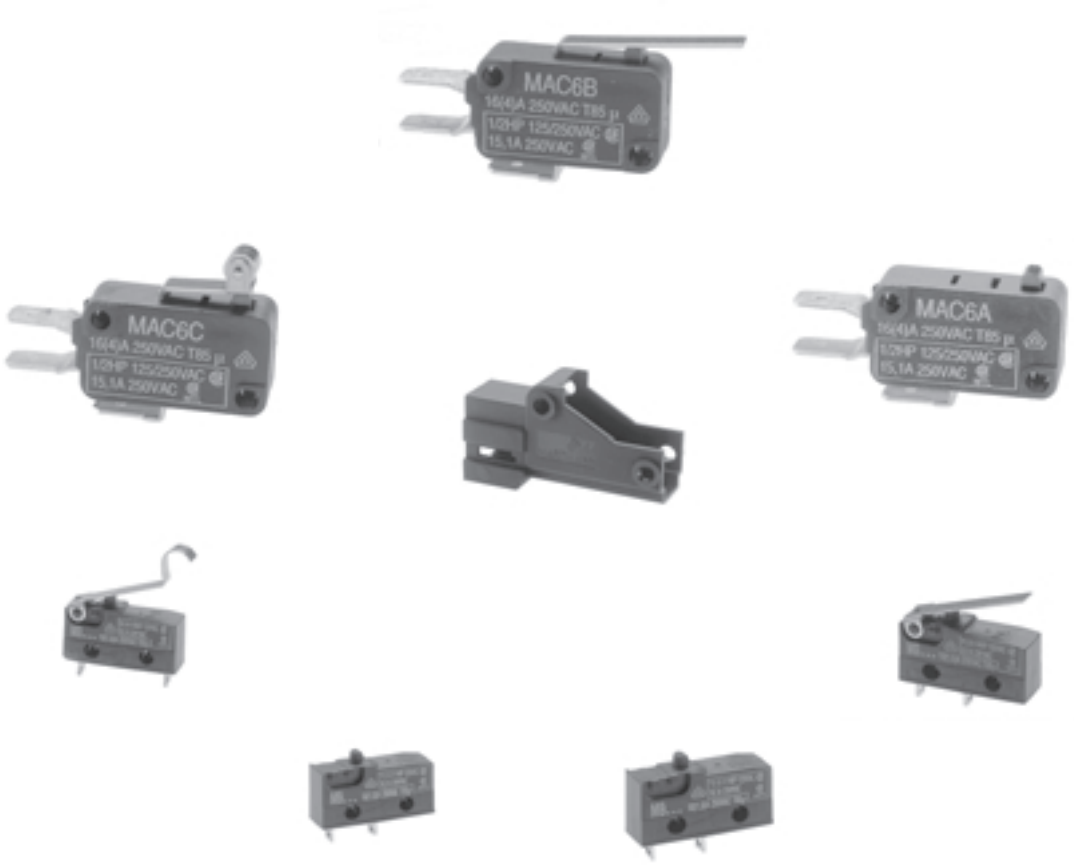
MICRO-LIMIT SWITCHES

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE



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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.

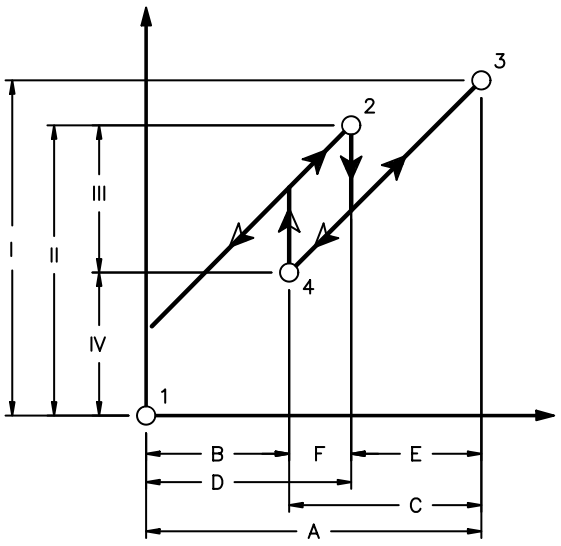
Release force
The force applied to the actuator at the moment the contact snaps back from the operating position.

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.

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

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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

NRTL

Approval pending.

SPECIFICATIONS

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

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

MA SERIES - MICRO-LIMIT SWITCHES

ORDER FORMAT

M A A 6 B

Series

MA

Circuit & quick-connect terminals

- **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)

Switch rating

- **6** 16(4)A 250 VAC
- **7** 3(0.1)A 250 VAC

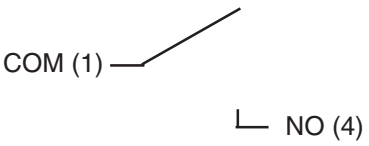
Actuator style

- **A** Pin actuator
- **B** Hinge actuator
- **C** Roller actuator

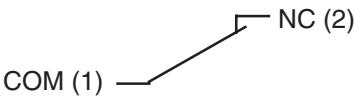
STANDARD MODELS

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	-

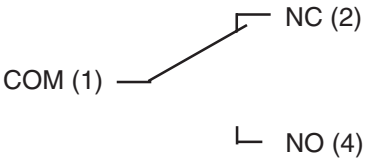
NO =
NORMALLY OPEN:



NC =
NORMALLY CLOSED:



CO =
CHANGE-OVER:



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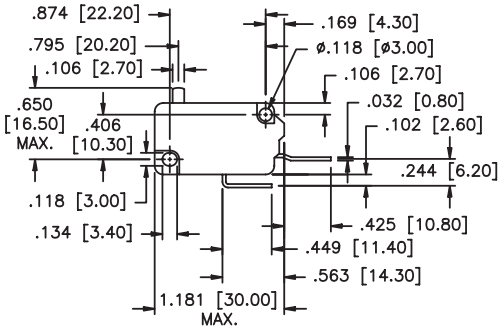
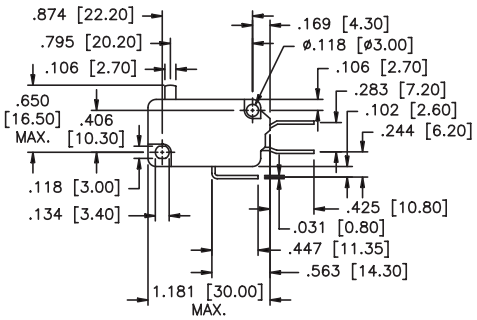
MECHANICAL OUTLINES

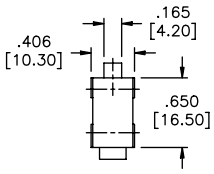
Models with quick-connect terminal .031x.248" (0.8x6.3mm)



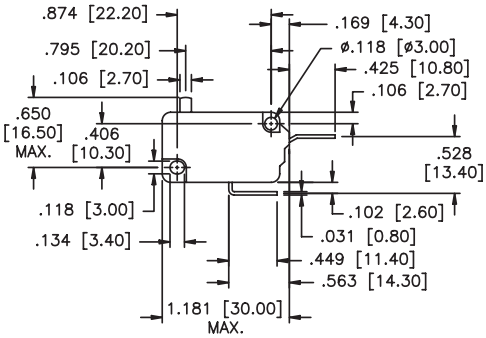
Normally open



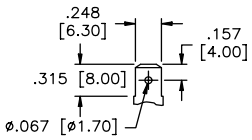
Change-over



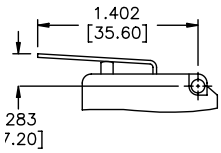
Side view



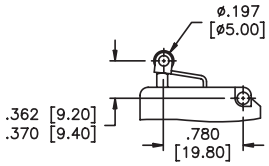
Normally closed



Quick-connect terminal



Hinge lever



Roller lever

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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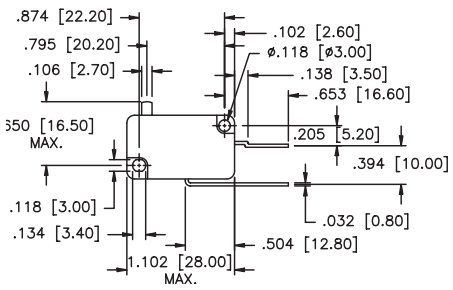
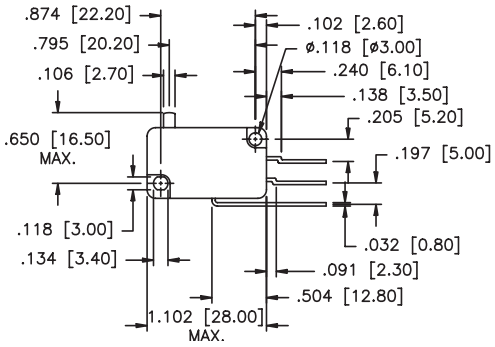
MA SERIES - MICRO-LIMIT SWITCHES

MECHANICAL OUTLINES

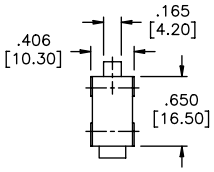
Models with quick-connect terminal .031x.248" (0.8x6.3mm) & pin spacing .197" (5mm)



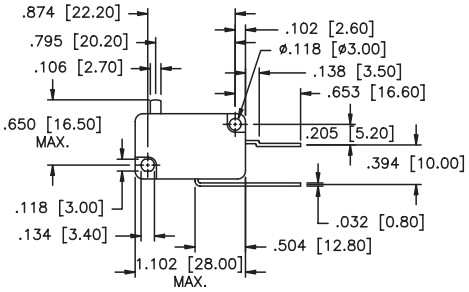
Normally open



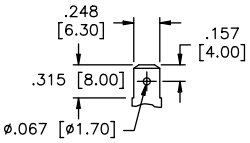
Change-over



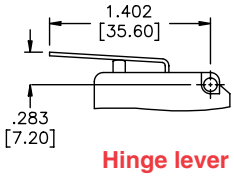
Side view



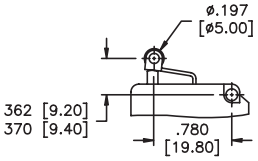
Normally closed



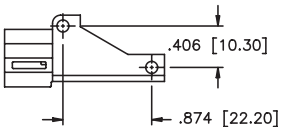
Quick-connect terminal



Hinge lever



Roller lever



Adaptor element

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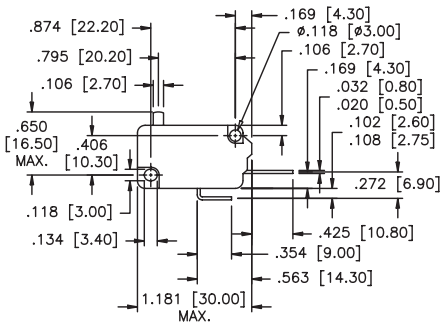
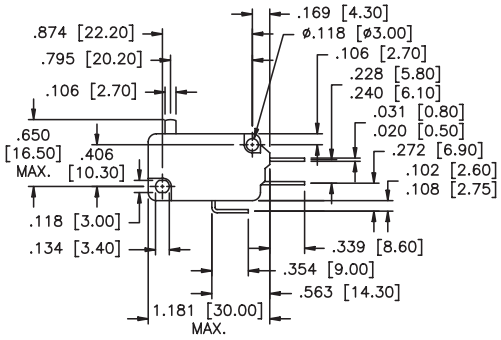
MECHANICAL OUTLINES

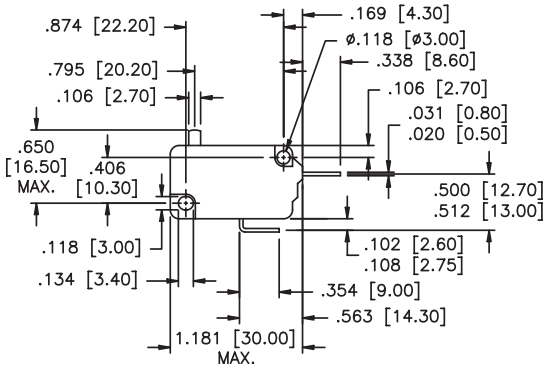
Models with quick-connect terminal .020 or .031x.248" (0.8 or 0.8x6.3mm)



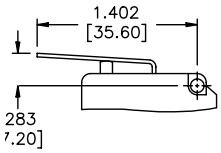
Normally open



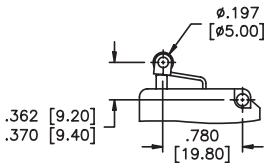
Change-over



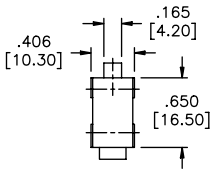
Normally closed



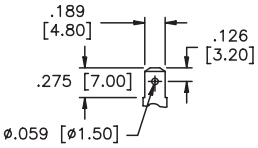
Hinge lever



Roller lever



Side view



Quick connect terminal

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

H

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

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SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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MB SERIES - MICRO-LIMIT SWITCHES

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

ORDER FORMAT

M B D 5 B 1

Series
MB

Circuit & quick-connect terminals
- 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)

Switch rating
5 10(1.5)A 250 VAC

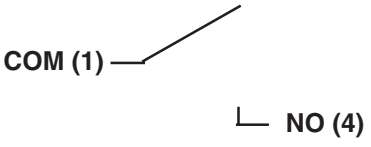
Actuator style
- A Pin actuator
- B Hinge actuator
- C Roller actuator

Length
Actuator length and fixed position- (see table below)

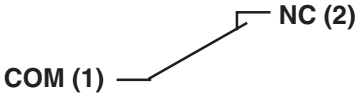
STANDARD MODELS

Circuit			Normally open		Normally closed		Change-over	
Terminals			Solder	P.C.	Solder	P.C.	Solder	P.C
Pin plunger with radius Pin plunger, spherical form			MBD5A MBD5D	MBG5A MBG5D	MBE5A MBE5D	MBH5A MBH5D	MBF5A MBF5D	MBJ5A 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

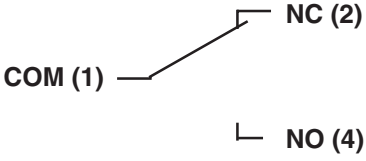
NO = NORMALLY OPEN:



NC = NORMALLY CLOSED:



CO = CHANGE-OVER:



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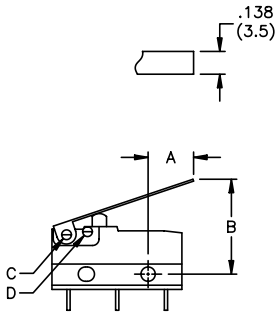
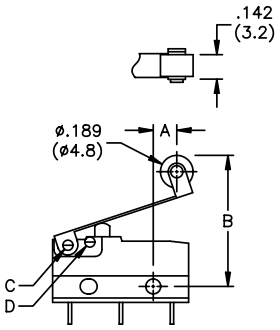
MB SERIES - MICRO-LIMIT SWITCHES

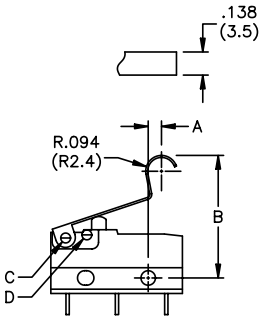
ACTUATORS AND SPECIFICATIONS



Hinge lever



Roller lever

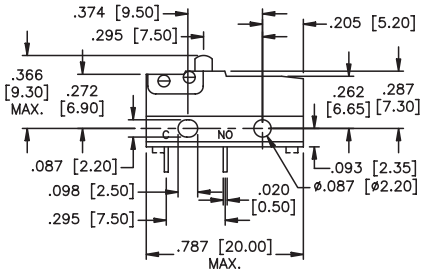


Simulated roller lever

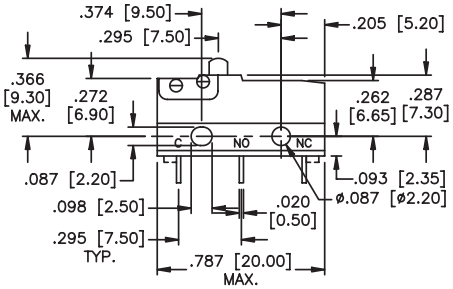
Actuator	Hinge lever				Roller lever				Simulated roller lever			
Actuator length, inches ±.031"	.189	.276	.276	.370	.098	.185	.185	.280	.098	.185	.185	.280
±0.8mm	4.8	7.0	7.0	9.4	2.5	4.7	4.7	7.1	2.5	2.7	4.7	7.1
Fixed position, EH=rear EV=front	EH	EV	EH	EV	EH	EV	EH	EV	EH	EV	EH	EV
Operating force, ≤ grams												
≤ **???**	100	45	85	40	110	50	95	40	115	60	95	50
Pre-travel, ≤ inches	.177	.354	.197	.394	.177	.354	.197	.394	.177	.354	.197	.394
≤ mm	4.5	9	5	10	4.5	9	5	10	4.5	9	5	10
Overtravel, min. inches	.030	.049	.030	.059	.030	.049	.030	.059	.030	.049	.030	.059
min. mm	0.75	1.25	0.75	1.5	0.75	1.25	0.75	1.5	0.75	1.25	0.75	1.5
Overtravel, max. inches	.059	.098	.059	.118	.059	.098	.059	.118	.059	.098	.059	.118
max.mm	1.5	2.5	1.5	3	1.5	2.5	1.5	3	1.5	2.5	1.5	3
Movement diff.≤ inches	.035	.059	.047	.071	.028	.059	.039	.071	.028	.059	.039	.071
≤ mm	0.9	1.5	1.2	1.8	0.7	1.5	1	1.8	0.7	1.5	1	1.8
Free position, ≤ inches	.551	.709	.591	.787	.748	.866	.787	.945	.748	.866	.787	.945
≤ mm	14	18	15	20	19	22	20	24	19	22	20	24
Operating position, inches	.421	.472	.437	.492	.622	.669	.638	.689	.630	.677	.646	.697
Tolerance inches ±	.063	.118	.071	.138	.063	.118	.071	.138	.063	.118	.071	.138
Operating position, mm	10.7	12	11.1	12.5	15.8	17	16.2	17.5	16	17.2	16.4	17.7
Tolerance mm ±	1.6	3	1.8	3.5	1.6	3	1.8	3.5	1.6	3	1.8	3.5
Order code	B	B2	B1	B3	C	C2	C1	C3	E	E2	E1	E3

H

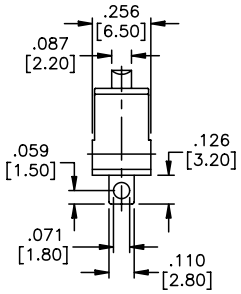
MECHANICAL OUTLINES



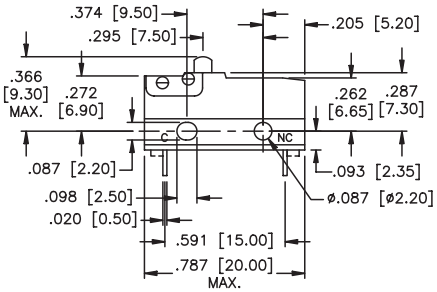
Normally open



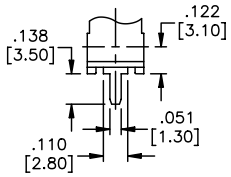
Change-over



Side view (w/solder terminal)



Normally closed



P.C. terminal

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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