

MICRO-LIMIT SWITCHES

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE



MICRO-LIMIT SWITCHES

Micro-limit pushbutton switches are used in many applications including microwave ovens, vending machines, copy and fax machines, medical and security equipment, computer peripherals and many others. They are characterized by close tolerance precision switching positions and long service life. APEM micro-limit switches are 100% electronic tested prior to shipment to insure proper operation and conformance with specifications.

DEFINITIONS OF TERMS

Free position

Position of the switch actuator when no force is applied.

Operating position

The position of the actuator when the contact snaps.

Overtravel position

The final position of the actuator.

Release position

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

Contact opening gap

The distance between the open contact pair.

Pretravel

The distance between free and operating positions.

Overtravel

The distance the actuator travels after the contact actuates.

Movement differential

The distance from the operating to release position of the actuator.

Free travel

The distance between the release and free positions.

Back travel

The distance between the overtravel and release positions.

Total travel

The sum of pretravel and overtravel.

Operating force

The force required to cause snap action of contact.

End operating force

The force to be applied to keep the actuator in the allowed final position.

Release force

The force applied to the actuator at the moment the contact snaps back from the operating position.

Differential force

The difference between the operating force and the release force.

Mechanical life

The minimum number of actuations with no load on the switch.

Electrical life

The minimum number of actuations at rated voltage, rated current and resistive load at 20°C ambient temperature.

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- | | |
|-----|-----------------------|
| 1 | free position |
| 2 | operating position |
| 3 | overtravel position |
| 4 | release position |
| A | total travel |
| B | free travel |
| C | back travel |
| D | pretravel |
| E | overtravel |
| F | movement differential |
| I | total force |
| II | operating force |
| III | differential force |
| IV | release force |



**FORCE vs.
TRAVEL
DIAGRAM**

MA SERIES - MICRO-LIMIT SWITCHES



FEATURES

- **Ratings: 16 Amps 250 VAC (resistive load). 4 Amps 250 VAC (motor load) or 3 Amps 250 VAC (resistive load). 0.1 Amps 250 VAC (motor load).**
- **Single pole CO (change-over or alternate action), NC (normally closed momentary) and NO (normally open momentary) configurations.**
- **Close tolerance switching action with long life (10,000,000 mechanical cycles min.).**
- **Pin plunger, hinge lever or roller lever actuator options.**

MATERIALS

| | |
|--------------------------|---|
| Contacts: | Stationary: Nicker silver Shorting: Beryllium copper |
| Actuator: | FS 161 (UL94V-O) |
| Case & cover: | PBT (UL94V-O) |
| Terminals: | Silver plated copper/zinc |

AGENCY RECOGNITION



Approval pending.

SPECIFICATIONS

| | |
|------------------------|---|
| Operating force: | \leq 12.59 oz. (343 grams) approx. for 16 Amp models \leq 0.72 oz. (20 grams) approx. for 3 Amp models |
| Pretravel: | \leq .047" (1.2mm) |
| Overtravel: | \geq .059" (1.5mm) min. |
| Movement differential: | \leq .016" (0.4mm) |
| Free position: | \leq .649" (16.5mm) |
| Operating position: | .578" \pm .020" (14.7mm \pm 0.5mm) |
| Operating temperature: | -40°C to +85°C |
| Contact gap: | less than .118" (3mm) |
| Tracking resistance: | > PTI 175 |

MA SERIES - MICRO-LIMIT SWITCHES

ORDER FORMAT

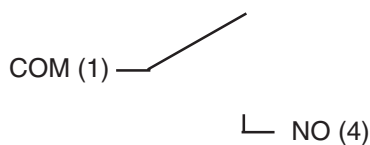
M A A 6 B

| Series | Circuit & quick-connect terminals | Switch rating | Actuator style |
|-----------|---|---|--|
| MA | A Normally open (standard) .031 x .248" (0.8x6.3mm) B Normally closed (standard) .031 x .248" (0.8x6.3mm) C Change-over (standard) .031 x .248" (0.8x6.3mm) D Normally open, .031 x .248" (0.8x6.3mm), spacing .197" (5mm) E Normally closed, .031 x .248" (0.8x6.3mm), spacing .197" (5mm) F Change-over, .031 x .248" (0.8x6.3mm), spacing .197" (5mm) G Normally open, .020 x .189" (0.5x4.8mm) H Normally closed, .020 x .189" (0.5x4.8mm) I Change-over, .020 x .189" (0.5x4.8mm) J Normally open, .031 x .189" (0.8x4.8mm) K Normally closed, .031 x .189" (0.8x4.8mm) L Change-over, .031 x .189" (0.8x4.8mm) | 6 16(4)A 250 VAC 7 3(0.1)A 250 VAC | A Pin actuator B Hinge actuator C Roller actuator |

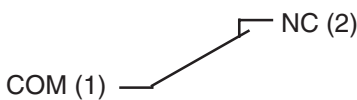
STANDARD MODELS

| Quick-connect terminal | | .031x.248" (0.8x6.3mm) | | .031x.248" (0.8x6.3mm) pin spacing - .197"(5mm) | | .020x.189" (0.5x4.8mm) | | .031x.189" (0.8x4.8mm) | |
|------------------------|----|---------------------------|--------------|--|--------------|---------------------------|--------------|---------------------------|--|
| Switching capacity | | 16(4)A | 3(0.1)A | 16(4)A | 16(4)A | 3(0.1)A | 16(4)A | 3(0.1)A | |
| Pin plunger | NO | MAA6A | MAA7A | MAD6A | MAG6A | MAG7A | MAJ6A | MAJ7A | |
| | NC | MAB6A | MAB7A | MAE6A | MAH6A | MAH7A | MAK6A | MAK7A | |
| | CO | MAC6A | MAC7A | MAF6A | MAI6A | MAI7A | MAL6A | MAL7A | |
| Hinge lever | NO | MAA6B | - | MAD6B | MAG6B | - | MAJ6B | - | |
| | NC | MAB6B | - | MAE6B | MAH6B | - | MAK6B | - | |
| | CO | MAC6B | - | MAF6B | MAI6B | - | MAL6B | - | |
| Roller lever | NO | MAA6C | - | MAD6C | MAG6C | - | MAJ6C | - | |
| | NC | MAB6C | - | MAE6C | MAH6C | - | MAK6C | - | |
| | CO | MAC6C | - | MAF6C | MAI6C | - | MAL6C | - | |

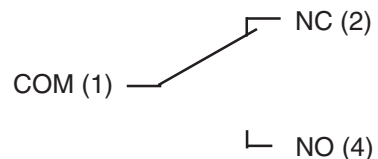
NO =
NORMALLY OPEN:



NC =
NORMALLY CLOSED:



CO =
CHANGE-OVER:



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MA SERIES - MICRO-LIMIT SWITCHES

MECHANICAL OUTLINES

Models with quick-connect terminal .031x.248" (0.8x6.3mm)

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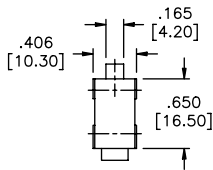
Normally open



Change-over



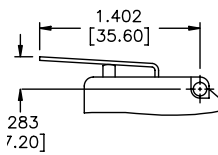
Normally closed



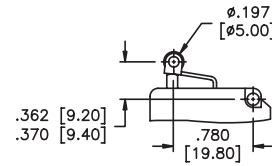
Side view



Quick-connect terminal



Hinge lever



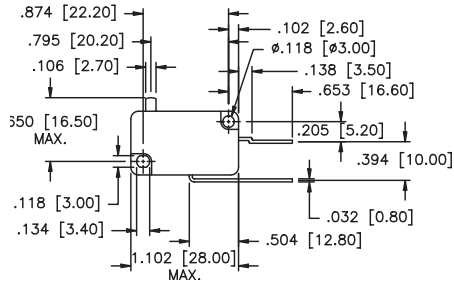
Roller lever

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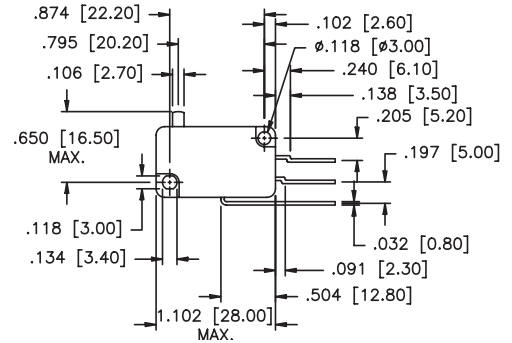
MA SERIES - MICRO-LIMIT SWITCHES

MECHANICAL OUTLINES

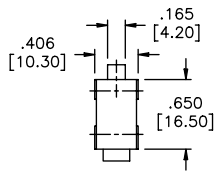
Models with quick-connect terminal .031x.248" (0.8x6.3mm) & pin spacing .197" (5mm)



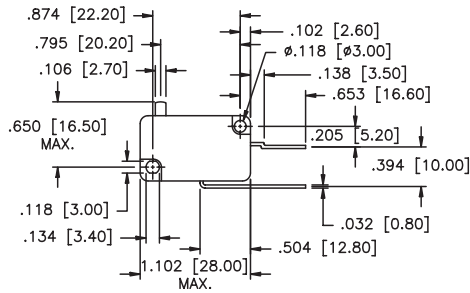
Normally open



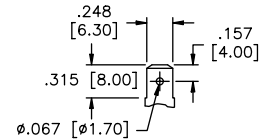
Change-over



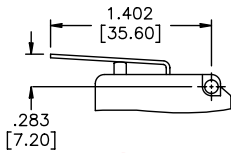
Side view



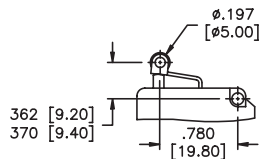
Normally closed



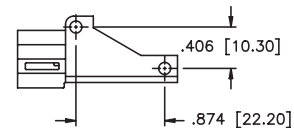
Quick-connect terminal



Hinge lever



Roller lever



Adaptor element

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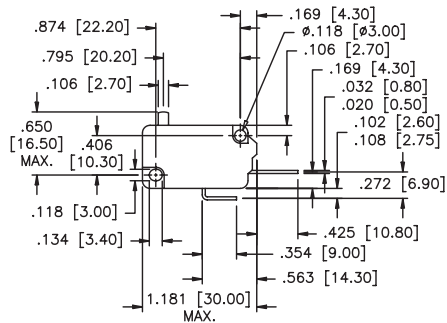
H

MA SERIES - MICRO-LIMIT SWITCHES

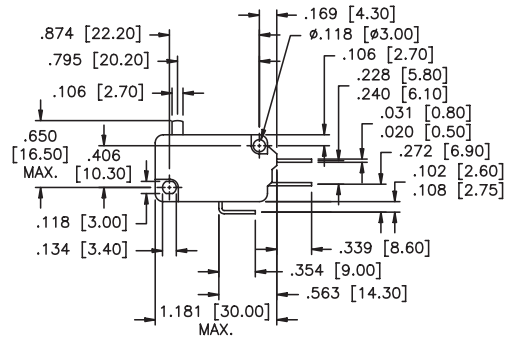
MECHANICAL OUTLINES

Models with quick-connect terminal .020 or .031x.248" (0.8 or 0.8x6.3mm)

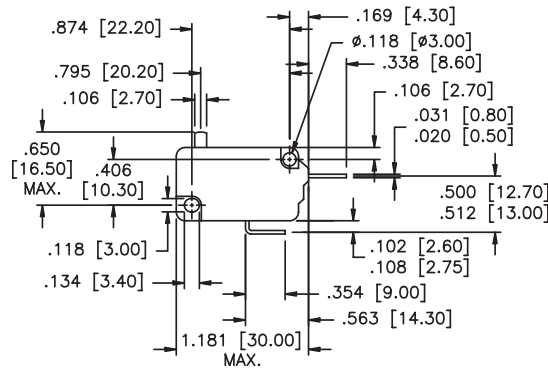
SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE



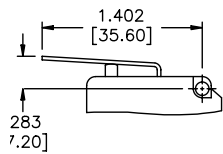
Normally open



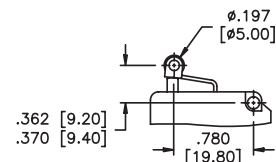
Change-over



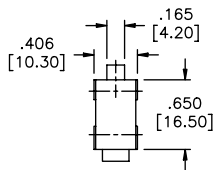
Normally closed



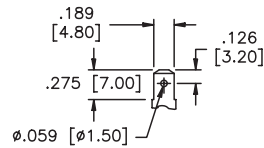
Hinge lever



Roller lever



Side view



Quick connect terminal

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MB SERIES - MICRO-LIMIT SWITCHES



FEATURES

- Ratings: 10 Amps 250 VAC (resistive load). 1.5 Amps 250 VAC (motor load).
- Single pole CO (change-over or alternate action), NC (normally closed momentary) and NO (normally open momentary) configurations.
- Close tolerance switching action with long life (10,000,000 mechanical cycles min.).
- Pin plunger, hinge lever or roller lever actuator options.

MATERIALS

| | |
|--------------------------|---|
| Contacts: | Stationary: Nickel silver Shorting: Beryllium copper |
| Actuator: | POM (UL94HB) |
| Case & cover: | PBT (UL94V-O) |
| Terminals: | Silver plated copper/zinc |

AGENCY RECOGNITION



SPECIFICATIONS

| | |
|------------------------|---------------------------------|
| Operating force: | ≤ 10 oz. (274 grams) approx. |
| Pretravel: | ≤ .039" (1mm) |
| Overtravel: | ≥ .024" (0.6mm) |
| Movement differential: | ≤ .005" (0.13mm) |
| Free position: | ≤ .366" (9.3mm) |
| Operating position: | .331" ± .012" (8.4mm ± (0.3mm)) |
| Operating temperature: | -40°C to +85°C |
| Contact gap: | < .118" (3mm) |
| Tracking resistance: | >PTI 175 |

MB SERIES - MICRO-LIMIT SWITCHES

ORDER FORMAT

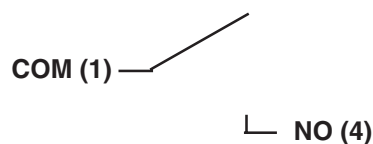
M B D 5 B 1

| Series | Circuit & quick-connect terminals | Switch rating | Actuator style | Length |
|-----------|--|---------------------------|--|---|
| MB | D Normally open (solder terminal) E Normally closed (solder terminal) F Change-over (solder terminal) G Normally open (p.c. terminal) H Normally closed (p.c. terminal) J Change-over (p.c. terminal) | 5 10(1.5)A 250 VAC | A Pin actuator B Hinge actuator C Roller actuator | Actuator length and fixed position- (see table below) |

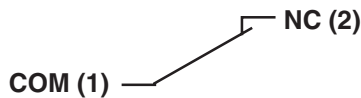
STANDARD MODELS

| Circuit | | | Normally open | | Normally closed | | Change-over | |
|-----------------------------|-----|---------------|---------------|---------------|-----------------|---------------|---------------|---------------|
| Terminals | | | Solder | P.C. | Solder | P.C. | Solder | P.C. |
| Pin plunger with radius | | | MBD5A | MBG5A | MBE5A | MBH5A | MBF5A | MBJ5A |
| Pin plunger, spherical form | | | MBD5D | MBG5D | MBE5D | MBH5D | MBF5D | MBJ5D |
| Lever type | Fix | Act. length | | | | | | |
| Hinge lever | EH | .189" (4.8mm) | MBD5B | MBG5B | MBE5B | MBH5B | MBF5B | MBJ5B |
| | EV | .276" (7.0mm) | MBD5B2 | MBG5B2 | MBE5B2 | MBH5B2 | MBF5B2 | MBJ5B2 |
| | EH | .276" (7.0mm) | MBD5B1 | MBG5B1 | MBE5B1 | MBH5B1 | MBF5B1 | MBJ5B1 |
| | EV | .370" (9.4mm) | MBD5B3 | MBG5B3 | MBE5B3 | MBH5B3 | MBF5B3 | MBJ5B3 |
| Roller lever | EH | .098" (2.5mm) | MBD5C | MBG5C | MBE5C | MBH5C | MBF5C | MBJ5C |
| | EV | .185" (4.7mm) | MBD5C2 | MBG5C2 | MBE5C2 | MBH5C2 | MBF5C2 | MBJ5C2 |
| | EH | .185" (4.7mm) | MBD5C1 | MBG5C1 | MBE5C1 | MBH5C1 | MBF5C1 | MBJ5C1 |
| | EV | .280" (7.1mm) | MBD5C3 | MBG5C3 | MBE5C3 | MBH5C3 | MBF5C3 | MBJ5C3 |
| Simulated roller lever | EH | .098" (2.5mm) | MBD5E | MBG5E | MBE5E | MBH5E | MBF5E | MBJ5E |
| | EV | .185" (4.7mm) | MBD5E2 | MBG5E2 | MBE5E2 | MBH5E2 | MBF5E2 | MBJ5E2 |
| | EH | .185" (4.7mm) | MBD5E1 | MBG5E1 | MBE5E1 | MBH5E1 | MBF5E1 | MBJ5E1 |
| | EV | .280" (7.1mm) | MBD5E3 | MBG5E3 | MBE5E3 | MBH5E3 | MBF5E3 | MBJ5E3 |

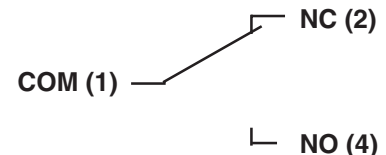
NO = NORMALLY OPEN:



NC = NORMALLY CLOSED:



CO = CHANGE-OVER:



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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MB SERIES - MICRO-LIMIT SWITCHES

ACTUATORS AND SPECIFICATIONS



Hinge lever



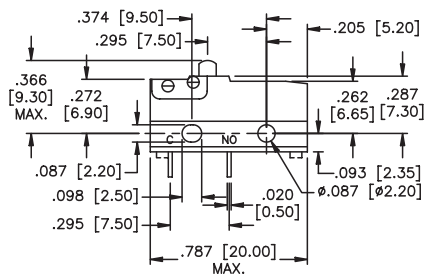
Roller lever



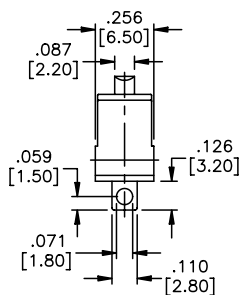
Simulated roller lever

| Actuator | Hinge lever | | | | Roller lever | | | | Simulated roller lever | | | |
|---|-------------|------|------|------|--------------|------|------|------|------------------------|------|------|------|
| | EH | EV | EH | EV | EH | EV | EH | EV | EH | EV | EH | EV |
| Actuator length, inches $\pm .031"$ $\pm 0.8\text{mm}$ | .189 | .276 | .276 | .370 | .098 | .185 | .185 | .280 | .098 | .185 | .185 | .280 |
| Fixed position, EH=rear EV=front | EH | EV | EH | EV | EH | EV | EH | EV | EH | EV | EH | EV |
| Operating force, \leq grams $\leq ???$ | 100 | 45 | 85 | 40 | 110 | 50 | 95 | 40 | 115 | 60 | 95 | 50 |
| Pre-travel, \leq inches \leq mm | .177 | .354 | .197 | .394 | .177 | .354 | .197 | .394 | .177 | .354 | .197 | .394 |
| Overtravel, min. inches min. mm | .030 | .049 | .030 | .059 | .030 | .049 | .030 | .059 | .030 | .049 | .030 | .059 |
| Overtravel, max. inches max. mm | .059 | .098 | .059 | .118 | .059 | .098 | .059 | .118 | .059 | .098 | .059 | .118 |
| Movement diff. \leq inches \leq mm | .035 | .059 | .047 | .071 | .028 | .059 | .039 | .071 | .028 | .059 | .039 | .071 |
| Free position, \leq inches \leq mm | .551 | .709 | .591 | .787 | .748 | .866 | .787 | .945 | .748 | .866 | .787 | .945 |
| Operating position, inches Tolerance inches \pm | .421 | .472 | .437 | .492 | .622 | .669 | .638 | .689 | .630 | .677 | .646 | .697 |
| Operating position, mm Tolerance mm \pm | 10.7 | 12 | 11.1 | 12.5 | 15.8 | 17 | 16.2 | 17.5 | 16 | 17.2 | 16.4 | 17.7 |
| Order code | B | B2 | B1 | B3 | C | C2 | C1 | C3 | E | E2 | E1 | E3 |

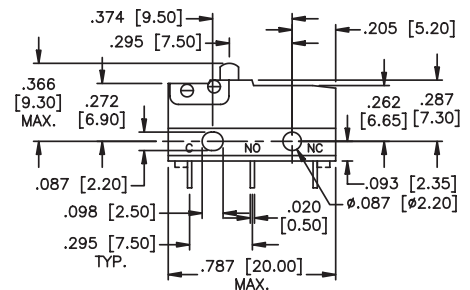
MECHANICAL OUTLINES



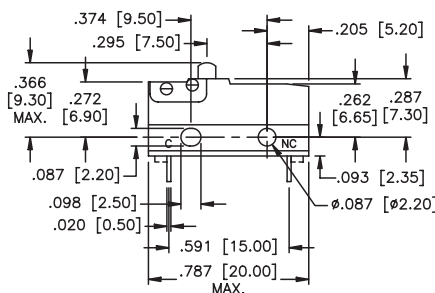
Normally open



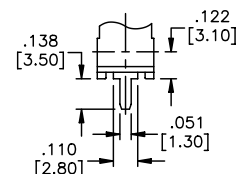
Side view (w/solder terminal)



Change-over



Normally closed



P.C. terminal

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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Mouser Electronics

Authorized Distributor

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[MBD5D](#) [MBD5A](#) [MBD5B](#) [MBD5B1](#) [MBD5B3](#) [MBD5C](#) [MBD5C2](#) [MBD5E](#) [MBD5E1](#) [MBD5E3](#) [MBE5B](#) [MBE5B2](#)
[MBE5B3](#) [MBE5C](#) [MBE5C1](#) [MBE5D](#) [MBE5E1](#) [MBF5A](#) [MBF5B](#) [MBF5B1](#) [MBF5B2](#) [MBF5B3](#) [MBF5C](#) [MBF5C1](#)
[MBF5C2](#) [MBF5C3](#) [MBF5D](#) [MBF5E](#) [MBF5E3](#) [MBG5A](#) [MBG5B1](#) [MBG5B3](#) [MBG5C](#) [MBG5E1](#) [MBH5A](#) [MBH5C2](#)
[MBJ5A](#) [MBJ5B](#) [MBJ5B1](#) [MBJ5B2](#) [MBJ5D](#) [MBJ5E](#)