

# Distinctive Characteristics

Antirootation design, standard on noncylindrical levers, mates toggle and bushing; bottom of toggle has two flattened sides which fit into a complementary opening inside bushing.

Antijamming design protects contacts from damage due to excessive downward force on actuator.

High torque bushing construction prevents rotation or separation from frame during installation.

High insulating barriers increase isolation of circuits in multipole devices and provide added protection to contact points.

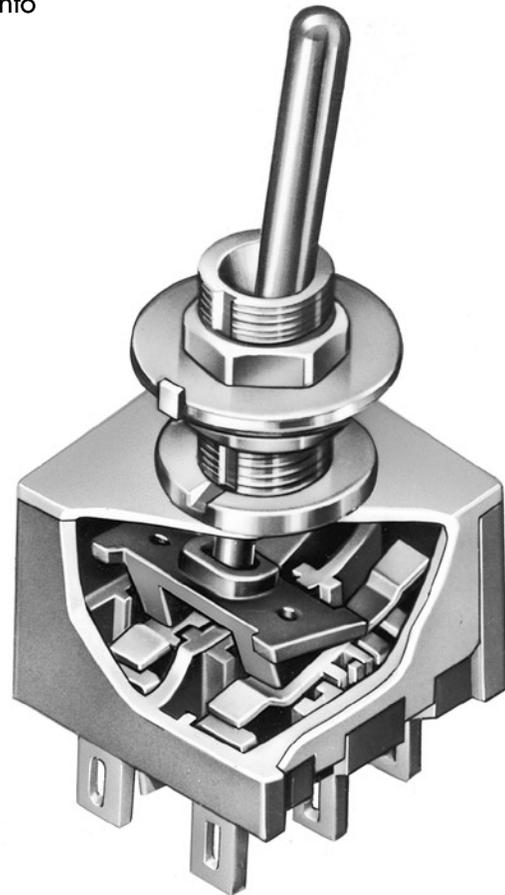
Molded diallyl phthalate case has a UL flammability rating of 94V-0.

Epoxy sealed terminals prevent entry of solder flux and other contaminants.

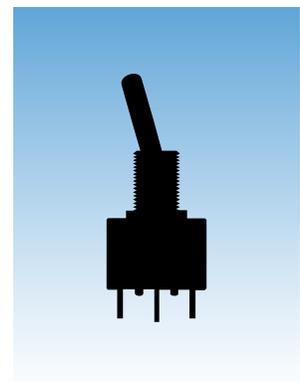
Prominent external insulating barriers increase insulation resistance and dielectric strength.

Interlocked actuator block, lever, and interior guide prevent switch failure due to biased lever movement.

Clinching of frame to case well above base and terminals provides 1,500V dielectric strength.



Actual Size



## General Specifications

### Electrical Capacity (Resistive Load)

<b>Power Level (code W):</b>	6A @ 125V AC & 3A @ 250V AC 4A @ 30V DC for On-None-On & On-None-Off; 3A @ 30V DC for all other circuits
<b>Logic Level (code G):</b>	0.4VA maximum @ 28V AC/DC maximum (Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)
<b>Logic/Power Level (code A):</b>	Combines W & G ratings Note: Find additional explanation of dual rating & operating range in Supplement section.

### Other Ratings

<b>Contact Resistance:</b>	10 milliohms maximum for silver; 20 milliohms maximum for gold
<b>Insulation Resistance:</b>	1,000 megohms minimum @ 500V DC
<b>Dielectric Strength:</b>	1,000V AC minimum between contacts for 1 minute minimum; 1,500V AC minimum between contacts and case for 1 minute minimum
<b>Mechanical Life:</b>	100,000 operations minimum; 50,000 operations minimum for flat, locking, & splashproof devices
<b>Electrical Life:</b>	25,000 operations minimum for silver; 50,000 operations minimum for gold; 50,000 operations minimum for silver at 3A @ 125V AC
<b>Nominal Operating Force:</b>	3.92N for Single Pole; 4.41N for Double Pole; 6.86N for Three Pole; 7.85N for Four Pole
<b>Angle of Throw:</b>	25°

### Materials & Finishes

<b>Toggle:</b>	Brass with chrome plating	<b>Frame:</b>	Stainless steel
<b>Bushing:</b>	Brass with nickel plating	<b>Support Bracket:</b>	Steel with tin plating
<b>Case:</b>	Diallyl phthalate resin (UL94V-0)		
<b>Movable Contactor:</b>	Phosphor bronze with silver or gold plating		
<b>Movable Contacts:</b>	Silver alloy (code W); copper with gold plating (code G); or silver alloy with gold plating (code A)		
<b>Stationary Contacts:</b>	Silver with silver plating (code W); copper or brass with gold plating (code G); or silver with gold plating (code A)		
<b>Terminals:</b>	Copper or brass with silver plating; or copper or brass with gold plating		

### Environmental Data

<b>Operating Temp Range:</b>	-30°C through +85°C (-22°F through +185°F)
<b>Humidity:</b>	90 ~ 95% humidity for 96 hours @ 40°C (104°F)
<b>Vibration:</b>	10 ~ 55Hz with peak-to-peak amplitude of 1.5mm traversing the frequency range & returning in 1 minute; 3 right angled directions for 2 hours
<b>Shock:</b>	50G (490m/s <sup>2</sup> ) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)
<b>Sealing:</b>	Panel seal bushing options B3 & D3 meet IP67 of IEC60529 Standards.

### Installation

<b>Mounting Torque:</b>	3.0Nm (26.55 lb•in) double nut for large bushing; 1.5Nm (13 lb•in) double nut & 0.7Nm (6 lb•in) single nut for all other bushings
-------------------------	--------------------------------------------------------------------------------------------------------------------------------------

### Processing

<b>Soldering:</b>	For all Gold Contacts & Circuits 1, 3, 8, & 9, see Wave Soldering Profile A in Supplement section. Manual Soldering: 4 seconds max. @ 410°C max. Note: Lever must be in OFF (center) position. For Silver Contact Circuits 2 & 4 through 7: Wave Soldering: 5 seconds maximum @ 270°C maximum. Manual Soldering: 3 seconds max. @ 350°C max.
<b>Cleaning:</b>	These devices are not process sealed. Hand clean locally using alcohol based solution. See Cleaning Specifications in Supplement section.

### Standards & Certifications

<b>Flammability Standards:</b>	UL94V-0 for case
<b>UL Recognized:</b>	All models recognized at 6A @ 125V AC or 3A @ 250V AC or 0.4VA maximum @ 28V DC maximum; UL File No. WOYR2.E44145; add "/U" to end of part number to order UL mark on switch.
<b>CSA Certified:</b>	All models recognized at 6A @ 125V AC or 3A @ 250V AC or 0.4VA maximum @ 28V maximum; CSA File No. 023535-0-000; add "/C" to end of part number to order CSA mark on switch.



TYPICAL SWITCH ORDERING EXAMPLE

M20

1

3

S

S1

W

01

**POLES**

1	SPST SPDT
2	DPST DPDT SP3T
3	3PDT
4	4PDT DP3T

**CIRCUITS**

* 1	ON	NONE	OFF
2	ON	NONE	ON
3	ON	OFF	ON
5	ON	NONE	(ON)
8	(ON)	OFF	(ON)
9	ON	OFF	(ON)
** 4	ON	ON	ON
** 6	(ON)	ON	(ON)
** 7	ON	ON	(ON)

( ) = Momentary  
 \* ON-NONE-OFF circuit available in 1- and 2-pole only.  
 \*\* 3-ON circuits

**SMALL TOGGLES**

S	.413" (10.5mm) Bat
S2	.200" (5.08mm) Bat
S3	.256" (6.5mm) Bat
E	.450" (11.4mm) Flatted
* E2	.256" (6.5mm) Flatted
E4	.840" (21.3mm) Flatted
* Q	.550" (14.0mm) Cone
* Q2	.640" (16.26mm) Cone
* Q4	.840" (21.3mm) Cone
* C	.571" (14.5mm) Color Tipped Cone
D	.840" (21.3mm) Color Tipped Cone
K1	.370" (9.4mm) Paddle
K2	.559" (14.2mm) Paddle

Specify cap color for toggles C, D, K1 & K2 at the end of the part number.  
 \*Available on 1- and 2-pole only.

**LARGE TOGGLES**

B	.453" (11.5mm) Large Bat
B2	.689" (17.5mm) Large Bat
R	.610" (15.5mm) Large Flatted

**LOCKING LEVER**

L	.201" (5.1mm) Dia. Locking Lever
---	----------------------------------

**SMALL BUSHINGS**

S1	.350" (8.9mm) Threaded with Keyway
S2	.350" (8.9mm) Smooth with Keyway
A1	.280" (7.1mm) Threaded with Keyway
A2	.280" (7.1mm) Smooth with Keyway
D1	.350" (8.9mm) Threaded with D Flat
D3	.350" (8.9mm) Threaded Splashproof with D Flat (combines only with S & S2)
S4	6mm .350" (8.9mm) Threaded with Keyway
D8	.350" (8.9mm) 6mm Threaded Splashproof with D Flat (combines only with S & S2)

**LARGE BUSHINGS**

B1	Large .472" (12mm) Threaded with Keyway
B3	Large .472" (12mm) Threaded Splashproof with D Flat

**BUSHINGS FOR LOCKING LEVERS**

L1	.291" (7.4mm) Threaded with Keyway for Lever Lock
L2	Smooth with Keyway for Lever Lock
L3	.295" (7.5mm) Threaded Splashproof with D Flat for Lever Lock

**CONTACT MATERIALS & RATINGS**

W	Silver; Rated 6A @ 125V AC & 3A @ 250V AC
G	Gold; Rated 0.4VA max @ 28V AC/DC max
A	Gold over Silver; Rated 6A @ 125V AC & 0.4VA max @ 28V AC/DC max

**TERMINALS**

01	Solder Lug
02	Quick Connect
03	.250" (6.35mm) Straight PC
05	.425" (10.8mm) Wirewrap
06	.750" (19.05mm) Wirewrap
07	.964" (24.5mm) Wirewrap
08	1.062" (27.0mm) Wirewrap

**OPTIONAL CAPS**

<b>For Small Bat Toggles</b>	
B	For S Bat Toggle
C	Conical Cap for S Bat Toggle
<b>For Large Bat Toggles</b>	
R	For B Toggle
V	For B2 Toggle

**CAP COLORS**

A	Black
B	White
C	Red
E	Yellow
F	Green
G	Blue
H	Gray (for K1 & K2 paddles)

**For Locking Lever**

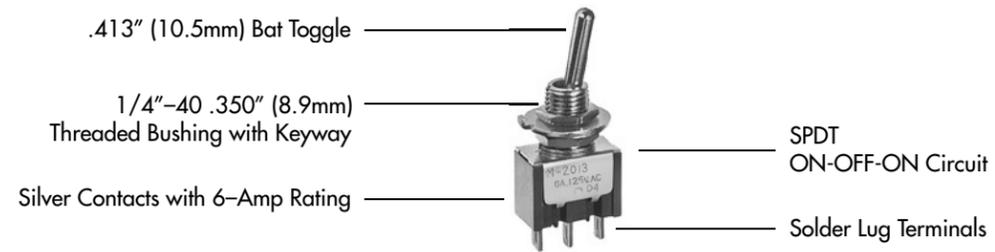
Supplied with nickel plated cap as standard.

**Optional Aluminum Caps**

A	Black
C	Red
G	Blue
H	Gray

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

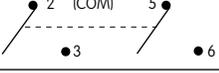
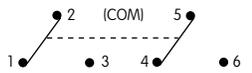
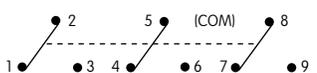
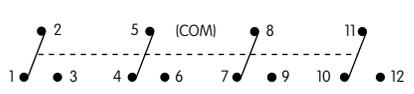
M2013SS1W01



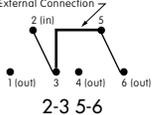
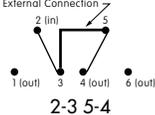
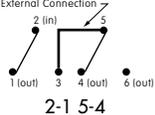
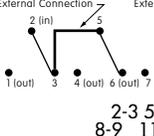
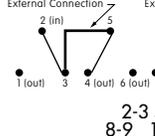
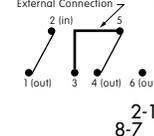
**IMPORTANT:**

Switches are supplied without UL & CSA marking unless specified. Specific models & ratings noted on General Specifications page.

## POLES & CIRCUITS

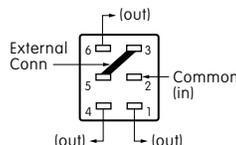
Pole	Model	Toggle Position ( ) = Momentary			Connected Terminals			Throw & Schematics  Note: Terminal numbers are not actually on the switch. * Reverse circuits available upon request.
		Down 	Center 	Up 	Down 	Center 	Up 	
SP	M2011	ON	NONE	OFF	2-3	OPEN	OPEN	SPST 
SP	M2012 M2013 *M2015 M2018 *M2019	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	2-3	OPEN	2-1	SPDT 
DP	M2021	ON	NONE	OFF	2-3 5-6	OPEN	OPEN	DPST 
DP	M2022 M2023 *M2025 M2028 *M2029	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	2-3 5-6	OPEN	2-1 5-4	DPDT 
3P	M2032 M2033 M2035 M2038 M2039	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	2-3 5-6 8-9	OPEN	2-1 5-4 8-7	3PDT 
4P	M2042 M2043 M2045 M2048 M2049	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	2-3 5-6 8-9 11-12	OPEN	2-1 5-4 8-7 11-10	4PDT 

### For 3 Throw (3-On)

Pole	Model	Down	Center	Up	Connected Terminals & Schematics
SP	M2024 M2026 M2027	ON (ON) ON	ON ON ON	ON (ON) (ON)	  
DP	M2044 M2046 M2047	ON (ON) ON	ON ON ON	ON (ON) (ON)	  

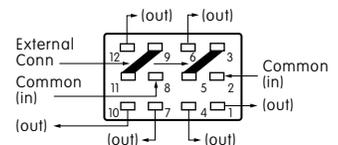
The SP3T model utilizes a double pole base.

External connection must be made during field installation.



The DP3T model utilizes a four pole base.

External connection must be made during field installation.



### SMALL TOGGLES

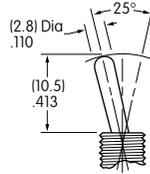
**Important:**

Toggle length changes based on bushing selected. All illustrations are shown with .350" long bushing. When using a .280" long bushing, toggle length increases .070".

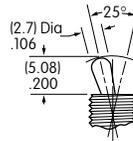
**Standard Material & Finish:**

Brass with Bright Chrome  
Contact factory for optional finishes.

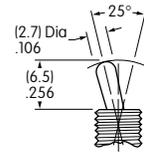
**S** .413" (10.5mm)  
Bat



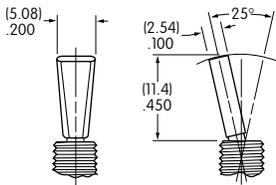
**S2** .200" (5.08mm)  
Bat



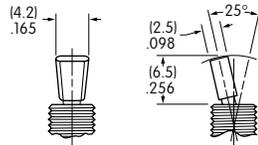
**S3** .256" (6.5mm)  
Bat



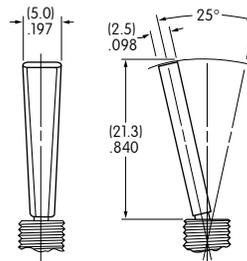
**E** .450" (11.4mm)  
Flatted



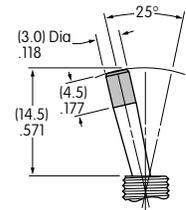
**E2** .256" (6.5mm)  
Flatted



**E4** .840" (21.3mm)  
Flatted



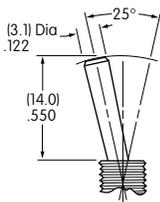
**C** .571" (14.5mm)  
Color Tipped Cone  
Supplied with Cap AT445  
Polycarbonate



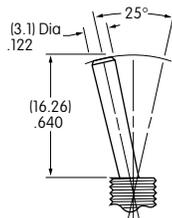
Only Available in 1- & 2-Pole

Only Available in 1- & 2-Pole

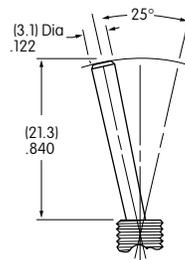
**Q** .550" (14.0mm)  
Cone



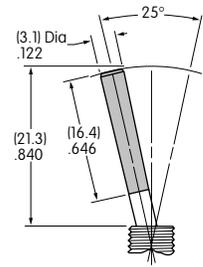
**Q2** .640" (16.26mm)  
Cone



**Q4** .840" (21.3mm)  
Cone



**D** .840" (21.3mm)  
Color Capped Cone  
Supplied with Cap AT460  
Polyethylene



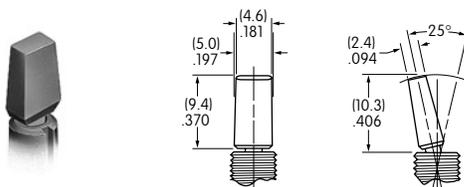
Only Available in 1- & 2-Pole

Only Available in 1- & 2-Pole

Only Available in 1- & 2-Pole

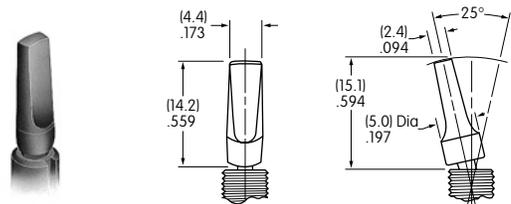
**K1** .370" (9.4mm) Paddle  
Supplied with Cap AT467

Polyamide



**K2** .559" (14.2mm) Paddle  
Supplied with Cap AT468

Polyamide

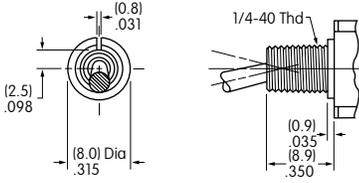


Cap Colors Available:

- A** Black
- B** White
- C** Red
- E** Yellow
- F** Green
- G** Blue
- H** Gray (For K1 & K2 only)

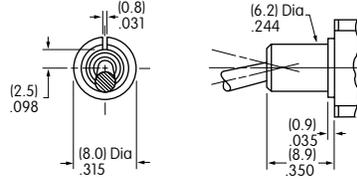
## SMALL BUSHINGS

**S1** 1/4-40 .350" (8.9mm)  
Threaded with Keyway

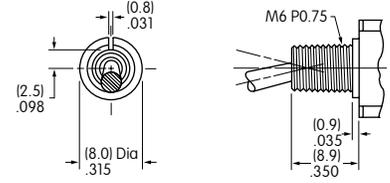


Max. Panel Thickness  
w/Standard Hardware: 2.6mm (.102")

**S2** .350" (8.9mm)  
Smooth with Keyway

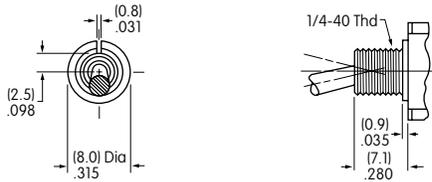


**S4** 6mm/.350" (8.9mm)  
Threaded with Keyway



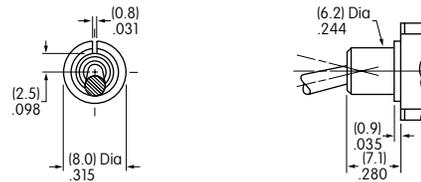
Max. Panel Thickness  
w/Standard Hardware: 2.6mm (.102")

**A1** .280" (7.1mm)  
Threaded with Keyway



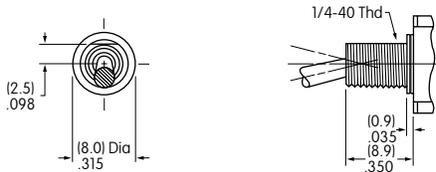
When using this bushing, toggle length is increased by .070".  
Max. Panel Thickness w/Standard Hardware: 0.8mm (.031")

**A2** .280" (7.1mm)  
Smooth with Keyway



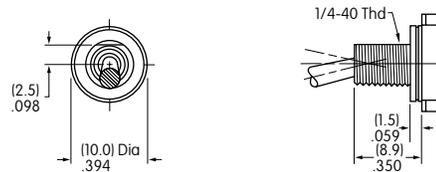
When using this bushing, toggle length is increased by .070".

**D1** .350" (8.9mm)  
Threaded with D Flat



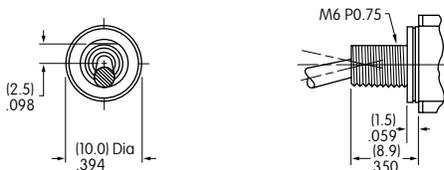
Max. Panel Thickness  
w/Standard Hardware: 2.6mm (.102")

**D3** 1/4-40 .350" (8.9mm)  
Threaded Splashproof with D Flat



D3 combines only with S & S2 toggles.  
Max. Panel Thickness w/Standard Hardware: 4.9mm (.193")

**D8** 6mm/.350" (8.9mm)  
Threaded Splashproof with D Flat

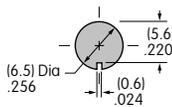


### Standard Hardware Supplied for Small Bushings

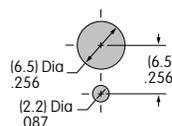
		Bushing Codes					
		S1/S4	A1	D1	D3/D8	L1	L3
Hardware and Quantity	Hex Nut	2	2	2	1	2	1
	Locking Ring	1	1	0	0	1	0
	Lockwasher	1	1	1	0	1	0
	O-ring	0	0	0	1	0	1

### Panel Cutouts

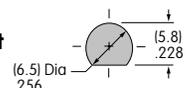
For S1, S2, A1, A2,  
or S4 Bushing  
with Keyway  
& for L1 Bushing



For S1, A1, or  
S4 Bushing  
with Locking Ring  
& for L1 Bushing



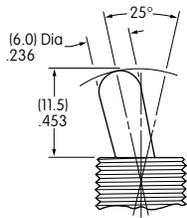
For D1, D3, or D8  
Bushings with D Flat  
& for  
L3 Bushing



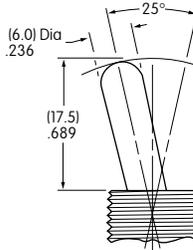
## LARGE TOGGLES

**Toggle & Bushing Combinations:** These toggles combine with the 12mm bushings B1 & B3.

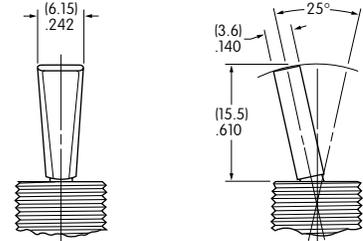
**B** .453" (11.5mm)  
Large Bat



**B2** .689" (17.5mm)  
Large Bat



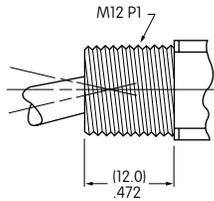
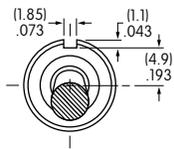
**R** .610" (15.5mm)  
Large Flatted



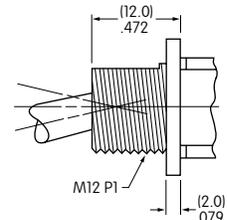
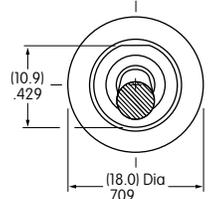
**Standard Material & Finish:** Brass with Bright Chrome  
Optional Finishes: Contact factory for satin chrome or black.

## LARGE BUSHINGS

**B1** Large .472" (12.0mm)  
Threaded with Keyway



**B3** Large .472" (12.0mm)  
Threaded Splashproof with D Flat



Max. Panel Thickness w/Standard Hardware: .216" (5.5mm)

Max. Panel Thickness w/Standard Hardware: .256" (6.5mm)

**Standard Hardware for B1:**

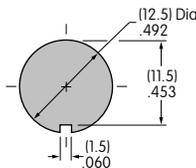
1 hex face nut AT503M, 1 locking ring AT506M,  
1 lockwasher AT508, and 1 hex backup nut AT527M

**Standard Hardware for B3:**

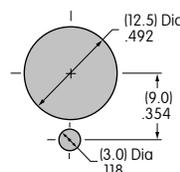
1 hex face nut AT503M  
and 1 o-ring AT401P

### Panel Cutouts

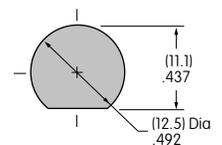
**For B1 Bushing with Keyway**



**For B1 Bushing with Locking Ring**

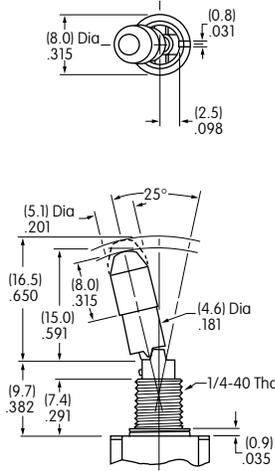


**For B3 Bushing with D Flat**



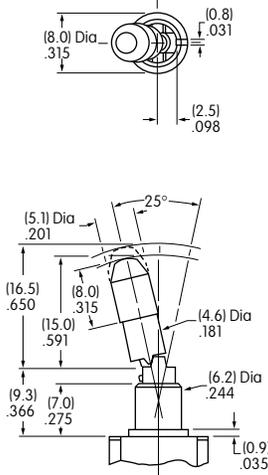
## LOCKING LEVER & BUSHINGS

### LL1 Threaded with Keyway

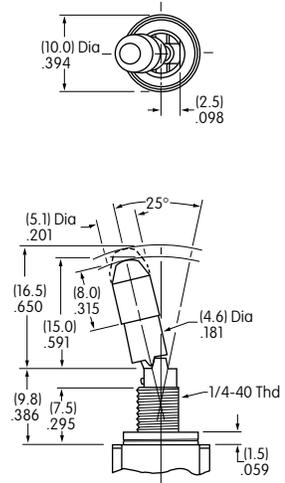


Max. Panel Thickness  
w/Standard Hardware: 1.2mm (.047")

### LL2 Smooth with Keyway



### LL3 .295" (7.5mm) Threaded Splashproof with D Flat

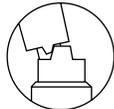


Max. Panel Thickness  
w/Standard Hardware: 1.2mm (.047")

Lever Material & Finish: Brass with Chrome Plating

Locking Mechanism

on-none-on



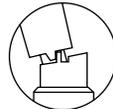
2 positions lock

on-none-(on)



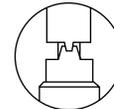
1 position locks

on-off-(on)  
on-on-(on)



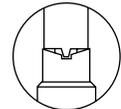
2 positions lock

on-off-on  
on-on-on

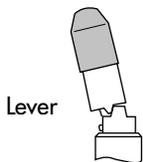


3 positions lock

(on)-off-(on)  
(on)-on-(on)



1 position locks



Supplied with  
Cap AT427

Cap Material:  
Brass with Nickel Plating

Color Codes for Optional Anodized Aluminum Caps

**A**

Black

**C**

Red

**G**

Blue

**H**

Gray  
(natural  
aluminum)

## CONTACT MATERIALS & RATINGS

**W**

Silver over Silver

Power Level

6A @ 125V AC & 3A @ 250V AC

**G**

Gold over Brass or Copper

Logic Level

0.4VA maximum @ 28V AC/DC maximum

Note: See Supplement section to find complete explanation of operating range.

**A**

Gold over Silver

Power Level  
or Logic Level

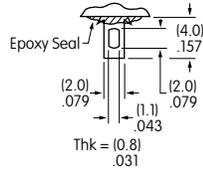
6A @ 125V AC  
or 0.4VA maximum @ 28V AC/DC maximum

Note: This dual rated option is suitable when two or more identical switches are used in logic and in power circuits within the same application. See Supplement section to find complete explanation of dual rating and operating range.

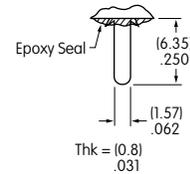
## TERMINALS

### 01 Solder Lug

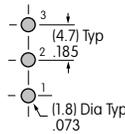
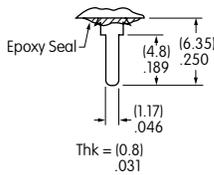
The .043" X .079" oblong hole accommodates 1 solid 18-gauge wire or 2 solid or stranded 20-gauge wires.



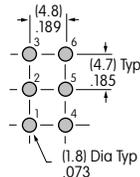
### 02 .062" (1.57mm) Wide Quick Connect



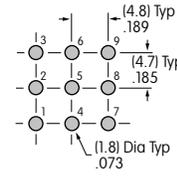
### 03 .250" (6.35mm) Straight PC



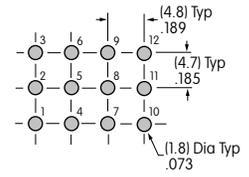
Single Pole



Double Pole



Three Pole



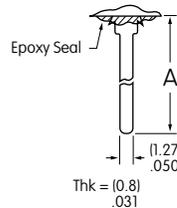
Four Pole

### 05 .425" (10.8mm) Wirewrap or Extended PC

### 06 .750" (19.05mm) Wirewrap or Extended PC

### 07 .964" (24.5mm) Wirewrap or Extended PC

### 08 1.062" (27.0mm) Wirewrap or Extended PC



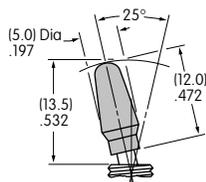
If using as extended PC terminal, refer to the above footprints.

Dimension A = terminal lengths as shown beside the terminal codes at the left.

## OPTIONAL CAPS & CAP COLORS

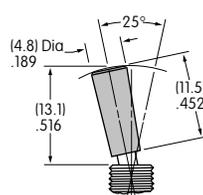
### B AT415 for S Bat Toggle

Material:  
Polyethylene



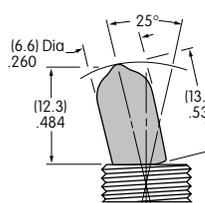
### C AT444 Conical Cap for S Bat Toggle

Material:  
Polyethylene



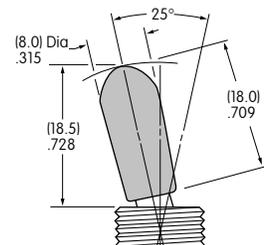
### R AT434 for B Toggle

Material:  
Vinyl Chloride



### V AT406 for B2 Toggle

Material:  
Vinyl Chloride



Cap Colors Available:

- A Black B White C Red E Yellow F Green G Blue