

1 N.O. and 1 N.C.



A = Max. travel of the operator in mm or degrees

B = Tripping travel of both contacts on actuation

C = Tripping travel of both contacts on release

D = Differential travel (between actuation and release)

P = Point from which positive opening is assured during actuation

| Part Series | Displacement Values (mm [in] or degrees) | | | |
|-------------|--|------------|------------|-------------|
| | A | B | C | P |
| ABMxE11Z11 | 6.0 [0.24] | 3.0 [0.12] | 1.8 [0.07] | 4.6 [0.18] |
| ABMxE13Z11 | 10.5 [0.41] | 5.3 [0.21] | 3.1 [0.12] | 8.2 [0.32] |
| ABMxE32Z11 | 15.5 [0.61] | 6.3 [0.25] | 3.1 [0.12] | 10.8 [0.43] |
| ABMxE42Z11 | 78° | 33° | 20° | 49° |
| ABMxE52Z11 | 78° | 33° | 20° | 49° |
| ABMxE71Z11 | 78° | 33° | 20° | 49° |
| ABMxE92Z11 | — | 21° | 9° | — |
| ABMxE93Z11 | — | 21° | 21° | — |
| ABPxH14Z11 | 5.9 [0.23] | 2.2 [0.09] | 1.0 [0.04] | 3.8 [0.15] |
| ABPxH19Z11 | 10.5 [0.41] | 4.6 [0.18] | 2.4 [0.09] | 7.5 [0.30] |
| ABPxH35Z11 | 17 [0.67] | 6.8 [0.27] | 3.8 [0.15] | 11.3 [0.44] |
| ABPxH41Z11 | 90° | 31° | 19° | 47° |
| ABPxH51Z11 | 90° | 31° | 19° | 47° |
| ABPxH71Z11 | 90° | 31° | 19° | 47° |
| ABPxH92Z11 | — | 27° | 15° | — |
| ABPxH93Z11 | — | 27° | 15° | — |

Terminal Markings

| European | |
|--------------|---|
| Terminal No. | Type |
| 11-12 | N.C. contact of pole no. 1 ¹ |
| 13-14 | N.O. contact of pole no. 2 ¹ |
| 21-22 | N.C. contact of pole no. 2 ² |
| 23-24 | N.O. contact of pole no. 1 ² |

¹ With non-isolated contacts ² With isolated contacts

Note: Green/yellow wire is physical earth ground.

□ = Contact open

■ = Contact closed

Bar Chart Examples (cam angle is 30 degrees)

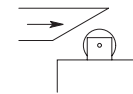


Diagram in millimeters/cam travel

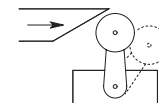
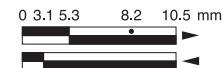


Diagram in degrees/lever rotation

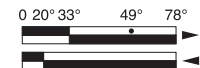
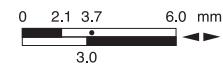
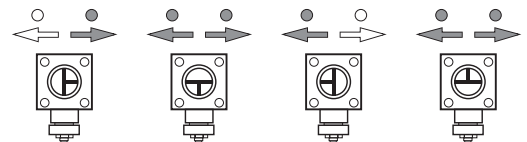


Diagram in millimeters/plunger travel

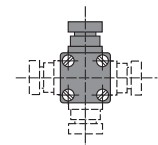


Changeable working heads (E42, E52, E71) models; view of cam insert when looking at bottom of head once removed from switch body.

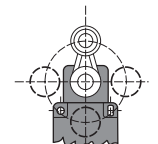
To change position, push in and twist until it locks into place



Positioning - 90° each way



Adjustable lever from 0-360°, 6° each increment



Plastic 37mm IEC Limit Switch With Remote Reset - 24VDC AHP Series

- 90-degree adjustable head, levers are adjustable to any angle on the operating shaft
- (2) N.C. snap action contacts per unit
- IP65
- Wide variety of head actuators

| IEC Limit Switch With Remote Reset - 24VDC AHP Series Selection Chart | | | | | | | | | | |
|---|---------|--|----------------------|----------------------|-----------------------------|----------------------------|-------------------|----------------|--|---------------------|
| Part Number | Price | Actuator Type | Max. Actuation Speed | Min. Actuation Force | Min. Positive Opening Force | Travel to Operate Contacts | Total Travel | Travel Diagram | Connection Type | Drawing Link * |
| Plastic Enclosure with 1m Cable | | | | | | | | | | |
| AHP2R002J02-024 | \$46.00 | Plastic plunger | 1ms | 15N | 30N | 2.4 mm [0.09 in] | 4.5 mm [0.17 in] | 1 | (2) PG11 and (1) 1/2in NPT cable entries | PDF |
| AHP2T11J02-024 | \$42.00 | Metal plunger | 0.5 ms | 15N | 30N | 2.4 mm [0.09 in] | 4.5 mm [0.17 in] | | | PDF |
| AHP2T12J02-024 | \$43.00 | Metal plunger with metal roller | 0.3 ms | 12N | 30N | 4.5 mm [0.17 in] | 7.8 mm [0.30 in] | 2 | | PDF |
| AHP2T30J02-024 | \$43.00 | One-way horizontal lever with 12.5mm plastic roller | 1ms | 7N | 24N | 8.6 mm [0.33 in] | 17.5 mm [0.68 in] | 3 | | PDF |
| AHP2T32J02-024 | \$43.00 | One-way vertical lever with 12.5mm plastic roller | | | | | | | | PDF |
| AHP2T41J02-024 | \$44.00 | Side rotary lever with 18mm nylon roller | 1.5 ms | 0.1 N•m | 0.32 N•m | 30° | 62° | 4 | | PDF |
| AHP2T5100J02-024 | \$45.00 | Side rotary 2mm step adjustable lever with 18mm nylon roller | | | | | | | | PDF |
| AHP2T5200J02-024 | \$46.00 | Side rotary 2mm step adjustable lever with 50mm nylon roller | | | | | | | | PDF |

* Weights are included on the drawing.

Travel Diagrams

Diagram 1

Diagram 1 shows the J02 switch with a plastic plunger actuator. The switch body has terminals 11, 12, 21, and 22. The actuator is a plastic plunger. The travel diagram shows the switch body with points A, B, C, and D. The travel distance from A to B is 2.4 mm, from B to C is 2.4 mm, and from C to D is 4.5 mm.

| TAG | mm |
|-----|-----|
| A | 0 |
| B | 2.4 |
| C | 4 |
| D | 4.5 |

Diagram 2

Diagram 2 shows the J02 switch with a metal plunger actuator. The switch body has terminals 11, 12, 21, and 22. The actuator is a metal plunger. The travel diagram shows the switch body with points A, B, C, and D. The travel distance from A to B is 4.5 mm, from B to C is 2.4 mm, and from C to D is 7.8 mm.

| TAG | mm |
|-----|-----|
| A | 0 |
| B | 4.5 |
| C | 7.4 |
| D | 7.8 |

Diagram 3

Diagram 3 shows the J02 switch with a metal plunger with metal roller actuator. The switch body has terminals 11, 12, 21, and 22. The actuator is a metal plunger with a metal roller. The travel diagram shows the switch body with points A, B, C, and D. The travel distance from A to B is 8.6 mm, from B to C is 8.6 mm, and from C to D is 17.5 mm.

| TAG | mm |
|-----|------|
| A | 0 |
| B | 8.6 |
| C | 13.1 |
| D | 17.5 |

Diagram 4

Diagram 4 shows the J02 switch with a side rotary lever actuator. The switch body has terminals 11, 12, 21, and 22. The actuator is a side rotary lever. The travel diagram shows the switch body with points A, B, C, and D. The travel distance from A to B is 30 degrees, from B to C is 16 degrees, and from C to D is 16 degrees.

| TAG | degree |
|-----|--------|
| A | 0 |
| B | 30 |
| C | 46 |
| D | 62 |

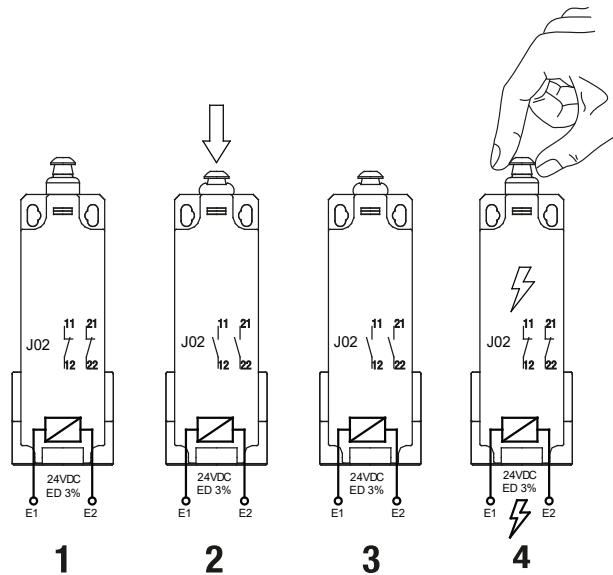


IEC Limit Switches With Remote Reset 24VDC

Wiring Diagrams



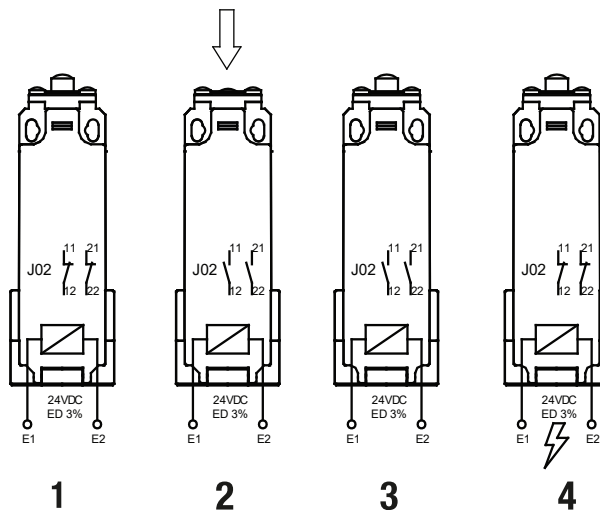
AHP2R002J02-024



- 1. Limit switch not actuated
- 2. Activation
- 3. Limit switch actuated
- 4. Reset by solenoid or manual



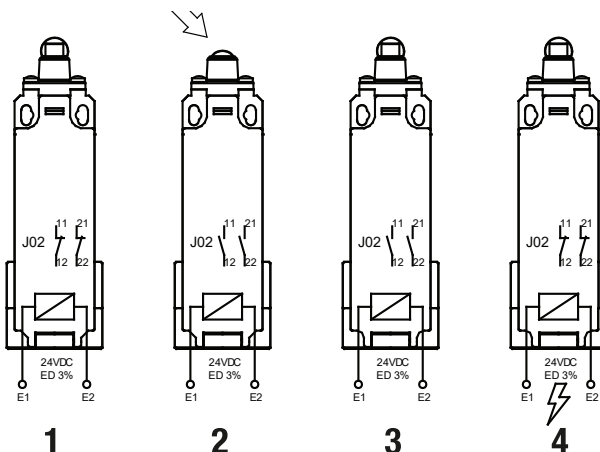
AHP2T11J02-024



- 1. Limit switch not actuated
- 2. Activation
- 3. Limit switch actuated
- 4. Reset by solenoid



AHP2T12J02-024



- 1. Limit switch not actuated
- 2. Activation
- 3. Limit switch actuated
- 4. Reset by solenoid

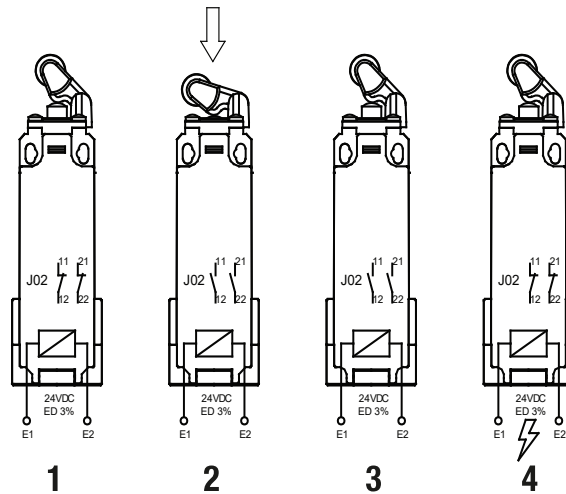


IEC Limit Switches With Remote Reset 24VDC

Wiring Diagrams



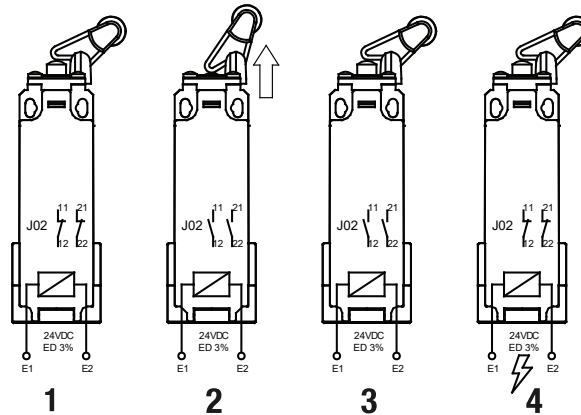
AHP2T30J02-024



- 1. Limit switch not actuated
- 2. Activation
- 3. Limit switch actuated
- 4. Reset by solenoid



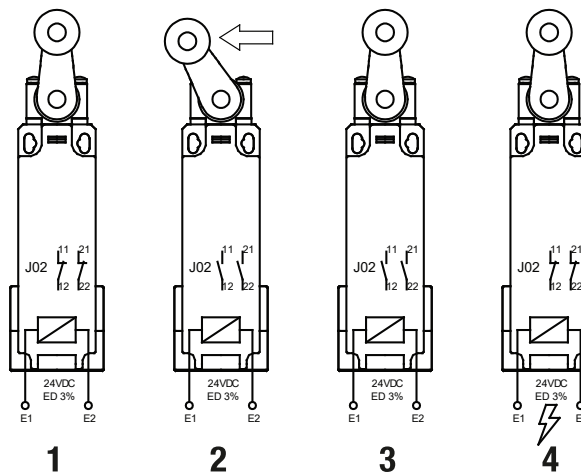
AHP2T32J02-024



- 1. Limit switch not actuated
- 2. Activation
- 3. Limit switch actuated
- 4. Reset by solenoid



AHP2T41J02-024



- 1. Limit switch not actuated
- 2. Activation
- 3. Limit switch actuated
- 4. Reset by solenoid

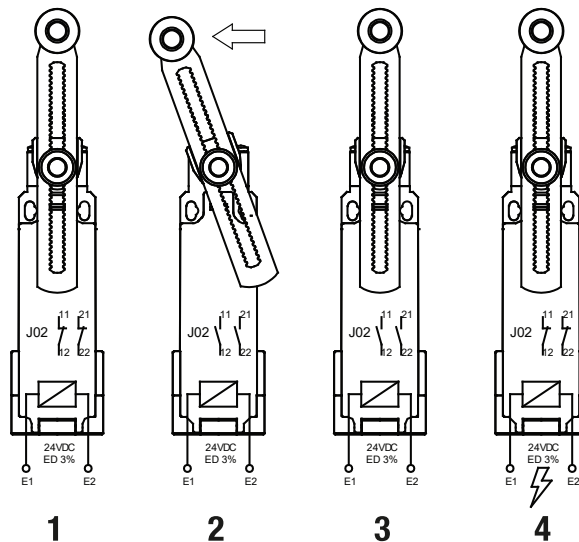


IEC Limit Switches With Remote Reset 24V

Wiring Diagrams



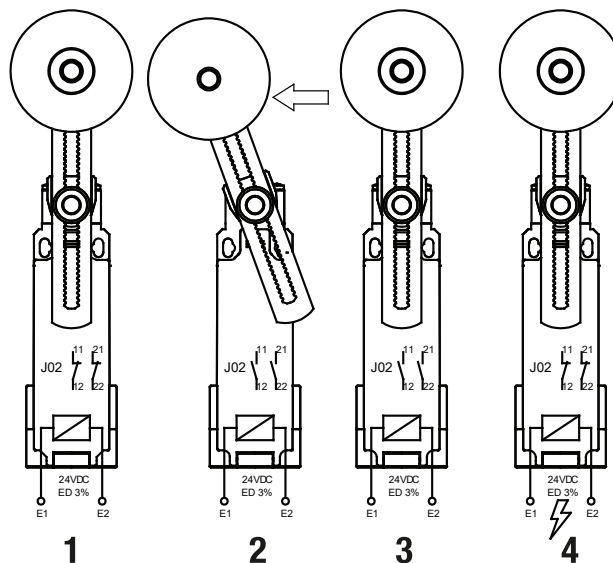
AHP2T5100J02-024



- 1. Limit switch not actuated
- 2. Activation
- 3. Limit switch actuated
- 4. Reset by solenoid



AHP2T5200J02-024



- 1. Limit switch not actuated
- 2. Activation
- 3. Limit switch actuated
- 4. Reset by solenoid



IEC Limit Switches With Remote Reset 24V Specifications

| IEC Limit Switch With Remote Reset 24V Specifications | | |
|---|---|--|
| Environmental | | |
| Degree of Protection | | IP65 |
| Temperature Range | | Storage: -30 to 80°C [-22 to 176°F] Operating: -25 to 70°C [-13 to 158°F] |
| Rated Impulse Withstand Voltage | | 6kV (degree of pollution 3) |
| Mechanical Ratings | | |
| Working Positions | | 90-degree adjustable head |
| Mechanical Life | | 50,000 Operations |
| Enclosure Material | | Reinforced thermoplastic |
| Contact Blocks Rating | | |
| Positive Opening | | Yes |
| Electrical Ratings (according to IEC 60947-1) | AC-15 | 4A @ 400VAC |
| | DC-13 | 3A @ 24VDC |
| Switching Frequency | | Max. 119 operations/hour |
| Repeat Accuracy | | 119ops/h |
| Short-Circuit Protection | | 4A @ 500VAC, 3A @ 24VDC. gG (gl) type fuses |
| Contact Resistance | | 25mΩ |
| Rated Insulation Voltage | according to IEC 60947-1 and EN 60947-1 | 400V |
| | according to UL508 and CSA C22-2n° 14 | A300 - Q300 |
| Terminal Markings | | According to IEC 60947-5-1 |
| Wiring Connections | | 18-14 AWG [0.75 to 2.5 mm ²] |
| Connection Type | | (2) PG11 and (1) 1/2in NPT cable entries |
| Torque Requirements | Head | 0.5 to 0.8 N•m [4.42 to 7.08 in-lb] |
| | Switch and Solenoid | 0.8 to 0.9 N•m [7.08 to 7.96 in-lb] |
| Solenoid Supply Voltage | | 24 VAC/VDC +/- 10% |
| Solenoid Current Consumption | | 4.25 A |
| Solenoid ON time | | 0.2 to 0.5 sec |
| Solenoid OFF Time* | | Min. 30 sec |
| Safety Data | | |
| Electrical Protection (according to IEC 61140) | | Class II |
| Agency Approvals** | | UL, CE |

*30 seconds between actuations at a max of 119 operations per hour.

**To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.

Achieve™ Compact Limit Switches

Metal Plunger Actuator AEM Series

- Die-cast metal housings
- 9.8 ft [3m] cable/5-pin M12 quick-disconnect (bottom and right)
- Compact size with standard 25mm [0.98 in] hole spacing
- Wide offering of head actuators
- Epoxy resin-filled for IP67 rating
- Snap action (Z11) and (Z22), slow make/slow-break (X11), contacts available
- N.C. contacts are positive-opening operated unless otherwise noted.

Compact Limit Switches AEM Series Selection Chart

| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed | Min. Actuation Force | Min. Positive Opening Force | Number of Contacts | Contact Configuration | Connection Type | Photo |
|---------------------------------|---------|---------------------|--------------------------------|----------------------|----------------------|-----------------------------|--------------------|-----------------------|--|-------|
| AEM2G11Z11-3 | \$27.50 | PDF | Metal plunger | 0.5 ms | 15N | 30N | (1) N.O./(1) N.C. | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | A |
| AEM2G11X11-3 | \$27.50 | PDF | | | | | | Diagram 2 | | |
| AEM2G1101Z11-3R | \$25.50 | PDF | | | | | | Diagram 1 | 9.8 ft [3m] cable (right exit) | |
| AEM2G1101Z11M | \$24.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G1101Z11MR | \$24.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |
| AEM2G1101Z22-3 | \$33.00 | PDF | | | | | (2) N.O./(2) N.C. | Diagram 3 | 9.8 ft [3m] cable (bottom exit) | B |
| AEM2G16Z11-3 | \$32.00 | PDF | Metal plunger with dust cap | 0.5 ms | 15N | 30N | (1) N.O./(1) N.C. | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | C |
| AEM2G16X11-3 | \$32.00 | PDF | | | | | | Diagram 2 | | |
| AEM2G1601Z11-3R | \$27.50 | PDF | | | | | | Diagram 1 | 9.8 ft [3m] cable (right exit) | |
| AEM2G1601Z11M | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G1601Z11MR | \$25.50 | PDF | | | | | | | 5-Pin M12 quick-disconnect (right exit) | |
| AEM2G1601Z22-3 | \$35.00 | PDF | | | | | (2) N.O./(2) N.C. | Diagram 3 | 9.8 ft [3m] cable (bottom exit) | D |
| AEM2G18Z11-3 | \$38.00 | PDF | Metal plunger with bevel cut | 0.5 ms | 15N | 30N | (1) N.O./(1) N.C. | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | E |
| AEM2G21Z11-3 | \$30.00 | PDF | Metal plunger with fixing nuts | 0.5 ms | 15N | 30N | | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | F |
| AEM2G21X11-3 | \$30.00 | PDF | | | | | | Diagram 2 | | |
| AEM2G2101Z11-3R | \$26.50 | PDF | | | | | | Diagram 1 | 9.8 ft [3m] cable (right exit) | |
| AEM2G2101Z11M | \$24.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G2101Z11MR | \$24.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |
| AEM2G2101Z22-3 | \$33.00 | PDF | | | | | (2) N.O./(2) N.C. | Diagram 3 | 9.8 ft [3m] cable (bottom exit) | G |

Achieve™ Compact Limit Switches

Metal Plunger Actuator AEM Series



A



B



C



D



E



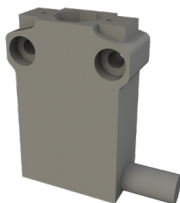
F



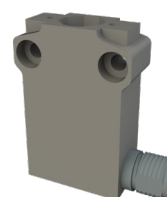
G



Cable Out (bottom)



Cable Out (right)

5-pin M12 quick-disconnect
(bottom exit)5-pin M12 quick-disconnect
(right exit)



Compact Limit Switches

Metal Plunger with Roller Actuator AEM Series

- Die-cast metal housings
- 9.8 ft [3m] cable/5-pin M12 quick-disconnect (bottom and right)
- Compact size with standard 25mm [0.98 in] hole spacing
- Wide offering of head actuators

- Epoxy resin-filled for IP67 rating
- Snap action (Z11) and (Z22), slow make/slow break (X11), contacts available
- N.C. contacts are positive-opening operated unless otherwise noted ➡

Compact Limit Switches AEM Series Selection Chart

| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Force | Min. Actuation Force | Min. Positive Opening Force | Number of Contacts | Contact Configuration | Connection Type | Photo |
|---------------------------------|---------|---------------------|---------------------------------------|----------------------|----------------------|-----------------------------|--------------------|-----------------------|--|-------|
| AEM2G12Z11-3 | \$33.50 | PDF | Metal plunger with metal roller | 0.1 ms | 10N | 30N | (1) N.O./(1) N.C. | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | A |
| AEM2G12X11-3 | \$33.50 | PDF | | | | | | Diagram 2 | | |
| AEM2G1201Z11-3R | \$27.50 | PDF | | | | | | Diagram 1 | 9.8 ft [3m] cable (right exit) | |
| AEM2G1201Z11M | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G1201Z11MR | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |
| AEM2G1201Z22-3 | \$35.00 | PDF | | | | | (2) N.O./(2) N.C. | Diagram 3 | 9.8 ft [3m] cable (bottom exit) | B |
| AEM2G13Z11-3 | \$32.00 | PDF | Metal plunger with nylon roller | 0.1 ms | 10N | 30N | (1) N.O./(1) N.C. | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | C |
| AEM2G13X11-3 | \$32.00 | PDF | | | | | | Diagram 2 | | |
| AEM2G1301Z11-3R | \$27.50 | PDF | | | | | | Diagram 1 | 9.8 ft [3m] cable (right exit) | |
| AEM2G1301Z11M | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G1301Z11MR | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |
| AEM2G14Z11-3 | \$33.00 | PDF | Metal plunger with metal cross roller | 0.1 ms | 10N | 30N | | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | D |
| AEM2G14X11-3 | \$33.00 | PDF | | | | | | Diagram 2 | | |
| AEM2G1401Z11-3R | \$27.50 | PDF | | | | | | Diagram 1 | 9.8 ft [3m] cable (right exit) | |
| AEM2G1401Z11M | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G1401Z11MR | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |
| AEM2G15Z11-3 | \$31.00 | PDF | Metal plunger with nylon cross roller | 0.1 ms | 10N | 30N | | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | E |
| AEM2G15X11-3 | \$31.00 | PDF | | | | | | Diagram 2 | | |
| AEM2G1501Z11-3R | \$26.50 | PDF | | | | | | Diagram 1 | 9.8 ft [3m] cable (right exit) | |
| AEM2G1501Z11M | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G1501Z11MR | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |

Achieve™ Compact Limit Switches

Metal Plunger with Roller Actuator AEM Series

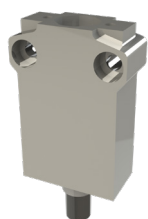
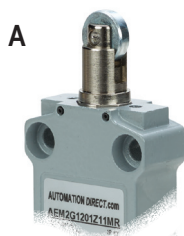
(Continued)

| Compact Limit Switches AEM Series Selection Chart | | | | | | | | | | |
|---|---------|---------------------|---|----------------------|----------------------|-----------------------------|--------------------|-----------------------|--|---------------------------------|
| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed | Min. Actuation Force | Min. Positive Opening Force | Number of Contacts | Contact Configuration | Connection Type | Photo |
| AEM2G17Z11-3 | \$30.00 | PDF | Metal plunger with metal roller and dust cap | 0.1 ms | 10N | 30N | (1) N.O./(1) N.C. | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | F |
| AEM2G1701Z11-3R | \$30.00 | PDF | | | | | | | 9.8 ft [3m] cable (right exit) | |
| AEM2G1701Z11M | \$26.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G1701Z11MR | \$26.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |
| AEM2G22Z11-3 | \$33.00 | PDF | Metal plunger with metal roller and fixing nuts | 0.1 ms | 10N | 30N | | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | G |
| AEM2G22X11-3 | \$33.00 | PDF | | | | | | Diagram 2 | | |
| AEM2G2201Z11-3R | \$29.00 | PDF | | | | | | Diagram 1 | 9.8 ft [3m] cable (right exit) | |
| AEM2G2201Z11M | \$26.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G2201Z11MR | \$26.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |
| AEM2G2201Z22-3 | \$35.00 | PDF | | 0.5 ms | | | | (2) N.O./(2) N.C. | Diagram 3 | 9.8 ft [3m] cable (bottom exit) |
| AEM2G2301Z11-3R | \$29.00 | PDF | Metal plunger with nylon roller and fixing nuts | 0.1 ms | 10N | 30N | (1) N.O./(1) N.C. | Diagram 1 | 9.8 ft [3m] cable (right exit) | I |
| AEM2G24Z11-3 | \$33.00 | PDF | Metal plunger with metal cross roller and fixing nuts | 0.1 ms | 10N | 30N | | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | J |
| AEM2G25Z11-3 | \$33.00 | PDF | Metal plunger with nylon cross roller and fixing nuts | 0.1 ms | 10N | 30 | | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | K |

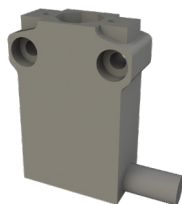
Achieve™ Compact Limit Switches

Metal Plunger with Roller Actuator AEM Series

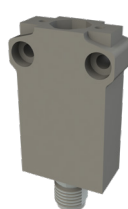
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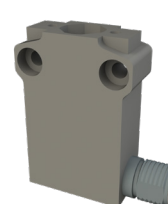
Cable Out (bottom exit)



Cable Out (right exit)



5-pin M12 quick-disconnect
(bottom exit)



5-pin M12 quick-disconnect
(right exit)

Achieve™ Compact Limit Switches

Lever with Roller Actuator AEM Series

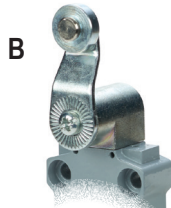
- Die-cast metal housings
- 9.8 ft [3m] cable/5-pin M12 quick-disconnect (bottom and right)
- Compact size with standard 25mm [0.98 in] hole spacing
- Wide offering of head actuators
- Epoxy resin-filled for IP67 rating
- Snap action (Z11) and (Z22), slow make/slow break (X11), contacts available
- N.C. contacts are positive-opening operated unless otherwise noted

Compact Limit Switches AEM Series Selection Chart

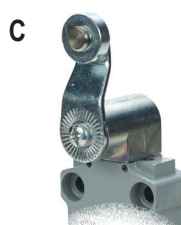
| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed | Min. Actuation Force | Min. Positive Opening Force | Number of Contacts | Contact Configuration | Connection Type | Photo |
|---------------------------------|---------|---------------------|---|----------------------|----------------------|-----------------------------|--------------------|-----------------------|--|-------|
| AEM2G41Z11-3 | \$30.00 | PDF | Side rotary lever with 14mm nylon roller | 1.5 ms | 0.08 N•m | 0.28 N•m | (1) N.O./(1) N.C. | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | A |
| AEM2G41X11-3 | \$30.00 | PDF | | | | | | Diagram 2 | | |
| AEM2G4120Z11-3R | \$26.50 | PDF | | | | | | Diagram 1 | 9.8 ft [3m] cable (right exit) | |
| AEM2G4120Z11M | \$24.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G4120Z11MR | \$24.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |
| AEM2G4120Z22-3 | \$33.00 | PDF | | | | | (2) N.O./(2) N.C. | Diagram 3 | 9.8 ft [3m] cable (bottom exit) | |
| AEM2G42Z11-3 | \$30.50 | PDF | Side rotary lever with 14mm metal roller | 1.5 ms | 0.08 N•m | 0.28 N•m | | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | B |
| AEM2G42X11-3 | \$30.50 | PDF | | | | | | Diagram 2 | | |
| AEM2G4220Z11-3R | \$26.50 | PDF | | | | | | Diagram 1 | 9.8 ft [3m] cable (right exit) | |
| AEM2G4220Z11M | \$24.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G4220Z11MR | \$24.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |
| AEM2G43Z11-3 | \$31.00 | PDF | Side rotary lever with 14mm ball bearing roller | 1.5 ms | 0.08 N•m | 0.28 N•m | (1) N.O./(1) N.C.. | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | C |
| AEM2G43X11-3 | \$31.00 | PDF | | | | | | Diagram 2 | | |
| AEM2G4320Z11-3R | \$27.50 | PDF | | | | | | Diagram 1 | 9.8 ft [3m] cable (right exit) | |
| AEM2G4320Z11M | \$24.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G4320Z11MR | \$24.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |
| AEM2G45Z11-3 | \$32.00 | PDF | Side rotary lever with 18mm nylon roller | 1.5 ms | 0.08 N•m | 0.28 N•m | | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | D |
| AEM2G45X11-3 | \$32.00 | PDF | | | | | | Diagram 2 | | |
| AEM2G4520Z11-3R | \$27.50 | PDF | | | | | | Diagram 1 | 9.8 ft [3m] cable (right exit) | |
| AEM2G4520Z11M | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G4520Z11MR | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |



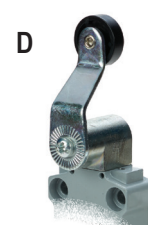
Cable Out (bottom exit)



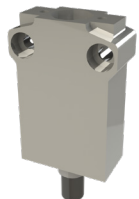
Cable Out (right exit)



5-pin M12 quick-disconnect (bottom exit)



5-pin M12 quick-disconnect (right exit)



Achieve™ Compact Limit Switches

Adjustable Lever with Roller Actuator AEM Series

- Die-cast metal housings
- 9.8 ft [3m] cable/5-pin M12 quick-disconnect (bottom and right)
- Compact size with standard 25mm [0.98 in] hole spacing
- Epoxy resin-filled for IP67 rating
- Snap action (Z11) and (Z22), slow make/slow break (X11), contacts available
- N.C. contacts are positive-opening operated unless otherwise noted.

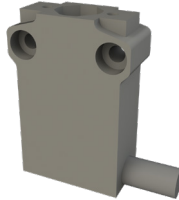
Compact Limit Switches AEM Series Selection Chart

| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed | Min. Actuation Force | Min. Positive Opening Force | Number of Contacts | Contact Configuration | Connection Type | Photo |
|---------------------------------|---------|---------------------|---|----------------------|----------------------|-----------------------------|--------------------|-----------------------|--|-------|
| AEM2G51Z11-3 | \$33.00 | PDF | Side rotary adjustable lever with 18mm nylon roller | 1.5 ms | 0.08 N•m | 0.28 N•m | (1) N.O./(1) N.C. | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | A |
| AEM2G51X11-3 | \$33.00 | PDF | | | | | | Diagram 2 | | |
| AEM2G5120Z11-3R | \$29.00 | PDF | | | | | Diagram 1 | | 9.8 ft [3m] cable (right exit) | |
| AEM2G5120Z11M | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G5120Z11MR | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |
| AEM2G5120Z22-3 | \$36.00 | PDF | | | | | (2) N.O./(2) N.C. | Diagram 3 | 9.8 ft [3m] cable (bottom exit) | |

A



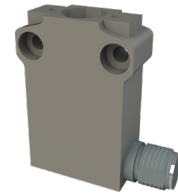
Cable Out (bottom exit)



Cable Out (right exit)



5-pin M12 quick-disconnect (bottom exit)



5-pin M12 quick-disconnect (right exit)

Compact Limit Switches

Adjustable Lever with SS Nylon Tip AEM2G Series

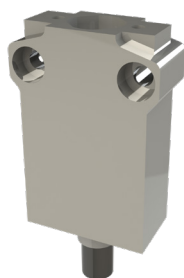
- Die-cast metal housings
- 3m cable/5-pin M12 quick-disconnect (center and right)
- (1) N.O./ (1) N.C. contact on all units
- Compact size with standard 25mm hole spacing
- Epoxy resin-filled for IP67 rating
- Both snap action (Z11) and slow make/slow break (X11) contacts available

Compact Limit Switches AEM2G Series Selection Chart

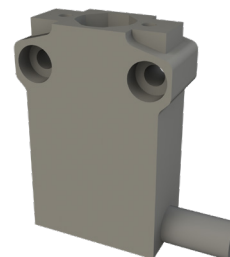
| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed (m/s) | Min. Actuation Force (N) Torque (N•m) | Min. Positive Opening Force (N) Torque (N•m) | Contact Configuration | Connection Type | Photo |
|---------------------------------|---------|---------------------|--|----------------------------|--|---|-----------------------|-------------------------------------|-------|
| AEM2G61Z11-3 | \$32.00 | PDF | Side rotary lever with nylon tipped stainless steel spring | 1.5 | 0.08 | 0.28 | Diagram 1 | Cable Out (bottom) | A |
| AEM2G61X11-3 | \$32.00 | PDF | | | | | Diagram 2 | | |
| AEM2G6120Z11-3R | \$27.50 | PDF | | | | | Diagram 1 | Cable Out (right) | |
| AEM2G6120Z11M | \$25.50 | PDF | | | | | | 5-pin M12 quick-disconnect (bottom) | |
| AEM2G6120Z11MR | \$25.50 | PDF | | | | | | 5-pin M12 quick-disconnect (right) | |



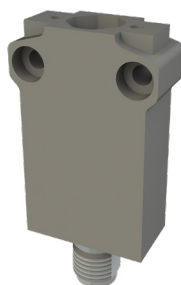
A



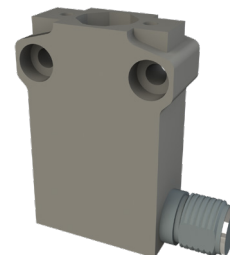
Cable Out (bottom)



Cable Out (right)



5-pin M12 quick-disconnect (bottom)



5-pin M12 quick-disconnect (right)

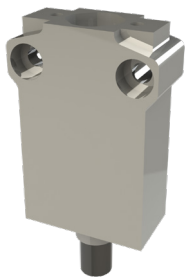
Compact Limit Switches

Adjustable Rod Actuator AEM2G Series

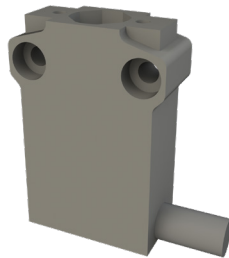
- Die-cast metal housings
- 3m cable/5-pin M12 quick-disconnect (center and right)
- (1) N.O./(1) N.C. contact on all units
- Compact size with standard 25mm hole spacing
- Wide offering of head actuators
- Epoxy resin-filled for IP67 rating
- Both snap action (Z11) and slow make/slow break (X11) contacts available
- N.C. contacts are positive-opening operated unless otherwise noted. ➡

Compact Limit Switches AEM2G Series Selection Chart

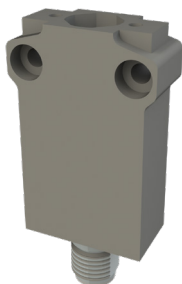
| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed (m/s) | Min. Actuation Force (N) Torque (N•m) | Min. Positive Opening Force (N) Torque (N•m) | Contact Config. Diagram | Connection Type | Photo |
|---------------------------------|---------|---------------------|--|----------------------------|--|---|-------------------------|-------------------------------------|-------|
| AEM2G71Z11-3 | \$32.00 | PDF | Side rotary adjustable 3mm stainless steel rod | 1.5 | 0.08 | 0.28 | Diagram 1 | Cable Out (bottom) | A |
| AEM2G71X11-3 | \$32.00 | PDF | | | | | Diagram 2 | | |
| AEM2G7120Z11-3R | \$27.50 | PDF | | | | | Diagram 1 | Cable Out (right) | |
| AEM2G7120Z11M | \$25.50 | PDF | | | | | | 5-pin M12 quick-disconnect (bottom) | |
| AEM2G7120Z11MR | \$25.50 | PDF | | | | | | 5-pin M12 quick-disconnect (right) | |
| AEM2G73Z11-3 | \$31.50 | PDF | Side rotary adjustable 6mm nylon rod | 1.5 | 0.08 | 0.28 | Diagram 1 | Cable Out (bottom) | B |
| AEM2G73X11-3 | \$31.50 | PDF | | | | | Diagram 2 | | |
| AEM2G7320Z11-3R | \$27.50 | PDF | | | | | Diagram 1 | Cable Out (right) | |
| AEM2G7320Z11M | \$25.50 | PDF | | | | | | 5-pin M12 quick-disconnect (bottom) | |
| AEM2G7320Z11MR | \$25.50 | PDF | | | | | | 5-pin M12 quick-disconnect (right) | |
| AEM2G74Z11-3 | \$31.50 | PDF | Side rotary adjustable 6mm fiberglass rod | 1.5 | 0.08 | 0.28 | Diagram 1 | Cable Out (bottom) | C |
| AEM2G75Z11-3 | \$31.50 | PDF | Side rotary adjustable 3mm square steel shaft | 1.5 | 0.08 | 0.28 | Diagram 1 | Cable Out (bottom) | D |



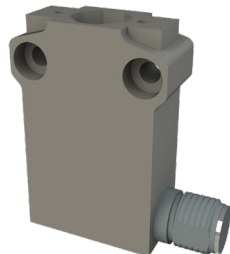
Cable Out (bottom)



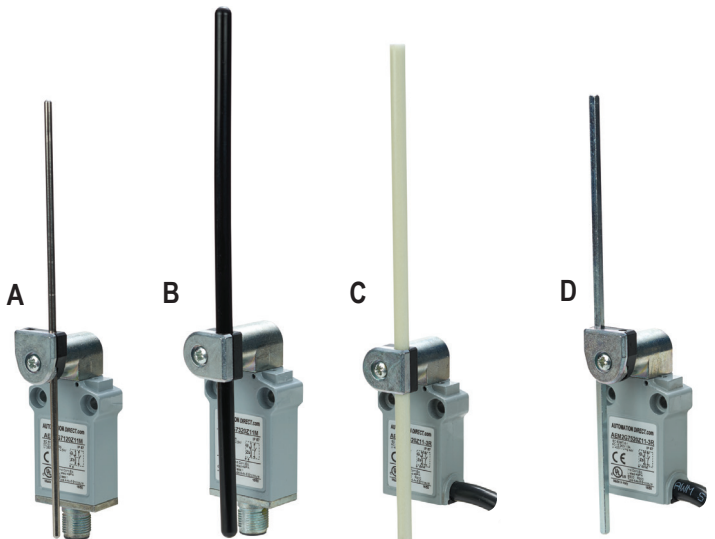
Cable Out (right)



5-pin M12 quick-disconnect (bottom)



5-pin M12 quick-disconnect (right)



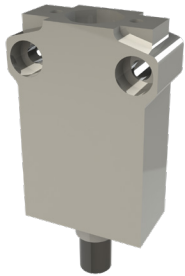
Achieve™ Compact Limit Switches

360 Degree Spring Actuator AEM2G Series

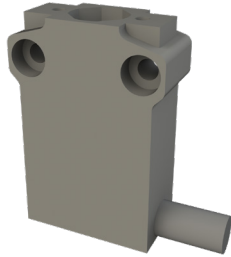
- Die-cast metal housings
- 9.8 ft [3m] cable/5-pin M12 quick-disconnect (bottom and right)
- Compact size with standard 25mm [0.98 in] hole spacing
- Epoxy resin-filled for IP67 rating
- Snap-action (Z11) and (Z22), slow-make/slow-break (X11), contacts available

Compact Limit Switches AEM2G Series Selection Chart

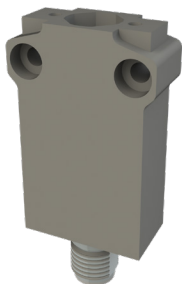
| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed | Min. Actuation Force | Min. Positive Opening Force | Number of Contacts | Contact Configuration | Connection Type | Photo |
|---------------------------------|---------|---------------------|--|----------------------|----------------------|-----------------------------|---------------------|-----------------------|--|-------|
| AEM2G92Z11-3 | \$31.00 | PDF | 360 degree stainless steel spring with nylon tip | 0.1 ms | 10N | 30N | (1) N.O. / (1) N.C. | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | A |
| AEM2G9201Z11-3R | \$27.50 | PDF | | | | | | | 9.8 ft [3m] cable (right exit) | |
| AEM2G9201Z11M | \$24.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G9201Z11MR | \$24.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |
| AEM2G93Z11-3 | \$31.00 | PDF | 360 degree stainless steel spring | 1.0 ms | 0.10 N•m | — | (1) N.O. / (1) N.C. | Diagram 1 | 9.8 ft [3m] cable (bottom exit) | B |
| AEM2G9301Z11-3R | \$27.50 | PDF | | | | | | | 9.8 ft [3m] cable (right exit) | |
| AEM2G9301Z11M | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (bottom exit) | |
| AEM2G9301Z11MR | \$25.50 | PDF | | | | | | | 5-pin M12 quick-disconnect (right exit) | |
| AEM2G9301Z22-3 | \$34.00 | PDF | | | | | (2) N.O. / (2) N.C. | Diagram 3 | 9.8 ft [3m] cable (bottom exit) | |



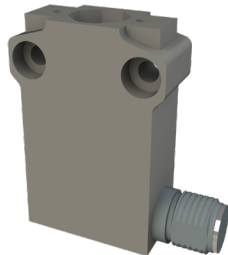
Cable Out (bottom exit)



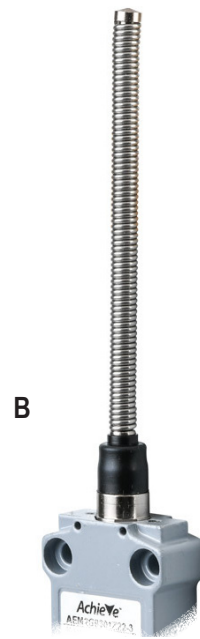
Cable Out (right exit)



5-pin M12 quick-disconnect (bottom exit)



5-pin M12 quick-disconnect (right exit)





Compact Limit Switches Specifications

| Compact Limit Switches Specifications AEM Series | | | |
|--|-------|---|---|
| Type | | (1) N.O./(1) N.C. | (2) N.O./(2) N.C. |
| Environmental | | | |
| Degree of Protection | | IP67 according to IEC 60529 | |
| Temperature Range | | Storage: -40 to 70°C (-40 to 158°F). Operating: -25 to 70°C [-13 to 158°F] | |
| Mechanical Ratings | | | |
| Mechanical Life | | 10 million operations. Models G16, G92, G93: 5 million operations. | |
| Enclosure Material | | ZAMAK (zinc alloy) | |
| Contact Blocks Rating | | | |
| Positive Opening | | Yes, except G61, G92, G93 | All models except 92, 93 operating heads |
| Electrical Ratings | AC-15 | Make: 100A @ 24VAC; 60A @ 120VAC; 30A @ 240VAC Break: 10A @ 24VAC; 6A @ 120VAC; 3A @ 240VAC | 4A @ 24VDC, 3A @ 240VAC |
| | DC-13 | 2.8 A @ 24VDC; 0.55 A @ 125VDC; 0.27 A@250VDC | 2A @ 24VDC, 0.4 A @ 250VDC |
| Maximum Switching Frequency | | Contact blocks: all one cycle per second | 3600 [cycles/hour] |
| Repeat Accuracy | | 0.05 mm on the operating points at 1 million operations | |
| Short-Circuit Protection | | 10A @ <500V | 4A @ <500VAC Part number AEM2G9301Z22-3 is 10A @ <500VAC |
| Contact Resistance | | 25mΩ | |
| Recommended Min Operating Speed | | With snap-action contacts: 20mm per minute With slow-action contacts: 500mm per minute | |
| Rated Insulation Voltage | | B300, R300 according to UL508; 400V (degree of pollution: 3) according to IEC 60947-1 | C300 - R300 according to UL508, 250V (degree of pollution 3) |
| Connection Type | | Cable: 3m [9.8 ft] PVC cable, 5 x 0.75 mm² (18AWG). Overall cable diameter: 8.20 mm (0.32 in) Connector: 5-pin M12 quick-disconnect | Pigtail 3m [9.8 ft], PVC, 0.5 mm² [20AWG] |
| Wiring Terminal Markings | | According to CENELEC EN50013 | N.C. Gray/Brown Red/Pink N.O. Blue/Yellow Green/White |
| Electrical Protection | | Class I according to IEC60536-1 | |
| Contact Blocks Performance | | | |
| Operation Frequency | | 3600 ops/h | |
| Electrical Durability (according to IEC 947-5-1) | | Utilization categories AC-15 and DC-13; load factor of 0.5. | |
| Torque | | All: 0.5 N•m [0.8 N•m max] | N/A |
| Approvals | | UL file E191072, CE | |

*To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.



Compact Limit Switches Supplemental

Limit Switch Types

Snap action contact: A contact element in which the contact motion is independent of the speed of the actuator. This feature ensures reliable electrical performance even in applications involving very slow moving actuators.

Slow make/slow break contacts: A contact element in which the contact motion is dependent on the actuator speed.

Contact Displacement Values and Bar Charts

Diagram 1

Z11 Snap-action Contacts
1 N.O. and 1 N.C.

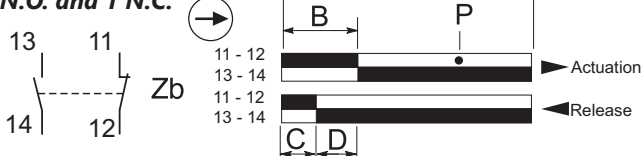


Diagram 2

X11 Snap-action Contacts
1 N.O. and 1 N.C.

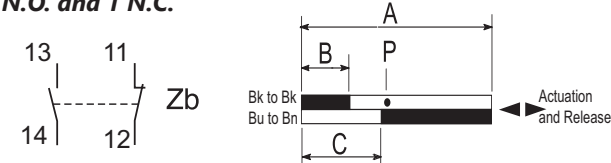
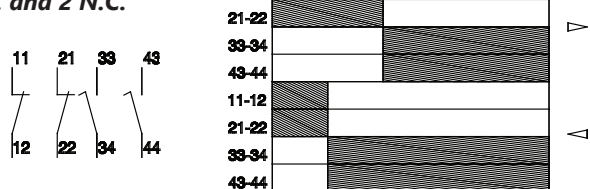


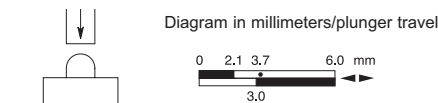
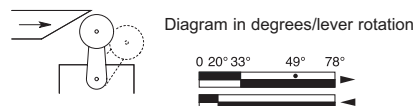
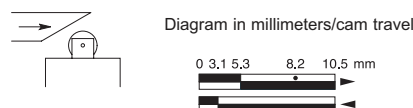
Diagram 3

Z22 Snap-action Contacts
2 N.O. and 2 N.C.



A = Max. travel of the operator in mm or degrees
B = Tripping travel of the N.C. contact
C = Tripping travel of the N.O. contact
D = Differential travel (between actuation and release)
P = Point from which positive opening is assured during actuation

Bar Chart Examples (cam angle is 30 degrees)

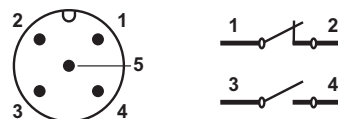


Note: Values represent travel of cam in direction of arrow.

Contact Displacement Values

| Part Series | Contact Configuration | Displacement Values mm [in] or degrees | | | |
|--|-----------------------|--|------------|------------|----------------------|
| | | A | B | C | P |
| AEM2G11, AEM2G16, AEM2G18, AEM2G21 | Z11 | 5.0 [0.20] | 2.2 [0.09] | 1.4 [0.06] | 4.3 [0.17] |
| AEM2G11, AEM2G16, AEM2G21 | X11 | 5.0 [0.20] | 1.9 [0.07] | 3.2 [0.13] | 3.4 [0.13] |
| AEM2G11, AEM2G16, AEM2G21 | Z22 | 5.0 [0.20] | 2.1 [0.82] | 1.3 [0.05] | 4.0 [0.16] |
| AEM2G12, AEM2G13, AEM2G14, AEM2G15, AEM2G17, AEM2G18, AEM2G22, AEM2G23, AEM2G24, AEM2G25 | Z11 | 8.7 [0.34] | 3.8 [0.15] | 2.4 [0.09] | 7.5 [0.30] |
| AEM2G12, AEM2G13, AEM2G14, AEM2G15, AEM2G22, AEM2G23, AEM2G24, AEM2G25 | X11 | 8.7 [0.34] | 3.3 [0.13] | 5.7 [0.22] | 5.9 [0.23] |
| AEM2G12, AEM2G22 | Z22 | 3.6 [0.14] | 8.7 [0.34] | 2.3 [0.09] | 7.0 [0.27] |
| AEM2G41, AEM2G42, AEM2G43, AEM2G45, AEM2G51, AEM2G71, AEM2G72, AEM2G73, AEM2G74, AEM2G75 | Z11 | 74° | 32° | 21° | 65° |
| AEM2G41, AEM2G42, AEM2G43, AEM2G45, AEM2G51, AEM2G71, AEM2G72, AEM2G73, AEM2G74, AEM2G75 | X11 | 74° | 28° | 48° | 50° |
| AEM2G41, AEM2G51 | Z22 | 75° | 30° | 10° | 55° |
| AEM2G61 | Z11 | 74° | 32° | 21° | Not positive-opening |
| AEM2G61 | X11 | 74° | 28° | 48° | |
| AEM2G92 | Z11 | — | 20° | 10° | |
| AEM2G93 | Z11 | — | 20° | 10° | — |
| AEM2G93 | Z22 | — | 19° | 5° | |

5-Pin M12 connector



Note: Green/yellow wire is physical earth ground.

□ = Contact open
■ = Contact closed

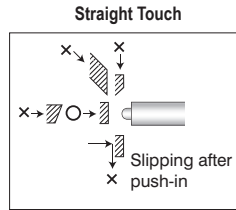


Precision Limit Switches

Precision Touch Limit Switches

Features

- Slim design (from M5) allows side-by-side installation
- Long-stroke and water-resistant models available
- 5 micron (µm) repeat accuracy
- Stainless steel housing
- Metal bearing
- Straight-touch and straight needle touch available



O indicates correct target approach and orientation.
X indicates approach and orientation that should be avoided.



CSJ055A-L



CS067A-CL

Precision Touch Limit Switches Selection Chart

| Part Number | Price | Drawing Link | Actuator/ Head Type* | Barrel Type | Barrel Diameter/ Thread* | Stroke | Switching Output | Contact Force | Connection Type |
|-------------------------------|---------|---------------------|------------------------------|-------------|--------------------------|--------|------------------|---------------|-------------------|
| Straight Touch | | | | | | | | | |
| CSJ055A | \$45.00 | PDF | Ø 2mm plunger, SR 1.5 mm | Threaded | M5×0.5 | 2.8mm | (1) N.O. | 1N | Cable, 3m [9.8ft] |
| CSJ055A-L | \$54.00 | PDF | Ø 2mm plunger, SR 1.5mm | | | 2.8mm | (1) N.O. | 1N | |
| CSJS50A | \$45.00 | PDF | Ø 2mm plunger SR 1.5mm | Smooth | Ø 5mm | 2.8mm | (1) N.O. | 1N | |
| CSJS50A-L | \$54.00 | PDF | Ø 2mm plunger, SR 1.5mm | | | 2.8mm | (1) N.O. | 1N | |
| CS065A-L | \$60.00 | PDF | Ø 2mm plunger, SR 1.5mm | Threaded | M6×0.5 | 2.8mm | (1) N.O. | 1N | |
| CSS60A-L | \$56.00 | PDF | Ø 2mm plunger, SR 1.5mm | Smooth | Ø 6mm | 2.8mm | (1) N.O. | 1N | |
| CSS60B-L | \$56.00 | PDF | Ø 2mm plunger, SR 1.5mm | | | 2.8mm | (1) N.C. | 1N | |
| CS067A | \$51.00 | PDF | Ø 2mm plunger, SR 1.5mm | Threaded | M6×0.75 | 2.8mm | (1) N.O. | 1N | |
| CS067A-B | \$55.00 | PDF | Ø 2mm plunger, Ø 4mm flat | | | 2.8mm | (1) N.O. | 1N | |
| CS067A-L | \$60.00 | PDF | Ø 2mm plunger, SR 1.5mm | | | 2.8mm | (1) N.O. | 1N | |
| CS067B | \$51.00 | PDF | Ø 2mm plunger, SR 1.5mm | | | 2.8mm | (1) N.C. | 1N | |
| CS067B-L | \$60.00 | PDF | Ø 2mm plunger, SR 1.5mm | | | 2.8mm | (1) N.C. | 1N | |
| CS067A-BL | \$65.00 | PDF | Ø 2mm plunger, Ø 4mm flat | | | 2.8mm | (1) N.O. | 1N | |
| CSS80A-L | \$56.00 | PDF | Ø 3.5mm plunger, SR 3mm | Smooth | Ø 8mm | 2.8mm | (1) N.O. | 1N | |
| CS087A-L | \$60.00 | PDF | Ø 3.5mm plunger, SR 3mm | Threaded | M8×0.75 | 2.8mm | (1) N.O. | 1N | |
| CSK087A | \$58.00 | PDF | Ø 3.5mm plunger, SR 3mm | | | 5mm | (1) N.O. | 1N | |
| CSK087A-L | \$67.00 | PDF | Ø 3.5mm plunger, SR 3mm | | | 5mm | (1) N.O. | 1N | |
| CSK087B-L | \$67.00 | PDF | Ø 3.5mm plunger, SR 5mm | | | 5mm | (1) N.C. | 1N | |
| CSP087A-AL | \$78.00 | PDF | Ø 5.5mm plunger, 2mm round | | | 2.8mm | (1) N.O. | 1N | |
| CSP087B-AL | \$78.00 | PDF | Ø 5.5mm plunger, 2mm round | | | 2.8mm | (1) N.C. | 1N | |
| Straight Needle Contact Touch | | | | | | | | | |
| CSJ055A-CL | \$60.00 | PDF | needle plunger, 1.5mm flat | Threaded | M5×0.5 | 2.8mm | (1) N.O. | 1N | Cable, 3m [9.8ft] |
| CS065A-CL | \$67.00 | PDF | needle plunger, 1.5mm flat | | M6×0.5 | 2.8mm | (1) N.O. | 1N | |
| CS067A-CL | \$83.00 | PDF | needle plunger, 1.5mm flat | | M6×0.75 | 2.8mm | (1) N.O. | 1N | |
| Spring Plunger | | | | | | | | | |
| SP080A-L | \$51.00 | PDF | Ø 2.5mm plunger SR 1.25mm | Threaded | M8×1.25 mm | 3mm | (1) N.O. | 8N | Cable 2m [6.56ft] |

* Ø = diameter, SR = surface radius

-L: LED indicator (mounted in cable 120mm from the switch)



Precision Limit Switches

**CSJ055A****CSJ055A-L****CSJS50A****CSJS50A-L****CS065A-L****CSS60A-L****CSS60B-L****CS067A****CS067A-B****CS067A-L****CS067B****CS067B-L****CS067A-BL****CSS80A-L****CS087A-L****CSK087A****CSK087A-L****CSP087A-AL****CSJ055A-CL****CS065A-CL****CS067A-CL****SP080A-L**



Precision Limit Switches

| Precision Touch Limit Switches Specifications | | | | | | |
|---|--|-------|-----|-----|-------|---------------------------------------|
| Type | Straight Touch Switches | | | | | |
| Series | CS | CSJ | CSS | CSK | CSP | SP |
| Environmental | | | | | | |
| Degree of Protection | IP65 | | | | IP67 | IP40 |
| Temperature Range | Operating: 0 to 80°C [32 to176°F] (Ice-free) | | | | | |
| Mechanical Ratings | | | | | | |
| Enclosure Material | Stainless Steel | | | | | |
| Pretravel | 0.3 mm | | | | | 2.2 mm |
| Torque (for nuts on threaded barrels, set screws on smooth barrels) | 4 N•m | 2 N•m | N/A | N/A | 7 N•m | L1 10N•m L2 5•Nm |
| Vibration | 10–55Hz total amplitude 1.5 for X, Y, Z each direction | | | | | |
| Shock | 300 m/s² for X, Y, Z each direction | | | | | |
| Repeat Accuracy | 5 micron (µm) * | | | | | Both On-Off, Off-On 0.01mm (range) |
| Recommended Minimum Operating Speed | 50mm (1.96 in)/minute | | | | | |
| Electrical Ratings | | | | | | |
| Contact Life | 10 million operations | | | | | 3 million (spring) |
| Contact Voltage | 5–24VDC | | | | | |
| Steady Current Rating | 10mA or less | | | | | |
| Max In-rush Current Rating | 20mA without LED indicator, 10mA with LED indicator | | | | | |
| Connection Type | Cable: 3m (2m for SP series) Oil resistant Ø2.8/ 2 cores, Tensile strength 30N, minimum bending R7 | | | | | |
| Indicating | -L models: LED indicator (mounted in cable 120mm from the switch) | | | | | |

* At operating speed 50-200 mm/minute. Operating speed slower than 10 mm/min is not recommended.

Circuit Diagrams

| Without LED | With LED (-L models) |
|-------------------------------|-------------------------------|
| <p>Normally open (N.O.)</p> | <p>Normally open (N.O.)</p> |
| <p>Normally closed (N.C.)</p> | <p>Normally closed (N.C.)</p> |

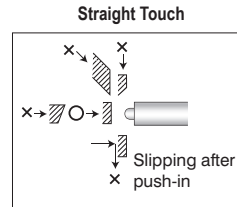


Precision Limit Switches

Precision Straight Touch Limit Switches

Features

- Ultra-small design (M5 or Ø5)
- 3 micron (µm) repeat accuracy
- No movement differential
- Dustproof / water-resistant (IP67) models available
- Stainless steel housing
- Metal bearing



O indicates correct target approach and orientation.

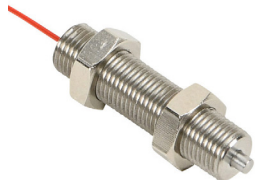
X indicates approach and orientation that should be avoided.

Precision Straight Touch Limit Switches Selection Chart

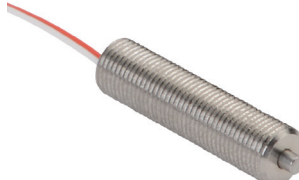
| Part Number | Price | Drawing Link | Actuator/Head Type* | Barrel | Barrel Diameter/Thread* | Stroke | Switching Output | Contact Force | Connection Type |
|----------------------------|----------|---------------------|-----------------------------|----------|-------------------------|--------|------------------|---------------|-------------------------|
| PT5M1WA | \$93.00 | PDF | Ø 1.5mm plunger, SR 2mm | Threaded | M5×0.5 | 1.5mm | (1) N.O. | 0.5N | Core wire, 0.5m [1.6ft] |
| PT5M3WA | \$72.00 | PDF | Ø 1.5mm plunger, SR 2mm | | | 1.5mm | (1) N.O. | 0.5N | |
| PT5M3WB | \$72.00 | PDF | Ø 1.5mm plunger, SR 2mm | | | 1.5mm | (1) N.C. | 0.5N | |
| PT5M3CB | \$85.00 | PDF | Ø1.5mm plunger, SR 2mm | | | 1.5mm | (1) N.C. | 0.5N | |
| PT5M3CB-L | \$86.00 | PDF | Ø 1.5mm plunger, SR 2mm | | | 1.5mm | (1) N.C. | 0.5N | |
| PT5S3CB-L | \$81.00 | PDF | Ø 1.5mm plunger, SR 2mm | Smooth | Ø 5 mm | 1.5mm | (1) N.C. | 0.5N | Cable, 2m [6.5ft] |
| PTP5M3CB-B | \$101.00 | PDF | Ø 1.5mm plunger, Ø 3mm flat | Threaded | M5×0.5 | 1.5mm | (1) N.C. | 0.8N | |
| PTP5M3CB-L | \$94.00 | PDF | Ø 11.5mm plunger, SR 2mm | Threaded | | 1.5mm | (1) N.C. | 0.8N | |
| PTP5S3CB-L | \$88.00 | PDF | Ø 1.5mm plunger, SR 2mm | Smooth | Ø 5 mm | 1.5mm | (1) N.C. | 0.8N | |

* Ø = diameter, SR = surface radius

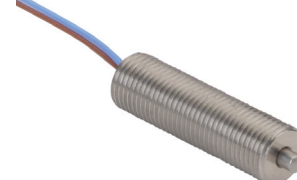
-L: LED indicator (mounted in cable 120mm from the switch)



[PT5M1WA](#)



[PT5M3WA](#)



[PT5M3WB](#)



[PT5M3CB](#)



[PTP5M3CB-L](#)



[PTP5S3CB-L](#)



[PTP5M3CB-B](#)



[PTP5M3CB-L](#)



[PTP5S3CB-L](#)



Precision Limit Switches

| Precision Straight Touch Limit Switches Specifications | | |
|---|--|----------|
| Series | PT5x3xx | PTP5x3CB |
| Environmental | | |
| Degree of Protection | IP40 | IP67 |
| Temperature Range | Operating: 0 to 80°C [32 to 176°F] (Ice-free) | |
| Mechanical Ratings | | |
| Enclosure Material | 303 Stainless Steel | |
| Pretravel | 0* (PT5M3WA and PT5M1WA about 0.3 mm) | |
| Torque (for nuts on threaded barrels, set screws on smooth barrels) | 1 N·m | |
| Vibration | 10–55 Hz total amplitude 1.5 for X, Y, Z each direction | |
| Shock | 300 m/s² for X, Y, Z each direction | |
| Electrical Ratings | | |
| Contact Life | 3 million operations | |
| Repeat Accuracy | Both On–Off, Off–On: 0.003 mm** | |
| Recommended Minimum Operating Speed | 50 mm/minute | |
| Contact Voltage | 5–24 VDC | |
| Steady Current Rating | 10mA or less | |
| Max In-rush Current Rating | 20mA without LED indicator, 10mA with LED indicator | |
| Connection Type | PTxxxWx: Core-wire cable, 0.5m (×2) Oil resistant Ø 0.6 Tensile strength 15N. PTxxxCB: Cable, 2m Oil-resistant Ø2.8/2 cores Tensile strength 30N, Minimum bending R7. | |
| Indicating | -L models: LED indicator (mounted in cable 120mm from the switch) | |

* Adjust the installed location of the switch by the signal switching point.

** At operating speed 50-200 mm/minute. Operating speed slower than 10 mm/min is not recommended.

Circuit Diagrams

| Without LED | With LED (-L models) |
|-------------------------------|-------------------------------|
| <p>Normally open (N.O.)</p> | |
| <p>Normally closed (N.C.)</p> | <p>Normally closed (N.C.)</p> |



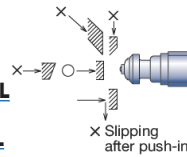
Precision Limit Switches

High Precision Touch Limit Switches

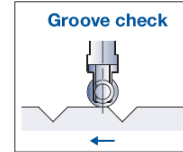
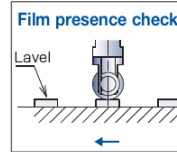
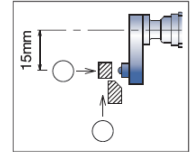
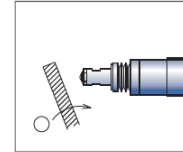
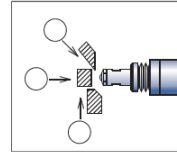
Features

- 0.5 micron (μm) repeat accuracy
- No movement differential
- No temperature drift
- Dustproof / water-resistant (IP67)
- LED indicator
- Stainless steel housing

P085DB-AL
P10DB-A
P10DA-AL
P10DB-AL
P10DLB-AL



O indicates correct target approach and orientation.
 X indicates approach and orientation that should be avoided.



P10DHA-TML
P10DHB-TML
P10DHLTB-TML

High Precision Touch Limit Switches Selection Chart

| Part Number | Price | Drawing Link | Actuator/Head Type* | Barrel Type | Barrel Diameter/Thread | Stroke | Switching Output | Contact Force | Connection Type |
|----------------------------------|----------|---------------------|-----------------------------|-------------|------------------------|--------|------------------|---------------|---------------------|
| Straight Touch | | | | | | | | | |
| P085DB-AL | \$148.00 | PDF | Ø 5.5mm plunger, 2mm round | Threaded | M8×0.5 | 3mm | (1) N.C. | 1N | Cable 3m [9.8ft] |
| P10DB-A | \$129.00 | PDF | Ø8.5mm plunger, 2mm round | Threaded | M10×0.5 | 3mm | (1) N.C. | 1N | |
| P10DB-AL | \$148.00 | PDF | Ø 8.5mm plunger, 2mm round | Threaded | M10×0.5 | 3mm | (1) N.C. | 1N | |
| P10DA-AL | \$148.00 | PDF | Ø 8.5mm plunger, 2mm round | Threaded | M10×0.5 | 3mm | (1) N.O. | 1N | |
| P10DLB-AL | \$149.00 | PDF | Ø 8.5mm plunger, 2mm round | Threaded | M10×0.5 | 10mm | (1) N.C. | 1N | |
| Straight Touch With Ball Bearing | | | | | | | | | |
| P10DHA-TML | \$312.00 | PDF | Ø 2.5mm plunger, 8mm roller | Threaded | M14×0.5 | 3mm | (1) N.O. | 1N | Cable 3m [9.8ft] |
| P10DHB-TML | \$312.00 | PDF | Ø 2.5mm plunger, 8mm roller | Threaded | M14×0.5 | 3mm | (1) N.C. | 1N | |
| P10DHLTB-TML | \$343.00 | PDF | Ø 2.5mm plunger, 8mm roller | Threaded | M14×0.5 | 10mm | (1) N.C. | 1N | |

* Ø = diameter, SR = surface radius

-xL: LED indicator (mounted in cable 120mm from the switch)

P085DB-AL



P10DB-A



P10DB-AL



P10DA-AL



P10DLB-AL



P10DHA-TML



P10DHB-TML



P10DHLTB-TML





Precision Limit Switches

High Precision Touch Limit Switches

| High Precision Touch Limit Switches Specifications | | | | |
|---|---|--|---------------------|--------|
| Series | P08 | P10 | P10DH | P10DHL |
| Environmental | | | | |
| Degree of Protection | IP67 | | | |
| Temperature Range | Operating: 0 to 80°C [32 to 176°F] (Ice-free) | | | |
| Mechanical Ratings | | | | |
| Enclosure Material | 303 Stainless Steel | | | |
| Pretravel | 0* | P10DA / P10DHA: 0.2 mm P10DB / P10DHB: 0* | | 0* |
| Torque (for nuts on threaded barrels, set screws on smooth barrels) | 4 N•m (2.95 lb•ft) | 8 N•m (5.90 lb•ft) | 10 N•m (7.38 lb•ft) | |
| Vibration | 10–55Hz total amplitude 1.5 for X, Y, Z each direction | | | |
| Shock | 300 m/s² for X, Y, Z each direction | | | |
| Repeat Accuracy | Both On–Off, Off–On: 0.0005 mm (range)** | | | |
| Recommended Minimum Operating Speed | 50mm/minute | | | |
| Electrical Ratings | | | | |
| Contact Life | 3 million operations | | | |
| Contact Voltage | 5–24VDC | | | |
| Steady Current Rating | 10mA or less | | | |
| Max In-rush Current Rating | 20mA without LED indicator, 10mA with LED indicator | | | |
| Connection Type | Cable: 3m Oil resistant Ø5/2 cores (P08: Ø4/2 cores), tensile strength 30N, minimum bending R7, 20AWG | | | |
| Indicating | -AL: LED indicator (mounted in cable 120mm from the switch) | | | |

* Adjust the installed location of the switch by the signal switching point.

** At operating speed 50-200 mm/minute. Operating speed slower than 10 mm/min is not recommended.

Circuit Diagrams

| Without LED | With LED (-AL models) |
|-------------------------------|-------------------------------|
| <p>Normally open (N.O.)</p> | <p>Normally open (N.O.)</p> |
| <p>Normally closed (N.C.)</p> | <p>Normally closed (N.C.)</p> |



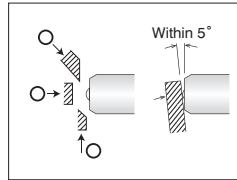
Precision Limit Switches

Ball Plunger Limit Switches

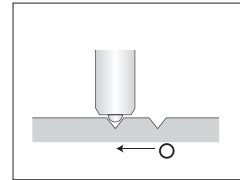
Features

- Indexing positioning ball plunger combined with touch switch for confirmation signal
- Dual function reduces number of components required
- 10 micron (μm) repeat accuracy
- Angled/Sliding Touch
- Higher contact force ideal for indexing

Angled/Sliding Touch



Indexing Touch



O indicates correct target approach and orientation.

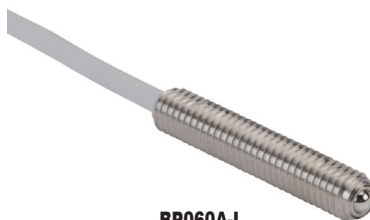
Ball Plunger Limit Switches Selection Chart

| Part Number | Price | Drawing Link | Actuator/Head Type* | Barrel Type | Barrel Diameter/Thread* | Stroke | Switching Output | Contact Force | Connection Type |
|--------------------------------------|---------|----------------------------|---------------------|-------------|-------------------------|--------|------------------|---------------|-----------------------------|
| Indexing/Angled/Sliding Touch | | | | | | | | | |
| <u>BP060A-F</u> | \$46.00 | <u>PDF</u> | Ø 3mm ball plunger | Threaded | Ø M6×1.0 | 0.8mm | (1) N.O. | 1N | Cable 2m [6.5 ft] |
| <u>BP060A-L</u> | \$55.00 | <u>PDF</u> | Ø 3mm ball plunger | | | 0.8mm | (1) N.O. | 8-13N | |
| <u>BP060A-LF</u> | \$55.00 | <u>PDF</u> | Ø 3mm ball plunger | | | 0.8mm | (1) N.O. | 1N | |
| <u>BP080A-L</u> | \$66.00 | <u>PDF</u> | Ø 4mm ball plunger | | Ø M8×1.25 | 1.0mm | (1) N.O. | 10-16N | |
| <u>BP080A-LF</u> | \$66.00 | <u>PDF</u> | Ø 4mm ball plunger | | | 1.0mm | (1) N.O. | 1N | |
| <u>BP100A-L</u> | \$69.00 | <u>PDF</u> | Ø 5mm ball plunger | | Ø M10×1.5 | 1.2mm | (1) N.O. | 15-20N | |
| <u>BP100A-LF</u> | \$69.00 | <u>PDF</u> | Ø 5mm ball plunger | | | 1.2mm | (1) N.O. | 1N | |
| <u>BP4SWA</u> | \$78.00 | <u>PDF</u> | Ø 3mm ball plunger | Smooth | Ø 4mm | 0.8mm | (1) N.O. | 1N | Core wire 0.5m [1.64 ft] |
| <u>BP5MWA</u> | \$73.00 | <u>PDF</u> | Ø 3mm ball plunger | Threaded | M5×0.5 | 1mm | (1) N.O. | 1N | |

* Ø = diameter



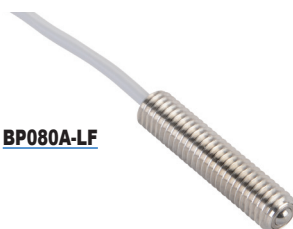
[BP060A-F](#)



[BP060A-L](#)



[BP080A-L](#)



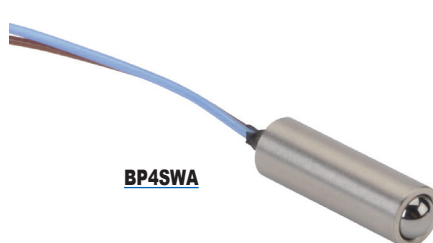
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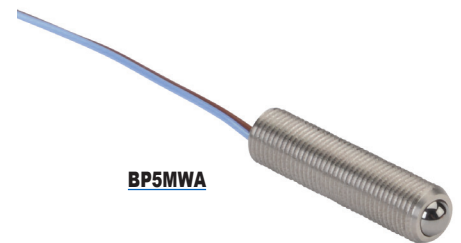
[BP100A-L](#)



[BP100A-LF](#)



[BP4SWA](#)



[BP5MWA](#)



Precision Limit Switches

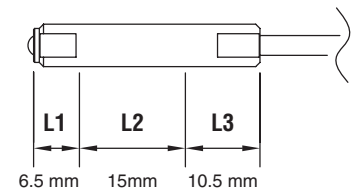
| Ball Plunger Limit Switches Specifications | | | | | |
|---|---|--------|--------|--|--------|
| Series | BP060A | BP080A | BP100A | BP4SWA | BP5MWA |
| Environmental | | | | | |
| Degree of Protection | IP40 | | | | |
| Temperature Range | Operating: 0 to 80°C [32 to 176°F] (Ice-free) | | | | |
| Mechanical Ratings | | | | | |
| Enclosure Material | 303 Stainless Steel | | | | |
| Pretravel | 0.3 mm | | | | |
| Torque (for nuts on threaded barrels, set screws on smooth barrels) | See Torque Limit Figure | | | NA | 1 N•m |
| Vibration | 10–55Hz total amplitude 1.5 for X, Y, Z each direction | | | | |
| Shock | 300 m/s² for X, Y, Z each direction | | | | |
| Repeat Accuracy | Both On–Off, Off–On: 0.01 mm (range)(axial direction)* | | | | |
| Recommended Minimum Operating Speed | 50mm/minute | | | | |
| Electrical Ratings | | | | | |
| Contact Life | 3 million operations | | | 1 million operations | |
| Contact Voltage | 5–24VDC | | | | |
| Steady Current Rating | 10mA or less | | | | |
| Max In-rush Current Rating | 10mA (limit current to protect LED indicator) | | | 20mA | |
| Connection Type | Cable: 2m Oil resistant Ø2.8/2 cores, Tensile strength 30N, minimum bending R7. | | | Core wire cable: 0.5m (×2), Oil resistant, Ø0.66, Tensile strength 15N | |
| Indicating | -L and -LF models: LED indicator (mounted in cable 120mm from the switch) | | | N/A | |

* At operating speed 50-200 mm/minute. Operating speed slower than 10 mm/min is not recommended.

Circuit Diagrams

| Without LED | With LED |
|-----------------------------|---|
| <p>Normally open (N.O.)</p> | <p>Normally open (N.O.)</p> <p>LED Normally Off</p> |

Torque Limits



| Tightening Torque for Case Screws and Nuts | | | | | | |
|--|--------|----------------------|--------|----------------------|--------|----------------------|
| Applicable Models | L1 | | L2 | | L3 | |
| | Length | Tightening Torque | Length | Tightening Torque | Length | Tightening Torque |
| BP060A | 6.5mm | 2.5 N•m [1.84 lb•ft] | 15mm | 5 N•m [3.68 lb•ft] | 10.5mm | 2.5 N•m [1.84 lb•ft] |
| BP080A | 8mm | 5 N•m [3.68 lb•ft] | 21.5mm | 10 N•m [7.37 lb•ft] | 5.5mm | 5 N•m [3.68 lb•ft] |
| BP100A | 6.5mm | 15 N•m [11.06 lb•ft] | 22.5mm | 25 N•m [18.44 lb•ft] | 9mm | 15 N•m [11.06 lb•ft] |

Caution: Use the lower torque (i.e. torque corresponding to L1 and L3) while tightening the bolt between lengths L1 and L2 or L2 and L3 in the picture. Please make sure to use a locknut if the bolt is likely to shift in position due to the vibrational impacts.



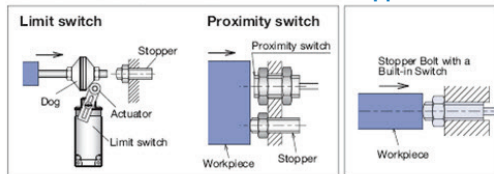
Precision Limit Switches

Stopper Bolt Precision Limit Switches

Overview

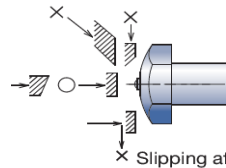
Stopper bolt precision limit switches incorporate a mechanical stop along with the limit switch function, eliminating the need for a separate mechanical stop in many situations. They can also absorb the high-impact forces required to stop a load.

Stopper Bolt Limit Switches can reduce parts count
 conventional switches stopper bolt switch



Features

- 2 tasks with one device
- Housing a high-accuracy built-in switch in a stopper bolt
- Provides higher contact force ideal for indexing/positioning
- 10 micron (µm) repeat accuracy
- No movement differential
- Stainless steel housing



O indicates correct target approach and orientation.

X indicates approach and orientation that should be avoided.

Stopper Bolt Precision Limit Switches Selection Chart

| Part Number | Price | Drawing Link | Actuator/Head Type* | Barrel Type | Barrel Diameter/Thread | Stroke | Switching Output | Contact Force | Connection Type |
|----------------------------|---------|---------------------|---|-------------|------------------------|--------|------------------|---------------|--------------------------|
| STP100UA-L | \$82.00 | PDF | Ø 5.5mm plunger with upward cover Ø 5mm | Threaded | M10×1.5 | 0.7mm | (1) N.O. | 4N | Cable 2m [6.56 ft] |
| STP100DA-L | \$82.00 | PDF | Ø 5.5mm plunger with downward cover Ø 5mm | Threaded | M10×1.5 | 0.7mm | (1) N.O. | 4N | |
| STS060PA | \$41.00 | PDF | Ø 1.5mm plunger, 3.4mm flat | Threaded | M6×1.0 | 0.7mm | (1) N.O. | 2N | |
| STS060PA-L | \$50.00 | PDF | Ø 1.5mm plunger, 3.4mm flat | Threaded | M6×1.0 | 0.7mm | (1) N.O. | 2N | |
| STS080PA-L | \$66.00 | PDF | Ø 1.5mm plunger, 4.5mm flat | Threaded | M8×1.25 | 0.7mm | (1) N.O. | 2N | |
| STS100PA-L | \$69.00 | PDF | Ø 1.5mm plunger, 4.5mm flat | Threaded | M10×1.5 | 0.7mm | (1) N.O. | 2N | |
| STE060PA-L | \$54.00 | PDF | Ø 1.5mm plunger, 3.4mm flat with hex | Threaded | M6×1.0 | 0.7mm | (1) N.O. | 2N | |
| STE080PA-L | \$72.00 | PDF | Ø 1.5mm plunger, 4.5mm flat with hex | Threaded | M8×1.25 | 0.7mm | (1) N.O. | 2N | |
| STE100PA-L | \$72.00 | PDF | Ø 1.5mm plunger, 4.5mm flat with hex | Threaded | M10×1.5 | 0.7mm | (1) N.O. | 2N | |

* Ø = diameter

STP Series (Stopper With Protective Cover)



[STP100UA-L](#)

STS Series (Straight Stopper Bolt)



[STS060PA-L](#)

STE Series (Hexagonal Stopper Bolt)



[STE060PA-L](#)



[STP100DA-L](#)



[STS080PA-L](#)



[STE080PA-L](#)



[STS060PA](#)



[STS100PA-L](#)



[STE100PA-L](#)



Precision Limit Switches

Stopper Bolt Precision Limit Switches Specifications

| Series | STP | STS | STE |
|---|---|--------|-----|
| Environmental | | | |
| Degree of Protection | IP67** | IP65** | |
| Temperature Range | Operating: 0 to 80°C [32 to 176°F] (Ice-free) | | |
| Mechanical Ratings | | | |
| Enclosure Material | Stainless steel | | |
| Torque (for nuts on threaded barrels, set screws on smooth barrels) | See Torque Limit Figure | | |
| Vibration | 10–55Hz total amplitude 1.5 for X, Y, Z each direction | | |
| Shock | 300 m/s² for X, Y, Z each direction | | |
| Repeat Accuracy | Both On-Off, Off-On/ 0.01 (range) (At operating speed 50-200mm/min) *2 | | |
| Recommended Minimum Operating Speed | 50mm (1.96in)/minute | | |
| Withstand Load | 5000N | | |
| Electrical Ratings | | | |
| Contact Life | 10 million (No bungle caused by vibration and use under contact rating) | | |
| Impact resistance | 0.4J | | |
| Contact Voltage | 5–24VDC | | |
| Steady Current Rating | 10mA or less | | |
| Max In-rush Current Rating | 20mA without LED indicator, 10mA with LED indicator | | |
| Connection Type | Standard length 2m [6.56 ft] oil resistant 2.8 / 2 cores, 26AWG Tensile strength 30N, minimum bending R7 | | |
| Indicating | -L models: LED indicator (mounted in cable 120mm from the switch) | | |

* At operating speed 50-200 mm/minute. Operating speed slower than 10 mm/min is not recommended.

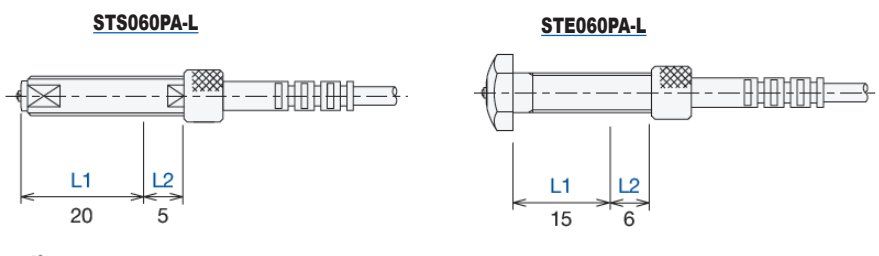
** At normal temperature (0–80°C [32–176°F]).

Circuit Diagram

| Without LED | With LED (-L models) |
|-----------------------------|-----------------------------|
| <p>Normally open (N.O.)</p> | <p>Normally open (N.O.)</p> |

Torque Limits

| Applicable models | Tightening torque |
|-------------------|--|
| <u>STS060PA-L</u> | L1: 5 N•m [3.68 lb•ft] L2: 2.5 N•m [1.84 lb•ft] |
| <u>STE060PA-L</u> | |
| <u>STS060PA</u> | |
| <u>STS080PA-L</u> | 10 N•m [7.38 lb•ft] |
| <u>STE080PA-L</u> | 10 N•m [7.38 lb•ft] |
| <u>STS100PA-L</u> | 25 N•m [18.44 lb•ft] |
| <u>STE100PA-L</u> | 25 N•m [18.44 lb•ft] |
| <u>STP100UA-L</u> | 25 N•m [18.44 lb•ft] |
| <u>STP100DA-L</u> | 25 N•m [18.44 lb•ft] |





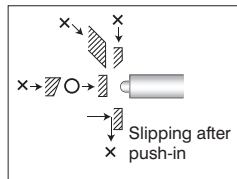
Precision Limit Switches

Low Contact Force Limit Switches: CSFN / CS / CSJ

Features

- 0.1N and 0.5N contact force
- 5 micron (µm) and 10 micron (µm) repeat accuracy
- Stainless steel housing
- Metal bearing
- Straight-touch and straight needle touch available

Low Contact Force Straight Touch

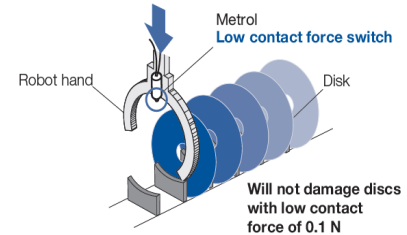


O indicates correct target approach and orientation.

X indicates approach and orientation that should be avoided.

CSFN105A-H6X must be mounted downward

Detects presence of HDD discs



Low Contact Force Limit Switches Selection Chart

| Part Number | Price | Drawing Link | Actuator/ Head Type* | Barrel Type | Barrel Diameter/Thread* | Stroke | Switching Output | Contact Force | Connection Type |
|---|---------|---------------------|--|-------------|-------------------------|-----------------|------------------|---------------|-------------------|
| Low Contact Force, Metal Bearing, Downward Mounting Only | | | | | | | | | |
| CSFN105A-H6X | \$46.00 | PDF | Ø 2mm plunger [0.079 in] SR 1.5 mm [0.059 in] | Threaded | M10x0.5 | 2mm [0.079in] | NPN, N.O. | 0.1N | 3m [9.8 ft] cable |
| Low Contact Force, Straight Touch, Metal Bearing | | | | | | | | | |
| CS067A-LG | \$61.00 | PDF | Ø 2mm plunger [0.079 in] SR 1.5 mm [0.059 in] | Threaded | M6x0.75 | 2.8mm [0.110in] | (1) N.O. | 0.5N | 3m [9.8 ft] cable |
| Low Contact Force, Straight Touch, Needle Contact | | | | | | | | | |
| CSJ055A-CG | \$53.00 | PDF | needle plunger Ø 1.5mm flat [0.059 in] | Threaded | M5x0.5 | 2.8mm [0.110in] | (1) N.O. | 0.5N | 3m [9.8 ft] cable |

Ø = diameter, SR = surface radius

* Must be mounted in a downward direction



[**CSFN105A-H6X**](#)



[**CS067A-LG**](#)



[**CSJ055A-CG**](#)



Precision Limit Switches

Low Contact Force Limit Switches Specifications

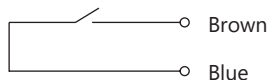
| Series | CSFN Metal Bearing | CS Custom Metal Bearing | CSJ Custom Needle Contact |
|---|--|---|---|
| Environmental | | | |
| Degree of Protection | IP40 | IP65 | |
| Temperature Range | Operating: 0 to 60°C [32 to 140°F] (Ice-free) | | Operating: 0 to 80°C [32 to 176°F] (Ice-free) |
| Mechanical Ratings | | | |
| Enclosure Material | Stainless Steel (mounting nuts are Ni-plated brass) | | |
| Pretravel | 0.4 mm [0.016 in] | 0.3 mm [0.012 in] | |
| Torque (for nuts on threaded barrels, set screws on smooth barrels) | 4 N•m [2.95 lb•ft] | 2 N•m [1.48 lb•ft] | N/A |
| Vibration | 10–55Hz total amplitude 1.5 for X, Y, Z each direction | | |
| Shock | 300 m/s² for X, Y, Z each direction | | |
| Repeat Accuracy | 0.01 mm (10 micron [μm]) * | 0.005 mm (5 micron [μm]) * | |
| Recommended Minimum Operating Speed | 50mm (1.96in)/minute | | |
| Electrical Ratings | | | |
| Contact Life | 10 million operations | | |
| Contact Voltage | 12–24VDC | 5–24VDC | |
| Steady Current Rating | 10mA or less | | |
| Max In-rush Current Rating | 10mA (limit current to protect LED indicator) | | |
| Connection Type | Cable: 3m PVC (polyvinyl chloride) oil resistant Ø4/3 cores, 30AWG Tensile strength 30N, minimum bending R7 | Cable: 3m PVC (polyvinyl chloride) oil resistant Ø2.8/2 cores, 26AWG Tensile strength 30N minimum bending R7 | |
| Indicating | -L: LED indicator (mounted in cable 120mm from the switch) | | |

* At operating speed 50-200 mm/minute. Operating speed slower than 10 mm (0.393 in)/min is not recommended.

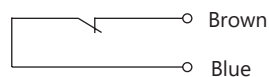
Circuit Diagrams

Without LED

Normally open (N.O.)

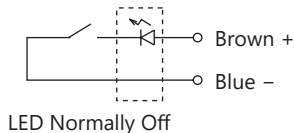


Normally closed (N.C.)

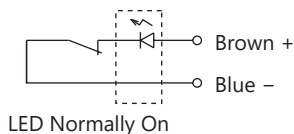


With LED

Normally open (N.O.)

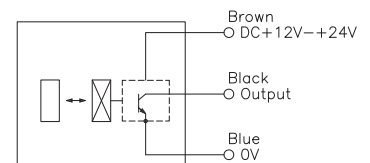


Normally closed (N.C.)



CSFN105A-H6X

Normally open (N.O.)
(NPN Open Collector)





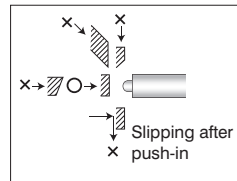
Precision Limit Switches

90-Degree Straight Touch Limit Switches

Features

- Slim design
- 90-degree cable orientation
- Long-stroke models available
- 5 micron (µm) repeat accuracy
- Stainless steel housing
- Metal bearing

90-Degree Straight Touch



O indicates correct target approach and orientation.
X indicates approach and orientation that should be avoided.

90-Degree Straight Touch Limit Switches Selection Chart

| Part Number | Price | Drawing Link | Actuator/ Head Type* | Barrel Type | Barrel Diameter/Thread* | Stroke | Switching Output | Contact Force | Connection Type |
|----------------------------|---------|---------------------|--|-------------|--|-----------------|------------------|---------------|----------------------|
| CSS60A-LR | \$56.00 | PDF | Ø 2mm plunger [0.079in] SR 1.5mm [0.059in] | Smooth | Ø 6mm | 2.8mm [0.110in] | (1) N.O. | 1N | Cable 3m [9.84ft] |
| CS065A-LR | \$67.00 | PDF | | Threaded | M6x0.5 | | (1) N.O. | | |
| CS067A-BLR | \$67.00 | PDF | Ø 2mm plunger [0.079in] Ø 4.5mm flat [0.1.77in] | | M6x0.75 | | (1) N.O. | | |
| CS067A-LR | \$65.00 | PDF | Ø 2mm plunger [0.079in] SR 1.5mm [0.059in] | | | | (1) N.O. | | |
| CS067B-LR | \$65.00 | PDF | M8x0.75 | | (1) N.C. | | | | |
| CS087A-LR | \$65.00 | PDF | | | Ø 3.5mm plunger [0.138in] SR 3 mm [0.118in] | | (1) N.O. | | |
| CSJ055A-LR | \$59.00 | PDF | Ø 2mm plunger [0.079in] SR 1.5 mm [0.059in] | M5x0.5 | (1) N.O. | | | | |
| CSJS50A-LR | \$59.00 | PDF | | Smooth | Ø 5mm | (1) N.O. | | | |
| CSK087A-LR | \$64.00 | PDF | Ø 3.5mm plunger [0.138in] SR 3 mm [0.118in] | Threaded | M8x0.75 | 5mm [0.197in] | (1) N.O. | | |
| CSK087B-LR | \$64.00 | PDF | | | | | (1) N.C. | | |

* Ø = diameter, SR = surface radius



[CSS60A-LR](#)



[CS065A-LR](#)



[CS067A-BLR](#)



[CS067A-LR](#)



[CS067B-LR](#)



[CS087A-LR](#)



[CSJ055A-LR](#)



[CSJS50A-LR](#)



[CSK087A-LR](#)



[CSK087B-LR](#)



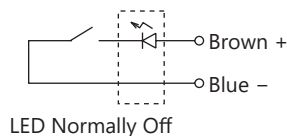
Precision Limit Switches

| 90-Degree Straight Touch Limit Switches Specifications | | | | |
|---|--|-----|--------------------|--------------------|
| Series | CS | CSS | CSJ | CSK |
| Environmental | | | | |
| Degree of Protection | IP65 | | | |
| Temperature Range | Operating: 0 to 80°C [32 to 176°F] (Ice-free) | | | |
| Mechanical Ratings | | | | |
| Enclosure Material | Stainless Steel | | | |
| Pretravel | 0.3 mm | | | |
| Torque (for nuts on threaded barrels, set screws on smooth barrels) | 4 N•m [2.95 lb•ft] | N/A | 2 N•m [1.48 lb•ft] | 7 N•m [5.16 lb•ft] |
| Vibration | 10–55Hz total amplitude 1.5 for X, Y, Z each direction | | | |
| Shock | 300 m/s² for X, Y, Z each direction | | | |
| Repeat Accuracy | 5 micron (µm) * | | | |
| Recommended Minimum Operating Speed | 50mm (1.96in)/minute | | | |
| Electrical Ratings | | | | |
| Contact Life | 10 million operations | | | |
| Contact Voltage | 5–24VDC | | | |
| Steady Current Rating | 10mA or less | | | |
| Max In-rush Current Rating | 10mA (limit current to protect LED indicator) | | | |
| Connection Type | Cable: 3m [9.84 ft], oil resistant, Ø2.8/2 cores, tensile strength 30N [6.74 lbf], minimum bending R7, 2-26AWG | | | |
| Indicating | -L: LED indicator (mounted in cable 120mm from the switch) | | | |

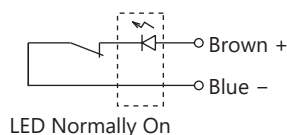
* At operating speed 50-200 mm/minute. Operating speed slower than 10 mm/min is not recommended.

Circuit Diagrams

Normally open (N.O.)



Normally closed (N.C.)





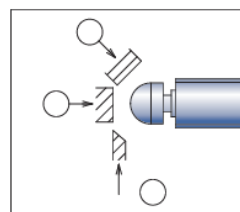
Precision Limit Switches

Sliding Angled Offset Touch Limit Switches

Features

- Metal and plastic hemisphere actuators
- 5 micron (μm) repeat accuracy
- Stainless steel housing

Sliding Angled Offset Touch



O indicates correct target approach and orientation.

Sliding Angled Offset Touch Limit Switches Selection Chart

| Part Number | Price | Drawing Link | Actuator/ Head Type* | Barrel Type | Barrel Diameter/Thread* | Stroke | Switching Output | Contact Force | Connection Type |
|-----------------------------|----------|---------------------|-------------------------------------|-------------|-------------------------|--------------------|------------------|---------------|-----------------------|
| CSHP085A-L | \$158.00 | PDF | Ø 4.7mm plunger SR 3mm | Threaded | M8×0.5 | 2.8mm [0.110in] | (1) N.O. | 1N | Cable 2m [6.56 ft] |
| CSHP085B-L | \$158.00 | PDF | Ø 4.7mm plunger SR 3mm | Threaded | M8×0.5 | | (1) N.C. | 1N | |
| CSH121A-A | \$79.00 | PDF | Ø 10mm hemisphere SR 5mm | Threaded | M12x1 | | (1) N.O. | 1.5N | |
| CSH121A-AL | \$78.00 | PDF | Ø 10mm hemisphere SR 5mm | Threaded | M12x1 | | (1) N.O. | 1.5N | |
| CSH121B-AL | \$81.00 | PDF | Ø 10mm hemisphere SR 5mm | Threaded | M12x1 | | (1) N.C. | 1.5N | |
| CSH121A-APL | \$90.00 | PDF | Ø 10mm hemisphere SR 5mm plastic | Threaded | M12x1 | | (1) N.O. | 1.5N | |
| CSH121B-APL | \$90.00 | PDF | Ø 10mm hemisphere SR 5mm plastic | Threaded | M12x1 | | (1) N.C. | 1.5N | |

* Ø = diameter, SR = surface radius



[CSHP085B-L](#)



[CSH121A-A](#)



[CSH121A-AL](#)



[CSH121B-AL](#)



[CSH121A-APL](#)



[CSH121B-APL](#)



Precision Limit Switches

Sliding Angled Offset Touch Limit Switches Specifications

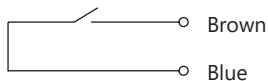
| Series | CSHP | CSH |
|---|---|---------------------|
| Environmental | | |
| Degree of Protection | IP67 | IP65 |
| Temperature Range | Operating: 0 to 80°C [32 to 176°F] (Ice-free) | |
| Mechanical Ratings | | |
| Enclosure Material | Stainless Steel | |
| Pretravel | 0.3 mm | |
| Torque (for nuts on threaded barrels, set screws on smooth barrels) | 4 N•m [2.95 lb•ft] | 12 N•m [8.85 lb•ft] |
| Vibration | 10–55Hz total amplitude 1.5 for X, Y, Z each direction | |
| Shock | 300 m/s² for X, Y, Z each direction | |
| Repeat Accuracy | 0.005mm (5 micron [μm]) * | |
| Recommended Minimum Operating Speed | 50mm [1.96in]/minute | |
| Electrical Ratings | | |
| Contact Life | 10 million operations | |
| Contact Voltage | 5–24VDC | |
| Steady Current Rating | 10mA or less | |
| Max In-rush Current Rating | 10mA (limit current to protect LED indicator) | |
| Connection Type | Cable: 2m [6.56ft] , oil resistant Ø2.8/2 cores, Tensile strength 30N [6.74 lbf], minimum bending R7, 2-26AWG | |
| Indicating | -L: LED indicator (mounted in cable 120mm from the switch) | |

* At operating speed 50-200 mm/minute. Operating speed slower than 10mm/min is not recommended.

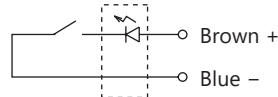
Circuit Diagrams

| Without LED | With LED |
|-------------|----------|
|-------------|----------|

Normally open (N.O.)

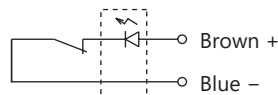


Normally open (N.O.)



LED Normally Off

Normally closed (N.C.)



LED Normally On



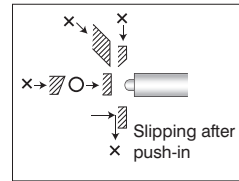
Precision Limit Switches

Precision Mini Straight Touch Limit Switches

Features

- Mini size suitable for machines required to be small and for narrow installation space
- Stroke length (1.5mm)
- 3 micron (μm) repeat accuracy
- Stainless steel housing
- Metal bearing

Precision Mini Touch



O indicates correct target approach and orientation.

X indicates approach and orientation that should be avoided.

Precision Mini Straight Touch Limit Switches Selection Chart

| Part Number | Price | Drawing Link | Actuator/ Head Type* | Barrel Type | Barrel Diameter/Thread* | Stroke | Switching Output | Contact Force | Connection Type |
|------------------------------------|---------|----------------------------|-----------------------------------|-------------|-------------------------|--------|------------------|---------------|-------------------------|
| <u>CSM105CA</u> | \$55.00 | <u>PDF</u> | Ø 3.5mm plunger SR 2.5mm | Threaded | M10×0.5 | 1.5mm | (1) N.O. | 1N | Cable 2m [6.56ft] |
| <u>CSM105WA</u> | \$57.00 | <u>PDF</u> | Ø 3.5mm plunger SR 2.5mm | Threaded | M10×0.5 | 1.5mm | (1) N.O. | 1N | Core wire 0.5m [1.64ft] |
| <u>CSMP105WA</u> | \$60.00 | <u>PDF</u> | 2mm plunger with boot SR 2.5mm | Threaded | M10×0.5 | 1.5mm | (1) N.O. | 1N | Core wire 0.5m [1.64ft] |
| <u>CSM105CA-L</u> | \$62.00 | <u>PDF</u> | Ø 3.5mm plunger SR 2.5mm | Threaded | M10×0.5 | 1.5mm | (1) N.O. | 1N | Cable 2m [6.56ft] |
| <u>CSMP105CA-L</u> | \$66.00 | <u>PDF</u> | 2mm plunger with boot SR 2.5mm | Threaded | M10×0.5 | 1.5mm | (1) N.O. | 1N | Cable 2m [6.56ft] |

* Ø = diameter, SR = surface radius

-L: LED indicator (mounted in cable 120mm from the switch)



[CSM105CA](#)



[CSM105WA](#)



[CSMP105WA](#)



[CSM105CA-L](#)



[CSMP105CA-L](#)



Precision Limit Switches

| Precision Mini Straight Touch Limit Switches Specifications | | |
|---|--|----------------|
| Type | Precision Angled | Precision Mini |
| Series | CSM | CSMP |
| Environmental | | |
| Degree of Protection | IP65 | IP67 |
| Temperature Range | Operating: 0 to 80°C [32 to 176°F] (Ice-free) | |
| Mechanical Ratings | | |
| Enclosure Material | 303 Stainless Steel | |
| Pretravel | 0.3 mm | |
| Torque (for nuts on threaded barrels, set screws on smooth barrels) | 8 N•m [5.901 lb•ft] | |
| Vibration | 10–55Hz total amplitude 1.5 for X, Y, Z each direction | |
| Shock | 300 m/s² for X, Y, Z each direction | |
| Repeat Accuracy | Both On–Off, Off–On: 0.003 mm* | |
| Recommended Minimum Operating Speed | 50mm [1.96in]/minute | |
| Electrical Ratings | | |
| Contact Life | 10 million operations | |
| Contact Voltage | 5–24VDC | |
| Steady Current Rating | 10mA or less | |
| Max In-rush Current Rating | 10mA (limit current to protect LED indicator) | |
| Connection Type | Core wire cable, 0.5 m (x2), oil resistant, Ø 0.6, tensile strength 15N, Cable: 2m, oil resistant Ø2.8/2 cores, tensile strength 30N [6.74 lbf], 2-26AWG | |
| Indicating | -L: LED indicator (mounted in cable 120mm from the switch) | |

* At operating speed 50-200 mm/minute. Operating speed slower than 10mm/min is not recommended.

Circuit Diagrams

| Without LED | With LED |
|-----------------------------|-----------------------------|
| <p>Normally open (N.O.)</p> | <p>Normally open (N.O.)</p> |



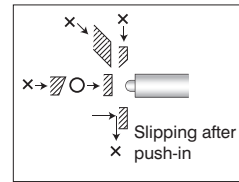
Precision Limit Switches

High-Vacuum Resistance Limit Switches

Features

- Can be used in 10⁻⁵ PA high-vacuum environments
- Switch body made using low outgassing material and adhesive

High Vacuum Resistance



O indicates correct target approach and orientation.

X indicates approach and orientation that should be avoided.

High-Vacuum Resistance Limit Switches Selection Chart

| Part Number | Price | Actuator/Head Type* | Barrel Type | Barrel Diameter/Thread | Stroke | Output Mode | Repeatability | Contact Force | Connection Type | Drawing Link |
|-----------------------------------|------------|---------------------------------------|-------------|------------------------|-----------------|-------------|---------------------|---------------|---|---------------------|
| <u>GN-BP5MA</u> | \$320.00 | Angled touch ball plunger SR 3mm | Threaded | M5x0.5 | 1.0mm [0.039in] | (1) N.O. | 0.01mm [0.00039in] | 1N | Cable direction: straight Polytetrafluoroethylene (PTFE) 0.5m [1.6ft] core wire, 27 AWG | PDF |
| <u>GN-BP5MA-R</u> | \$326.00 | Angled touch ball plunger SR 3mm | Threaded | M5x0.5 | 1.0mm [0.039in] | (1) N.O. | 0.01mm [0.00039 in] | 1N | Cable direction: 90° Polytetrafluoroethylene (PTFE) 0.5m [1.6ft] core wire, 27 AWG | PDF |
| <u>GN-PT5M3A</u> | \$234.00 | Straight touch Ø 1.5mm plunger SR 2mm | Threaded | M5x0.5 | 1.5mm [0.059in] | (1) N.O. | 0.003mm [0.00012in] | 0.5N | Cable direction: straight Polytetrafluoroethylene (PTFE) 0.5m [1.6ft] core wire, 27 AWG | PDF |
| <u>GN-PT5M3B</u> | \$234.00 | Straight touch Ø 1.5mm plunger SR 2mm | Threaded | M5x0.5 | 1.5mm [0.059in] | (1) N.C. | 0.003mm [0.00012in] | 0.5N | Cable direction: straight Polytetrafluoroethylene (PTFE) 0.5m [1.6ft] core wire, 27 AWG | PDF |
| <u>GN-BP161B</u> | \$1,138.00 | Angled touch Ø 2mm plunger SR 4mm | Threaded | M16x1 | 2.9mm [0.114in] | (1) N.C. | 0.01mm [0.00039in] | 1.5N | Cable direction: straight Polytetrafluoroethylene (PTFE) 0.5m [1.6ft] core wire, 27 AWG | PDF |
| <u>GN-CSK141B</u> | \$1,138.00 | Straight touch Ø 12mm plunger SR 4mm | Threaded | M14x1 | 5mm [0.197mm] | (1) N.C. | 0.01mm [0.00039in] | 0.8N | Cable direction: straight Polytetrafluoroethylene (PTFE) 0.5m [1.6ft] core wire, 27 AWG | PDF |

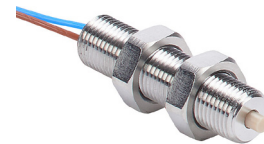
* Ø = diameter, SR = surface radius



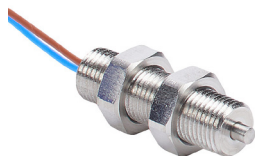
[GN-BP5MA](#)



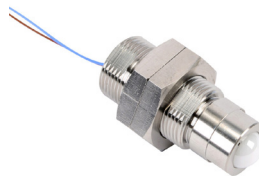
[GN-BP5MA-R](#)



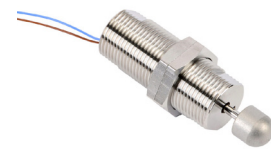
[GN-PT5M3A](#)



[GN-PT5M3B](#)



[GN-BP161B](#)



[GN-CSK141B](#)



Precision Limit Switches

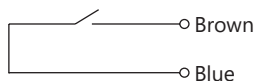
| High-Vacuum Resistance Limit Switches Specifications | |
|---|--|
| Series | GN |
| Environmental | |
| Compatible Vacuum | 10 ⁻⁵ PA |
| Degree of Protection | IP40 |
| Temperature Range | 120°C [248°F] (allowable baking temperature) |
| Mechanical Ratings | |
| Enclosure Material | 304 Stainless Steel |
| Pretravel | 0mm [0in]: (GN-PT5M3B, GN-CSK141B) * 0.2 mm [0.0079 in]: (GN-BP161B) 0.3 mm [0.0118 in]: (GN-BP5MA, GN-BP5MA-R, GN-PT5M3A) |
| Torque (for nuts on threaded barrels, set screws on smooth barrels) | 1 N•m [0.73 lb•ft] GN-PT5M3A, GN-PT5M3B, GN-BP5MA 10 N•m [7.37 lb•ft] GN-CSK141B 12 N•m [8.85 lb•ft] GN-BP161B |
| Vibration | 10–55Hz total amplitude 1.5 for X, Y, Z each direction |
| Shock | 300 m/s ² for X, Y, Z each direction |
| Electrical Ratings | |
| Contact Life | 3 million operations |
| Repeat Accuracy** | Both On-Off, Off-On: See Selection Table |
| Recommended Minimum Operating Speed | 50mm [1.96in] / minute |
| Contact Voltage | 5-24 VDC |
| Steady Current Rating | 10mA or less |
| Max In-rush Current Rating | 20mA |
| Connection Type | 0.5 m [19.69 in] Polytetrafluoroethylene (PTFE) core wire, 27AWG |
| Indicating | N/A |

* Adjust the installed location of the switch by the signal switching point.

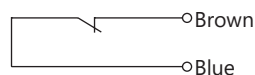
** At operating speed 50-200 mm/minute. Operating speed slower than 10 mm/min is not recommended.

Circuit Diagrams

Normally open (N.O.)



Normally closed (N.C.)





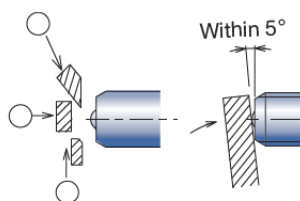
Precision Limit Switches

High Temperature: HT Series Limit Switches

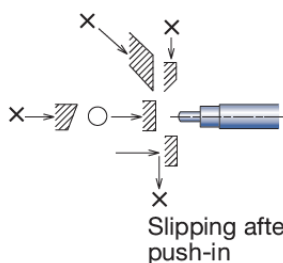
Features

- Plunger and ball plunger models
- Constructed using heat resistant parts and adhesives
- Heat resistant cable
- Operating temperature upper limit of 200°C [392°F]

High Temperature HT Series



O indicates correct target approach and orientation.



X indicates approach and orientation that should be avoided.

High Temperature Limit Switches Selection Chart

| Part Number | Price | Actuator/Head Type* | Barrel Type | Barrel Diameter/Thread | Stroke | Switching Output | Contact Force | Connection Type | Drawing Link |
|---|----------|-----------------------------|-------------|------------------------|--------|------------------|---------------|-------------------|--------------|
| Straight/Precision Touch | | | | | | | | | |
| HT-CS067A | \$235.00 | Ø2mm plunger, SR 1.5mm | Threaded | M6×0.75 | 2.8mm | (1) N.O. | 1N | Cable 2m [6.56ft] | PDF |
| Indexing/Angled/Sliding Touch/Ball Plunger | | | | | | | | | |
| HT-BP060A | \$214.00 | Ø 3mm ball plunger | Threaded | M6×1.0 | 0.8mm | (1) N.O. | 6-13N | Cable 2m [6.56ft] | PDF |
| Heat Resistant Stopper Bolt | | | | | | | | | |
| STS060A-HT2 | \$196.00 | 1.5mm plunger 3.4mm flat | Threaded | M6×1.0 | 0.7mm | (1) N.O. | 1N | Cable 2m [6.56ft] | PDF |
| STM82A-HT2 | \$192.00 | Ø 3mm plunger with boot | Threaded | M10×0.75 | 0.3mm | (1) N.O. | 1N | Cable 2m [6.56ft] | PDF |

* Ø = diameter, SR = surface radius



[HT-CS067A](#)



[HT-BP060A](#)



[STS060A-HT2](#)



[STM82A-HT2](#)



Precision Limit Switches

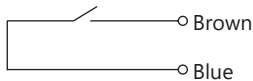
| High Temperature Limit Switches Specifications | | | | |
|--|---|---------------------------------|---|------------------|
| Part Number | HT-CS067A | HT-BP060A | STS060A-HT2 | STM82A-HT2 |
| Environmental | | | | |
| Degree of Protection | IP65** | IP40** | IP40** | IP65** |
| Temperature Range | Operating: 0 to 200°C [32 to 392°F] (Ice-free) | | | |
| Mechanical Ratings | | | | |
| Enclosure Material | Stainless Steel | | | |
| Pretravel | 0.3 mm (0.012 in) | 0.5 mm [0.020 in] from end face | 0.3 mm [0.012 in] from stopping face | Middle of stroke |
| Vibration | 10–55 Hz total amplitude 1.5 for X, Y, Z each direction | | | |
| Shock | 300 m/s² for X, Y, Z each direction | | | |
| Electrical Ratings | | | | |
| Contact Life | 3 million operations | | | |
| Repeat Accuracy | 0.01 mm [0.00039 in] * ** | | | |
| Recommended Minimum Operating Speed | 50mm [1.96in]/minute | | | |
| Contact Voltage | 5-24 VDC | | | |
| Steady Current Rating | 10mA or less | | | |
| Max In-rush Current Rating | 20mA | | | |
| Connection Type | Cable: 2m [6.56ft] heat-resistant Ø 2.8 2 cores, 24AWG | | Cable: 2m [6.56ft] heat-resistant Ø 2.8 2 cores, 26AWG | |
| Indicating | N/A | | | |

* At operating speed 50-200 mm [1.97-7.87 in]/minute. Operating speed slower than 10mm [0.39in]/min is not recommended.

** At normal temperature (0 to 80°C [32 to 176°F]).

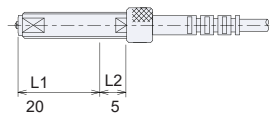
Circuit Diagrams

Normally open (N.O.)

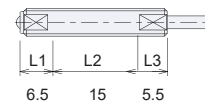


Torque Limits

Stopper Bolt



Ball Plunger



| Tightening Torque for Case Screws and Nuts | | | | | | |
|--|--------|----------------------|--------|--------------------|--------|--------------------|
| Applicable Models | L1 | | L2 | | L3 | |
| | Length | Tightening Torque | Length | Tightening Torque | Length | Tightening Torque |
| HT-CS067A | 6.5mm | 4 N•m [2.95 lb•ft] | — | — | — | — |
| HT-BP060A | 6.5mm | 2.5 N•m [1.84 lb•ft] | 15 mm | 5 N•m [3.68 lb•ft] | 5.5mm | 5 N•m [3.68 lb•ft] |
| STS060A-HT2 | 20mm | 5 N•m [3.68 lb•ft] | 5mm | 5 N•m [3.68 lb•ft] | — | — |
| STM82A-HT2 | 6.5mm | 10 N•m [7.376 lb•ft] | — | — | — | — |

Caution: Use the lower torque (i.e. torque corresponding to L1 and L3) while tightening the bolt between lengths L1 and L2 or L2 and L3 in the picture. Please make sure to use a locknut if the bolt is likely to shift in position due to the vibrational impacts.



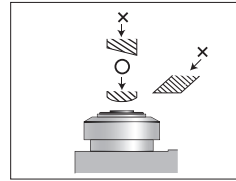
Precision Limit Switches

High Precision Touch and Tool Setter Limit Switches

Features

- Tool setter for blade positioning, wear detection, breakage, etc.
- 0.5 micron (μm) repeat accuracy
- No movement differential
- No temperature drift
- Dustproof / water-resistant (IP67)
- LED indicator

Tool Setter



O indicates correct target approach and orientation.

X indicates approach and orientation that should be avoided.

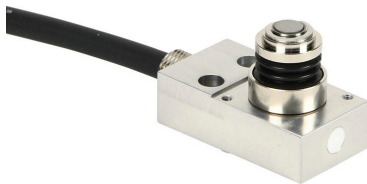
High Precision Touch and Tool Setter Limit Switches Selection Chart

| Part Number | Price | Drawing Link | Actuator/Head Type* | Mounting Direction | Mounting Hole | Stroke | Switching Output | Contact Force | Connection Type |
|--------------------------------------|----------|----------------------------|-------------------------------|--------------------|---------------|--------|------------------|---------------|-------------------|
| <u>P11DDB-DLD</u> | \$172.00 | <u>PDF</u> | Ø 16mm plunger, Ø5mm flat | downward | (2) Ø 4.6 | 3mm | (1) N.C. | 1.5N | Cable 3m [9.8ft] |
| <u>P11DDB-DULD</u> | \$186.00 | <u>PDF</u> | Ø 16mm plunger, Ø 5mm flat | upward | (2) Ø 4.6 | 3mm | (1) N.C. | 1.5N | Cable 3m [9.8ft] |
| <u>P11DMB-DULD</u> | \$172.00 | <u>PDF</u> | Ø 16mm plunger, Ø 5mm flat | upward | (2) M4 | 3mm | (1) N.C. | 1.5N | Cable 3m [9.8ft] |
| <u>P11EDB-DULD</u> | \$186.00 | <u>PDF</u> | Ø 16mm plunger, Ø 5mm flat | upward | (2) Ø 4.6 | 5mm | (1) N.C. | 1.5N | Cable 3m [9.8ft] |
| <u>P21EDBP-22-28</u> | \$634.00 | <u>PDF</u> | Ø 18.5mm plunger, Ø 10mm flat | upward | (2) Ø 4.6 | 5mm | (1) N.C. | 1.5N | Cable 5m [16.4ft] |

* Ø = diameter

-xxLD: LED indicator (attached to sensor)

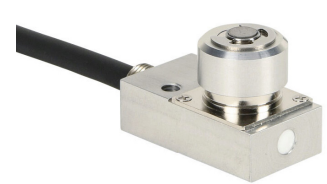
[P21EDBP-22-28](#) includes M5 air inlet



[P11DDB-DLD](#)



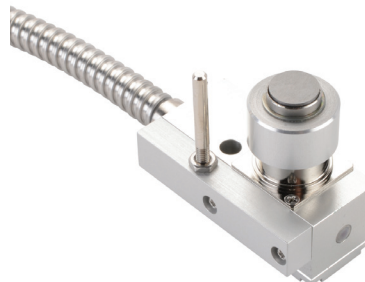
[P11DDB-DULD](#)



[P11DMB-DULD](#)



[P11EDB-DULD](#)



[P21EDBP-22-28](#)



Precision Limit Switches

High Precision Touch and Tool Setter Limit Switches Specifications

| Series | P11 | P21 |
|---|---|--|
| Environmental | | |
| Degree of Protection | IP67 | |
| Temperature Range | Operating: 0 to 80°C [32 to 176°F] (Ice-free) | |
| Mechanical Ratings | | |
| Enclosure Material | Aluminum | |
| Pretravel | 0* | 1st signal 0*, 2nd signal 2.5 mm (0.098 in) |
| Torque (for nuts on threaded barrels, set screws on smooth barrels) | N/A | |
| Vibration | 10–55Hz total amplitude 1.5 for X, Y, Z each direction | |
| Shock | 300 m/s² for X, Y, Z each direction | |
| Repeat Accuracy | Both On–Off, Off–On: 0.0005 mm (range)** | |
| Recommended Minimum Operating Speed | 50mm [1.96in]/minute | |
| Electrical Ratings | | |
| Contact Life | 3 million operations | |
| Contact Voltage | 5–24VDC | |
| Steady Current Rating | 10mA or less | |
| Max In-rush Current Rating | 10mA (limit current to protect LED indicator) | |
| Connection Type | Cable: 3m (9.84 ft) oil resistant Ø5/2 cores (P08: Ø4/2 cores) Tensile strength 30N, minimum bending R7, 30AWG | Cable: 5m (16.40ft) oil resistant Ø3.7/4 cores (P08: Ø4/2 cores), Tensile strength 30N, minimum bending R7, 30AWG |
| Indicating | -L: LED indicator (mounted in cable 120mm from the switch) | |

* Adjust the installed location of the switch by the signal switching point.

** At operating speed 50-200 mm/minute. Operating speed slower than 10 mm/min is not recommended.

Circuit Diagrams

P21 Wiring

| Without LED | With LED |
|-------------------------------|-------------------------------|
| <p>Normally closed (N.C.)</p> | <p>Normally closed (N.C.)</p> |

| With LED |
|---|
| <p>2-signal type (P21)</p> <p>First Signal</p> <p>Normally closed (N.C.)</p> <p>Second Signal</p> <p>Normally closed (N.C.)</p> |



Precision Limit Switches

Mini Stopper Precision Limit Switches

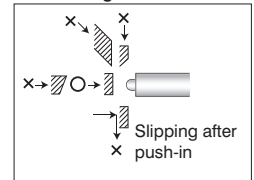
Overview

Precision stopper limit switches incorporate a mechanical stop and a limit switch function in a single switch, eliminating the need for a separate stop.

Features

- Mini Stopper switch
- Provides higher contact force ideal for indexing/positioning
- 10 micron (μm) repeat accuracy
- No movement differential
- No temperature drift

Straight Touch

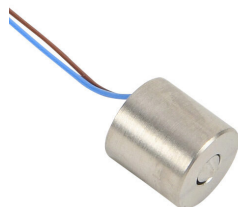


O indicates correct target approach and orientation. X indicates approach and orientation that should be avoided.

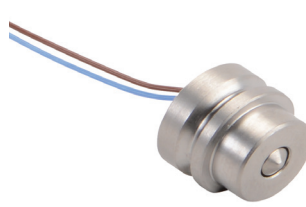
Mini Stopper Precision Limit Switches Selection Chart

| Part Number | Price | Drawing Link | Actuator/Head Type* | Barrel Type | Barrel Diameter/Thread | Stroke | Switching Output | Contact Force | Connection Type |
|--------------------------|---------|---------------------|----------------------------------|-------------|------------------------|--------|------------------|---------------|-------------------------|
| STM11A | \$36.00 | PDF | Ø 3mm plunger, 8mm flat | Smooth | Ø8 | 0.5mm | (1) N.O. | 0.8N | Core wire, 0.5m [1.6ft] |
| STM13A | \$47.50 | PDF | Ø 3mm plunger, 8mm flat | Smooth | Ø10 | 0.5mm | | 0.8N | |
| STM31A | \$49.00 | PDF | Ø 3mm plunger, 8mm flat | Threaded | M10×0.75 | 0.5mm | | 0.8N | |
| STM32A | \$43.00 | PDF | Ø 3mm plunger, 8mm flat | Threaded | M10×0.75 | 0.5mm | | 0.8N | Cable, 2m [6.5ft] |
| STM33A | Retired | PDF | Ø 3mm plunger, 13mm flat | Threaded | M10×1.5 | 0.5mm | | 0.8N | Core wire, 0.5m [1.6ft] |
| STM34A | \$44.00 | PDF | Ø 3mm plunger, 8mm flat | Threaded | M10×1.5 | 0.5mm | | 0.8N | Cable, 2m [6.5ft] |
| STM63A | \$62.00 | PDF | Ø 3mm plunger with boot, Ø 2.5mm | Smooth | Ø11 | 0.3mm | | 1N | Core wire, 0.5m [1.6ft] |
| STM81A | \$66.00 | PDF | Ø 3mm plunger with boot, Ø 2.5mm | Threaded | M10×0.75 | 0.3mm | | 1N | |
| STM83A | \$62.00 | PDF | Ø 3mm plunger with boot, Ø 2.5mm | Threaded | M10×1.5 | 0.3mm | | 1N | |
| STM14A-L | \$66.00 | PDF | Ø 3mm plunger, 8mm flat | Smooth | Ø10 | 0.5mm | | 0.8N | Cable, 2m [6.5ft] |
| STM36A-L | \$51.00 | PDF | Ø 3mm plunger, 4.5mm flat | Threaded | M10×0.75 | 0.5mm | | 0.8N | |
| STM64A-L | \$78.00 | PDF | Ø 3mm plunger with boot, Ø 2.5mm | Smooth | Ø11 | 0.3mm | | 1N | |
| STM32A-L | \$72.00 | PDF | Ø 3mm plunger, 8mm flat | Threaded | M10×0.75 | 0.5mm | | 0.8N | |
| STM82A-L | \$84.00 | PDF | Ø 3mm plunger with boot, Ø 2.5mm | Threaded | M10×0.75 | 0.3mm | | 1N | |
| STM34A-L | \$73.00 | PDF | Ø 3mm plunger, 13mm flat | Threaded | M10×1.5 | 0.5mm | | 0.8N | |
| STM84A-L | \$88.00 | PDF | Ø 3mm plunger with boot, Ø 2.5mm | Threaded | M10×1.5 | 0.3mm | | 1N | |

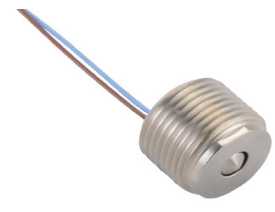
* Ø = diameter



STM11A



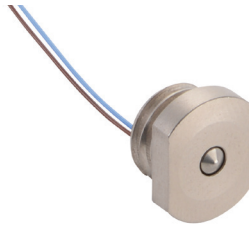
STM13A



STM31A



STM32A



STM33A



STM34A

METROL Precision Limit Switches

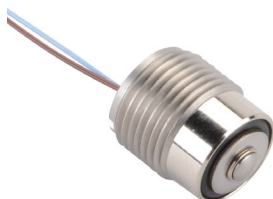
Mini Stopper: STM Series



STM36A-L



STM63A



STM81A



STM83A



STM14A-L



STM64A-L



STM32A-L



STM82A-L



STM34A-L



STM84A-L



Precision Limit Switches

Mini Stopper Precision Limit Switches Specifications

| | |
|--|--|
| Series | STM |
| Environmental | |
| Degree of Protection | IP44 (STM11A, STM13A, STM31A, STM32A, STM33A, STM34A, STM14A-L, STM32A-L, STM34A-L) IP67 (STM63A, STM81A, STM83A, STM64A-L, STM82A-L, STM84A-L) |
| Temperature Range | Operating: 0 to 80°C [32 to 176°F] (Ice-free) |
| Mechanical Ratings | |
| Enclosure Material | Stainless Steel |
| Torque (for nuts on threaded barrels, set screws on smooth barrels) | 10Nm |
| Vibration | 10–55Hz total amplitude 1.5 for X, Y, Z each direction |
| Shock | 300 m/s ² for X, Y, Z each direction |
| Withstand Load | 3000N |
| Repeat Accuracy | Both On→Off, Off→On/ 0.01 (range) (At operating speed 50-200mm/min) * |
| Recommended Minimum Operating Speed | 50mm [1.96in]/minute |
| Electrical Ratings | |
| Contact Life | 10 million (No bounce caused by vibration and use under contact rating) |
| Impact Resistance | 0.2J |
| Contact Voltage | 5–24VDC |
| Steady Current Rating | 10mA or less |
| Max In-rush Current Rating | 20mA without LED indicator, 10mA with LED indicator |
| Connection Type | Standard length 2m or 0.5 m Oil resistant 2.8 / 2 cores, Tensile strength 30N, minimum bending R7 |
| Indicating | -L models: LED indicator (mounted in cable 120mm from the switch) |

* At operating speed 50-200 mm/minute. Operating speed slower than 10 mm/min is not recommended.

Circuit Diagrams

| Without LED | With LED (-L models) |
|-----------------------------|-----------------------------|
| <p>Normally open (N.O.)</p> | <p>Normally open (N.O.)</p> |



IDEM Micro Switches

Plunger Series Limit Switches

- A high precision, 15A-rated micro switch available in a wide variety of styles
- Plunger series models are available with a choice of actuator types including pin plunger, spring plunger, and roller plunger
- Panel mount options available
- Screw terminals for easy connection
- Suitable for a wide range of operating conditions
- Terminal enclosure available



| IDEM Plunger Series Micro Switches | | | | | | | |
|------------------------------------|---------|---------------------|---|----------------------|----------------------|-----------------------|-----------------------------|
| Part Number | Price | Drawing Link | Actuator Type | Snap Action Contacts | Pretravel (max) | Over Travel | Force to Operate Contacts |
| 176101-1 | \$13.50 | PDF | Metal pin plunger | (1) N.O./(1) N.C. | 0.4 mm [0.016 in] | 0.13 mm [0.005 in] | 250-350 g [0.55-0.77 lb] |
| 176101-5 | \$49.50 | PDF | Metal pin plunger (pack of 5) | | | | |
| 176104-1 | \$14.50 | PDF | Metal pin plunger long | (1) N.O./(1) N.C. | 0.4 mm [0.016 in] | 1.6 mm [0.063 in] | 250-350 g [0.55-0.77 lb] |
| 176104-5 | \$57.00 | PDF | Metal pin plunger long (pack of 5) | | | | |
| 176105-1 | \$14.50 | PDF | Metal plunger | (1) N.O./(1) N.C. | 0.4 mm [0.016 in] | 1.6 mm [0.063 in] | 250-350 g [0.55-0.77 lb] |
| 176105-5 | \$58.00 | PDF | Metal plunger (pack of 5) | | | | |
| 176106-1 | \$18.50 | PDF | Metal plunger with fixing nuts | (1) N.O./(1) N.C. | 0.4 mm [0.016 in] | 5.5 mm [0.217 in] | 250-350 g [0.55-0.77 lb] |
| 176106-5 | \$71.00 | PDF | Metal plunger with fixing nuts (pack of 5) | | | | |
| 176107-1 | \$22.50 | PDF | Metal plunger with metal roller and fixing nuts | (1) N.O./(1) N.C. | 0.4 mm [0.016 in] | 3.58 mm [0.141 in] | 250-350 g [0.55-0.77 lb] |
| 176107-5 | \$92.00 | PDF | Metal plunger with metal roller and fixing nuts (pack of 5) | | | | |
| 176108-1 | \$22.50 | PDF | Metal plunger with metal cross roller and fixing nuts | (1) N.O./(1) N.C. | 0.4 mm [0.016 in] | 3.58 mm [0.141 in] | 250-350 g [0.55-0.77 lb] |
| 176108-5 | \$92.00 | PDF | Metal plunger with metal cross roller and fixing nuts (pack of 5) | | | | |

| | | | |
|--------------------------|--------|---------------------|---|
| 176000-1 | \$2.00 | PDF | IDEM terminal enclosure, PVC. For use with IDEM micro limit switches. |
| 176000-5 | \$9.25 | PDF | IDEM terminal enclosure, PVC. Package of 5. For use with IDEM micro limit switches. |

[176101-1](#)[176104-1](#)[176105-1](#)[176106-1](#)[176107-1](#)[176108-1](#)[176000-1](#)

IDEM Micro Switches, Plunger Series

Operating Characteristics

Metal Pin Plunger (176101)



| Operating Characteristics | |
|----------------------------|--------------------------------|
| Operating Force | 250-350 g [0.55-0.77 lb] |
| Release Force (min) | 114g [0.25 lb] |
| Pre-Travel (max) | 0.4 mm [0.016 in] |
| Over-Travel (min) | 0.13 mm [0.005 in] |
| MD (max) | 0.05 mm [0.002 in] |
| Operating Position | 15.9 ± 0.4 mm [0.626±0.016 in] |

Metal Pin Plunger Long (176104)



| Operating Characteristics | |
|----------------------------|--------------------------------|
| Operating Force | 250-350 g [0.55-0.77 lb] |
| Release Force (min) | 114g [0.25 lb] |
| Pre-Travel (max) | 0.4 mm [0.016 in] |
| Over-Travel (min) | 1.6 mm [0.063 in] |
| MD (max) | 0.5 mm [0.020 in] |
| Operating Position | 28.2 ± 0.5 mm [1.110±0.020 in] |

Metal Plunger (176105)



| Operating Characteristics | |
|----------------------------|--------------------------------|
| Operating Force | 250-350 g [0.55-0.77 lb] |
| Release Force (min) | 114g [0.25 lb] |
| Pre-Travel (max) | 0.4 mm [0.016 in] |
| Over-Travel (min) | 1.6 mm [0.063 in] |
| MD (max) | 0.05 mm [0.002 in] |
| Operating Position | 21.5 ± 0.5 mm [0.846±0.020 in] |

Metal Plunger With Fixing Nuts (176106)



| Operating Characteristics | |
|----------------------------|--------------------------------|
| Operating Force | 250-350 g [0.55-0.77 lb] |
| Release Force (min) | 114g [0.25 lb] |
| Pre-Travel (max) | 0.4 mm [0.016 in] |
| Over-Travel (min) | 5.5 mm [0.217 in] |
| MD (max) | 0.05 mm [0.002 in] |
| Operating Position | 21.8 ± 0.8 mm [0.858±0.032 in] |

Metal Plunger With Metal Roller and Fixing Nuts (176107)



| Operating Characteristics | |
|----------------------------|--------------------------------|
| Operating Force | 250-350 g [0.55-0.77 lb] |
| Release Force (min) | 114g [0.25 lb] |
| Pre-Travel (max) | 0.4 mm [0.016 in] |
| Over-Travel (min) | 3.58 mm [0.141 in] |
| MD (max) | 0.05 mm [0.002 in] |
| Operating Position | 33.4 ± 1.2 mm [1.315±0.047 in] |

Operating Characteristics definitions:

- Operating Force: Force required to cause "snap."
- Release Force: Force still applied to plunger or lever when the contacts snap back from the operated position.
- Pre-Travel: Distance from free position to operating position.
- Over-Travel: The extra travel for the plunger or lever to travel safely beyond the operating position.
- MD (Max): Maximum differential (plunger or lever travel from the point where the contacts snap to the point where they snap back).
- FP (max): Extra distance relative to mounting holes that the plunger or lever travels to the snap position, including loose flex.
- Operating Position: Distance relative to mounting holes that the plunger or lever travels to the snap position.

IDEM Micro Switches, Plunger Series

Operating Characteristics (continued)

Metal Plunger With Cross Roller and Fixing Nuts (176108)



Terminal Enclosure for IDEM Micro Limit Switches (176000)



| Operating Characteristics | |
|----------------------------|--------------------------------|
| Operating Force | 250-350 g [0.55-0.77 lb] |
| Release Force (min) | 114g [0.25 lb] |
| Pre-Travel (max) | 0.4 mm [0.016 in] |
| Over-Travel (min) | 3.58 mm [0.141 in] |
| MD (max) | 0.05 mm [0.002 in] |
| Operating Position | 33.4 ± 1.2 mm [1.315±0.047 in] |

| Operating Characteristics |
|--|
| Designed to cover and protect all varieties of IDEM Micro Switches |

Operating Characteristics definitions:

- Operating Force: Force required to cause "snap."
- Release Force: Force still applied to plunger or lever when the contacts snap back from the operated position.
- Pre-Travel: Distance from free position to operating position.
- Over-Travel: The extra travel for the plunger or lever to travel safely beyond the operating position.
- MD (Max): Maximum differential (plunger or lever travel from the point where the contacts snap to the point where they snap back).
- FP (max): Extra distance relative to mounting holes that the plunger or lever travels to the snap position, including loose flex.
- Operating Position: Distance relative to mounting holes that the plunger or lever travels to the snap position.



IDEM Micro Switches

Lever Series Limit Switches

- A high-precision, 15A-rated micro switch available in a wide variety of styles
- Lever Series models are available with a choice of actuator types including lever, hinge lever, and roller lever
- Screw terminals for easy connection
- Suitable for a wide range of operating conditions
- Terminal enclosure available



IDEM Lever Series Micro Switches

| Part Number | Price | Drawing Link | Actuator Type | Snap Action Contacts | Pretravel (max) | Over Travel | Force to Operate Contacts |
|--------------------------|---------|---------------------|--|----------------------|----------------------|----------------------|---------------------------|
| 176102-1 | \$14.00 | PDF | Lever | (1) N.O./ (1) N.C. | 4 mm [0.157 in] | 1.6 mm [0.063 in] | 141g [0.31 lb] |
| 176102-5 | \$52.00 | PDF | Lever (pack of 5) | | | | |
| 176103-1 | \$14.50 | PDF | Lever with steel roller | (1) N.O./ (1) N.C. | 4 mm [0.157 in] | 1.6 mm [0.063 in] | 141g [0.31 lb] |
| 176103-5 | \$57.00 | PDF | Lever with steel roller (pack of 5) | | | | |
| 176109-1 | \$15.00 | PDF | Lever hinge long | (1) N.O./ (1) N.C. | 10 mm [0.394 in] | 5.6 mm [0.220 in] | 70g [0.15 lb] |
| 176109-5 | \$57.00 | PDF | Lever hinge long (pack of 5) | | | | |
| 176110-1 | \$14.50 | PDF | Lever hinge | (1) N.O./ (1) N.C. | 7 mm [0.276 in] | 3.5 mm 0.138 in] | 90g [0.2 lb] |
| 176110-5 | \$57.00 | PDF | Lever hinge (pack of 5) | | | | |
| 176111-1 | \$15.50 | PDF | Lever hinge long with steel roller | (1) N.O./ (1) N.C. | 7.1 mm [0.280 in] | 4 mm [0.157 in] | 100g [0.22 lb] |
| 176111-5 | \$60.00 | PDF | Lever hinge long with steel roller (pack of 5) | | | | |
| 176112-1 | \$15.50 | PDF | Lever hinge with steel roller | (1) N.O./ (1) N.C. | 2.7 mm [0.106 in] | 2.4 mm [0.094 in] | 160g [0.35 lb] |
| 176112-5 | \$59.00 | PDF | Lever hinge with steel roller (pack of 5) | | | | |
| 176113-1 | \$17.50 | PDF | One-way horizontal hinge lever with steel roller | (1) N.O./ (1) N.C. | 2.7 mm [0.106 in] | 2.4 mm [0.094 in] | 170g [0.37 lb] |
| 176113-5 | \$67.00 | PDF | One-way horizontal hinge lever with steel roller (pack of 5) | | | | |

| | | | |
|--------------------------|--------|---------------------|---|
| 176000-1 | \$2.00 | PDF | IDEM terminal enclosure, PVC. For use with IDEM micro limit switches. |
| 176000-5 | \$9.25 | PDF | IDEM terminal enclosure, PVC. Package of 5. For use with IDEM micro limit switches. |

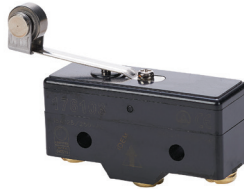
[176102-1](#)[176103-1](#)[176109-1](#)[176110-1](#)[176111-1](#)[176112-1](#)[176113-1](#)[176000-1](#)

IDEM Micro Switches, Lever Series

Operating Characteristics

Lever (176102)

| Operating Characteristics | |
|----------------------------|---------------------------------|
| Operating Force | 141g [0.31 lb] |
| Release Force (min) | 14g [0.03 lb] |
| Pre-Travel (max) | 4 mm [0.157 in] |
| Over-Travel (min) | 1.6 mm [0.063 in] |
| MD (max) | 1.3 mm [0.051 in] |
| FP (max) | 20.8 mm [0.819 in] |
| Operating Position | 17.4 ± 0.8mm [0.685 ± 0.031 in] |

Lever With Steel Roller (176103)

| Operating Characteristics | |
|----------------------------|----------------------------------|
| Operating Force | 141g [0.31 lb] |
| Release Force (min) | 14g [0.03 lb] |
| Pre-Travel (max) | 4 mm [0.157 in] |
| Over-Travel (min) | 1.6 mm [0.063 in] |
| MD (max) | 1.3 mm [0.051 in] |
| FP (max) | 31.8 mm [1.252 in] |
| Operating Position | 28.6 ± 0.8 mm [1.126 ± 0.031 in] |

Lever Hinge Long (176109)

| Operating Characteristics | |
|----------------------------|--------------------------------|
| Operating Force | 70g [0.15 lb] |
| Release Force (min) | 14g [0.03 lb] |
| Pre-Travel (max) | 10 mm [0.394 in] |
| Over-Travel (min) | 5.6 mm [0.220 in] |
| MD (max) | 1.27 mm [0.050 in] |
| FP (max) | 28.2 mm [1.110 in] |
| Operating Position | 19 ± 0.8 mm [0.748 ± 0.031 in] |

Lever Hinge (176110)

| Operating Characteristics | |
|----------------------------|----------------------------------|
| Operating Force | 90g [0.2 lb] |
| Release Force (min) | 18g [0.04 lb] |
| Pre-Travel (max) | 7 mm [0.276 in] |
| Over-Travel (min) | 3.5 mm [0.138 in] |
| MD (max) | 1 mm [0.039 in] |
| FP (max) | 26.2 mm [1.031 in] |
| Operating Position | 19.8 ± 0.8 mm [0.780 ± 0.032 in] |

Lever Hinge Long With Steel Roller (176111)

| Operating Characteristics | |
|----------------------------|----------------------------------|
| Operating Force | 100g [0.22 lb] |
| Release Force (min) | 22g [0.05 lb] |
| Pre-Travel (max) | 7.1 mm [0.280 in] |
| Over-Travel (min) | 4 mm [0.157 in] |
| MD (max) | 1.02 mm [0.040 in] |
| FP (max) | 36.5 mm [1.437 in] |
| Operating Position | 30.2 ± 0.4 mm [1.189 ± 0.016 in] |

Operating Characteristics definitions:

- Operating Force: Force required to cause "snap."
- Release Force: Force still applied to plunger or lever when the contacts snap back from the operated position.
- Pre-Travel: Distance from free position to operating position.
- Over-Travel: The extra travel for the plunger or lever to travel safely beyond the operating position.
- MD (Max): Maximum differential (plunger or lever travel from the point where the contacts snap to the point where they snap back).
- FP (max): Extra distance relative to mounting holes that the plunger or lever travels to the snap position, including loose flex.
- Operating Position: Distance relative to mounting holes that the plunger or lever travels to the snap position.

IDEM Micro Switches, Lever Series

Operating Characteristics (continued)

Lever Hinge With Steel Roller (176112)

| Operating Characteristics | |
|----------------------------|----------------------------------|
| Operating Force | 160g [0.35 lb] |
| Release Force (min) | 42g [0.09 lb] |
| Pre-Travel (max) | 2.7 mm [0.106 in] |
| Over-Travel (min) | 2.4 mm [0.094 in] |
| MD (max) | 0.5 mm [0.020 in] |
| FP (max) | 32.5 mm [1.280 in] |
| Operating Position | 30.2 ± 0.4 mm [1.189 ± 0.016 in] |

One-way Horizontal Hinge Lever With Steel Roller (176113)

| Operating Characteristics | |
|----------------------------|----------------------------------|
| Operating Force | 170g [0.37 lb] |
| Release Force (min) | 42g [0.09 lb] |
| Pre-Travel (max) | 2.7 mm [0.106 in] |
| Over-Travel (min) | 2.4 mm [0.094 in] |
| MD (max) | 0.51 mm [0.020 in] |
| FP (max) | 43.6 mm [1.717 in] |
| Operating Position | 41.3 ± 0.8 mm [1.626 ± 0.031 in] |

Terminal Enclosure for IDEM Micro Limit Switches (176000)

| Operating Characteristics |
|--|
| Designed to cover and protect all varieties of IDEM Micro Switches |

Operating Characteristics definitions:

- Operating Force: Force required to cause "snap."
- Release Force: Force still applied to plunger or lever when the contacts snap back from the operated position.
- Pre-Travel: Distance from free position to operating position.
- Over-Travel: The extra travel for the plunger or lever to travel safely beyond the operating position.
- MD (Max): Maximum differential (plunger or lever travel from the point where the contacts snap to the point where they snap back).
- FP (max): Extra distance relative to mounting holes that the plunger or lever travels to the snap position, including loose flex.
- Operating Position: Distance relative to mounting holes that the plunger or lever travels to the snap position.

IDEM Micro Switches General Specifications

| IDEM Micro Switches General Specifications | |
|--|---|
| Environmental | |
| Degree of Protection | None |
| Temperature Range | -25 to 80°C [-13 to 176°F] |
| Mechanical Ratings | |
| Mechanical Life | 1,000,000 operations minimum |
| Switch Body | Phenolic (composite resin) |
| Enclosure (Part Number 176000) | Polyvinyl chloride (PVC) |
| Contact Blocks Rating | |
| Contact Resistance | 15m Ohms max (initial) |
| Electrical Ratings | 0.5 A 125VDC 0.25 A 250VDC 0.125 hp 125VDC 0.25 hp 250VDC 20A @ 250VAC EN61058-1 and 15A @ 125VAC or 250VAC UL61058-1 |
| | Make: 0.25 A at 120VDC; 0.125 A at 240VDC |
| Dielectric Strength | Between terminals of same polarity 100VAC (50/60 Hz for 1 minute) |
| Electrical Life | 100,000 operations at full load |
| Wiring Connections | M4x5.5 terminal screw |
| Torque Requirements | Mounting screws: 1.5 N•m [1.11 lb•ft] Connector screws: 1.0 to 1.2 N•m [0.74 to 0.89 lb•ft] |
| Agency Approvals * | cULus E482215 (Exception: 176000 not UL listed) CE/Reach compliant |

*To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Compact Limit Switches

Metal Housing (Halogen-Free Cable)

AEM2G Series

- Die-cast metal housings
- 1m halogen-free cable
- 1 N.O. and 1 N.C. contact on all units
- Compact size with standard 25mm hole spacing
- Wide offering of head actuators
- Epoxy resin filled for IP67 rating
- Snap-action (Z11) contacts
- N.C. contacts are positive-opening operated unless otherwise noted.

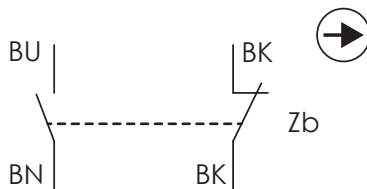
AEM2G Series Compact Limit Switches Selection Chart

| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed (m/s [ft/sec]) | Min. Actuation Force (N) or Torque (N•m) | Min. Positive Opening Force (N) or Torque (N•m) | Connection Type |
|--|---------|---------------------|---|-------------------------------------|--|---|---------------------------------|
| <u>AEM2G12Z11-HF1</u> | \$26.00 | PDF | Metal plunger with metal roller | 0.1 [0.33] | 10N [2.25 lbf] | 30N [6.74 lbf] | 3.28 ft [1m] cable, bottom exit |
| <u>AEM2G16Z11-HF1</u> | \$26.00 | PDF | Metal plunger with dust cap | 0.5 [1.64] | 15N [3.37 lbf] | 30N [6.74 lbf] | 3.28 ft [1m] cable, bottom exit |
| <u>AEM2G42Z11-HF1</u> | \$26.00 | PDF | Side rotary lever with 14mm metal roller | 1.5 [4.92] | 0.08 N•m [0.06 lb•ft] | 0.28 N•m [0.21 lb•ft] | 3.28 ft [1m] cable, bottom exit |
| <u>AEM2G51Z11-HF1</u> | \$26.00 | PDF | Side rotary adjustable lever with 18mm nylon roller | 1.5 [4.92] | 0.08 N•m [0.06 lb•ft] | 0.28 N•m [0.21 lb•ft] | 3.28 ft [1m] cable, bottom exit |
| <u>AEM2G71Z11-HF1</u> | \$26.00 | PDF | Side rotary adjustable 3mm stainless steel rod | 1.5 [4.92] | 0.08 N•m [0.06 lb•ft] | 0.28 N•m [0.21 lb•ft] | 3.28 ft [1m] cable, bottom exit |
| <u>AEM2G93Z11-HF1*</u> | \$26.00 | PDF | 360 degree stainless steel spring | 0.1 [0.33] | 0.10 N•m [0.07 lb•ft] | — | 3.28 ft [1m] cable, bottom exit |

* This unit is not a positive opening unit.

Contact Configuration

Z11 Snap-action contacts
1 N.O. and 1 N.C.



NOTE: Units are positive opening unless indicated otherwise in selection chart



[AEM2G12Z11-HF1](#)



[AEM2G16Z11-HF1](#)



[AEM2G71Z11-HF1](#)



[AEM2G42Z11-HF1](#)



[AEM2G51Z11-HF1](#)



[AEM2G93Z11-HF1](#)

Compact Limit Switches Specifications

| Compact Limit Switches Specifications | | |
|---|-------------|--|
| Series | | AEM-HF1 |
| Environmental | | |
| Degree of Protection | | IP67 according to IEC 60529 |
| Temperature Range | | Storage: -40 to 70°C [-40 to 158°F]. Operating: -25 to 70°C [-13 to 158°F] |
| Mechanical Ratings | | |
| Mechanical Life | | 10 million operations: Models G12, G42, G51, G71 5 million operations: G16, G93. |
| Enclosure Material | | ZAMAK (zinc alloy) |
| Contact Blocks Rating | | |
| Positive Opening | | Yes, except G93 |
| Electrical Ratings | AC15 | Make: 100A @ 24VAC; 60A @ 120VAC; 30A @ 240VAC Break: 10A @ 24VAC; 6A @ 120VAC; 3A @ 240VAC |
| | DC13 | 2.8A @ 24VDC; 0.55A @ 125VDC; 0.27A @ 250VDC |
| Maximum Switching Frequency | | Contact blocks: all one cycle per second |
| Repeat Accuracy | | 0.05 mm on the operating points at 1 million operations |
| Short-Circuit Protection | | 10A @ <500V |
| Contact Resistance | | 25mΩ |
| Head Rotation | | 180 Degree Only |
| Rated Insulation Voltage | | B300, R300 according to UL508 400V (degree of pollution: 3) according to IEC 60947-1 |
| Connection Type | | Cable: 1m [3.28 ft] Halogen Free cable, 5 x 0.75mm ² (18 AWG). Overall cable diameter: 8mm [0.31 in] |
| Wiring Terminal Markings | | N.C. black/brown, N.O. blue/brown |
| Electrical Protection | | Class I according to IEC60536-1 |
| Contact Blocks Performance | | |
| Operation Frequency | | 3600 ops/h |
| Electrical Durability (according to IEC 947-5-1) | | Utilization categories AC-15 and DC-13; load factor of 0.5 |
| Torque | | N/A |
| Agency Approvals * | | UL file E191072, CE |

*To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Achieve™ Compact Limit Switches

Plastic Housing Plunger Actuator AEP Series

- Double insulated plastic housing
- 3.28 ft [1m] cable/5-pin M12 quick-disconnect (right exit)
- Compact size with standard 25mm [0.98 in] hole spacing
- Epoxy resin-filled for IP67 rating
- Snap-action (Z11) and (Z22) contacts are available
- N.C. contacts are positive-opening operated unless otherwise noted.

Compact Limit Switches AEP Series Selection Chart

| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed | Min. Actuation Force | Min. Positive Opening Force | Number of Contacts | Connection Type |
|------------------------------|---------|---------------------|---|----------------------|----------------------|-----------------------------|--------------------|--|
| AEP2G11Z11-1 | \$16.00 | PDF | Metal plunger | 0.5 ms | 15N [3.37 lbf] | 30N [6.74 lbf] | 1 N.O./1 N.C. | 3.28 ft [1m] cable (bottom exit) |
| AEP2G11Z11MR | \$19.00 | PDF | | | | | | 5-pin M12 quick-disconnect (right exit) |
| AEP2G11Z22-1 | \$22.00 | PDF | | | | | 2 N.O./2 N.C. | 3.28 ft [1m] cable (bottom exit) |
| AEP2G12Z11-1 | \$18.00 | PDF | Metal plunger with metal roller | 0.1 ms | 10N [2.25 lbf] | 30N [6.74 lbf] | 1 N.O./1 N.C. | 3.28 ft [1m] cable (bottom exit) |
| AEP2G12Z11MR | \$22.00 | PDF | | 0.1 ms | 10N | 30N [6.74 lbf] | | 5-pin M12 quick-disconnect (right exit) |
| AEP2G12Z22-1 | \$25.00 | PDF | | | | | 2 N.O./2 N.C. | 3.28 ft [1m] cable (bottom exit) |
| AEP2G16Z11-1 | \$18.00 | PDF | Metal plunger with dust cap | 0.5 ms | 15N [3.37 lbf] | 30N [6.74 lbf] | 1 N.O./1 N.C. | 3.28 ft [1m] cable (bottom exit) |
| AEP2G16Z11MR | \$22.00 | PDF | | | | | | 5-pin M12 quick-disconnect (right exit) |
| AEP2G16Z22-1 | \$24.00 | PDF | | | | | 2 N.O./2 N.C. | 3.28 ft [1m] cable (bottom exit) |
| AEP2G21Z22-1 | \$24.00 | PDF | Metal plunger fixing nuts | | | | | 3.28 ft [1m] cable (bottom exit) |
| AEP2G22Z22-1 | \$26.00 | PDF | Metal plunger with metal roller and fixing nuts | | 10N [2.25 lbf] | | | 3.28 ft [1m] cable (bottom exit) |



[AEP2G11Z11-1](#)



[AEP2G12Z11-1](#)



[AEP2G16Z11-1](#)

Housing style



3.28 ft [1m] cable,
(bottom exit)



5-pin M12 quick-disconnect
(right exit)



Compact Limit Switches



[AEP2G11Z22-1](#)



[AEP2G12Z22-1](#)



[AEP2G16Z22-1](#)

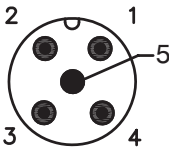


[AEP2G21Z22-1](#)

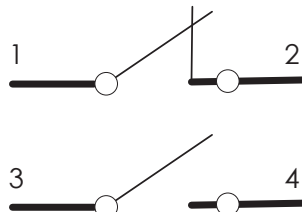


[AEP2G22Z22-1](#)

Connector

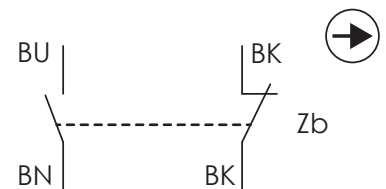


Contact Configuration



Note: Pin 5 is not connected

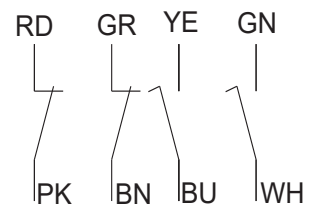
Z11 Snap-action contacts
1 N.O. and 1 N.C.



[AEP2G11Z22-1](#), [AEP2G16Z22-1](#) and [AEP2G21Z22-1](#)

| Z4 | | | A | B | C | D | E | TAG | mm |
|-------|-------|-------|-------|---|---|---|---|-----|-----|
| | | | | | | | | | |
| 11-12 | 21-22 | 33-34 | 43-44 | A | B | C | D | E | TAG |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 12 | 22 | 34 | 44 | A | B | C | D | E | TAG |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 11-12 | 21-22 | 33-34 | 43-44 | A | B | C | D | E | TAG |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 12 | 22 | 34 | 44 | A | B | C | D | E | TAG |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Z22 Snap-action contacts
2 N.O. and 2 N.C.



[AEP2G12Z22-1](#) and [AEP2G22Z22-1](#)

| Z4 | | | A | B | C | D | E | TAG | mm |
|-------|-------|-------|-------|---|---|---|---|-----|-----|
| | | | | | | | | | |
| 11-12 | 21-22 | 33-34 | 43-44 | A | B | C | D | E | TAG |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 12 | 22 | 34 | 44 | A | B | C | D | E | TAG |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 11-12 | 21-22 | 33-34 | 43-44 | A | B | C | D | E | TAG |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 12 | 22 | 34 | 44 | A | B | C | D | E | TAG |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Achieve™ Compact Limit Switches

Side Rotary Lever Actuator AEP Series

- Double insulated plastic housings
- 3.28 ft [1m] cable/5-pin M12 quick-disconnect (right exit)
- Compact size with standard 25mm [0.98 in] hole spacing
- Epoxy resin-filled for IP67 rating
- Snap-action (Z11) and (Z22) contacts are available
- N.C. contacts are positive-opening operated unless otherwise noted.

Compact Limit Switches AEP Series Selection Chart

| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed | Min. Actuation Force | Min. Positive Opening Force | Number of Contacts | Connection Type |
|------------------------------|---------|---------------------|---|----------------------|----------------------|-----------------------------|--------------------|---|
| AEP2G41Z11-1 | \$17.00 | PDF | Side rotary lever with 14mm nylon roller | 1.5 ms | 0.08 N•m | 0.28 N•m | 1 N.O./1 N.C. | 3.28 ft [1m] cable (bottom exit) |
| AEP2G41Z11MR | \$21.00 | PDF | | | | | | 5-pin M12 quick-disconnect (right exit) |
| AEP2G41Z22-1 | \$23.00 | PDF | | | | | 2 N.O./2 N.C. | 3.28 ft [1m] cable (bottom exit) |
| AEP2G42Z11-1 | \$17.00 | PDF | Side rotary lever with 14mm metal roller | 1.5 ms | 0.08 N•m | 0.28 N•m | 1 N.O./1 N.C | 3.28 ft [1m] cable (bottom exit) |
| AEP2G42Z11MR | \$21.00 | PDF | | | | | | 5-pin M12 quick-disconnect (right exit) |
| AEP2G43Z11-1 | \$18.00 | PDF | Side rotary lever with 14mm ball bearing roller | 1.5 ms | 0.08 N•m | 0.28 N•m | | 3.28 ft [1m] cable (bottom exit) |
| AEP2G43Z11MR | \$22.00 | PDF | | | | | | 5-pin M12 quick-disconnect (right exit) |
| AEP2G51Z11-1 | \$18.00 | PDF | Side rotary adjustable lever with 18mm nylon roller | 1.5 ms | 0.08 N•m | 0.28 N•m | | 3.28 ft [1m] cable (bottom exit) |
| AEP2G51Z11MR | \$21.00 | PDF | | | | | | |
| AEP2G51Z22-1 | \$24.00 | PDF | | | | | 2 N.O./2 N.C. | 3.28 ft [1m] cable (bottom exit) |
| AEP2G71Z11-1 | \$18.00 | PDF | Side rotary adjustable 3mm stainless steel rod | 1.5 ms | 0.08 N•m | 0.28 N•m | 1 N.O./1 N.C | 3.28 ft [1m] cable (bottom exit) |
| AEP2G71Z11MR | \$22.00 | PDF | | | | | | 5-pin M12 quick-disconnect (right exit) |



[AEP2G41Z22-1](#)



[AEP2G42Z11-1](#)



[AEP2G43Z11-1](#)



[AEP2G51Z22-1](#)

Housing style



3.28 ft [1m] cable,
bottom exit



5-pin M12 quick-disconnect
(right)

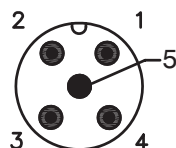


[AEP2G71Z11-1](#)

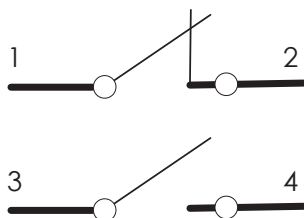


Compact Limit Switches

Connector

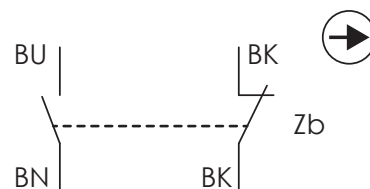


Contact Configuration



Note: Pin 5 is not connected

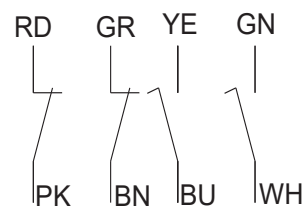
Z11 Snap-action contacts 1 N.O. and 1 N.C.



AEP2G41Z22-1 and AEP2G51Z22-1

| Z4 | | A B C D | | | | TAG | degree |
|-------|----|---------|-------|-------|-------|-----|--------|
| | | 11-12 | 21-22 | 33-34 | 43-44 | | |
| 11-12 | 12 | | | | | A | 0 |
| | 21 | | | | | B | 30 |
| | 33 | | | | | C | 55 |
| | 43 | | | | | D | 75 |
| 21-22 | 12 | | | | | E | 10 |
| | 22 | | | | | | |
| | 34 | | | | | | |
| | 44 | | | | | | |
| 33-34 | 12 | | | | | | |
| | 22 | | | | | | |
| | 34 | | | | | | |
| | 44 | | | | | | |
| 43-44 | 12 | | | | | | |
| | 22 | | | | | | |
| | 34 | | | | | | |
| | 44 | | | | | | |

Z22 Snap-action contacts 2 N.O. and 2 N.C.





Compact Limit Switches

Plastic Housing Stainless Steel Spring Actuator AEP Series

- Double-insulated plastic housing
- 3.28 ft [1m] cable/5-pin M12 quick-disconnect (right exit)
- Compact size with standard 25mm [0.98] in hole spacing
- Epoxy resin-filled for IP67 rating
- Snap-action (Z11) and (Z22) contacts are available

Compact Limit Switches AEP Series Selection Chart

| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed | Min. Actuation Force | Min. Positive Opening Force | Number of Contacts | Connection Type |
|------------------------------|---------|---------------------|--|----------------------|----------------------|-----------------------------|--------------------|---|
| AEP2G92Z11-1 | \$18.00 | PDF | 360 degree stainless steel spring with nylon tip | 0.1 ms | 0.10 N•m | — | 1 N.O./1 N.C | 3.28 ft [1m] cable (bottom exit) |
| AEP2G92Z11MR | \$22.00 | PDF | | | | | | 5-pin M12 quick-disconnect (right exit) |
| AEP2G93Z11-1 | \$18.00 | PDF | 360 degree stainless steel spring | | | | | 3.28 ft [1m] cable (bottom exit) |
| AEP2G93Z11MR | \$22.00 | PDF | | | | | | 5-pin M12 quick-disconnect (right exit) |
| AEP2G93Z22-1 | \$26.00 | PDF | | | | | 2 N.O./2 N.C | 3.28 ft [1m] cable (bottom exit) |



[AEP2G92Z11-1](#)



[AEP2G93Z22-1](#)

Housing style



3.28 ft [1m] cable,
(bottom exit)

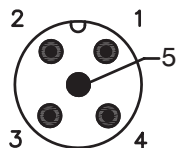


5-pin M12 quick-disconnect
(right exit)

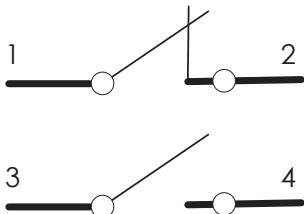
Compact Limit Switches

Plastic Housing Stainless Steel Spring Actuator AEP Series

Connector

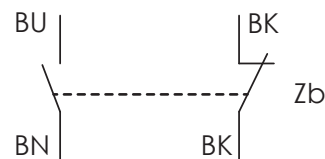


Contact Configuration

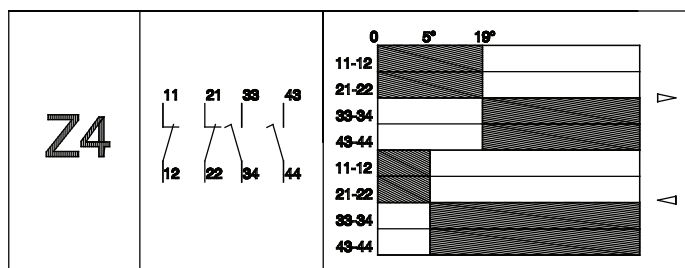


Note: Pin 5 is not connected

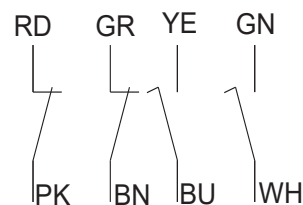
Z11 Snap-action contacts 1 N.O. and 1 N.C.



AEP2G93Z22-1



Z22 Snap-action contacts 2 N.O. and 2 N.C.





Compact Limit Switch Specifications

| Compact Limit Switches AEP Series Specifications | | | |
|---|-------|--|---|
| Type | | 1 N.O. / 1 N.C. | 2 N.O. / 2 N.C. |
| Environmental | | | |
| Degree of Protection | | IP67 according to IEC 60529 | |
| Temperature Range | | Storage: -40 to 70°C [-40 to 158°F]. Operating: -25 to 70°C [-13 to 158°F] | |
| Mechanical Ratings | | | |
| Mechanical Life | | 10 million operations. Models G11,G12,G41,G42,G43,G51,G71 5 million operations. Models G16, G92, G93 | 10 million operations |
| Enclosure Material | | Reinforced Thermoplastic | |
| Contact Blocks Rating | | | |
| Positive Opening | | All models except 92 and 93 operating heads | |
| Electrical Ratings | AC-15 | Make: 100A @ 24VAC; 60A @ 120VAC; 30A @ 240VAC Break: 10A @ 24VAC; 6A @ 120VAC; 3A @ 240VAC | 4A @ 24VDC, 3A @ 240VAC |
| | DC-13 | 2.8A @ 24VDC; 0.55A @ 125VDC; 0.27A@250VDC | 2A @ 24VDC, 0.4 A @ 250VDC |
| Maximum Switching Frequency | | Contact blocks: all one cycle per second | 3600 [cycles/hour] |
| Repeat Accuracy | | 0.05 mm on the operating points at 1 million operations | |
| Short-Circuit Protection | | 10A @ <500V | 4A @ <500VAC Part number: AEP2G93Z22-1 10A @ <500VAC |
| Contact Resistance | | 25mΩ | |
| Head Rotation | | 180 Degree Only | |
| Rated Insulation Voltage | | B300, R300 according to UL508 400V (degree of pollution: 3) according to IEC 60947-1 | C300 - R300 according to UL508, 250V (degree of pollution 3) |
| Connection Type | | Cable: 1m [3.28 ft] PVC cable, 4 x 0.75mm² (18 AWG). Overall cable diameter: 7mm [0.275 in.] Connector: 5-pin M12 quick disconnect | Pigtail 1m [3.28 ft], PVC, 0.5 mm² [20AWG] |
| Wiring Terminal Markings | | Cable Models: N.C. Black/Black, N.O. Blue/Brown M12 Models: N.C. Pin 1-2, N.O. Pin 3-4 | N.C. Gray/Brown Red/Pink N.O. Blue/Yellow Green/White |
| Electrical Protection | | Class II according to IEC60536-1 | |
| Contact Blocks Performance | | | |
| Operation Frequency | | 3600 ops/h | |
| Electrical Durability (according to IEC 947-5-1) | | Utilization categories AC-15 and DC-13; load factor of 0.5 | |
| Torque | | N/A | |
| Approvals * | | UL file E191072, CE | |

*To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.

IEC Limit Switches

Metal Housing Plunger Actuator AAM Series

- Small body allows mounting in tight spaces
- Durable cast metal housing
- Single conduit 1/2" NPT opening or 5-pin M12 quick-disconnect
- 1 N.O. and 1 N.C. contact on all units
- Snap-action (Z11) contacts

AAM Series Limit Switches With Metal Enclosure Selection Chart

| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed (m/s [ft/sec]) | Min. Actuation Force (N) or Torque (N•m) | Min. Positive Opening Force (N) or Torque (N•m) | Connection Type |
|----------------------------|---------|---------------------|--|-------------------------------------|--|---|-------------------------------------|
| AAM2F11Z11 | \$13.00 | PDF | Metal plunger | 0.5 [1.64] | 15N [3.37 lbf] | 30N [6.74 lbf] | 1/2-in NPT cable entry |
| AAM2F12Z11 | \$14.00 | PDF | Metal plunger with metal roller | 0.3 [0.98] | 12N [2.70 lbf] | 30N [6.74 lbf] | 1/2-in NPT cable entry |
| AAM7F12Z11 | \$21.00 | PDF | Metal plunger with metal roller | 0.3 [0.98] | 12N [2.70 lbf] | 30N [6.74 lbf] | 5-pin M12 quick-disconnect (bottom) |
| AAM2T14Z11 | \$14.00 | PDF | Metal plunger with dust cap | 0.5 [1.64] | 15N [3.37 lbf] | 30N [6.74 lbf] | 1/2-in NPT cable entry |
| AAM2T35Z11 | \$15.00 | PDF | One-way horizontal lever with nylon roller | 1 [3.28] | 7N [1.57 lbf] | 24N [5.40 lbf] | 1/2-in NPT cable entry |
| AAM7T35Z11 | \$21.00 | PDF | One-way horizontal lever with nylon roller | 1 [3.28] | 7N [1.57 lbf] | 24N [5.40 lbf] | 5-pin M12 quick-disconnect (bottom) |



[AAM2F11Z11](#)



[AAM2F12Z11](#)



[AAM2T14Z11](#)



[AAM2T35Z11](#)

Housing style



1/2-in NPT cable entry

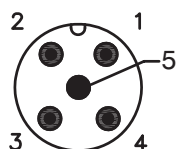


5-pin M12 quick-disconnect (bottom)

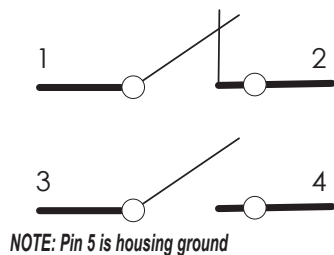
IEC Limit Switches

Metal Housing Plunger Actuator AAM Series

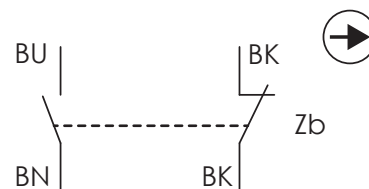
Connector



Contact Configuration



Z11 Snap-action contacts 1 N.O. and 1 N.C.



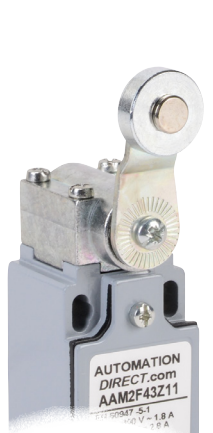
IEC Limit Switches

Metal Housing Side Rotary Lever Actuator AAM Series

- Small body allows mounting in tight spaces
- Durable cast metal housing
- Single conduit 1/2" NPT opening or 5-pin M12 quick-disconnect
- 1 N.O. and 1 N.C. contact on all units
- Snap-action (Z11) contacts

Limit Switches With Metal Enclosure AAM Series Selection Chart

| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed (m/s [ft/sec]) | Min. Actuation Force (N) or Torque (N•m) | Min. Positive Opening Force (N) or Torque (N•m) | Connection Type |
|----------------------------|---------|---------------------|---|-------------------------------------|--|---|-------------------------------------|
| AAM2F43Z11 | \$15.00 | PDF | Side rotary lever with 18mm metal roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | 1/2-in NPT cable entry |
| AAM7F43Z11 | \$21.00 | PDF | Side rotary lever with 18mm metal roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | 5-pin M12 quick-disconnect (bottom) |
| AAM2F46Z11 | \$15.00 | PDF | Side rotary lever inward with 18mm metal roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | 1/2-in NPT cable entry |
| AAM7F46Z11 | \$22.00 | PDF | Side rotary lever inward with 18mm metal roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | 5-pin M12 quick-disconnect (bottom) |
| AAM2F53Z11 | \$15.00 | PDF | Side rotary adjustable metal lever with 18mm metal roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | 1/2-in NPT cable entry |
| AAM7F53Z11 | \$22.00 | PDF | Side rotary adjustable metal lever with 18mm metal roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | 5-pin M12 quick-disconnect (bottom) |
| AAM2F71Z11 | \$15.00 | PDF | Side rotary adjustable 3mm stainless steel rod | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | 1/2-in NPT cable entry |
| AAM7F71Z11 | \$22.00 | PDF | Side rotary adjustable 3mm stainless steel rod | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | 5-pin M12 quick-disconnect (bottom) |



[AAM2F43Z11](#)



[AAM2F46Z11](#)



[AAM2F53Z11](#)



[AAM2F71Z11](#)

Housing style



1/2-in NPT cable entry

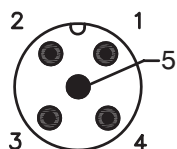


5-pin M12 quick-disconnect (bottom)

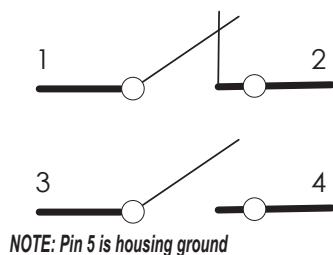
IEC Limit Switches

Metal Housing Side Rotary Lever Actuator AAM Series

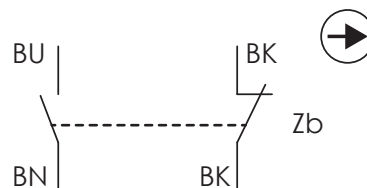
Connector



Contact Configuration



Z11 Snap-action contacts 1 N.O. and 1 N.C.



IEC Limit Switches

Metal Housing Stainless Steel Spring Actuator AAM Series

- Small body allows mounting in tight spaces
- Durable cast metal housing
- Single conduit 1/2" NPT opening or 5-pin M12 quick disconnect
- 1 N.O. and 1 N.C. contact on all units
- Snap-action (Z11) contacts

Limit Switches With Metal Enclosure AAM Series Selection Chart

| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed (m/s [ft/sec]) | Min. Actuation Force (N) or Torque (N•m) | Min. Positive Opening Force (N) or Torque (N•m) | Connection Type |
|-----------------------------------|---------|----------------------------|-----------------------------------|-------------------------------------|--|---|-------------------------------------|
| <u>AAM2T93Z11</u> | \$15.00 | <u>PDF</u> | 360 degree stainless steel spring | 1 [3.28] | 0.12 N•m [0.09 lb•ft] | — | 1/2-in NPT cable entry |
| <u>AAM7T93Z11</u> | \$22.00 | <u>PDF</u> | 360 degree stainless steel spring | 1 [3.28] | 0.12 N•m [0.09 lb•ft] | — | 5-pin M12 quick-disconnect (bottom) |



[AAM2T93Z11](#)

Housing style



1/2-in NPT cable entry

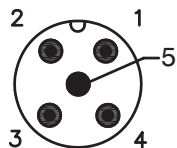


5-pin M12 quick-disconnect (bottom)

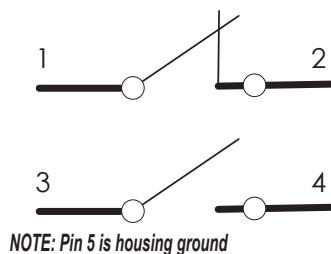
IEC Limit Switches

Metal Housing Stainless Steel Spring Actuator AAM Series

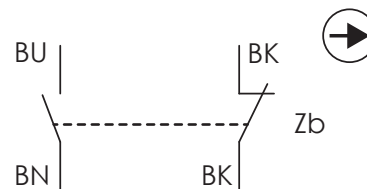
Connector



Contact Configuration



Z11 Snap-action contacts 1 N.O. and 1 N.C.



IEC Limit Switches

Plastic Housing Plunger Actuator AAP Series

- Small body allows mounting in tight spaces
- Double insulated PBT housing
- Single conduit opening PG11 with 1/2" NPT adapter or 5-pin M12 quick disconnect
- 1 N.O. and 1 N.C. contact on all units
- Snap-action (Z11) contacts

Compact Limit Switches With Plastic Enclosure With Connector AAP Series Selection Chart

| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed (m/s [ft/sec]) | Min. Actuation Force (N) or Torque (N•m) | Min. Positive Opening Force (N) or Torque (N•m) | Connection Type |
|----------------------------|---------|---------------------|--|-------------------------------------|--|---|--|
| AAP2T10Z11 | \$9.50 | PDF | Plastic plunger | 0.5 [1.64] | 15N [3.37 lbf] | 30N [6.74 lbf] | PG11 threads with 1/2-inch NPT adapter |
| AAP2T13Z11 | \$13.50 | PDF | Galvanized steel plunger with polyamide plastic roller | 0.3 [0.98] | 12N [2.70 lbf] | 30N [6.74 lbf] | PG11 threads with 1/2-inch NPT adapter |
| AAP7T13Z11 | \$15.00 | PDF | Galvanized steel plunger with polyamide plastic roller | 0.3 [0.98] | 12N [2.70 lbf] | 30N [6.74 lbf] | 5-pin M12 quick-disconnect (bottom) |
| AAP2T14Z11 | \$13.50 | PDF | Metal plunger with dust cap | 0.5 [1.64] | 15N [3.37 lbf] | 30N [6.74 lbf] | PG11 threads with 1/2-inch NPT adapter |
| AAP2T35Z11 | \$13.50 | PDF | One-way horizontal lever with polyamide roller | 1.0 [3.28] | 7N [1.57 lbf] | 24N [5.40 lbf] | PG11 threads with 1/2-inch NPT adapter |
| AAP7T35Z11 | \$17.00 | PDF | One-way horizontal lever with polyamide roller | 1.0 [3.28] | 7N [1.57 lbf] | 24N [5.40 lbf] | 5-pin M12 quick-disconnect (bottom) |

Housing style



[AAP7T10Z11](#)



[AAP7T13Z11](#)



[AAP7T14Z11](#)



[AAP7T35Z11](#)



PG11 threads with
1/2-inch NPT adapter

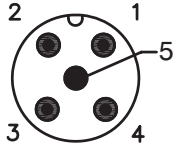


5-pin M12 quick- disconnect
(bottom)

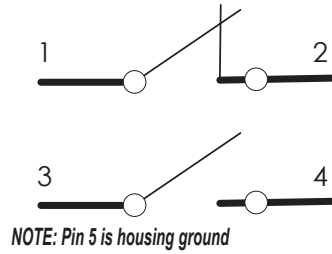
IEC Limit Switches

Plastic Housing Plunger Actuator AAP Series

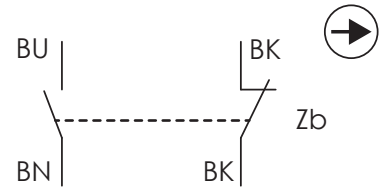
Connector



Contact Configuration



Z11 Snap-action contacts 1 N.O. and 1 N.C.



IEC Limit Switches

Plastic Housing Side Rotary Lever Actuator AAP Series

- Small body allows mounting in tight spaces
- Double insulated PBT housing
- 1 N.O. and 1 N.C. contact on all units
- Snap-action (Z11) contacts
- Single conduit opening PG11 with 1/2" NPT adapter or 5-pin M12 quick-disconnect

Compact Limit Switches With Plastic Enclosure With Connector AAP Series Selection Chart

| Part Number | Price | Drawing Link | Actuator Type | Max. Actuation Speed (m/s [ft/sec]) | Min. Actuation Force (N) or Torque (N•m) | Min. Positive Opening Force (N) or Torque (N•m) | Connection Type |
|-------------------------------------|---------|----------------------------|--|-------------------------------------|--|---|--|
| <u>AAP2T41Z11</u> | \$13.50 | <u>PDF</u> | Side rotary lever with polyamide roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | PG11 threads with a 1/2-inch NPT adapter |
| <u>AAP7T41Z11</u> | \$16.00 | <u>PDF</u> | Side rotary lever with polyamide roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | 5-pin M12 quick-disconnect (bottom) |
| <u>AAP2T42Z11</u> | \$13.00 | <u>PDF</u> | Side rotary lever with 50mm rubber roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | PG11 threads with a 1/2-inch NPT adapter |
| <u>AAP2T45Z11</u> | \$13.00 | <u>PDF</u> | Side rotary lever inward with 18mm nylon roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | PG11 threads with a 1/2-inch NPT adapter |
| <u>AAP2T51Z11</u> | \$13.50 | <u>PDF</u> | Side rotary adjustable metal lever with polyamide roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | PG11 threads with a 1/2-inch NPT adapter |
| <u>AAP7T51Z11</u> | \$17.00 | <u>PDF</u> | Side rotary adjustable metal lever with polyamide roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | 5-pin M12 quick-disconnect (bottom) |
| <u>AAP2T5100Z11</u> | \$13.00 | <u>PDF</u> | Side rotary 2mm step adjustable lever with 18mm nylon roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | PG11 threads with a 1/2-inch NPT adapter |
| <u>AAP7T5100Z11</u> | \$17.00 | <u>PDF</u> | Side rotary 2mm step adjustable lever with 18mm nylon roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | 5-pin M12 quick-disconnect (bottom) |
| <u>AAP2T5200Z11</u> | \$14.00 | <u>PDF</u> | Side rotary adjustable lever with 50mm rubber roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | PG11 threads with a 1/2-inch NPT adapter |
| <u>AAP7T5200Z11</u> | \$18.00 | <u>PDF</u> | Side rotary adjustable lever with 50mm rubber roller | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | 5-pin M12 quick-disconnect (bottom) |
| <u>AAP2T71Z11</u> | \$13.50 | <u>PDF</u> | Side rotary adjustable 3mm stainless steel rod | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | PG11 threads with a 1/2-inch NPT adapter |
| <u>AAP7T71Z11</u> | \$17.00 | <u>PDF</u> | Side rotary adjustable 3mm stainless steel rod | 1.5 [4.92] | 0.10 N•m [0.07 lb•ft] | 0.32 N•m [0.24 lb•ft] | 5-pin M12 quick-disconnect (bottom) |

IEC Limit Switches

Plastic Housing Side Rotary Lever Actuator AAP Series



[AAP7T41Z11](#)



[AAP7T42Z11](#)



[AAP7T45Z11](#)



[AAP7T51Z11](#)



[AAP7T5100Z11](#)



[AAP7T5200Z11](#)



[AAP7T71Z11](#)

Housing style



PG11 threads with
1/2-inch NPT adapter

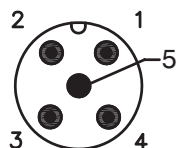


5-pin M12 quick-disconnect
(bottom)

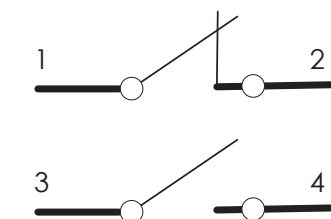
IEC Limit Switches

Plastic Housing Side Rotary Lever Actuator AAP Series

Connector

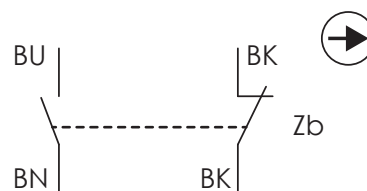


Contact Configuration



NOTE: Pin 5 is housing ground

Z11 Snap-action contacts 1 N.O. and 1 N.C.



IEC Limit Switches

Plastic Housing Stainless Steel Spring Actuator AAP Series

- Small body allows mounting in tight spaces
- Double insulated PBT housing
- Single conduit opening PG11 with 1/2" NPT adapter or 5-pin M12 quick-disconnect
- 1 N.O. and 1 N.C. contact on all units
- Snap-action (Z11) contacts

Compact Limit Switches With Plastic Enclosure With Connector AAP Series Selection Chart

| Part Number | Price | | Actuator Type | Max. Actuation Speed (m/s [ft/sec]) | Min. Actuation Force (N) or Torque (N•m) | Min. Positive Opening Force (N) or Torque (N•m) | Connection Type |
|----------------------------|---------|--|-----------------------------------|-------------------------------------|--|---|--|
| AAP2T93Z11 | \$13.00 | | 360 degree stainless steel spring | 1 [3.28] | 0.12 N•m [0.09 lb•ft] | — | PG11 threads with a 1/2-inch NPT adapter |
| AAP7T93Z11 | \$17.00 | | 360 degree stainless steel spring | 1 [3.28] | 0.12 N•m [0.09 lb•ft] | — | 5-pin M12 quick-disconnect (bottom) |



Housing style



PG11 threads with
1/2-inch NPT adapter

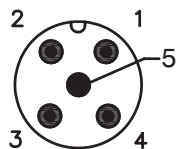


5-pin M12 quick-disconnect
(bottom)

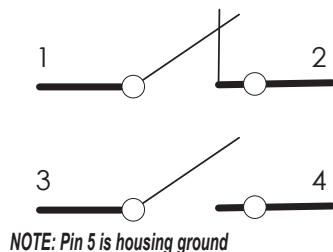
IEC Limit Switches

Plastic Housing Stainless Steel Spring Actuator AAP Series

Connector

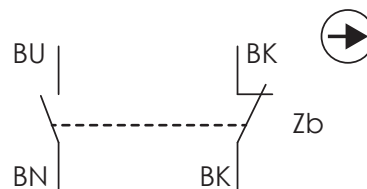


Contact Configuration



NOTE: Pin 5 is housing ground

Z11 Snap-action contacts 1 N.O. and 1 N.C.



IEC Limit Switches Specifications

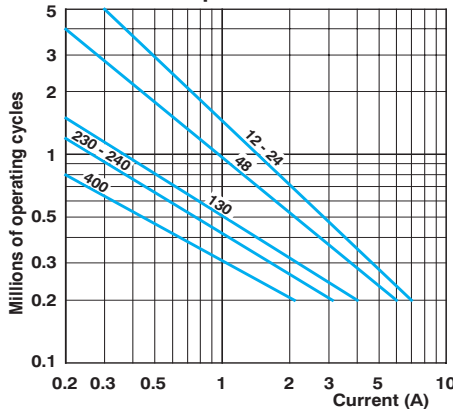
| IEC Limit Switches Specifications | | | | |
|--|------|--|--|---|
| Type | | Plastic | | Metal |
| Environmental | | | | |
| Degree of Protection | | IEC IP65 | | IEC IP66 |
| Temperature Range ¹ | | Stocking: -30 to 80°C [-22 to 176° F] Working: -25 to 70°C [-13 to 158°F] | | Stocking: -30 to 80°C [-22 to 176°F] Working: -10 to 70°C [14 to 158°F]; |
| Rated Insulation Voltage | | 690V (degree of pollution 3) | | |
| Mechanical Ratings | | | | |
| Working Positions ² | | All actuators can be rotated in 90° increments | | |
| Mechanical Life | | Straight line working heads: 30 million operations | Side rotary heads: 25 million operations, | Multidirectional heads: 10 million operations |
| Enclosure Material | | Fiberglass-reinforced plastic - V0 class (UL94) | | Die-cast aluminum |
| Contact Blocks Rating | | | | |
| Positive Opening ³ | | Yes, all models | | |
| Electrical Ratings | AC15 | Make: 60A@120VAC; 30A @ 240VAC; 18A @ 400VAC Break:10A @ 24VAC; 6.5 A @130VAC; 3.1 A @ 230VAC; 1.8 A @ 400VAC | | |
| | DC13 | 2.8A @ 24VDC; 0.5A @ 110VDC | | |
| Maximum Switching Frequency | | Contact blocks: all two cycles per second | | |
| Repeat Accuracy | | 0.01 mm on the operating points at 1 million operations | | |
| Short-Circuit Protection | | Cartridge fuses gl 10A-500V 10.3x38 1 100KA | | |
| Contact Resistance | | 0.025 Ω | | |
| Recommended Minimum Operating Speed | | With snap-action contacts: 20mm [0.787 in] per minute ⁴ With slow-action contacts: 500mm [19.685 in] per minute ⁵ | | |
| Rated Insulation Voltage | | 660V | | |
| Terminals Marking | | According to CENELEC EN 50013 | | |
| Wiring Connections | | 2 x 2.5mm² (AWG14) to 2 x 0.5mm² (AWG18) | | |
| Wiring Terminal Type | | Captive screw with self-lifting pressure plate | | |
| Wiring Terminal Markings | | According to CENELEC EN50013 | | |
| User Protection | | Double insulation (plastic models only) | | |
| Contact Blocks Performance | | | | |
| Operation Frequency | | 3600 ops/h | | |
| Electrical Durability (according to IEC 947-5-1) | | Utilization categories AC-15 and DC-13; load factor of 0.5. See table and curves in supplemental section. | | |
| Approvals | | UL file E191072, CE | | |
| Tools Needed | | Phillips screwdriver, #1 #2 / Hex wrench, 10mm | | |

1. Minimum temperatures assume that the atmosphere is free of moisture, which could cause moving parts to freeze up.
2. Some types of actuators, such as a long, heavy spring with the adjustable actuator fully extended, may not work properly if installed in a horizontal position.
3. Positive opening in a snap-action contact block is performed by a rigid mechanism that forces the N.C. contact to open in case the snap action mechanism fails. This would provide protection if, for example, the contacts became "welded" together by excessive current rush. Generally, positive opening is not considered to work properly on switches with actuators that are not a solid design (such as a spring or rubber roller), despite the fact that the contact block itself has positive opening. In order to be considered as having positive opening, a switch must not have flexible components between actuator actioning points and the electrical contact.
4. This is the speed at which snap-action contact blocks are tested. There is no minimum operating speed for snap-action contacts because the speed has no influence on the switch action. When using spring actuators, the changeover time may vary from 1ms to 3ms from maximum to minimum operating speed.
5. Slow-action contacts must not be operated at very low speeds because of the tendency to maintain the arc if contacts are not rapidly separated.

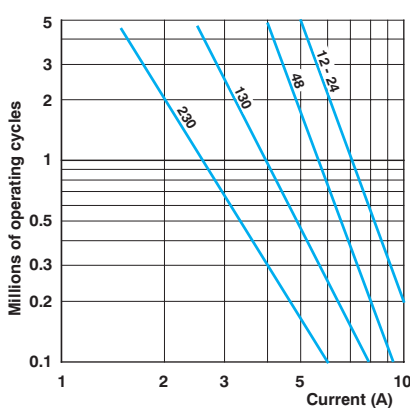
Limit Switches Supplemental

Electrical Durability (according to IEC 947-5-1)

AC-15 Snap Action



AC-15 Slow Action



Limit switch types

Snap-action contact: A contact element in which the contact motion is independent of the speed of the actuator. This feature ensures reliable electrical performance even in applications involving very slow moving actuators.

Slow-make/slow-break contacts: A contact element in which the contact motion is dependent on the actuator speed.

Terminal identification (IEC)

Each terminal is marked with two digits. The first digit indicates the pole (circuit). The second digit indicates the type of contact.

_1-_2 is N.C., _3-_4 is N.O.
so 11-12, 21-22 are N.C., while 13-14, 23-24 are N.O.

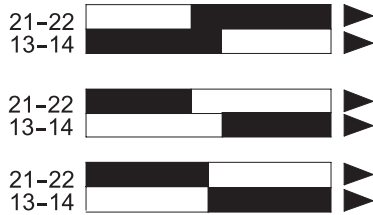
| DC-13 | Snap Action | Slow Action |
|-------|---|-------------|
| | Power breaking for a durability of 5 million cycles | |
| 24V | 9.5 W | 12W |
| 48V | 6.8 W | 9W |
| 110V | 3.6 W | 6W |

Terminal Markings

| European | |
|--------------|---|
| Terminal No. | Type |
| 11-12 | N.C. contact of pole no. 1 ¹ |
| 13-14 | N.O. contact of pole no. 2 ¹ |
| 21-22 | N.C. contact of pole no. 2 ² |
| 23-24 | N.O. contact of pole no. 1 ² |

¹ With non-isolated contacts ² With isolated contacts

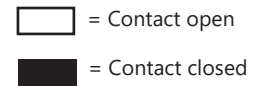
Note: Green/yellow wire is physical earth ground.



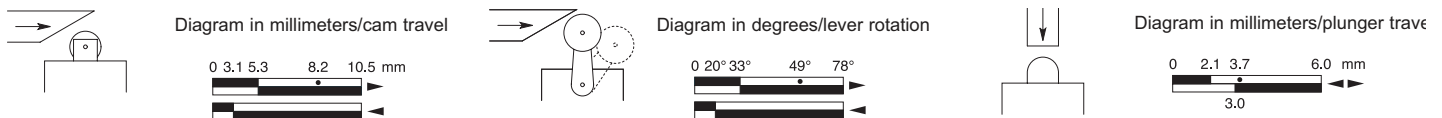
Make-before-break (overlapping) SPDT: the N.O. contact closes before the N.C. contact opens. (See ex: Y11)

Break-before-make (offset) SPDT: the N.C. contact opens before the N.O. contact closes. (See ex: X11)

Simultaneous make and break SPDT: the N.C. contact opens at the same time as the N.O. contact closes. (See ex: Z11)



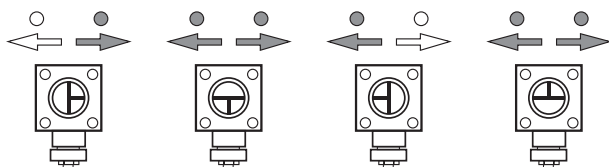
Bar Chart Examples (cam angle is 30 degrees)



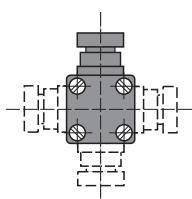
Changeable working heads (E42, E52, E71)

View of cam insert when looking at bottom of head once removed from switch body.

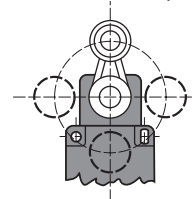
To change position, push in and twist until it locks into place



Positioning - 90° each way

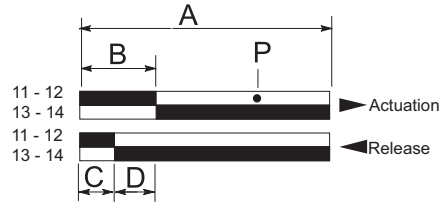
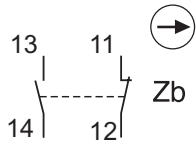


Adjustable lever from 0-360°
(6° each increment)



Contact Displacement Values

Z11 Snap Action Contacts 1 N.O. and 1 N.C.



A = Max. travel of the operator in mm or degrees

B = Tripping travel of both contacts on actuation

C = Tripping travel of both contacts on release

D = Differential travel (between actuation and release)

P = Point from which positive opening is assured during actuation

| Contact Displacement Values | | | | |
|-----------------------------|--|-------------|-------------|--------------|
| Part Series | Displacement Values — mm [in] or degrees | | | |
| | A | B | C | P |
| AEM Halogen | | | | |
| AEM2G12Z11-HF1 | 8.7 [0.343] | 3.8 [0.150] | 2.4 [0.095] | 7.5 [0.295] |
| AEM2G16Z11-HF1 | 5 [0.197] | 2.2 [0.867] | 1.4 [0.055] | 4.3 [0.169] |
| AEM2G42Z11-HF1 | 74° | 32° | 21° | 65° |
| AEM2G51Z11-HF1 | 74° | 32° | 21° | 65° |
| AEM2G71Z11-HF1 | 74° | 32° | 21° | 65° |
| AEM2G93Z11-HF1 | — | 10° | 20° | — |
| AAM Series | | | | |
| AAMxF11Z11x | 5.6 [0.220] | 2.5 [0.098] | 1.3 [0.051] | 4.1 [0.161] |
| AAMxF12Z11x | 5.6 [0.220] | 2.5 [0.098] | 1.3 [0.051] | 4.1 [0.161] |
| AAMxT14Z11x | 5.6 [0.220] | 2.5 [0.098] | 1.3 [0.051] | 4.1 [0.161] |
| AAMxT35Z11x | 21 [0.827] | 9 [0.354] | 4.5 [0.177] | 14.5 [0.571] |
| AAMxF43Z11x | 74° | 31° | 17° | 47° |
| AAMxF46Z11x | 74° | 31° | 17° | 47° |
| AAMxF53Z11x | 74° | 31° | 17° | 47° |
| AAMxF71Z11x | 74° | 31° | 17° | 47° |
| AAMxT93Z11x | — | 12° | 23° | — |
| AAP Series | | | | |
| AAPxT10Z11x | 5.6 [0.220] | 2.5 [0.098] | 1.3 [0.051] | 4.1 [0.161] |
| AAPxT13Z11x | 9.6 [0.378] | 4.7 [0.185] | 2.5 [0.098] | 7.6 [0.299] |
| AAPxT14Z11x | 5.6 [0.220] | 2.5 [0.098] | 1.3 [0.051] | 4.1 [0.161] |
| AAPxT35Z11x | 21 [0.827] | 9 [0.354] | 4.5 [0.177] | 14.5 [0.571] |
| AAPxT41Z11x | 74° | 31° | 17° | 47° |
| AAPxT42Z11x | 74° | 31° | 17° | 47° |
| AAPxT45Z11x | 74° | 31° | 17° | 47° |
| AAPxT51Z11x | 74° | 31° | 17° | 47° |
| AAPxT5100Z11x | 74° | 31° | 17° | 47° |
| AAPxT5200Z11x | 74° | 31° | 17° | 47° |
| AAPxT71Z11x | 74° | 31° | 17° | 47° |
| AAPxT93Z11x | — | 12° | 23° | — |

Contact Displacement Values tables continued on next page



IEC Limit Switches Bar Charts

Contacts Configuration and Bar Charts

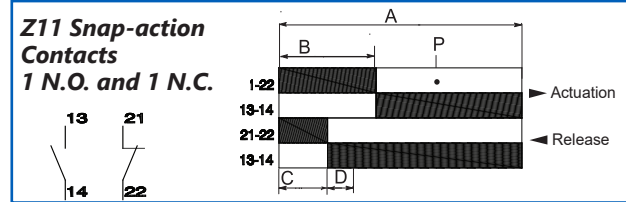
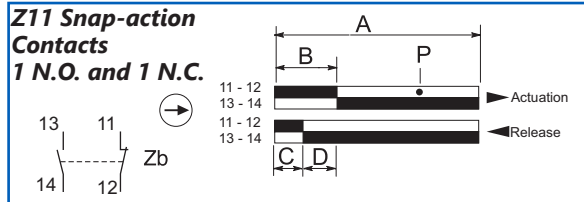
A = Max. travel of the operator in mm or degrees

B = Tripping travel of both contacts on actuation

C = Tripping travel of both contacts on release

D = Differential travel (between actuation and release)

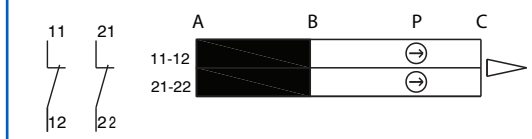
P = Point from which positive opening is assured during actuation



| Contact Displacement Values | | | | |
|-----------------------------|--|------------|------------|-------------|
| Part Series | Displacement Values (mm [in] or degrees) | | | |
| | A | B | C | P |
| ABMxE11Z11 | 6.0 [0.24] | 3.0 [0.12] | 1.8 [0.07] | 4.6 [0.18] |
| ABMxE13Z11 | 10.5 [0.41] | 5.3 [0.21] | 3.1 [0.12] | 8.2 [0.32] |
| ABMxE32Z11 | 15.5 [0.61] | 6.3 [0.25] | 3.1 [0.12] | 10.8 [0.43] |
| ABMxE42Z11 | 78° | 33° | 20° | 49° |
| ABMxE52Z11 | 78° | 33° | 20° | 49° |
| ABMxE71Z11 | 78° | 33° | 20° | 49° |
| ABMxE92Z11 | — | 21° | 9° | — |
| ABMxE93Z11 | — | 21° | 21° | — |
| ABPxH14Z11 | 5.9 [0.23] | 2.2 [0.09] | 1.0 [0.04] | 3.8 [0.15] |
| ABPxH19Z11 | 10.5 [0.41] | 4.6 [0.18] | 2.4 [0.09] | 7.5 [0.30] |
| ABPxH35Z11 | 17 [0.67] | 6.8 [0.27] | 3.8 [0.15] | 11.3 [0.44] |
| ABPxH41Z11 | 90° | 31° | 19° | 47° |
| ABPxH51Z11 | 90° | 31° | 19° | 47° |
| ABPxH71Z11 | 90° | 31° | 19° | 47° |
| ABPxH92Z11 | — | 27° | 15° | — |
| ABPxH93Z11 | — | 27° | 15° | — |

| Contact Displacement Values | | | | |
|-----------------------------|--|------------|------------|-------------|
| Part Number | Displacement Values (mm [in] or degrees) | | | |
| | A | B | C | P |
| ADP2T13Z11 | 9.6 [0.37] | 4.7 [0.19] | 2.5 [0.10] | 7.6 [0.29] |
| ADP2T14Z11 | 5.6 [0.22] | 2.5 [0.10] | 1.3 [0.05] | 4.1 [0.16] |
| ADP2T35Z11 | 21 [0.82] | 9.0 [0.35] | 4.9 [0.19] | 14.5 [0.57] |
| ADP2T41Z11 | 74° | 31° | 17° | 47° |
| ADP2T45Z11 | 74° | 31° | 17° | 47° |
| ADP2T51Z11 | 74° | 31° | 17° | 47° |
| ADP2T5100Z11 | 74° | 31° | 17° | 47° |
| ADP2T71Z11 | 74° | 31° | 17° | 47° |
| ADM2F11Z11 | 5.6 [0.22] | 2.5 [0.10] | 1.3 [0.05] | 4.1 [0.16] |
| ADM2F12Z11 | 9.6 [0.37] | 4.7 [0.19] | 2.5 [0.10] | 7.6 [0.29] |
| ADM2T35Z11 | 21 [0.82] | 9.0 [0.35] | 4.9 [0.19] | 14.5 [0.57] |
| ADM2F43Z11 | 74° | 31° | 17° | 47° |
| ADM2F46Z11 | 74° | 31° | 17° | 47° |
| ADM2F53Z11 | 74° | 31° | 17° | 47° |
| ADM2F71Z11 | 74° | 31° | 17° | 47° |
| ADM2T93Z11 | 23° | 23° | 12° | — |
| ADM2T9805Z11A | 5.6 [0.22] | 2.0 [0.07] | 0.9 [0.03] | — |

J02 Snap-action Contacts
2 N.C.



| Contact Displacement Values | | | | |
|-----------------------------|--|------------|---|-------------|
| Part Number | Displacement Values (mm [in] or degrees) | | | |
| | A | B | C | P |
| AHP2R002J02-024 | — | 2.4 [0.09] | | 4 [0.15] |
| AHP2T11J02-024 | — | 2.4 [0.09] | | 4 [0.15] |
| AHP2T12J02-024 | — | 4.5 [0.17] | | 7.4 [0.29] |
| AHP2T30J02-024 | — | 8.6 [0.33] | | 13.1 [0.51] |
| AHP2T32J02-024 | — | 8.6 [0.33] | | 13.1 [0.51] |
| AHP2T41J02-024 | — | 30° | | 46° |
| AHP2T5100J02-024 | — | 30° | | 46° |
| AHP2T5200J02-024 | — | 30° | | 46° |

Contact Displacement Values (continued)

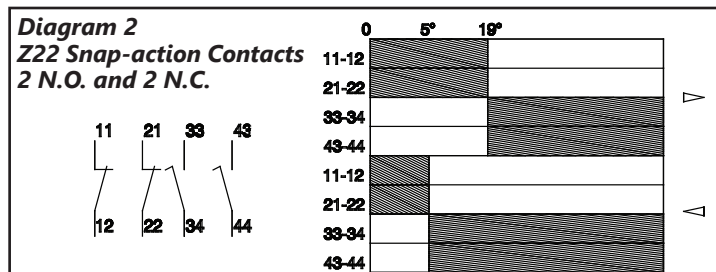
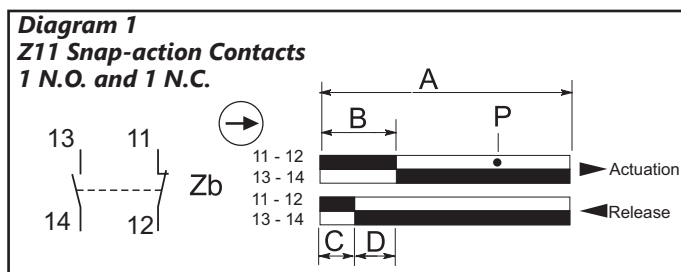
A = Max. travel of the operator in mm or degrees

B = Tripping travel of the N.C. contact

C = Tripping travel of the N.O. contact

D = Differential travel (between actuation and release)

P = Point from which positive opening is assured during actuation



| Contact Displacement Values | | | | | |
|-----------------------------|-----------------------|--|------------|------------|------------|
| Part Series | Contact Configuration | Displacement Values mm [in] or degrees | | | |
| | | A | B | C | P |
| AEP2G11 | Z11 | 5.0 [0.20] | 2.2 [0.09] | 1.4 [0.06] | 4.3 [0.17] |
| AEP2G11 | Z22 | 5.0 [0.20] | 2.1 [0.82] | 1.3 [0.05] | 4.0 [0.16] |
| AEP2G12 | Z11 | 8.7 [0.34] | 3.8 [0.15] | 2.2 [0.09] | 7.5 [0.30] |
| AEP2G12 | Z22 | 8.7 [0.34] | 3.8 [0.15] | 2.3 [0.09] | 7.0 [0.27] |
| AEP2G16 | Z11 | 5.0 [0.20] | 2.2 [0.09] | 1.4 [0.06] | 4.3 [0.17] |
| AEP2G16 | Z22 | 5.0 [0.20] | 2.1 [0.82] | 1.3 [0.05] | 4.0 [0.16] |
| AEP2G21 | Z22 | 5.0 [0.20] | 2.1 [0.82] | 1.3 [0.05] | 4.0 [0.16] |
| AEP2G22 | Z22 | 8.7 [0.34] | 3.8 [0.14] | 2.3 [0.09] | 7.0 [0.27] |
| AEP2G41 | Z11 | 74° | 32° | 21° | 65° |
| AEP2G41 | Z22 | 75° | 30° | 10° | 55° |
| AEP2G42 | Z11 | 74° | 32° | 21° | 65° |
| AEP2G43 | Z11 | 74° | 32° | 21° | 65° |
| AEP2G51 | Z11 | 74° | 32° | 21° | 65° |
| AEP2G51 | Z22 | 75° | 30° | 10° | 55° |
| AEP2G71 | Z11 | 74° | 32° | 21° | 65° |
| AEP2G92 | Z11 | — | 20° | 10° | — |
| AEP2G93 | Z11 | — | 20° | 10° | — |
| AEP2G93 | Z22 | — | 19° | 5° | — |